TQ-S-Tracer, TQ-F-Tracer

Tracer discharge measurement system

Manual

Setup version 1.18.00 (Firmware 1.04.00)

21.01.2026

Sommer Messtechnik

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Validity

This manual applies to the Tracer discharge measurement system with the setup version 1.18.00, including all its subversions.

Created: 01.01.2020

Last update: 21.01.2026

EU conformity

CE

This product is in conformity with the following standards:

EMC	2014/30/EU	EN 301 489-1 V1.9.2
EMC	2014/30/EU	EN 61326-1:2013
		EN 55022:2010
LVD	2014/35/EU	EN 62311:2008
		EN 62368-1:2014
MID	2014/32/EU	
RED	2014/53/EU	EN 300 440-2 V1.4.1
Machinery directive	2006/42/CE	
RoHS II	2011/65/EU	EN 50581:2012
RoHS III	2015/863/EU	
REACH	1907/2006/EU	

FCC compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC and IC compliance

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Changes or modifications made to this equipment not expressly approved by Sommer Messtechnik may void the FCC authorization to operate this equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

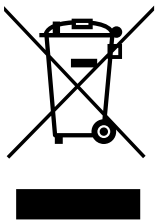
ISED Certification Number:

Safety information

Please read this manual carefully before installing or operating this equipment. Non-compliance with the instructions given in this manual can result in failure or damage of the equipment or may put people at risk by injuries through electrical or mechanic impact.

- Make sure that the personnel responsible for installation, configuration and maintenance is familiar with the applicable regulations and standards!
- Do not perform any installations in bad weather conditions, e.g. thunderstorms.
- Prior to installation of equipment inform the owner of the measurement site or the authority responsible for it. Upon completion, secure the installation from trespassers.
- Maintenance and repair must be performed by trained personnel or an engineer of Sommer Messtechnik. Only replacement parts supplied by Sommer Messtechnik should be used for repairs.
- Make sure that NO power is connected to the equipment during installation and wiring!
- Only use a power supply that complies with the power rating specified for this equipment!
- Keep equipment dry during wiring and maintenance!
- If applicable, it is recommended to use accessories of Sommer Messtechnik with this equipment.

Disposal



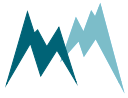
After this device has reached the end of its lifetime, it must not be disposed of with household waste! Instead, dispose of the device by returning it to a designated collection point for the recycling of waste electrical and electronic equipment.

Dispose of batteries separately!

Feedback

Should you come across any error in this manual, or if you miss information to handle and operate the TQ we are pleased to receive your feedback to office@sommer.at.

Content



1 What is the TQ?

The Tracer discharge measurement system is a mobile system to measure the discharge with salt tracer (TQ-S) or fluorescence tracer (TQ-F).

The Tracer discharge measurement system consists of at least one conductivity sensor and the software TQ-Commander.

The Tracer discharge measurement system is a measuring device with Bluetooth data transmission to which a conductivity probe can be connected. It is possible to use up to four conductivity sensors at the same time when using TQ-Commander. This software supports you in conducting a measurement and when performing post processing of measured data. TQ-Commander is available for Microsoft Windows PCs and Laptops Contents of assortment.

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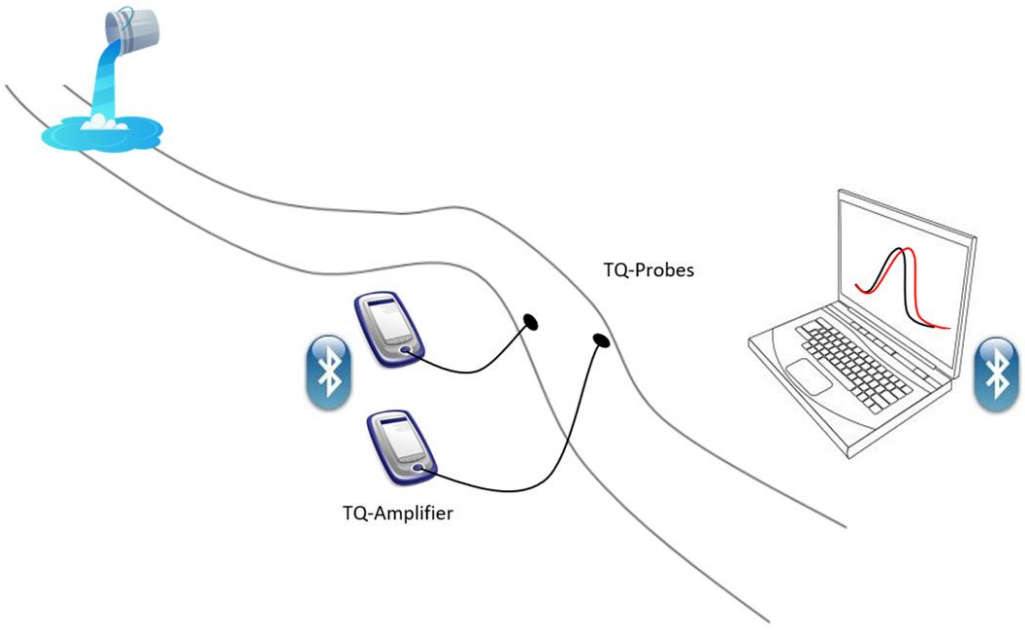
2 Tracer dilution method

2.1 How the measurement works

A single person can do a measurement in a short time. The **data transmission via Bluetooth** from the receiving device to the notebook allows to remain at a safe and comfortable place. The measurement curves are displayed in real-time and the device calculates continuously the given discharge.

First, the probes have to be calibrated at the site. Simultaneously measurements with up to four probes are possible what provides an immediate plausibility check.



2.2 Measurement principle

The tracer dilution method requires a slug injection of a defined amount of tracer substance into the water body to be measured. Prior to the injection at least one conductivity probe has to be placed in the water body downstream of the injection site. The conductivity sensor is used to measure and record the concentration of the tracer substance in the water.

The conductivity sensor outputs the currently measured conductivity of the water. To define a relation of the measured values with the actual concentration the probes need to be calibrated to determine the calibration factor (k). This calibration factor is not only dependent on the used tracer substance and the probes but also on the river or canal's water. Therefore, Sommer Messtechnik strongly recommends performing a calibration of the probes prior to every measurement.

The calibration of the probes is of equal importance as the absolute accuracy of the used probes with regards to the accuracy of the discharge calculation. Accordingly, Sommer Messtechnik suggests using tracer solutions with a concentration of 10 g/l (Salt) and 2mg/l (Fluorescein), which can be carefully and thoroughly prepared by the end user (see Calibration of the sensors).

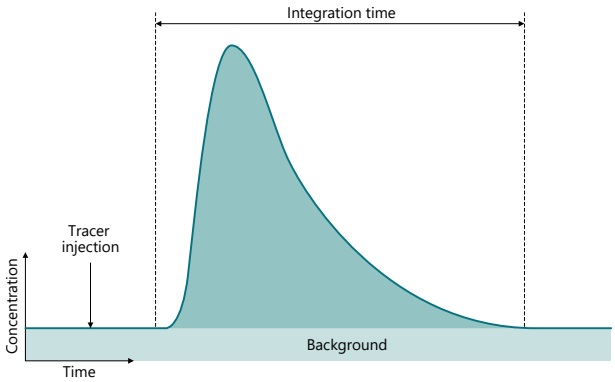
From the recorded peak the TQ computes the discharge as follows:

$$Q = \frac{M}{\int_0^\infty (c(t) - c_b)\,dt}$$

M is the injected amount of tracer,

c(t) the tracer concentration at time t,

c_b the background concentration.



The minimum increase in measured conductivity must be at least:

- 100 µS/cm (in low base conductivities, e.g. below 100 µS/cm)
- 50% base increase or higher in normal base conductivities above 100 µS/cm than the base value

The discharge calculation is based on the injection amount (m), the previously determined calibration factor (k) and the measured values during the passage of the tracer substance in the form of the area between the curve and the base value (A).

The supplied software TQ-Commander guides the user through the complete measurement procedure, starting from the calibration through to issuing the measurement report. The necessary steps and requirements are described in this manual.

2.3 Requirements

The following requirements must be fulfilled to get good and correct measurement results:

- Constant water flow during the measurement
- Constant base value during the measurement
- Even distribution of the tracer in the whole river cross section (vertical and horizontal) at the position of the conductivity sensor(s)
- The whole tracer must pass the sensors completely (no backwater) meaning that after the tracer substance passed the sensor the measured value should be very close to the base value (see above diagram)

2.4 Selection of the measurement location

To ensure a sufficient mixing of the tracer substance the following topographic aspects should be considered.

Positive:

- Varying cross sections
- High roughness
- Stones and rocks

Negative:

- Backwater areas (pools, rollers, dead water zones …)
- Low turbulence
- High vegetation

Especially consider the following points:

1. Suitable tracer injection site
2. Sufficient mixing distance
3. Appropriate location for placing the conductivity probes in the river

Ad 1: Tracer input

The goal is to input the complete tracer substance (injection amount) as fast and as completely as possible in one single impulse (with swift rinsing of tracer remains) into the main stream. There should be no vegetation present at the injection site.

ATTENTION
Always take care of your own safety at the tracer input location!

Input form:

The tracer injection must be carried out in dissolved form.

In good mixing areas and with sufficient water temperature you can also inject crystalline salt.

Input quantity:

The input quantity depends on the total discharge, the base value and the mixing distance.

The more tracer substance is injected, the greater the maximum increase of the measured values.

The goal is to achieve an increase of at least 100 µS/cm or 50% of the base value (see above diagram).

The rule of thumb to approximate the amount of tracer substance needed is 3-5 kg per m^3/s of total discharge. In case the resulting measurement curve shows that the maximum measurement is well below the aforementioned minimum increase, the measurement can be easily repeated with a higher amount of tracer substance. In such a case the previous measurement result can be used to more accurately estimate the total discharge of the river.

NOTE

If the measured values exceed the probe's detection limit of 2000 µS/cm the measurement result is invalid. In such a case the measurement should be repeated with i.e. half the amount of tracer used in the first attempt.

Ad 2: Selection of the mixing distance

The goal is a complete vertical and lateral distribution of the tracer substance at the measurement location.

Rule of thumb: Mixing distance = 50-times the width of the water body to be measured (for low turbulences).

ATTENTION

The longer the mixing distance the better the mixing, but at the same time the lower the maximum increase of the measurement and the longer it takes for the complete tracer to pass the measurement location (this can be compensated for by using a higher amount of tracer substance, i.e. > 3-5 kg per m^3/s).

A shorter mixing distance (reduced down to 20-times the width of the water body) can be chosen when the following preconditions are met:

- High turbulences
- Changing cross sections
- High roughness
- Presence of stones and rocks
- Hanging probes

NOTE Various factors determine the mixing distance, which are site and stage dependent. The site's geometrical constraints impose the global flow conditions, while high or low flow conditions can greatly alter the turbulence. The indicated factor of n-times the width of the water body is a rough starting point. The determining factor for establishing the mixing distance, which should follow the rule "as short as possible and as long as necessary," is the complete mixing of the tracer vertically and laterally across the measuring cross section.

Complete mixing is best determined by the deviation of the probes used for measurement. The probes must all be located in the same cross-section, never behind or in front of each other. However, they should be clearly separated from each other. It is best to place one probe in the main stream of the river and the other probe(s) at the side. In this case, the measurement curves will differ with regard to the beginning, maximum and end of the tracer passage. With complete mixing, the calculated discharges of the individual measurements are nevertheless almost identical and show a small deviation. In this case, the above rule of thumb is no longer valid.

A background probe for background level and change control is **recommended but optional**.

Ad 3: Positioning of the probes

The goals are:

- Good circulation of water around the probes
- Stable position of the probes
- Probes must lie on the bottom of the river bed in high turbulent flows or hang in the water in low tortuous flows.
- **PRO TIP:** If you can hang the probe this is best practice to receive good measurement results.
- Probe position should be:
  - 1 probe in the middle / center of the water body and 1 probe on the side (left / right side)
  - 1 probe on the right of the water body and 1 probe on the left side
- **Get creative:** use a tagline to hang your probes or use existing infrastructure See below example. Branches of trees or bridges can also be utilized.

ATTENTION
Safety and accessibility at the measurement location must be considered!

ATTENTION
Avoid placing the sensors in mud or high vegetation prevent the sensors from floating in the water and avoid positions where air bubbles aeration is present.

ATTENTION
Ensure when placing probes in the water that you have a visible line of sight when measurement is taking place and the USB Bluetooth dongle.

Abstract:

The tracer substance has to be mixed up completely. For this purpose, choosing longer mixing distances is better than shorter ones and using bigger amounts of tracer substance is preferred to using smaller amounts. Tracer flowing through the sensors has to be clearly visible in the measurement results and the maximum increase must fulfill the minimum requirement (> 100 µS/cm and/or 50 % of the base value). After the tracer passage, the measured values should decrease to the base value.

3 Scope of delivery

Tracer discharge measurement system versions:

- Conductivity sensor(s) and accessories together in one case
- Conductivity sensor(s) with heavy armour and 25 m cable spool

3.1 Conductivity and Fluorescence measurement

	Case
Conductivity sensors	1-4 conductivity sensors each with one TQ-Amp
Fluorescence sensors	1-4 fluorescence sensors each with one TQ-Amp

Figure 1 TQ-Amp (V3)
with conductivity probe

Figure 2 TQ-Amp (V3)
with fluorescence probe

TQ-Amp and probe with heavy armour on cable spool:

Cable spool for TQ measurement:

One-piece TQ-Amp and sensor with heavy armour and one TQ-Amp each per cable spool.

Orange transport case (conductivity/fluorescencesensors and accessories):

	TQ-S Case	TQ-F Case
Number of TQ-Amp	2 pieces	
Sensors	1 conductivity sensor per TQ-Amp	1 fluorescence sensor per TQ-Amp
Pipette	500 µl pipette with additional reserve tips	

	TQ-S Case	TQ-F Case
Jars	■ Vessel for calibration solution ■ Measuring cup ■ Volumetric flask 500 ml ■ Measuring cup with handle 600 ml	■ Dark bottle for calibration solution ■ Stainless steel measuring cup ■ Volumetric flask 500 ml ■ Measuring cup with handle 600 ml
Other	■ USB flash drive (documentation + software) ■ USB Bluetooth dongle ■ Charging cables (X1 data/charging cable, X1 charging cable) ■ Quick start guide	
		

3.2 USB Bluetooth adapter

The supplied USB Bluetooth (V5.3) dongle can be used to establish a connection with the conductivity sensors with a computer that has no integrated Bluetooth module or to increase the maximum transmission distance.

The supplied class 1 Bluetooth dongle provides a connectivity reach of up to 100 m.

The USB Bluetooth dongle is normally installed automatically and does not require a manual driver installation. If you are asked to manually choose a driver during the automatic installation, select "automatically search for drivers online".

4 Specifications

	Tracer System TQ-S	Tracer System TQ-F
		
Measurement principle	Tracer dilution method with instantaneous injection	
Application	Discharges up to 10 m^3/s	All discharge volumes

TQ-Amp	Tracer System TQ-S	Tracer System TQ-F
Memory capacity, Display	8 MB internal Memory, 128 x 64 Pixel	
Transmission interval	1 second	
Data transfer	Bluetooth class 1 (transmission range up to 100 m)	
Working temperature	-20 … +60 °C	
Protection	IP66	
Energy supply	4x 1.2 V, 260 mAh NiMH battery, size AA (Remember that batteries are rechargeable and must be replaced with similar if changed in future to ensure that there are no issues when recharging the TQ-Amp)	
Battery capacity (with 4x 2500 mAh battery)	40 hrs	25 hrs
Charging time	approx. 10 hrs	

Probes	Tracer System TQ-S	Tracer System TQ-F
Probe type	Conductivity probe	Fluorescence probe
Measurement range	0 … 2000 µS/cm	Fluorescein/Rhodamine WT: 0 … 50 µg/l (ppb)
Resolution	0.0001 µS/cm	0.005 µg/l (ppb)

	Tracer System TQ-S	Tracer System TQ-F
Working temperature	0 … +60 °C	0 … +50 °C
Other features	■ Integrated temperature compensation ■ Measurement linearization acc. to: EN 27888:1993 for natural water	■ Further types of probes for different tracer substances available upon request

Accessories included	Tracer System TQ-S	Tracer System TQ-F
Pipette	500 µl pipette	
Jars	■ Bottle for calibration solution ■ Measuring cup 600 ml ■ Measuring cup 500 ml ■ Volumetric flask 500 ml	■ Bottle for calibration solution ■ Measuring cup 500 ml ■ Measuring cup 750 ml, stainless steel ■ Volumetric flask 500 ml
Others	■ USB memory stick (documentation + software) ■ USB Bluetooth adapter	
TQ-Commander (Software)	TQ-Commander Version 3	

5 Before you start

5.1 TQ-Commander requirements

- Windows 10, Windows 11, No additional installations required
- When the amplifier is fully charged, please ensure it is removed from the USB connection
- Registered Sommer Account with registered module (refer to license documentation)

5.2 Installation of the TQ-Commander

The software TQ-Commander is available on the supplied USB flash drive in the folders ‘Software PC’ for PC/Laptop. A license will be provided for the software upon purchases of the TQ-Amps and probes. Please unsure you use the relevant sign-up details for access.

5.3 Setting up Menu Language

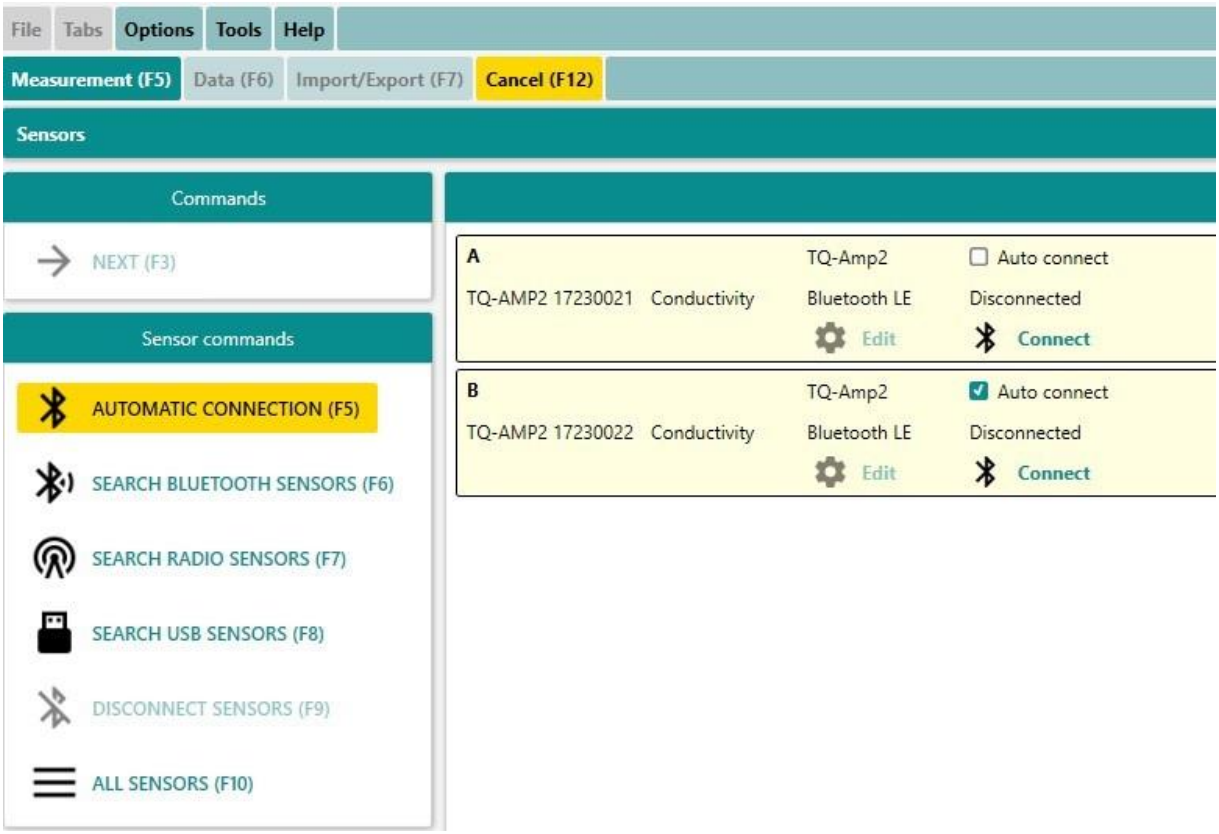
The menu language can be selected by clicking the options tab at the top of the TQ-Commander software. There you can navigate to the common options where language can be selected.

