MaS control

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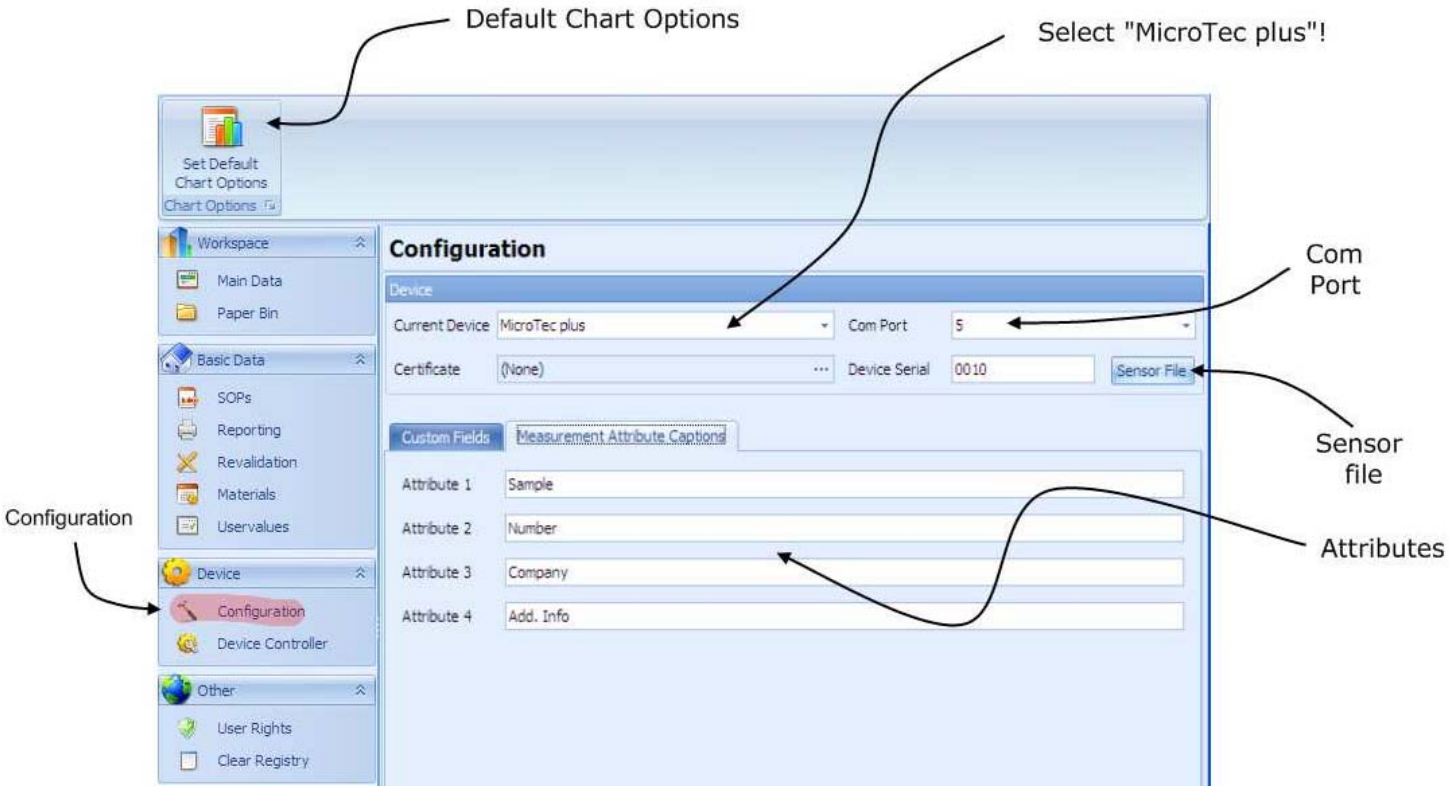
Getting started

What setup can or must be made in the Configuration section?

After installation of ***MaS control*** first go to the Configuration section of the program.



Picture 1: Configuration section of MaS control

Most important inputs are:

1. Com Port: When your computer is connected to the MicroTec plus (or NanoTec plus) you will find the LPT/Com ports in the Control Panel -> System -> Hardware -> Device Manager -> Connections (COM and LPT) of your Computer system. Here listed should be the Prolific device (if you have installed the Prolific driver for the serial-to-USB converter as advised during the installation procedure of MaS control) and the COM port that is used. Give in this number in the configuration section of MaS control (see picture 1).

2. Sensor File: Click on the button “Sensor File”. A window will open where are asked to select the appropriate sensor file. This file is unique for every machine! You find the correct file on the Fritsch DVD in the directory

\MicroTec Plus Parameter Files (or **\NanoTec Plus Parameter Files**)

The correct file is the one with has a file name that is identical to the serial number of your machine (e.g. **8400_00016.dat** for the machine with the S/N 8400-00016).

3. Current Device: Select “MicroTec plus” (or “NanoTec plus”).

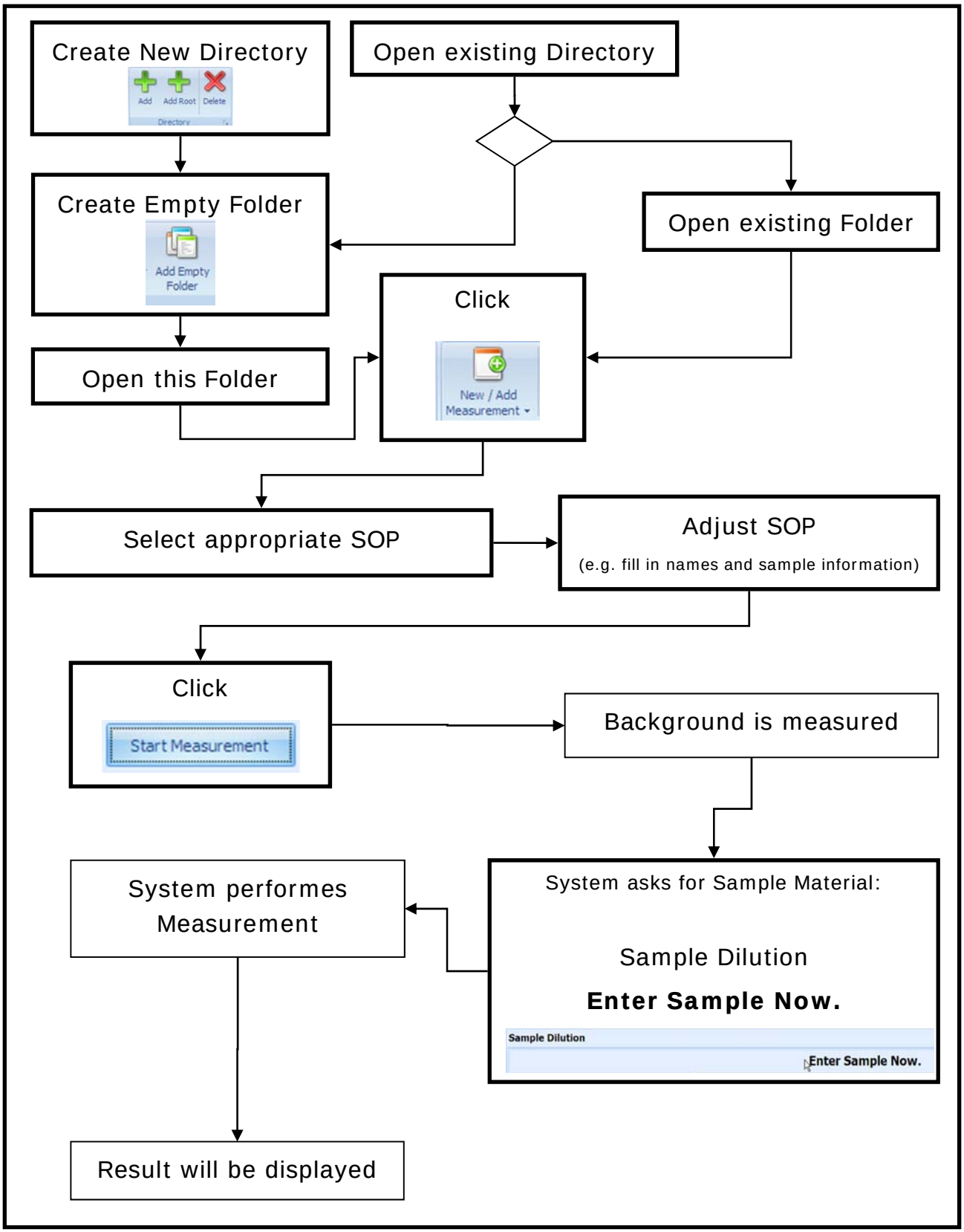
Besides these important inputs there are several more possible settings that can be made here:

Attributes: Here it is possible to edit the name of the attributes that can be used to input information about the measurement. Four attributes are available. See also **How to run a wet measurement**, picture 4, Fields for data input. Here the Attributes are used.

Default Chart Options: Here you can setup the standard chart options (like colour pallet, line thickness, grid etc.).

How to run a wet measurement?

Quick overview:
( = Directory,  = Folder – see: **MaScontrol / Main Data**)



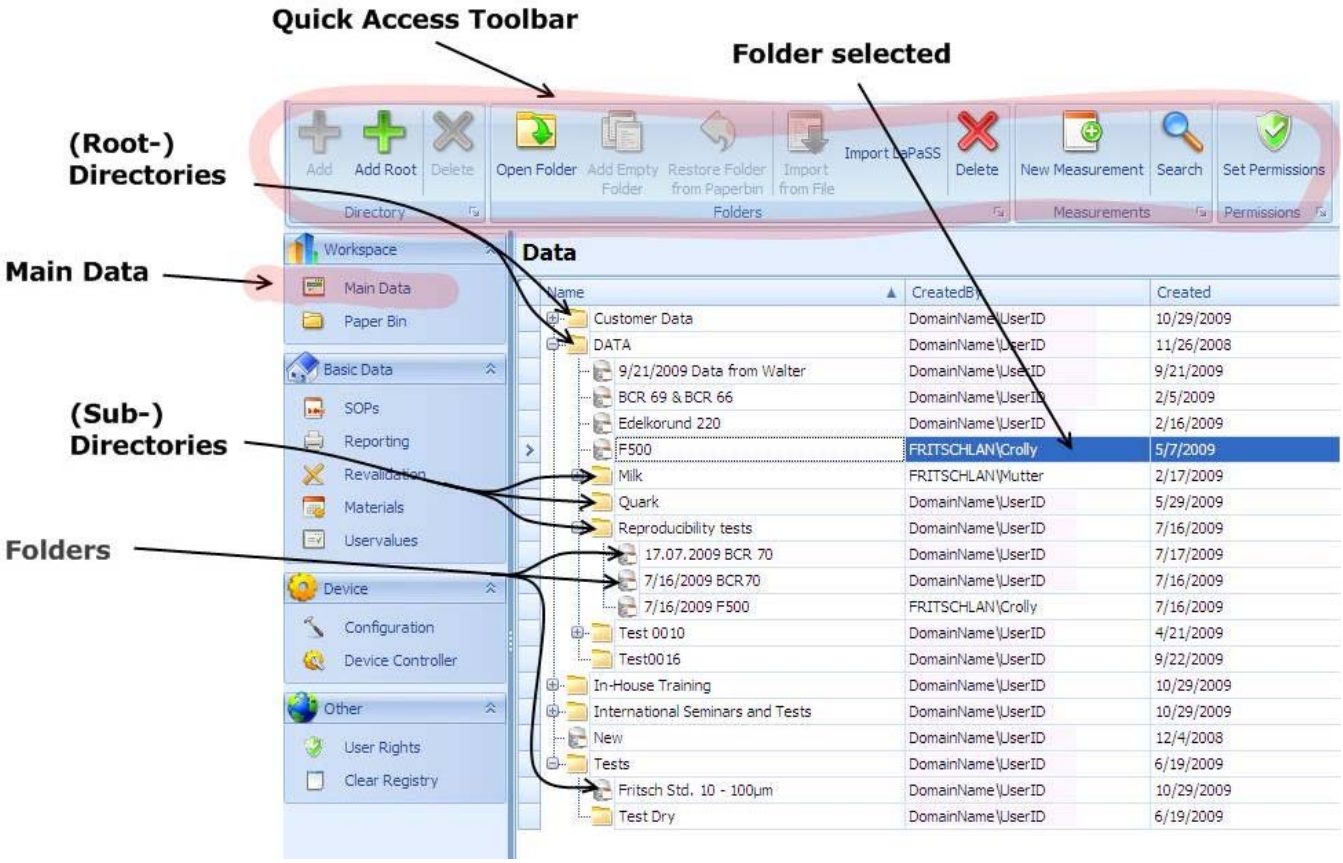
When MaS control has started click on **Main Data** (see picture 1).

1. The window now shows the data structure of the already performed measurements. The data structure has two elements:
   I. Directories (Root- and Sub-directories)
   II. Folders

   The measurement data are found in the **folders**.

   To **open** a directory or a folder double-click on the corresponding icon.

