DOC342.52.90848

TEIS 2

User Manual

12/2025, Edition 1

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Section 1 General Information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

1.1 Disclaimer

Hach does not warrant the hardware will work properly in all environments and applications, and makes no warranty and representation, either implied or expressed, with respect to the quality, performance, merchantability, or fitness for a particular purpose.

Hach has made every effort to ensure that this manual is accurate; Hach disclaims liability for any inaccuracies or omissions that may have occurred.

Information in this manual is subject to change without notice and does not represent a commitment on the part of Hach. Hach assumes no responsibility for any inaccuracies that may be contained in this manual. Hach makes no commitment to update or keep current the information in this manual and reserves the right to make improvements to this manual and/or to the products described in this manual, at any time without notice.

If you find information in this manual that is incorrect, misleading, or incomplete, we would appreciate your comments and suggestions.

1.2 Preface

Congratulations on your purchase of your QP1680 system including the TEIS 2 software.

The TEIS 2 software is the QP1680's control platform for your system, providing data acquisition, processing, and instrument control.

This user manual contains important information to assist you in using all features of the TEIS 2 software. It is strongly advised to read the document before starting to work with the instrument.

This manual covers the operation of TEIS 2, software version 2.10.7.

When questions arise, please do not hesitate to contact Hach Technical Support.

1.3 Legal information

Manufacturer: TE Instruments B.V.

Distributor: Hach Lange GmbH

The translation of the manual is approved by the manufacturer.

This derivative manual is based on TE Instruments documentation and that the original instructions have not been misrepresented or altered.

1.4 Warranty

Information on warranty conditions are specified in the sales contract. Contact your Hach representative for further information.

Any unauthorized modification of the software is strictly prohibited and voids all warranty and liability conditions.

1.5 Intended use

The QP1680 Software (TEIS) provides total control of the instrument product line for the analysis of samples.

1.6 Service and Maintenance

For the highest level of performance and safety from your QP1680 instrument, proper attention to maintenance is crucial. We recommend that all service and maintenance for the analyzer and accessories should be carried out by Hach trained and certified service engineers.

To ensure an optimum product performance we recommend an annual maintenance inspection by a trained service engineer.

1.7 Preamble

Before setting up or operating the QP1680 analyzer it is important to read this User Manual thoroughly and completely. Non-observance of the instructions contained in this manual may entail safety hazards.

1.8 Pictograms

In this User Manual, pictograms are used to point out important information.

	Indicates the presence of acids and/or corrosive substances. Non-compliances with the instructions may lead to physical injury.		Instructions preceded by this sign must be complied with exactly. Failure to do so may result in physical injury.
	Indicates that non-compliance with instructions or procedures may lead to physical injury or even death or could cause damage to the instrument.		Attention for an important annotation
	Label used for potentially hot instrument surfaces.		

1.9 Safety information

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

The QP1680 analyzer and software must be used only by trained and qualified personnel.

It is essential that the following safety precautions required for installation and operation of the QP1680 are carefully read and observed. Please ensure that the safety precautions are accessible for every employee working with the QP1680 analyzer.

When the QP1680 are to be used while going through this manual, be aware of the Installation and Handling Precautions. These can be found in the QP1680 User Manual.

Section 2 Introduction

This manual describes the functionality of the TEIS 2 software. From the creation of tasks in the task manager to measuring samples in the sample manager.

2.1 Minimum PC specifications

A summary of the minimum PC specifications required to run TEIS 2.

Table 1 Minimum PC Specifications

Minimum PC Specifications	
Operating-system	Up to TEIS 2.5.0: Windows XP; TEIS 2.5.0+: Windows 7, Windows 10, Windows 11 pro
Interfaces	USB 2.0 or higher
Processor	2 GHz 32-bit or 64-bit dual core processor or faster
Memory	8 GB or higher
Hard drive	10 GB available disk space
Video card	Support for DirectX 9 graphics with 128 MB memory
Monitor	Minimum resolution 1920 x 1080

A sound card is required to hear notifications when a sample or sample list is complete.

TEIS 2 uses the “.” (Point) as decimal separator.

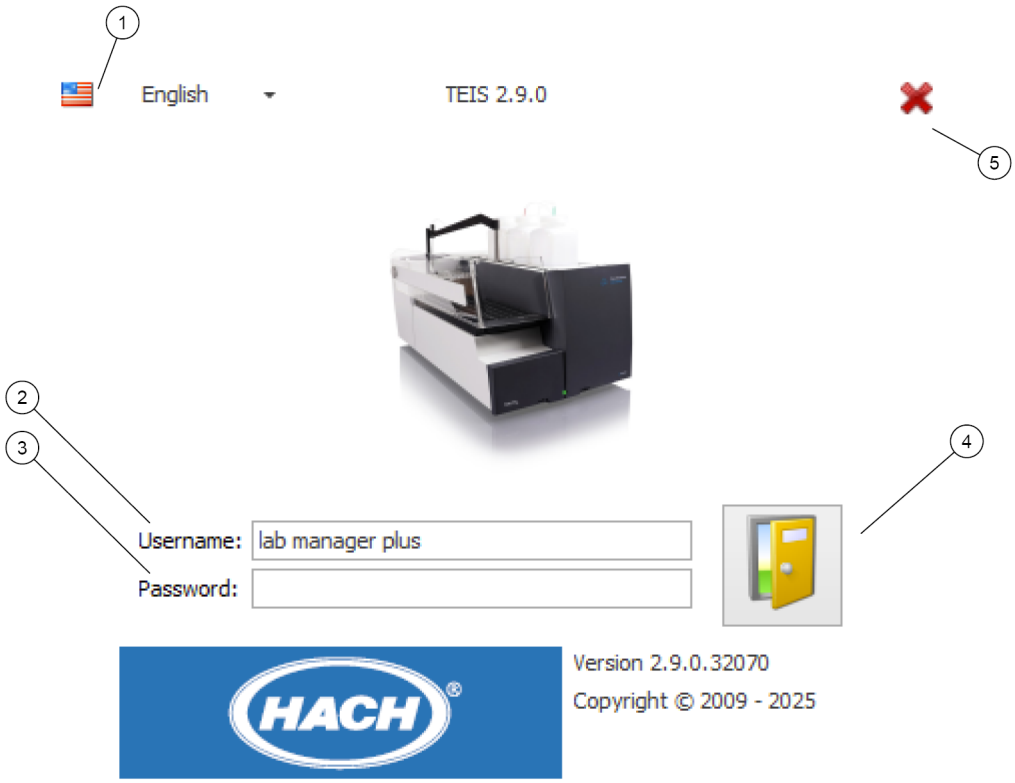
Section 3 Software

3.1 Login TEIS software

The software can be started from the shortcut on the desktop or from the Start menu of Windows.

To use the TEIS software you are required to login first by entering your credentials.

Explanation of the functions of the login screen:



1	Language selection and login with challenge.	**2**	Login button.
3	Username to login.	**4**	Exit login screen.
5	Password to login.		

3.1.1 Default login levels

During a default installation of TEIS 2, the usernames “Analyst” and “Lab manager” are created with no password required. A lab manager can create or change user accounts which users can use to login.

When a “Lab manager plus” account is created as default with a password, this password can be retrieved by a support engineer in special cases to make advanced changes to the software/analyzer.

A valid username and password will grant access to the software by pressing the login button. The software will show only those functions which can be accessed by the user level.

3.1.2 Available login levels

The available login levels and their access privileges are:

Table 2 Software login levels

Login	Access	Functionality
Guest	Read	• Counters. • Configuration – device actions, controllers, log messages, counter center, task manager, status • Sample manager. • System status. • Visual devices. • Dashboard – View.
	Read and write	• Change Language. • Enter challenge. • Print reports, export sample lists. • Create sample group and edit parameters in Add-Sample-Manager, but cannot start task • Calibrate sampler arm
Analyst Includes Guest access.	Read	• Method manager – save, import Methods • Counters -- can reset some counters.
	Read and write	• Method manager – Open, save, import method, view history of method. • Sample manager – edit, run tasks, create sample groups, print reports, start and stop sample manager. Set measurement to fault, delete not analyzed or faulty measurement. • Task manager – Add system method, sample group, tray configuration, start and stop task. Put task on hold, remove task, edit and activate/deactivate weekly planner. • Visual devices – Execute actions. • Dashboard – Import and Export.

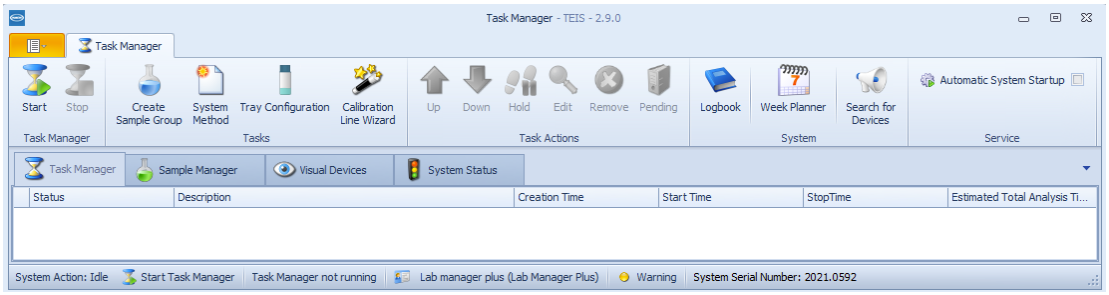
Lab manager (password required) Includes Analyst access.	Read	• Sample Manager -- More sample information. • Configuration – Read device actions and controllers, Interface settings, device status and variables.
	Read and write	• Counters – Reset multiple counters. • Database manager • User manager. • Configuration – Edit and save Interface Settings. • Method manager – Edit user parameter value, method signals. Export method. • Sample manager – enable/disable calibration lines. • System status – Add, edit and remove signals (read and write). • Visual devices – Edit variable boxes. • Dashboard – Full access.
Lab manager plus (password required) Includes Lab manager access.	Read and write	• Configuration – Execute action, disable and enable controllers, area calculation settings, enable and disable device status, edit device variables. • Method manager – Edit method information, script, user parameters. Create, remove and edit methods.
Service engineer (password required) Includes Lab manager plus access. Exclusive access for authorized and trained personnel.	Read	• Counters – Software and system running hours. • Method Manager – Edit build and version of method.
	Read and write	• Counters – Reset counters.

3.1.3 Login With Challenge

When selecting the language drop-down menu, an item called Login with challenge can be selected. When selecting this item, the Username and Password input boxes will change to Challenge and Answer. If you send the text (case sensitive) in the Challenge input box to Hach, an answer is generated and sent back for the user to enter in the answer box which then allows “Service Engineer Rights” for a 24 hour period (Challenge and answer stays the same for 24 hours to re-login if necessary)

3.2 Software Layout

When the software is loaded, a screen, as shown below, will open. The functionality shown varies based on user level.

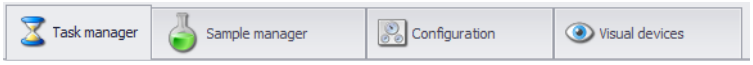


Description of the main layout functionality:

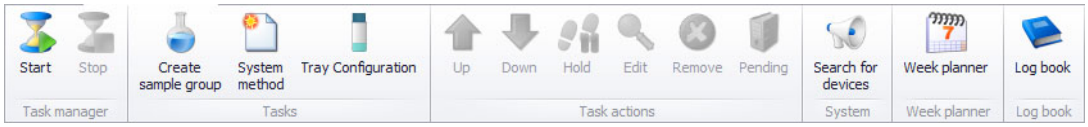
1. Menu.

The menu button is for opening a new window. When a second sample manager is required in order to switch quickly between multiple sample groups, it is possible to open it with the menu button. The selected tab or window becomes the heading of the ribbon. The ribbon is divided in multiple groups, each with functions specific for the selected working area.

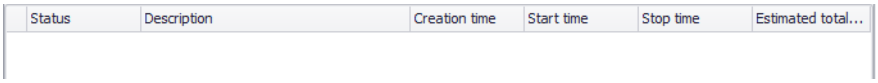
2. Selected window or tab.



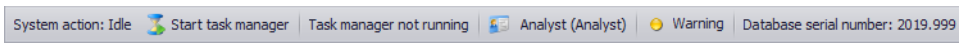
3. Ribbon with actions that the current selected window or tab supports. Some windows have more than one ribbon tabs



4. Working area (under the tab pages).

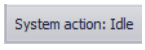


5. Status bar (at the bottom of the main screen).

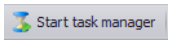


The status bar contains the following items (explained from left to right):

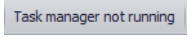
a. Current action of the system.



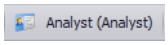
b. Start or Stop Task manager, available from every screen.



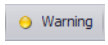
c. The current status of Task manager (Running, Not running or Stopping).



d. The current user, with user level. Clicking this button allows you to login as another user.

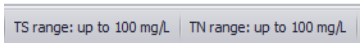


e. The current system state:



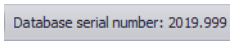
Color	Image	State
Grey		Waiting for device(s) to connect
Green		Idle
Yellow		Warning
Blue		Measuring
Red		Error

f. The current ranges of the TOC and TN detector after they have been set.



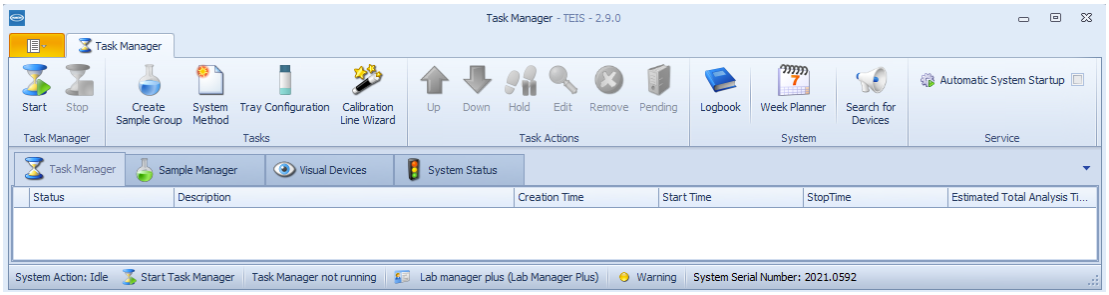
g. The empty space of the bar can show additional information, for example: running time of current sample.

h. The analyzer's serial number and the database serial number (if they do not match it will be shown in red). The database serial number and analyzer serial number should always match, because the settings saved in the database are linked to the analyzer.

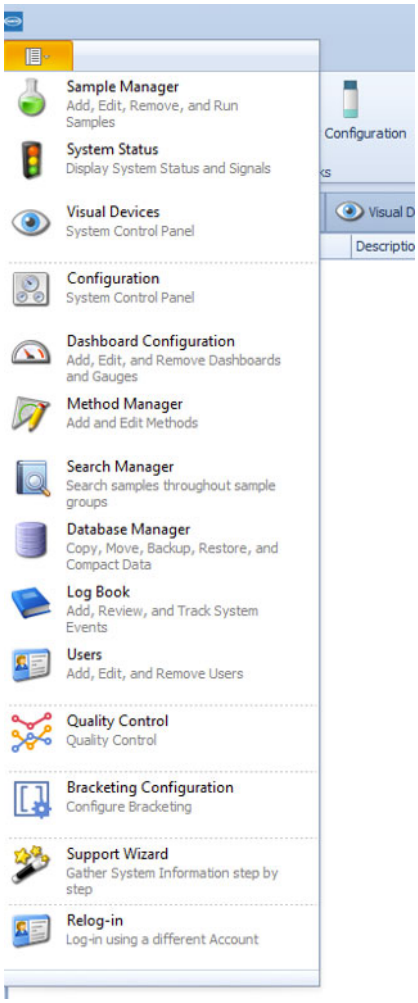


3.3 Docking of Windows

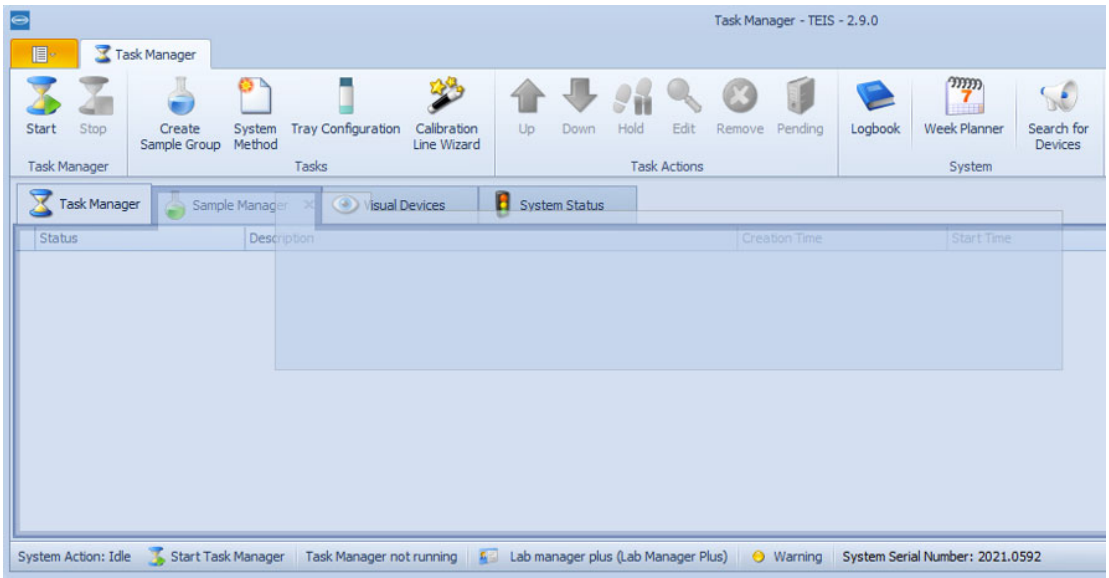
Windows can be arranged as tab-pages and opened at the same time. The content of those windows is visible. This functionality is called docking. In the illustrations below, the pages are docked as tab-pages.



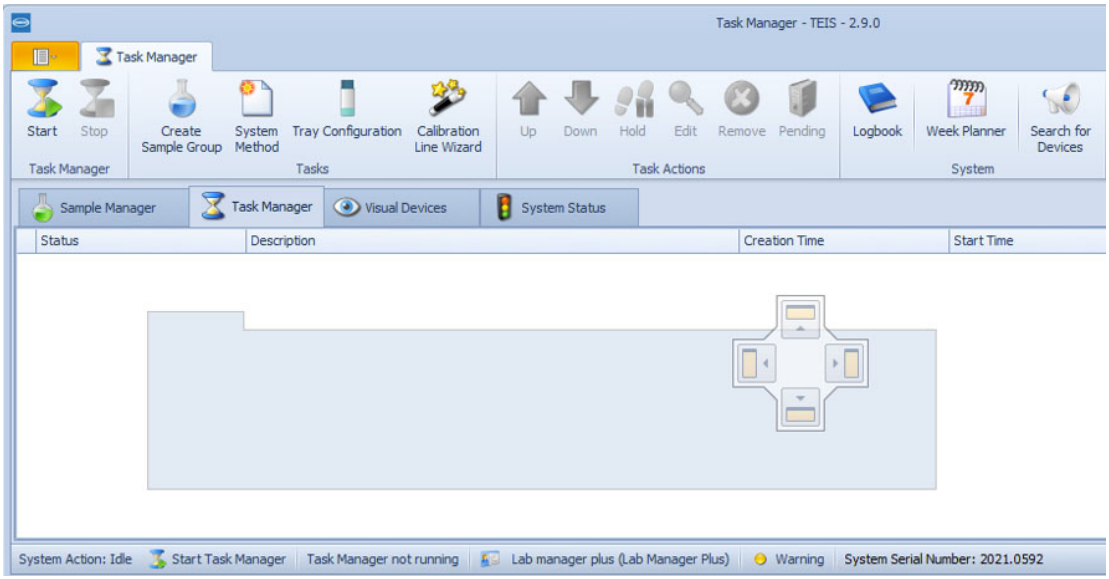
To dock multiple windows, it is required to have multiple windows open. To open a new window, click the menu button and click the window to open it. When the software is first started, multiple windows are opened by default.



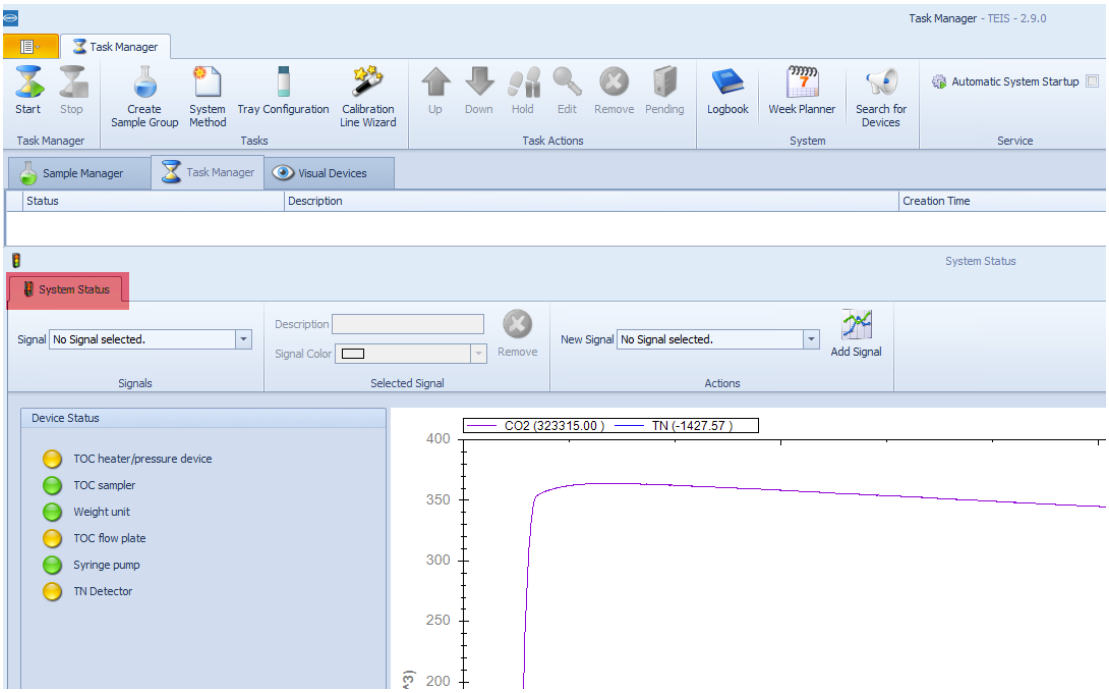
Changing the order of the tab-pages can be done by selecting the tab-page (left mouse click) and dragging it to the desired position. In the example below, the System status can be dragged to the left and positioned, for example, between the Task manager and the Sample manager.



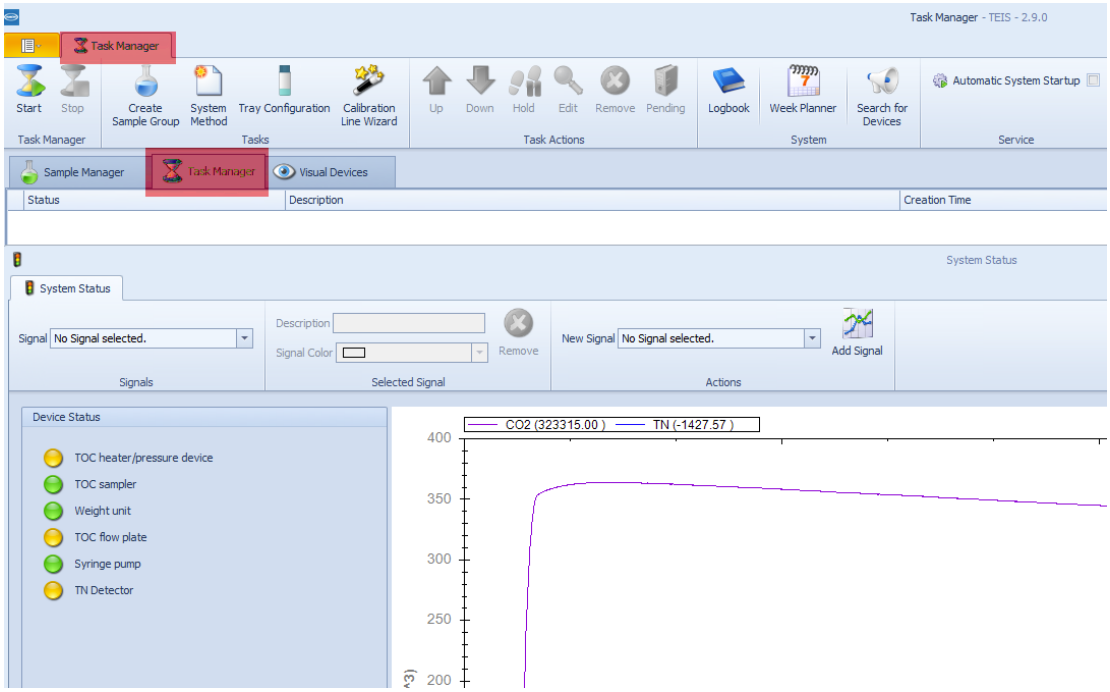
To dock an individual tab-page somewhere else in the screen, click (left mouse button) on the tab (see example above) and drag it away from the headers to the middle of the screen. A docking manager appears, and while still dragging the tab-page, move your mouse indicator over the docking manager to see the different possibilities in docking the tab-page. In the example below the new position of the tab-page is indicated as a blue area, releasing the left mouse button results in the tab-page opening as a separate window at that position.



Now the window is docked at the bottom of the screen (see example below). In the example the System status is docked at the bottom of the screen. The actions in the ribbon are specific for the selected window (in this example the System status).



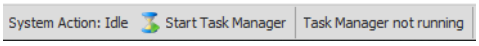
The second example shows that the functions available in the ribbon change when the heading of another tab is selected (indicated in red).



3.4 Task Manager

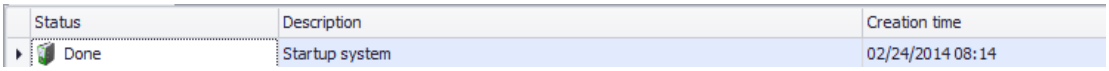
The Task Manager is used to create a task queue. It executes the tasks in the order that they are listed in the table. Tasks can be created, removed, rearranged, started and stopped.

The Task Manager has an entry on the status bar, where it shows the current status and where the user can start/stop the Task Manager. The example below shows Task Manager as Idle.

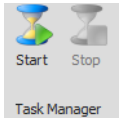


Description of the functions:

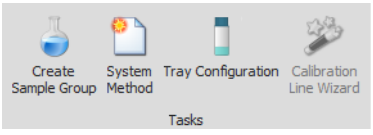
1. The Task table shows the task that is being executed or are scheduled to be executed.



2. The ribbon of the Task Manager shows the Start and Stop button. It also indicates if a task is already running (Start button not available, greyed out), or that the user can start the task (Start button available, Stop button greyed out).



3. The user can create new tasks in the Task manager.

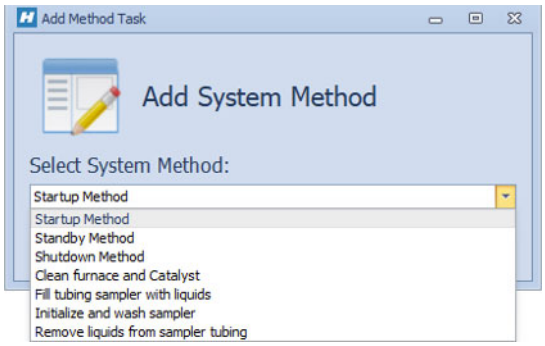


The functions of the ribbon section Tasks in more detail:

a. The button **Create Sample Group** creates a new sample group with samples to be analyzed. How to create a new sample group, is explained in the “Sample Manager” on page 18.

b. The button **System Method** allows for the selection of predetermined methods. For example, a startup method, standby method or shutdown method.
After clicking on System Method, a screen opens, where a system method can be

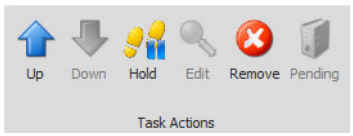
selected from the drop-down menu. The used methods are predetermined based on the configuration of the system and selecting a method may require a certain User login level.



c. The Calibration Line Wizard will be enabled when a supported sampler is connected. For more information, please refer to Calibration Line Wizard on page 69

d. Calibration Line Wizard on page 69.

4. The group Task Actions provides the ability to change the execution of a task selected in the Task table.



The functions of the Task actions part of the ribbon in more detail:

a. The buttons Up and Down move the currently selected task up or down the Task table.

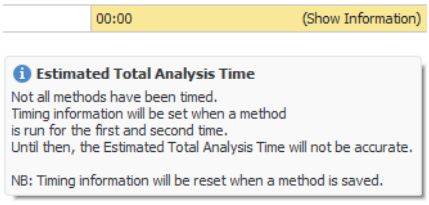
b. The button Hold/Pending toggles the current selected task in the list between Hold (will not be executed) and Pending (will be executed).

c. The button Remove removes the selected task from the Task Manager.

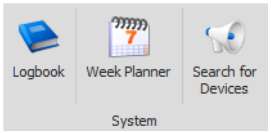
d. The button Pending toggles a task not correctly executed (listed as error) back to pending for execution again.

Table5, Task Manager Columns

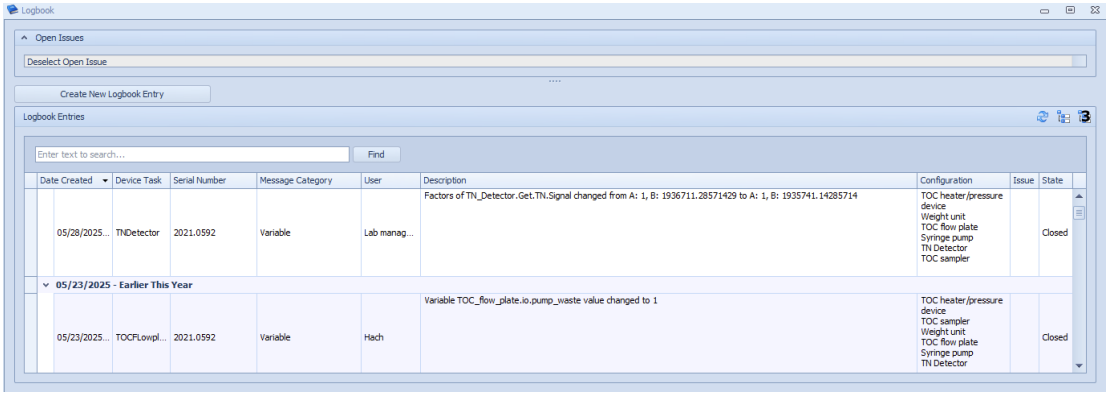
Name	Description
Status	The current status of the task.
Description	Description of the task to execute.
Creation Time	Time the task has been created.
Start Time	Time the task has started or will start execution. This can be changed to a desired date and time in the future.
Stop Time	Time the task has finished executing.

Name	Description
Estimated Total Analysis Time	An estimation of the time required to analyze all non-analyzed samples of the sample group. When a method in the sample group has not yet been run (new or changed), the background of the cell is changed to yellow and a tooltip is available (hover over Show Information). This indicates that the estimate will not be accurate until the method has been used during an analysis at least 2 times. This is to acquire the method duration including and excluding sample preparation time. If a method is used to acquire an NPOC signal, where sample preparation has a large impact on time estimation, the time including sample preparation is used for the 1st injection from a vial to calculate the estimated total time. 