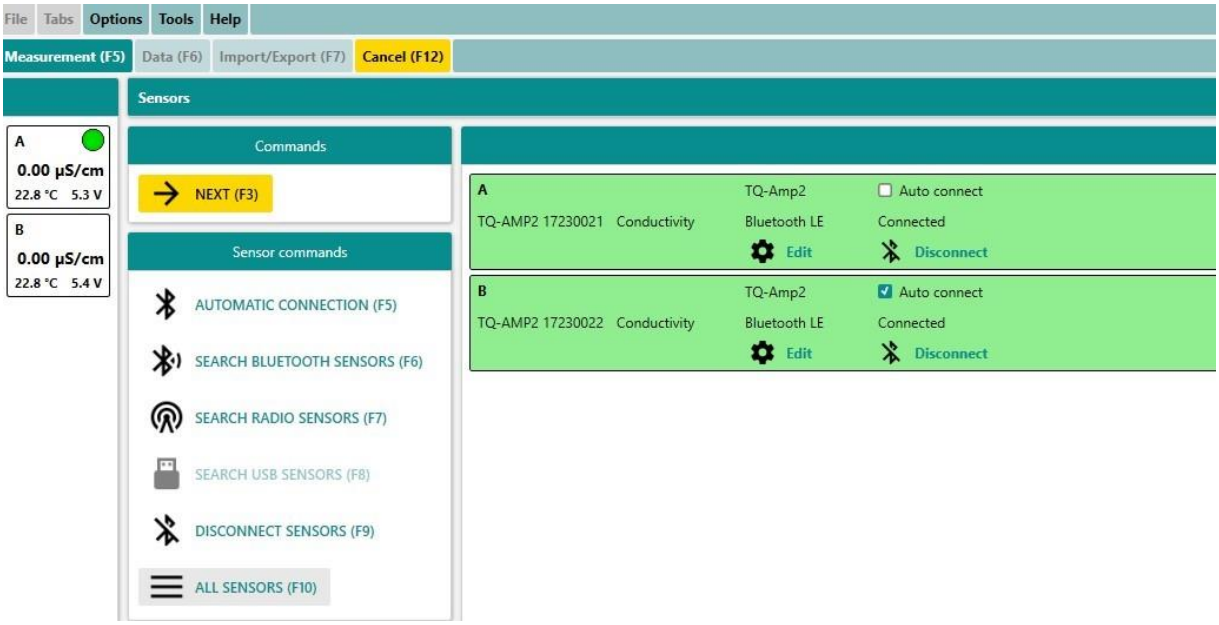
5.4 First-time setup of TQ-Amp via Bluetooth

ATTENTION Before you plug in the supplied USB Bluetooth dongle please check if an internal Bluetooth module is available and enabled instead of USB Bluetooth dongle. Sommer Messtechnik strongly suggests not to use an internal Bluetooth module and the supplied Bluetooth dongle at the same time

to avoid problems caused by incompatibilities (see No internal Bluetooth adapter found).

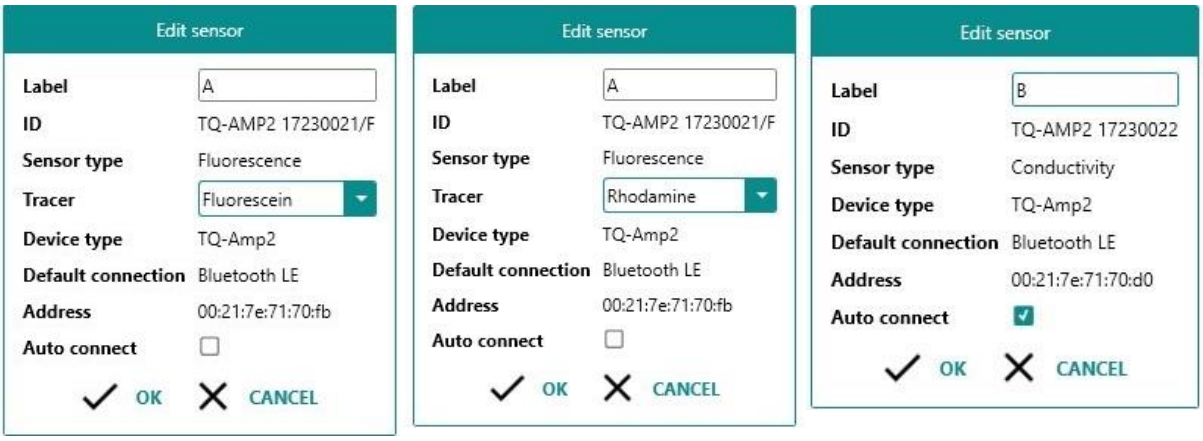
Power on all TQ-Amp and ensure the USB Bluetooth dongle is in PC that will be used for the measurement and proceed by clicking on Measurement (F5). Upon selecting Measurement (F5) the TQ-Commander will automatically search and connect to sensors that have already been used with the software in the past. For Initial connection user can Search Bluetooth Sensors (F6) then connect to the relevant sensor as displayed below.





When connected to the TQ-Amp and sensor the background of the associated device will become green in colour. If the sensor probe is not connected to the TQ-Amp the connection will not be successful.

When connecting to a sensor it is important that if using Fluoresceine or Rhodamine the correct tracer type has been selected. See below diagrams for reference to pop up window that appears upon connection.



If there is issue with connection to TQ-Amp and sensor please ensure that the drivers for the Bluetooth dongle have been installed correctly. It may also be necessary to disable the internal Bluetooth of your PC / Laptop through the device management settings on your device (see No internal Bluetooth adapter found). To disconnect from a TQ-Amp and sensor simply click the disconnect button and the background of the sensor will no longer be highlighted in green in the Sensor command windows.

5.5 Charging and operation of the TQ-Amp

The TQ-Amp is delivered with 4 NiMH rechargeable batteries, each with 2600 mAh capacity. When fully charged the batteries will operate for up to 40 hours, until the battery voltage falls below 3.8 V, at which point it is recommended to recharge or replace the batteries to prevent data loss with new rechargeable batteries.

NOTE
If in the field and need replacement batteries, then they can be replaced with normal AA batteries from local store, however please remember these are not rechargeable like the ones provided.

Figure 3 After connecting the USB cable power supply the batteries are charged

ATTENTION When the charging process is completed, please remove disconnect the USB cable and power supply. Charging can only be done with rechargeable NiMH batteries ensure the TQ-Amp is not charged through USB with normal AA batteries. For safety reasons as with any other battery supplied device unmonitored charging over night or so is to avoid!

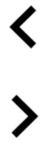
ATTENTION Every battery can potentially catch fire or cause a fire! Therefor please monitor the charging. Do not charge the batteries longer than 6h.

The TQ-Amp charges as soon as the USB cable is connected, it does not matter if it is switched on or not. The battery status is only visible when the TQ-Amp is switched on.

5.6 Screen and buttons

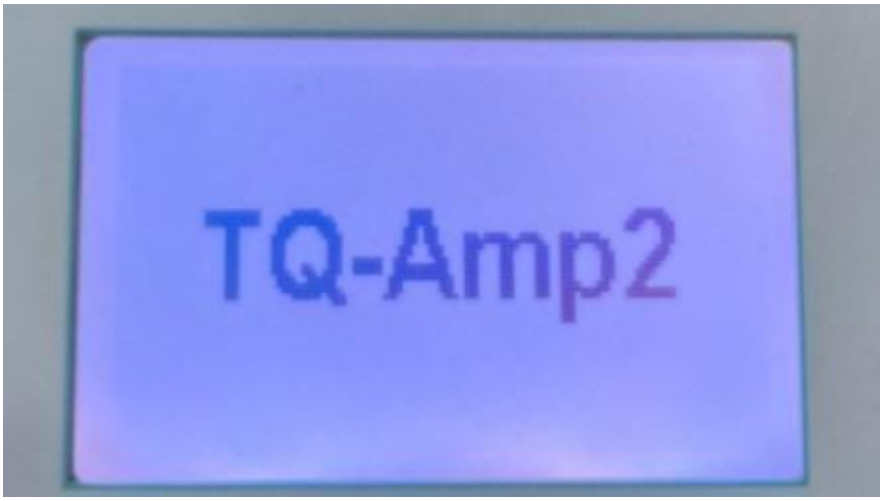
The new versions (V3) of the TQ-Amp now comes with a screen and additional buttons.

See below the relevant buttons and uses.

	Exit the current menu / home
	Move up and down through pages /increase and decrease value
	Move left and right through pages. Press both together for option settings manually on TQ-Amp
	Turn on / off. Select / Cancel

5.6.1 Start-up screen

Press and hold the tick button to turn the power on (✓). To power off to the TQ-Amp press and hold the Cross button (X). The TQ-Amp backlight will light up and display the below



Once the TQ-Amp is turned on, the below screen should appear. If the below screen does not appear then it is likely that you have not connected a sensor to the TQ-Amp and therefor you will be prompted to do this first.

The down button can also be pressed / selected and a graphical representation of what the connected probe is reading will appear. This is displayed in the above photo.

5.6.2 How to start/stop a measurement via keypad

Starting a measurement using the keyboard:

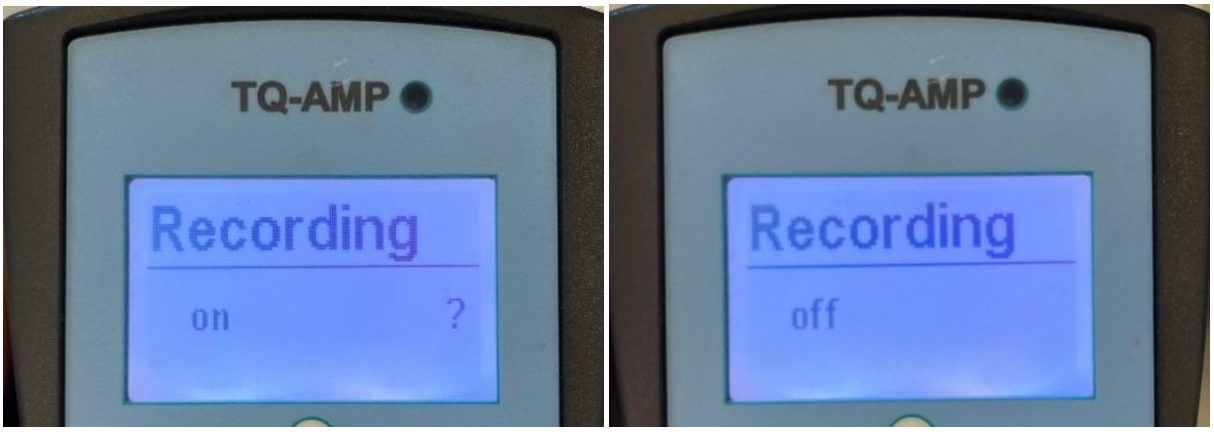
1. Press the left (<) and right (>) arrows together.
2. Press Select (✓) to confirm.
3. If the screen shows OFF, press the right arrow (>) to switch to ON.

4. Press Select (✓) again to confirm.
5. Return to the main screen and check that the floppy disk icon appears at the top. This means measurement is active and data is being saved.

Stopping a measurement using the keyboard:

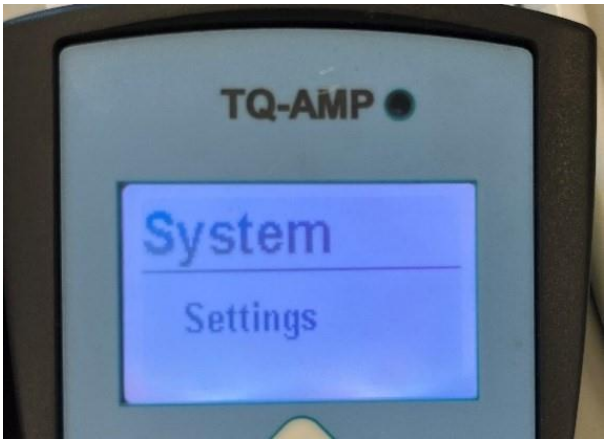
1. Press the left (<) and right (>) arrows together.
2. Press Select (✓) to confirm.
3. If the screen shows ON, press the left arrow (<) to switch to OFF.
4. Press Select (✓) again to confirm.
5. Return to the main screen and check that the floppy disk icon has disappeared. This means measurement has stopped and no data is being recorded.

NOTE A question mark (?) next to ON/OFF means you are in change mode.
If there is no question mark, you are only viewing the status.
Press Select (✓) to enter change mode. To exit change mode without changes, press the (x) button.



5.6.3 How to access menu via keypad

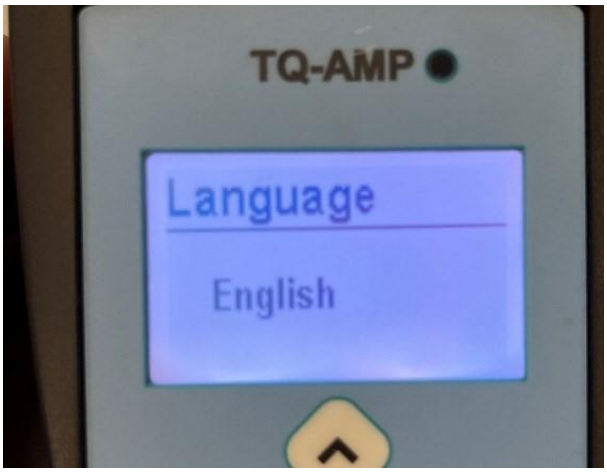
When the Measurement recording window appears on screen you can navigate using the up and down arrows to reach the device menu. The below window should be available and by pressing (✓) we can enter the menu for the device settings.



Once in the settings menu, the below options window will be available. For each of the below options within the settings menu we can select the options by clicking the (✓) button and make alterations to the relevant setting. The below settings are available for altering.

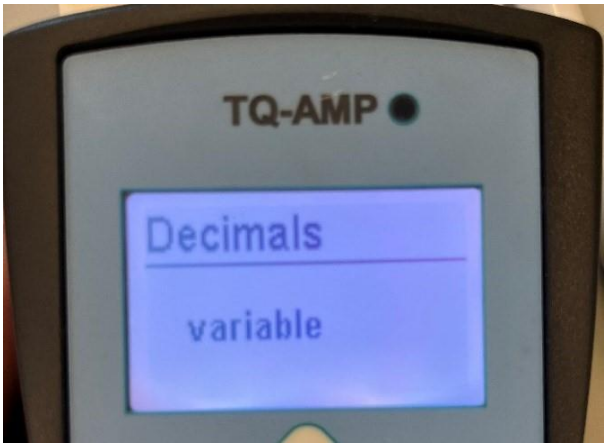
5.6.4 Language choice

Select the language of the device



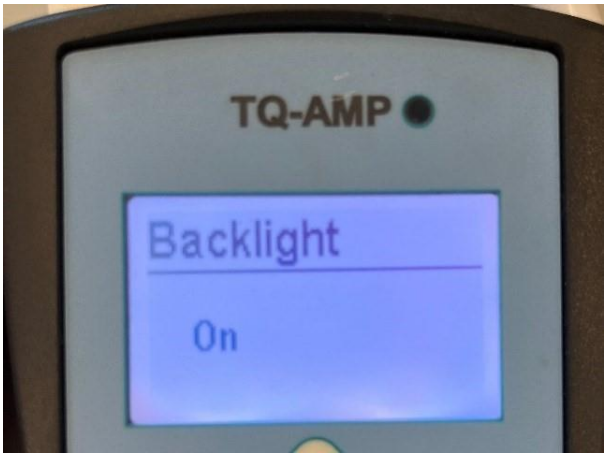
5.6.5 Decimals and unit selection

Up to four decimal places can be selected and the option for none is also available when working with large discharge levels. The decimals can only be changed with conductivity probe. When using the TQ-Amp with Fluorescence sensor then the decimal values are fixed and cannot be changed.



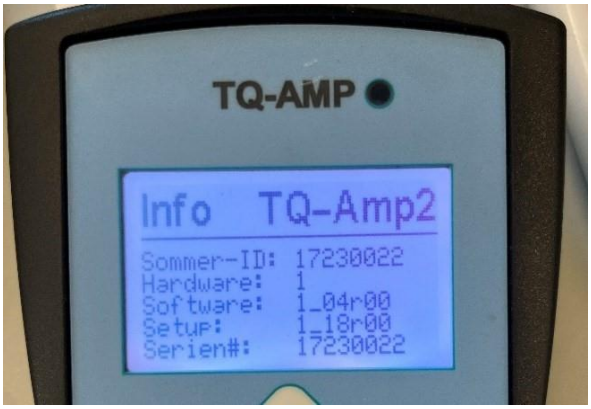
5.6.6 Backlight

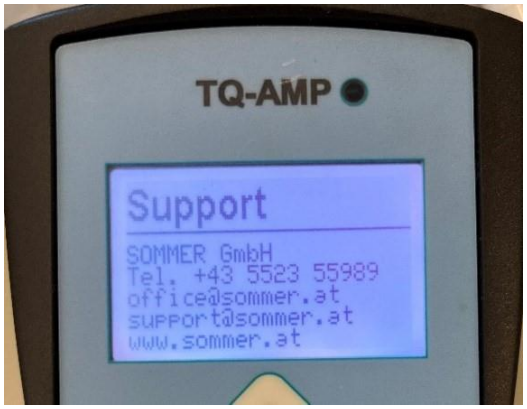
the options of on, light sensor and keystroke. To change between options press (✓) button and then use the up and down arrows to navigate and select preferred option.



5.6.7 Device information

Finally, we have info surround the device information and a window for support and how to get in touch should you have any issues arise. These can not be edited through the TQ-Amp only with the TQ-Commander software.

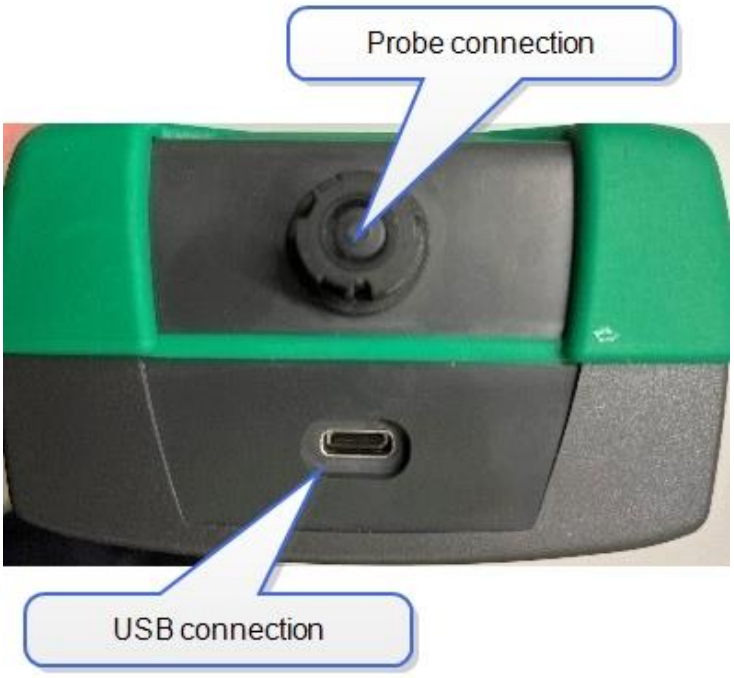




New physical changes to the TQ-Amp also include probe connection port and also USB-C connection to the device which can be seen on the below photo. Ensure when transferring data through USB-C you use the 2m long cable provided with your TQ-Amp.

NOTE when charging the TQ-Amp through the USB-C ensure that the USB-C is removed once the device is fully charged

NOTE there are two cables included in the bundles a charging cable (1m long) and a data/charging cable (2m long) for data communication between the TQ-Amp and the TQ-Commander you can only use the data/charging cable (2m long) one!