   To **modify the name** of a directory or folder click on the name



Picture 1 "Data"- Area of MaS control.
Appearance of Quick Access Toolbar when a folder is selected (blue row)



Picture 2 Appearance of Quick Access Toolbar when a directory is selected

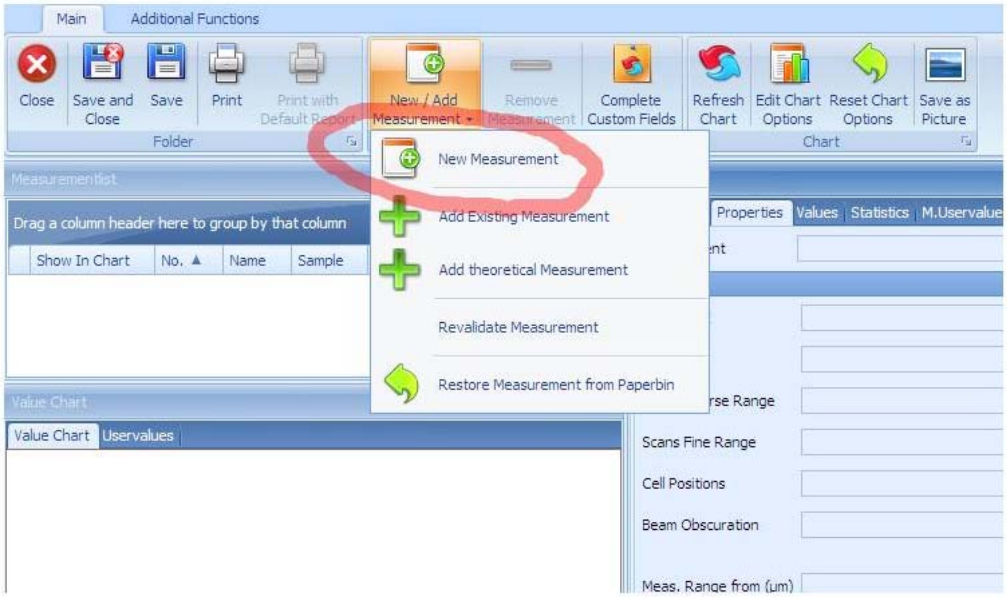
2. To start a new measurement different approaches are possible:

   I. Open an existing folder (in any directory)
   ⇒ Continue with step 3

   II. Create a new empty folder (in a selected directory):
   ⇒ click **Add Empty Folder** (Quick Access Toolbar)
   ⇒ type in a folder name (or leave the date as name)
   ⇒ click **OK**
   ⇒ Open this new folder
   ⇒ Continue with step 3

   III. Select (highlight) a directory and click **New Measurement**
   (see Picture 1, Quick Access Toolbar)
   A new folder is automatically created at the end of the measurement. The name of this folder is the current date
   ⇒ Continue with step 4

3. In opened measurement folder click **New/Add Measurement**.
   ⇒ Click **New Measurement** (Picture 3)

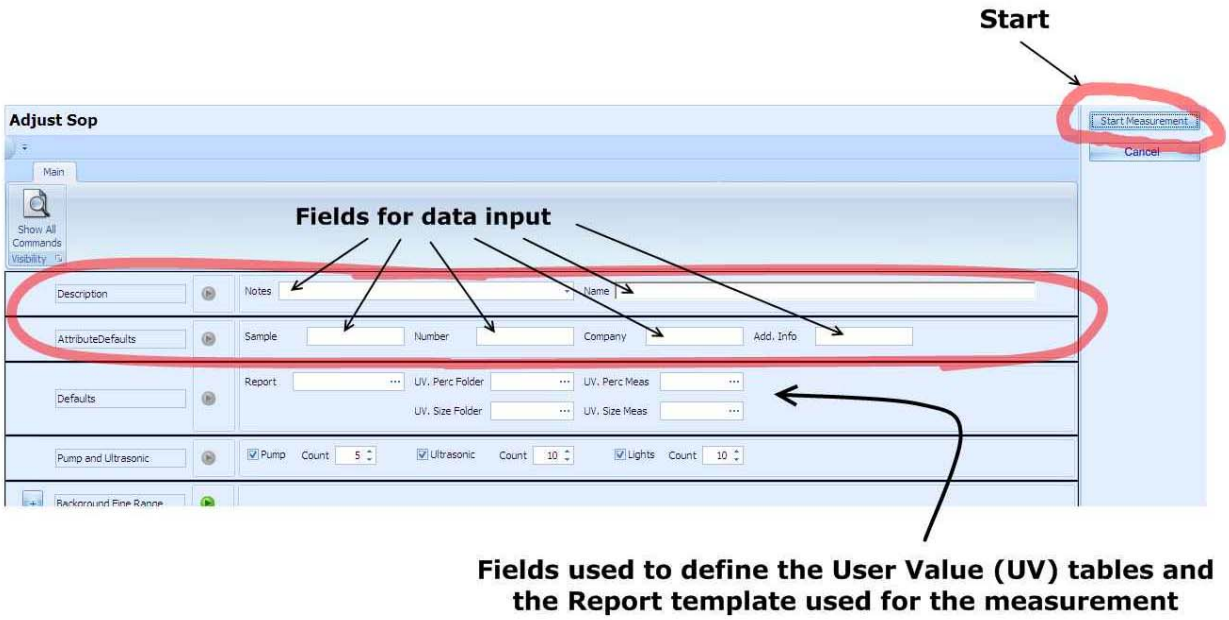


Picture 3 The **New/Add Measurement** Icon in the Quick Access Toolbar

4. New window: List of all available SOPs (Standard Operating Procedures)
   ⇒ Select the appropriate SOP (double-click or click and **OK**)

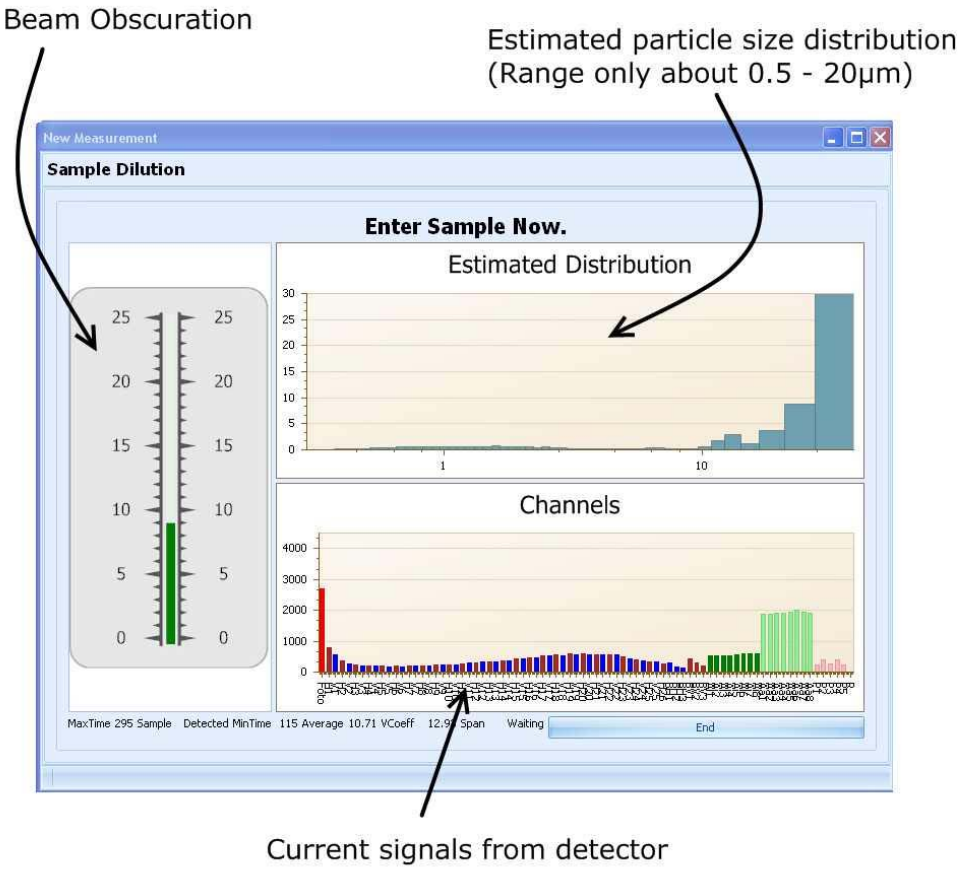
5. The "Adjust SOP" window opens: The procedure flow of the SOP is shown.
   ⇒ Give in information (about the sample or the measurement) to the appropriate fields. Not all fields must be filled
   (see picture 4)

6. Click **Start Measurement** in the upper right corner of this window



Picture 4 Example for the upper part of the SOP procedure flow

7. The system will continuously give feedback which command is currently performed.
   When the system asks for sample material (sample dilution) carefully give in sample material till the correct beam obscuration is reached.
   A good beam obscuration typically lies between 10 and 15%
   (see picture 5 on next page).



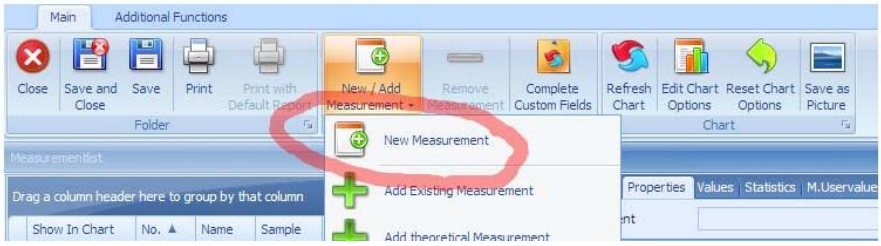
Picture 5 System is asking for sample material. The beam obscuration is indicated by the vertical bar at the left side.

8. When enough sample material is given to the dispersion unit (i.e. the minimum beam obscuration as defined in the SOP is reached) and the material is homogeneously distributed in the measurement circuit the measurement starts automatically. For more details about the window **Sample Dilution** please refer to **What does all these parameters during Sample Dilution mean?**
   At the end of the measurement the result is displayed on the screen.

How to run a second wet measurement without changing the sample material?

In many cases it makes sense to have a second measurement of the exactly same sample to see if due to the dispersion process the particle size distribution changes. In that way you can judge if the still de-agglomeration takes place or if some components of the sample material solve in the liquid.
To run a second measurement proceed as follows:

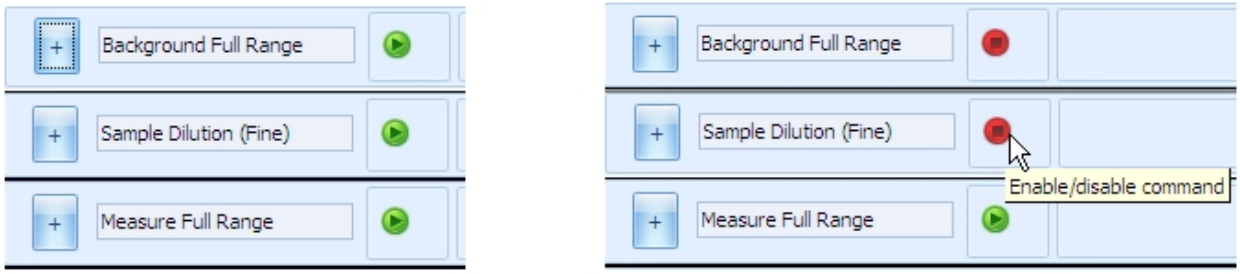
1. In opened measurement folder click **New/Add Measurement**.
   ⇒ Click **New Measurement** (Picture 1)



Picture 1 The **New/Add Measurement** Icon in the Quick Access Toolbar

2. New window: List of all available SOPs (Standard Operating Procedures)
   ⇒ Select the same SOP as for the first measurement
3. New window: The procedure flow of the SOP is shown.
   ⇒ Give in information (about the sample or the measurement) to the appropriate fields. Not all fields must be filled

Switch the Commands / Blocks of Background and Sample Dilution off. This is done by simply click to the green “Execute” symbol The Execute symbol will change to the “Do-not-execute” symbol
Picture 2 shows an example:



Picture 2 The **Background Full Range** and the **Sample Dilution** are turned on in the left part of the picture but turned off by simple clicking to the green arrow (resulting situation shown in right part of the picture)

4. Click **Start Measurement** in the upper right corner of the window. The process will start with **Measure Full Range.**

Additional Information concerning the Measurement Process…

What are SOPs and SOMs?

In MaS control the recipes that control the complete measurement circuit including the calculation etc. are called **Standard Operating Procedures (SOPs)**.
They consist of basic commands to control the instrument, to calculate results from the obtain measurement data or to allow data input for each measurement.
These commands are ordered from top to bottom so they give something like a "process flow".
In MaS control it is also possible to create loops so repetitive measurements can be done in a very simple way.
For a list of all commands please see the section **SOP commands**.
When several fundamental commands are joined together a more complex function like "Take background of the sensor signal" or "Measure the intensity distribution of the scattered light" can be established. These blocks or modules are so called **Standard Operating Modules (SOMs)**.
Architecture: In SOMs only Laser- and Sensor-related commands are used (**Laser On/Off**, **Position**, **Align**, **Get Sensor Values**, **Sample Dilute**). All other commands like **Pump**, **Calculate** or **Clean** are separately used in an SOP.
In this way they are always visible and are not altered by chance when turning on/off a complete block (SOM)
SOPs may consist of only commands or of commands + SOMs.

How does a typical complete measurement process look like?

A typical procedure flow that is written down in a SOP consists of the following elements (for wet dispersion):

Data Input (names and additional information for the measurement)

⇓

Turn on pump (and ultrasound if needed)

⇓

Measurement of **Background**

⇓

Adding sample material to the system **(Sample Dilution)**

⇓

Measurement of the scattered light intensity distribution

⇓

Turn off pump (and ultrasound)

⇓

Calculation of particle size distribution

⇓

Automatic **Clean / Fill** of the measurement circuit (if required)

More complex SOPs may contain a loop to measure several times in a row without changing the sample (e.g. with increasing time of sonification) or it can first process one measurement without ultrasound and then one or several measurements with ultrasound. Also it is possible to program an SOP again with a loop for several measurements in a row but ultrasound is only turned on during a defined period of time between the subsequent measurements. So dispersion conditions can be varied in a very simple and reproducible way.

Data Input: Names and additional information for the measurement can be filled in the fields of **`Description`** and **`AttributeDefaults`**. **`AttributeDefaults`** are four field. The names of these four fields can be edited in the configuration of MaS control (See **What setup can or must be made in the Configuration section?**)

Turn on pump: Depending on the particle size and the density of the material under investigation the pump speed can be adjusted. The setting is called **count** and can be varied between 0 (0%) and 10 (100%) of the max. pump speed.
The **Ultrasound** is adjusted with the same command. **count** can again set between 0 and 10 (0% and 100%, respectively)

Measurement of Background: Before a measurement can be performed a background must be recorded. After the measurement with sample material (see below) this background is subtracted from the measurement data to eliminate signals produced by dirty measurement cell windows etc.

Adding sample material: Carefully sample material is added to the vessel that is filled with the dispersion liquid. The pump is continuously pumping the material through the measurement cell and the beam obscuration is observed on the computer screen. When enough sample material has been given to the vessel the measurement starts automatically (see also **What does all these parameters during Sample Dilution mean?**).

Measurement of the scattered light intensity distribution: Now the main measurement is running. The screen displays the detector signals and the number of so far finished scans. When the number of scans predefined in the SOP is reached the measurement stops. Depending on the selected measurement range one or two laser positions are used. When the full measurement range was selected (80nm – 2mm) then typically first a measurement with the green laser is recorded and after this the IR laser is used to measure a second time.

Turn off pump (and ultrasound): The pump can also be turned down to a low pumping speed (**count** = 1 to 3) so that material is still transported in the measurement circuit and no sedimentation occurs. Ultrasound should typically turned off after the measurement.

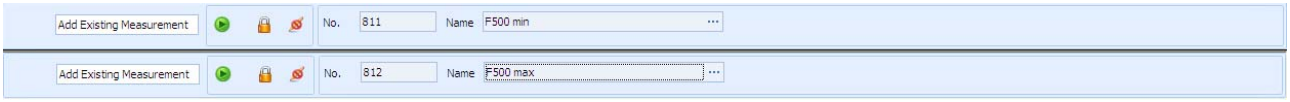
Calculation of particle size distribution: All measurement data are now used to calculate a particle size distribution that is shown on the screen when finished.

Automatic **Clean / Fill:** The complete volume of the measurement circuit is drained and the system is automatically refilled with liquid again. Hence it is then ready for the next measurement.