5. The group System provides the ability to start-up/stand-by the system at designated times.

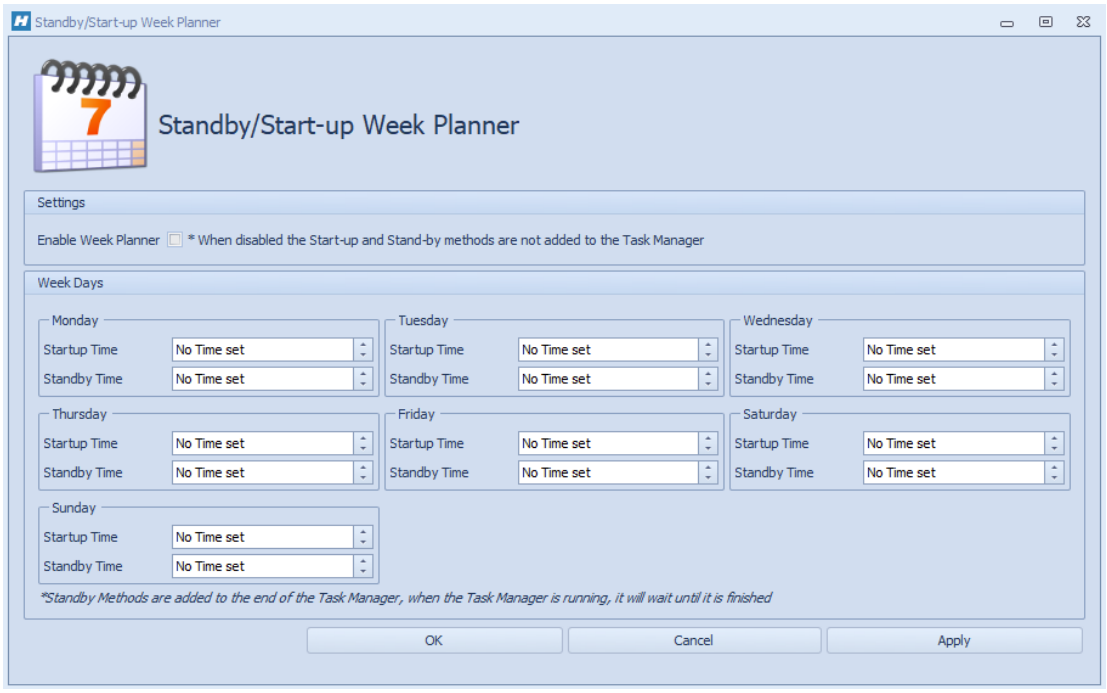


   a. The button Logbook opens a new window where the log entries can be reviewed or added.
   Logbook can be used to manually log changes made to the analyzer or track issues. It is possible to create an issue to link the logbook entries to each other for this issue. It is also used to provide an audit trail for system parameters. For more information refer to “Logbook” on page 53.



   b. The button Week Planner opens a new window where the settings can be changed.

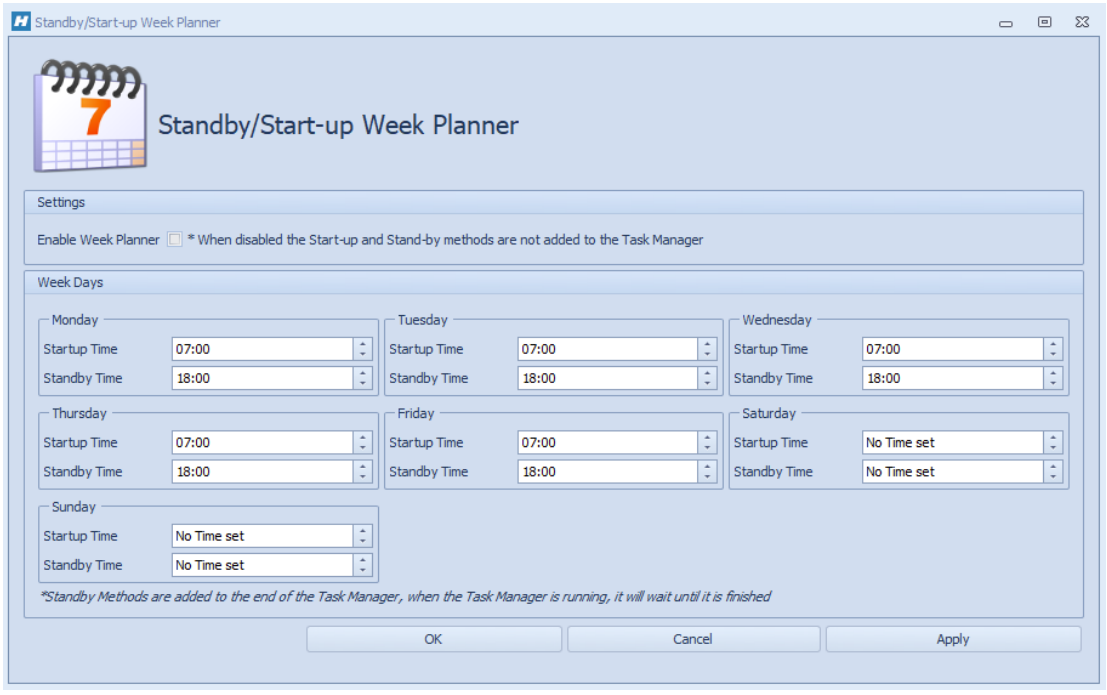
For the week planner to be implemented within the Task Manager the Enable Week Planner box must be checked. If checked, then the days showing a start-up time and standby time will be used in the Task Manager.



Every day of the week, a time can be entered to start-up the analyzer and automatically set the analyzer in standby mode.

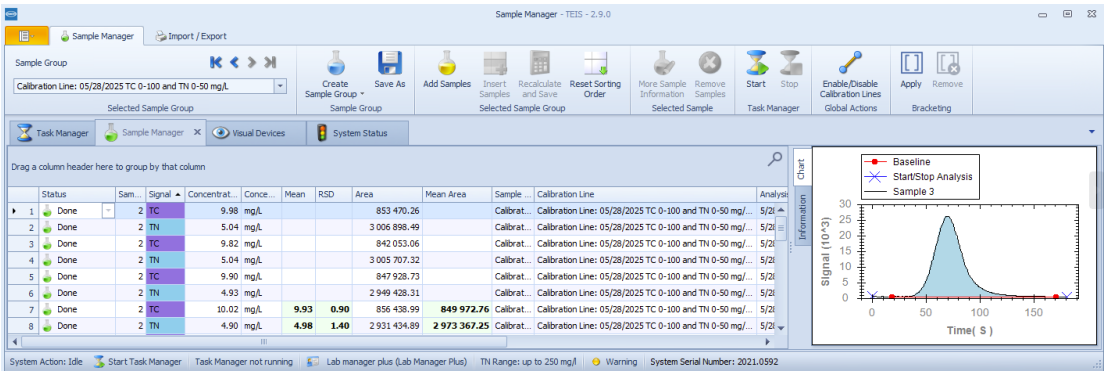
When the analyzer is in standby mode, the startup method is added to the task manager as first task in the queue, and the task manager is started at the time indicated. The startup method is executed and when this is done, the Task Manager is stopped again.

When the time of the standby is reached, the standby method is added to the end of the Task Manager. When the task manager is not running, all tasks in the Task Manager are set to “Hold” and the Task manager is started to execute the standby method. When the Task Manager is running, the standby method is added to the end of the queue if not already there. All sample groups are analyzed and after that the analyzer goes to standby.



3.5 Sample Manager

The Sample Manager manages the samples which are being analyzed or still must be analyzed. The Sample manager allows you to create sample groups, add samples to a sample group, manage sample data and re-evaluate the results.

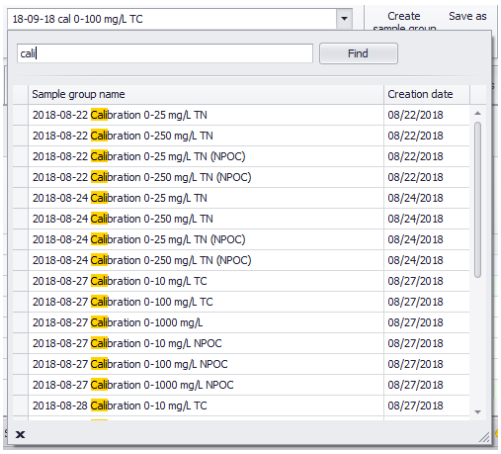


3.5.1 Sample Manager Tab

1. The group **Selected Sample Group** shows the current selected sample group. At startup of the software, the last created sample group is shown, or, when enabled in the settings (Configuration/Interface settings), the last used sample group. The buttons at the top right of the group allow quick navigation through the list of sample groups. They will select the First, Previous, Next, and Last sample group respectively.

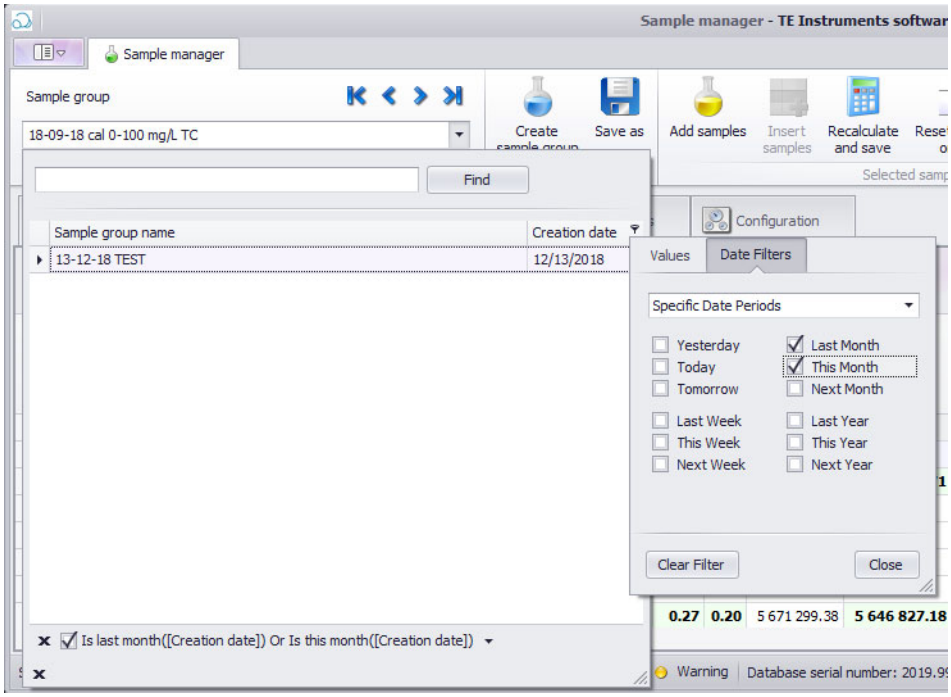
The functions of the Select Sample Group part in more detail:

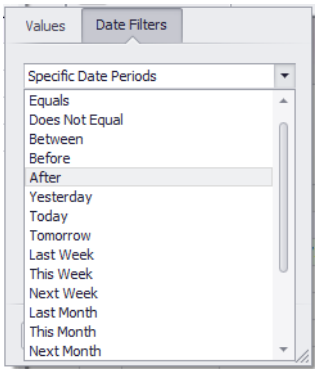
The drop-down window shows all sample groups and allows you to sort on the column headers Sample Group Name or Creation Date. The window also provides a way to search for any text in the Sample Group Name column. Simply type in the box and press Find. To select the sample group from the list, click on it.



The column headers can also be used to filter, by clicking the funnel symbol (). It is shown when hovering the mouse over a column header (top right). An active filter is shown below the list and

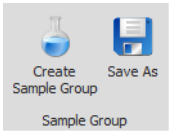
can be removed by selecting the x next to the filter. It can also temporarily be disabled by clearing the checkmark.





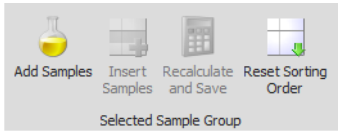
2. The **Sample Group** is for actions regarding the whole sample group.

   a. The button **Create Sample Group** creates a new sample group in order to analyze samples. Refer to “Analyze Samples” on page 41 how to create a new sample group.



   b. The button **Save As** saves the current sample group, including all its information and samples, to a new sample group with a different name. All samples are listed as not analyzed.

3. The group **Selected Sample Group** provides actions which can be performed on the current selected sample group.



   a. The button **Add Samples** adds new samples to the bottom of the current sample list.

   b. The button **Insert Samples** inserts a sample directly above the current selected sample. The button can be pressed if the current selected sample is not yet analyzed.

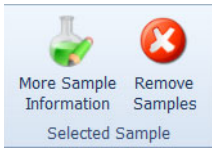
   c. The button **Recalculate and Save** recalculates the sample group and saves all the changes to the database. If changes are made regarding a sample, the row of that sample in the sample table will be (light) red. After recalculation and saving, all red lines are saved, and the rows will reset to the default color.

   d. The button **Reset Sorting Order** removes all custom sorting and groupings in the sample table. It sorts the table in the same order the system analyzes the samples (Analysis ID).

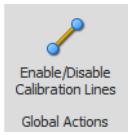
4. The group Selected Samples provides actions which can be performed on the selected samples.

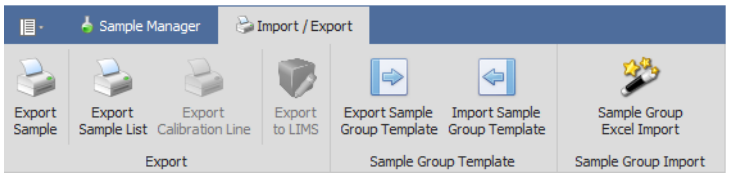
   a. The button More Sample Information opens a new window with all the sample information analyzed and saved.

   b. The button Remove Samples removes all selected samples. Note the status of samples to be removed must be Fault. The login level must be sample manager or higher.



5. Enable/Disable Calibration Lines allows a Lab Manager to prevent older calibration lines from being selected when adding samples. Calibration lines that have been disabled will no longer be shown in the calibration line selection list in the Sample Manager. This button is also available in Database Manager.

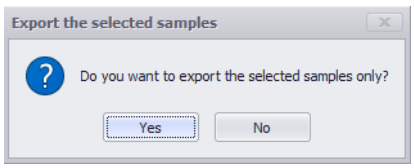




3.5.2 Import / Export Tab

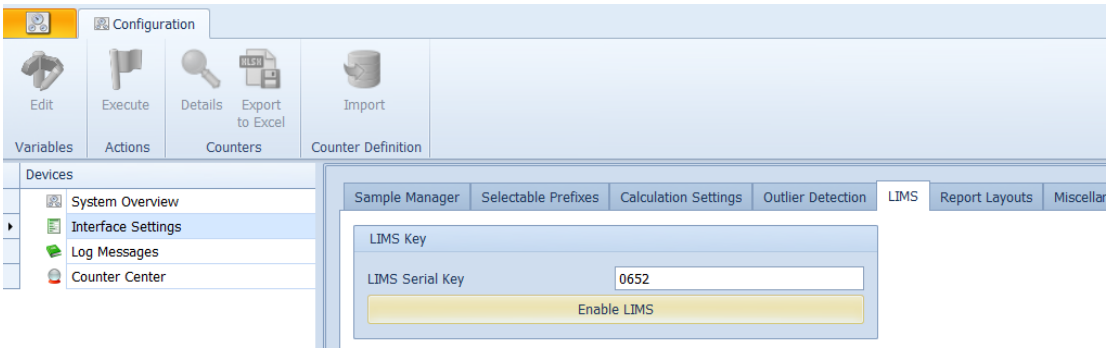
1. The button Export Sample exports all selected samples to a report with data and chart. Each sample selected is exported in a separate report.

2. The button Export Sample List exports the selected sample group to a Sample table report. The sample table report is an overview of the analyzed samples and can be printed or saved. If one sample in the group is selected, the whole group is exported to the report. If multiple samples are selected, only the samples selected will be exported to the report.



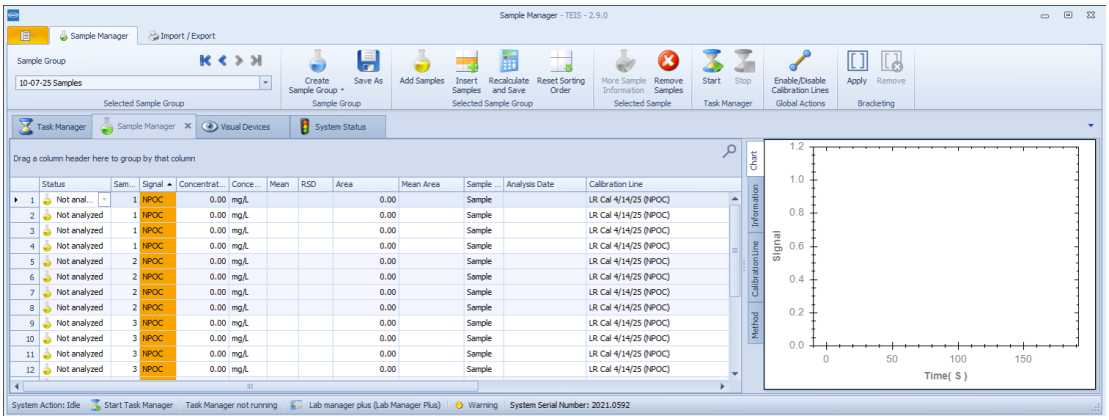
3. The button Export Calibration Line provides the possibility to export the calibration line.

4. The button Export to LIMS exports all selected samples to the LIMS export directory as defined by the user. To enable this button a device-specific LIMS passcode must be ordered and entered. Please contact your Hach representative for more information.

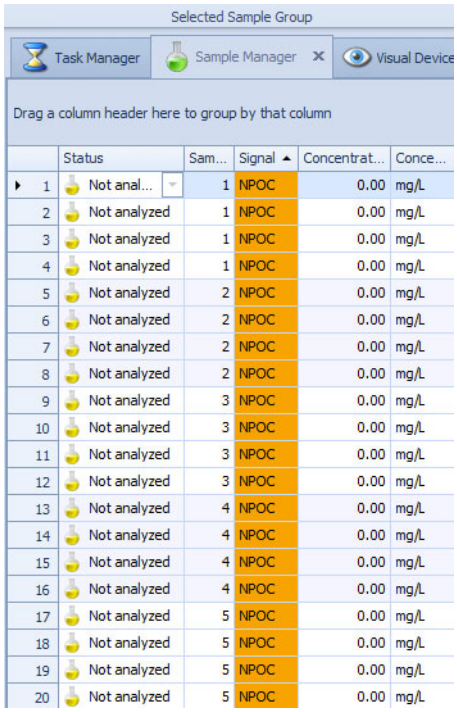


3.5.3 Sample Data and Sample Chart Areas

The sample manager consists of two areas. One displays the sample table (default on the left side) and the other area shows selected sample or sample group **Information**, including a sample data **Chart**, its **Calibration Line**, and its **Method**.

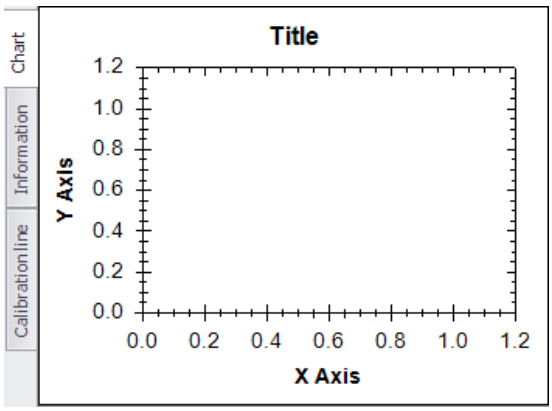


1. The sample table contains all sample data entered by the user and calculated by the software. The data from the sample can be changed. The possibility of changing the data of a column will depend on the status of the sample. For example: a sample position can only be changed when a sample is not analyzed.

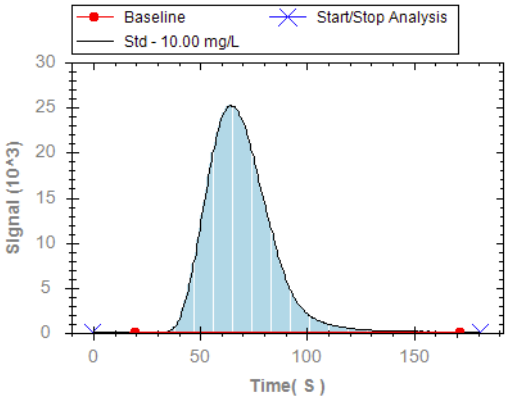


	Status	Sam...	Signal	Concentrat...	Conce...
1	Not anal...	1	NPOC	0.00	mg/L
2	Not analyzed	1	NPOC	0.00	mg/L
3	Not analyzed	1	NPOC	0.00	mg/L
4	Not analyzed	1	NPOC	0.00	mg/L
5	Not analyzed	2	NPOC	0.00	mg/L
6	Not analyzed	2	NPOC	0.00	mg/L
7	Not analyzed	2	NPOC	0.00	mg/L
8	Not analyzed	2	NPOC	0.00	mg/L
9	Not analyzed	3	NPOC	0.00	mg/L
10	Not analyzed	3	NPOC	0.00	mg/L
11	Not analyzed	3	NPOC	0.00	mg/L
12	Not analyzed	3	NPOC	0.00	mg/L
13	Not analyzed	4	NPOC	0.00	mg/L
14	Not analyzed	4	NPOC	0.00	mg/L
15	Not analyzed	4	NPOC	0.00	mg/L
16	Not analyzed	4	NPOC	0.00	mg/L
17	Not analyzed	5	NPOC	0.00	mg/L
18	Not analyzed	5	NPOC	0.00	mg/L
19	Not analyzed	5	NPOC	0.00	mg/L
20	Not analyzed	5	NPOC	0.00	mg/L

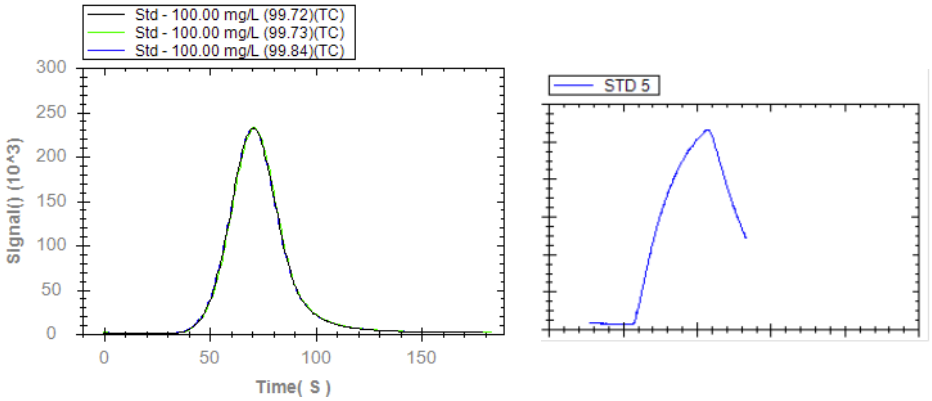
2. The chart area has multiple tab pages (in the figure below visible on the left side). Depending on the selected sample type the detector signal will become visible.



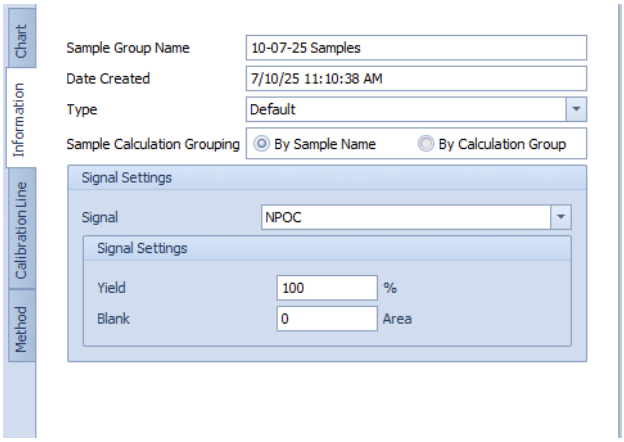
a. If one analyzed sample is selected, the user can change the baseline's start and stop position on the chart window. Click and hold on a red dot using the left mouse button, drag it to the desired position, then release the mouse button. Press recalculate and save to apply the changes and re-integrate the sample. The calculated area is shown by the blue color under the graph. The area above the baseline is taken as positive area count, area under the baseline as negative area count (and will be subtracted from the positive area count).



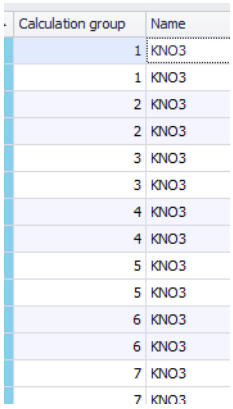
b. When multiple analyzed samples are selected, the software will show an overlay of up to 6 samples in the graphs, allowing the data to be compared.



c. When a sample is being analyzed (measuring state), selecting it will show the progress of the acquired data for that signal type. Selecting multiple samples will show an overlay of the progress.

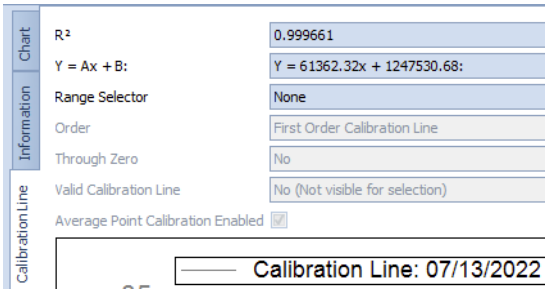


3. On the tab page **Information**, information of the sample group is shown. The group Type, Yield and Blank can be changed per signal. Sample Calculation Grouping defines how samples are grouped together when calculating average values (Mean, SD, RSD, Mean area, SD area, and RSD area, etc.). The default is By sample name, but new sample groups will use the setting set in Configuration, Interface settings, which by default is set to By Sample Name. Selecting By Calculation Group will group samples based on the Sample Name, Sample Type, Quantity, Real Concentration, Method Name, and Range Method Name values. It will also insert a Calculation Group column next to the Sample Name column. Changing any of its constituent columns will automatically update the Calculation Group.

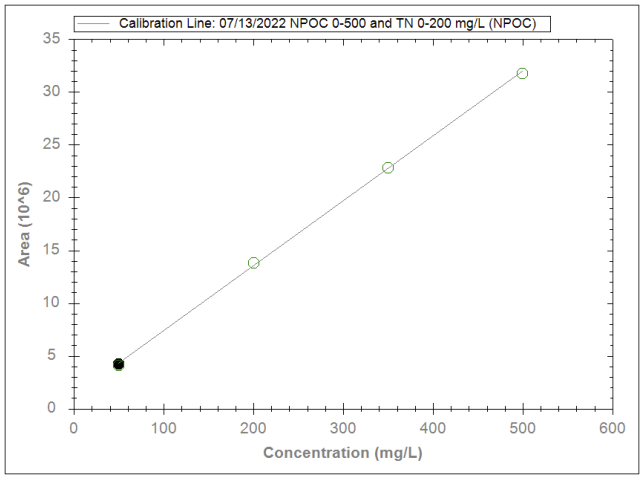


Calculation group	Name
1	KNO3
1	KNO3
2	KNO3
2	KNO3
3	KNO3
3	KNO3
4	KNO3
4	KNO3
5	KNO3
5	KNO3
6	KNO3
6	KNO3
7	KNO3
7	KNO3

4. On the tab page Calibration Line, the R2 and the calibration line equation are displayed. When the sample group type is set to Calibration Line, the calibration line information can be changed. The calibration line order can be set to First- or Second Order Calibration Line if the line should go Through Zero or not.
When Valid Calibration Line is set to No (Not visible for selection), the calibration line cannot be selected for new analysis.
Enabling Average Point Calibration will calculate R2 based on the average area.



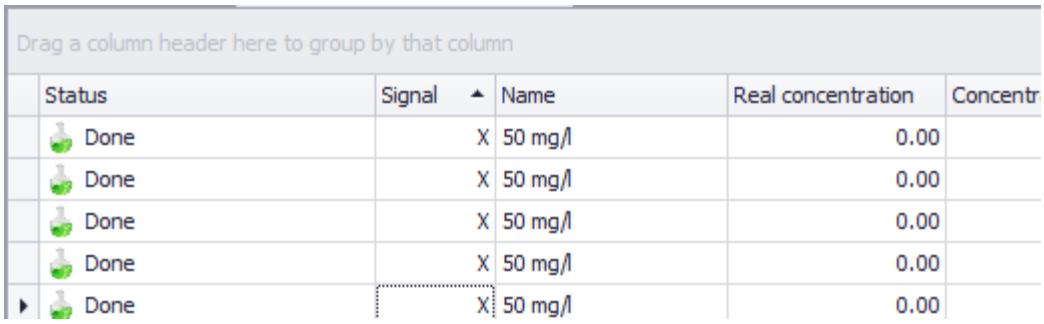
The selected sample is represented as a black point in the chart. When a Sample Type is Sample, the following is shown:



The information box additionally shows the calculated concentration on the calibration line in brackets, next to the area. The corresponding connecting line to the concentration axis is omitted.

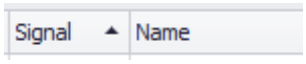
3.5.4 Sample Table

The sample table in Sample manager, can be configured to your preference. It is possible to sort on every column, move the columns and hide/show columns.

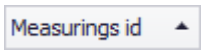


Description of the functions:

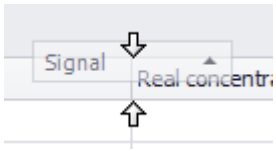
1. The column headers show a description of the data in the column.



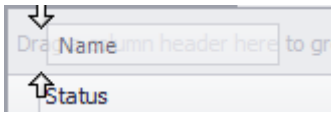
2. A column with a little arrow on the right indicates that the table is sorted on that column in the order shown by the arrow.



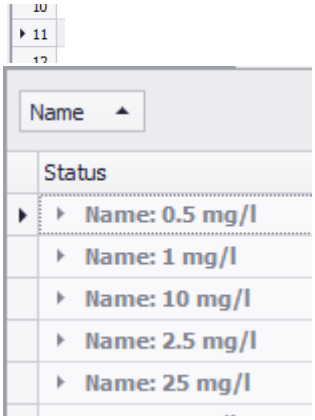
3. The order of the columns can be changed by dragging (left mouse button) a column header to the desired position (left to right or right to left).



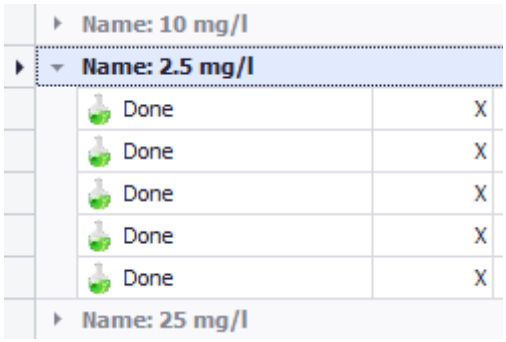
4. If you drag a column header to the row above the columns, the table will be grouped on that column. The row above the headers can be identified by the text “Drag a column header here to group by that column”.



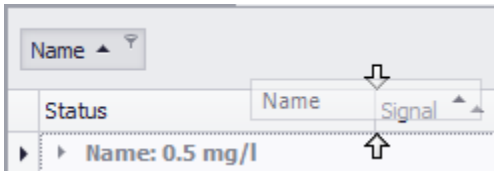
5. The small arrow on the left side of the table indicates the current selected row.
6. Grouping samples may simplify finding a result. For example, grouping results on name: all sample names are grouped with each other.