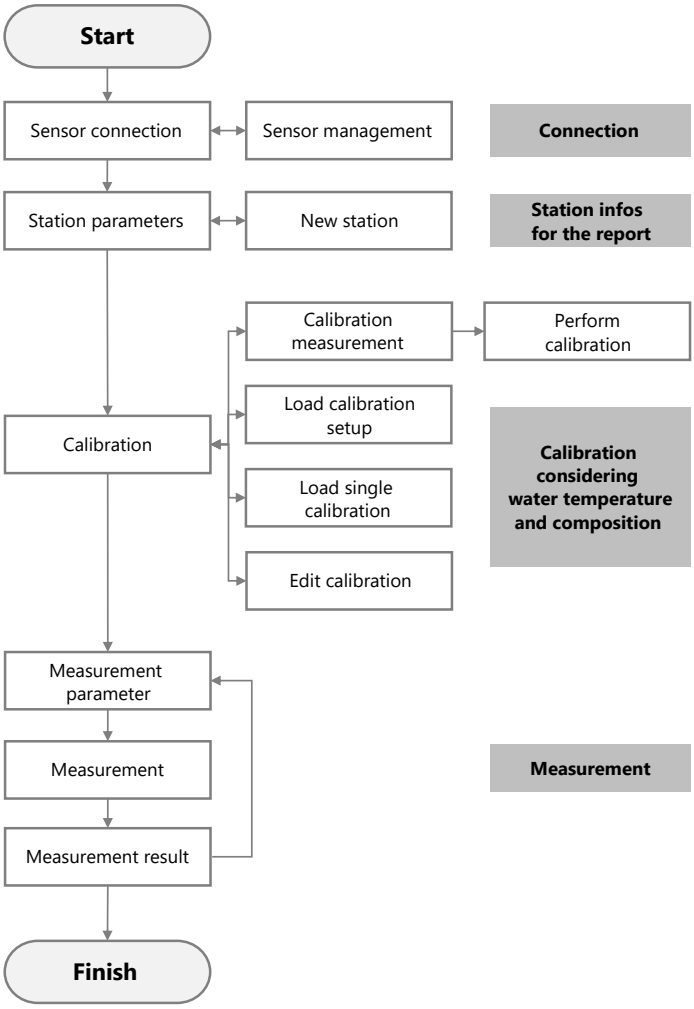


6 Measurements with TQ-Commander

6.1 Introduction

The measurement procedure contains the following steps:

1. Switch on the TQ-Amp
2. Establish the Bluetooth connection
3. Input information about the measuring site or station
4. Perform a calibration for the compensation of the local water characteristics (temperature and chemical composition)
5. Perform the measurement of the conductivity while the tracer passes the sensors and the discharge is automatically calculated



The software TQ-Commander guides the user through all necessary steps of a complete measurement after clicking on Measurement (F5) in the menu:

- Connecting the TQ-Amp (Connection of the TQ-Amp and sensors) and if necessary, performing the first-time sensor setup (First-time setup of TQ-Amp via Bluetooth)
- Placing the probes in the water body to be measured to get them to the same temperature
- Input of information for the report and site information (Input of the measurement site information)
- Calibrating the sensors (Calibration of the sensors)
- Estimation of the tracer amount needed and injection of the tracer solution into the river

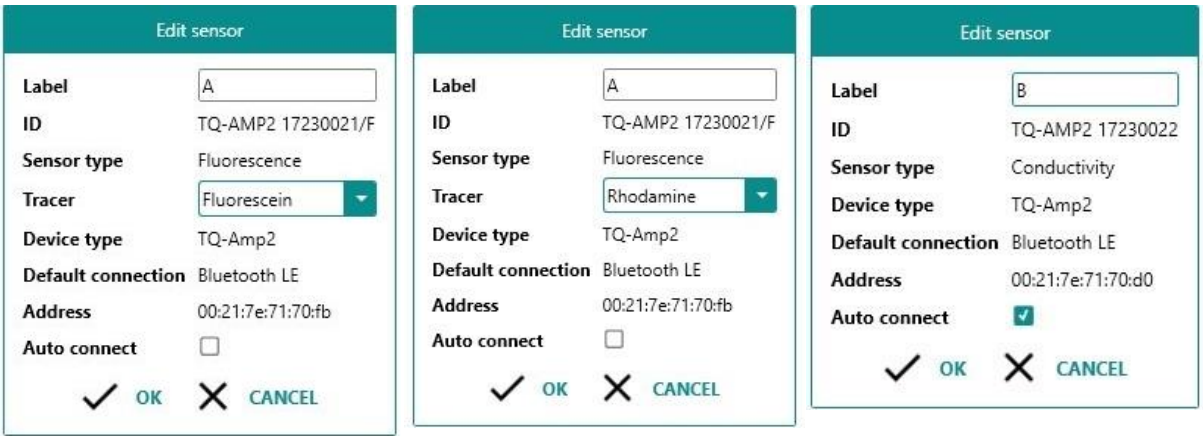
> **ATTENTION** It is important that the complete tracer amount is injected. In most cases the tracer solution is prepared in a bucket for an easy and complete injection.

- Placing the sensors in the water body and injecting the tracer solution (Measurement and discharge calculation)
- Performing the measurement and report issuing (Post Processing)

6.2 Connection of the TQ-Amp and sensors

- Switch on the TQ-Amp
- Start TQ-Commander
- Ensure that the Bluetooth dongle is installed on laptop. Sometimes internal Bluetooth on Laptop / PC will manually need to be turned off in device manager settings.
- Ensure there is clean line of sight between the Bluetooth dongle and the TQ-Amp being used in measurement.
- Click Measurement (F5)
- Check the connection status Automatic connection (F5) if the sensors have been previously connected the TQ-Commander will look to auto connect as default setting. If devices not found through auto connect, then press Search for sensors (F6). Once connected the background of the connected probe will turn Green as highlighted in below picture. Please be aware if the senor is not connected to the TQ-Amp the TQ-Commander software will not connect. Ensure sensor is connected if you have trouble with connection.

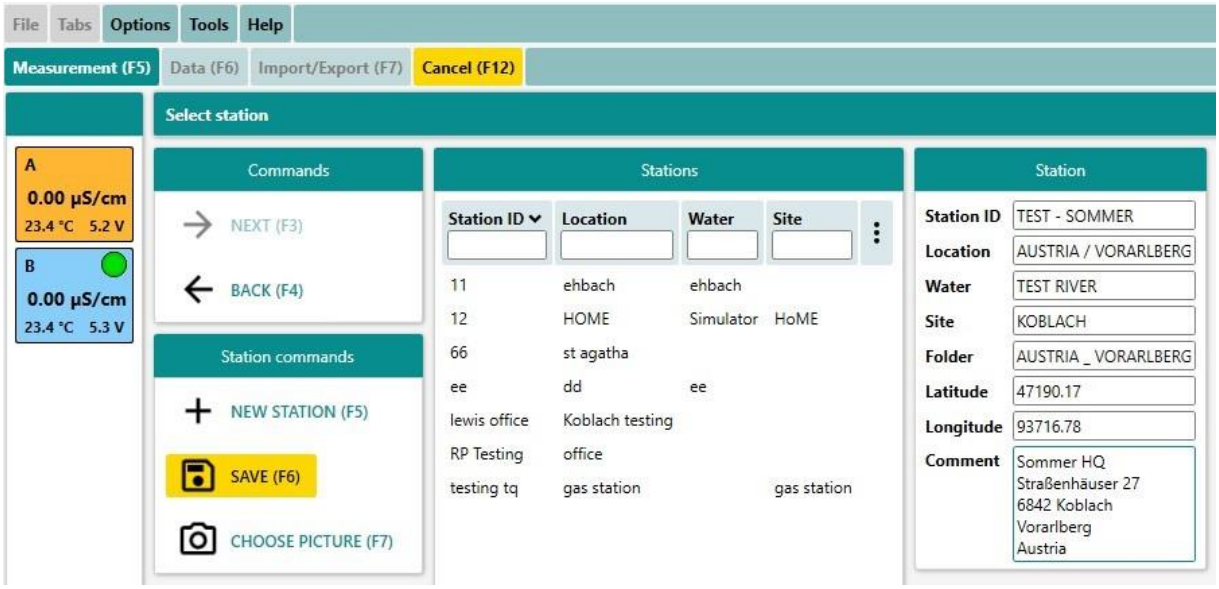
During the initial connection to a TQ-Amp and sensor the following will need to be completed and the commander software saves these details for future connections to the TQ-Amp and sensor.



6.3 Input of the measurement site information

Once connected to the relevant TQ-Amp and sensor click Next (F3) and you will be taken to the next step of setting up or selecting an existing station.

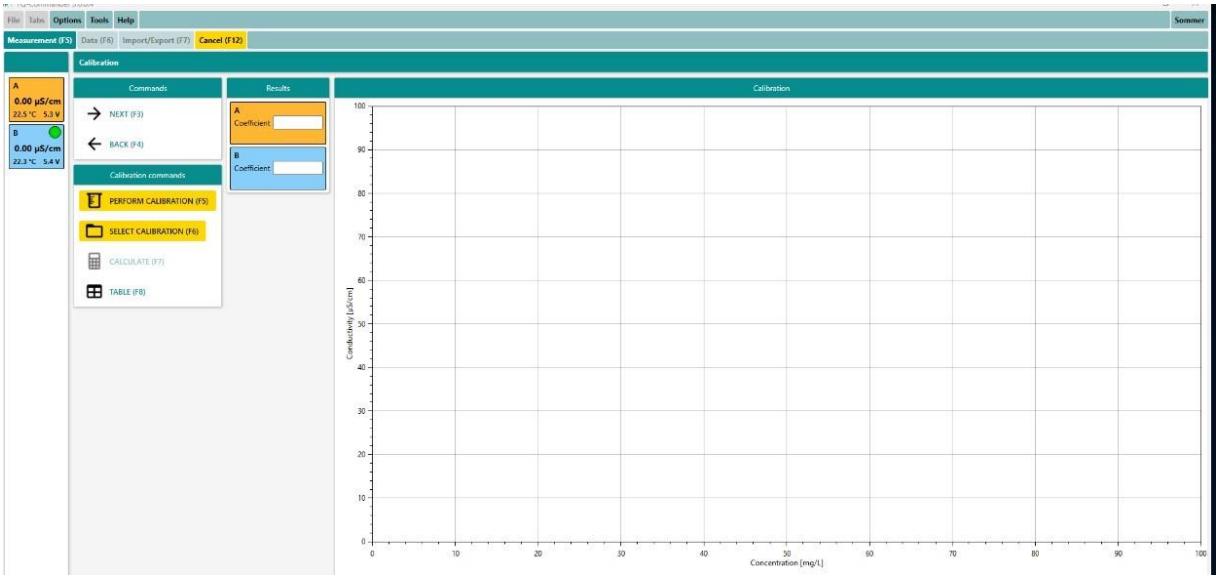
The measurement site information is saved automatically for every measurement and calibration. This information is saved to the measurement automatically each time a measurement is performed and the relevant station is selected. Once the Station information is completed then we can click Save (F6) to add to our list of stations on the TQ-Commander



Once a station has been created and selected we can then click Next (F3) and we will be taken to the calibration window.

6.4 Calibration of the sensors

After we have selected a station or created a station, we can now begin the calibration process. The below window should appear.



Here we can Perform calibration (F5) or Select calibration (F6) that has been previously carried out. When performing calibration the following window should appear. We must ensure that the first value in the calibration has a stable conductivity value and that we input the correct data in the calibration parameters. It is important that the values in this tab are completed correctly as the values

are used within the calibration. If we have a poor calibration, we also will get poor results from the sensor probes during measurement.

After the values have filled in correctly, we can the click Next (F3) to begin the calibration. Once we have collected our initial volume for calibration, we can begin to execute the calibration with the supplied accessories and the TQ-Amp and sensors. The above values are default with the accessories provided and the below table outlines the recommended values for a good calibration based on tracer type.

Recommended calibration parameters:

	Salt (standard)	Salt (low base conductivity: < 100 µS)	Fluorescein (standard)
Initial volume	500 ml		
Addition volume	0.50 ml		
Addition concentration	10 g/l	Please see pro tips	2 mg/l

TIP

- Write the date and amount of concentration on the bottle and readable. If you change the salt batch, redo the calibrations.
- Use the same salt for your calibration as you use when taking your measurement
- Fluorescein dissolved in water only last 6 months 'shelf life' in dark bottle in refrigerator
- Rhodamine only last 1 year 'shelf life' in a dark bottle
- If the base conductivity is below 100 µS/cm you might need to change the calibration concentration to 5 g/L of salt.

Knowing the calibration is effective is important in retrieving good data and results.

Extract the water from the river and gauge exactly 500 ml with the supplied volumetric flask and then pour this into the measurement beaker. Once the 500 ml has be poured into the beaker we can then add our probes to the beaker (a maximum of 4 probes can be calibrated at one time).

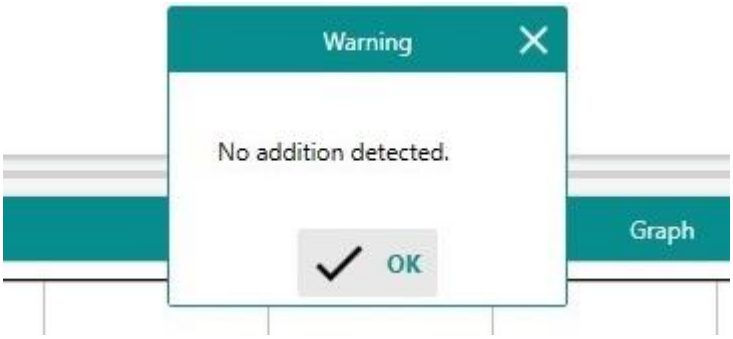
ATTENTION For accurate measurement of water discharge, it is important that the temperature of the sensors is approximately equal to the temperature of the water in the measurement beaker.
Therefore, before starting the calibration, leave the sensors for 3-5 minutes in the environment of the flow you will measure.

It is important that we Confirm (F5) the first calibration point without adding any calibration liquid.

NOTE When the sensors are lowered into the beaker, it is important that no air bubbles form, which can affect the calibration results.

Once we add each addition of calibration liquid we need to mix (at least 20sec) after that the values of the probe should be stable, then we have to Confirm (F5) at each addtion. If no addition is detected the following pop up window will appear.

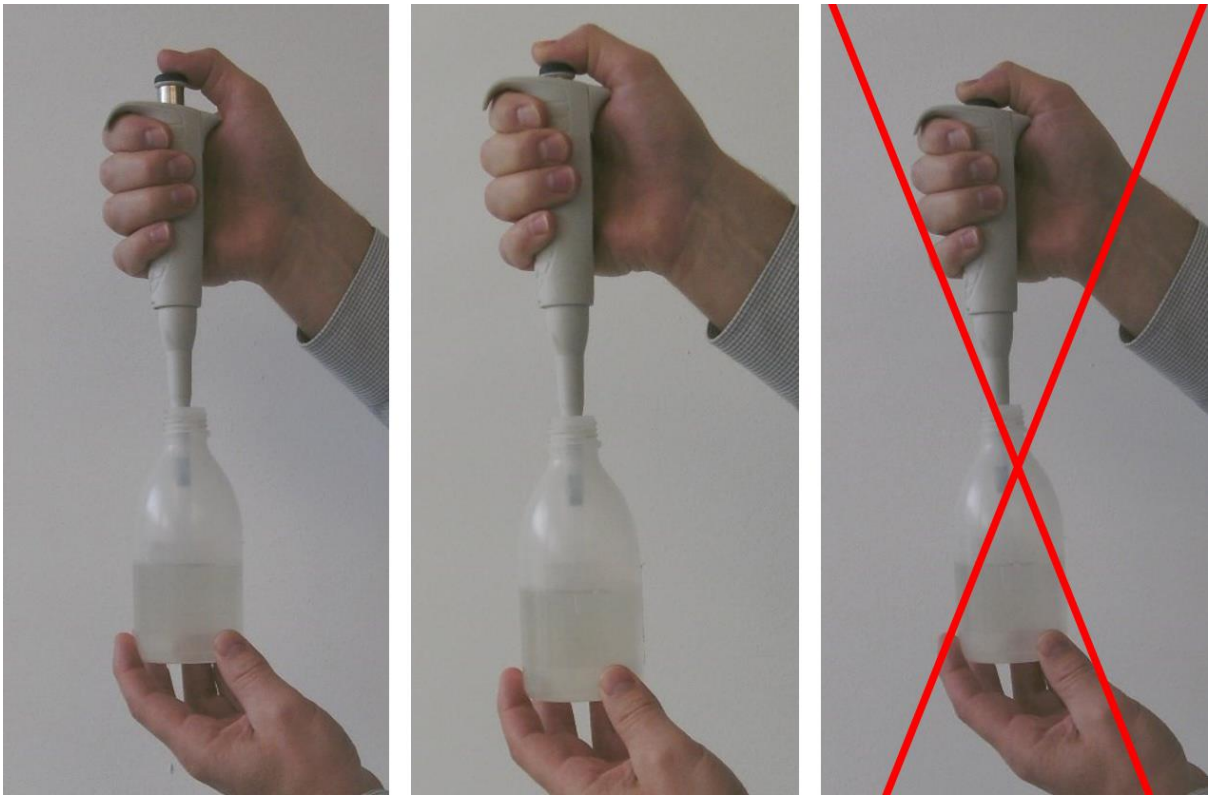
Ensure that after adding the calibration liquid at each step you are mixing the water within the beaker well. To create new batch of calibration solution please see the Appendix.



ATTENTION In Options the parameter "Minimal addition" is set to 10 µS/cm and 10 mV. When addition causes an increase lower than this value the message "No addition detected" is displayed and the addition is not accepted. In this case you need to adjust this parameter. Otherwise TQ-Commander is not able to continue with the calibration.

Please see below steps when using the supplied pipette and carrying out your calibration before measurement with the TQ-Amp and sensors.

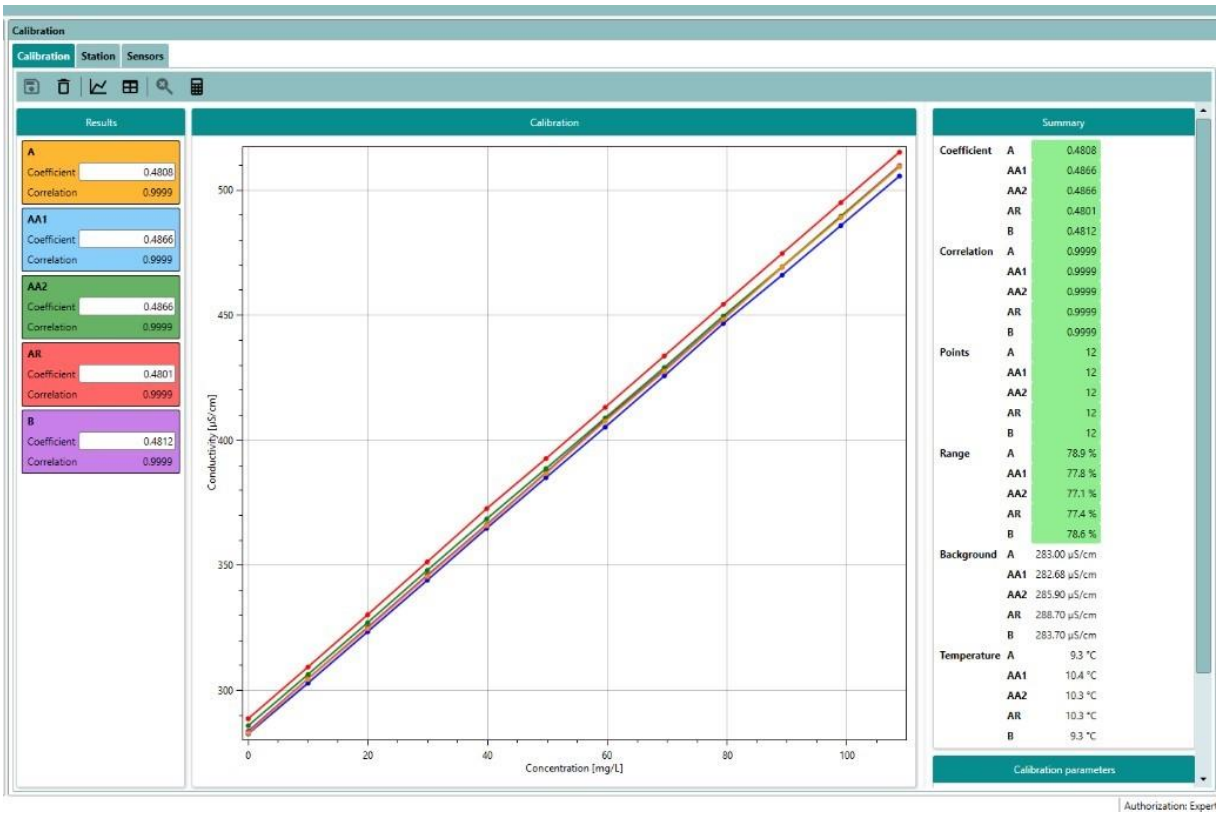
ATTENTION When taking up 0.5 ml of calibration solution with the pipette make certain to use the **first pressure point**!



Operating button not pressed: No taking up of liquid when released	Press the operating button to the first stop and dip the tip into the solution to a depth of 1 cm, and slowly release the operating button	Operating button pressed to the second stop: When released an undefined amount of solution is picked up

Dispense the liquid into the receiving vessel by gently pressing the operating button to the first stop and then press the operating button to the second stop. **All needs to go directly into the water, not on the sensors!**

Once the calibration is completed each point will be plotted in the table and graph within the TQ-Commander. For a good calibration all calibration points are connected by a straight line with a correlation of **0.9998 or higher**. See below example of a good calibration line.



NOTE

With an expected minimum increase in conductivity of 200 µS/cm during the discharge measurement the calibration should at least cover the expected range of measured values.