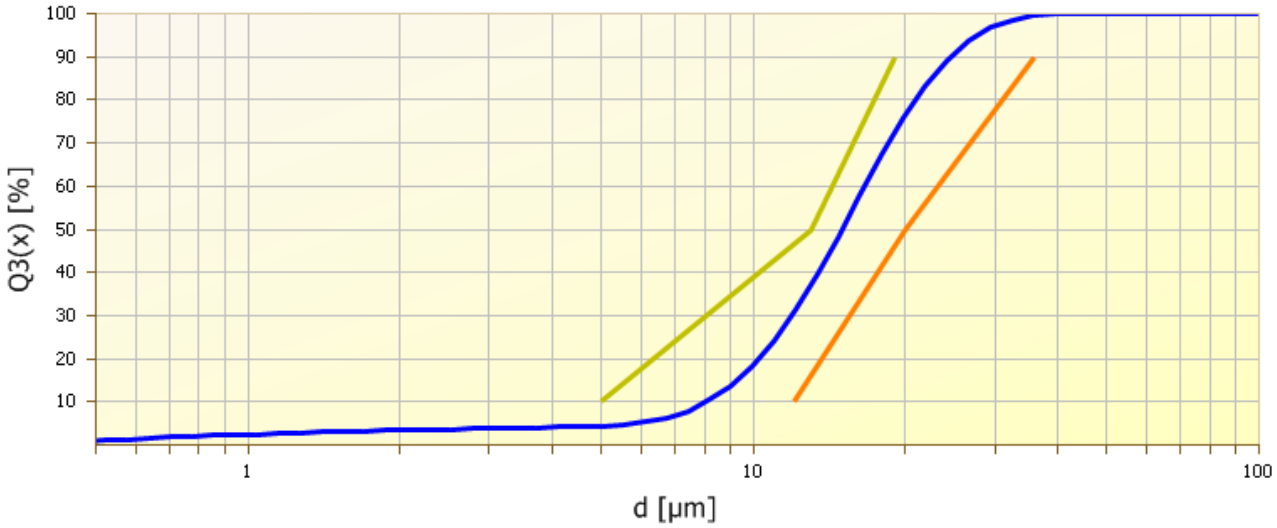
SOP commands

Add Existing Measurement Before starting a new measurement it is possible to define an already existing result that will be used to compare with the now performed measurement. Clicking the 3 dots at the end of the field **Name** will bring up a screen to select the required measurement.

Example: With this command it is possible e.g. to load minimum and maximum limits for a given sample material.



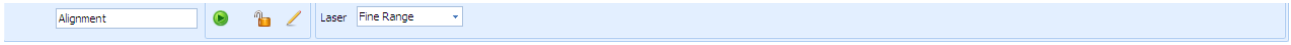
The two lines shown above will result in a graph as shown below: Besides the actual measurement result (blue line) two limits are displayed.



Q3(x) graph for a new measurement compared to allowed minimum and maximum values. The blue curve must lie between the tow other lines. The minimum and maximum curves only consist of three values (d10, d50 and d90). Therefore the display of the dQ3(x) curve would not give a “nice” picture.

Alignment

Performing alignment of the laser beam(s). Typically the beam alignment is done with turned on pump.
In the field **Laser** you can select Fine Range (what is the green laser) or Coarse Range (the IR laser).



Attribute Defaults

Input of information that belongs to the measurement. The names of the four attribute fields are defined in the configuration section of MaS control.
The fields can be pre-set while creating/editing an SOP, they can be filled out during the SOP adjustment right before the start of a measurement or they can remain empty. The required information can be filled to these fields at any time later.



Block / End Block

Grouping several commands together in a block. The whole block can then later be enabled or disabled during a measurement (**End Block** must be added to the SOP separately).
A **Block** command always shows a rectangular click-box at the beginning of the row with a + or a – sign inside. The + sign indicates that the block is now collapsed and all commands between **Block** and **End Block** are not shown. To make all these commands visible click on the + sign and the complete block expands. The + sign will change to a – sign.



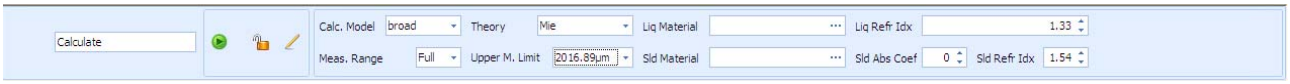
Note: The word “Block” can be edited. In some SOPs you will find a short description of the blocks task like e.g. “Measurement Full Range”

Calculate

Calculates the particle size distribution (PSD) directly after the measurement of the light distribution.

With **Theory** you can choose between **Fraunhofer** and **Mie** theory. When using the Mie theory the refractive index of the liquid (**Liq Refr Idx**) as well the refractive and absorption index of the solid sample material (**Sld Refr Idx** and **Sld Abs Coef**) must be entered. When clicking to the three dots at the end of the fields **Liq Material** and **Sld Material** a list of liquid and solid materials opens.

Upper M.Limit allows the restriction of the calculation of the particle size distribution to a specified upper limit. This is helpful when in the coarse measurement range only a very limited amount of material is present. If e.g. the particle size distribution ends around 100µm it makes sense to limit the upper measurement range to about 800 - 1000µm. Otherwise small fluctuations of the light intensity in the region of very large particles (around 1000 – 2000µm) - caused e.g. by small air bubbles – may result in significant disturbance of the PSD.



Clean

Drains the current water and sample and refills the system with liquid so it is ready for the next measurement. **Count** is the number of drain/refill processes that will be performed. With some critical samples it may be helpful to run more than one drain/refill process. **Fill height** can be set to **1/3**, **2/3** and **3/3** corresponding with a total volume of around 300, 400 and 500 ml, respectively. For **Material** you can choose between **Fine**, **Medium** and **Coarse**. For **Coarse** more liquid is used to run the Clean process.



Defaults

To pre-define user tables (size and percentage) that are used to present the measurement results. Report pre-defines a report template that is used for later print out of the result.

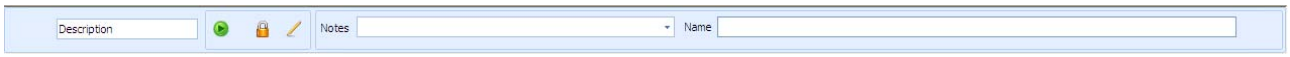
UV.Perc.Folder and **UV.Size.Folder** defines a tables of Q3(x)-percentage values and a table of size values that are assigned to all measurements in a folder that are currently tagged to display in the graph. This is a very convenient way of getting a quick an easy overview on the results of several subsequently run measurements. For each value in the **UV.Perc.Folder** list the average and the CV of the selected measurements are displayed.

UV.Perc.Meas and **UV.SIze.Meas** does the same thing but only for the currently selected measurement. The currently selected measurement is the measurement that is highlighted in the Measurement list (see Measurement Folder) in blue.



Description

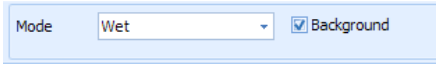
Some additional information can be given for each measurement.



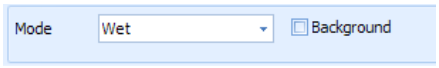
Get Sensor Values

This is the measurement itself. Data from the detector are collected and stored to the computer. From these data the particle size distribution is then calculated. There are two different applications of **Get Sensor Values**

1. Measure the background without sample



2. Measure the light distribution with sample in the system

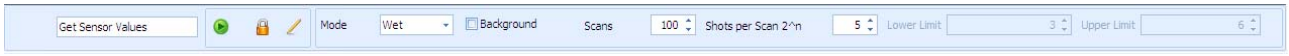


Scans define the number of scans per measurement. For wet measurements a typical value is 100. For dry measurements it can go down to 10-20.

Shots per scan 2^n is the number of shots that are averaged up to give one scan.

The light detector of the ANALYSETTE 22 is a semiconductor device attached to an A/D converter that runs with a given frequency. Therefore every few milliseconds a value is delivered by the A/D converter. These single values are called **Shot**. Now 2^n shots are averaged to give one scan.

For wet measurements a typical value of n should be 4-6, for dry measurements n is 0 or 1.



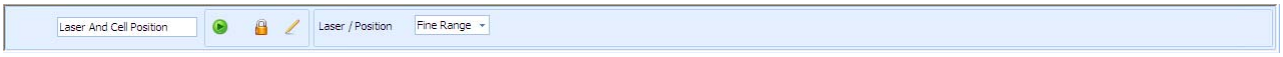
Note: The text “Get Sensor Values” can be edited. In some SOPs you will find a text like e.g. “Measure Full Range”

Laser and Cell Position

Moves the measurement cell to the correct measurement position. This determines the measurement range. Can be set to:

Fine Range → Green laser is used and measurement range is from 0.08 to about 40µm

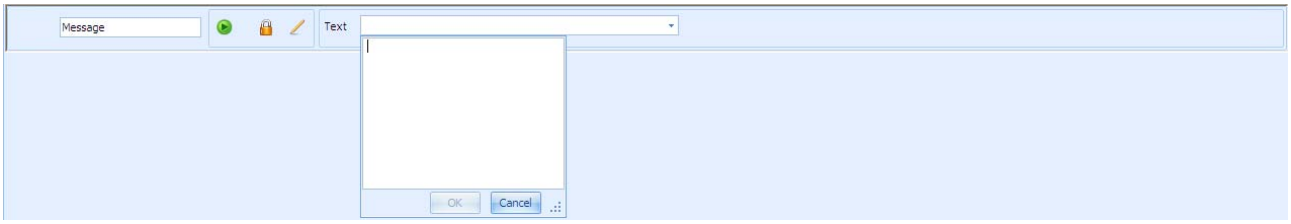
Coarse Range → IR laser is used and measurement range is from about 15 to 2000µm



Note: The Text “Laser And Cell Position” can be edited. In some SOPs you will find a text like e.g. “Fine Range”

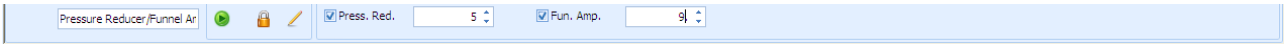
Message

The text that is defined here is displayed on the screen. Clicking on the small down-arrow at the right hand end of the field **Text** opens a small text box that can be used to type in extended text messages.
When running the SOP the process stops at a message and the user must acknowledge the message by clicking a OK button.



Pressure Reducer / Funnel Amplitude

This command is used for dry measurements. It adjusts the pressure used in dispersing



Pump and Ultrasonic

To turn on/off the pump and/or the ultrasound (and/or the light that illuminates the dispersion bath). The parameter **count** can have values from 0 to 10. 0 means 0% and 10 means 100% (of pump speed, ultrasound intensity or brightness of light)

Repeat / End Repeat

Enables you to create a loop. E.g. more than one measurement of the same sample load can be performed automatically with each measurement creating its own result.
All commands between **Repeat** and **End Repeat** are repeated as many times as defined in the **Repeat** command. (**End Repeat** must be added to the SOP separately)

Sample Dilution

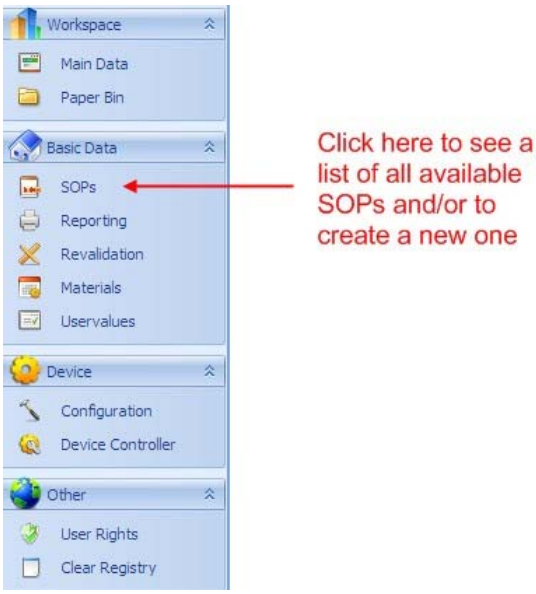
This command is used to enter sample material to the system. For the meaning of the parameters please refer to the section **What is the Beam Obscuration?** and

What does all these parameters during Sample Dilution mean?

Select Measurement This command is used to recalculate an already existing measurement with new parameters (like Mie theory instead of Fraunhofer or different refractive indices). Therefore the **Select Measurement** command is always followed by a **Calculate** command.

Wait Introduces a waiting period. The system remains in the state that was defined before this wait command. This means the pump is continuing running, the ultrasound remains on etc.

When editing an SOP, what do these icons mean?



To see a list of all SOPs saved on your computer click to the icon as shown in the left picture. To open one of the now listed SOPs simply double-click to the one that you want to modify.
This opens the SOP-editor.
This SOP-editor has three pages: **Main Page**, **Procedures** and **Revisions**.
Please select the **Procedures** page.
Here now the process flow that defines the complete measurement is shown. (When starting a measurement this process flow is proceeded from the top down to the bottom.)
In each command there are three different icons visible. These icons are:


or


"Allow user to change parameters" command.
When running an SOP, i.e. when a measurement is performed, the so called "Adjust SOP" window opens (see also the section **How to run a wet measurement?**). This window looks very much like the SOP-editor but in fact only some changes (adjustments) can be made here. The general setup of the SOP can not be changed in the "Adjust SOP" window.
When the pencil is not crosses out (visible only in the SOP-editor!) then in the "Adjust SOP" window the parameters of the corresponding command can be changes. Else no changes are possible.


or


"Allow user to enable/disable command".
When this command shows an open lock the corresponding command can be enabled/disabled (see next icon) in the "Adust SOP" window. When the lock is closed this is not possible.

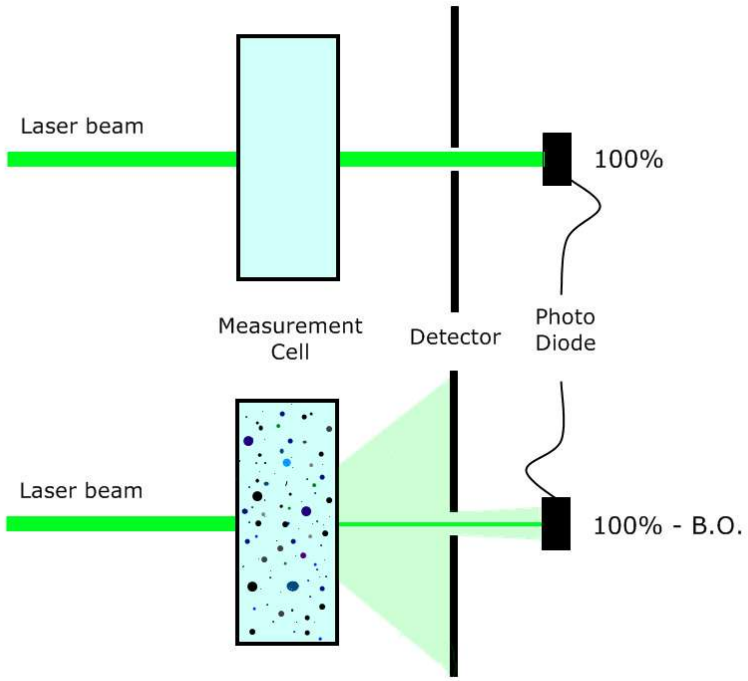

or


This is the "**Enable/disable command**". When showing the green arrow the corresponding command is executed when running the SOP. Sometimes it makes sense to not execute a command that is defined in the SOP (see e.g. the section **How to run a second wet measurement without changing the sample material?**.) Then by simply clicking on it the green arrow changes to a red square.