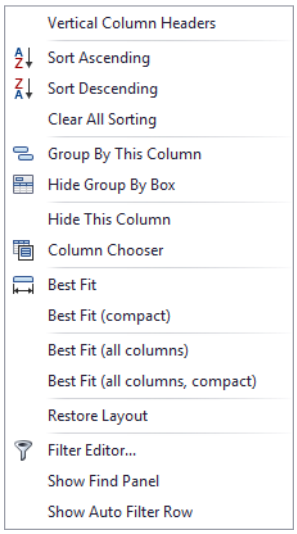
7. The small arrow next to the grouped sample allows the group to expand. In the example below, it shows all the samples with the same Name: 2.5 mg/l.



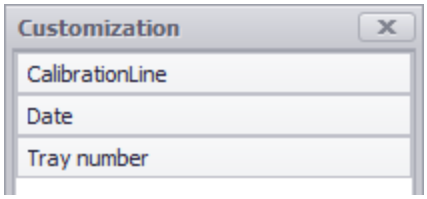
8. Dragging the column out of the group area puts the column back between the rest of the columns of the table.



9. Right clicking on a column header will show a context menu, allowing you to sort and group. It further allows you to switch the column headers to be shown vertically. Selecting Best Fit (all columns, compact), all columns will be resized to best fit their contents, ignoring the column header. Restore Layout will undo the changes and restore the previously stored layout settings. The layout settings are stored when Sample Manager is closed or when TEIS 2 is closed. Refer to “Sample Table Column Definitions” on page 25 and “Sample Type Definitions” on page 27..



10. The Column Chooser allows to hide and show columns in the table. To open the Column Chooser right click on a column header and click on Column Chooser. The window which opens allows you to remove and add columns by dragging and dropping them to the headers.



11. Columns can also be removed from the Sample table by dragging the columns header until the mouse indicator changes into a cross. Releasing the left mouse button will result in the column being removed (made invisible) from the Sample table. It can be added back by using the **Column Chooser**.

Table 3 Sample Table Column Definitions

Name	Description
Analysis Date	The date and time the sample analysis was started.
Analysis ID	The order in which the samples are analyzed.
Analyst	The name or initials of the analyst who performed the analysis.
Area	The area calculated by the software.
Calculation Group	An indication of the grouping applied to the sample for calculation of grouped results. Refer to 3.5.2 Import / Export Tab on page 20.
Calibration Line	The calibration line used to calculate the concentration of the sample.
Calibration Line Range	
Comment	A comment or note.
Concentration	The concentration calculated by the software.
Concentration Unit	The unit of the **Concentration** and **Real Concentration**.

Configuration Method	A configuration method is executed before measuring a sample to reconfigure the analyzer for every sample. For example: Change the loops of the GLS for every sample.
Creation Date	Sample Group creation date.
Creation ID	The order in which the samples have been created.
Density	The density of the sample (kg/m^3).
Dilution	The dilution factor of the sample.
Dosed Volume	CIC: sample quantity dosed in the vial. QP1680: injected sample quantity.
Element Type	The element that will be analyzed.
Mean	The mean of the concentrations of samples, grouped according to the **Sample Calculation Grouping** setting.
Mean Area	The mean of the area of samples, grouped according to the **Sample Calculation Grouping** setting.
Method	The method used to analyze the sample. When the sample is not analyzed, the method may be changed.
Mol Weight	The molecular weight of the element used for calculation (g/mol).
Name	The name given to the sample by the user. For samples with the same name the Mean, RSD and SD are calculated, when **Sample Calculation Grouping** is set to **By Sample Name**.
Outlier	Indicates whether the sample was flagged or added (reinjection) by Outlier Detection.
Outlier Source ID	Used by GESD Outlier Detection to refer to the originating Sample ID.
Prepared Method name	The method used to prepare the sample. This method is only executed once for every sample name and/or position. For example: Purge out IC to analyze NPOC on the QP1680.
QC Comment	User comment from a QC Chart. Refer to 9.7 Quality Control on page 69.
QC System Comment	Comment set by the system from a QC Chart. Refer to 9.7 Quality Control on page 69.
Quality Control Chart	QC Chart reference and flag color, when set. Refer to 9.7 Quality Control on page 69.
Quantity	The amount of sample used for the analysis.
Quantity Unit	The unit of the **Quantity**.
Range Selector	
Real Concentration	The entered real concentration of a standard.
RSD	The RSD of samples, grouped according to the **Sample Calculation Grouping** setting.
RSD Area	The RSD of the area of samples, grouped according to the **Sample Calculation Grouping** setting.
Sample Blank Area	Blank Area to subtract from Area.
Sample Group Date	Only used in Sample Search, creation date of the sample group.

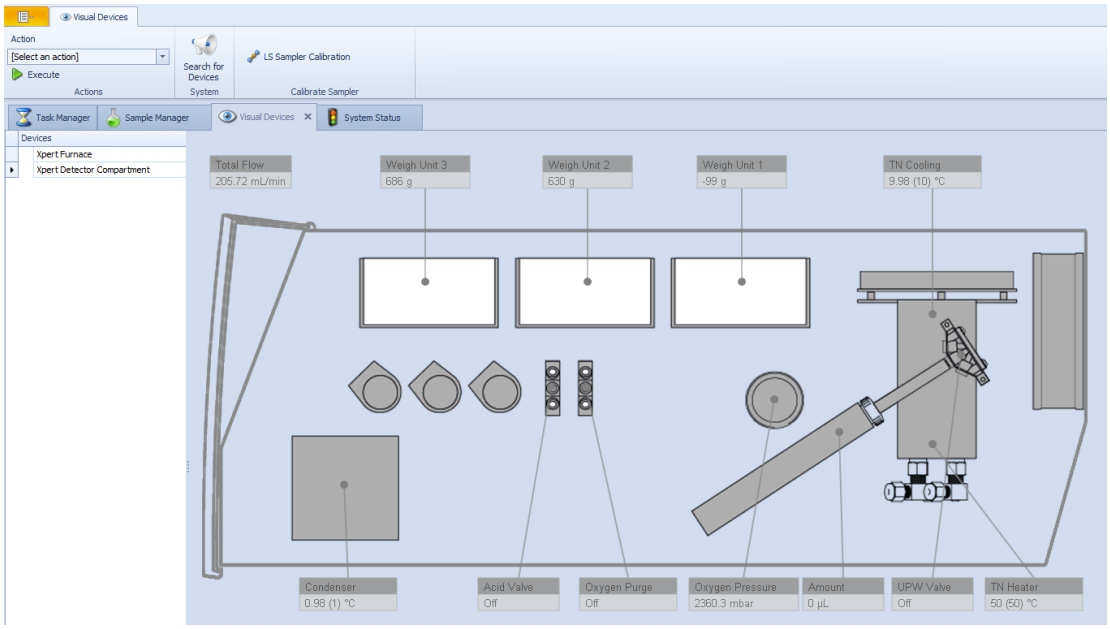
Sample Group Name	Only used in Sample Search, name of the sample group.
Sample ID	A unique number assigned by the database.
Sample Position	The position of the sample in the tray.
Sample Type	Type of sample how it is handled by the software, refer to Sample Type Definitions on page 27 for further explanation.
SD	The SD of samples, grouped according to the **Sample Calculation Grouping** setting.
SD Area	The SD of the area of samples, grouped according to the **Sample Calculation Grouping** setting.
Signal	The main signal of the sample.
Status	The current status of the sample. The status can be changed from **Done** to **Fault** and vice versa. The software changes the status from **Not Measured** to **Done** or **Fault**. Samples set to **Fault** are not used in calculations.
System Serial Number	The serial number of the system used to acquire the data.
Tray Number	The tray in which the sample is positioned.
Variable 1	
Variable 2	
Variable 3	
Variable 4	

Table 4 Sample Type Definitions

Name	Description
Blank (do not use)	Blank sample is used to determine the blank area for the system and/or solvent blank. When samples are marked as blank, the mean area of those samples are used to determine the group blank. Group blank stored with the sample group and can be found under *Information -> signal settings -> blank*.
Calibration	When the sample group is marked as calibration line (*Information -> Type*), all samples set to “calibration” are used to create the calibration line. When a blank area is used, this area is first subtracted before the results are calculated.
Reference (do not use)	A reference sample is used to determine the yield of a sample group. When samples are marked as Reference, the mean yield of those samples are used to determine the group yield. Sample group yield can be found at *Information -> signal settings -> Yield*. Yield is a percent recovery. Yield is calculated as the concentration relative to the entered ‘Real Concentration’.
Sample	Samples marked as sample are calculated with correction of blank on the area, then the calibration line is used to create a concentration, which is corrected for the yield.

3.6 Visual Devices

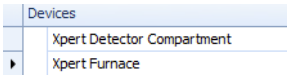
The Visual Devices screen shows information of all connected devices. Actions can be performed on a selected device, for example initializing the introduction module.



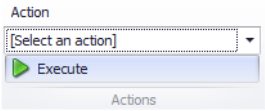
Search for Devices button will retry to connect to Hach supported devices.

Description of the functions:

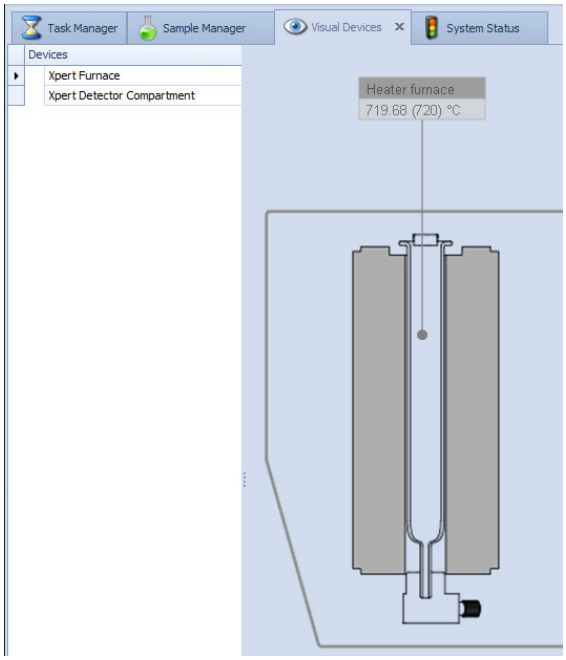
1. On the left side of the screen a list of connected devices can be found. Select a device to make its information visible. When this list is empty, no devices are connected.



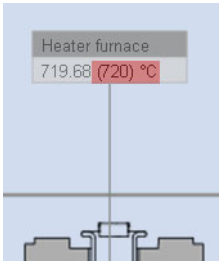
2. In the ribbon of the Visual devices a drop-down menu is present containing the available actions for the selected device. When an action is selected, the button Execute should be clicked to execute the action.



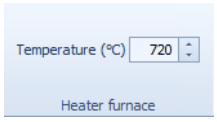
3. The image of the device shown below, displays the actual temperature and the setpoint (between brackets) for the furnace.



4. With user level ”Lab manager” and higher (refer to Software login levels on page 8), the value of parameters can be changed when the analyzer is not measuring. Note: when an analysis is started, values from the method will overwrite the manually set values.



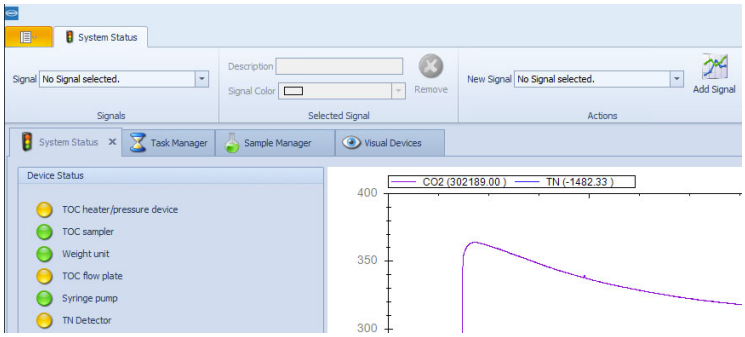
5. When a box is selected, that can be changed, an edit field will be visible in the ribbon. Press enter to store the new value.



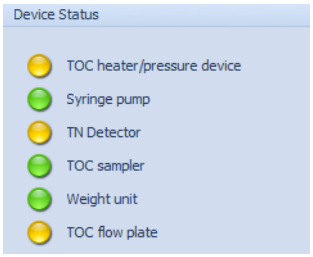
3.7 System Status

The system status shows the current connected devices with their status. It contains a chart with the main signals and signals added by the user.

Description of the functions:



1. On the left side of the system status screen the currently connected devices are shown with their status.

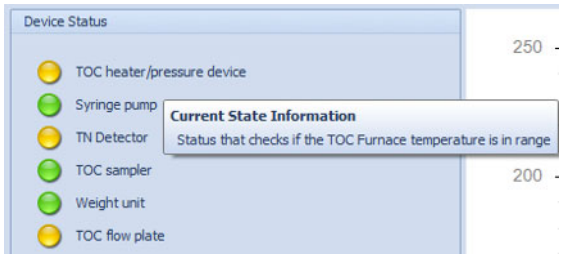


The color in front of the device displays the status of the device.

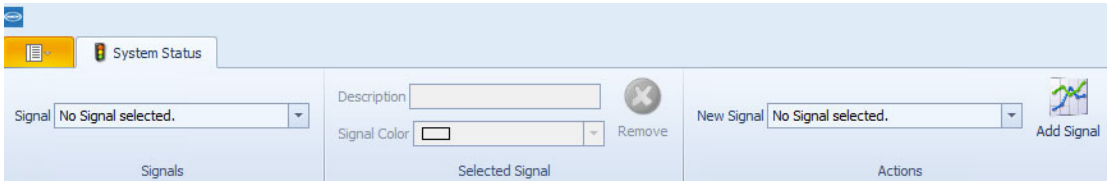
Table 5 Device status

Color	Image	State
Green		The device is ready for analysis.
Yellow		The device is not ready (out of range).
Red		The device is in error.
Blue		The device is measuring.

Hover the mouse over a device to show a tooltip with information which status is out of range. The message shown varies for each device. When all devices are in range it is possible to analyze samples, the method waits for a ready signal from all devices.

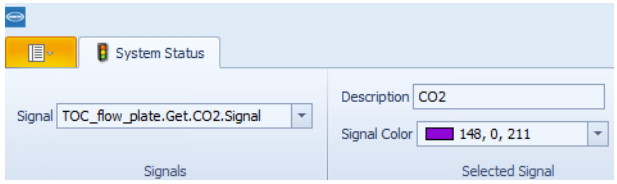


2. When the system status is selected the ribbon shows information about the signal shown in the chart of the system status.

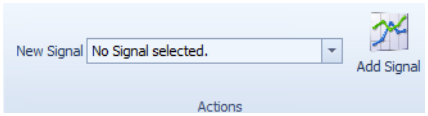


If the logged-in user level is at least Lab manager, s(he) can add, remove and edit signals in the System status. From the ribbon group Signals a signal that is currently present in the chart can be selected.

3. In the ribbon group Selected signal the line color and description of the selected signal can be changed. A signal can be removed from the chart when no longer required. The main signals will be automatically added to the chart when the analyzer connects.



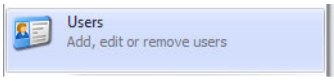
4. The ribbon group Actions allows you to add new signals to the chart. The dropdown list New signal contains all signals currently connected. Select the signal you want to add and click the button Add signal. The signal will be added to the chart.



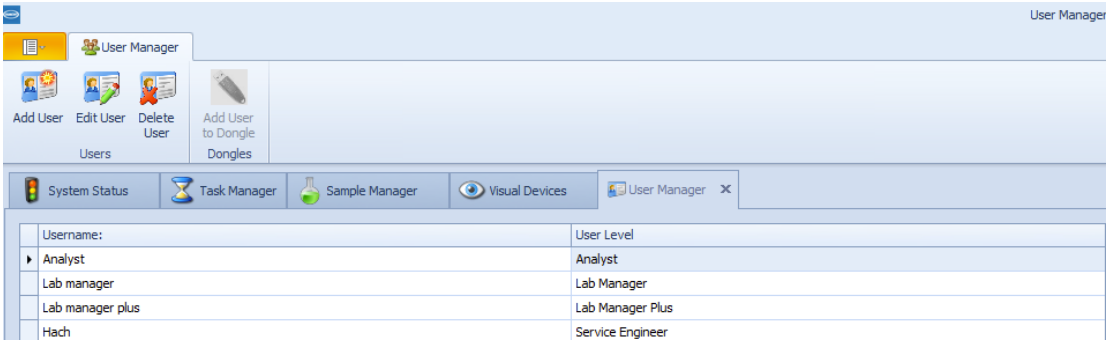
3.8 User Manager

User manager allows the lab manager login (or higher) to add, remove and edit users.

The User manager can be opened by selecting Users from the menu.

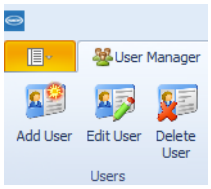


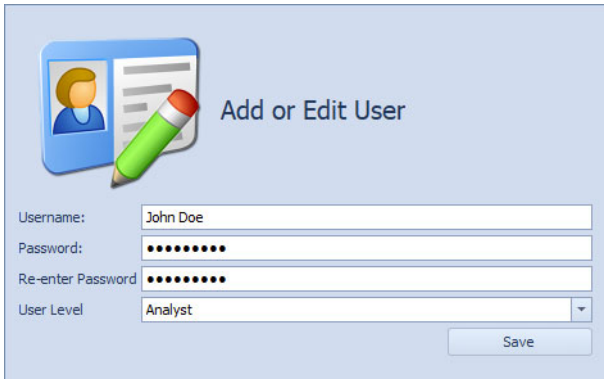
The ribbon group Users shows the actions to add, edit and delete a user.



To add a user, click Add user from the ribbon. A new screen will appear, enter all data to create a new user.

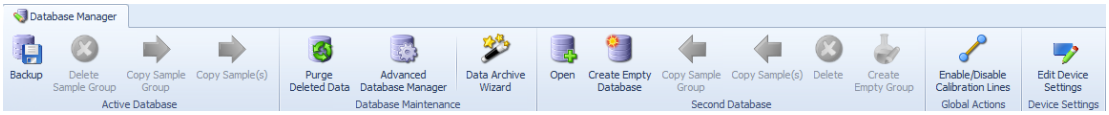
A password for the user is optional. Click Save to add the new user. To edit or delete a user, select the user from the table and click Edit/Remove user from the ribbon.





3.9 Database Manager

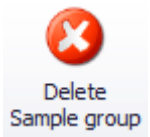
The Database Manager allows the user to create a backup of the current database, export, import or remove sample groups, or a single sample. It will also allow basic maintenance of the database. To open the Database Manager the logged-in user must be at least Lab manager.



Description of the functions:

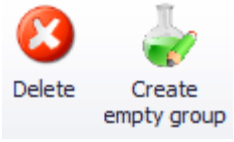
1. To create a full backup (= copy) of the current database, click Backup. Select a location to save the backup of the database (note: due to database engine restrictions, this cannot be on a network share). The backup contains all data, sample data, configuration and settings.
   The table on the left side of the screen shows the current sample groups in the database. The right side shows an open second database, the destination database.

2. To delete a sample group from the current database, it is required to create a backup first. After the creation of the backup, the deleted functionality will be enabled until the Database Manager is closed.



3. The ribbon Second Database allows the user to copy data from and to a backup or a previously created database.


Press Open to browse for the second database (note: due to database engine restrictions, this cannot be on a network share).
Create Empty Database will create a new database at the provided location, allowing you to copy data from the current database.
When a database file is opened, copying sample groups and samples to the other database is possible. To copy samples, select a sample group on the database where the data needs to be copied to. Then select the samples that need to be copied and click Copy Sample. To copy a sample group, select a sample group and click Copy Sample Group.

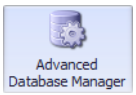
4. Data can be removed from the open second database file. Select the sample or sample group and click Delete. To create a new empty sample group in the open second database to save certain samples, click Create Empty Group.


5. Database Maintenance allows you to purge the current database of deleted items and perform more advanced database maintenance.

   a. For performance reasons, deleted items are not removed, but marked as deleted. Purge Deleted Data will remove these items from the database, allowing for the freed-up database space to be reused. Note, this will not free up disk space, it will merely allow the database engine to recycle the space that has already been allocated and thus minimize the need to expand the database on disk. Purging for the first time may take a considerable amount of time (~30-45 min/10GB). It depends on the amount of data in the database, the amount of purge-able data and the overall speed of the computer system (cpu/disk/etc).


      Tip: When purging on a regular basis (eg. once a month/once per quarter), the time required to purge will decrease compared to the first time.

      Note: Purge cannot be used while the system is running. Task Manager should not be running, and Week Planner's startups should not coincide with an ongoing purge.

   b. Advanced Database Manager has the following functionality:


   - Compact (backup, restore and replace)
   - Backup
   - Restore and replace

Advanced Database Manager (ADM) is a separate tool and requires exclusive access to the database, it is therefore required to close TEIS. Clicking the button will start ADM and issue TEIS to close, which in turn will prompt if you really want to close TEIS, please confirm the dialog before proceeding with ADM.

Compact will create a backup of the data in the database (note: this is not the same as the backup referred to in 3.9.1, which is a copy of the database file), restore the backup of the data into a new database, and then swap current database with the new database, and rename the original (previous current).

Backup will create a backup of the data in the database.

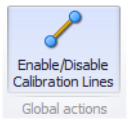
Restore and replace will recreate a new database from the backup and swap it with the current database.

Advanced Database Manager can also be used from the command line to automate any of the actions mentioned above.

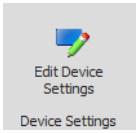
For more information, please read the Advanced Database Manager manual.

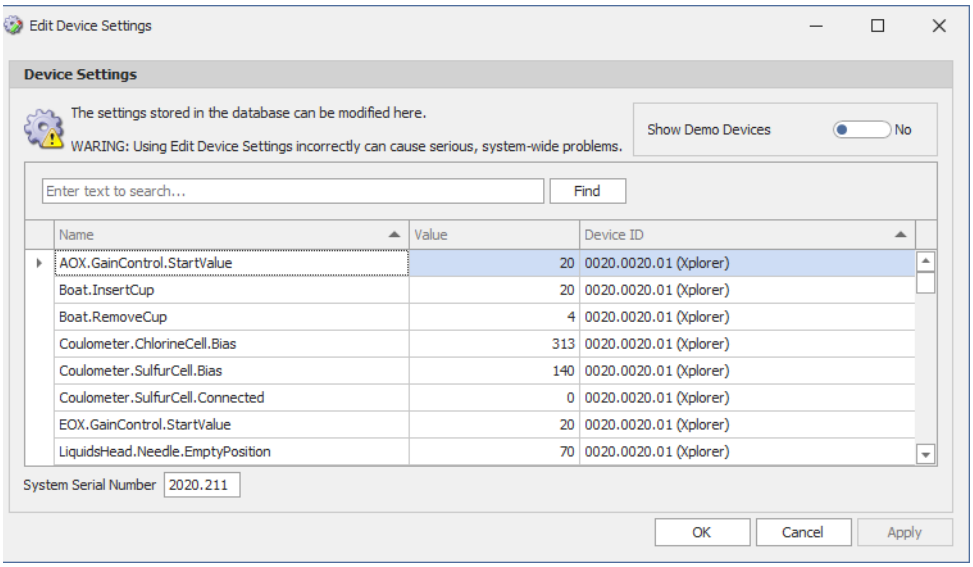
c. Data Archive Wizard, refer to Support Wizard on page 59.

6. Enable/Disable Calibration Lines allows you to prevent older calibration lines from being selected when adding samples. Calibration Lines that have been disabled will no longer be shown in the calibration line selection list in the Sample Manager and the Add Samples screen. This button is also available in Sample Manager.



7. Edit Device Settings allows you to edit settings of a device (refer to Devices on page 38) without the need for the device to be connected.
By default, Demo device settings are not shown, to enable them, slide the Show Demo Devices to the right (Yes).

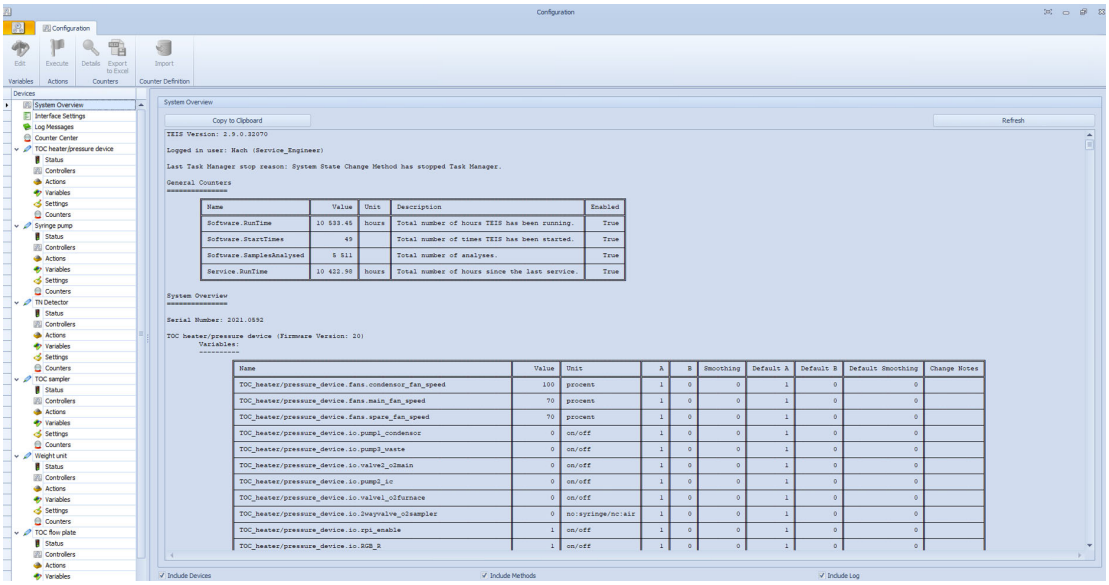




Use this screen with care. There is no input validation. Entering incorrect values can cause serious, system-wide problems. It is recommended to use the device specific settings screen (refer to Devices on page 38).

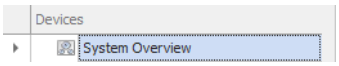
3.10 Configuration

The configuration screen manages all data and settings of the connected devices. For each connected device detailed information about the Status, Controllers, Actions, Settings and Counters of the device is shown.



3.10.1 System Overview

When System Overview is selected after one of the other devices was selected, the system overview will appear in the right window. This overview contains data used to solve problems with the analyzer.

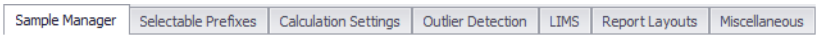


The Copy to Clipboard button copies data into memory and can be pasted into notepad or in an e-mail and sent to a Hach representative. An alternative is to use the Support wizard and attach the created file to an e-mail. Refer to Support Wizard on page 59.

Toggle the checkboxes Include Devices, Include Methods, Include Log to include or exclude them from the overview. The Refresh button will update the information to include the latest values.

3.10.2 Interface Settings

When Interface Settings is selected, settings for how the interface reacts and appears can be changed. The values can be changed depending on the login level.

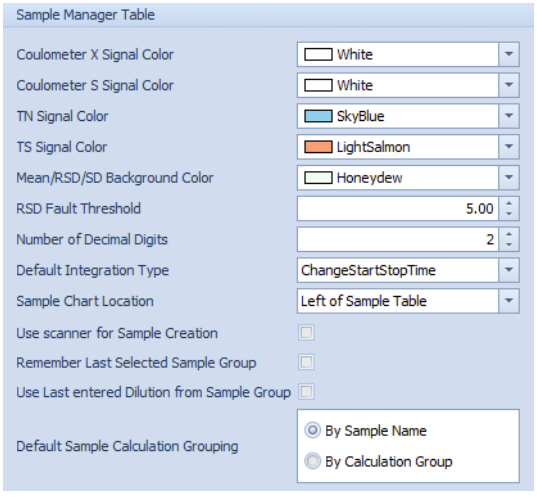


The Interface Settings screen in divided into 7 categories:

1. Sample Manager
2. Selectable Prefixes
3. Calculation Settings
4. Outlier Detection
5. LIMS
6. Report Layouts
7. Miscellaneous

1. The **Sample Manager tab** contains 2 groups:
   - Sample Manager Table
   - Selectable Sample Manager Concentration Units

The **Sample Manager Table** group shows the settings which can be changed for the Sample Manager.



   a. The **Signal Color** is shown on the sample table signals column; the cell's background color can be set with the settings given here.

b. The **RSD Fault Threshold**, indicates a cut-off value for the RSD's. A value higher than the cut-off value shows the RSD(s) in the table with a red background cell color.

c. The **Number of Decimal Digits** lets you define the number of decimal digits shown in the Concentration, Real Concentration, Mean and SD columns of the Sample Manager Table. Range: 0-9, default: 2.

d. The **Default Integration Type** is the integration type used when a sample in the sample table is integrated, in other words directly from screen. Overview of the different integration types:

- Automatic – Draws the baseline automatically.
- Change start/stop value – The start and/or stop value can be adjusted
- Horizontal baseline – Draws a horizontal baseline from a start point
- Freestyle – Integration from a point of the chart to another point of the chart

e. The **Sample Chart Location** is the area where the sample chart is shown, on the **Left** side of the table or **Below** the table.

f. The **Use Scanner for Sample Creation**, enables the ability to use a barcode scanner to set the sample name.

g. The **Remember Last Selected Sample Group** option, when enabled, will use the last opened sample group at startup, the next time TEIS is started.

h. The **Default Sample Calculation Grouping** setting defines the default for this setting for new samples groups. For more information, please refer to 3.5.3-3 (page 35).

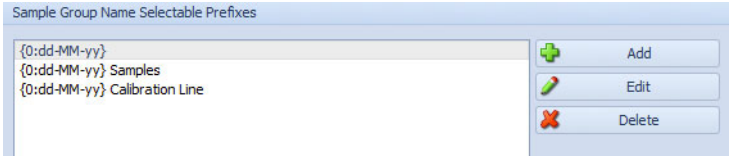
The **Selectable Sample Manager Concentration Units** group allows you to define which units will be available in the Sample Manager Concentration Unit column.

Use the reset button ( ) to reset to default (all enabled).

2. The **Selectable Prefixes** category shows the selectable name prefix settings for Sample Groups and Samples.

   a. The **Sample Group Name Selectable Prefixes** group shows the prefix definitions for new Sample Group names. These are available from a drop-down menu, when entering a sample group name. {0} is a placeholder for the current date and time. It can be formatted by appending a colon and a format specifier after the 0. The {0:dd-MM-yy} or {0:yy/MM/dd} formats the string to show only the date of the day where yy is the year (use yyyy for a 4 digit year), the MM is the month using 2 digits and the dd is the day using 2 digits.

   b. Similar to Sample Group Name Selectable Prefixes, Sample Name Selectable Prefixes allow you to define selectable, predefined names for samples. It also allows you to link QC Chart(s). So, when a defined sample name is selected the newly created sample will also be added to the specified QC Chart(s).



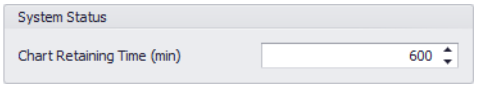
3. The **Calculation Settings** category shows multiple settings related to the calculations performed by the software.

   - Default Calibration Line Settings defines the default settings for new calibration lines.
   - Sample defines the default area calculation. Default Normal.

4. The **Outlier Detection** category shows the Automatic Outlier Detection settings, refer to Outlier Detection on page 66.

5. The LIMS category shows the LIMS Key settings. Enter your LIMS Serial Key and press Enable LIMS to activate your LIMS license.