Example:

Base value = 300 µS/cm

Minimum increase = 200 µS/cm

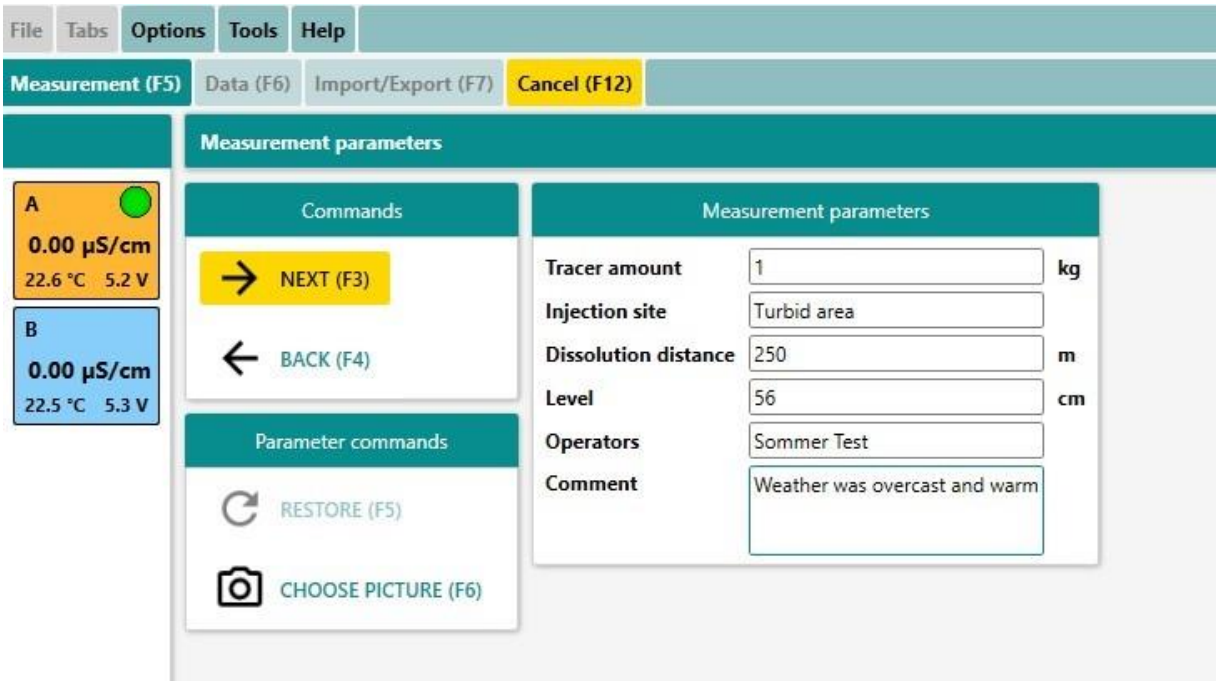
- The calibration should cover at least the range from 300 µS/cm to 500 µS/cm.
- e.g. target increase in conductivity would be 450 µS/cm this equals 50% of the base conductivity
- Aim for 100% increase above base level and I low base conductivity places (base below 100 µS/cm at least 100 µS/cm increase

Once we have completed the calibration and happy with results, we can move to the next step of carrying out the measurement. Click Save (F3) once completed and the calibration will be saved and can be used again in the future if need be. After this is completed the Measurement within the river can begin.

6.5 Measurement and discharge calculation

Every discharge measurement with the TQ-S system requires preparatory operations like placing the probes in the water and preparing the tracer solution. These operations are explained in this section of the manual.

Click on Next (F3) after saving the calibration and the following pop-up window will appear. It is important that the values are input correctly and the tracer amount is critical / mandatory for formulating results. The rest of the measurement values that are input in the below window are for documentation purposes. At this stage we can also attach a picture of site at time of measurement. Click Choose picture (F6) to attach an image of your choice.

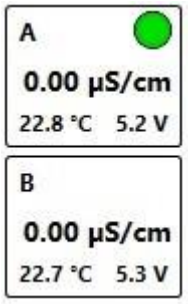


Once the Measurement parameters are completed we can clickNext (F3) where we will carry out the measurement process. It is important to ensure the measurement parameters are entered correctly, the tracer amount is used to formulate results. Until a value is added you can not move forward to the next step of carrying out the measurement.

If the measurement is performed by one single operator only, recording the measured data should be started at this point. After wards the prepared tracer solution is injected. If two or more operators are present, both tasks can be performed at the same time. The time it takes the tracer substance to reach the probes can be used to estimate the flow velocity. Please refer to (Measurement principle) in regards to mixing your tracer. It is of key importance that the tracer is well mixed.

TIP **Remember:** There must be a good connection between laptop and TQ-Amp when carrying out measurement. When we click Start (F3) the TQ-Amp will start their measurement and then Stop (F3) to stop measurement a pop-up window will ten prompt you to finish measurement and save it.

If there are any issues with the measurement we can also click Repeat (F4) and we can immediately carry out another measurement with the same calibration and measurement parameters that were used previously.



During the measurement the course of the measured values is displayed and refreshed continuously. The (blinking) green dot in the sensor window indicates a good connection. Especially at the beginning and end of a measurement the connection with the sensor must be good.

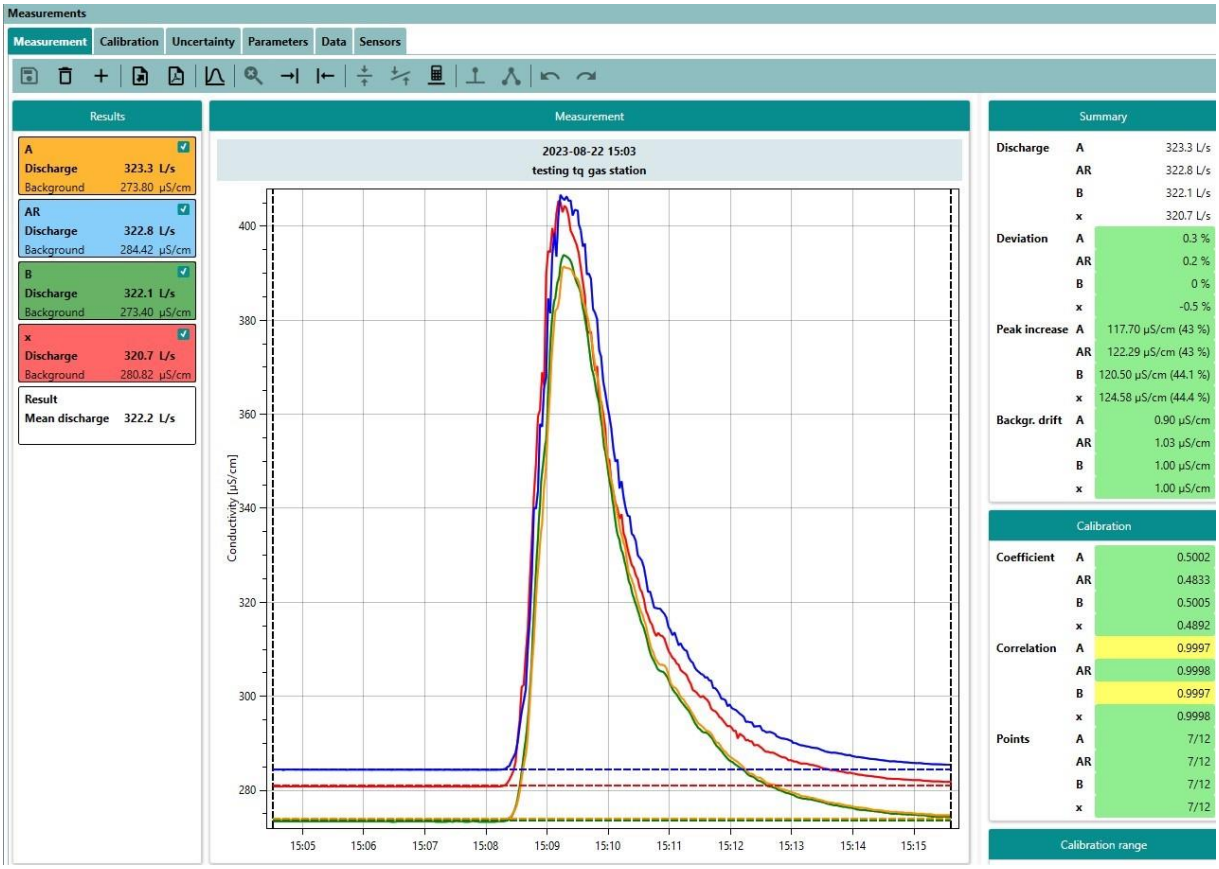
If instead of a green dot a red dot is blinking, there is a problem with the connection. For further information please refer to (Optimizing the Bluetooth range).

If the connection is temporarily interrupted and then re-established during a measurement, the missing measurement values are read and transmitted from a buffer in the sensor. If this happens the green dot will be displayed for a few seconds until all buffered values are received.

In addition, the percentage of successfully transmitted measurement values is displayed. This value should be 100% by the end of the measurement (see Post Processing). If this is not the case, please check if all the relevant points were transmitted successfully. Especially points on the rising slope and at or near the maximum are important for a good measurement quality. If not all of the data is transferred this can be done afterwards by downloading the data via USB (Upload calibration).

ATTENTION

Click Stop (F3) to finish the measurement. As soon as the complete tracer has passed the probes and the measured values have dropped to the base value the measurement can be stopped. The resulting curves and discharges will be displayed in a new window. Ensure the graph lines come back down to base conductivity level before stopping the measurement. If the background conductivity changes try to get as close as possible. When we get back to base level conductivity it is good practice to let the measurement run for another 5 minutes to ensure all tracer material has passed.



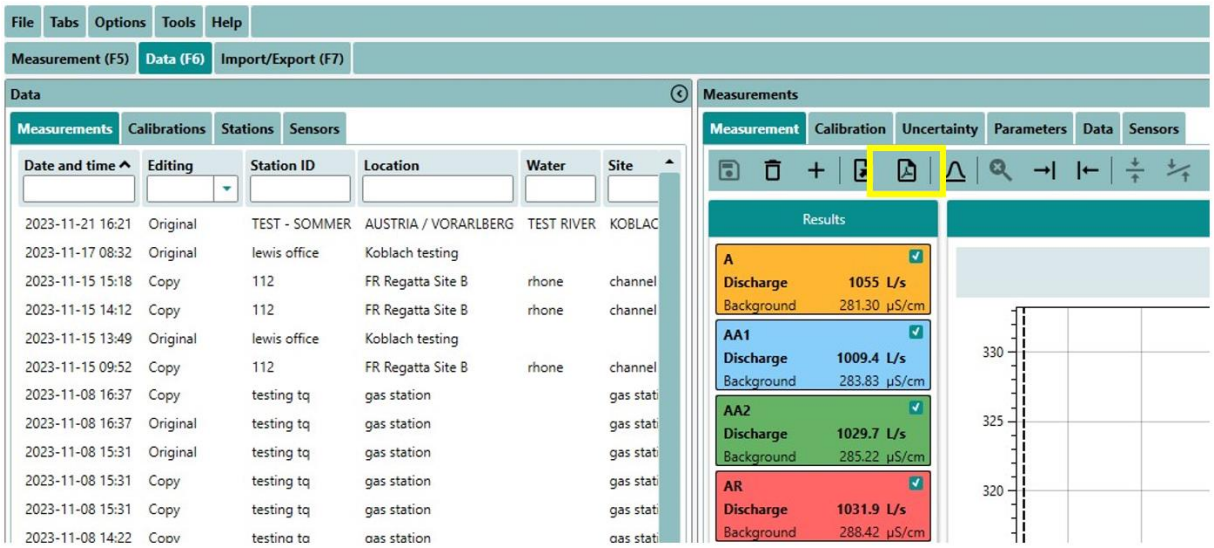
NOTE By clicking Stop (F3) the measurement is completed (then when click finish it is saved). By clicking Repeat (F4) all data will be saved and you are going back to the **Measurement parameters** menu. There you can input all parameters again (optional) and repeat the measurement.

TIP Always finish the measurement and save it, if you want to repeat a measurement do another measurement and reuse the calibration information from previous measurement.

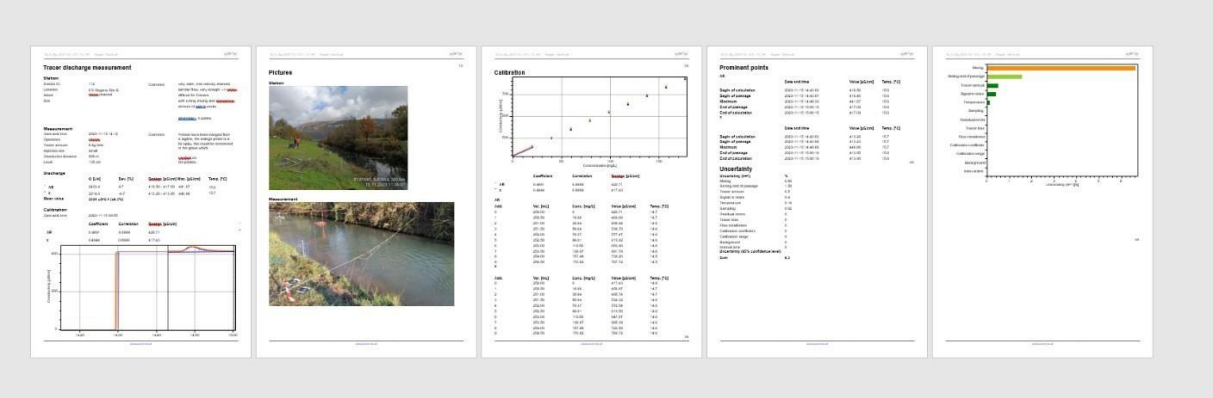
By clicking Finish (F3) the measurement will be saved automatically. You can view the results by clicking on Data (F6) and selecting the relevant measurement.

Once the Measurement has been saved it will be available to see through the Data (F6) tab in the TQ-Commander. When selecting this tab, we can see all our past measurements, calibrations, stations, and sensors that have been used in conjunction with the TQ-Commander software. The relevant measurement

can be selected in the left-hand side window and then from there we can look in detail at the measurement and alter the values as described in **Post Processing**.



If we select the pdf page highlighted in the above photo, we can create a report which can be downloaded, saved and printed. The report outlines all the measurements taken and the accuracy. Also any pictures that were taken and uploaded to the commander during the measurement. The report output looks like the following example. Adjustments to the format of the PDF export can be made using the "**Options**" → "**Output**"



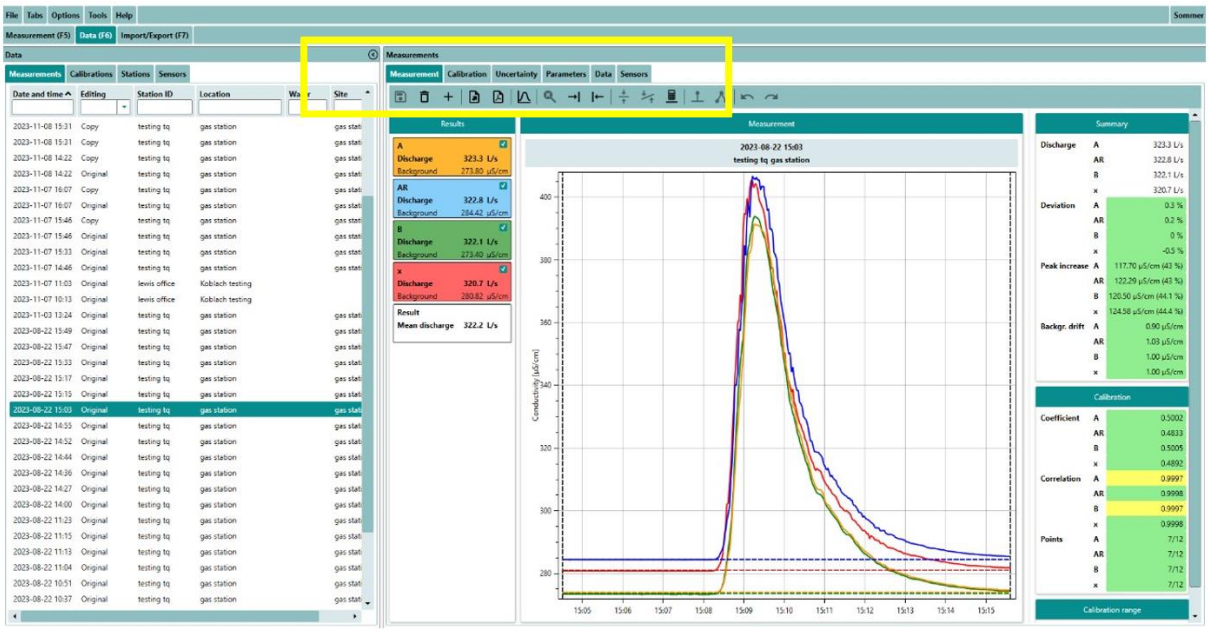
It is also possible to Import/Export (F7) data in the TQ-Commanderand the process is outlined in (Import / Export of data). Once the data is imported, we can then use the TQ-Commandersoftware to compile a report.

7 Post Processing

In some cases, it makes sense to post process the measured data for correction e.g. false measurements and fluctuating base values.

Choose a data set by selecting Data (F6) → **Measurements**.

Then choose the tab Measurement on the right side, which will make a set of tools available. These tools are highlighted and these tools can be used to process the measurement data once it has been completed.



7.1 Reloading data from TQ-Amp

7.1.1 Data updating

TQ-Amp (V3) has the ability to upload data from the TQ-Amp to the TQ-Commander software. If the TQ-Commander software loses connection with the TQ-Amp for a period or duration of the tracer measurement, the measurement is still recorded on to the TQ-Amp. After the tracer has passed by and we can see that we only have a percentage of the measurement data within the TQ-Commandersoftware.

We can connect manually to the TQ-Amp through USB connection between PC and TQ-Amp. We can then download the data from the TQ-Amp so that we have 100% of our data in the commander software. Once this has been completed, we can then move on to post processing.

First you must connect to the probe with USB and then we can upload the missing data.

For correct connection it is important:

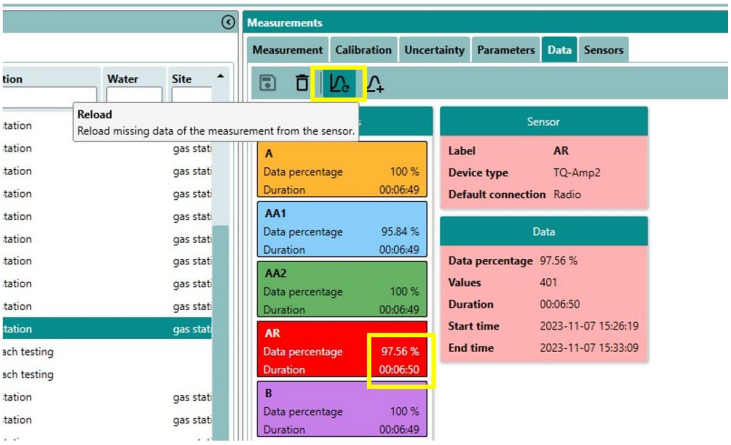
• use USB **Data** cable (2m, provided in your TQ bundle)

• TQ-Amp with corresponding probe

• and TQ-Commander V3 (v3.0.0.10 or higher)

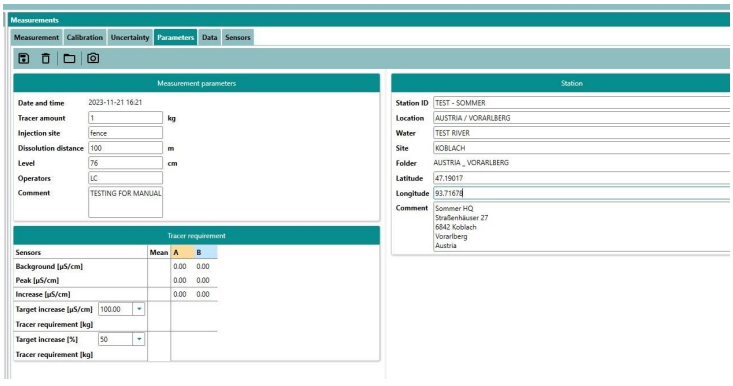
The probe needs to be connected to theTQ-Ampthat means if you want to update a Salt measurement theTQ-Ampneeds a salt probe connected. If you want to update a Rhodamine/Fluorescin measurement the corresponding probe needs to be connected.

If no probe is connected the TQ-Commander will show "No device found" message.



As you can see above, the (AR) probe is only at 97.56%. By clicking the reload function when connected to the amp through USB this will now updated to 100% like the rest of the probes.

Version 3 of the TQ-Commander allows us to see much more in the Data (F6) menu. The parameters tab below shows us the exact parameters for the selected measurement that is being processed.