What is the Beam Obscuration?

Before sample material is added to the system the intensity of the (more or less) undisturbed laser beam is detected with a specific photo diode. When now sample material is given to the dispersion unit some of the light is scattered away and the observed intensity of the photo diode is decreasing. The percentage of the intensity reduction is called **Beam Obscuration**.
Typically a good value for the beam obscuration during a wet dispersion measurement is 10 – 15%.
If too much material has been given to the sample dispersion unit the beam obscuration is very high and multiple scattering can occur (light that has been scattered by one particle is scattered again by a second one).
If not enough material has been given to the system then the signal of the scattered light may be to low to detect all parts of the distribution.

In the SOPs a value called **Minimum Beam Obscuration** is defined. This value must be reached during sample dilution before the measurement can start.

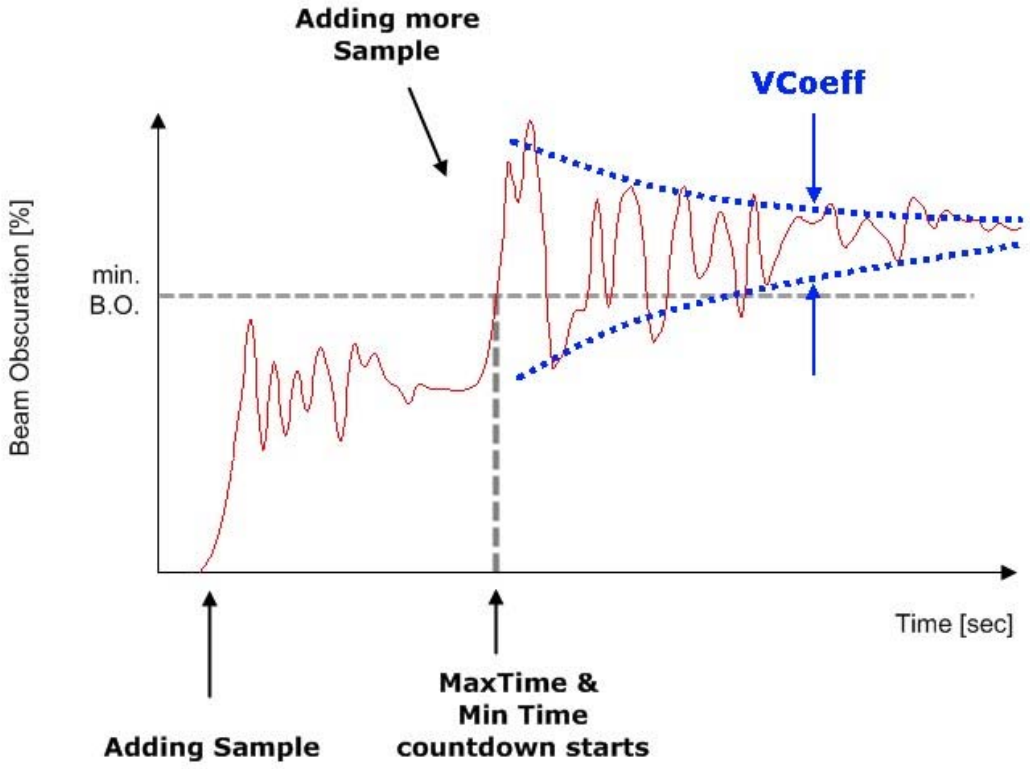


Picture 1: Concept of Beam Obscuration. In the upper part no sample material is present and hence no scattering occurs. The intensity detected at the photo diode is now 100%. When sample material is added due to scattering processes the intensity detected by the photo diode decreases to the value 100% - Beam Obscuration

What do all these parameters during Sample Dilution mean?

After having recorded the background the system asks for sample material (**Enter Sample Now**). The **Sample Dilution** window continuously shows the beam obscuration, the actual detector signals and an estimated particle size distribution (limited to the size range that can be covered by the laser used for the sample dilution measurement). See picture 5 of section **How to run a wet measurement?**

An example how the beam obscuration (B.O.) evolves after sample material has been added is shown in picture 1.

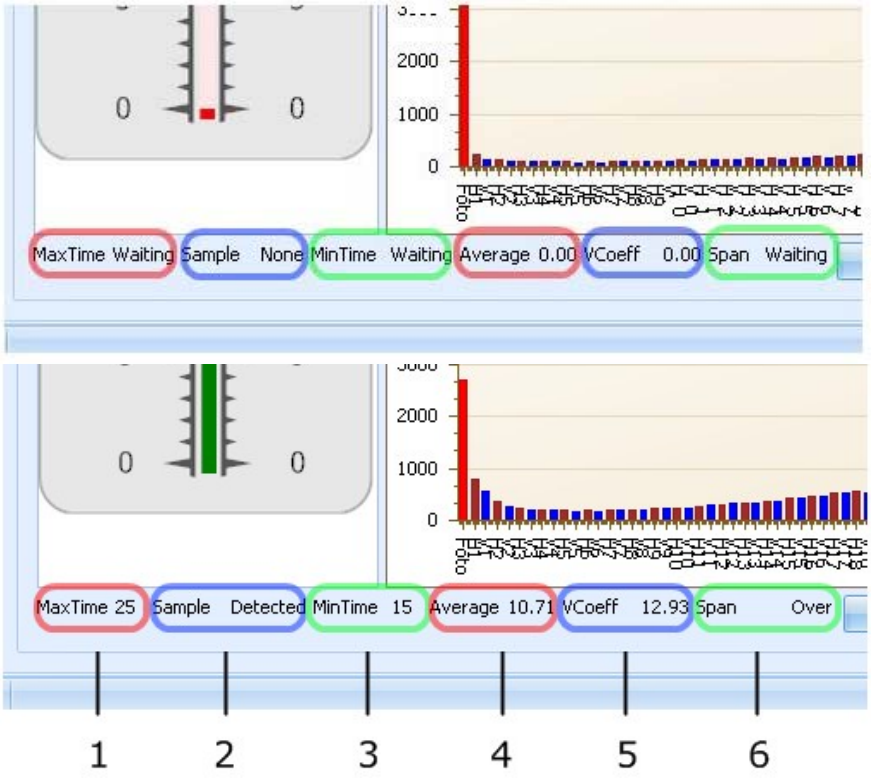


Picture 1 Beam obscuration vs. time. When sample material is added the first time the beam obscuration increases. In the example shown here it does not reach the minimum beam obscuration that is defined in the SOP. After adding more material the min. B.O. is exceeded the first time and the countdown of MinTime and MaxTime begins. When MinTime and MaxTime have reached Zero the measurement starts. Or if VCoeff (the fluctuation of the B.O.) has fallen below its preset value.

In the lower part of the **Sample Dilution** window several parameters are displayed (see picture 2):

(1) MaxTime: This is the maximum dispersion time after the minimum beam obscuration (as defined in the SOP) has been reached the first time. The value of MaxTime remains **Waiting** as long as the minimum beam obscuration has not yet reached. In the moment when the minimum beam obscuration has been reached for the first time a countdown starts.

(2) Sample: This parameter can have the values **None** and **Detected**. It starts with **None** before sample is entered to the system and will change to **Detected** the first time the beam obscuration has a non-zero value.



Picture 2 Parameters listed at the lower part of the “Sample Dilution” window
Upper part: No sample given to system
Lower part: Sample has been given to system

(3) MinTime: This is the minimum dispersion time that the system processes regardless if all other requirements needed to start a measurement are fulfilled or not. MinTime remains **Waiting** as long as the minimum beam obscuration

has not yet reached. In the moment when the minimum beam obscuration has been reached for the first time a countdown starts.

(4) Average and **(6) Span:** The beam obscuration is permanently detected. ***Average*** gives the value of the beam obscuration averaged over a time period (the **Span**-period*) defined in the SOP. In the Sample Dilution window **Span** remains **Waiting** as long as the span period has not yet passed by. When the span period is over **Span** changes to **Over**.

(5) VCoeff: This parameter defines the Coefficient of variation of the beam obscuration during the time period defined in the SOP with the parameter **Span** (see picture 2 on the following page). After the sample being added this value is typically large and now falls with time. When falls below a value defined in the SOP the measurement starts.

The measurement starts when:

Beam obscuration > min. B.O. †
AND
MinTime = 0
AND
VCoeff < value defined in SOP
OR
MaxTime = 0

* In a SOP the "Span" value is a number (span period in seconds) while in the Sample Dilution window „Span" can have the values „Waiting" and „Over"

† This condition means that the beam obscuration must have exceeded the min. B.O. at least once. Hence it can happen that during the sample dilution the min. B.O. has been exceeded once but the beam obscuration then falls down below min. B.O. again. However, when now no more material is added the measurement starts when MaxTime reaches zero.

The Calculation of the Particle Size Distribution

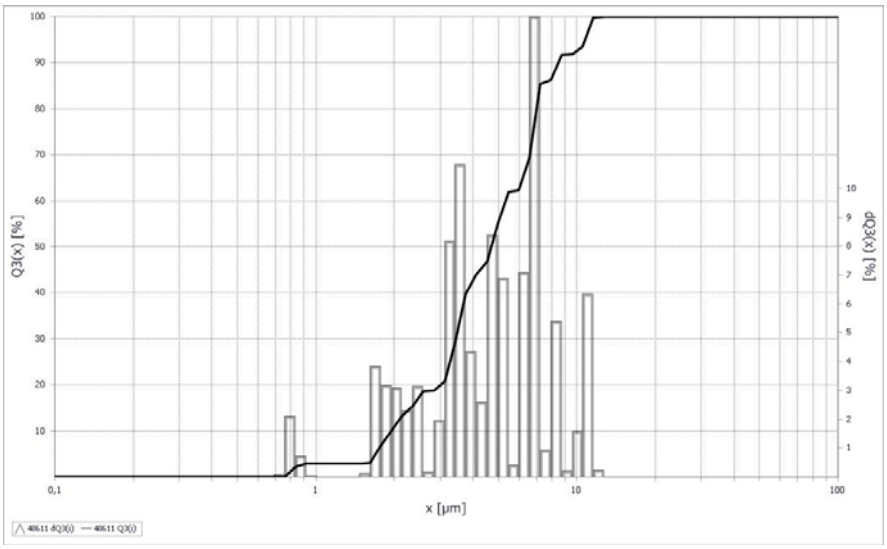
During calculation, what is the meaning of the TradeOff parameter (Calc. Model)?

The TradeOff parameter can be pre-selected in the **calculate** command of the SOP. There it is called **Calc. Model** (for calculation model) and can be set to **very narrow**, **narrow**, **medium**, **broad**, **very broad** or **automatic**. **very narrow** is associated with a very small TradeOff parameter (like 10-8) and very broad is associated with a very large one (like 10000).
The effect of the TradeOff is a smoothing of the result.

- The larger the TradeOff the smoother will be the result.
- With a smaller TradeOff parameter more details of the size distribution get visible.

As the name implies choosing the correct value for the TradeOff parameter is some kind of a trade-off between getting noisy results and loosing details. In most cases the automatic model selection will work properly. Therefore start with automatic for unknown samples.
In quality control of always the same sample material (i.e. always the same particle size distribution is expected) it is recommended to fix the TradeOff parameter by choosing a distinct calculation model (like **broad** or **medium**).
A second parameter that is important to evaluate the quality of a measurement is the so called RMS error (Root Mean Square error). Without explaining exactly what this parameter describes we can say here that typically for a very small TradeOff parameter you will get a small RMS error while larger TradeOff parameters also will result in larger RMS error values (see also the values given below the pictures on the next page).

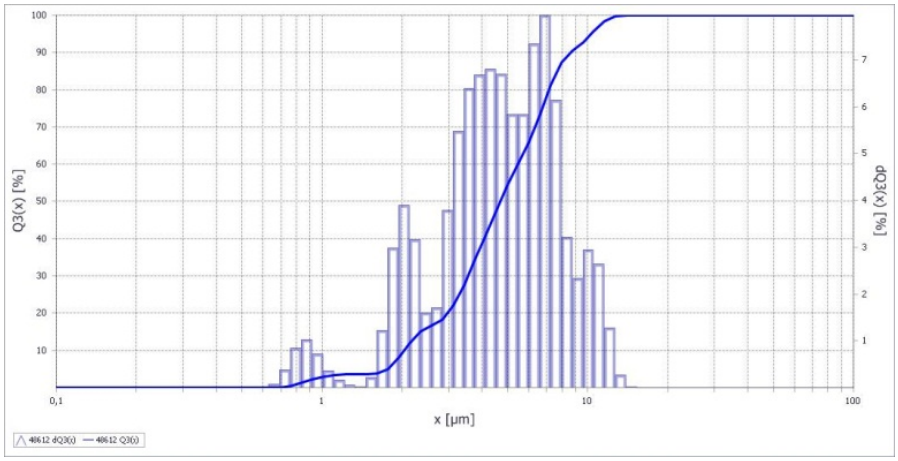
The RMS error shall not get larger than 0.2 (or 20%). Else something is wrong with the measurement (e.g. dirty measurement cell, bad laser alignment)



Cal. Model = ***very narrow***

TradeOff = 10^{-8}

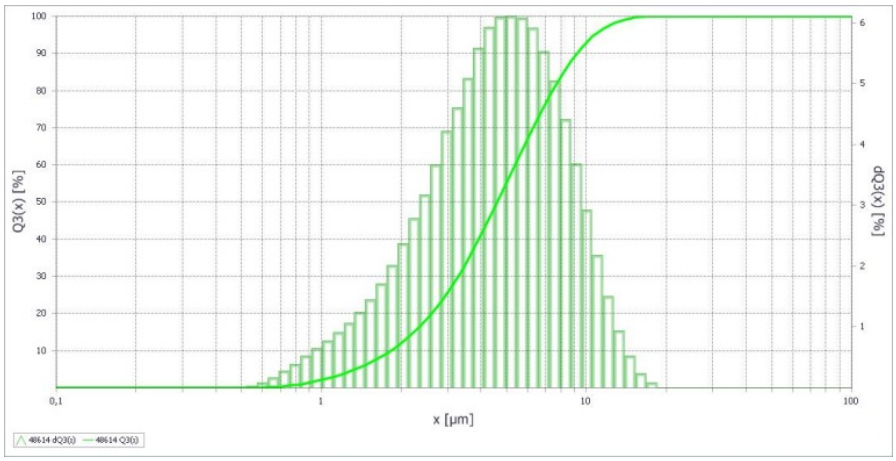
RMS error = 1.60%



Cal. Model = ***narrow***

TradeOff = 0,001

RMS error = 1.75%



Cal. Model = ***broad***

TradeOff = 1000

RMS error = 2.93%

Picture 1: F1200 calculated with different calculation models (TradeOff parameters). N.B. The RMS error gets larger with increasing TradeOff!