6. Report Layouts lets you customize (Edit) the default report layout or Reset it to the default layout for:
   - Sample,
   - Sample list (= Sample Group),
   - Calibration Line,
   - Method,
   - Search Result
7. **Miscellaneous** category contains all other options and settings:
   - **Software Settings** allows you to specify if the new dashboard system should be loaded at startup. This only works when a dashboard has been assigned in the dashboard settings. Refer to Dashboard on page 63.
   - **Dashboard Layout**, applies to the obsolete dashboard system. It is recommended to use the new dashboard system and set this to None.
   - The **System Status** group shows the setting how long the system status should retain its data in the chart in minutes. The maximum of this value is 24 hours (1440 minutes), default this is 600 minutes.



3.10.3 Log Messages

When **Log Messages** is selected an overview is shown of all messages created by the software.

3.10.4 Counter Center

Counter Center is used to keep track of the lifetime of components inside the analyzer.

Components are defined by the software and are counted automatically.

Name	Description	Value	Unit	Warning Postponed Until	Low Limit	Mid Limit	High Limit	Reset Access	Last Reset	Reset
Software										
RunTime	Total number of hours TEIS has been running.	2 384.03	hours					Factory	Never	
StartTimes	Total number of times TEIS has been started.	552						Factory	Never	
SamplesAnalysed	Total number of analyses.	3 345						Factory	Never	
Service										
RunTime	Total number of hours since the last service.	2 384.03	hours		7 200	8 640	12 960	Service Engineer	Never	

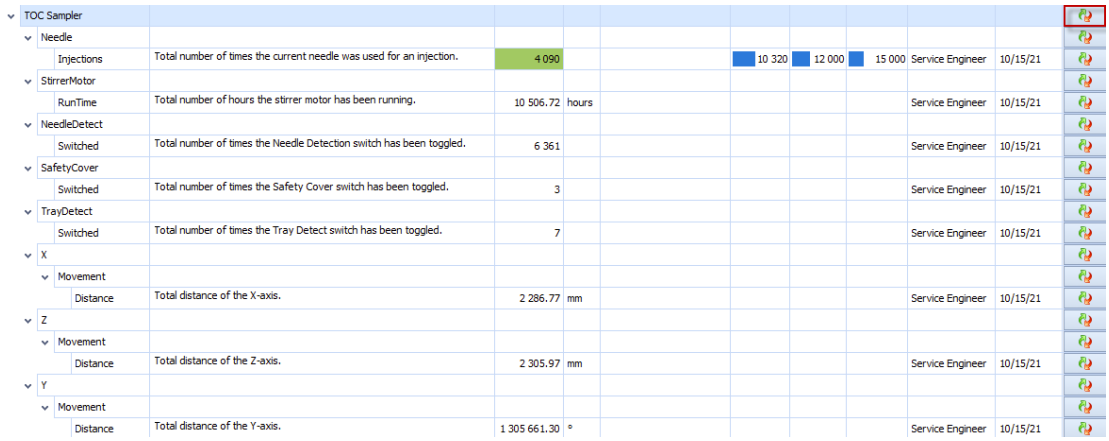
33.1 %

This table has multiple columns

1. Name, the name of the counter, this usually includes a device or software category and its components.
2. Description, a short description of the item counted
3. Value, the current amount, since last reset
4. Unit, the unit of the displayed value
5. Warning Postponed Unit, if and until when a counter warning will not be shown
6. Reset level (the minimum reset level to reset this counter)
7. Low/Mid/High Limits, are the limit values and how much the current value is from reaching the limit (2348.03 hours is 33.1% of 7200)
8. Reset Access, the minimum user login level required to reset the counter.
9. Last Reset, when the counter was last reset
10. Reset, reset button

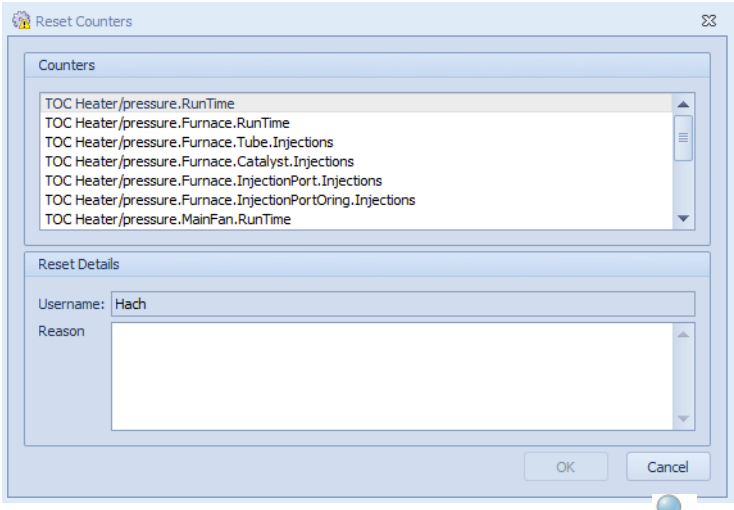
Entries other than Software and Services depend on whether devices are currently connected or not.

When logged in with the proper user level a counter can be reset to 0. Press the Reset button ( ). A new window is opened; all applicable counters will be shown and a reason for the reset must be provided.

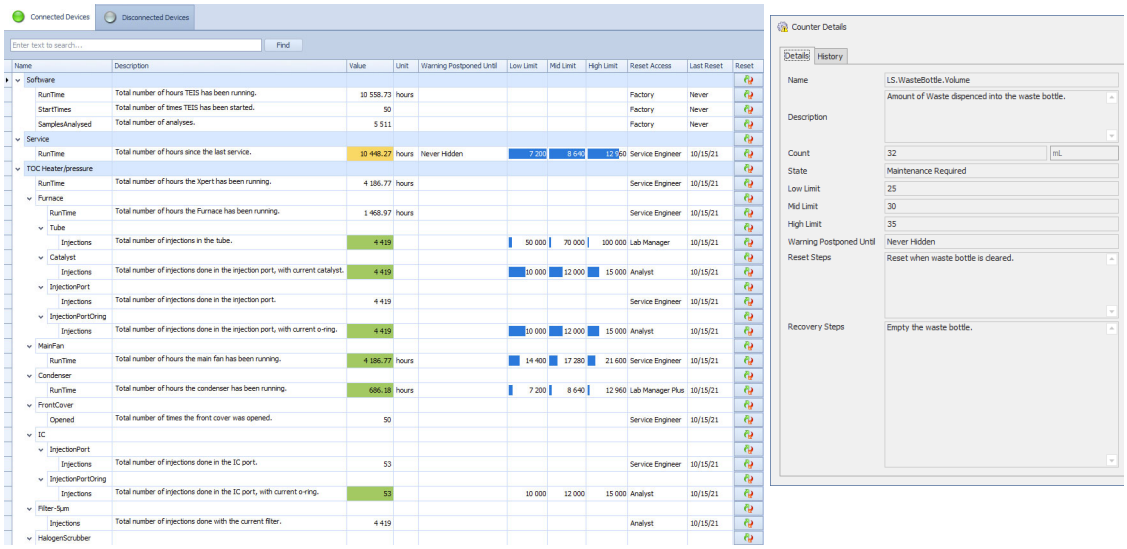


TOC Sampler									
Needle									
Injections	Total number of times the current needle was used for an injection.	4 090			10 320	12 000	15 000	Service Engineer	10/15/21
StirrerMotor									
RunTime	Total number of hours the stirrer motor has been running.	10 506.72	hours					Service Engineer	10/15/21
NeedleDetect									
Switched	Total number of times the Needle Detection switch has been toggled.	6 361						Service Engineer	10/15/21
SafetyCover									
Switched	Total number of times the Safety Cover switch has been toggled.	3						Service Engineer	10/15/21
TrayDetect									
Switched	Total number of times the Tray Detect switch has been toggled.	7						Service Engineer	10/15/21
X									
Movement									
Distance	Total distance of the X-axis.	2 286.77	mm					Service Engineer	10/15/21
Z									
Movement									
Distance	Total distance of the Z-axis.	2 305.97	mm					Service Engineer	10/15/21
Y									
Movement									
Distance	Total distance of the Y-axis.	1 305 661.30	°					Service Engineer	10/15/21

When resetting the counters, the following reset counter dialog is shown. A user can only reset those counters that are covered by the user's credentials.

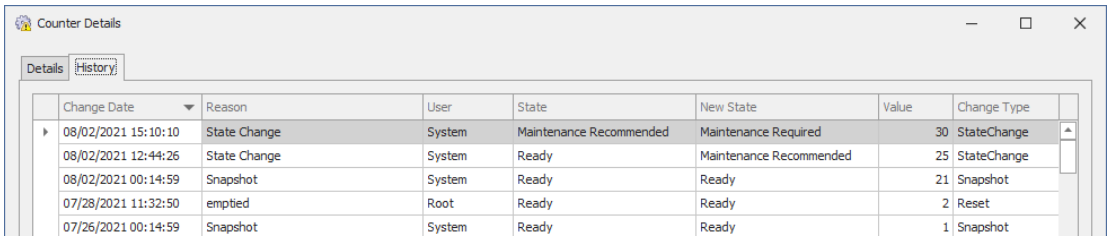


Selecting a counter (row with a value) and pressing the Details button (Details), or double clicking it opens up the Counter Details window.



The History tab shows the history of the counter; a new entry is added when:

- A limit is exceeded (State Change),
- A snapshot is created, created automatically every Monday or earliest day after that when the software has not been running,
- The counter has been reset.



Export to Excel (

) creates an excel file that contains all counters (connected and disconnected on separate sheets), including the counter colors:

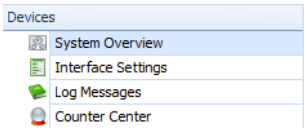
- Green: Ready or Maintenance Recommended (Low Limit exceeded),
- Yellow: Maintenance Required
- Red: System Failure Probable

The file is stored in Desktop\System Support Files <serial number> and the filename is SystemHealth_<serial number>_<Date and Time>.xlsx.

This file can be used to inform a Service Engineer of upcoming or pending maintenance, and prepare for a service visit and, when required, order replacement parts ahead of time.

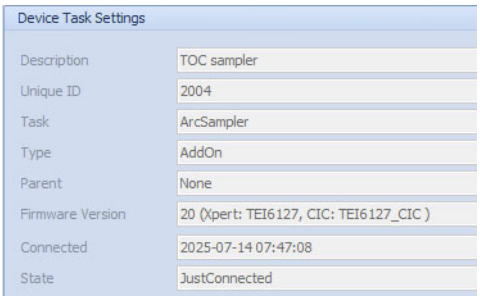
3.10.5 Devices

Every connected device has 5 subcategories:



1. Status, tracks if the system is ready to start an analysis
2. Controllers, execute actions on pre-defined events
3. Actions, actions which can be executed on the device
4. Variables, values sent to and received from the device
5. Settings, values depending on the hardware
6. Counters, tracks component health of the device

When a device is selected in the tree view on the left side, information about this device is shown.



a. The Status screen shows the status of a device. The State shows if the device or part of the device is out of range. A Service Engineer or Lab Manager Plus can disable a status when a status is not required. When the status is disabled, the status is not used to generate the main status of the device. Disabling requires you to enter a reason which will be shown in Disabled by User Reason, the background of Disabled by User will

change to red. Enabling the status will clear the Disabled by User Reason and reset the background of Disabled by User. The Status.General cannot be disabled.

Name	Description	State	Disabled by User	Disabled by User Reason
Status.General	General status of the TOC sampler	Idle		
Status.ArcSampler.Tray	Status that checks the tray availability	Idle	☑	test

b. The Actions screen shows all actions which can be executed by the device. These actions are used by the methods to execute an analysis on the analyzer. When the action is running, the state of the action will show if the action is running, done, or in an error.

Name	Description	State
Action.ArcSampler.InitWhenNeeded	Initialize the X-, Y-, Z-, and S-axis when needed, and go back to the original location	Nothing
general.reset_cpu		Nothing
general.save_settings		Nothing
logic.change_y_holdpower		Nothing

c. The Variables screen of a device shows the values sent to and received from the device. These variables are used by the status, controllers and actions that perform the task. These values can be changed by hand by a Service Engineer or Lab Manager Plus. When a value needs to be permanently changed, the variable should be added to the startup method of the device by a Service Engineer or added as User Parameter, so they will be applied each time a device starts up.

Variable				Current Values			Default Values			Notes
Name	Value	Unit	Description	A	B	Smoothing (s)	A	B	Smoothing (s)	Change Notes
TOC_sampler.general.productid	0		TOC sampler	1	0	0	1	0	0	
TOC_sampler.general.firmware	0		Version	1	0	0	1	0	0	
TOC_sampler.general.clock	872	s	Up-time	1	0	0	1	0	0	
TOC_sampler.general.func_run_id	0			1	0	0	1	0	0	
TOC_sampler.general.func_run_state	1			1	0	0	1	0	0	
TOC_sampler.general.func_run_nr_executed	0			1	0	0	1	0	0	
TOC_sampler.general.func_run_error	0			1	0	0	1	0	0	
TOC_sampler.general.settings_valid	14			1	0	0	1	0	0	
TOC_sampler.general.com_index	57834			1	0	0	1	0	0	

Change Notes can be set by a Service Engineer or Lab Manager Plus to add a note for the variable. A, B are calibration parameters for the raw data and Smoothing is the sliding time window over which the raw value is averaged. When A, B and/or Smoothing are not set to their default or are within a preset tolerance range the background is changed to red.

Name	Description	State	Disabled by User	Disabled by User Reason
Status.General	General status of the TOC sampler	Idle		
Status.ArcSampler.Tray	Status that checks the tray availability	Idle	☑	test

When logged in as Service Engineer or Lab Manager Plus, extra columns are shown for A, B and Smoothing in green and show the default values. Some variables have a preset tolerance, they are marked in dark green, when hovering the mouse over the value, the range of the tolerance is show. The tolerance range allows the value to be changed within that range without being marked as red.

Variable				Current Values			Default Values			Notes
Name	Value	Unit	Description	A	B	Smoothing (s)	A	B	Smoothing (s)	Change Notes
TOC_sampler.general.productid	0		TOC sampler	1	0	0	1	0	0	

d. In the Settings screen, device specific properties can be changed. For example, injection depth.

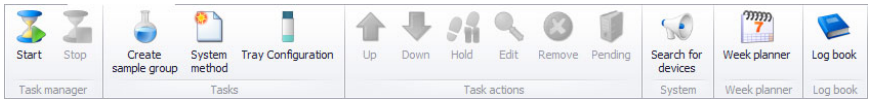
Setting	Value	Description
Injection.Depth.Furnace	46.5	The depth the needle goes into the furnace injection port
Injection.Depth.IC	49	The depth the needle goes into the IC injection port
Injection.Depth.Waste	50	The depth the needle goes into the Waste port
Xpert.Tray.Type	65 Positions	The current type of tray used on the Xpert
Injection.Depth.Wash	110	The depth the needle goes into the Wash port
Xpert.WashStation.Installed	☐	Indicates that the wash station is installed

e. The Counters screen shows the health of components of the device. For more information, please refer to 3.10.4 Counter Center.

3.11 Week Planner

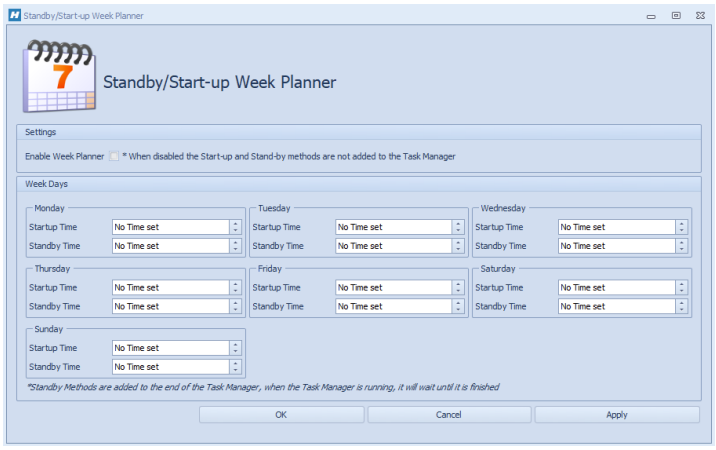
The week planner is designed to startup/standby the system at designated times.

3.11.1 Open Week Planner



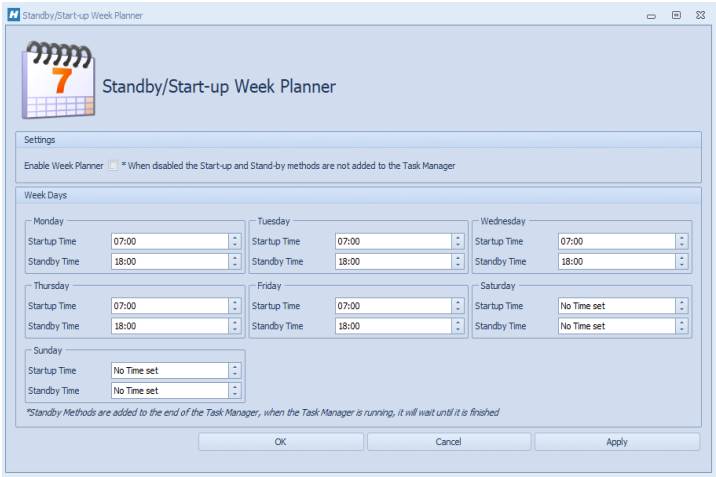
When the task manager is selected, the ribbon shows the week planner button to open the week planner screen.

3.11.2 Enable Week Planner



At the settings group box, it is possible to enable and disable the week planner. When this value is checked, the week planner is enabled. When it is unchecked the week planner will not be executed at the times given. This feature can be used during vacations or maintenance.

3.11.3 Week Planner Example



In the example above, the system will startup at 07:00 (7 am) and will go to standby at 18:00 (6 pm).

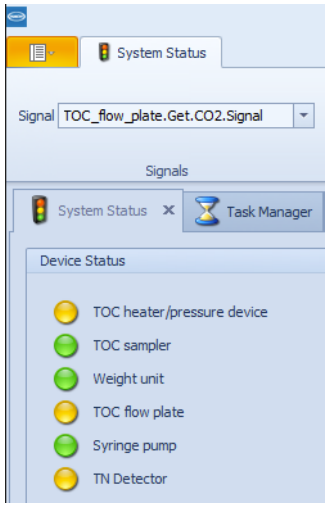
On Saturday and Sunday, the week planner will do nothing.

When the analyzer is measuring samples at the time the week planner wants to go to standby/startup, the software will add the standby method to the end of the task manager and will be executed when all queued tasks are done.

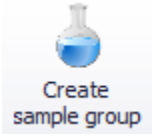
To remove the time given, select the time and press the delete button on your keyboard, the time will be replaced with “No time set”.

Every 30 seconds the week planner checks if the startup/standby method needs to be added to the task manager, it will only be added 1 time a day. So, when you change the time of the standby/startup to another time, but this method is already executed this day, it will be executed the next day.

To analyze samples, an analyzer (configuration) must be connected and recognized by the software. System status displays the devices that are connected. When all connected are green, the system is ready to start analyzing samples.



To start an analysis, you need to create a Sample group, using the Sample manager. Open the sample manager and click Create sample group.



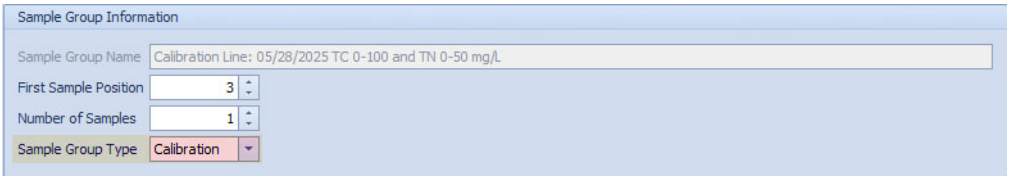
A window opens, prompting you to enter a name for the new sample group.
Tip: select a prefix from the drop down, to create easy to locate names. Refer to Configuration on page 33 for more information on how to configure the prefixes. Click Ok to create the new sample group.

In the Add samples window you can define the sample group and sample data.

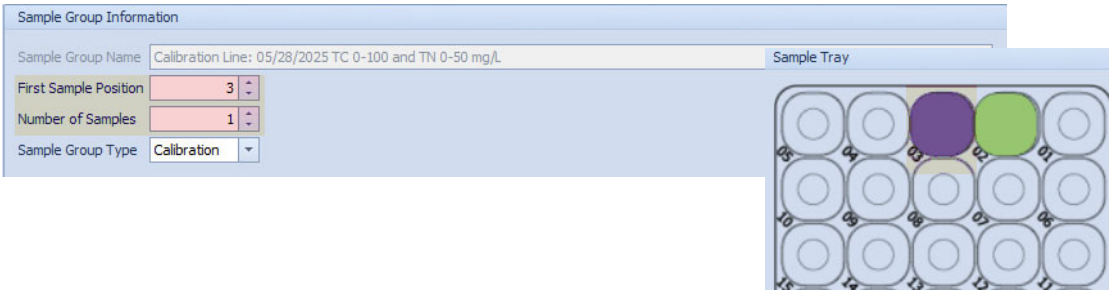
In the group box Sample Group Information, the type of the new sample group is selected. The creation of a calibration line or regular analysis of samples needs to be selected here.

Sample group types:

- Default Used, when measuring samples
- Calibration line Used, when creating a calibration line

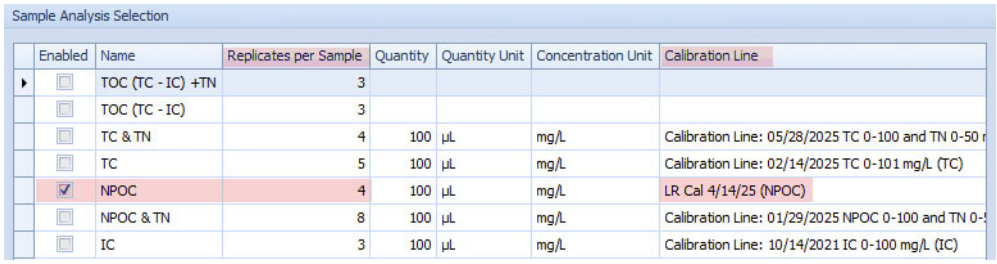


The number of samples represents the number of vials placed on an autosampler tray:

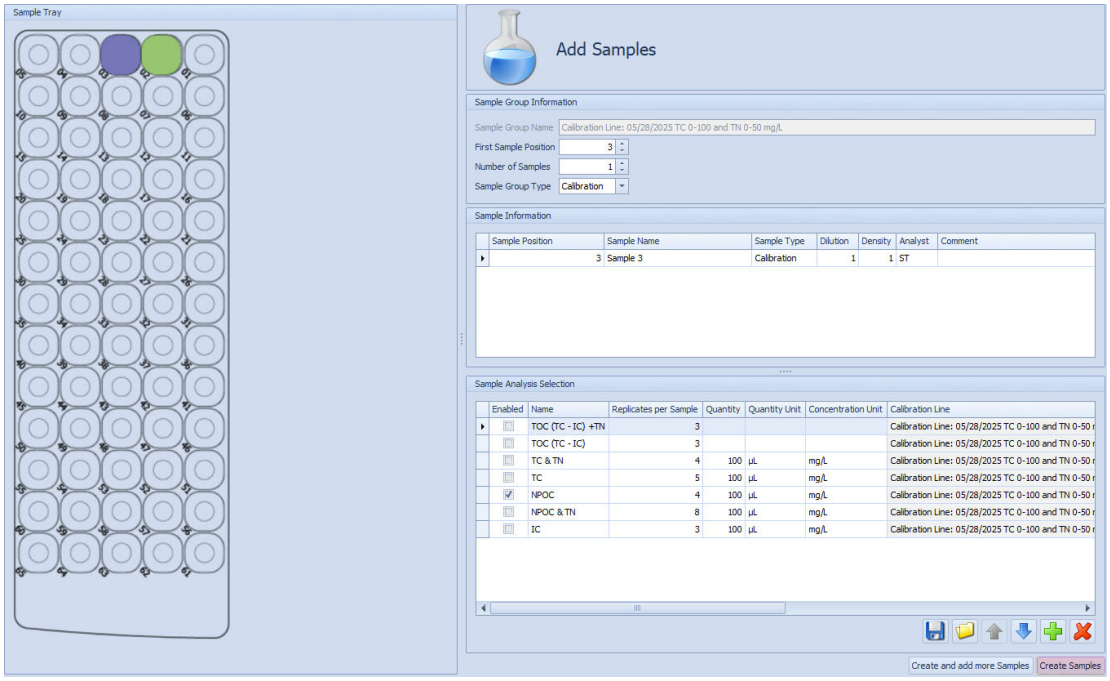


The group box Signal analysis selection is used to select which of the available signals will be acquired during the analysis. Each signal will have its own sample line created. The calculation

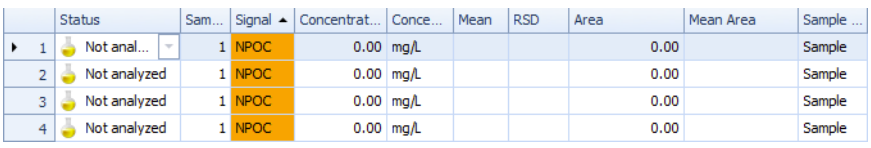
type, calibration line or an absolute calculation can be selected. When the sample group type is set to Calibration line, one can select the calibration range, when applicable. The available signals depend on the connected devices. Replicates per sample will create multiple sample lines in the sample group:



The group box Add Sample contains all information for the samples that will be created. The first sample position will be the vial position of the first sample, all remaining vials will be relative to this position, adding 1 for each vial. Data entered in this screen can later be changed in the Sample table in the Sample manager. All fields need to be entered, except for Comment, which is optional.

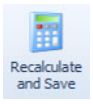


When Create samples is clicked new samples lines are added to the Sample group. Multiple lines can be edited at the same time, by selecting the lines: select the first sample with the left mouse button, hold the Shift button and select the last sample with the left mouse button, then start typing, or change the selection. Press the enter button to confirm the change and apply it to all selected lines.



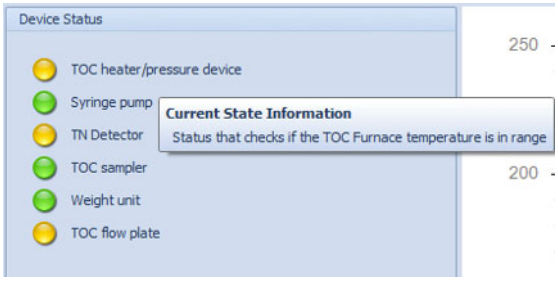
To add or insert samples to a sample group, first select the sample group, then click the Add samples or Insert samples button to add or insert new samples to the selected sample group. Adding or inserting samples can be done when the Task manager is running.

Remember that after every adjustment in the sample table needs to be save by clicking the Recalculate and Save button, in order to apply the changes:

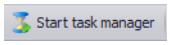


When all data is correct the analysis can be started. (See the User Manual QP1680 for more information regarding the preparation of the QP1680 for measuring samples).

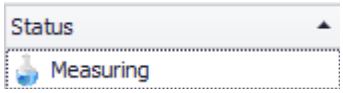
When all devices are green (see 3.7 System Status, page 50) analysis can be started. When any of the devices shows a yellow LED, hover the mouse over the LED, to show a message for the reason why the device is not ready (for example: TOC Furnace temperature is in range).



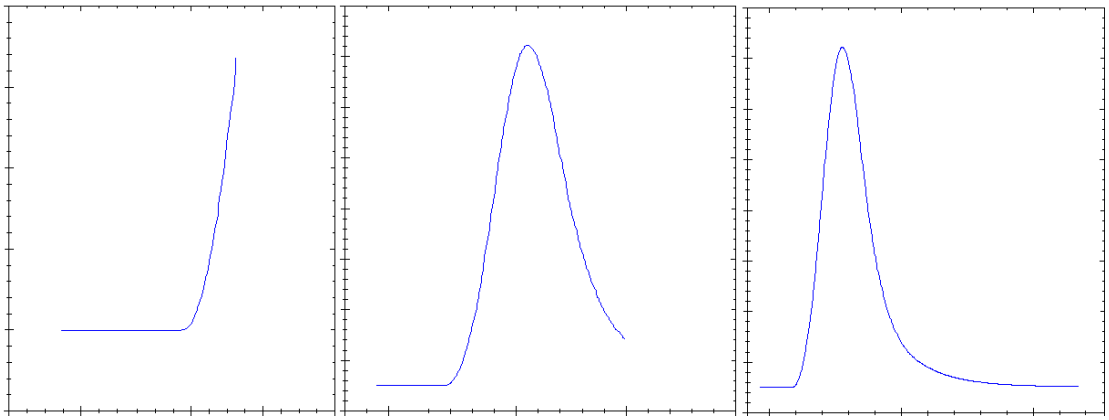
When the system is ready, click Start Task manager on the status bar or use the Play button in the ribbon.



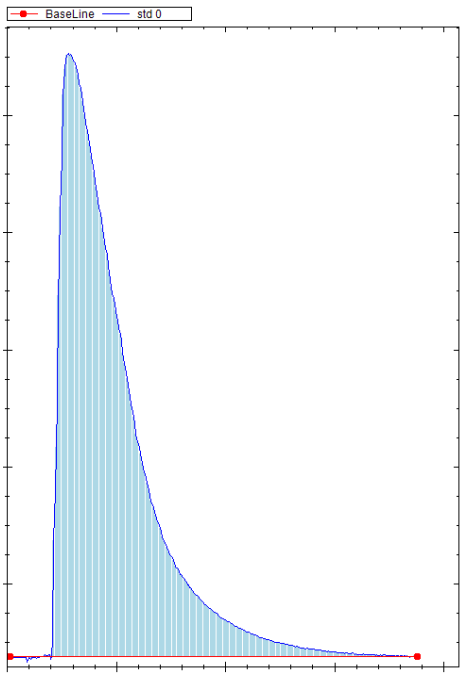
The status of the first sample changes to Measuring. When selecting this sample, the current signal for this sample is shown.



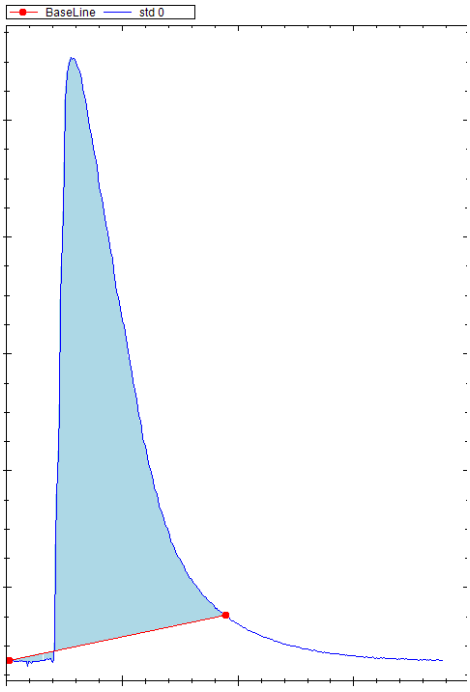
The signal is shown in the chart. When the sample is combusted, the signal should rise. The signal decreases towards the end of the chart. A correct sample combustion can be recognized by a start of a peak at a certain value and a stop at the same value, as shown in the charts below.



When the analysis is finished, the software integrates the sample automatically. A correctly integrated peak is shown below: the red integration baseline is horizontal and indicates a start and stop of the integration at the same value.



The chart below shows an incorrectly integrated peak because the start and stop of the integration are not at the same value.