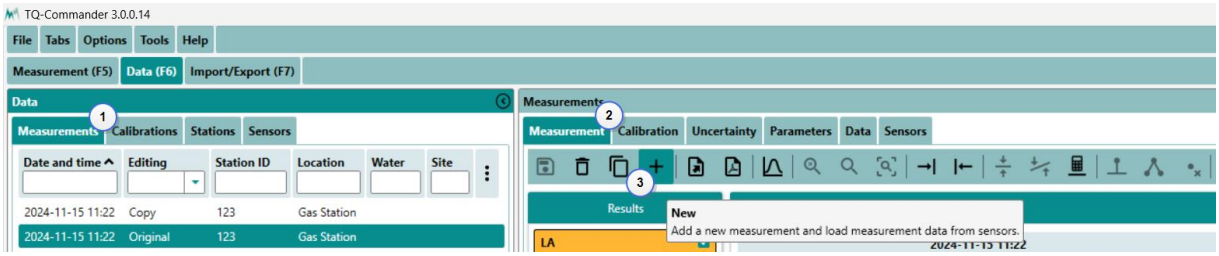


7.1.2 Create new profile

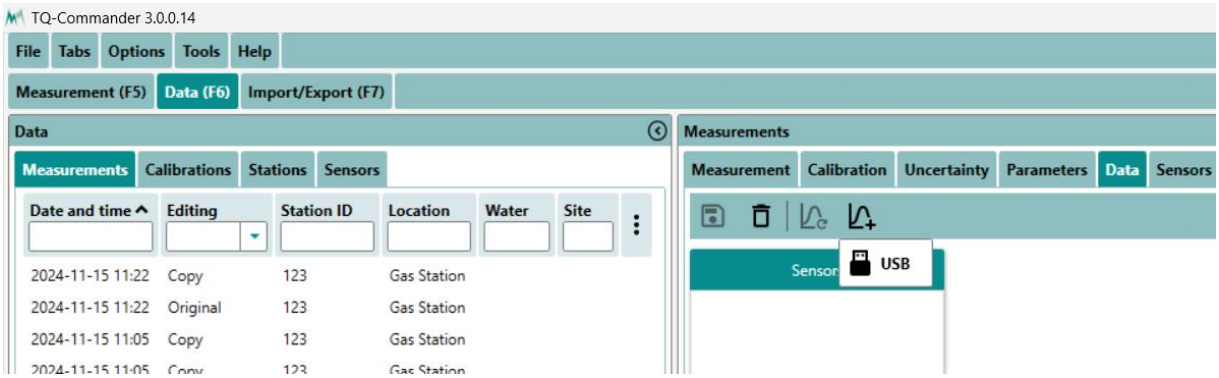
Sometimes, to verify or test different situations, there is a need to create a new profile from different measurements. This is very easy to do in TQ-Commander using the Load Data function.

Turn on TQ-Amp, connect it manually through USB connection (see New Features of TQ-Amp & TQ-Commander) with laptop/PC and start TQ-Commander.

Go to Measurement window and select New button:



After that, you will automatically be taken to the Data tab, where you need to click the Add button and select the necessary measurements from the connected TQ-Amp.



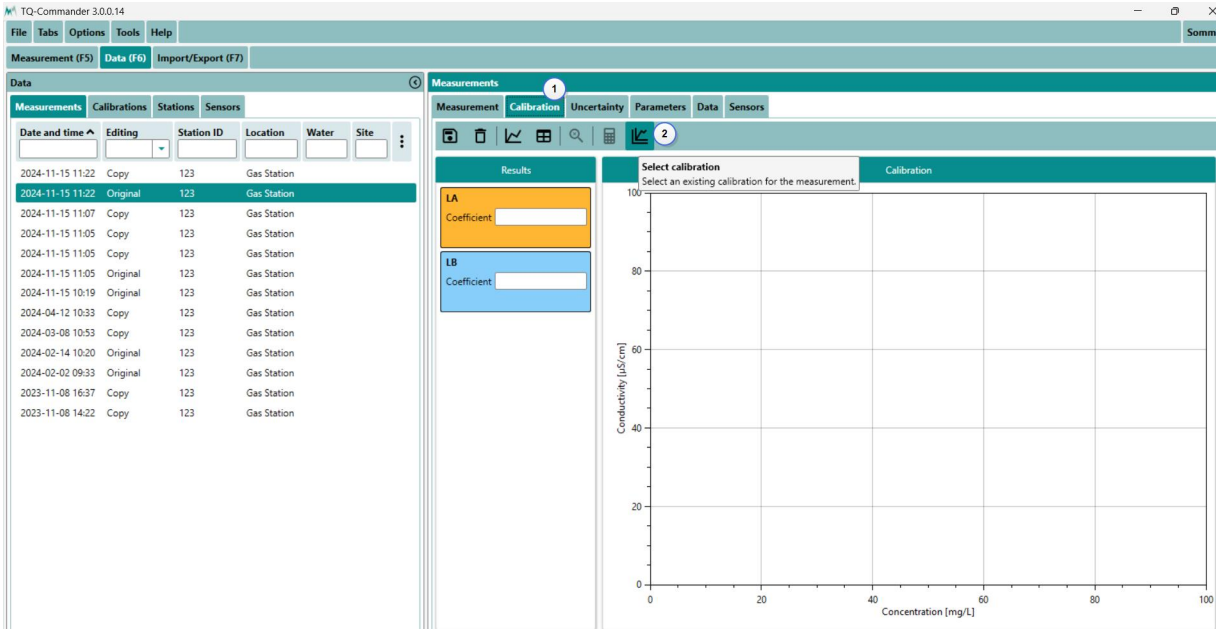
After adding measurements, the profile must be saved.

> **TIP** When a measurements are loaded, all profile parameters will be taken from the **first measurement** and can be changed if necessary after saving profile.

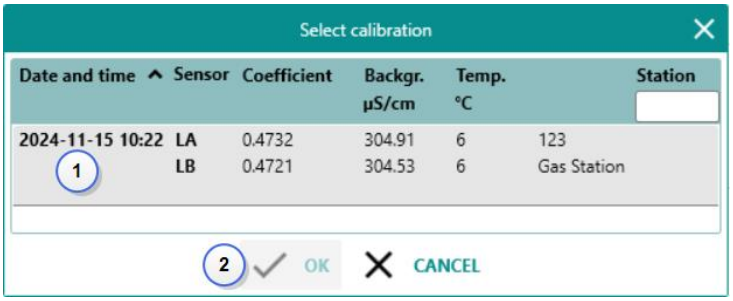
7.2 Upload calibration

Sommer Messtechnik strongly recommends performing a calibration of the probes prior to every measurement. But for testing measurements or exceptional situations, the calibration table can be loaded into an already existing measurement profile.

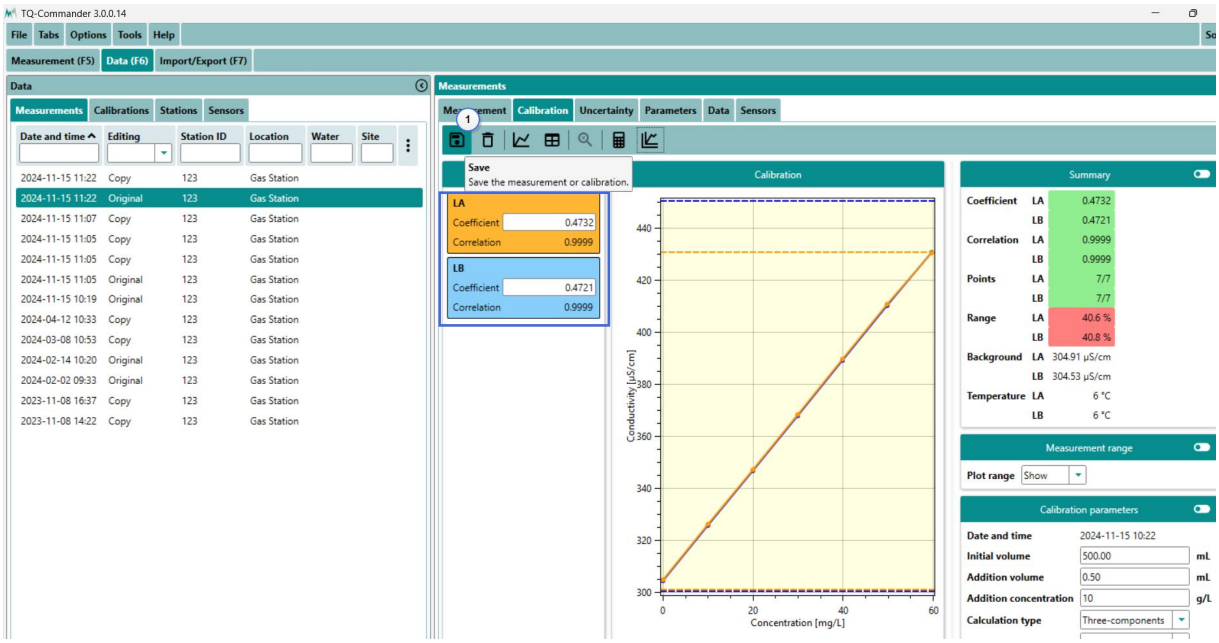
To do this, after selecting the desired profile, you need to go to the Calibration tab and select Select cabirtion.



After choosing the needed entry, click OK.



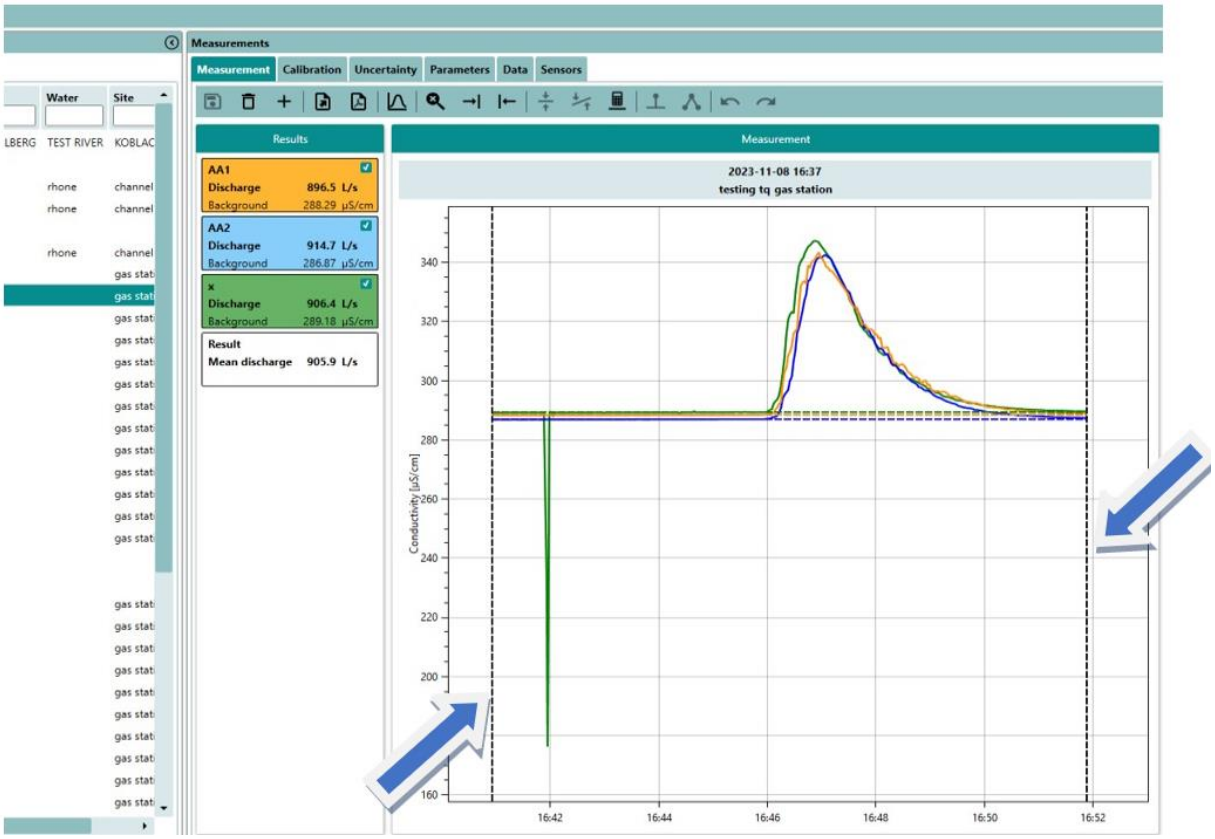
Now when the calibration table has appeared in the TQ-Commander window, click Save button.



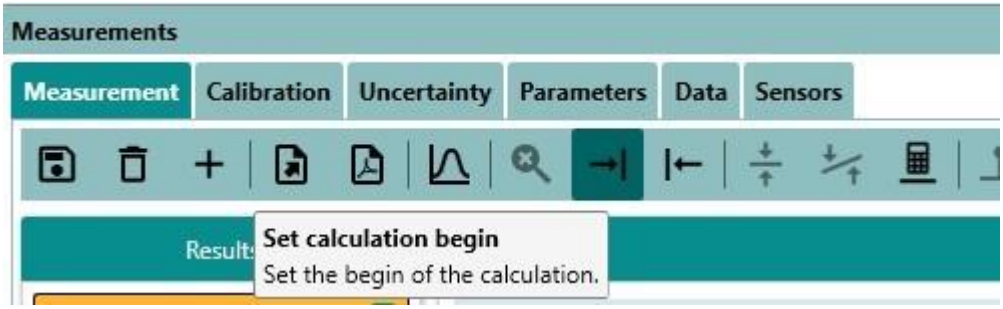
7.3 Calculation

7.3.1 Example 1: Altering the calculation begin

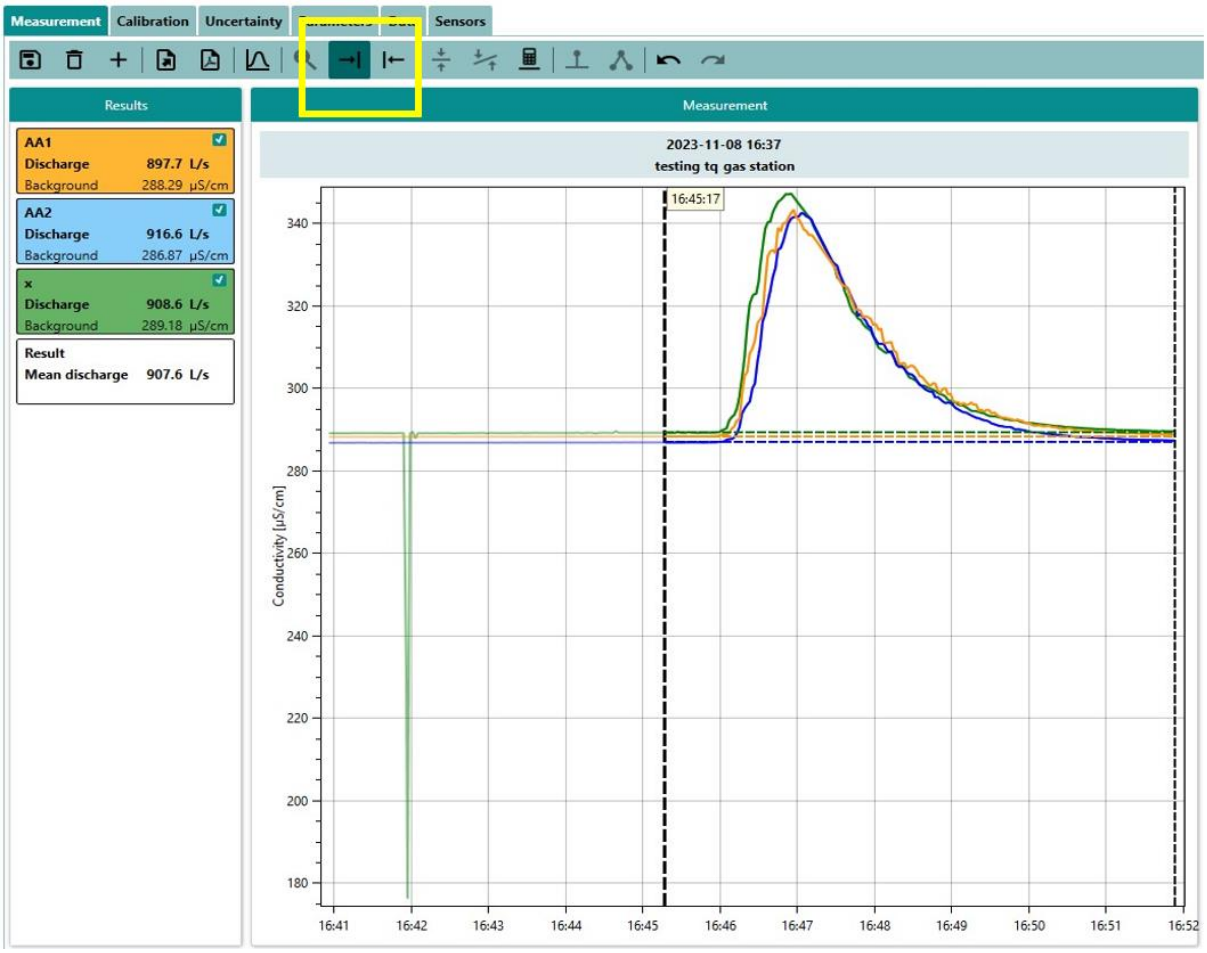
In the following example the measurement was started too early (the position of the sensor had been changed, which caused the downward peak). This means that the downward peak will be included in the discharge calculation and so we need to alter the data manually so it will not be included.



To exclude the peak from the discharge calculation, click on the **Set calculation begin** symbol:

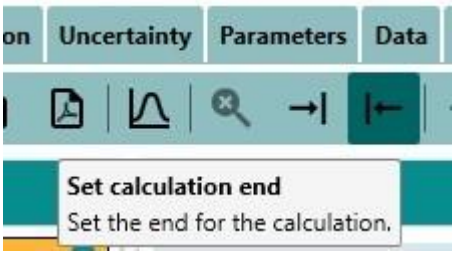


The dotted line you can see in the below example can now be moved to exclude the initial downward peak. Now the downward peak (green line) will be excluded from the discharge calculation.



7.3.2 Example 2: Altering the calculation end

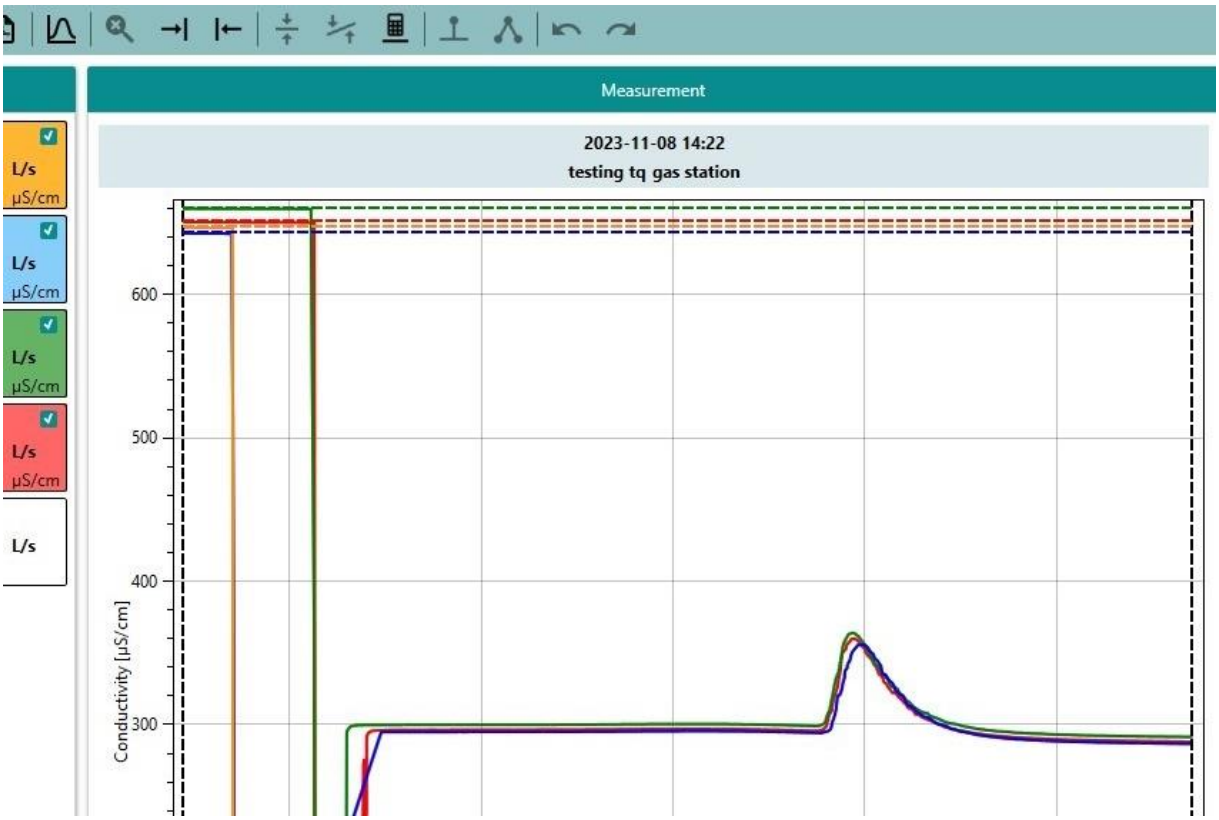
Using the below highlighted we can change the end time of the discharge calculation. To ensure a good overall measurement from the TQ-Amp it is important to ensure any larger upward or downward peaks outside the period of tracer passing by are removed.