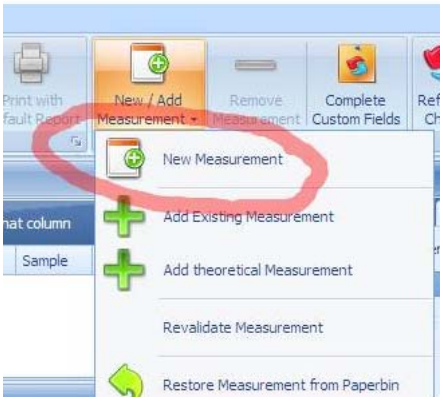
Measuring once, calculating many times: RECALCULATING

Determining a particle size distribution with the ANALYSETTE 22 means:

- Measure the scattered light intensity distribution (and store it in the database!)
- Calculate from these data the particle size distribution (PSD).

Now there are different parameters that can be varied for the calculation of the PSD. Two different Theories can be chosen (Fraunhofer diffraction for rather large particles or Mie scattering for rather small particles) and also different TradeOff parameters (see section above **During calculation, what is the meaning of the TradeOff parameter (Calc. Model)?**) can be used. Therefore it is sometimes necessary to recalculate an old measurement with new calculation parameters. Since the measurement data (the scattered light intensities) are stored in the database it is always possible to recalculate as often as you want.

Recalculation is a new measurement!



Therefore open the folder where you want to store the new result (or create a new folder (see e.g. **How to run a wet measurement?**) and click to "**New/Add Measurement**" and select then "**New Measurement**".

The SOP selection window now opens (as for any new measurement) and you can select the SOP **Recalculate** (it may have a different name). Double-click on it or click and **OK**.

A SOP for recalculation has the following structure:

- **Select Measurement** (this is the measurement that will be recalculated)
- Input of information (Sample name, comments etc.)
- **Calculate**

In the Calculate command the parameters used for the recalculation are set.

To perform more than one recalculation (e.g. to make calculations of the same measurement for different values of the Mie parameters) it is convenient to have a SOP as the one below:

Here six **Calculate** commands are shown. This means that for the measurement that is selected with the first command of the SOP the calculation can be done up to six times with e.g. six different values of the Mie parameters. And each of these calculations will give a new result.

The green arrows indicate that these commands will be executed when you run this SOP while the commands with the red squares are not executed. When the little lock is open it is possible to turn ON/OFF the corresponding command when the SOP is executed. When the little pen is not crossed out the corresponding parameters can be altered.



View of the SOP in the edit mode. Note that during runtime of the SOP (i.e. when a measurement is performed) the small locks and the pencils are not visible.

Note that the Measurement Range of the Recalculation must fit the range of the original measurement. This means:

Range of Original Measurement	Possible Range of Recalculation
Full Range	Full Range or Fine Range or Coarse Range
Fine Range	only Fine Range
Coarse Range	only Coarse Range

Measurement Data and Results

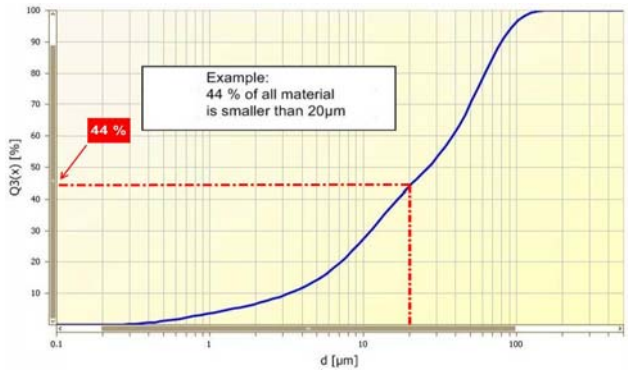
What are User Values?

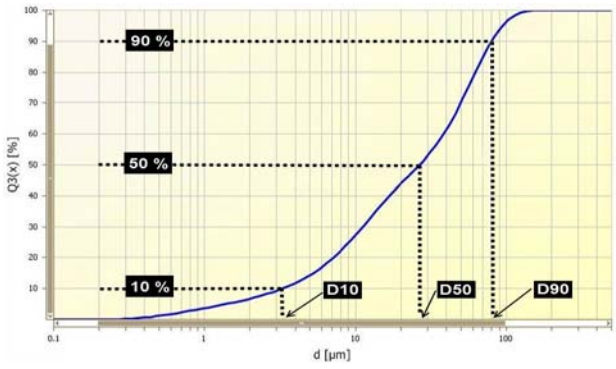
Some applications ask for very specific particle sizes and the user of the ANALYSETTE 22 may need to know e.g. the percentage of material that is contained in particles smaller than e.g. 250µm, 125µm, 63µm and 20µm. in this case it is possible to create a “Uservalues Size” table with 250, 125, 63 and 20µm.
In other cases not specific particle sizes are in the focus of the user but rather some given percentages. To get a quick overview often only the D10, D50 and D90 values are printed. But again tables of any D-Value can be created (“Uservalues Percentage”) and used for any measurement.

Background:

The result of a particle size measurement tells you how many percent of the complete sample volume is filled with particles smaller than x µm.
This is often called Q3(x) [%]. The Q3-Values are also called D-Values.
This means Q3(x) of 10 % is D10, Q3(x) of 50 % is D50 and Q3(x) of 90 % is D90.

And the result tells you how many percent of the complete sample volume is filled with particles with a diameter between x and y µm
This is often called dQ3(x) [%]



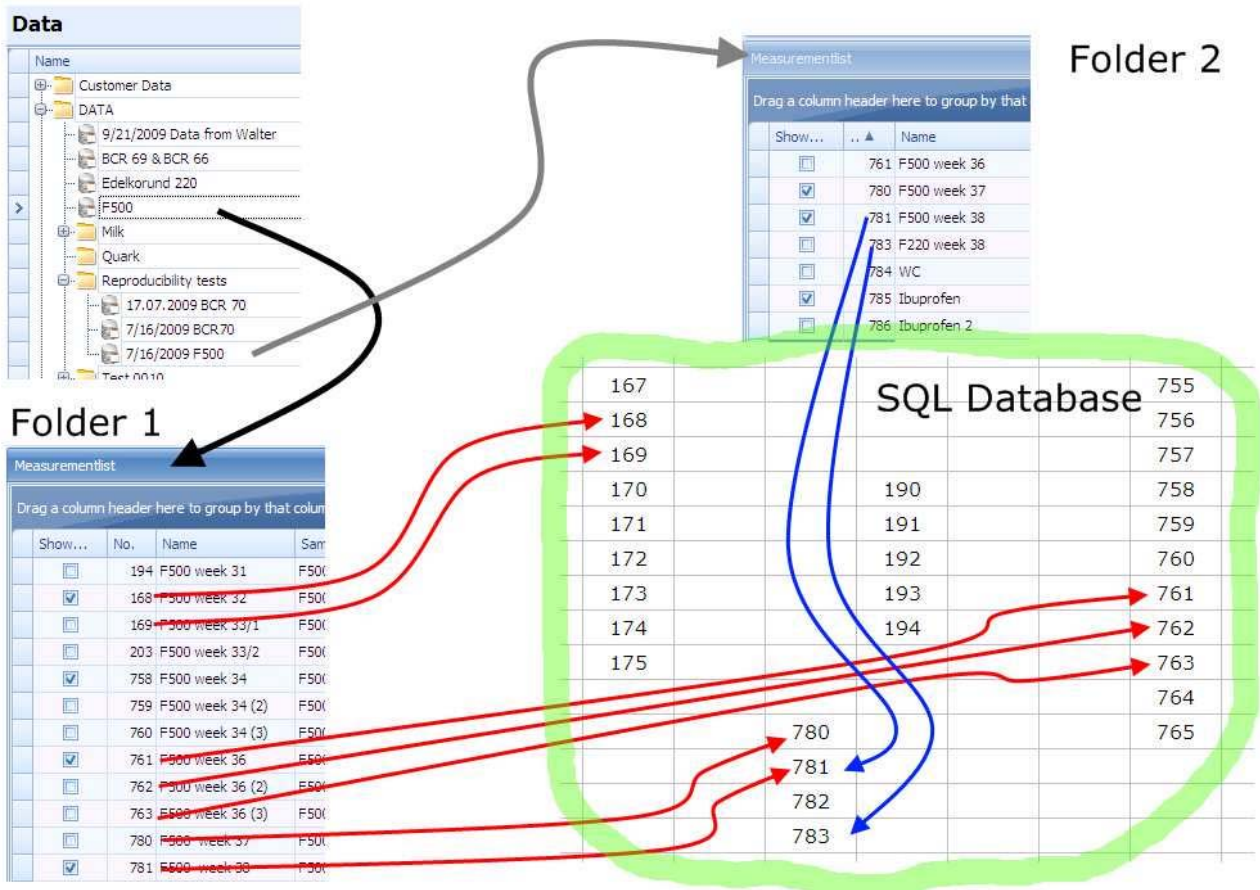


Where are all my data stored?

In MaS control all data (including SOPs and templates) are stored in a Microsoft SQL database. This means there does not exist single files for single measurements.

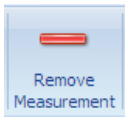
As already mentioned in the **How to run a wet measurement?** MaS control organizes data in directories and folders. But this does not mean that the measurement data are stored in a folder. It is only that you “see” the results in the folder. The measurement list that is shown in the folders simply is a list of links to the results that are stored somewhere in the database. Hence it is possible to have the same measurement in more than one folder or to remove a measurement from a folder (delete the link between folder and database) without deleting the data themselves.

The situation can be explained in the following sketch:



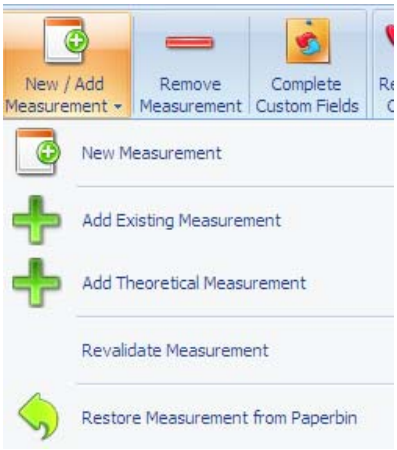
How can I get rid of some measurements in a folder?

In MaS control it is not possible to delete measurement data since all data are stored in a SQL database. However, if you want to remove a measurement



from a folder just highlight the measurement and click to the **Remove Measurement** button. The measurement is now not deleted but removed from the measurement list of the current folder.

How can I get back a measurement that has been removed from a folder?



To get back the removed measurement open the folder to which you want to re-store the data and click the **New/Add Measurement** button. A pull-down menu opens with different possible selections. Choose **Restore Measurement from Paperbin**. A list of measurements opens and you simply select the required on and press **OK**.

I want to have the same measurement in two different folders. How to do this?

Sometimes it makes sense to have one measurement in more than one folder.

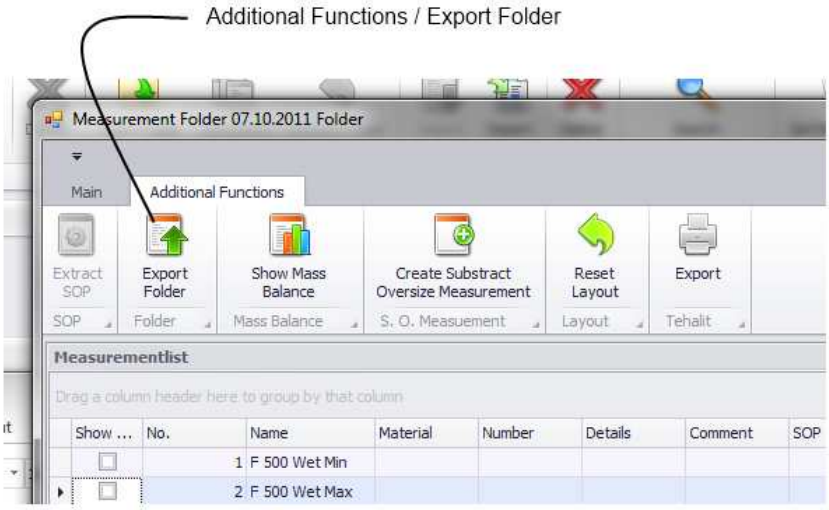
> E.g. you measure a specific product ten times a day and all these ten measurements of a day you have stored in one folder. After a while you want to compare all first measurements of a day for this product. Then you will need to create a new folder (maybe called “First measurements of each day of product xyz”) and add the required measurements to this new folder.

If you want to add a measurement to the currently opened folder that is already used in an other folder then click he **New/Add Measurement** button. A pull-down menu opens with different possible selections. Choose **Add Existing Measurement**. A list of measurements opens and you simply select the required on and press **OK**.

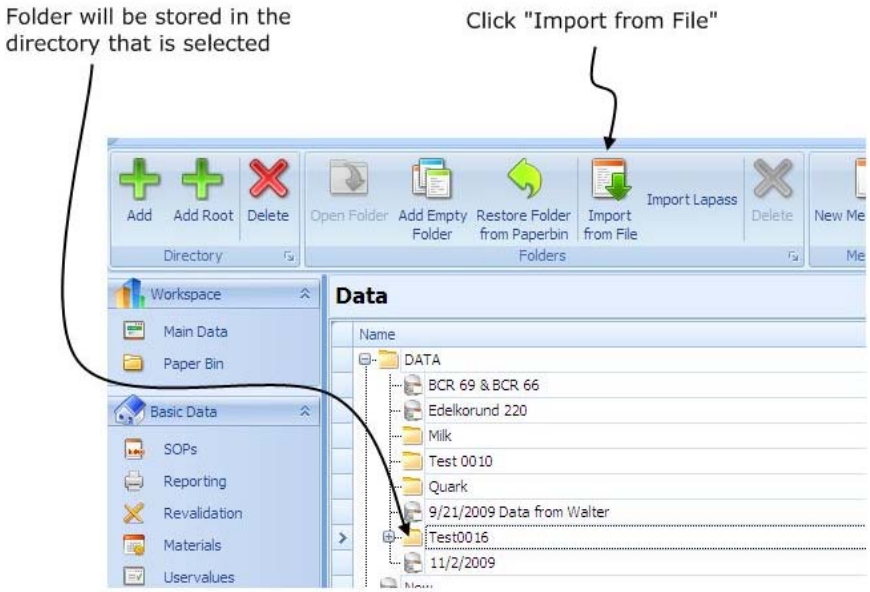
How can I transfer data from one computer to another?