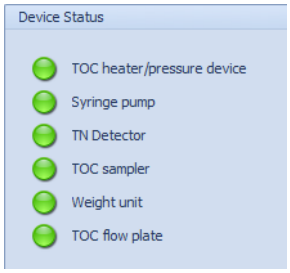
To change the integration, select and drag one or both of the red dots to the desired positions. To reintegrate the sample, click Recalculate and save to recalculate the group and save the changed data.

Status	Name	Signal	Real concentration	Concentration	Concentration Unit	Mean	RSD	SD	Sample position
Done	10 mg/l	X	0.00	9.93	mg/L				1
Done	10 mg/l	X	0.00	10.11	mg/L				1
Done	10 mg/l	X	0.00	10.08	mg/L				1
Done	10 mg/l	X	0.00	10.12	mg/L				1
Done	10 mg/l	X	0.00	10.11	mg/L	10.07	0.79	0.08	1

When the same sample is analyzed more than once (replicates), the RSD is an indication of the reproducibility of the analysis (a value below 5% is generally seen as correct). The average (mean) is 10.07 and the relative standard deviation (RSD) is 0.79.

Section 5 Create a Calibration Line

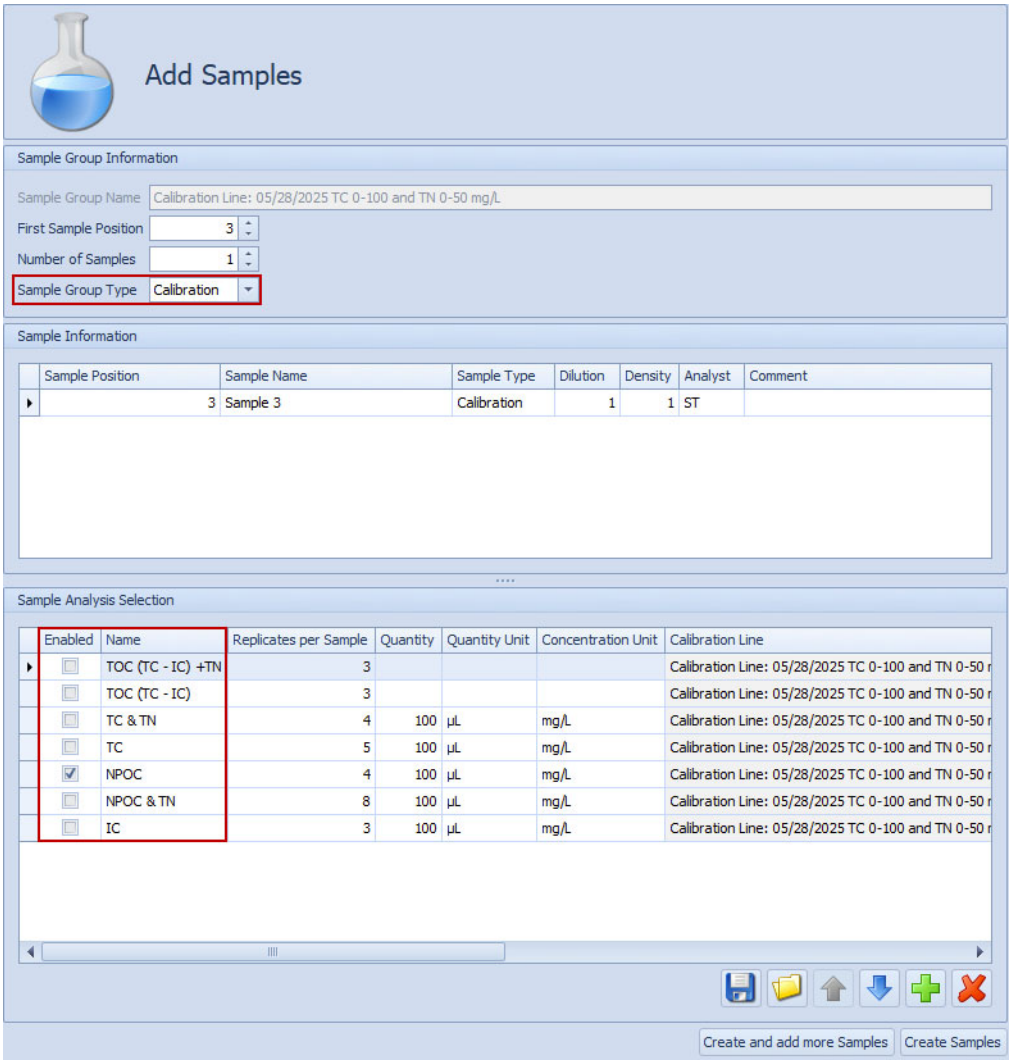
To analyze a calibration line an analyzer needs to be connected. View the system status which devices there are connected and verify all devices for your configuration are connected.



When all devices are connected (they don't need to be green yet, the heaters need some time to heat up) it is possible to create a sample group for measuring a calibration line.

Click Create sample group and enter a name for the new sample group. Tip: select a prefix from the drop down, to create easy to find names. See 3.10-0 (page 60) for more information on how to configure the prefixes. Click Ok to create the new sample group.

Set Sample group type to Calibration line. All samples added to the group will be of type Calibration.

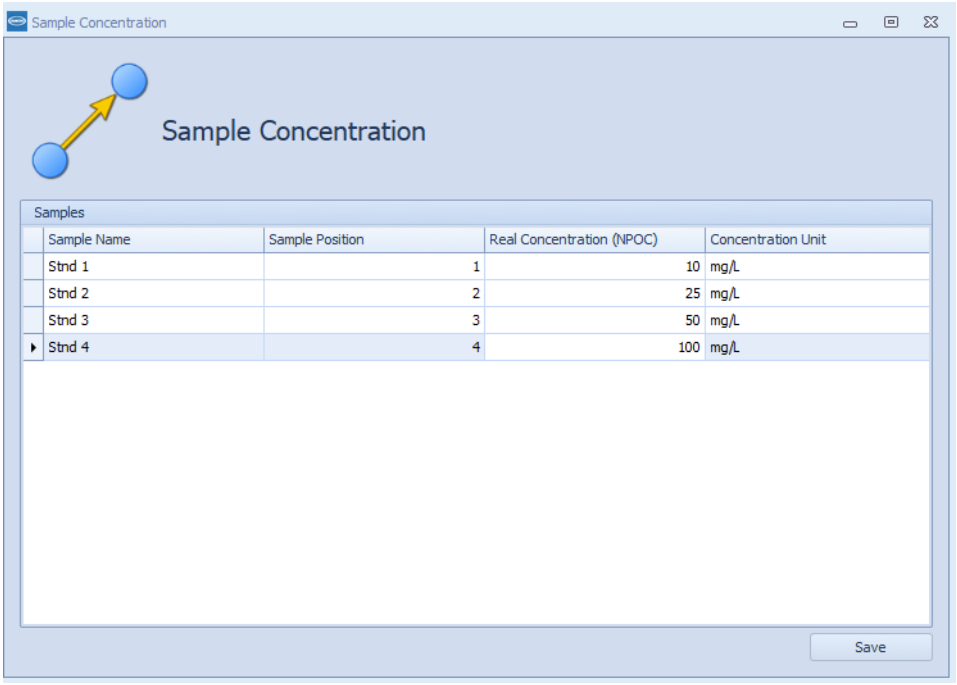


At the Signal Analysis Selection there is no need to select a calibration line, the calibration line used to calculate the concentration is created directly after the sample group is finished. In this case you do need to select a range method to set the detector in the correct range. The range that needs to be selected should correspond to the range of the calibration line, to set the detector to the best matching sensitivity. Samples analyzed with this calibration line are automatically analyzed with the same range used for this calibration line.

Enter all data for the samples (standards) to create the calibration line. Set Number of samples to the number of standards, set Replicates to the number of replicates per sample (standard). Recommended are 3-5 replicates per sample (standard).

Create samples opens a screen where the concentrations of the given standards can be entered. The table shows the Sample Name, Sample Position, Concentration Unit and a column for every signal selected.

The concentrations in the columns Real concentration are the concentrations used to create the calibration line.



When all concentrations are entered, click Save to create the new sample group for the calibration line.

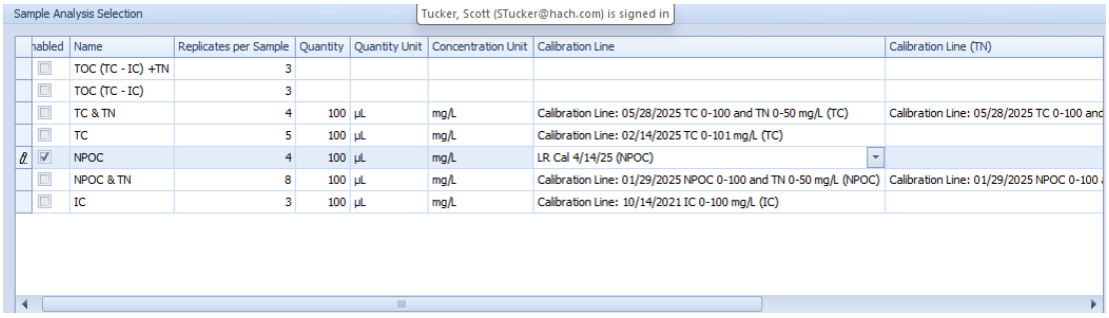
The names of the standards are changed, the software appends the real concentration and its unit, for example “– 10 mg/L”. The concentration and unit are added to the name, reason is that entries with the same name are added as the same sample (calculation of Mean/RSD/SD). Having the correct format of sample name, for calculations, is of no importance when Sample calculation grouping is set to by calculation group (See 3.5.3-3 (page 35)).

In the example below the std 0 – 25 mg/L is added as an entry in the calibration line and the std 0 – 25 mg/L is added as a new entry. In the column Real concentration, the real concentration of the sample is shown. The column Concentration represents the concentration calculated by the software after the calibration has been finished.

Status	Sample Position	Signal	Name	Concentration	Concentration Unit
Done	12	NPOC	Std - 0.00 mg/L	0.04	mg/L
Done	12	NPOC	Std - 0.00 mg/L	0.04	mg/L
Done	12	NPOC	Std - 0.00 mg/L	0.04	mg/L
Done	12	NPOC	Std - 0.00 mg/L	0.09	mg/L
Done	12	NPOC	Std - 0.00 mg/L	0.03	mg/L
Done	11	NPOC	Std - 10.00 mg/L	9.86	mg/L
Done	11	NPOC	Std - 10.00 mg/L	9.77	mg/L
Done	11	NPOC	Std - 10.00 mg/L	10.09	mg/L
Done	11	NPOC	Std - 10.00 mg/L	10.10	mg/L
Done	11	NPOC	Std - 10.00 mg/L	10.22	mg/L
Done	11	NPOC	Std - 25.00 mg/L	24.82	mg/L
Done	11	NPOC	Std - 25.00 mg/L	24.89	mg/L
Done	11	NPOC	Std - 25.00 mg/L	25.03	mg/L
Done	11	NPOC	Std - 25.00 mg/L	24.76	mg/L
Done	11	NPOC	Std - 25.00 mg/L	24.75	mg/L

The Sample Type column shows that the samples added to the table are calibration samples, type Calibration. Samples not used to create the calibration line are indicated by the type of Sample.

When creating a calibration line, the default selected calibration line for calculation is empty when the samples are not yet analyzed. When the calibration line has been created, the box Calibration Line will point to the sample group that they belong to.



abled	Name	Replicates per Sample	Quantity	Quantity Unit	Concentration Unit	Calibration Line	Calibration Line (TN)
	TOC (TC - IC) +TN	3					
	TOC (TC - IC)	3					
	TC & TN	4	100	µL	mg/L	Calibration Line: 05/28/2025 TC 0-100 and TN 0-50 mg/L (TC)	Calibration Line: 05/28/2025 TC 0-100 and
	TC	5	100	µL	mg/L	Calibration Line: 02/14/2025 TC 0-101 mg/L (TC)	
✓	NPOC	4	100	µL	mg/L	LR Cal 4/14/25 (NPOC)	
	NPOC & TN	8	100	µL	mg/L	Calibration Line: 01/29/2025 NPOC 0-100 and TN 0-50 mg/L (NPOC)	Calibration Line: 01/29/2025 NPOC 0-100
	IC	3	100	µL	mg/L	Calibration Line: 10/14/2021 IC 0-100 mg/L (IC)	

When all entered data is verified the analysis can start. If changes need to be made to the data of the Sample table, make the changes and click Recalculate and Save before continuing.

When a sample is analyzed, the status is set to Done. Verify all values calculated by the software are in range. The default RSD fault indication is set to 5%, if the value of the RSD is higher than the fault indication the background color of the cell is red. Also verify if the Mean is as expected.

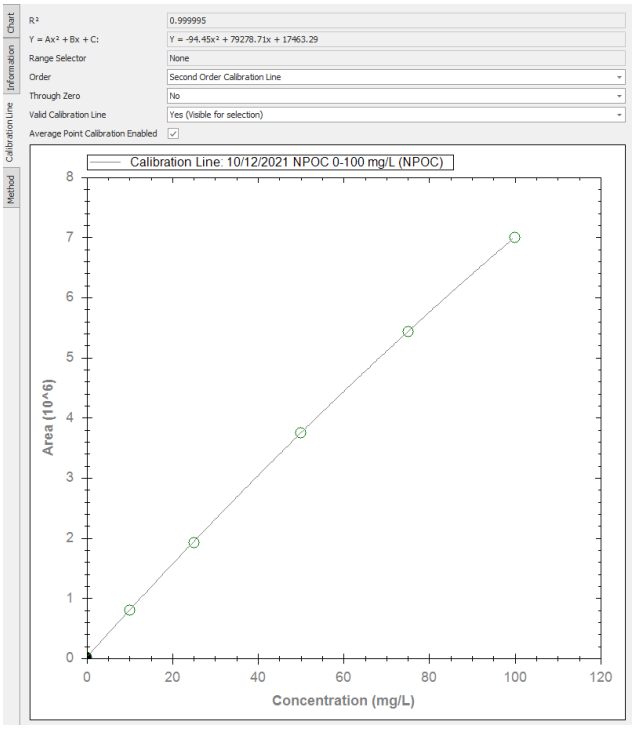
Status	Sample Position	Signal	Name	Concentration	Concentration Unit	Mean	RSD	SD	Area
Done	11	NPOC	Std - 10.00 mg/L	10.22	mg/L	**10.01**	**1.85**	**0.19**	818 160.93
Done	11	NPOC	Std - 25.00 mg/L	24.75	mg/L	**24.85**	**0.45**	**0.11**	1 921 873.76

After all samples have been analyzed, verify the resulting calibration line.

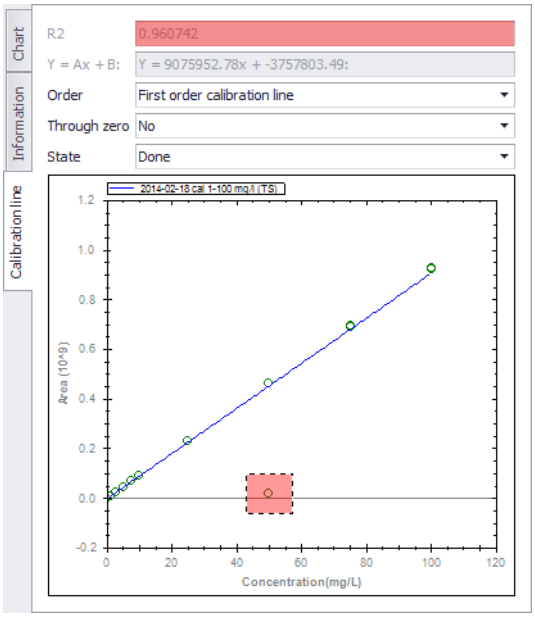
On the left side of the sample chart are tab pages, select the Calibration line tab.

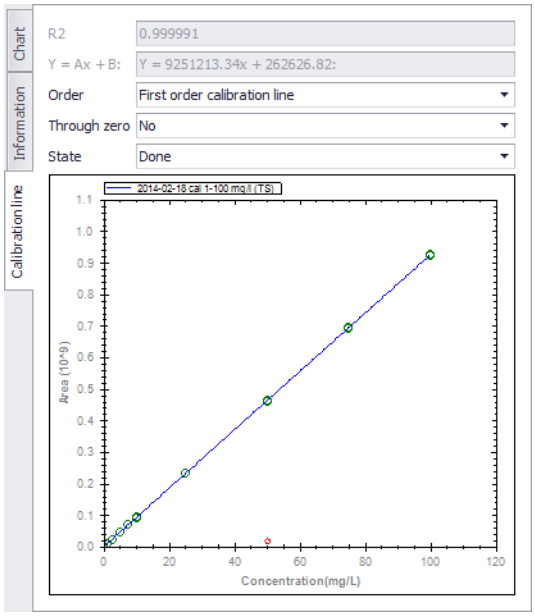
A coefficient of determination, designated by R2, of at least 0.995 indicates a first order line is a good fit, a lower value may indicate a second order line might be a better fit.

Samples can now be calculated using the new calibration line. When the calibration line is not correct or too old for use, it can be set to Fault, this way it is not possible to select the calibration line for new samples.



In the figure below, the R2 is 0.96. A reason for this low value can be found in the fact that a calibration point is out of range. Find the sample in the Sample table and set it to Fault. Click Recalculate and Save, to recalculate the calibration line. The sample is shown in red and is no longer used to contribute to the calibration line.



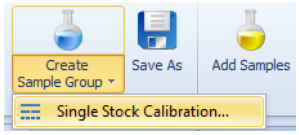


5.1 Single Stock Calibration

In a regular calibration line, all standards are made separately and 100µL is injected for each standard. A Single Stock Calibration is a calibration line that is made from a single stock solution. In this situation the standards are made by injecting the relative amount to the stock solution, e.g. the 50mg/L standard is analyzed by injecting 50µL of the 100mg/L stock and 50µL of ultra-pure water.

5.2 Wizard Single Stock Calibration

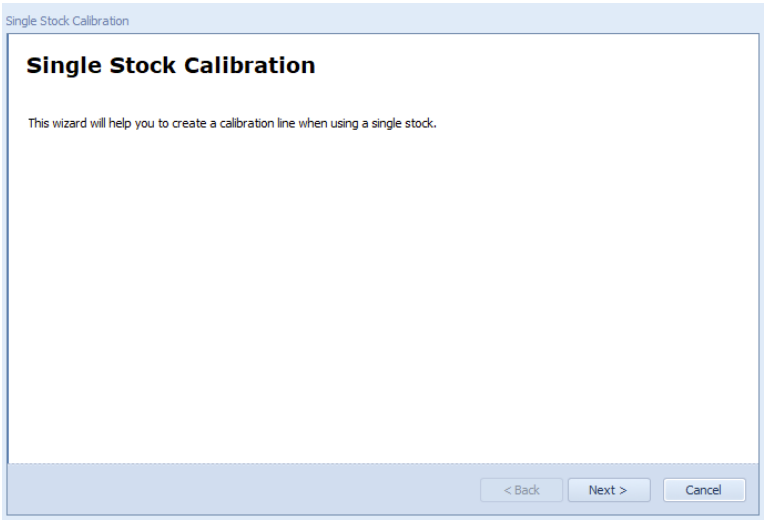
In TEIS2 there is a feature that will help you create a calibration line using a single stock solution. This feature uses the syringe pump to create dilutions using different quantities. To access this feature, go to the “Sample Manager” tab and use the dropdown button within the “Create Sample Group” button. For now, this feature is only available on the QP1680 TOC/TNb.



The feature consist of the following windows where user input is required:

1. Element selection

a. Here you can select the signal / element you want to calibrate. It is possible to use available combinations of signals like NPOC/TN.



2. Calibration information

a. Range selection

- Select the range you want to calibrate. Your stock solution is expected to be the highest concentration of that range. E.g. 0-100 mg/L selected a stock = 100 mg/L.
- The actual concentration of the stock cannot deviate more than +/- 10% of the expected concentration.

b. Concentration of stock

- Here you enter the actual concentration of the stock solution.

c. Position of stock

- In what position will the stock be placed. This textbox will notify you, by turning orange, that this position is taken in a sample group that is not done measuring yet. Nothing will happen, just a notification.

d. Method selection

- Select the right method here for the sample group

3. Overview

a. Size

- Here you can select the number of points for the calibration. The calibration line points are preset and not configurable.

b. Reverse order

- Orders calibration points from high to low.

c. Replicates

- How many replicates per standard.

d. Blank Position

- For the blank you only need to enter the position on the tray. Enter 0 to exclude blank in calibration line. This textbox will notify you, by turning orange, that this position is taken in a sample group that is not done measuring yet. Nothing will happen, just a notification.

e. Blank

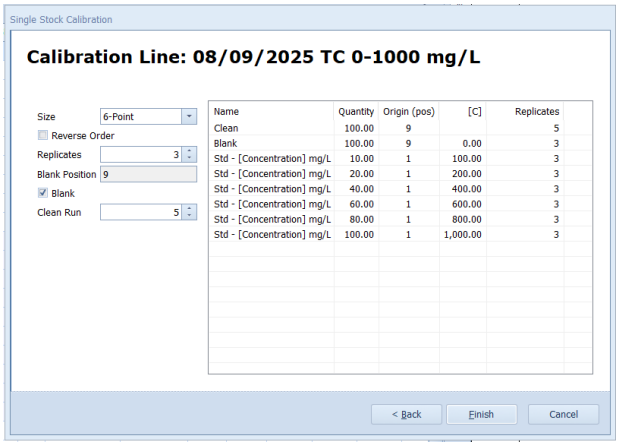
- Check the box, if you want the blank to be a calibration point.

f. Clean Run

- Determines the number of conditioning blank measurements that will be run before the calibration. These will not be taken into account for the calibration itself.

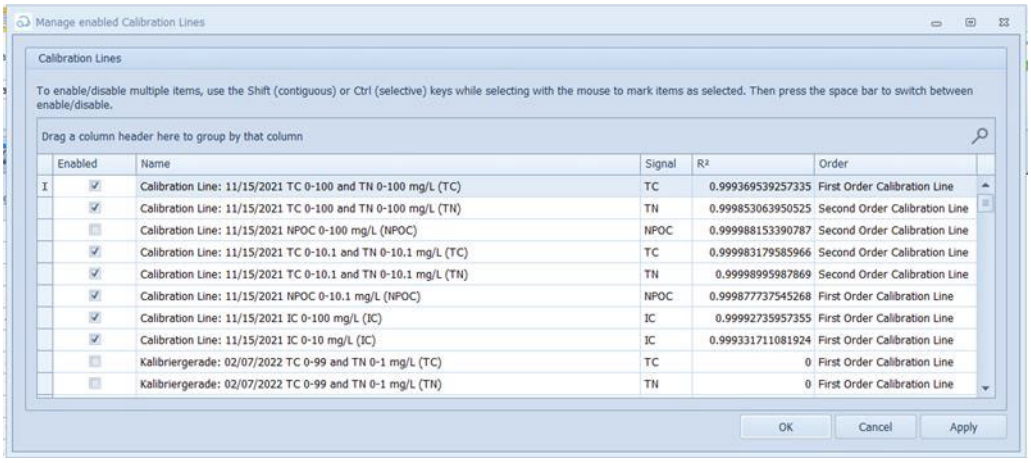
g. Overview table sample group

- Here you can see a preview of the sample group. The software calculates the quantity needed to inject, to come as close as possible to the wanted concentrations. With that quantity, the actual concentration is calculated to make sure all real concentrations are correct.

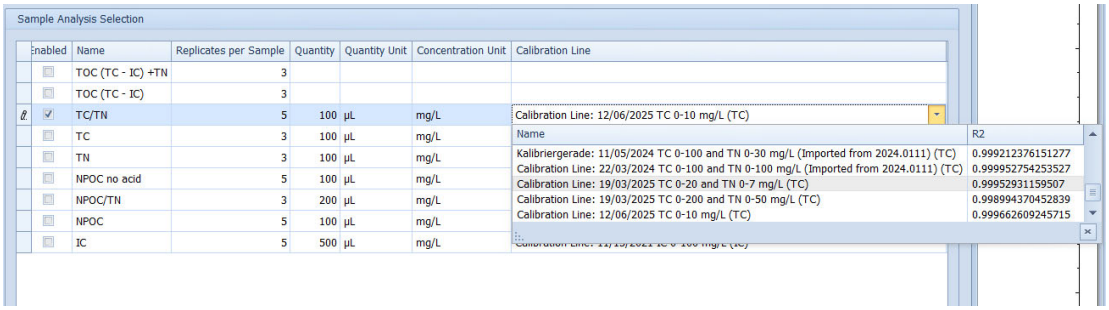


5.3 Enable or Disable Calibration Lines

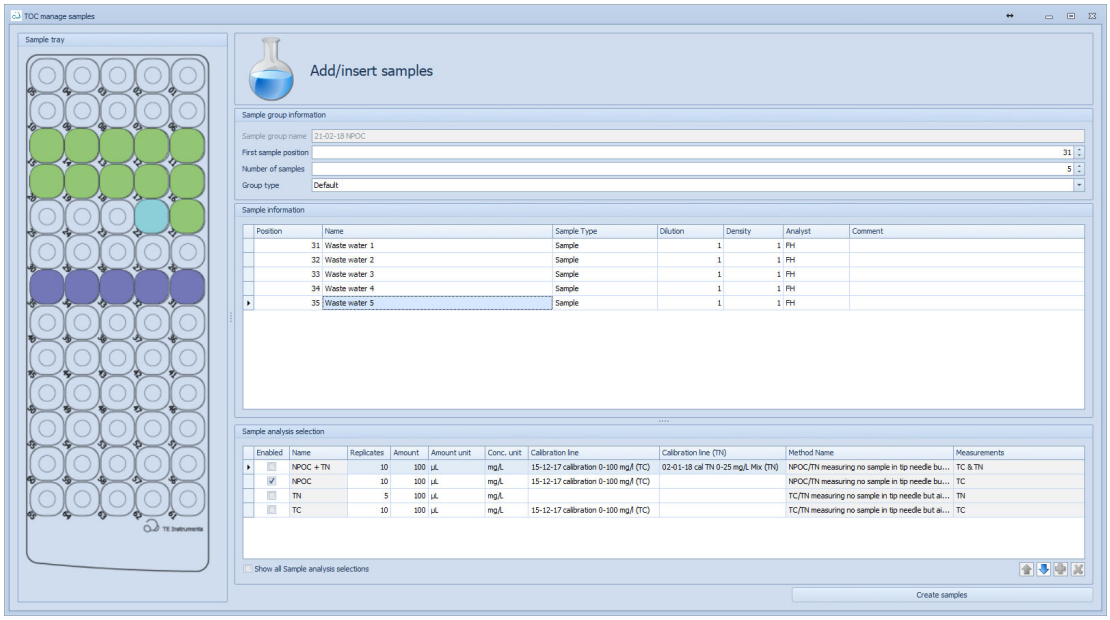
When clicking on “Enable/Disable Calibration Lines” a window opens listing all calibration lines recorded with the respective correlation (r2).



By checking /unchecking the box in front of the calibration, you can enable / disable the respective calibration for selection in the “Add Sample” table.



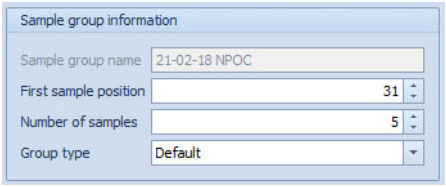
When adding samples to the sample manager a different screen is shown. This screen is used to easily create multiple analysis for each sample, like IC, TC and NPOC from the same vial.



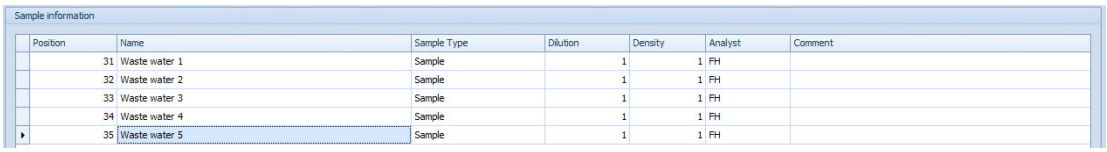
On the left side the QP1680 tray is shown, click with the left mouse button on the tray to select a tray position and use left Ctrl to select the number of samples.

- Green indicates a position where all replicate analysis in the current sample group is analyzed.
- Yellow indicates a position where all replicate analysis in the current sample group has not yet been analyzed.
- Blue indicates that this position is currently being analyzed, this includes any possible replicates, that have yet to be analyzed.
- Purple indicates the new sample we are creating in this screen.

The Sample group information shows the number of samples created and from which position it starts. The group type indicates the type of group and samples created, when default is selected a default group is created with sample of the sample type Sample. When the group type is calibration line, a calibration line group is created with the sample type Calibration.

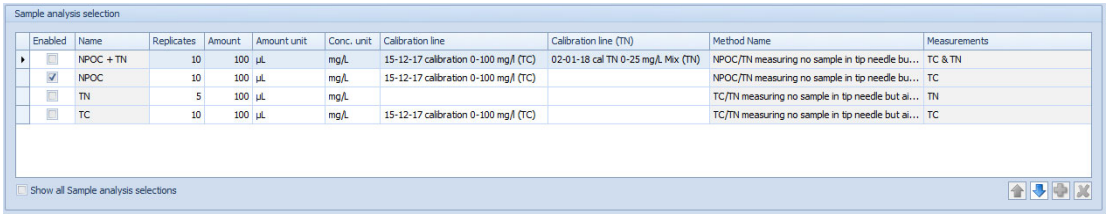


The Sample Information shows the information of the sample that needs to be created. For each sample we can enter a name, position, sample type, dilution, density, analyst and comments.



The Sample Analysis Selection is used to select the type of analysis that needs to be done for each sample created in the Sample information. If NPOC and TC need to be analyzed, use the

checkbox in the first column to select the type of analysis. Each sample created in Sample information is created for each row checked in Sample analysis selection.



For each analysis of the sample, we can enter the replicates, amount injected, concentration unit and calibration line. The lines are only shown when the method selected for this line can be executed (needed devices are connected).

When a TC and an IC analysis is available, a TOC line is automatically added to the list of analysis. When the TOC line is checked, the TC and IC are checked, the list is filtered only for the TOC, TC and IC analysis, it is not possible to create other samples at once.

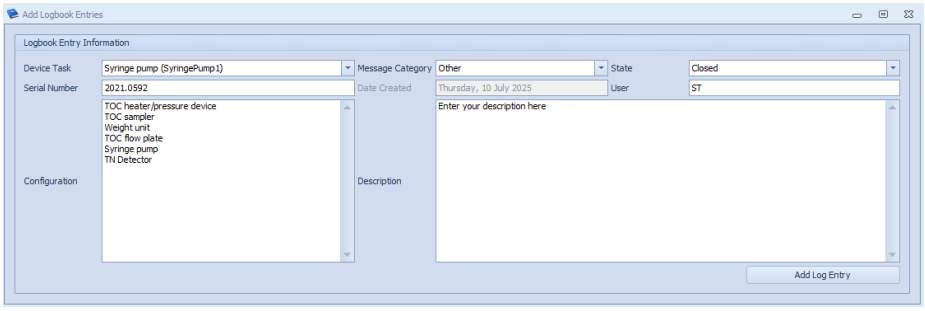
When NPOC sample also needs to be analyzed, click on the Add samples button in the sample manager to add those samples.

Logbook entries can be used to keep track of events during operation of the analyzer. When a malfunction in the system or the software occurs more frequently, it is possible to trace logbook entries created for this issue to each other.

Select the Task Manager tab, where the button Logbook is located.

It is possible to keep the logbook window open and work with the software, so the logbook is always available to add some new entries.