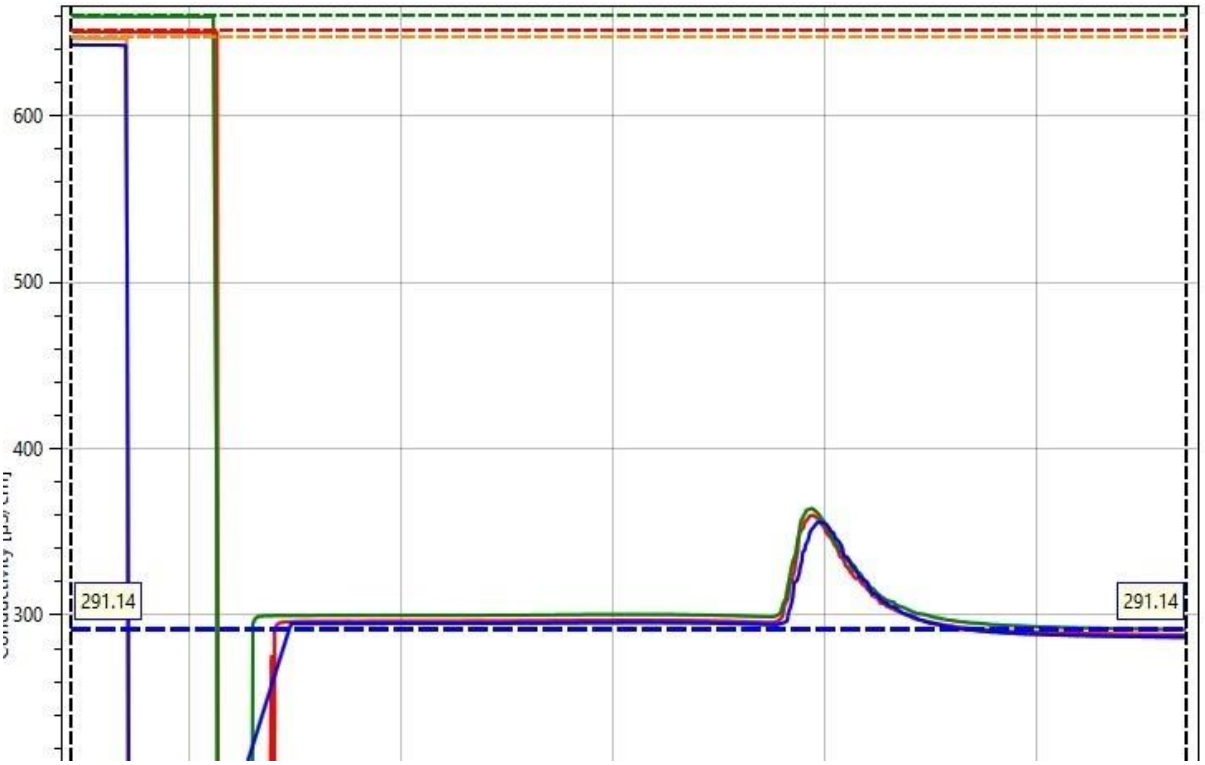
7.3.3 Example 3: Setting background value

If the background value changes during the period of measuring the tracer pass by the sensors, we can adjust this back ground level in two ways. The background level can be adjusted to remain a constant up and down. The background can also be set 'to fit'.

In the below examples you must individually select each probe to adjust each of the dotted lines. This is done by clicking on the relevant probe and moving the mouse cursor over the dotted line we can adjust it. The following example was caused by starting the measurement before the probes were placed in the river.

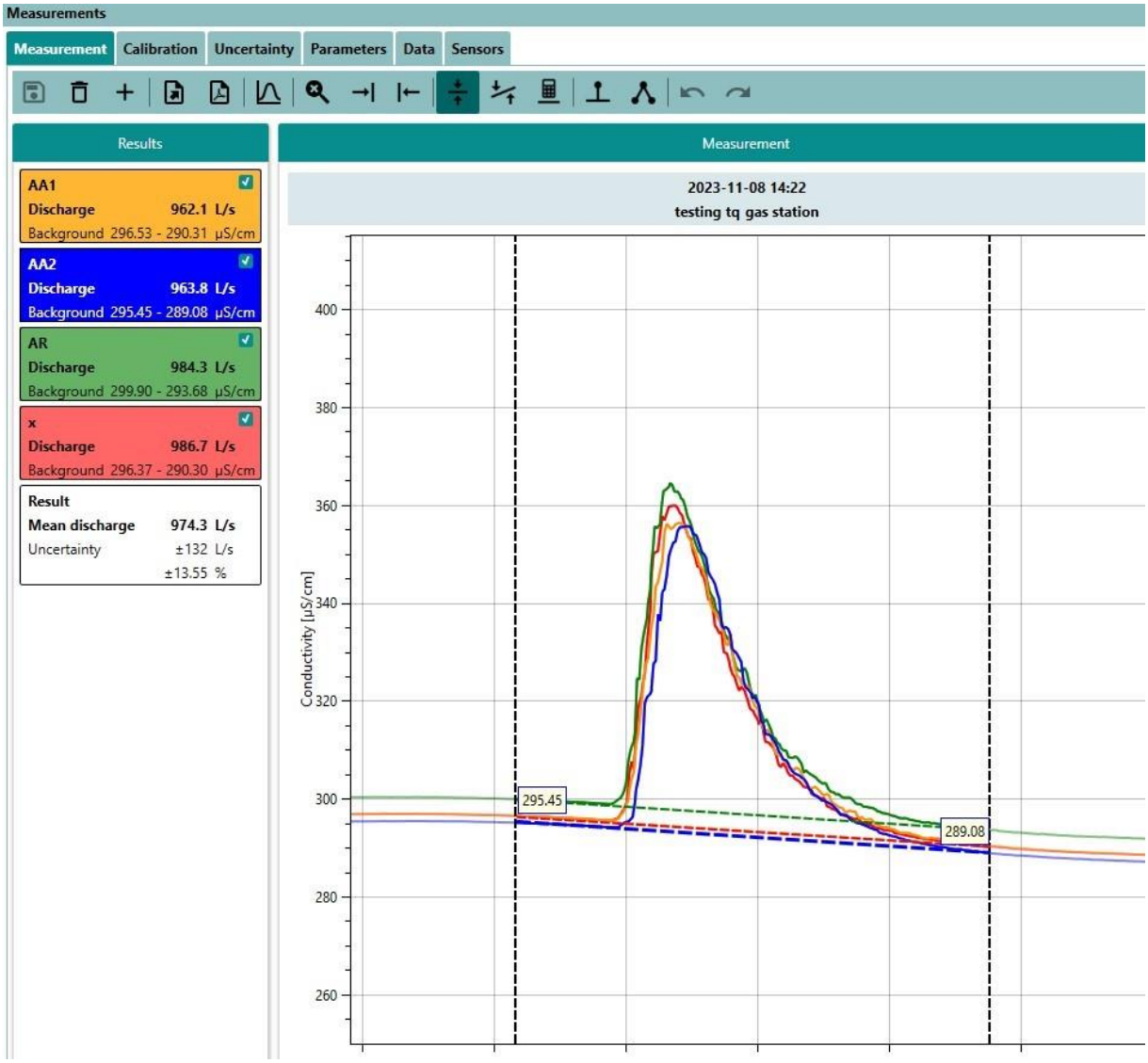


The dotted lines for each probe are much higher than the tracer measurement as the background in our calibration beaker was higher. In order to adjust we can select each sensor **individually** and drag the dotted line down to its correct postion. Below one of the sensors has been highlighted and dragged down. To make each sensor fit correctly to the tracer measurement we can also zoom in and out using the rightclick button on your mouse and dragging a box over area you wish to zoom.

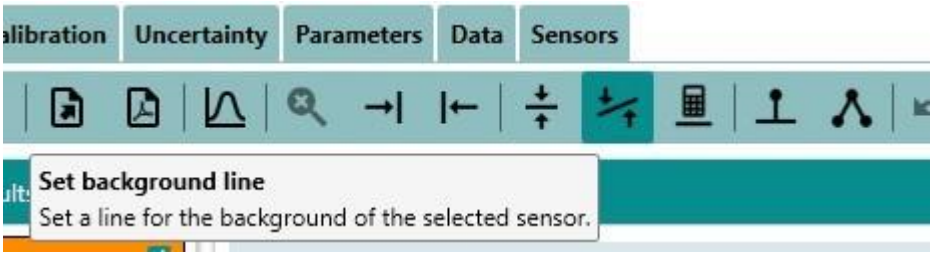


7.3.4 Example 4: Adjusting the background value

If over the duration of the measurement and the tracer passing by the probes the background value has changed we also adjust the background for each probe individually to fit its tracer measurement. This in turn gives us a more accurate discharge measurement. The example below shows that the lines are not straight but on a slight angle to fit the start of the tracer passing by and when it ended. Please see the dark blue probe (AA2) is highlighted and this can be seen in below example that we can adjust the baseline probe by probe. To change another baseline select another probe and alter as desired to fit curve.



This can be done by highlighting the adjusted by **set background line** highlighted below. This has to be done for each individual TQ-Amp and sensor used during the duration of the measurement to ensure an accurate overall discharge.

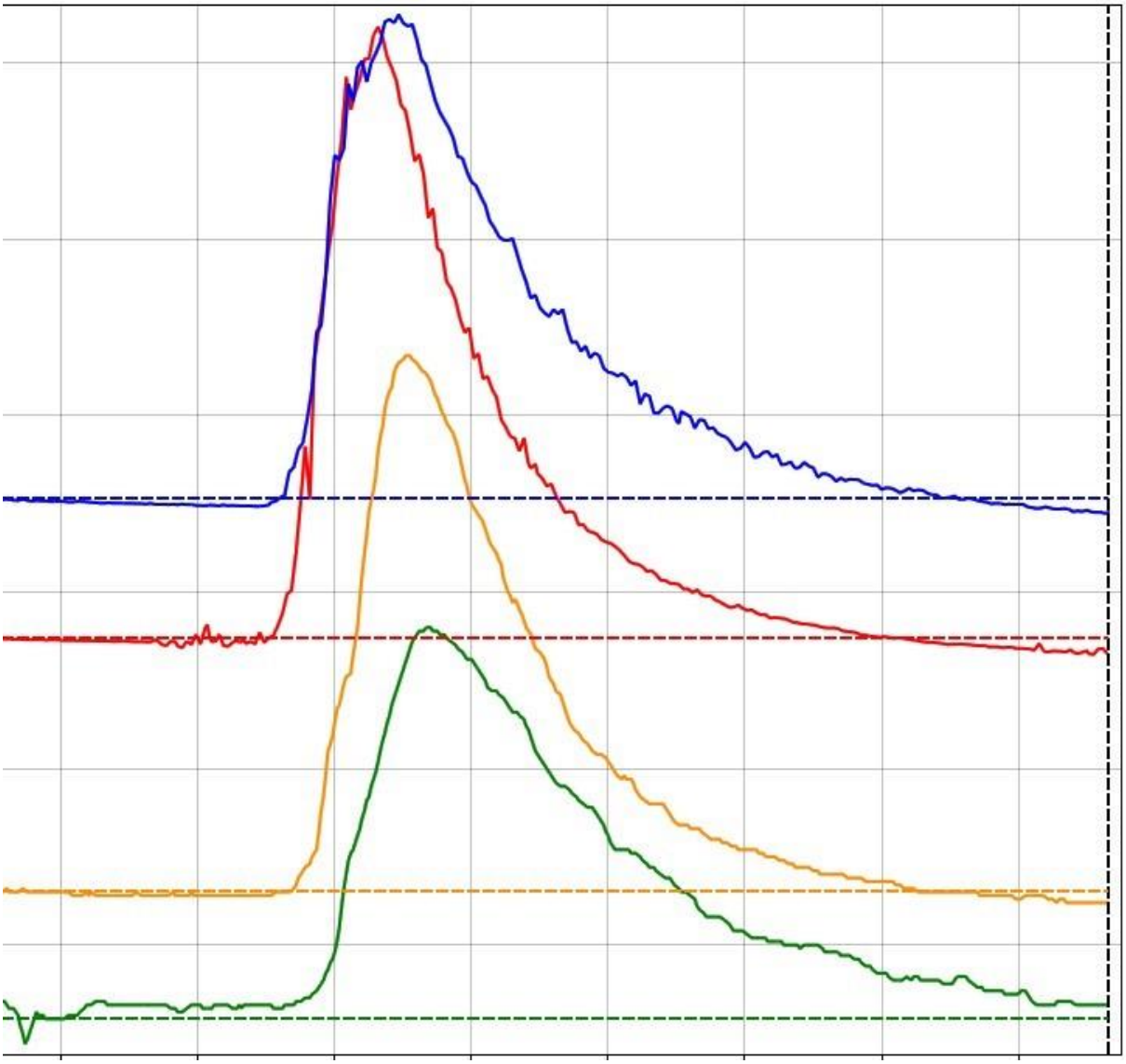


TIP Always try to ensure that your curve line finishes on the background (dotted line) or as close to as possible for best accuracy. Although it can be altered

after it is often better to wait a little longer with your measurement time period to ensure that all the tracer has passed by the probes.

TIP Always ensure that 100% of data has been retrieved from the TQ-Amp before doing any post processing. See Upload calibration.

7.3.5 Example 5: Pro tip



The example above shows that 3 out of four sensors had returned to the background conductivity value, however the probe highlighted by the (green) line had still not reached back to its original background value. It is important to wait a little time to ensure that all probes have returned to

background value. All probes need to return to baseline conductivity level, then at this point we can alter the background conductivity to suit and improve accuracy of the overall discharge measurement.

Use the calculator to recalculate the measurement. Once the measurement has been completed and the probes are matching the background conductivity at the start and end of measurement, we can click the below calculator and the TQ-Commander will automatically fit the best bespoke line to each probe.

> **TIP** Ensure that all data is in the TQ-Commander software before moving on to any post processing of your measurement, see New Features of TQ-Amp & TQ-Commander.

7.4 Upcoming features

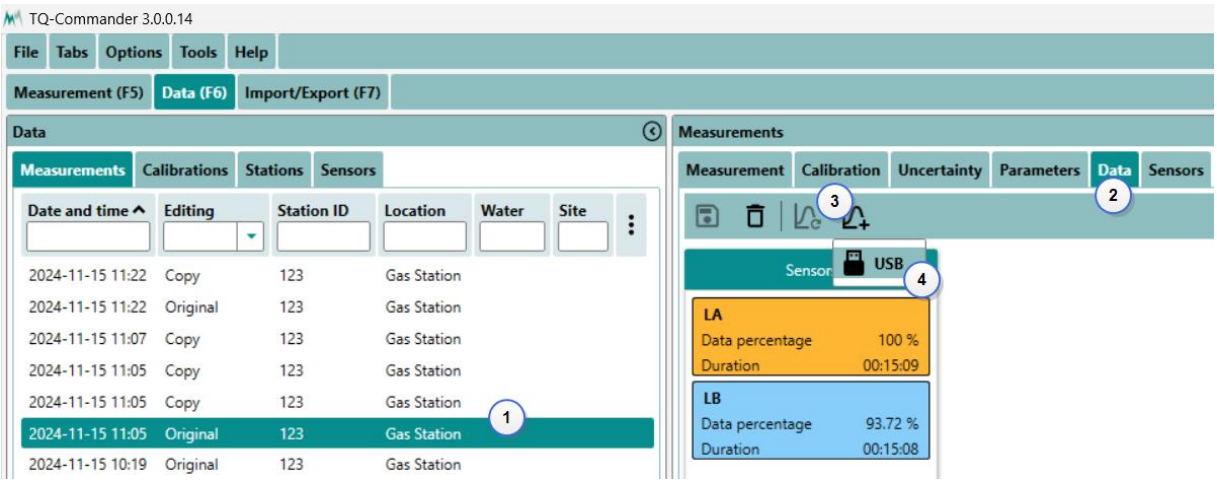
approximately from the middle of 2025

7.4.1 Using a background sensor

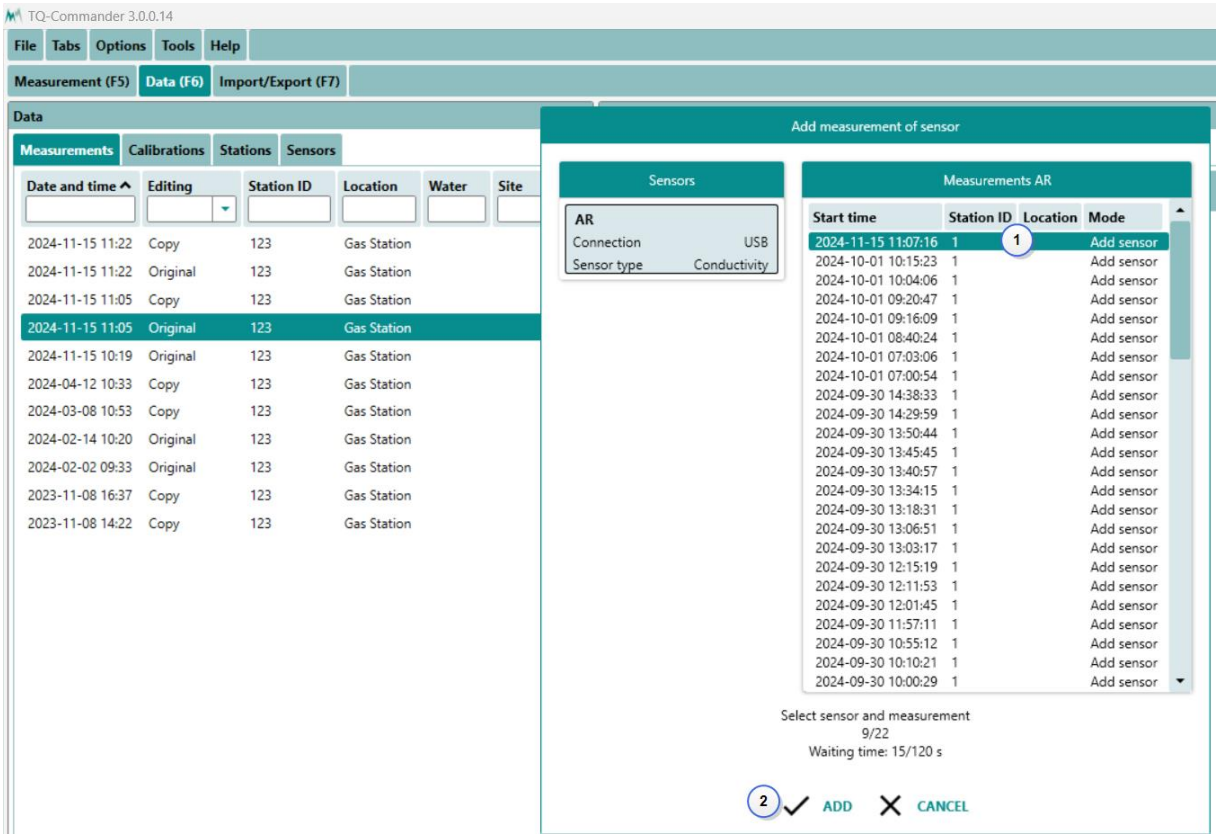
For accurate results and verification, we recommend using 3 sensors. 2 below the saline injection site and 1 before it (background value). If necessary, or if the third one was used separately and was not connected to the TQ-Commander – data from it can be imported to an already existing measurement.

Turn on TQ-Amp and connect it manually through USB connection (see Data updating) with laptop/PC. Start TQ-Commander.

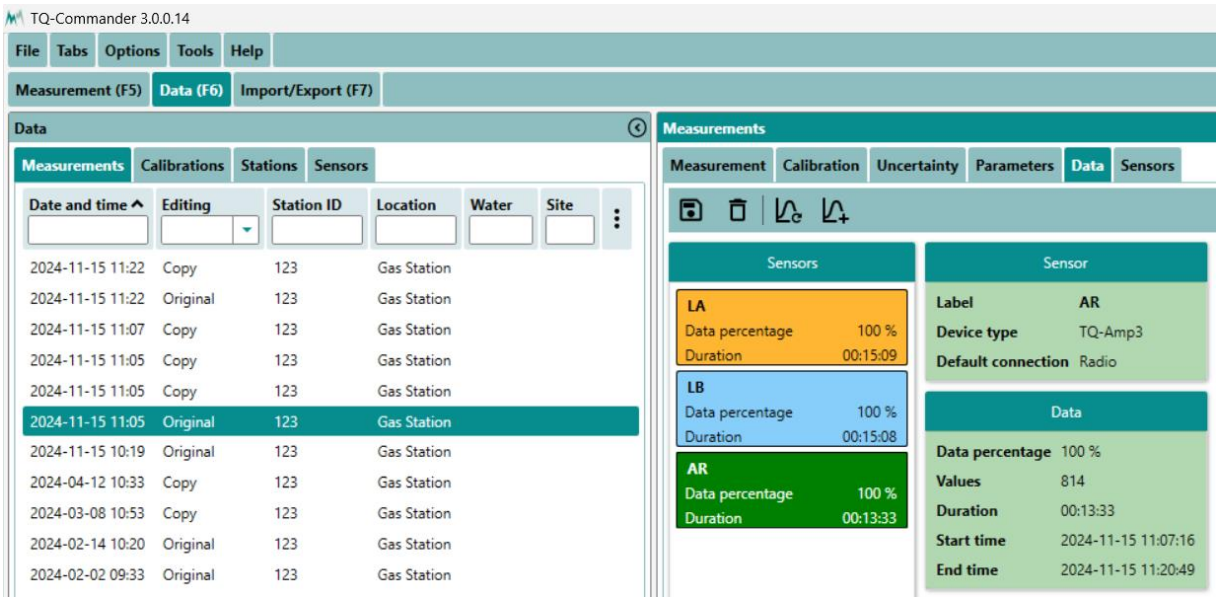
Select right measurement and go to Data window. Click on Add button and then USB.