This is done by simply export a complete folder (with all the measurements listed in this folder) and to import it to MaS control on the other computer.

To **export** a folder open the folder of interest and go to “Additional Functions” (top of the measurement folder window) and click “Export Folder”.



To **import** a folder you need to go to the Main Data page and highlight the directory where you want to store the folder.



Printing Reports – Report Templates

MaS control includes a powerful Report Generator (DevExpress) that allows the customization of the printed reports. To print a report it is necessary to open a measurement folder. When now the ‘Print’ icon is clicked a window opens to select the template that is used for printing. After clicking ‘OK’ a preview is opened that shows the report. ‘File’ → ‘Print’ starts printing on the selected printer.
The report contains all measurements that are tagged (‘**Show in Chart’**) in the Measurement List of the measurement folder.
The **Uservalues** of each measurement have to be chosen in the measurement folder itself. If no User Value table is loaded for a given measurement the corresponding field in the report stays empty (only an empty bar will be printed). For more information see ‘**Uservalue Tables in Report Templates**’.
The styles of the graphs are defined in the report template. Hence it may look different than what you see in the measurement folder. To change the style of the template must be edited (see ‘**How to modify the Chart Options of a printed report?**’).

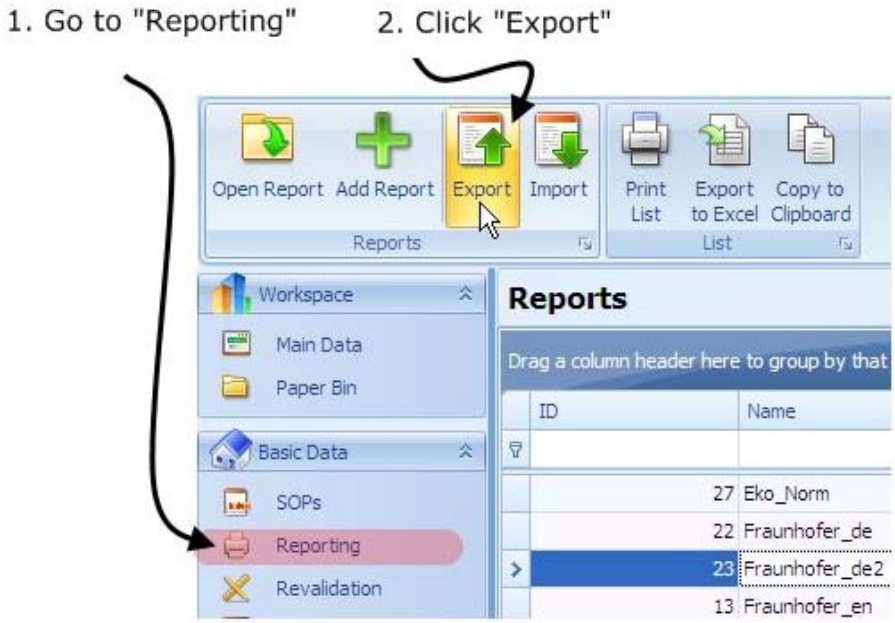
How to copy a report template before I modify it?



Before modifying a report template it is advisable to make a copy of the original one, otherwise it will be lost. **It is not possible to open an existing report, make modifications and then store with a new ID!**

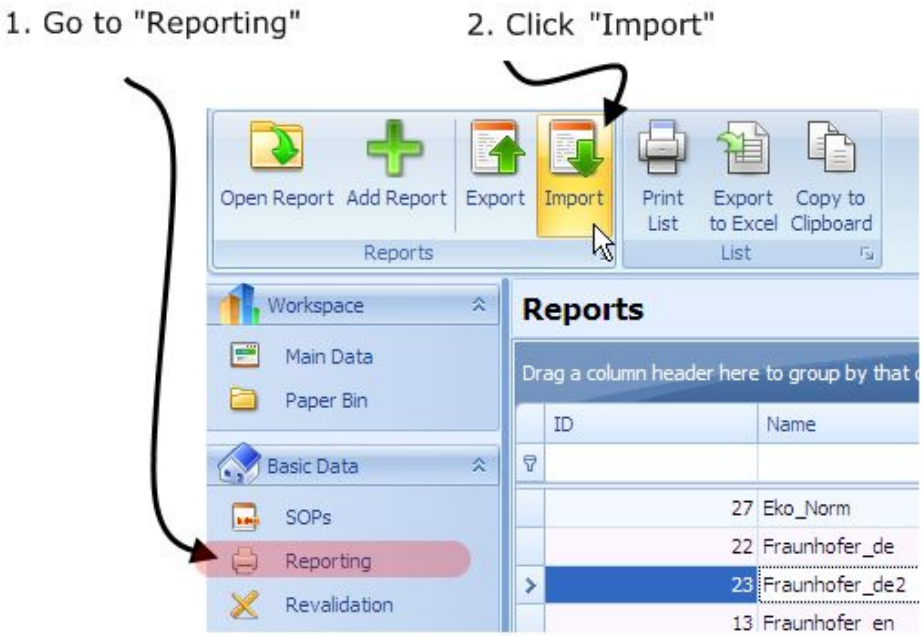
To copy a report template simply export it to any location on your computer and then again import it:

Export report template:



Picture 1 First export an existing template. After clicking **Export** a "**Save to…**" window will open

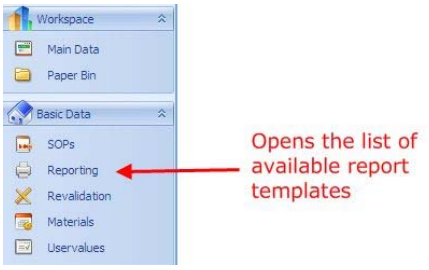
Import report template:



Picture 2 Then import the same template again

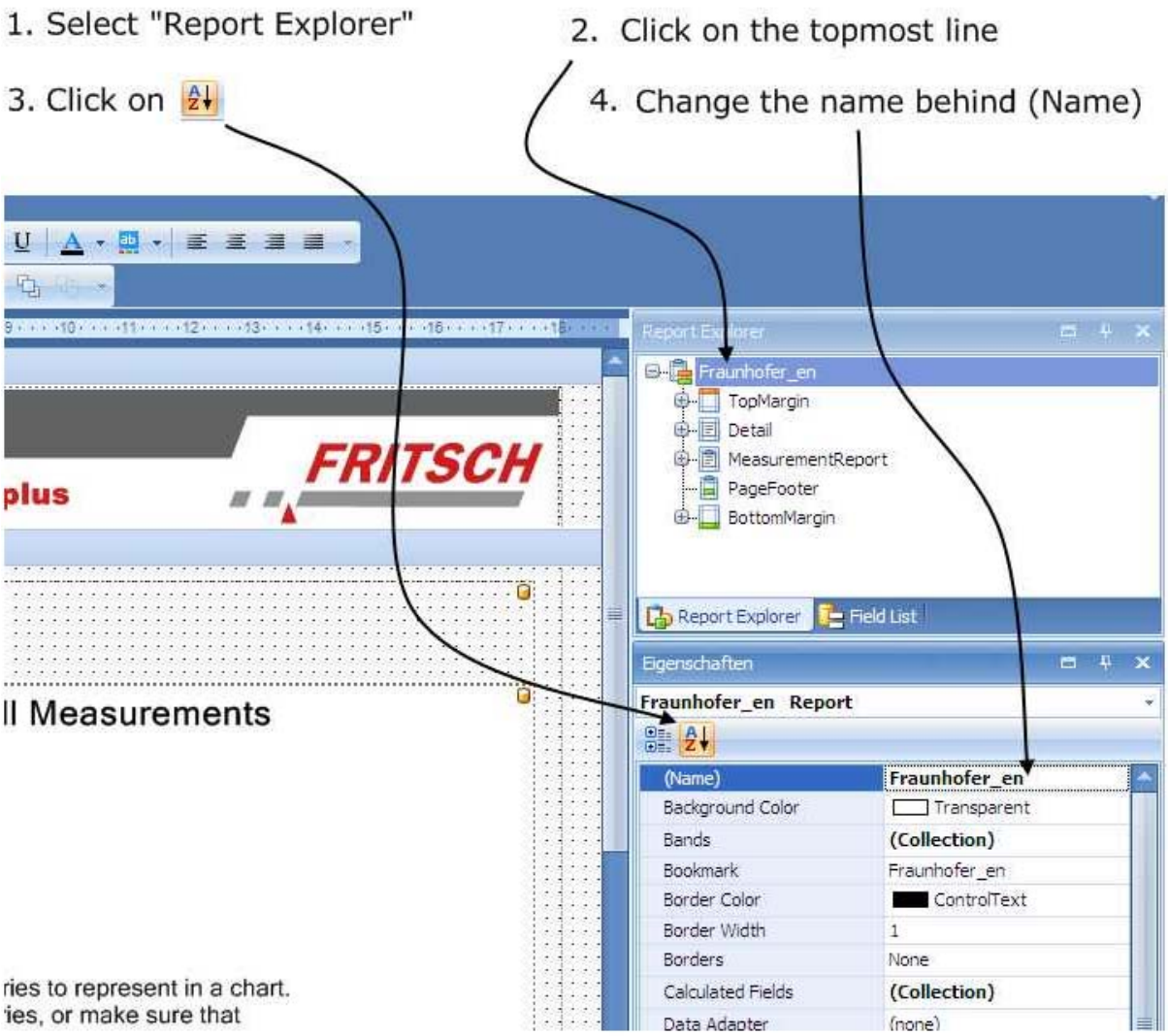
After the template has been imported it will appear in the report templates list with a new ID number. The name of the report will be the same as the name of the original one. It has nothing to do with the filename that was used for import/export. Therefore it is advisable to change the name immediately.
See **How to modify the name of a report template?**

How to modify the name of a report template?



- Open the list of all available report templates (Reporting)
- Open the required report template by double click on it

Follow the steps shown in picture below.



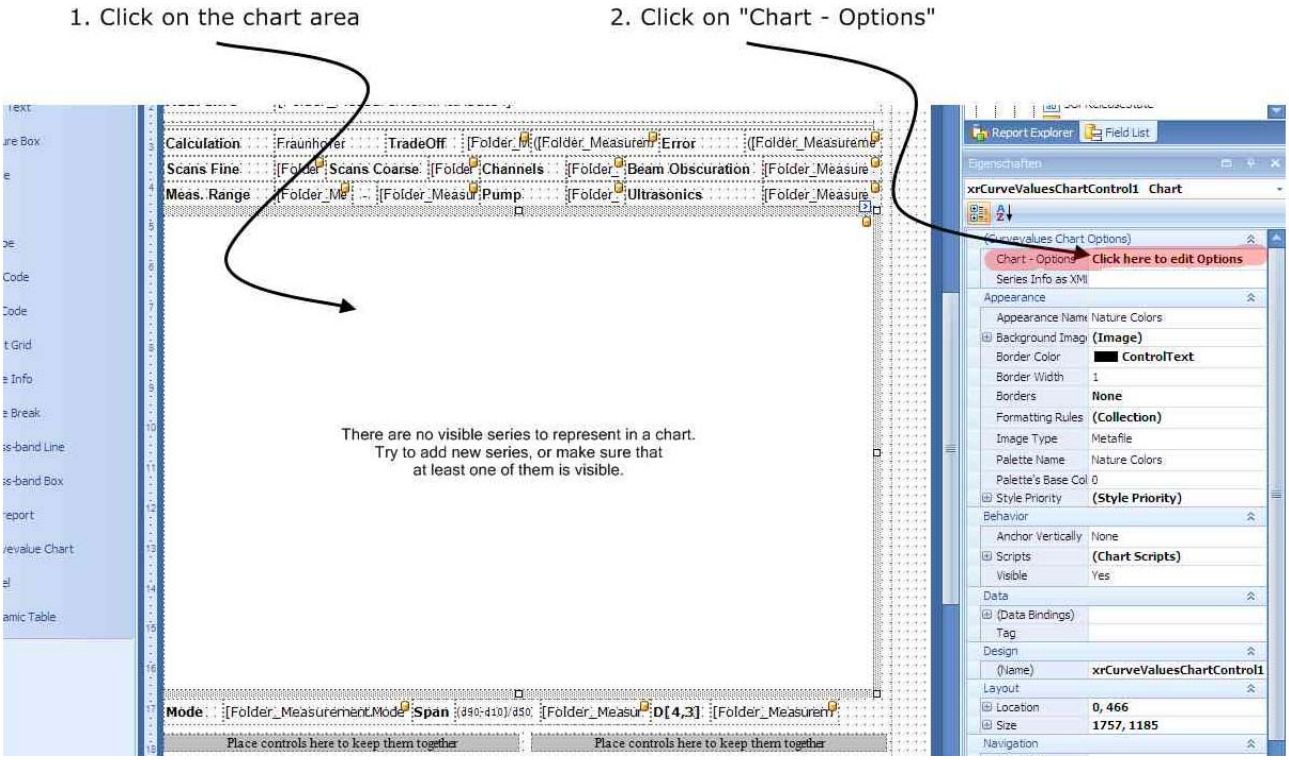
How to modify the Chart Options of a printed report?