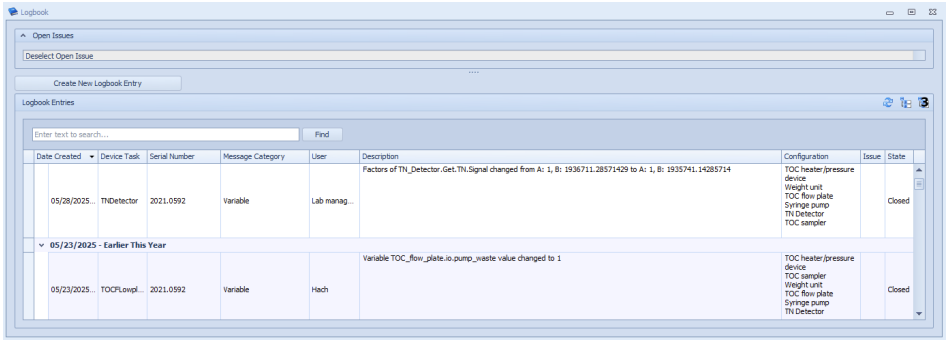
To create a new entry or issue press the button Create New Logbook Entry, a window will appear to fill in the necessary information.



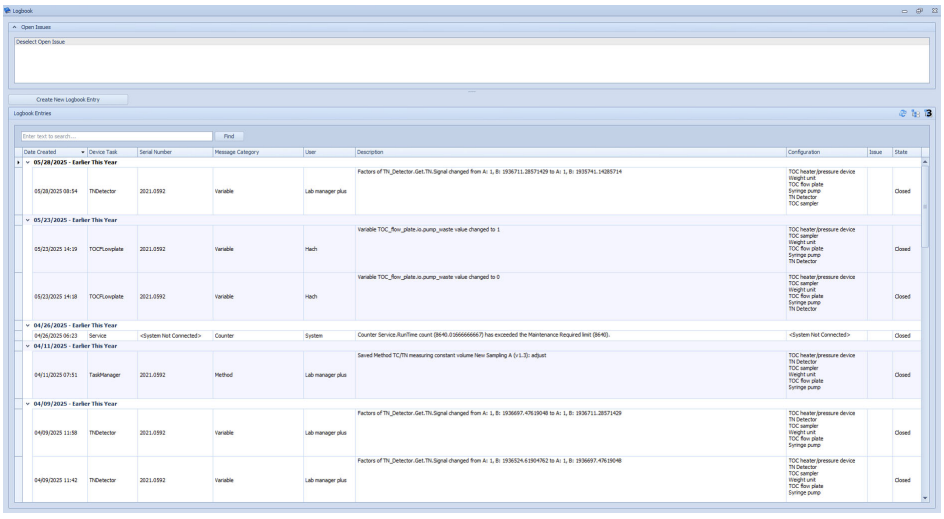
Select the category where this message belongs to in this case the measuring group. The state, in this case closed, because we want to add 1 logbook entry. Serial number and configuration are added automatically for the connected configuration.

Add a description of what you have done with the system, to keep track of what happened to the system over time. In this case the liquids module is cleaned.

Press the Add log entry button.



The newly added entry is shown in the table of the logbook.

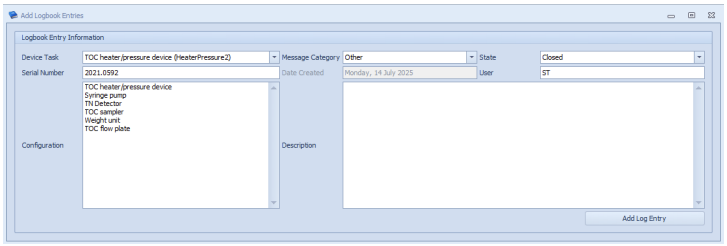


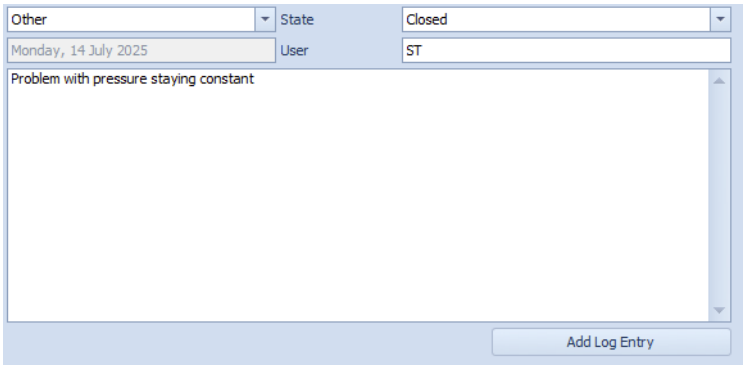
7.1 Create an Issue

Press the Create New Logbook Entry button of the logbook to create the first entry of this issue.

Fill in all the information. The difference between a single logbook entry and an issue is the State value, this is set to Open.

Press the Add Log Entry button to add the issue.

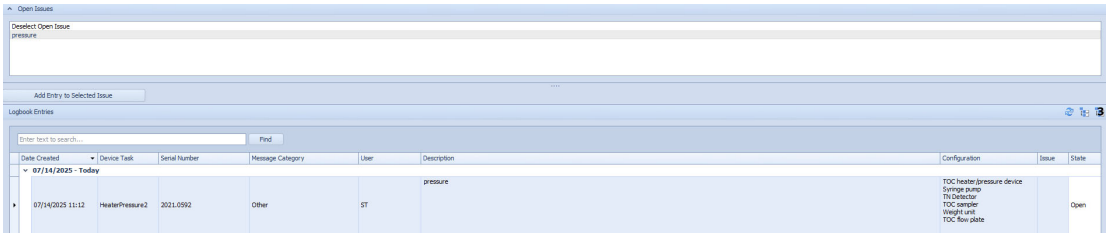




The software askes for a description of this Issue to recover the information easier later. Enter a description and press on OK.

A new line is added to the logbook table, in the column Issue the issue description is shown.

In the Open Issues a new entry is created.



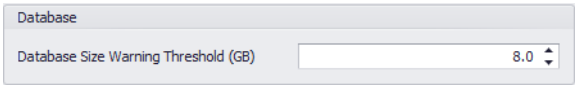
When an Open Issues is selected the table is updated with logbook entries only linked to the selected issue. The button Create New Logbook Entry is changed to Add Entry to Selected Issue. When this button is pressed a new logbook entry is added to this issue (and shown in the overall Logbook overview).

When a new logbook entry is added to this issue and the state is set to Closed, the issue is removed from the Open Issues list and the issue is closed

Section 8 Data Management

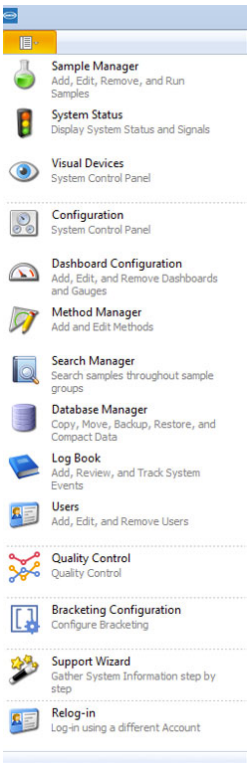
8.1 Data Management

By default, when the database file size exceeds 8.0 GB, TEIS, at startup, will show a warning referring to this chapter. This chapter will guide you through the steps required to minimize the database growing to a size that could become problematic. This warning limit can be changed in Configuration / Interface Settings (default: 8.0, minimum: 0.1, maximum: 2147 483 647).



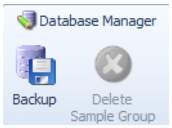
8.2 Create a Backup

A backup can be created of the database, where all sample data, methods and settings that are used for the connected database need to be saved to prevent the loss of data. Note this will create a copy of the database file, ADM can be used to create and restore a backup of the data contained in the database, in addition it can compress this backup to much smaller sizes than a file copy of the database. Please refer to 3.9-5.2 (page 54).



Go to the database manager to create a backup of the database.

1. Press the backup button, to create a backup. Save the file to a location.

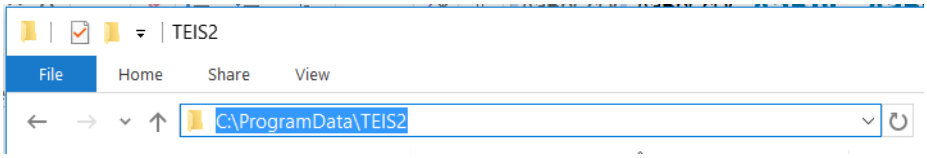


This backup contains ALL data used and produced by the analyzer.

2. To restore a backup place the TEIS_DATA.FDB file back in the folder:
C:\ProgramData\TEIS2\Database\

Always, make a backup before replacing this file, data could be lost when no backup is created.

3. To create a full backup of all data including the settings of TEIS, custom reports, dashboard(s), LIMS settings, etc. make a backup of the folder:
C:\ProgramData\TEIS2\
Note: the “ProgramData” folder is hidden by default by Windows. To navigate to the folder, enter its full name in the windows file eQP1680 (Press Windows Key + e to open a new file eQP1680).



8.3 Archiving Data

It is recommended to not run any analyses while archiving the data.

For performance reasons, deleted data is only marked as deleted until it is manually purged. Purging frees up space inside the database so it can be reused and thus minimizes the need to expand the database on disk. Note: purging will not reduce the size of the database on disk.

Purging for the first time may take a considerable amount of time (~30-45 min/10GB). It depends on the amount of data in the database, the amount of purge-able data and the overall speed of the computer system (CPU/disk/etc.).

Tip: When purging on a regular basis (e.g. once a month/once per quarter) the time required to purge will decrease compared to the first time.

Note: Purge cannot be used while the system is running. Task Manager should not be running and Week Planner startups should not coincide for as long as the purge is running.

Before starting this task, ensure that at least about 3-4 times the current database size is available as free disk space.

1. Create a New Database
   Open the Database Manager (requires at least Lab manager access) and press Create Empty Database, select a local storage medium (default: Desktop), and optionally change the default file name, press Save to continue. The System Information is automatically copied.
2. Copy Sample Groups
   Select the Sample Group(s) you want to archive, in the list under Current Database. When at least one Sample group is selected the Copy Sample Group button will become active. To select multiple items, press and hold the Shift-key and then select the start and end Sample Group. Hold the Ctrl-key while selecting to include or exclude an individual Sample Group. Press Copy Sample Group to start the copy process.
3. Backup
   Press Backup to create a file copy of the database and enable the Delete Sample Group button. It will remain enabled until the Database Manager screen is closed.
4. Delete Sample Groups
   Select the Sample Groups you want to remove from this database and press Delete Sample Group. Please ensure you do not delete calibration lines that are still in use by data that you do not archive.
5. Purge Deleted Data
   This will reclaim the storage space that is occupied by data that is marked as deleted. It does not reduce the database file size.
   The following steps are optional but are strongly recommended. They will reduce the file size of the database.
6. Advanced Database Manager
   For more information, refer to Database Manager on page 31 and the Advanced Database Manager manual.
   Select Compact under Database Action. Optionally select if you want to keep the intermediate data backup (Backup File).
7. Free Up Diskspace
   Move the archive (created at step 1; *.fdb) and any backups (*.bak, *.fbk; refer to Create a Backup on page 55 for file location) created in the process to a safe location (preferably not on the same disk or computer).

8.4 Archive Data, Alternative (faster, manual)

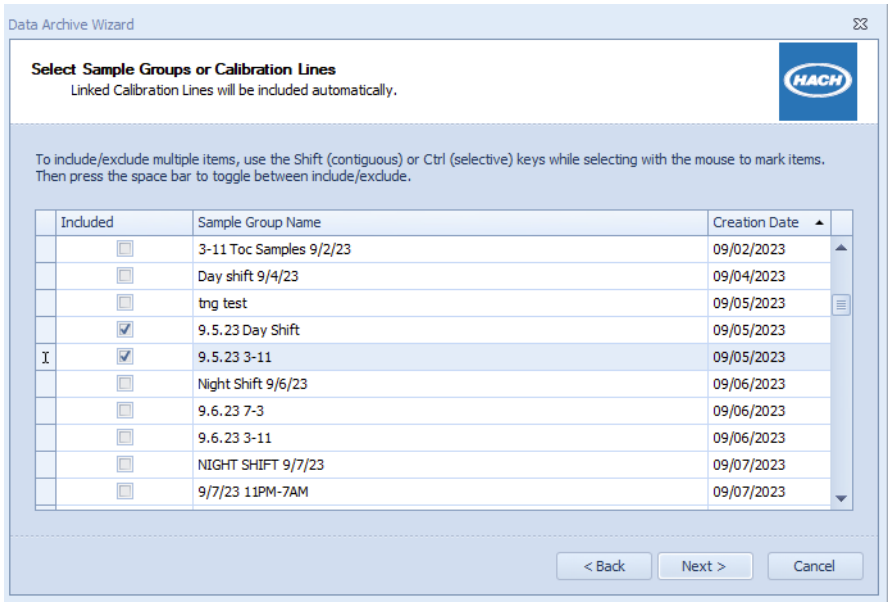
1. Create a New Database
   Open the Database Manager (requires at least Lab manager access) and press Create Empty Database, select a local storage medium (default: Desktop), and optionally change the default file name, press Save to continue. The System Information is copied automatically.

2. Copy Sample Groups
   Select the Sample Group(s) you want to keep using, in the list under Current Database. When at least one Sample group is selected the Copy Sample Group button will become active. To select multiple items, press and hold the Shift-key and then select the start and end Sample Group. Hold the Ctrl-key while selecting to include or exclude an individual Sample Group. Press Copy Sample Group to start the copy process.
3. Close TEIS
   The following steps require that TEIS is not running. Close TEIS.
4. Swap Databases
   Move the current database (C:\ProgramData\TEIS2\Database\TEIS_DATA.FDB) to a safe location (preferably not on the same disk or computer) and preferably rename it. Move the database created at Step 1 to C:\ProgramData\TEIS2\Database\TEIS_DATA.FDB.
5. Start TEIS.

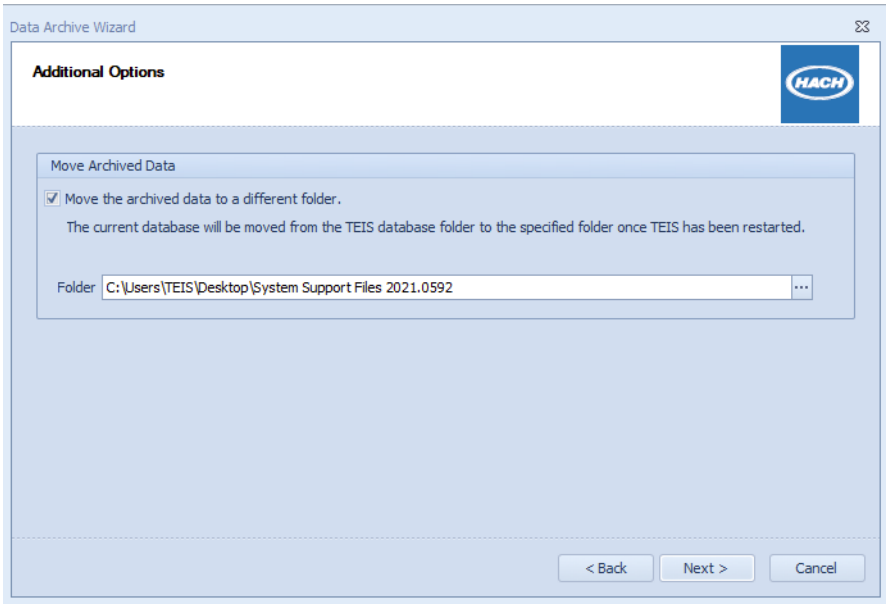
8.5 Data Archive Wizard (recommended)

An easier way to archive data. It follows the same steps as Archive Data, Alternative (faster, manual), but will guide you through the process, automates restarting TEIS, and optionally, moving the archived data to a selected location.

1. Select Sample Groups you want to keep. Typically, this would be one or more calibration lines:



2. To move the archived data to a different destination, enable the Move Archived Data.

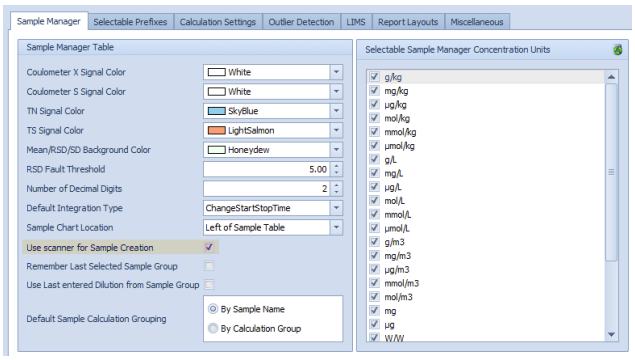


3. Finish will start the process of copying the data to a new database, closing TEIS, swapping out the databases, optionally moving the archived data, and restarting TEIS with the new database. The archived data will have an ARCHIVE_<serial number> prefix and when not moved, can be found in C:\ProgramData\TEIS2\Database\.

Section 9 Further Functions

9.1 Barcode Scanner

TEIS contains the capability to use a barcode scanner for vial identification to the sample manager. To enable the scanner, go to the Configuration, Interface Settings, Sample Manager and enable Use scanner for Sample Creation.



This will enable a button on the Add Samples screen to activate the scanner.

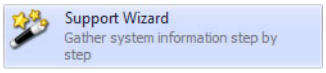
First enter all information for the samples that need to be created, like injection quantity, method, calibration line, replicates, etc.

To activate, highlight the sample name field in the Sample Manager tab and press the barcode next to the sample name, and start scanning your vials. A new sample is added to the sample group, for every scan made.

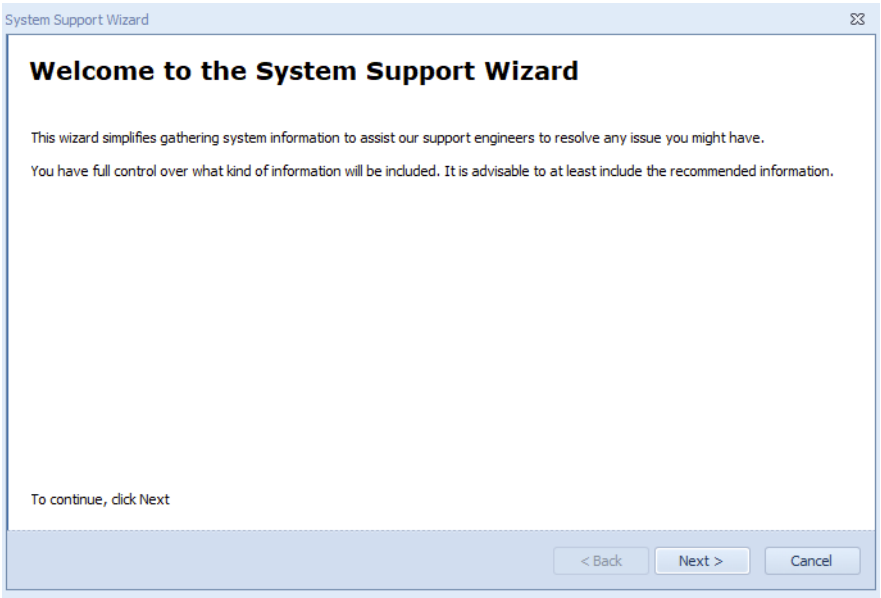
9.2 Support Wizard

The support wizard allows you to gather system information, that will help our support engineers diagnose issues you might have, in a few easy steps. You will have full control over which information will be included. At any stage of the wizard can you cancel the collection of information, or step back and change your selections. Recommended information will be included by default but can be excluded by clearing the checkmark. The resulting file will be placed in a folder on the desktop called System Support Files <serial number>. Where <serial number> is the serial number of your system in the format of yyyy.nnn.

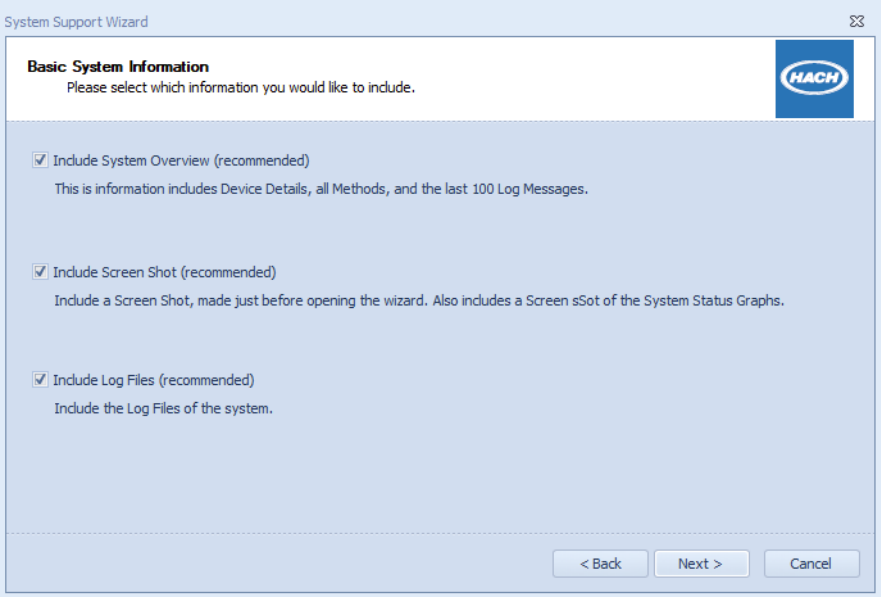
To start the wizard, select Support Wizard from the main menu.



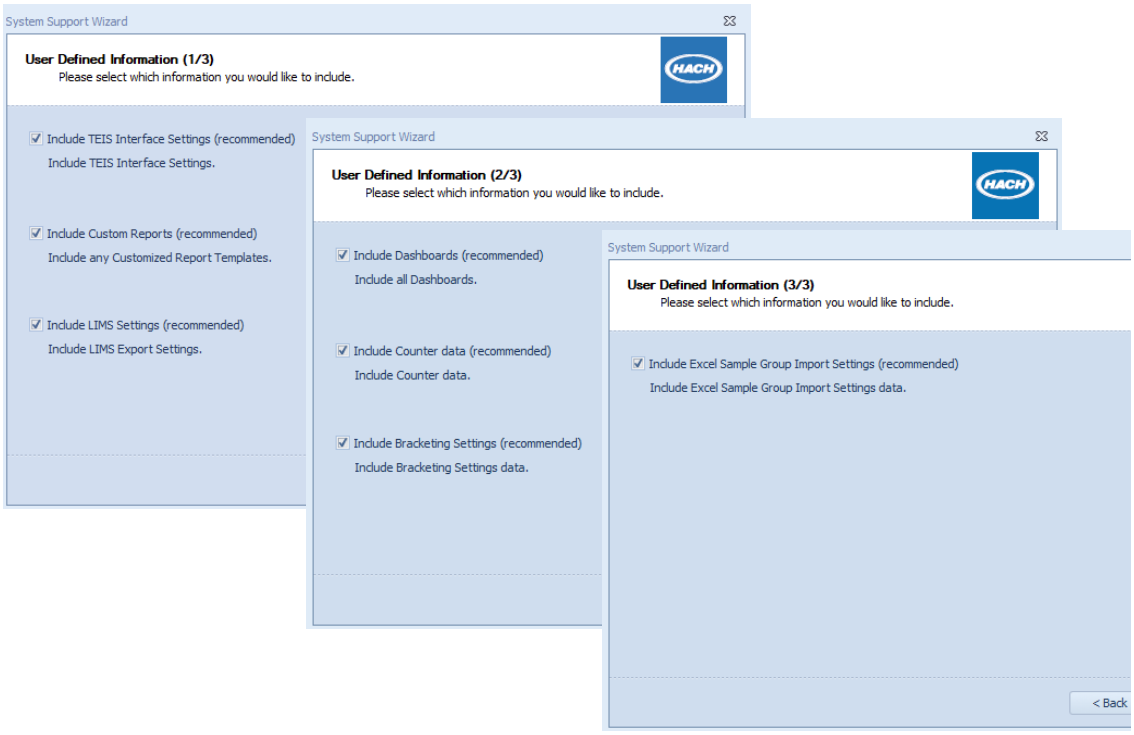
1. The first page shows an introduction:



2. The second page gathers basic system information, such as System Overview, screenshots and log files. The contents of System Overview is shown in Configuration, System Overview. The screen shots are of TEIS just before the support wizard was started and of the System status screen. The log files contain information about the system and software functionality. This information helps our support engineers with their root cause analysis.

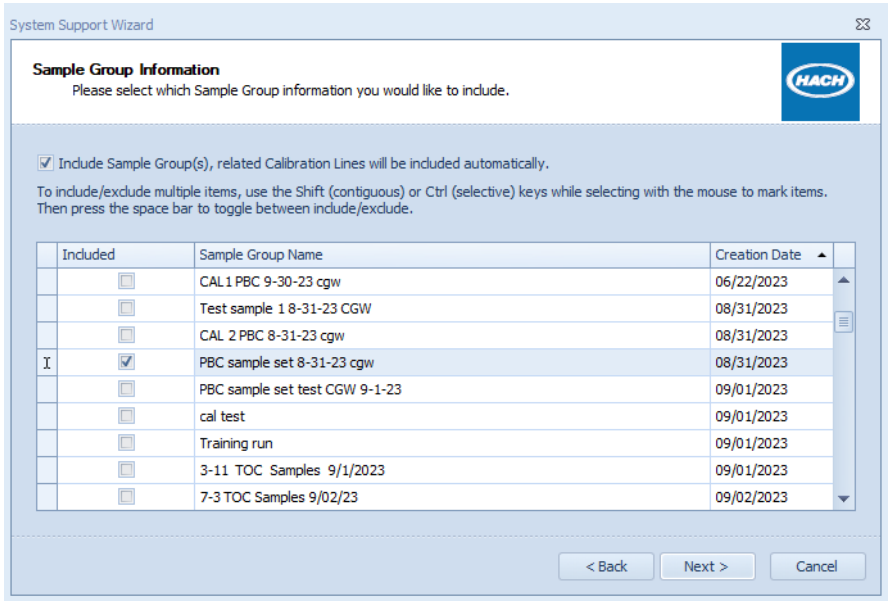


3. The third step gathers user-defined information, such as Interface Settings, custom reports, LIMS export settings, dashboards and more (3 pages).

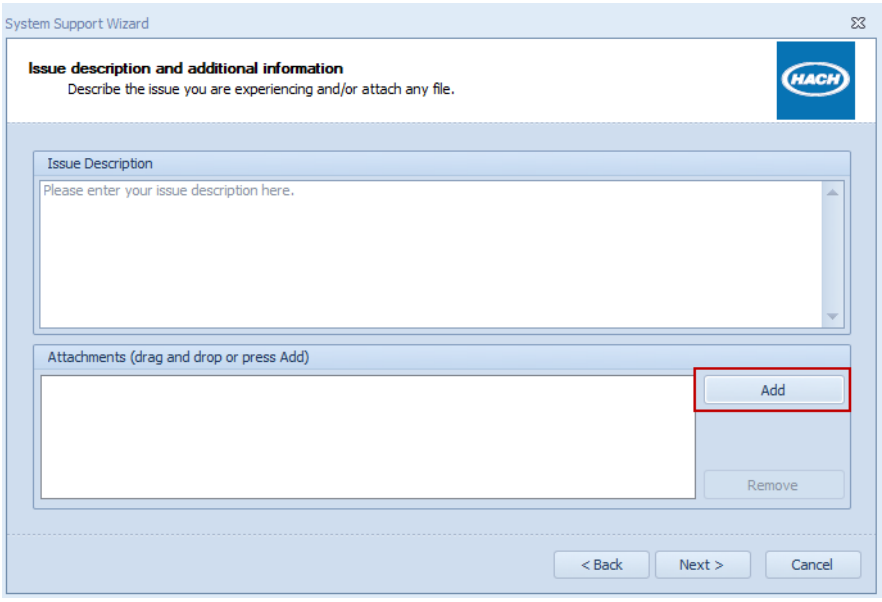


4. The next page allows you to include any sample group that might be related to the issue you are reporting. Any related calibration line(s) will automatically be included. To include a sample group, click the Include Sample Group(s) option and then set the checkmark for the

sample group that you would like to include. If you want to include more than one sample group, and do not want to click each item separately, please follow the on-screen directions.

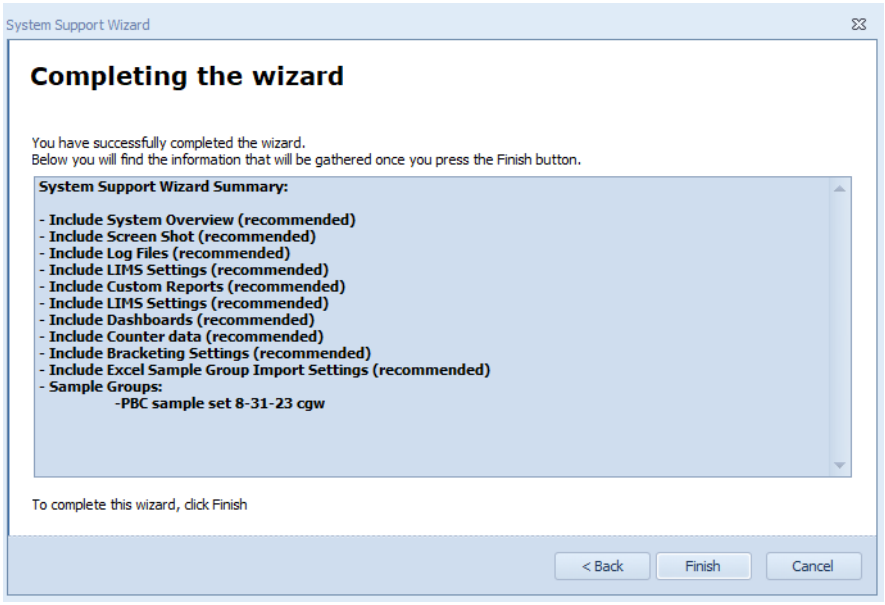


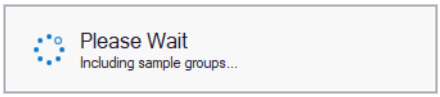
5. The second to last page allows you to describe the issue in the Issue Description box. If you want to include more information, such as your own screenshots, or documents that describe the issue you can add these as attachments by pressing the Add button and selecting the file(s).



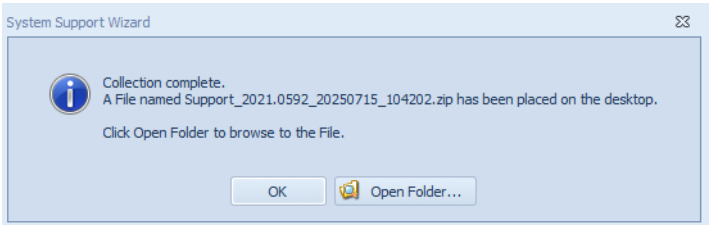
6. The last page shows an overview of the items that will be included. This is the last page you can go back to and change your selections. Pressing Finish will start the collection of the

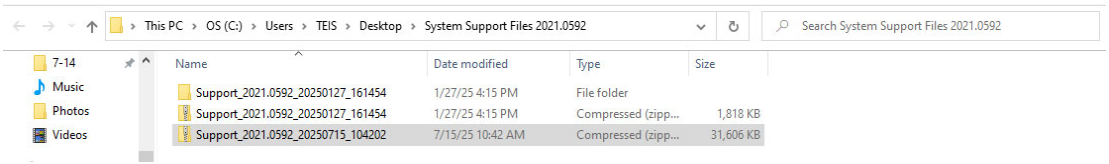
information into one file. Please note that the duration of this step depends on the amount of information you choose to include.