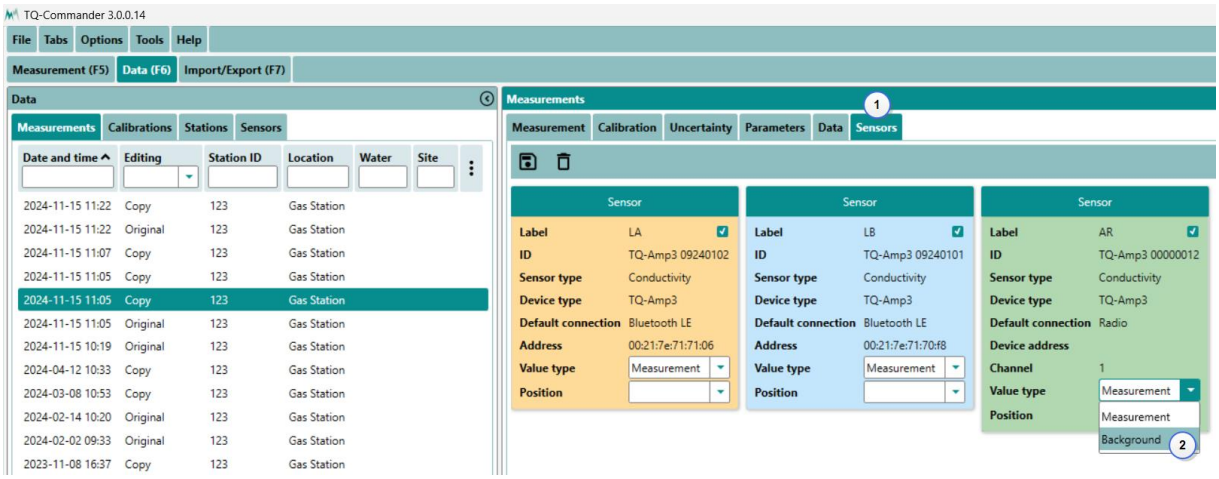
Choose right measurement and then Add.



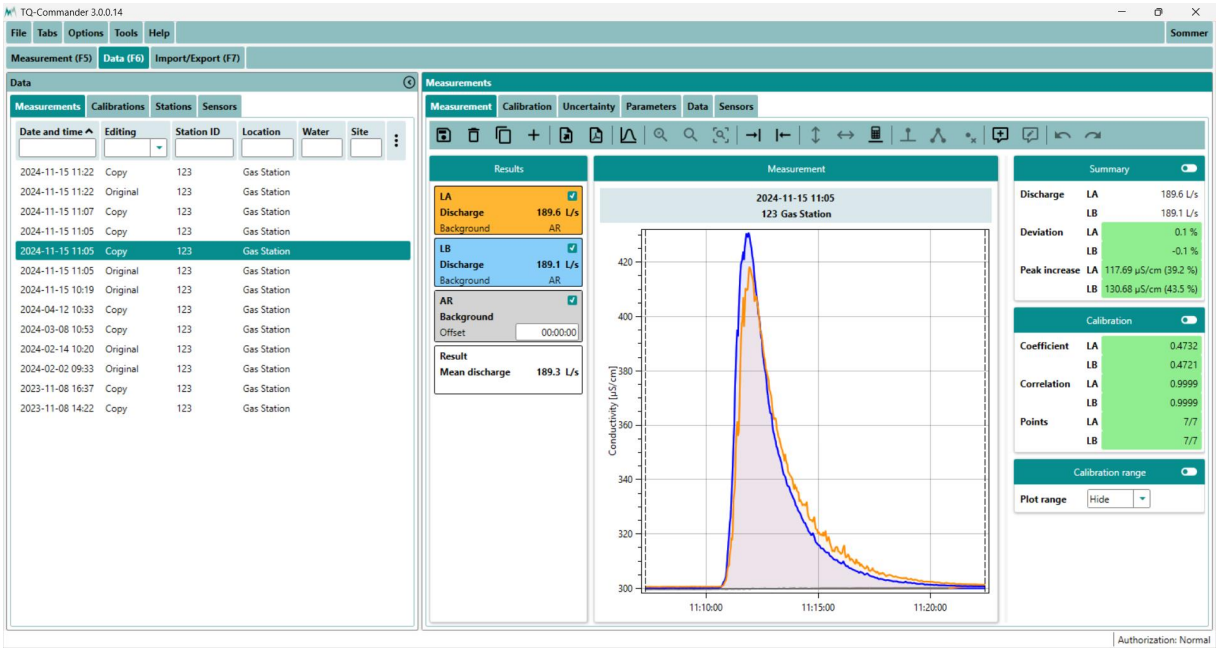
Now you can see all 3 sensors on Data window.



So, now you need to determine which of the sensors is the background in TQ-Commander. To do this, we go to the Sensor tab and select Background in Value type.



Returning to the Measurement screen, we can see that the Background values are applied to both sensors.



You can adjust this background value, If it changes during the measurement (see Example 3: Setting background value).

7.4.2 Defining a zoom range

For convenience and efficiency of processing measurement data, TQ-Commander provides the Define zoom range function.

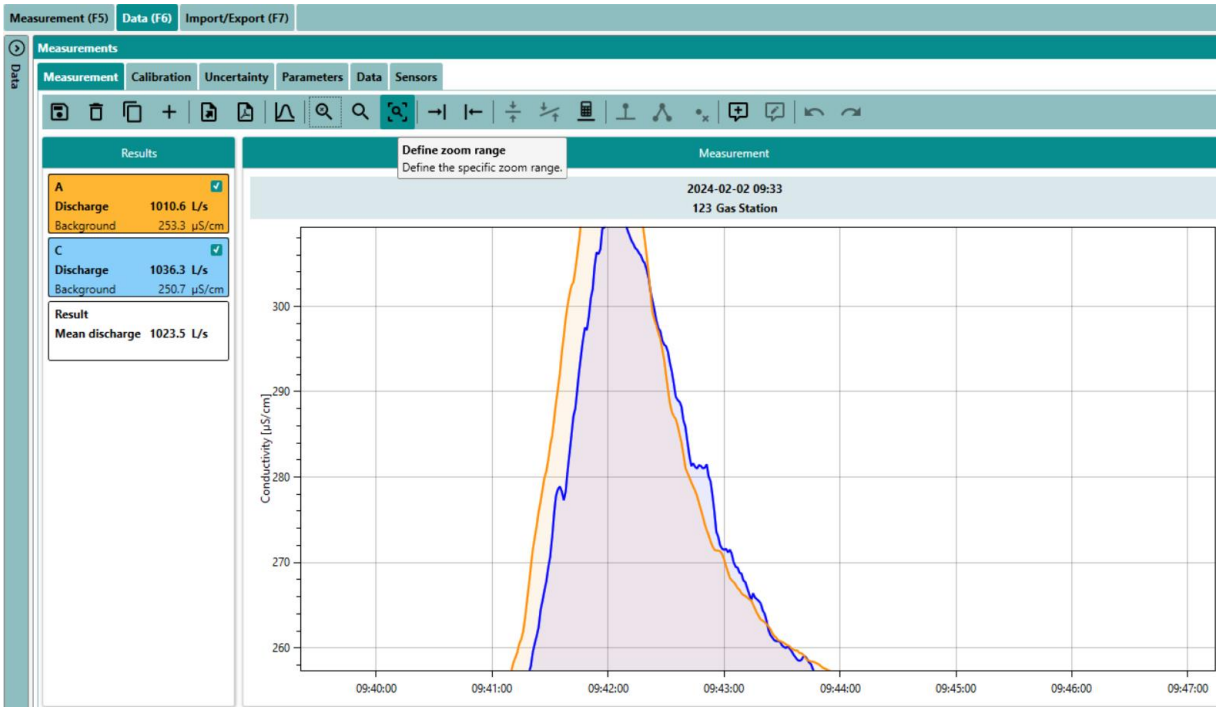
The zoom range can be defined for the measurement plot. This zoom range will then be the initial zoom when opening the measurement and also could be used for reports.

To work with it, use these buttons:

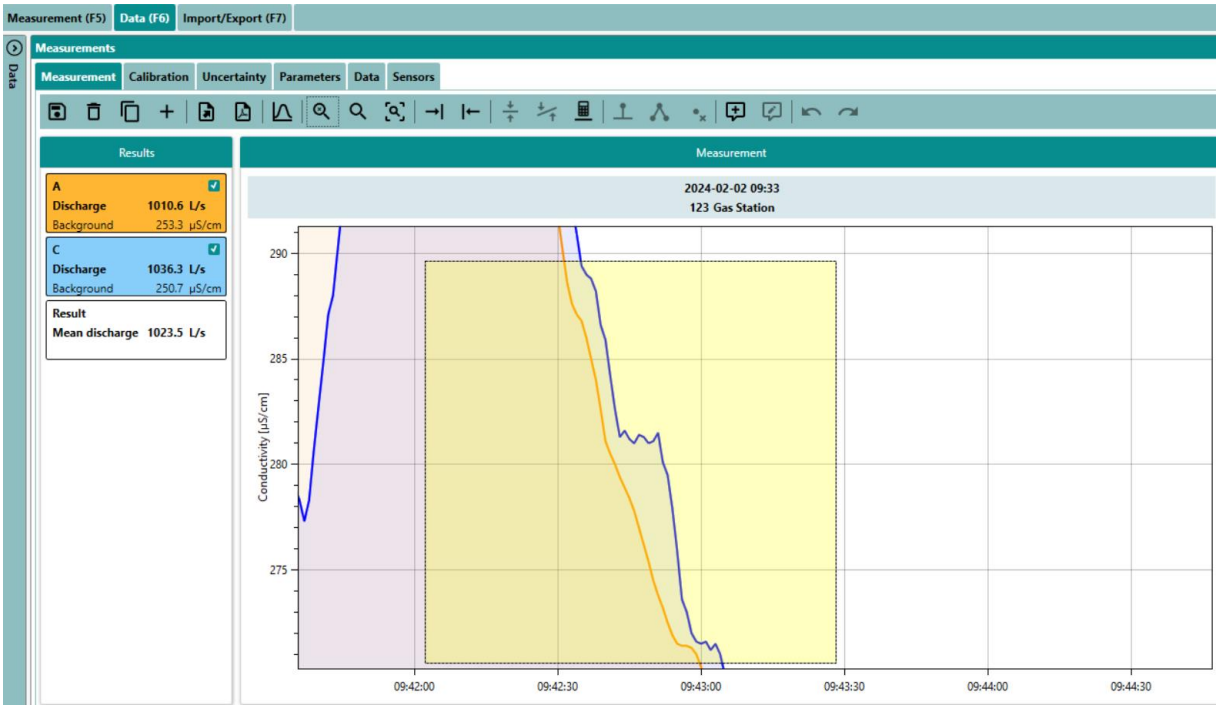
Use Reset zoom to show all measurement plot. If zoom range was already predefined click on Set to zoom range.

To determine the desired zone open the correct measurement:

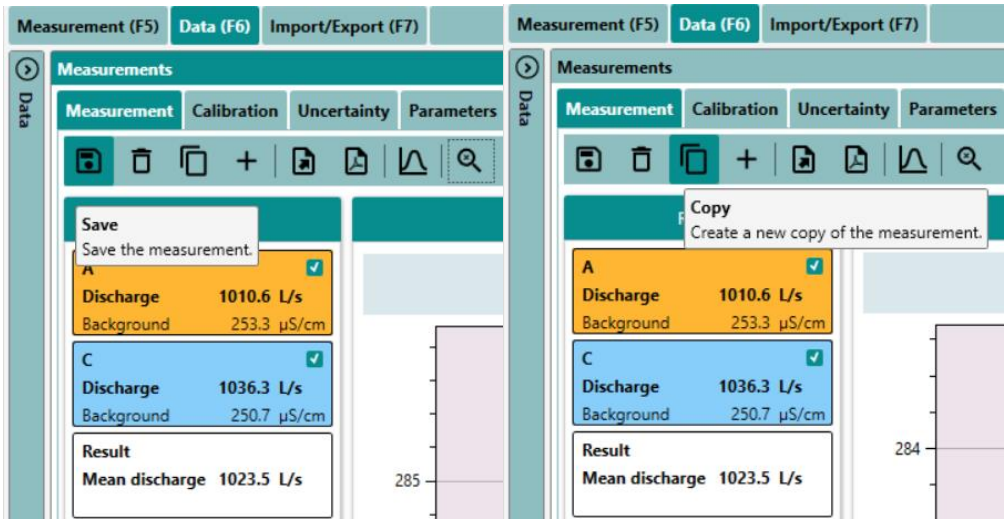
- use the mouse wheel to zoom in/out the desired segment and press the Define zoom range button;



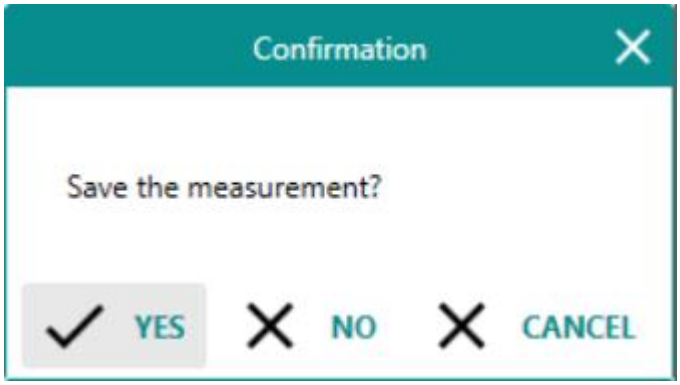
- or change the display scale, press the Define zoom range button and then use the right mouse button to determine the zone that needs to be saved.



Now you can Save measurement or make a Copy:



If you don’t Save or make Copy, TQ-Commander will ask you for confirmation:

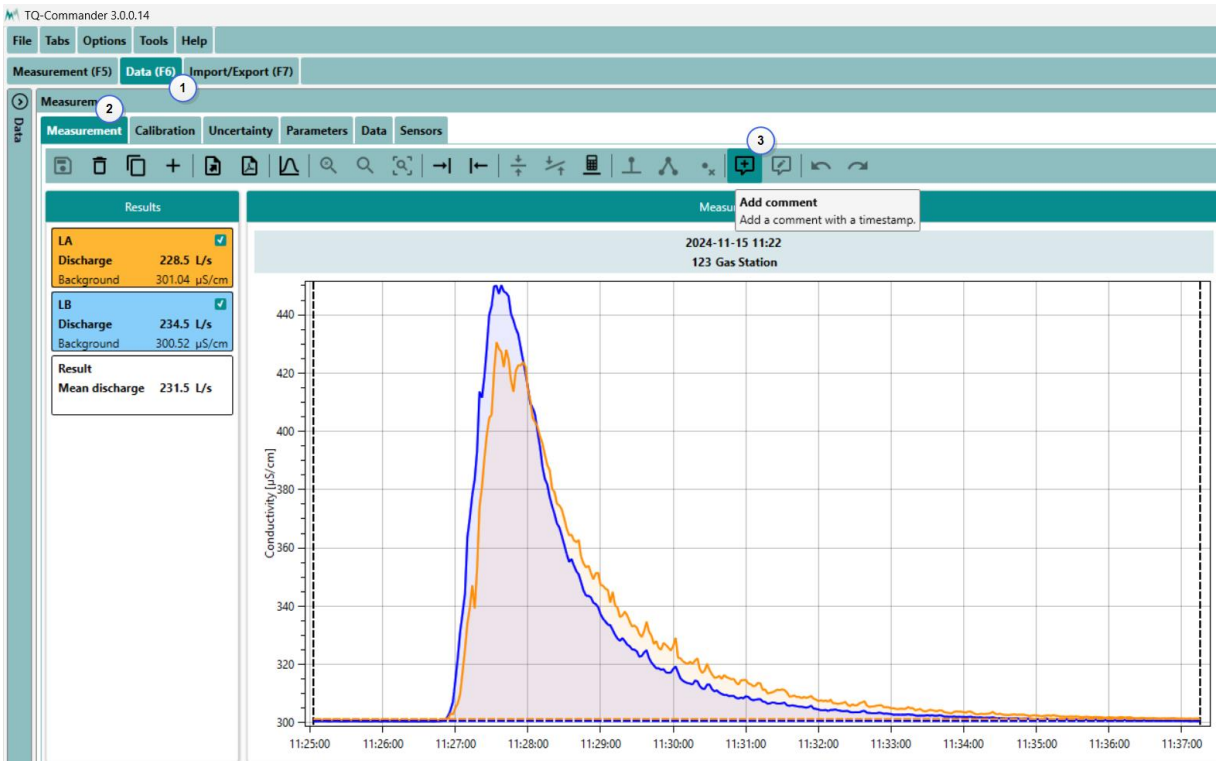


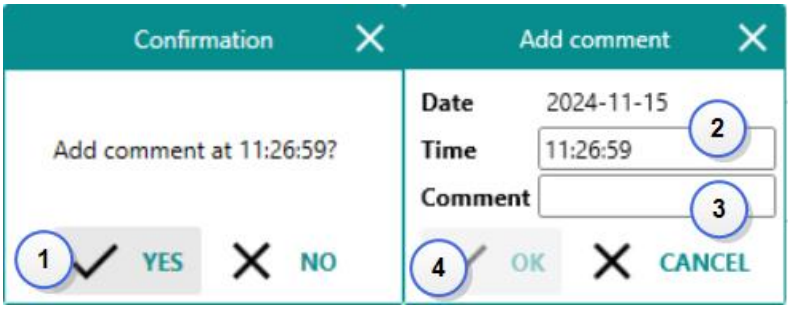
Thanks to this convenient functionality, it is possible to create several copies of the measurement plot in order not to lose the original measurements and accurately analyze individual areas without unnecessary selections.

7.4.3 Add comments

Commenting on the measurements helps to visually and quickly analyze the data.

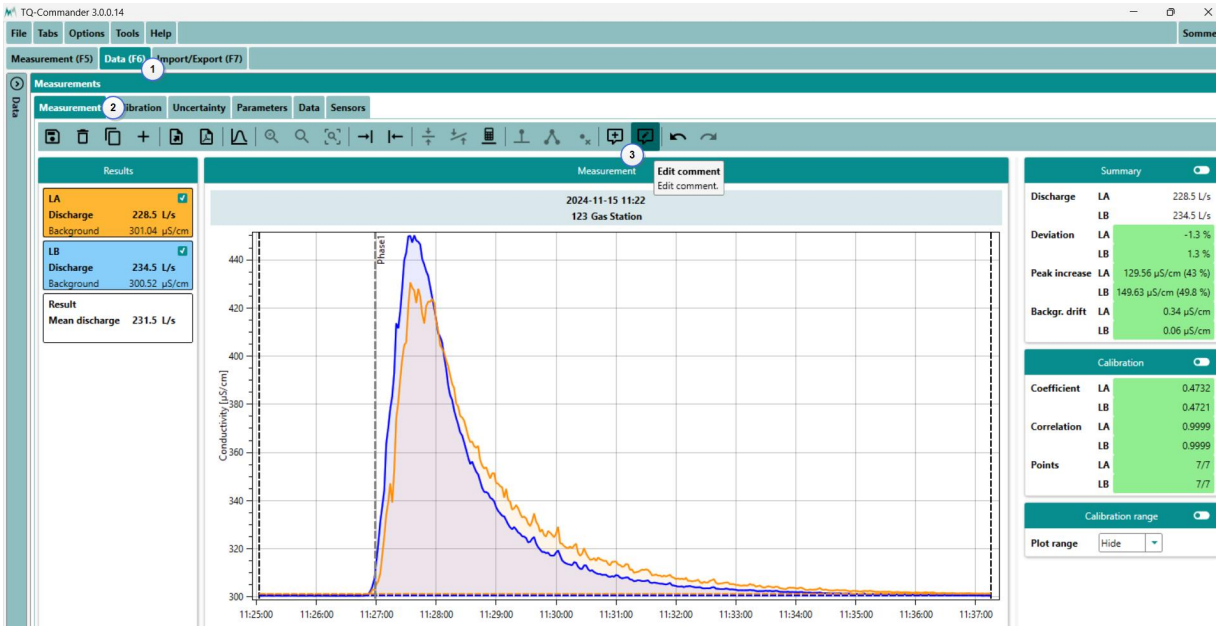
Click in the desired place on the timeline, confirm the needed time, or edit it in the next window, add a comment and select OK.

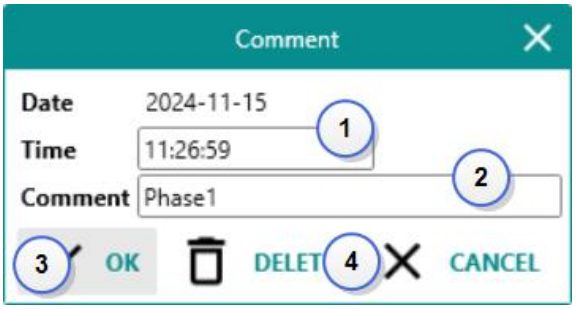




Now the comment is placed in the right place, it is clearly highlighted with a dotted line and provides important information.