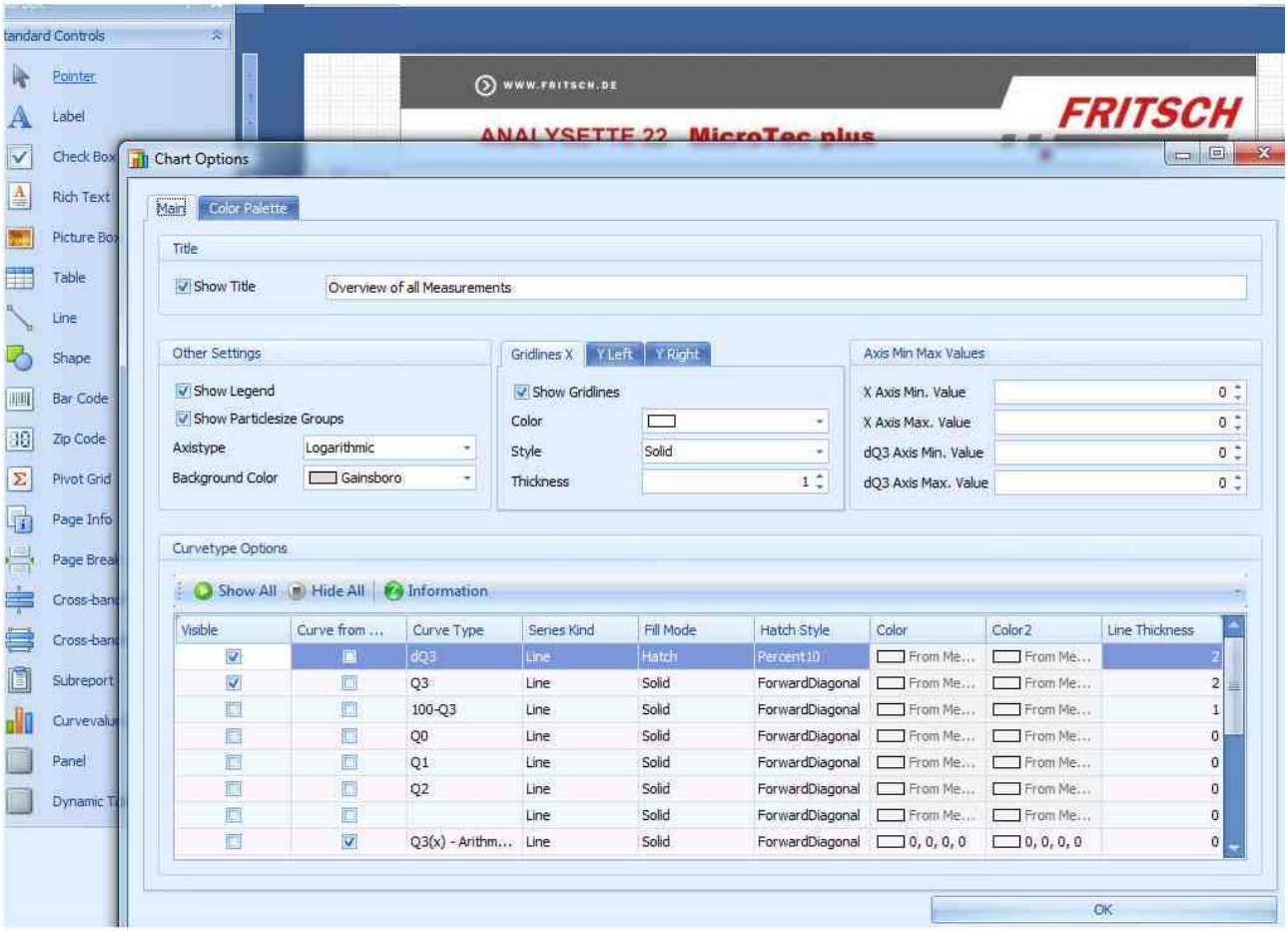
In MaS control the layout of the printed report are defined in the report template. Especially the appearance of the graphs in the printout is often not identical to the appearance of the graphs on the screen. To modify the chart options of the printout proceed as follows:



- Open the list of all available report templates (Reporting)
- Open the required report template by double click on it

The report generator opens.
Graphs are shown as just empty areas with the text There are no visible series to represent in a chart. Try to add new series, or make sure that at least one of them is visible. This text is just a placeholder and does not have a deeper meaning.
Click on the chart area and then find the entry “Chart – Options” in the properties list (Eigenschaften, see picture below). Click there and the window of the chart options opens. This is the same window as when changing the chart options of a measurement folder.



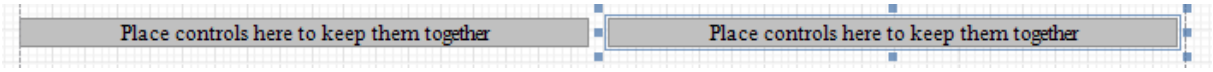


The range of the particle size that is printed in the report can be set in the “Axis Min Max Values” section. To show the complete range use a Zero as X Axis Min. and X Axis Max. value.

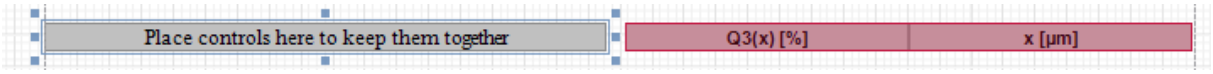
“Series Kind” can be switched from “Line” to “Bar”, “Fill Mode” defines how the bars are filled and if “Hatch” is chosen for Fill Mode then here the used pattern for filling the bar can be selected.

Uservalue Tables in Report Templates

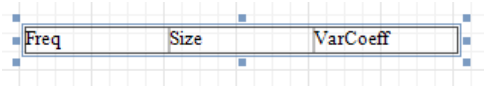
To print **Uservalues** in MaS control so called “Dynamic Tables” are used. When you open any existing report template you will find some placeholders of those dynamic tables:



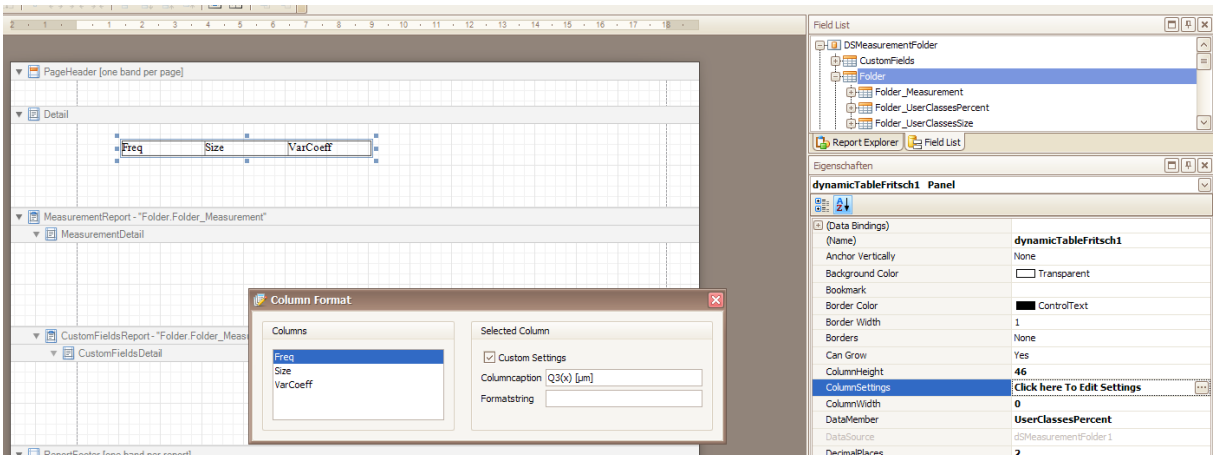
When you now click to one of those objects you get these small squares around it (right side) and when you then change the size of the object by placing the mouse to any of the squares and move the boundaries just a bit you also get the **heading title of the columns** of this table.



Often the following column heading titles will be visible:

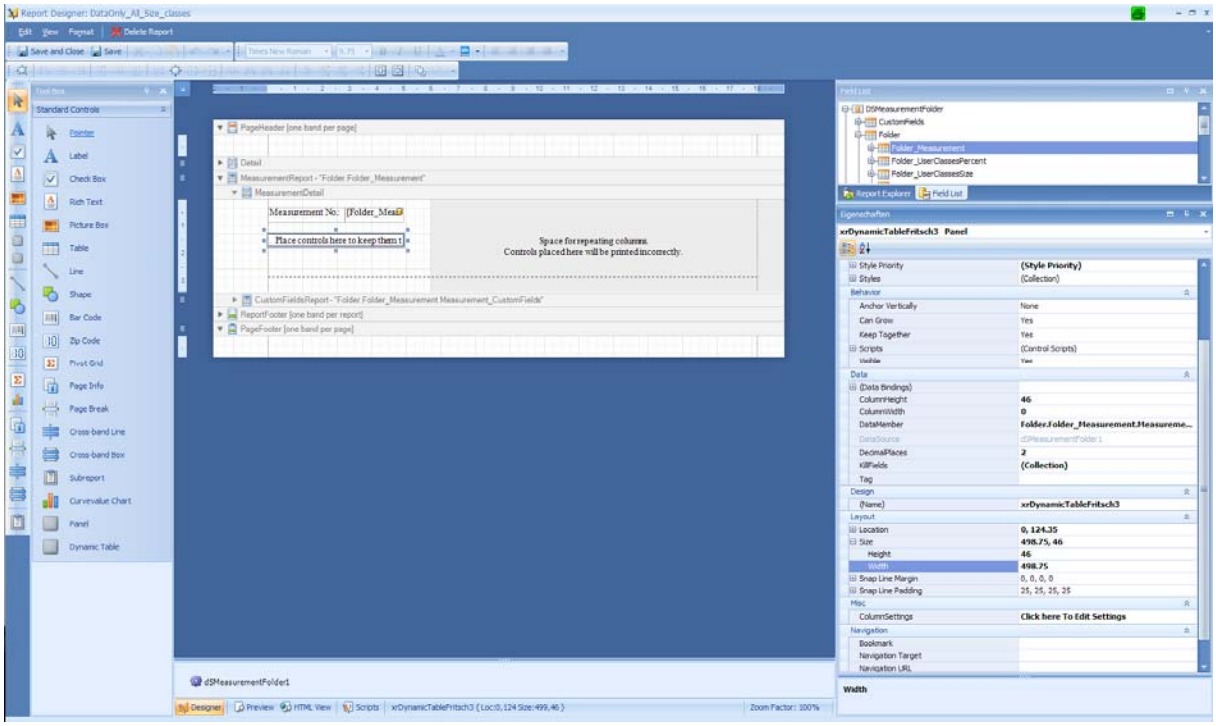


These are the default titles when a new table is created in the template (in some cases the VarCoeff will miss)[‡]. To edit the titles search the ‘**ColumnSettings**’ in the right hand list of properties (this is the section with the heading “**Eigenschaften**” what is the German word for properties) and click to the three dots behind “**Click here To Edit Settings**”. The “**Column Format**” box will open and here you can customize the headings.



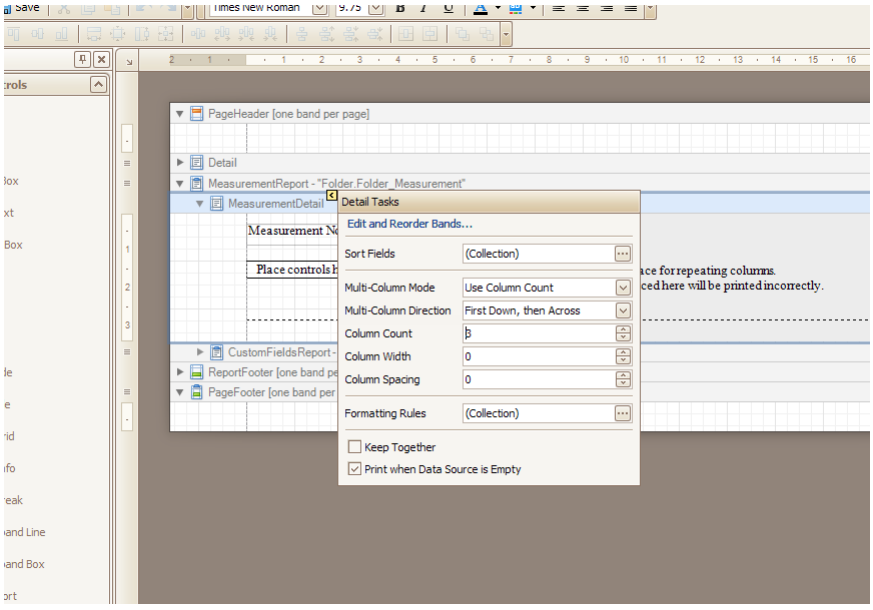
[‡] **Freq** stands for ‚Frequency’. It means the Q3(x) values. **Size** is the particle size x in microns, **VarCoeff** is the variation coefficient of a value when more than one measurement is listed in one table. This is typically only done in the **Details** band of a report template.

To modify the size and/or position of a table just click on it and in the properties you will find „**Layout**“. Here you can change both position of the whole table and width of the columns. ‘Height’ can be used to adjust the height of the lines of the table.
Of course you may also just use the mouse and touch one of the small squares that surround the selected placeholder of the table and change its size.



To create a multi column table you may also click to the header of the desired band (e.g. “Measurement Detail”) and click to the small arrow that appears:

A new menu opens and here you can select “Multi-Column Mode”. Disadvantage: This will affect the whole band and hence if more than just one table is contained in the band this will create crazy results.



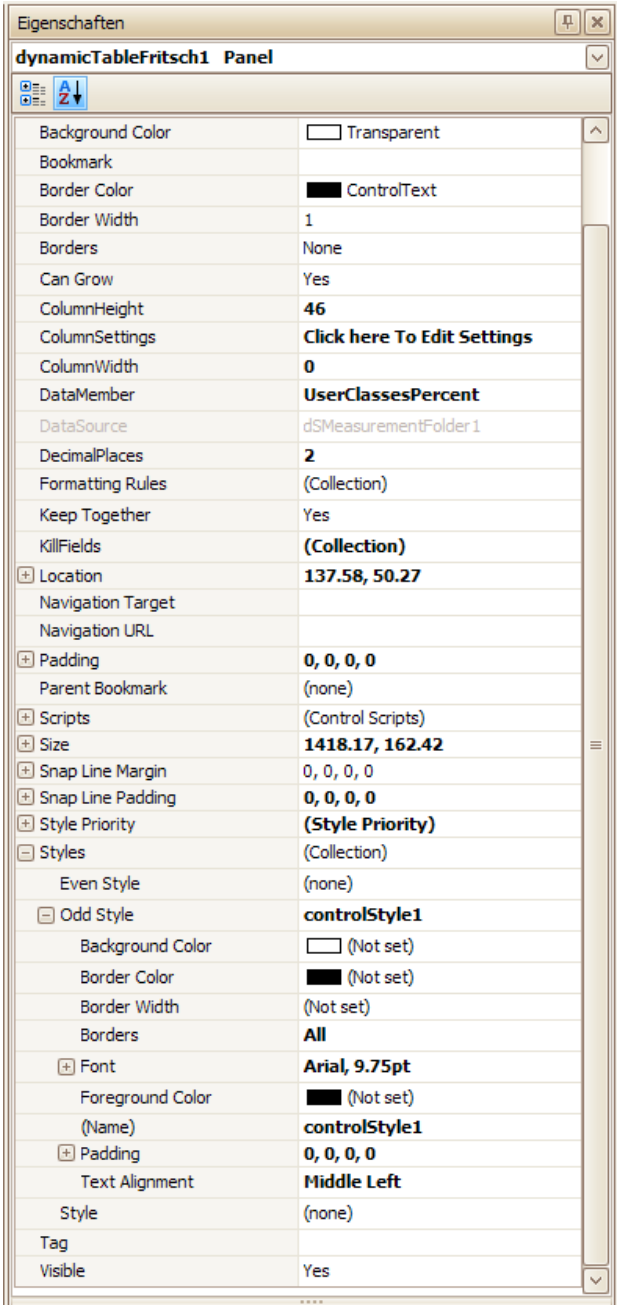
Now here is a list of further parameters in the properties section:

DecimalPlaces: Defines the number of digits including the decimal point.