7. Once the collection has finished, the wizard will create a file in the System Support Files folder on the desktop. The file name is a zip file and formatted as follows:
Support_<serial number>_<yyyyMMdd>_<HHmmss>.zip
Where <serial number> is your system's serial number, <yyyyMMdd> is the local date and <HHmmss> is the local time in 24h.
Press Open Folder… to browse to the folder containing the file.

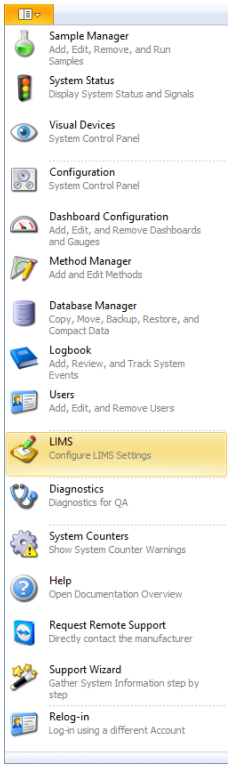




Note: files smaller than 10MB, can usually be sent as an attachment via e-mail, however bigger files might need to be transferred another way. Please contact your local support to discuss an alternative way to transfer the file.

9.3 LIMS

Note: To access the LIMS functionality, a LIMS Serial Key is required. Please contact your local Hach salesperson for more information.



TEIS has LIMS export functionality built into the software. To make use of this feature and configure settings, select LIMS in the main menu. This functionality is designed to help the user export data using a pre defined format or a format of your own customization.

The LIMS settings tab is divided into two sections with the following options:

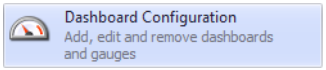
LIMS Output Settings

- Output directory – use the “Select Output Directory” to define where the data should be exported to. Here you have the option to use the serial number and/or the name of the sample group as a folder divider. The preview will show you what the final path will be.
- Filename Format – here you can create a dynamic filename using the sample information shortcuts. With dynamic shortcuts you are able to name an export file with sample information, to create a unique filename.
    - Entering {0} – {1} will result in:
      OID – SampleName: 123 – WasteWater
- Create PDF Sample Report – Also create a pdf using the Sample Report layout.
- Export after measuring – Toggle this checkbox if you want to export automatically when a sample has been analyzed.

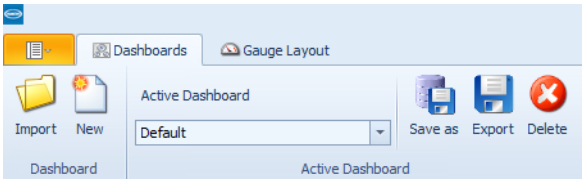
1. Export Only Last Sample – This setting is available when “Export after measuring” has been enabled. It will only export the last non-Fault sample of a set of samples that have the same Calculation ID.

9.4 Dashboard

The dashboard is opened by selecting Dashboard Configuration from the main menu.



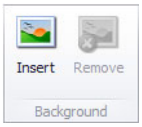
Lab managers can create new dashboards or change existing ones.



At startup, when no existing dashboards are found, a default empty dashboard will be created. It will be called “Default” and will be made the active dashboard. Dashboards can be added by pressing New to add an empty dashboard or Import to import a dashboard which was exported from another system. The active dashboard can be changed by selecting one from the Active dashboard list. Save As, creates a copy of the current dashboard with a new name. Export allows you to save the dashboard to a location of your choice, so it can be imported on another system. Delete dashboard will remove the dashboard.

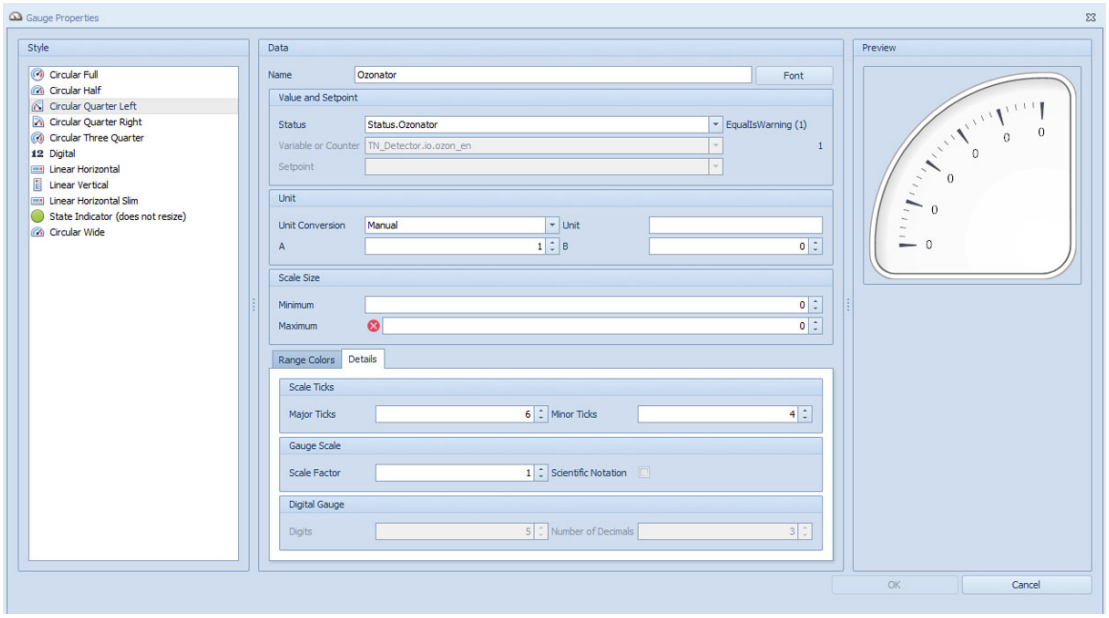
Note: when the option Show new dashboard system at startup (Configuration, Software Settings) and at least 1 gauge is present, the active dashboard will be automatically opened at startup.

To add a background for a dashboard, press the Insert button and select an image file (supported formats: png, jpg, bmp, tiff, gif). To remove the background, press the Remove button.



The Gauge Layout ribbon page has all functionality to add, edit or change gauges. It also provides access to counters when a counter is selected and the logged in user has the required privileges.

The Add button will open a dialog, allowing you to define a name, a gauge style, bind it to a value provider (status, counters, variables), set its value range, set color ranges, set the number or major and minor ticks and the scale factor.

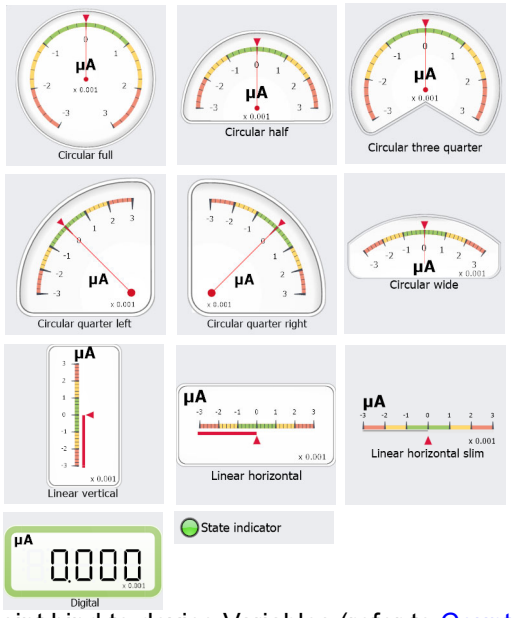


Gauge Style defines the type of gauge that will be added. Below is an overview of the gauge styles as they are placed on the dashboard (refer to Dashboard Gauge Styles on page 65).

The Name of the gauge must be unique and will be shown at the bottom of the gauge or to the right of it when it is a State Indicator.

Setting Status to any value other than <No Status, use Current> will bind the gauge to a status of a device (refer to Interface Settings on page 34). A status will set the appropriate Current and Setpoint device variables, and when applicable a Unit. Range Colors will be disabled as the status will set them. When Status is set to <No Status, use Current>, Current must have a value provider selected.

Figure 1 Dashboard Gauge Styles

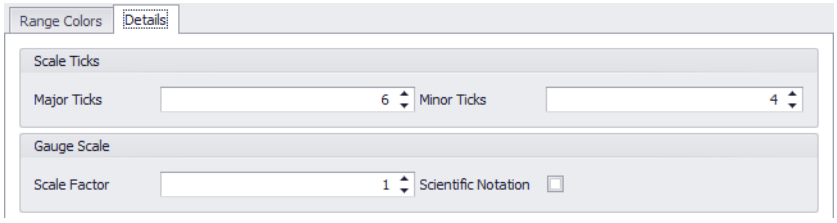


Current and Setpoint bind to device Variables (refer to Counter Center on page 36) and Counters. When Current is set its Unit will be filled, when applicable.

Unit Conversion has a selection list for well-known conversion units (based on the ones used by the system). When it is set to Manual, Unit, A and B (y=Ax+B) can be set.

Minimum and Maximum define the scale start and end values of the gauge.

The Range Colors tab defines a colored band along the scale of the gauge. Each color has a start and end value (minimum, maximum). For the Digital gauge it defines the border color, for the State indicator gauge it defines the led color.

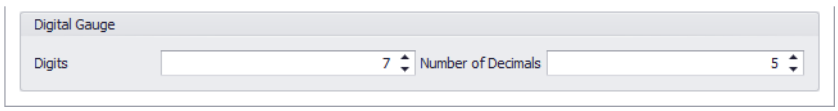


The Details tab allows you to modify the scale ticks, scale factor and number of digits.

Scale Ticks are available for gauges that support a scale. Major and Minor Ticks are used to divide the scale.

Gauge Scale is available for gauges that support a scale or the digital scale. Scale Factor is an integer value by which the current, setpoint value and scale label values will be divided. If a value other than 1 is entered, the value will also be displayed on the gauge. This can be used to reduce the number of digits required for the scale labels. Scientific Notation changes the scale label to use scientific notation (10xxx) which could be more compact.

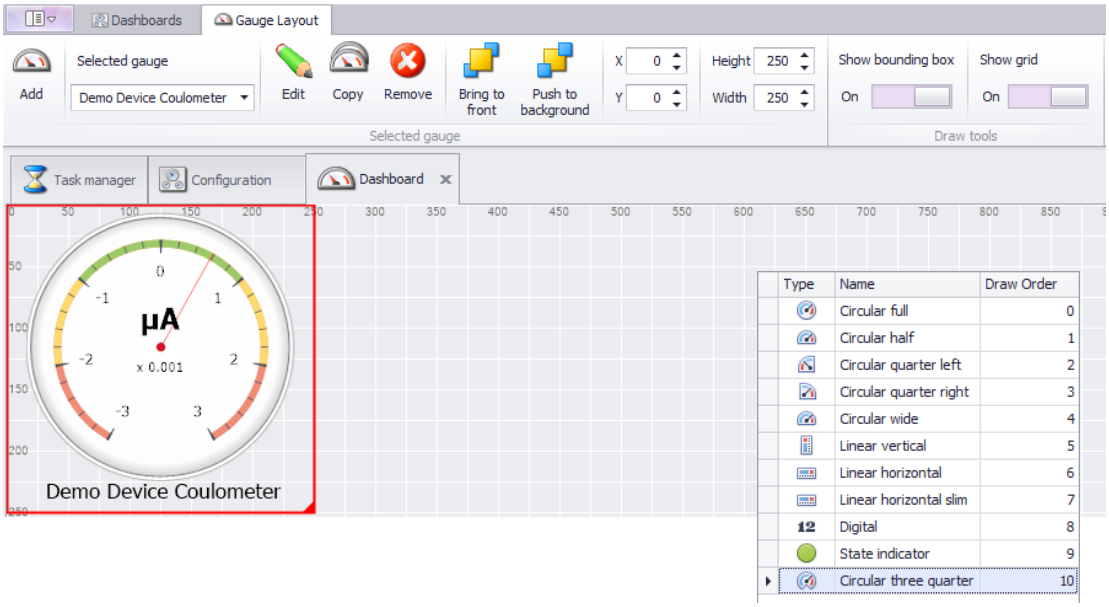
For a Digital Gauge the total number of Digits and the Number of Decimals can be set. Please note that a negative sign requires a digit, so if a negative value is expected set Digits and Number of Decimals accordingly or else it might not be visible.



Note: Status, Current and Setpoint only shows values from devices that are currently connected. Selecting or changing these values requires the appropriate device to be connected.

The selected gauge is highlighted with a red box along its borders; it is also shown in the Selected Gauge drop down list. This list allows you to select a gauge when multiple gauges

overlap and makes it difficult to select a gauge using the mouse. It also shows the order in which the gauges are drawn, 0 being the first (bottom).



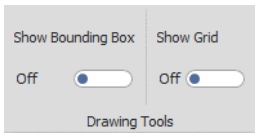
Bring to Front and Push to Background will move the selected gauge to the front (largest draw order) or push it to the background (setting the draw order to 0).

X, Y, Height and Width determine the position and size of the gauge.

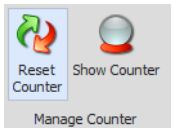
A gauge can also be moved to a position by clicking and holding the left mouse button when it shows the moving cursor and then move the mouse. To place the gauge, release the left mouse button.

The size can also be changed by clicking and holding the left mouse button when the mouse is over the resize grip (the red triangle in the bottom right corner of the selected gauge). Release the left mouse button to stop resizing.

Show Bounding Box and Show Grid are visual aids to make placement and sizing gauges easier. Show Bounding Tox toggles a thin blue box along the boundaries of the gauges. Show Grid toggles a background grid.



When a gauge is bound to a Counter and the user has the appropriate privileges, the Reset Counter and Show Counter buttons will be available, depending of the type of counter.



9.5 Outlier Detection

TEIS has 2 different kinds of Outlier Detection that each detect and handle outlier values in their own specific way. Automatic Outlier Detection can be enabled by selecting a Detection Type on the Configuration, Interface Settings page:

- None, Automatic Outlier Detection is disabled
- SD / RSD, one outlier per set, refer to SD/RSD on page 67.
- GESD (Generalized Extreme Studentized Deviate) ASTM D7915, multiple outliers per set, refer to GESD (Generalized Extreme Studentized Deviate) ASTM D7915 on page 67.

Please note that while Outlier Detection can help isolate values that seem to be extreme, and may possibly be ignored (removed), it is not a catch-all-tool to fix underlying issues in the system, samples, or environment.

“Potential outliers should be examined to see if they are possibly erroneous. If the data point is in error, it should be corrected if possible and deleted if it is not possible. If there is no reason to believe that the outlying point is in error, it should not be deleted without careful consideration.” (NIST, 2019)

“But an important point that I always mention when discussing outliers is that automatic rejection is wrong. The outlier is not always an error and sometimes it provides important information about the data. Valid data should not be removed just because it doesn't conform with our theory of reality. Whether or not it is difficult to do, the reason why the outlier occurred should always be investigated.” (Chernick M. R., 2012)

9.5.1 SD/RSD

Determines if a value is an outlier based on SD (Standard Deviation) and RSD (Relative Standard Deviation) thresholds. The following steps are takes when all samples in a replicate set have been analyzed:

1. When SD and RSD are exceeding the thresholds, a replicate is added and the set is reevaluated after analysis.
2. When SD and RSD are still exceeding the threshold, the replicates, up to a maximum of the number of added replicates, that are furthest from the mean are marked as outlier and the set is evaluated again, and when it exceeds the SD and RSD and the maximum number of reinjections has not been reached, a replicate is added and the set is reevaluated after analysis. This step is repeated until the maximum number of reinjections has been reached or no more replicate has been added.
3. All marked outliers will be set to fault.

Calculations:

The data set mean: $\mu = \frac{1}{n}\sum_{i=1}^{n} x_i$

Where:

μ is the average of all values in the data set

n is the number of values in the data set

Furthest away from the mean: $max_i|x_i - \mu|$

Sample standard deviation (RS): $\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \mu)^2}{n-1}}$

Relative standard deviation in % (RSD; coefficient of variation): $\hat{c_v} = \frac{\sigma}{\mu} \times 100$

9.5.2 GESD (Generalized Extreme Studentized Deviate) ASTM D7915

9.5.2.1 Significance and Use

1. The GESD procedure can be used to simultaneously identify up to a pre-determined number of outliers (r) in a data set, without having to pre-examine the data set and make a priori decisions as to the location and number of potential outliers.

2. The GESD procedure is robust to masking. Masking describes the phenomenon where the existence of multiple outliers can prevent an outlier identification procedure from declaring any of the observations in a data set to be outliers.

9.5.2.2 Scope

This practice provides a step-by-step procedure for the application of the Generalized Extreme Studentized Deviate (GESD) Many-Outlier Procedure to simultaneously identify multiple outliers in a data set. (See Bibliography.)

This practice is applicable to a data set comprising observations that is represented on a continuous numerical scale.

This practice is applicable to a data set comprising a minimum of 6 observations.

This practice is applicable to a data set where the normal (Gaussian) model is reasonably adequate for the distributional representation of the observations in the data set.

The probability of false identification of outliers associated with the decision criteria set by this practice is 0.01.

It is recommended that the execution of this practice be conducted under the guidance of personnel familiar with the statistical principles and assumptions associated with the GESD technique.

This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee. (D02.94, 2018).

9.5.2.3 GESD Test

In short: given the suspected number of outliers, k, the GESD test performs r separate (Grubbs) tests: a test for one outlier, a test for two outliers, and so on up to k outliers.

The calculation assumes the values in the data set are a normal distribution. For each data point the maximum deviation from the mean is calculated:

$$R_i = \frac{max_i|x_i - \mu|}{s}$$

Where:

- R_i: maximum deviation from the mean for iteration i.
- μ is the average of all values in the data set
- s is the sample standard deviation of the data set
- i =1,2,…,k

Then, for each iteration the data point with the largest distance from the mean is removed from the data set. This process is repeated for the number of outliers.

Each maximum deviation (R_i) is then tested against its critical value (λ_i), which is calculated as follows:

$$\lambda_i = \frac{(n-1) \cdot t_{crit}}{\sqrt{n \cdot \left(n - 2 + t_{crit}^2\right)}}$$

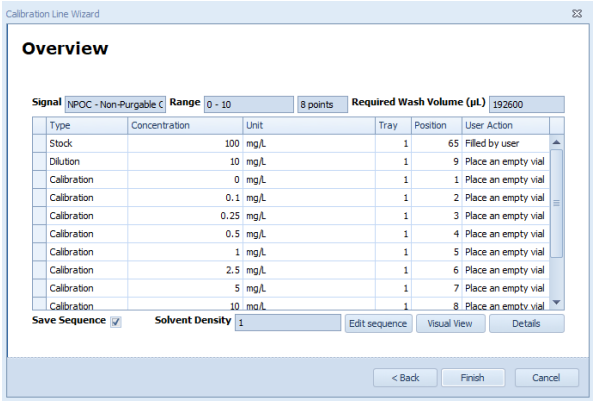
t_{crit} is the reverse of the Student-t distribution with the two-tailed probability p (p-value = α/n) and the specified degrees of freedom (= n - 2).

The number of outliers follows, where for the largest value of i, $R_i > \lambda_i$.

9.6 Calibration Line Wizard

Do not use! Not intended for use with QP1680.

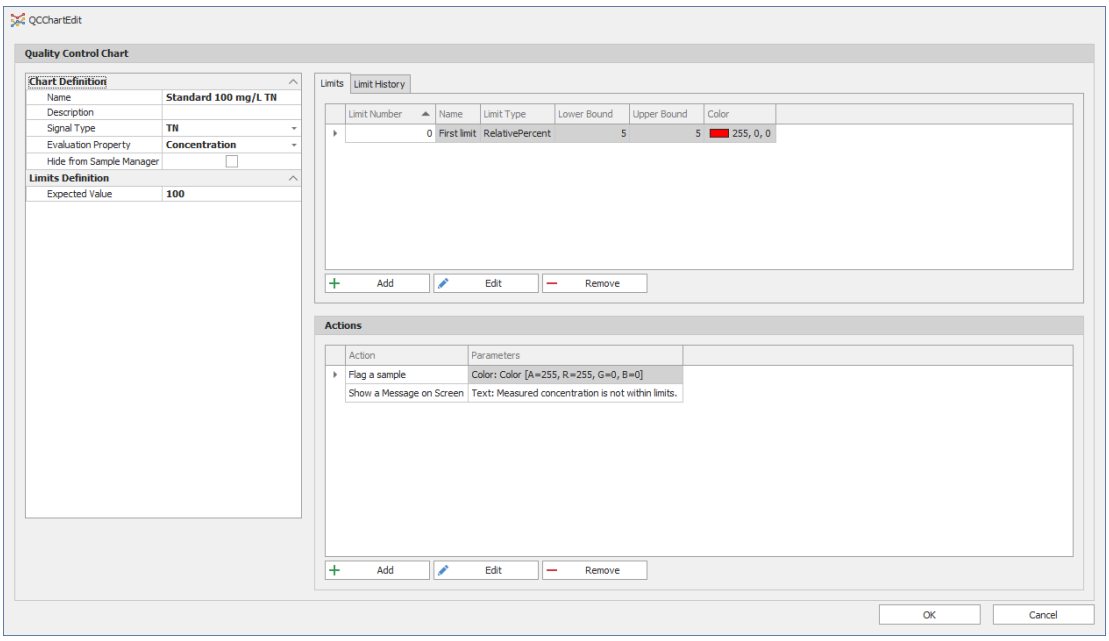
9.7 Quality Control



Quality Control allows you to monitor the system's suitability. Quality Control can be accessed via the application main menu.

9.7.1 Quality Control Chart

A QC Chart defines the parameters to which sample replicate sets are checked once analyzed. When a user defined limit is exceeded user defined actions can be executed.



9.7.2 Chart Definition

Name: user definable name, used to refer to this chart.

Description: optional user definable description, used to describe the chart.

Signal Type: user selectable signal type, used to filter charts in Sample Manager.

Evaluation Property: user selectable sample property (Area, Concentration).

Expected Value: user definable value, used as reference value when evaluating limits.

9.7.3 Limits

Limit Number: order in which the limit is evaluated.

Name: user definable name.

Limit Type: Absolute, Relative, Relative Percent

Lower Bound: lower bound of the limit

Upper Bound: upper bound of the limit

Color: the color of the limit in the graph

9.7.4 Actions

Once a limit has been exceeded, an action is executed. The following actions can be assigned:

Flag a sample: mark the sample replicate set with the provided color.

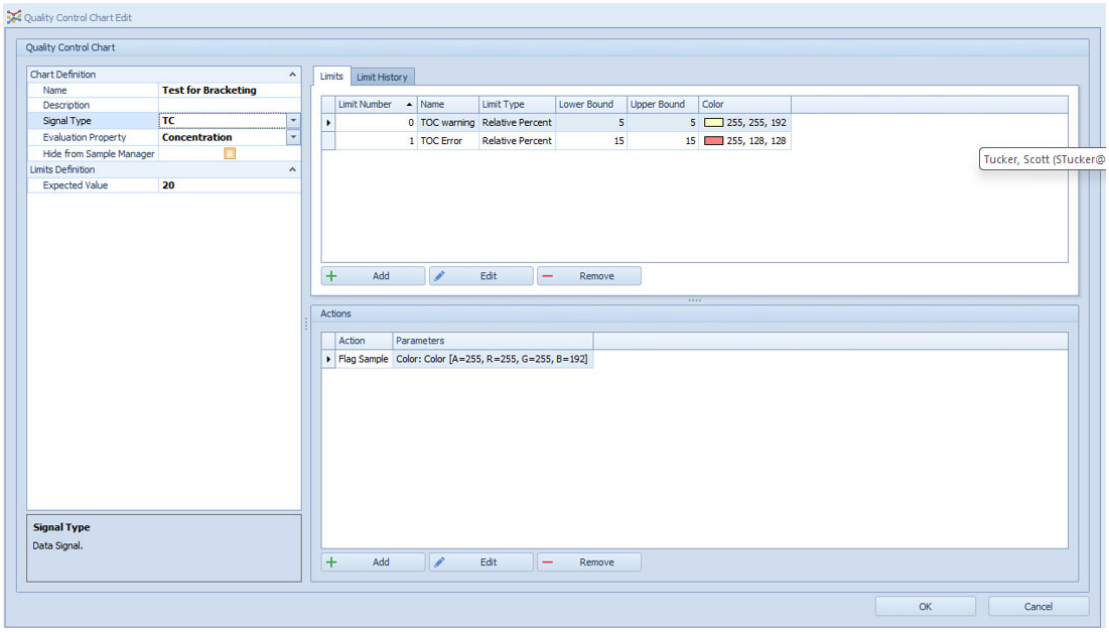
Reanalyze sample: the current sample replicate set is marked as fault and the set is reanalyzed.

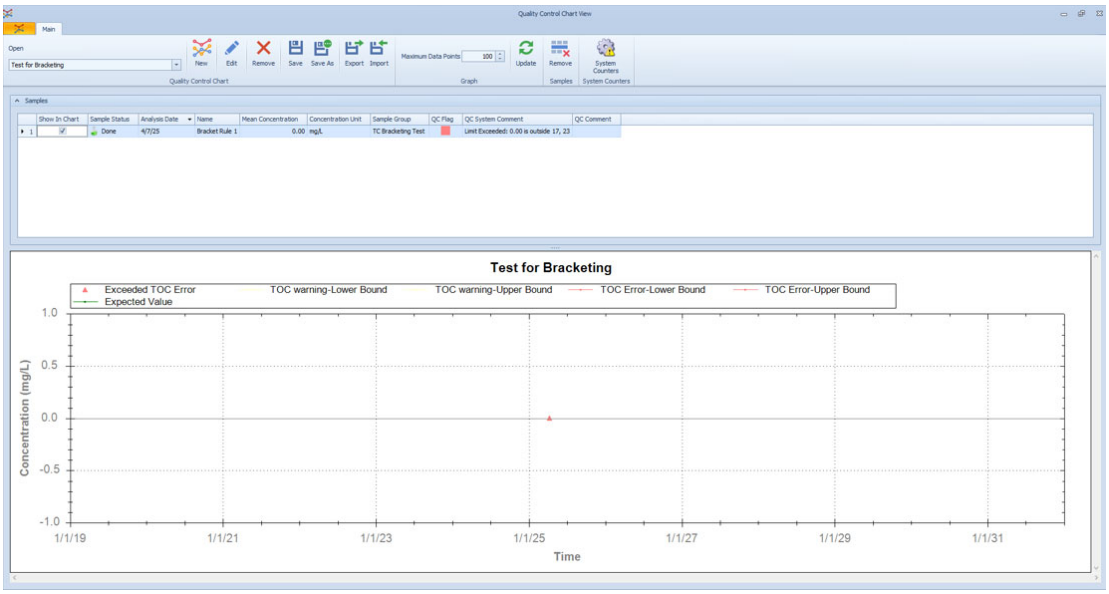
Show a message on screen shows a message box with user definable text on screen.

Stop Task Manager: stops Task Manager, halting all analyses.

9.7.5 Quality Control Chart View

The Chart View allows you to manage your charts (create, edit, remove, save, save as, import and export), and view the results of the chart in a graph.





9.7.6 Quality Control Chart

Open: select an existing chart to open it.

New: create a new chart.

Edit: edit an existing chart.

Remove: remove an existing chart.

Save: save the changes to a chart.

Save As: create a copy of the chart.

Export: save the chart definition as a file, so it can be transferred to other systems. It will not contain samples.

Import: import a saved export of a chart.

9.7.7 Graph

Maximum Data Points: by default, up to the latest 100 results will be shown in the graph.

Refresh: force the graph to update.

9.7.8 Samples

Remove: remove the selected sample replicate set from the chart.

9.7.9 Samples (table)

Show In Chart: when unchecked the sample replicate set will not be shown in the graph

Sample Status: Sample Status of the replicate set.

Measure Date: the time of analysis for the replicate set

Name: the sample name

Mean Concentration: the mean concentration of the replicate set (visibility depends on Evaluation Property of the chart)

Concentration Unit: the unit of the concentration (visibility depends on Evaluation Property of the chart)

Mean Area: the mean area of the replicate set (visibility depends on Evaluation Property of the chart)

Sample Group: the parent sample group of the set

QC Flag: if flagged by an action, this contains the color of the flag

QC System Comment: comment set by the system when a limit is exceeded during an analysis.

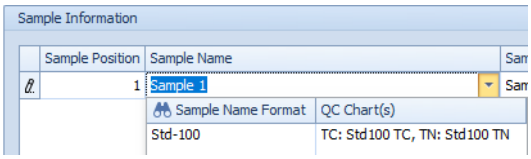
QC Comment: user definable comment.

9.7.10 Sample Manager

Sample Manager has QC related columns that can be enabled. To add a sample replicate set to a chart, enable the Quality Control Chart column (right click a column header, select Column Chooser) and select the chart you want to use for evaluation. The QC Chart column is a combination of the QC Chart Name and the QC Flag column of the QC Chart View screen.

Other QC columns are QC System Comment and QC Comment, which are identical to the QC Chart View screen.

Adding samples to a QC Chart can also be done automatically by using the Sample Name Selectable Prefixes settings (Configuration, Interface Settings, Selectable Prefixes). By adding an entry and linking a QC Chart to it. It can then be selected in the Sample Name field when adding Samples to an existing Sample Group, or when creating a new one.

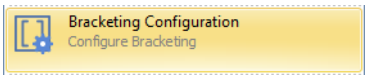


9.8 Bracketing

Bracketing is most often used to monitor the stability of the system or when high confidence in the results is needed. It is done by analyzing calibration standards just before and/or after a set of samples. Deviation of the standards can be an indication that the system is in need of re-calibration or (temporary) external factors influenced the result. The Bracketing feature allows you to define the brackets of standard(s) you want to add and apply them to a sample group repeatedly by the push of a button. Set it up once, apply on demand many times.

9.8.1 Bracketing Configuration

Bracketing Configuration is accessible to Lab Manager or higher from the main menu.



Bracketing toolbar group:

- Bracketing Master Switch toggles the availability of the Apply and Remove Bracketing buttons in Sample Manager.
  Save, stores the settings to file.
  Batch Size is the number of vials bunched together between a backet.

Signals toolbar group:

- Signals is a selection box where a single signal or group of signals can be selected:
  Single Signal: any supported signal, set the signal using the Signal Type column in the table.

The following signal groups are supported (availability is limited to the connected analyzer):

- TN,
- TC and TN,
- NPOC and TN,
- TOC (TC - IC),
- TOC (TC - IC) and TN

The signal and/or signal groups can be added, inserted, removed, and moved up and down using the Add, Insert, Remove, Move Up, and Move Down buttons.

Bracket rule table columns:

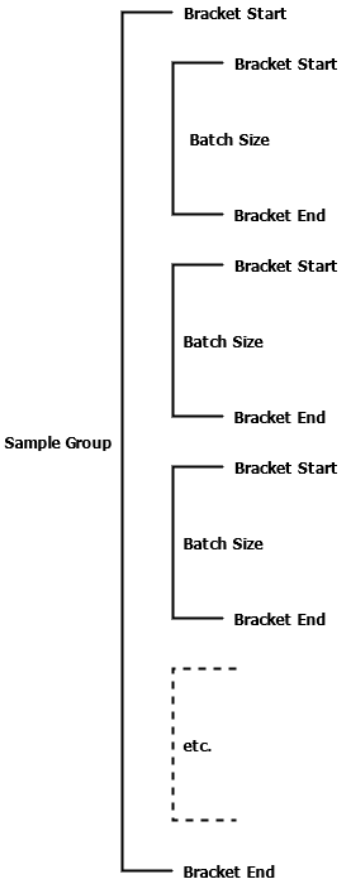
- Bracket Scope is the score at which the bracket is applied.
- Backet Start/End indicates if the rule is applied before and/or after the selected scope.
- Tray and Position are the vial’s tray and position.
- Replicates is the number of replicate entries that will be created for this rule.
- Sample Name is the Sample Name.
- Signal Type is the type of signal used for the rule.
- QC Chart Name is an optional selection to include the created sample in a QC Chart.
- Quantity (Unit) are the amount and unit of sample.
- Concentration Unit is the unit used for the calculated concentration.
- Density is the density of the sample.
- Method is the method used for the analysis.
- Calibration Line is the optional calibration line used for the concentration calculation.

Please note that QC Chart and Calibration Line selection availability depends on the selected Signal Type.

The configuration is saved when closing the Bracket Configuration window, or explicitly by using the Save button.

9.8.2 Bracket Scope

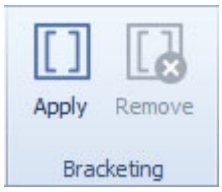
Brackets can be created with 2 scopes and each scope can have a start, end or both. The following figure (Figure 2.) illustrates how bracket scope and bracket start/end are applied.



A Batch Size scope bracket is applied to each Batch Size, or remainder thereof. The Sample Group scope is applied to the complete Sample Group, after Batch Size scope brackets have been applied. By toggling Bracket Start and/or Bracket End the application of the start and end rules can be controlled. Applying or Removing bracketing to a Sample Group is available in Sample Manager.

9.8.3 Applying Brackets

When Bracketing Master Switch is enabled, bracketing functionality will be available in Sample Manager.



1. Apply
   Bracketing is applied according to the currently saved Bracketing Configuration. The applied bracketing will be saved automatically.

   Bracketing cannot be applied in the following situations:

   h. If there are unsaved changes. When pressed, TEIS will ask if you want to save the changes before applying bracketing,

   i. If not all the samples are Not analyzed,

   j. If the Sample Group already has bracketing applied. To reapply, first remove the bracketing (provided the Sample Group complies with the remove restrictions).

2. Remove
   Bracketing can be removed using this button. The changes will automatically be saved.

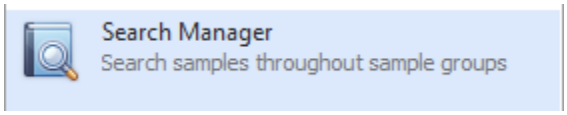
Bracketing cannot be removed in the following situations:

a. If there are unsaved changes. When pressed, TEIS will ask if you want to save the changes before removing bracketing,

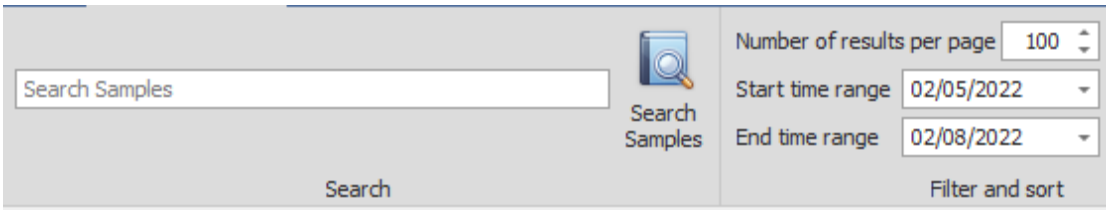
b. If the Sample Group is running.

9.9 Search Manager

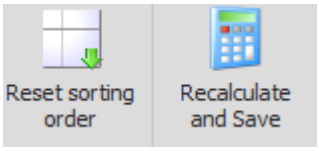
In this chapter the search manager will be covered. The Search Manager is a tool to search samples over multiple sample groups in a familiar Sample Manager derived interface. These samples can then be modified and reported upon. To open Search Manager click the button shown below in de main menu:



To search a sample, enter one or more words in the Search Samples text box. The Search Manager will return the samples which contain each whole word from the search query in its sample name. When the user wants to find words in a certain order, the user can put these words between quotation marks (“”), which will search for that exact string between the marks in the sample name. In the filter and sort section the user can select the time frame to sort in and the number of results per page. If the number of search results exceeds this number, the other samples will be shown on the next page.



By default, the search results will be grouped per sample group to give oversight in the search results. If the user wants to undo this grouping, for example when the user wants to sort over the entire search query, the user can drag the tag in the header bar to the column headers to add., the sample group name as a column to the table. Alternatively, right click on the aforementioned tag and click Ungroup to remove the grouping. To return to the original group and sorting, the user can click on the reset sorting order button in the ribbon header shown below to return to the original grouping and sorting.

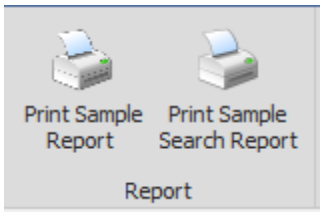


Just like sample manager, the user can change certain values of the samples in the grid. If a sample is changed, the row will turn red. To save and recalculate the changes, the user should click on the recalculate and save button shown above.

In the footer of the table, one finds the controls of the pagination, namely first page , previous page , previous sample, next sample, next page and last page . Next to these is the Sample Group information of the selected sample and last the paging information.

To the right of the table, one finds the familiar tabs of the sample manager, with one addition, namely the Measurement history tab. Here, the history of the selected measurements is plotted. The user can pick between the concentration and the area count for the y axis.

Last, two different types of reports can be printed. The first one is the sample report, which is the same as the sample report in the sample manager. The second type of the report is the Sample Search report, which reports a selection or the whole search query. This includes a measurement history plot.

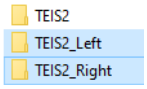


9.10 Multiple Analyzers on One desktop PC

This chapter will explain how to use multiple analyzers on one desktop PC. It will be explained with an example of two analyzers: Left and Right.

The feature of multiple analyzers on one desktop PC, can only be used with a fixed configuration.

1. Go to the ProgramData folder. In Windows, by default, this is a hidden folder, so C:\ProgramData should be entered in Windows EQP1680 navigation bar.
2. Create two copies of the TEIS2 folder and name them TEIS2_Left and TEIS2_Right. Inside each folder there is a database folder. NOTE: You are free to use any folder name as long as they do not contain any spaces, “TEIS2_Left” and “TEIS2_Right” are used as an example.
   Please see the NOTE about copying at the end of this chapter.



3. Place the corresponding database in these folders.
4. Next, navigate to the “C:\Program Files (x86)\Hach\TEIS 2” folder.
5. Create two shortcuts to the desktop of the TEInstruments.TEIS.Interface executable. Right click, Send to, Desktop(create shortcut).
6. Rename the two shortcuts on the desktop TEIS2_Left and TEIS2_Right (or any name you prefer; shortcut names do not influence the functionality).
7. Open Device Manager and expand Ports (COM &LPT).
8. Verify to which COM port(s) the analyzers are connected. In this example the analyzers are connected on COM 3 & 4.
9. Right click one of the shortcuts made on the desktop and select Properties.
   Go to the target and append the following to the end of the text (please note that there should be a space between the last “ and the - of -tdf):
   tdf TEIS2_Left -ouc COM3
   For the other analyzer this should be:
   tdf TEIS2_Right -ouc COM4

Now TEIS2 can be started twice with each their own connection to an analyzer, using their respective shortcuts.

NOTE: If in the previous steps the TEIS2 folder was not copied, but created by hand, Security permission must be set by hand as well. Not setting this permission might result in TEIS being unable to change, update or save settings, store/perform analysis, or several other tasks pertaining to reading, writing or modifying files/database in that folder.

Follow the steps below (described are the UI elements of an English version of Windows 10):

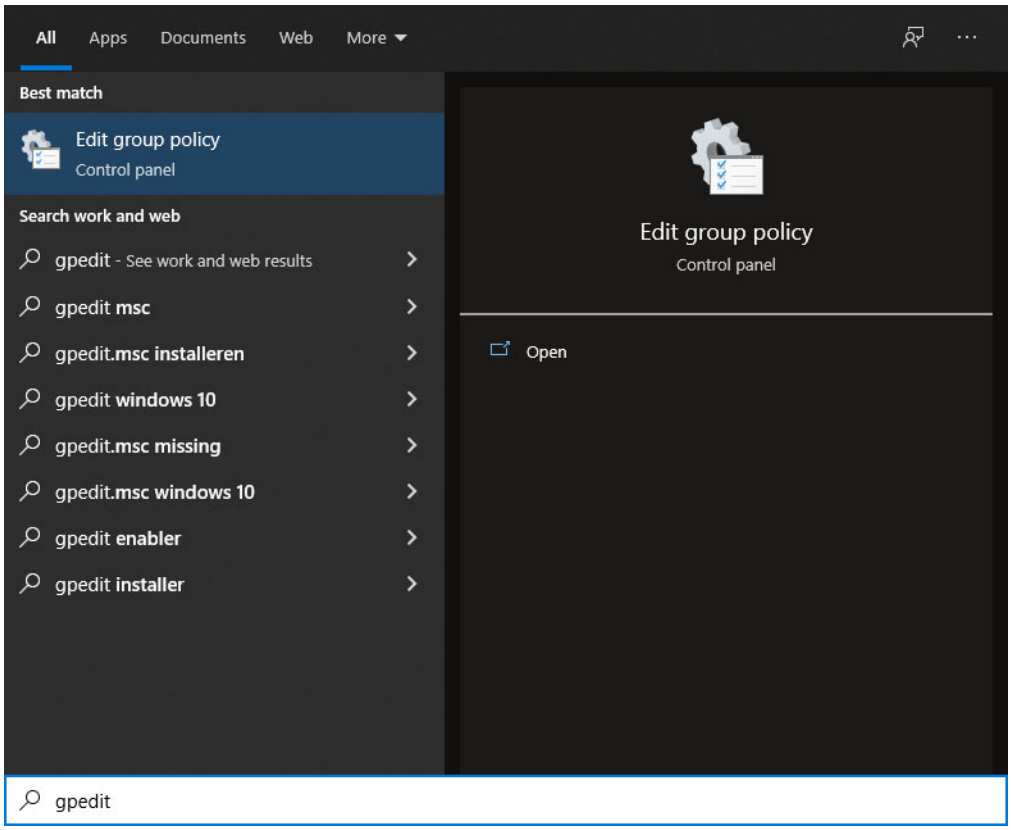
1. Right click the folder and select Properties
2. Select the Security tab
3. Press Edit
4. Press Add
5. Type Everyone (or its localized equivalent when using a non-English Windows)
6. Press Check Names, when accepted the name will be underlined
7. Press OK
8. Check Full control
9. Press OK to close the Folder Security window
10. Press OK to close the Folder Properties window

Depending on your local/network Windows security policies, these steps might require you to log into Windows as an Administrator. Ask your Network/System administrator for more information.

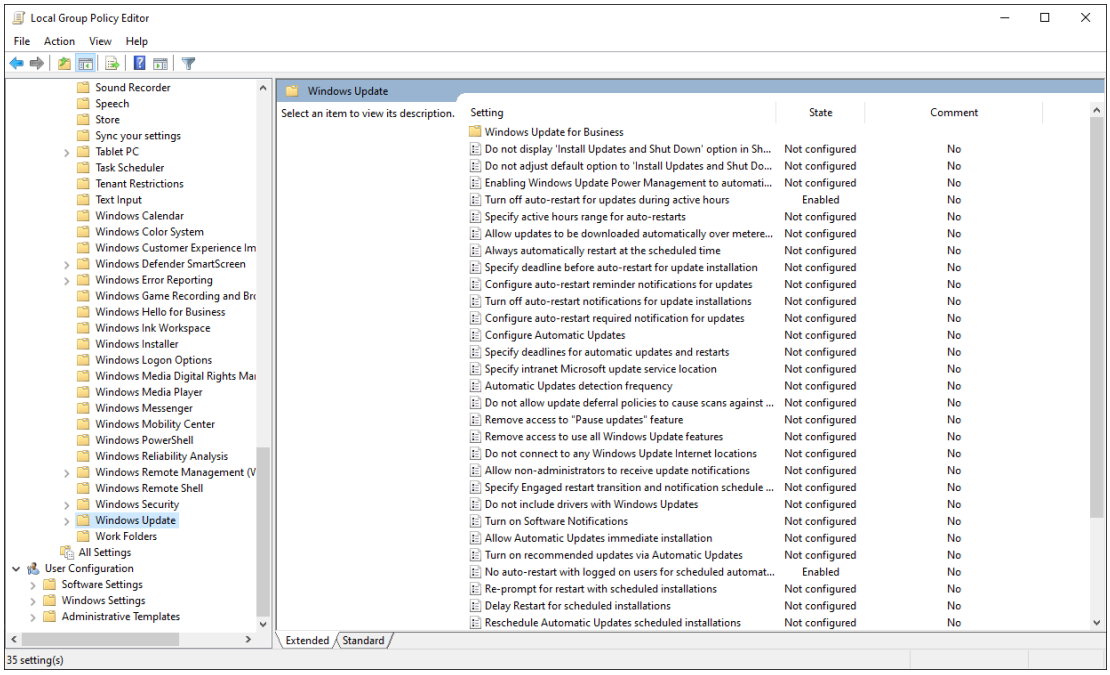
9.11 Windows Settings Configuration

To prevent Windows Update from forcibly restarting the system overnight, some settings in Windows need to be set. To do so, you need a Professional or Enterprise version of Windows installed and be logged in to an account with Administrator rights. Note that, if this setting is set in the Active Directory, this will override the local group policy set here. An Active Directory group then needs to be made for this PC and other mission critical PCs which cannot switch off. Please contact your company IT administrator on how to do this.

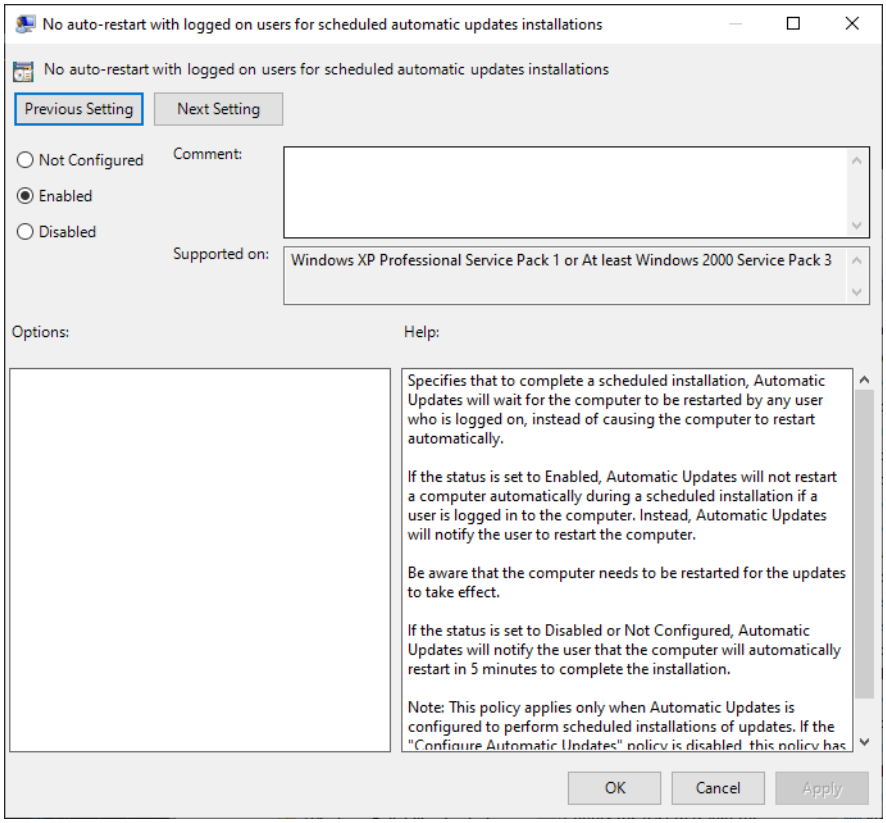
Click on start or search and type “gpedit” and click on Edit group policy.



In the left side menu of the “Local Group Policy Editor”, select Computer Configuration\Administrative Templates\Windows Components\Windows Update. The following screen should appear:



Then, select the “No auto-restart with logged on users for scheduled automatic updates installations” option and the following screen should appear:



Set the radio button on the top left to enabled and click on apply. You can close the setting window and the local group policy editor now.

Table 6 Standard Date and Time Format Strings

Format specifier	Description	Examples
"d"	Short date pattern.	2009-06-15T13:45:30 -> 6/15/2009 (en-US) 2009-06-15T13:45:30 -> 15/06/2009 (fr-FR) 2009-06-15T13:45:30 -> 2009/06/15 (ja-JP)
"D"	Long date pattern.	2009-06-15T13:45:30 -> Monday, June 15, 2009 (en-US) 2009-06-15T13:45:30 -> 15 июня 2009 г. (ru-RU) 2009-06-15T13:45:30 -> Montag, 15. Juni 2009 (de-DE)
"f"	Full date/time pattern (short time).	2009-06-15T13:45:30 -> Monday, June 15, 2009 1:45 PM (en-US) 2009-06-15T13:45:30 -> den 15 juni 2009 13:45 (sv-SE) 2009-06-15T13:45:30 -> Δευτέρα, 15 Ιουνίου 2009 1:45 μμ (el-GR)
"F"	Full date/time pattern (long time).	2009-06-15T13:45:30 -> Monday, June 15, 2009 1:45:30 PM (en-US) 2009-06-15T13:45:30 -> den 15 juni 2009 13:45:30 (sv-SE) 2009-06-15T13:45:30 -> Δευτέρα, 15 Ιουνίου 2009 1:45:30 μμ (el-GR)
"g"	General date/time pattern (short time).	2009-06-15T13:45:30 -> 6/15/2009 1:45 PM (en-US) 2009-06-15T13:45:30 -> 15/06/2009 13:45 (es-ES) 2009-06-15T13:45:30 -> 2009/6/15 13:45 (zh-CN)
"G"	General date/time pattern (long time).	2009-06-15T13:45:30 -> 6/15/2009 1:45:30 PM (en-US) 2009-06-15T13:45:30 -> 15/06/2009 13:45:30 (es-ES) 2009-06-15T13:45:30 -> 2009/6/15 13:45:30 (zh-CN)
"M", "m"	Month/day pattern.	2009-06-15T13:45:30 -> June 15 (en-US) 2009-06-15T13:45:30 -> 15. juni (da-DK) 2009-06-15T13:45:30 -> 15 Juni (id-ID)
"O", "o"	Round-trip date/time pattern.	DateTime values: 2009-06-15T13:45:30 (DateTimeKind.Local) --> 2009-06-15T13:45:30.0000000-07:00 2009-06-15T13:45:30 (DateTimeKind.Utc) --> 2009-06-15T13:45:30.0000000Z 2009-06-15T13:45:30 (DateTimeKind.Unspecified) --> 2009-06-15T13:45:30.0000000 DateTimeOffset values: 2009-06-15T13:45:30-07:00 --> 2009-06-15T13:45:30.0000000-07:00
"R", "r"	RFC1123 pattern.	2009-06-15T13:45:30 -> Mon, 15 Jun 2009 20:45:30 GMT
"s"	Sortable date/time pattern.	2009-06-15T13:45:30 (DateTimeKind.Local) -> 2009-06-15T13:45:30 2009-06-15T13:45:30 (DateTimeKind.Utc) -> 2009-06-15T13:45:30
"t"	Short time pattern.	2009-06-15T13:45:30 -> 1:45 PM (en-US) 2009-06-15T13:45:30 -> 13:45 (hr-HR) 2009-06-15T13:45:30 -> 01:45 م (ar-EG)
"T"	Long time pattern.	2009-06-15T13:45:30 -> 1:45:30 PM (en-US) 2009-06-15T13:45:30 -> 13:45:30 (hr-HR) 2009-06-15T13:45:30 -> 01:45:30 م (ar-EG)

Format specifier	Description	Examples
"u"	Universal sortable date/time pattern.	With a DateTime value: 2009-06-15T13:45:30 -> 2009-06-15 13:45:30Z With a DateTimeOffset value: 2009-06-15T13:45:30 -> 2009-06-15 20:45:30Z
"U"	Universal full date/time pattern.	2009-06-15T13:45:30 -> Monday, June 15, 2009 8:45:30 PM (en-US) 2009-06-15T13:45:30 -> den 15 juni 2009 20:45:30 (sv-SE) 2009-06-15T13:45:30 -> Δευτέρα, 15 Ιουνίου 2009 8:45:30 μμ (el-GR)
"Y", "y"	Year month pattern.	2009-06-15T13:45:30 -> June, 2009 (en-US) 2009-06-15T13:45:30 -> juni 2009 (da-DK) 2009-06-15T13:45:30 -> Juni 2009 (id-ID)
Any other single character	Unknown specifier.	Throws a run-time FormatExpection.

For more information please refer to https://docs.microsoft.com/en-us/dotnet/standard/base-types/standard-date-and-time-format-strings.

Table 7 Customer Date and Time Format Strings

Format specifier	Description	Examples
"d"	The day of the month, from 1 through 31.	2009-06-01T13:45:30 -> 1 2009-06-15T13:45:30 -> 15
"dd"	The day of the month, from 01 through 31.	2009-06-01T13:45:30 -> 01 2009-06-15T13:45:30 -> 15
"ddd"	The abbreviated name of the day of the week.	2009-06-15T13:45:30 -> Mon (en-US) 2009-06-15T13:45:30 -> Пн (ru-RU)
"dddd"	The full name of the day of the week.	2009-06-15T13:45:30 -> Monday (en-US) 2009-06-15T13:45:30 -> понедельник (ru-RU)
"f"	The tenths of a second in a date and time value.	2009-06-15T13:45:30.6170000 -> 6 2009-06-15T13:45:30.05 -> 0
"ff"	The hundredths of a second in a date and time value.	2009-06-15T13:45:30.6170000 -> 61 2009-06-15T13:45:30.0050000 -> 00
"fff"	The milliseconds in a date and time value.	6/15/2009 13:45:30.617 -> 617 6/15/2009 13:45:30.0005 -> 000
"ffff"	The ten thousandths of a second in a date and time value.	2009-06-15T13:45:30.6175000 -> 6175 2009-06-15T13:45:30.0000500 -> 0000
"fffff"	The hundred thousandths of a second in a date and time value.	2009-06-15T13:45:30.6175400 -> 61754 6/15/2009 13:45:30.000005 -> 00000
"ffffff"	The millionths of a second in a date and time value.	2009-06-15T13:45:30.6175420 -> 617542 2009-06-15T13:45:30.0000005 -> 000000
"fffffff"	The ten millionths of a second in a date and time value.	2009-06-15T13:45:30.6175425 -> 6175425 2009-06-15T13:45:30.0001150 -> 0001150

Format specifier	Description	Examples
"F"	If non-zero, the tenths of a second in a date and time value.	2009-06-15T13:45:30.6170000 -> 6 2009-06-15T13:45:30.0500000 -> (no output)
"FF"	If non-zero, the hundredths of a second in a date and time value.	2009-06-15T13:45:30.6170000 -> 61 2009-06-15T13:45:30.0050000 -> (no output)
"FFF"	If non-zero, the milliseconds in a date and time value.	2009-06-15T13:45:30.6170000 -> 617 2009-06-15T13:45:30.0005000 -> (no output)
"FFFF"	If non-zero, the ten thousandths of a second in a date and time value.	2009-06-15T13:45:30.5275000 -> 5275 2009-06-15T13:45:30.0000500 -> (no output)
"FFFFF"	If non-zero, the hundred thousandths of a second in a date and time value.	2009-06-15T13:45:30.6175400 -> 61754 2009-06-15T13:45:30.0000050 -> (no output)
"FFFFFF"	If non-zero, the millionths of a second in a date and time value.	2009-06-15T13:45:30.6175420 -> 617542 2009-06-15T13:45:30.0000005 -> (no output)
"FFFFFFF"	If non-zero, the ten millionths of a second in a date and time value.	2009-06-15T13:45:30.6175425 -> 6175425 2009-06-15T13:45:30.0001150 -> 000115
"g", "gg"	The period or era.	2009-06-15T13:45:30.6170000 -> A.D.
"h"	The hour, using a 12-hour clock from 1 to 12.	2009-06-15T01:45:30 -> 1 2009-06-15T13:45:30 -> 1
"hh"	The hour, using a 12-hour clock from 01 to 12.	2009-06-15T01:45:30 -> 01 2009-06-15T13:45:30 -> 01
"H"	The hour, using a 24-hour clock from 0 to 23.	2009-06-15T01:45:30 -> 1 2009-06-15T13:45:30 -> 13
"HH"	The hour, using a 24-hour clock from 00 to 23.	2009-06-15T01:45:30 -> 01 2009-06-15T13:45:30 -> 13
"K"	Time zone information.	With DateTime values: 2009-06-15T13:45:30, Kind Unspecified -> 2009-06-15T13:45:30, Kind Utc -> Z 2009-06-15T13:45:30, Kind Local -> -07:00 (depends on local computer settings) With DateTimeOffset values: 2009-06-15T01:45:30-07:00 --> -07:00 2009-06-15T08:45:30+00:00 --> +00:00
"m"	The minute, from 0 through 59.	2009-06-15T01:09:30 -> 9 2009-06-15T13:29:30 -> 29
"mm"	The minute, from 00 through 59.	2009-06-15T01:09:30 -> 09 2009-06-15T01:45:30 -> 45
"M"	The month, from 1 through 12.	2009-06-15T13:45:30 -> 6
"MM"	The month, from 01 through 12.	2009-06-15T13:45:30 -> 06
"MMM"	The abbreviated name of the month.	2009-06-15T13:45:30 -> Jun (en-US) 2009-06-15T13:45:30 -> juin (fr-FR) 2009-06-15T13:45:30 -> Jun (zu-ZA)

Format specifier	Description	Examples
"MMMM"	The full name of the month.	2009-06-15T13:45:30 -> June (en-US) 2009-06-15T13:45:30 -> juni (da-DK) 2009-06-15T13:45:30 -> uJuni (zu-ZA)
"s"	The second, from 0 through 59.	2009-06-15T13:45:09 -> 9
"ss"	The second, from 00 through 59.	2009-06-15T13:45:09 -> 09
"t"	The first character of the AM/PM designator.	2009-06-15T13:45:30 -> P (en-US) 2009-06-15T13:45:30 -> 午 (ja-JP) 2009-06-15T13:45:30 -> (fr-FR)
"tt"	The AM/PM designator.	2009-06-15T13:45:30 -> PM (en-US) 2009-06-15T13:45:30 -> 午後 (ja-JP) 2009-06-15T13:45:30 -> (fr-FR)
"y"	The year, from 0 to 99.	0001-01-01T00:00:00 -> 1 0900-01-01T00:00:00 -> 0 1900-01-01T00:00:00 -> 0 2009-06-15T13:45:30 -> 9 2019-06-15T13:45:30 -> 19
"yy"	The year, from 00 to 99.	0001-01-01T00:00:00 -> 01 0900-01-01T00:00:00 -> 00 1900-01-01T00:00:00 -> 00 2019-06-15T13:45:30 -> 19
"yyy"	The year, with a minimum of three digits.	0001-01-01T00:00:00 -> 001 0900-01-01T00:00:00 -> 900 1900-01-01T00:00:00 -> 1900 2009-06-15T13:45:30 -> 2009
"yyyy"	The year as a four-digit number.	0001-01-01T00:00:00 -> 0001 0900-01-01T00:00:00 -> 0900 1900-01-01T00:00:00 -> 1900 2009-06-15T13:45:30 -> 2009
"yyyyy"	The year as a five-digit number.	0001-01-01T00:00:00 -> 00001 2009-06-15T13:45:30 -> 02009
"z"	Hours offset from UTC, with no leading zeros.	2009-06-15T13:45:30-07:00 -> -7
"zz"	Hours offset from UTC, with a leading zero for a single-digit value.	2009-06-15T13:45:30-07:00 -> -07
"zzz"	Hours and minutes offset from UTC.	2009-06-15T13:45:30-07:00 -> -07:00
":"	The time separator.	2009-06-15T13:45:30 -> : (en-US) 2009-06-15T13:45:30 -> . (it-IT) 2009-06-15T13:45:30 -> : (ja-JP)
"/"	The date separator.	2009-06-15T13:45:30 -> / (en-US) 2009-06-15T13:45:30 -> - (ar-DZ) 2009-06-15T13:45:30 -> . (tr-TR)
"*string*" '*string*'	Literal string delimiter.	2009-06-15T13:45:30 ("arr:" h:m t) -> arr: 1:45 P 2009-06-15T13:45:30 ('arr:' h:m t) -> arr: 1:45 P
%	Defines the following character as a custom format specifier.	2009-06-15T13:45:30 (%h) -> 1

Format specifier	Description	Examples
\	The escape character.	2009-06-15T13:45:30 (h \h) -> 1 h
Any other character	The character is copied to the result string unchanged.	2009-06-15T01:45:30 (arr hh:mm t) -> arr 01:45 A

For more information please refer to https://docs.microsoft.com/en-us/dotnet/standard/base-types/custom-date-and-time-format-strings.

Table 8 Shortcuts for export options (CSV, LIMS)

Name	Shortcut	Name	Shortcut
OID	{0}	Tray Number	{32}
Sample Name	{1}	Raw data	{33}
Amount uL	{2}	Sample Amount in µg	{34}
Amount Unit	{4}	Sample Group Name	{35}
Amount	{3}	Device Serial Number	{36}
Analyst	{5}	Total Concentration	{37}
Sample Area	{6}	Total Mean Concentration	{38}
Calibration line	{7}	Calculation ID	{39}
Comment	{8}		
Concentration in mg/Kg	{9}		
Concentration	{10}		
Concentration Unit	{11}		
Density g/ml	{12}		
Dilution factor	{13}		
Concentration mean	{14}		
Concentration RSD	{15}		
Concentration SD	{16}		
Measured Date	{17}		
Method Name	{18}		
Method Build	{19}		
Method Version	{20}		
Mol Weight	{21}		
Real Concentration	{22}		
Sample Position	{23}		
Sample Status	{24}		

Sample Type	{25}		
SignalType	{26}		
Export Date	{27}		
Signal Element Type	{31}		

10.1 References

Chernick, M. R. (1999). *Bootstrap Methods, A Practitioner's Guide.* Wiley Interscience.

Chernick, M. R. (2012, 09 24). *Cross Validated, Is there a simple way of detecting outliers?* Retrieved from https://stats.stackexchange.com/q/37877

D02.94, D. b. (2018). *ASTM D7915-18, Standard Practice for Application of Generalized Extreme Studentized Deviate (GESD) Technique to Simultaneously Identify Multiple Outliers in a Data Set, ASTM International, West Conshohocken*. Retrieved from https://www.astm.org/Standards/D7915.htm

Grubbs, F. (1969, February). Procedures for Detecting Outlying Observations in Samples. *Technometrics, 11*(1), 1-21.

Lau, A. T. (2019, 11 04). *ASTM Standardization News.* Retrieved from ASTM,https://www.astm.org: https://www.astm.org/standardization-news/images/nd15/nd15_datapoints.pdf

NIST. (2019, 11 04). *Generalized ESD Test for Outliers*. Retrieved from Engineering Statistics Handbook, NIST: https://www.itl.nist.gov/div898/handbook/eda/section3/eda35h3.htm

Rosner, B. (1983, May). Percentage Points for a Generalized ESD Many-Outlier Procedure. *Technometrics, 25*(2), 165-172.

unknown. (2019). *TINV function*. (MedCalc Software bv) Retrieved from MedCalc: https://www.medcalc.org/manual/tinv_function.php

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