KillFields: Gives you a list of columns that are not drawn. Can be used to get rid of e.g. the VarCoeff column.

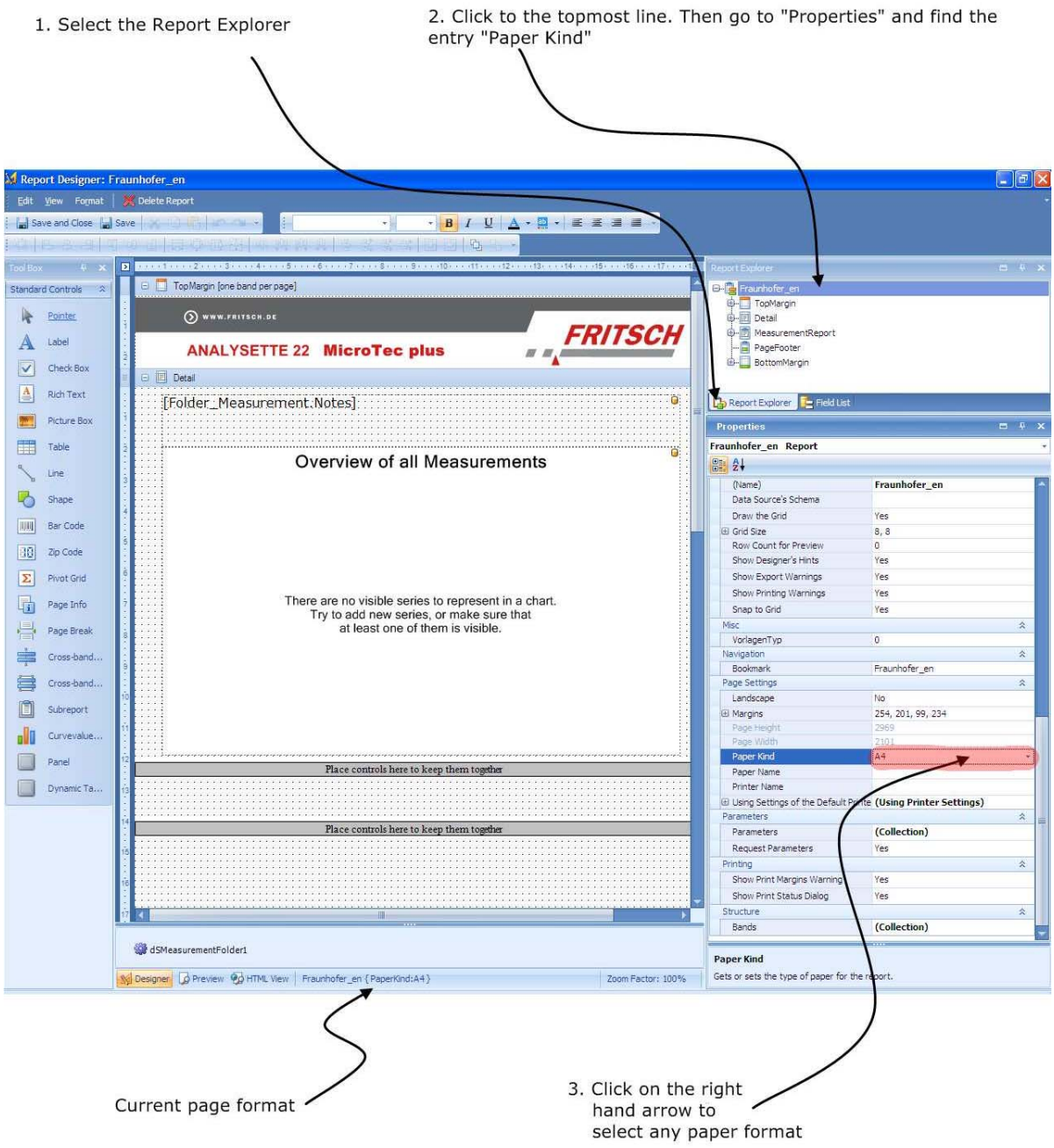
Padding: Distance between text and border of a cell. When expanded *left*, *right top* and *bottom* can be defined individually.

Styles: Used to define complete sets of style parameters for table lines. **Even Style** and **Odd Style** refers to even and odd line numbers, respectively. Hence background colour, text alignment, padding etc. can be defined individually.



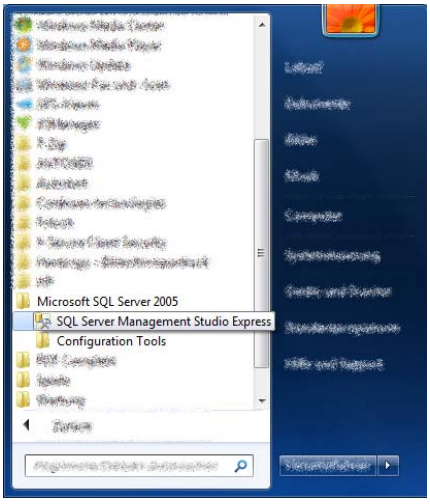
How to change the paper format of the report?

Typically MaS control is delivered with report templates that have A4 as paper format. If you want to change this e.g. to B4 open an existing report by double-click to it in the list of available reports (Reporting) and follow the steps shown below:

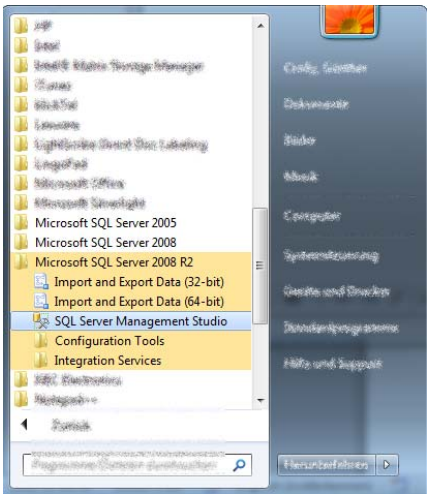


Handling the Database

In **MaS control** all measurement data are stored to a relational database server, either a MICROSOFT SQL SERVER 2005 EXPRESS or a MICROSOFT SQL SERVER 2008 R2. A Microsoft SQL Server is a software product whose primary function is to store and retrieve data (to and from a database file) as requested by other software applications as e.g. **MaS control**.
During the installation of **MaS control** the Microsoft SQL Server (either the 2005 or the 2008 version) is installed to the system. Furthermore a database management program is installed, SQL SERVER MANAGEMENT STUDIO EXPRESS (for SQL Server 2005) or SQL SERVER MANAGEMENT STUDIO (for SQL Server 2008). And also a database file (that contains all the measurement data and results) is created. This database file itself can be found at **C:/Fritsch/MaScontrol[_X64]/Data** (or for older installations C:/Program Files/Fritsch…) and is called **MaScontrol.MDF**.



SQL Server 2005



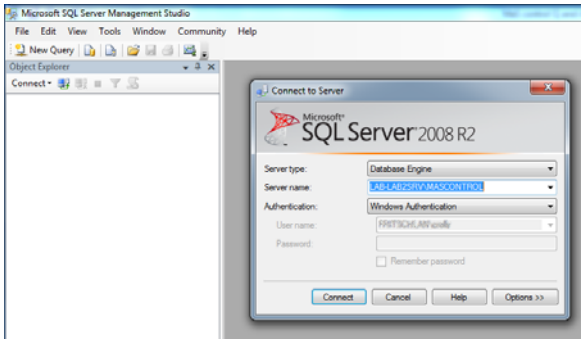
SQL Server 2008

For all following descriptions the SQL SERVER MANAGEMENT STUDIO of SQL Server 2008 is used. For the SQL Server 2005 some specific procedures or items may look a bit different but the general approach will remain the same.

How to create a Back Up of the Database

When the SQL database file **MaScontrol.MDF** (stored in: /Fritsch/MaScontrol[_x86]/Data) is destroyed or deleted all measurement data are gone!
Therefore it is important to have a Back Up routine of the database. To complete this task the SQL SERVER MANAGEMENT STUDIO is required.

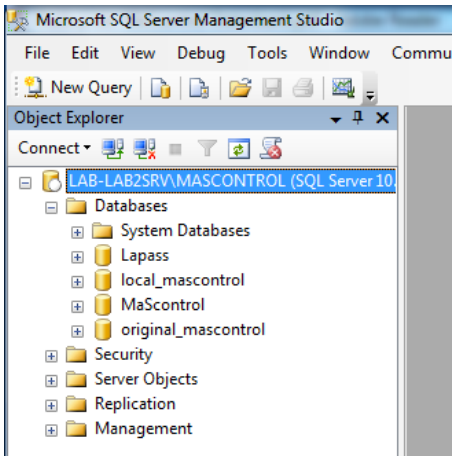
- Start the SQL Server Management Studio. A window that asks for the correct server name appears. The server name is the computer name (that you find in the Windows Control Panel) and MASCONTROL:



Server name: 'computer name'/MASCONTROL

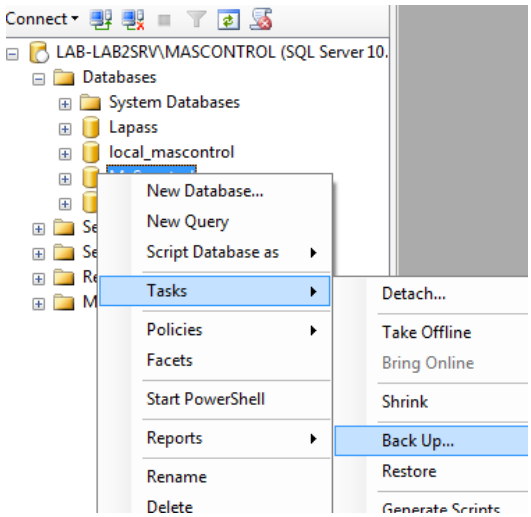
- Connect to server.

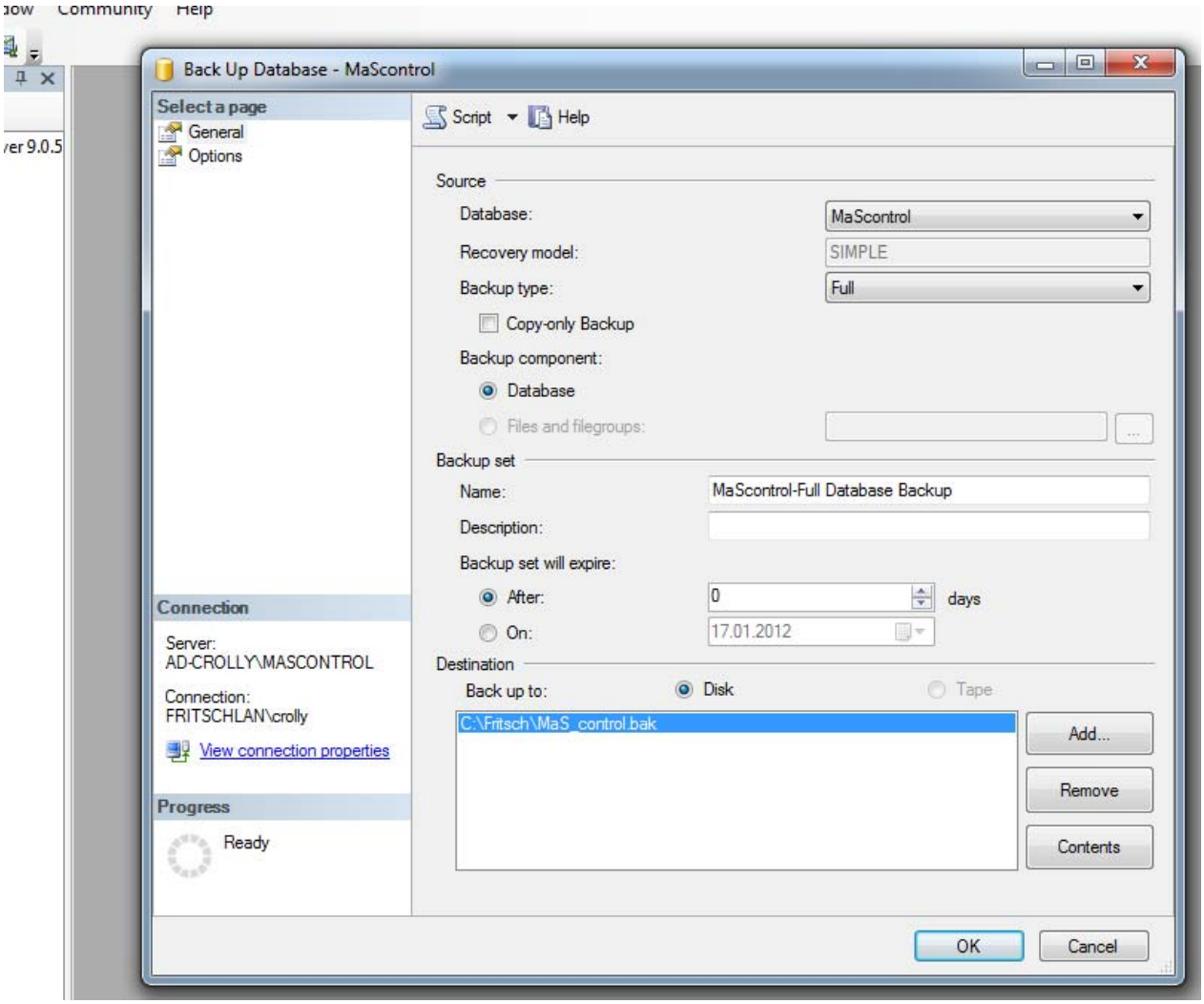
- After the server has been connected you can expand the list of Databases. In all cases a database called "MaScontrol" must be listed.



- With a right-click to MaScontrol a new menu opens. Here click to:

  Tasks ▸ Back Up...





Specify the name of the backup file in the section “Destination”. Append the extension .bak to the desired file name. Click “OK” to execute the backup process.

NOTE: The location of the Back Up file (Destination) must be on the same computer where the corresponding SQL Server (Microsoft SQL Server 2005 Express or Microsoft SQL Server 2008 R2) is installed (typically the Laptop or PC that is used to run MaS control). **The created Back Up file should now be copied to an external drive**.

How to restore a Back Up of the Database

To restoring a Back Up of the SQL database file **MaScontrol.MDF** (stored as *.bak) proced as describes in the previous section but when reaching the sub-menu “Tasks” chose “Restore” instead of “Back Up”.