Already existing comments can be edited or deleted. While in the desired profile, select Edit comment, update or delete it.





8 Import / Export of data

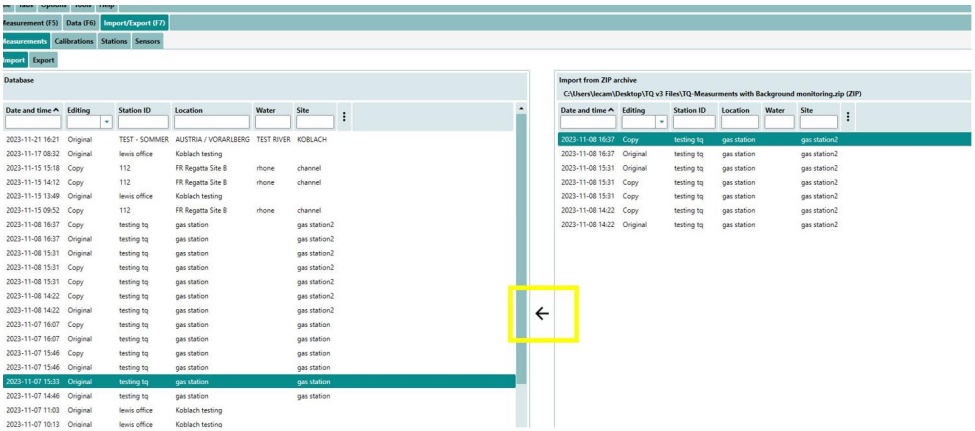
8.1 Export Data

Menu bar → Import / Export (F7)

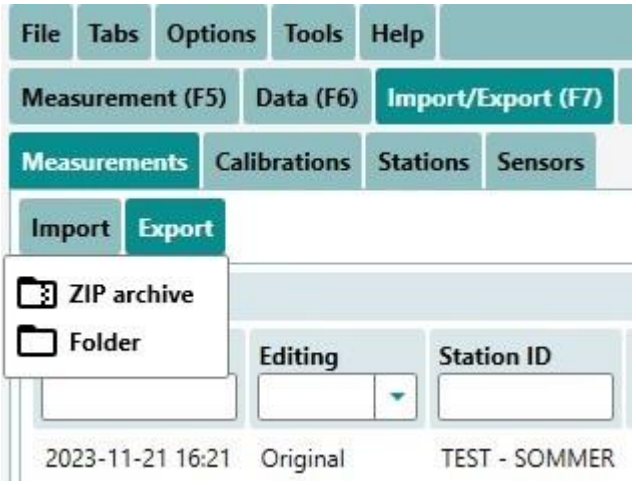
We can import and export data in the TQ-Commander software by clicking on the 'arrow' between the **Import / Export** windows detailed below. The following formats are available for the export of the measurement data:

- XML
- Zip archive

Depending on whether the Import or export tab is selected, the arrow will change direction to either export it out to a specified folder or import a file into the TQ-Commander software so we can look at the data and manipulate or create reports from the measurements.

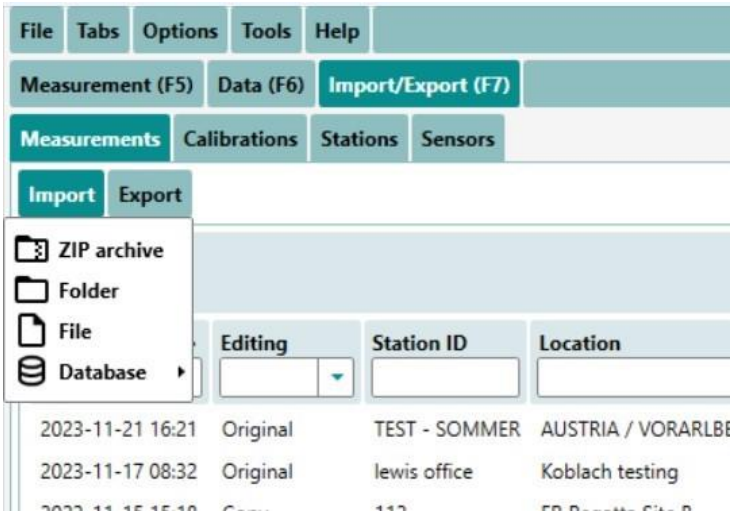


Files from the TQ-Commander can be exported as a folder or Zip folder depending on requirements of user. Ensure you have highlighted the relevant measurements or file you wish to export. If we want to Import / export multiple measurements / calibrations / stations then use the Zip archive. If you wish to focus on one individual measurement then use the XML or Zip file.



8.2 Import data

In the menu bar click on **Import tab** once you have selected the Import/Export (F7). When clicking on this we can see that the following options for importing the document are available. We can import a folder, a Zip folder or a file that has been saved previously in the TQ-Commander software.



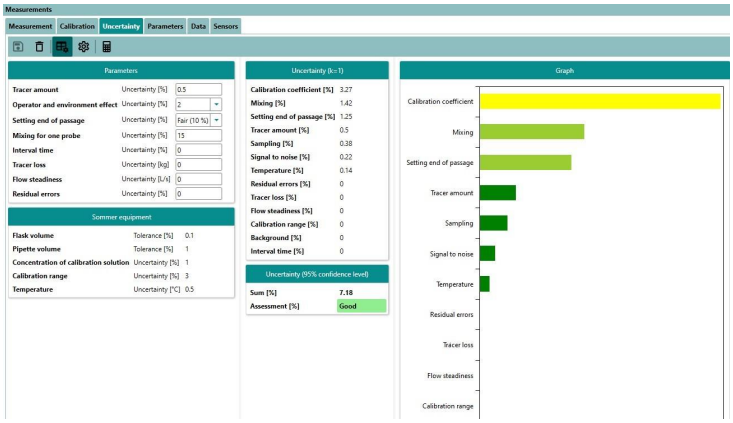
Choose the file you wish to import, then it will appear in the right-hand side window of the Import/Export (F7) window. You can then select and highlight the relevant file and then it can be imported by clicking the arrow. Multiple files can be selected at once and imported into the TQ-Commandersoftware.

9 New Features of TQ-Amp & TQ-Commander

The new (V3) has many new functions to help assist its users.

9.1 Uncertainty tab

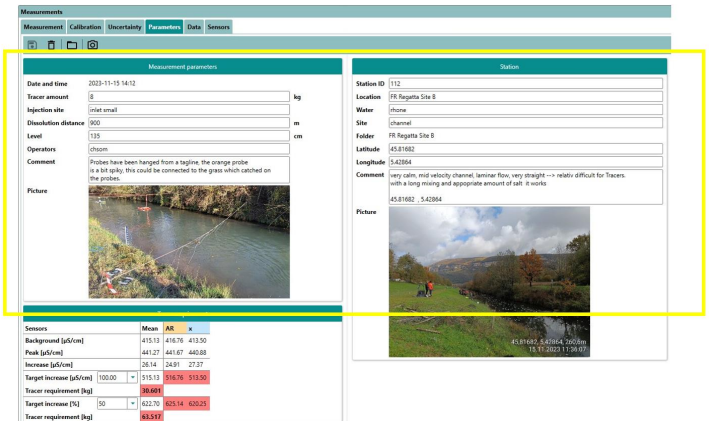
We now have a separate tab in the measurement's menu for **Uncertainty**. We can now quickly navigate to the details surrounding the uncertainty of each measurement. This is a new addition and is very useful for checking the uncertainty quickly and if need be repeat the measurement at site if the uncertainty values are too high or out with what is required.



The assessment values can be adjusted in **Options** > **Menu**. The assessment is based on the uncertainty and for example if the uncertainty is below 5% then it is a very good measurement if the assessment is above 15% then it is a poor measurement.

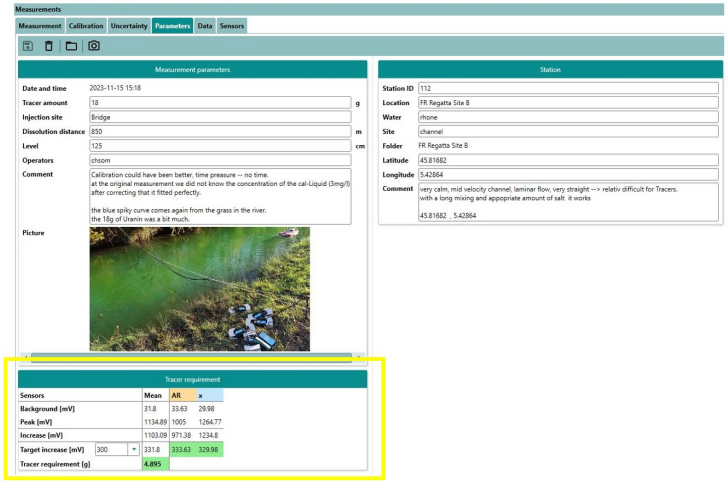
9.2 Parameters tab

When selecting the parameters tab the information looks like the below example



The **Parameters tab** in the **Measurement's menu** can be used to quickly look at the parameters surrounding the relevant measurement that was taken on site. This menu also displays the attached photos from the measurement and the station. The more details that are added in each step of the measurement process the better detail will be displayed in the parameters menu as displayed in the example above. This helps to remember details from the measurement at the time also in the future.

Recommendation add detailed information for the future (see picture above in the yellow box).



9.3 New tracer calculator

From user feedback we have found that it can sometimes be difficult to find the right tracer amount to be injected into the river being measured in order to get a good accurate measurement. Highlighted in the yellow box above is our new tracer calculator feature. This tool shall help the user to optimize the amount of tracer used for injections. This can be used after your first measurement on site has been completed.

After the first measurement the user can check if the mixing is complete or not. If it is complete the user can use the tracer calculatror to make sure he uses the correct (opimized) amount of tracer for the mixing distance used for the first measurement. This is part of the optimization of used tracer so users do not inject too much not needed tracer into their waters.

If mixing is not complete, the user needs to extend the mixing distance until he has complete mixing, as soon as there is complete mixing again, we can start using the tracer calculator.

Remember: the tracer calculater calculates the needed tracer only for a specific (used) mixing distance! More advice on tracer amounts can be found (Minimum mixture length for the conductivity measurement).

10 Appendix

10.1 No internal Bluetooth adapter found

If this message is displayed after clicking on Measurement (F5) there are two possible reasons:

- There is no internal Bluetooth Radio available.
- The internal Bluetooth Radio is not deactivated (hardware switch, FN-shortcut; please refer to the laptop manual).

In both cases Sommer Messtechnik suggests using the supplied Bluetooth dongle with a range of up to 100 meters.

Plug in the supplied Bluetooth dongle in an available USB port and wait until the automatic installation process is completed. (the supplied USB V5.3) will not function when another Bluetooth is active on your device. If using your own Bluetooth Dongle, please ensure it is above 5.0 and is the activated Bluetooth on your laptop. Again, click Measurement (F5).

ATTENTION Please note that the internal Bluetooth module must not be active when new measurements are performed to ensure that the supplied USB Bluetooth dongle is used for establishing the connection with the TQ-Amp.

10.2 Optimizing the Bluetooth range

Under the following conditions a Bluetooth range of up to 100 m can be achieved (however this is dependent on the position of the TQ-Amp in the field and the USB dongle antenna).

- Bluetooth needs a clear line of sight! Consider any obstacles between the laptop and the TQ-Amp.
- The connection is established with the supplied Bluetooth dongle. For information on how to (permanently) enable the Bluetooth dongle please refer to (Deactivating the internal Bluetooth module and enabling the Bluetooth dongle).
- Position the TQ-Amp perpendicular to the line of sight.

ATTENTION Please note that the internal Bluetooth module must not be active when new measurements are performed to ensure that the supplied Bluetooth dongle is used for establishing the connection with the TQ-Amp (Deactivating the internal Bluetooth module and enabling the Bluetooth dongle).

10.3 Deactivating the internal Bluetooth module and enabling the Bluetooth dongle

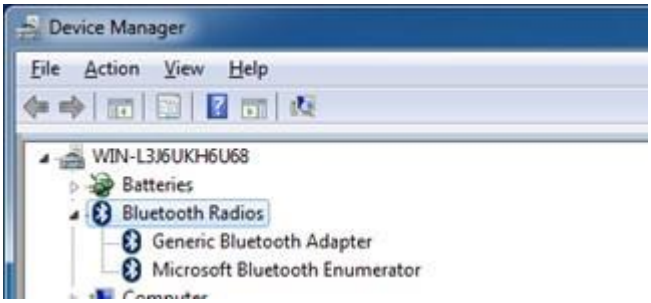
The following steps ensure that the supplied Bluetooth dongle will always be used for the connection with the TQ-Amp.

- Deactivate the internal Bluetooth module (three options):
- Via the Windows device manager (deactivation)
- Restart / reboot laptop
- Plugin the supplied Bluetooth dongle in an available USB port and wait until the automatic installation is completed.
- After this is complete, we can then click Measurement (F5)

Please note that the internal Bluetooth module must not be active when new measurements are performed to ensure that the supplied USB Bluetooth dongle is used for establishing the connection with the TQ-Amp.

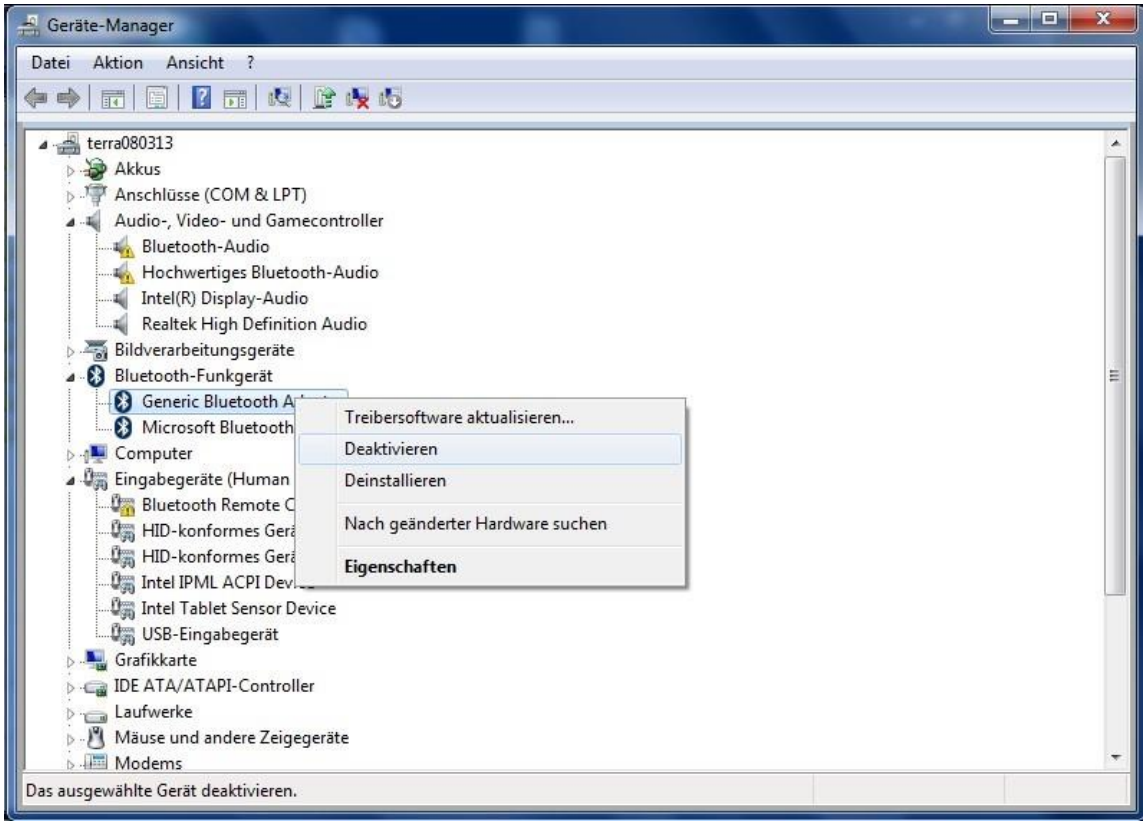
10.4 Deactivating an internal Bluetooth module via Windows Control Panel

- Ensure that only the internal Bluetooth module is active and no external Bluetooth dongles are connected.
- Open the Windows Device manager find the entry '**Generic Bluetooth Adapter**' respectively 'Generic Bluetooth Radio':



In case Microsoft Bluetooth Stack **is not** used the name and colour of the entry may vary from above screenshot. In that case please look for similar entries.

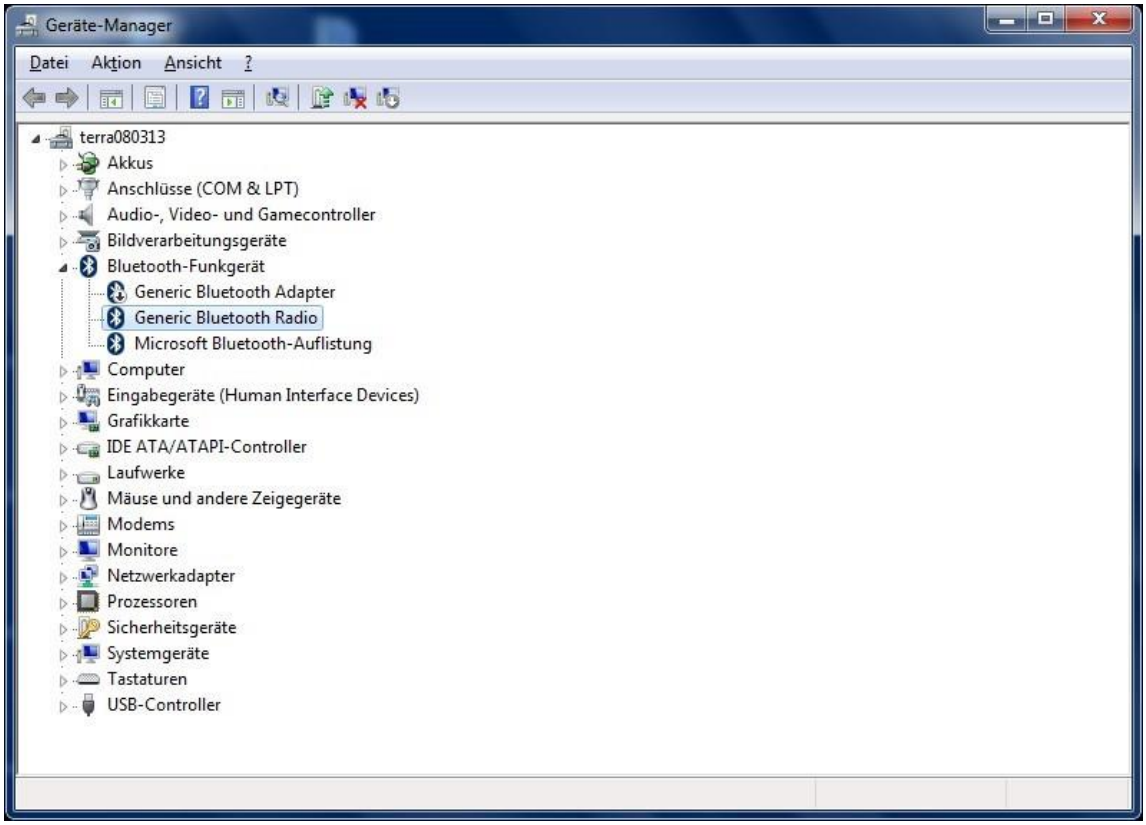
- By performing a right-click on the entry a menu is displayed via which the Bluetooth module can be deactivated. There is also a button in the menu panel where you can enable and disable the selected Bluetooth devices.



- After deactivating the Bluetooth adapter the entry should look like this:

The entry ‘Microsoft Bluetooth Enumerator’ disappears from the list after the Bluetooth module was deactivated.

- Now insert the supplied Bluetooth dongle and wait until the automatic installation is completed.
- Because the supplied Bluetooth dongle by default works with the Microsoft Bluetooth Stack a new entry named "Generic Bluetooth Adapter" respectively "Generic Bluetooth Radio" is created.



- The supplied Bluetooth dongle is now installed and ready to be used. Remember if your Laptop is required to use Internal Bluetooth in the future that you will have to go back to the device manager and enable it.

10.5 Mixing the calibration solution

The calibration solution with a concentration of 10 g/liter is made of salt (if possible, use the same salt that will be used for the slug injection) and distilled water.

ATTENTION The salt has to be stored under dry conditions!
(Salt has the tendency to absorb water and so increases its weight)

ATTENTION Use distilled water! A base conductivity in the range of 0…1 µS/cm is recommended.

a) Use distilled water to rinse the container which will be used to store the calibration solution.

b) Fill the container with 1 liter of distilled water.

c) Lie down a sheet of paper on the precision scale and adjust the offset so that the scale shows a zero for the weight.

d) Dump the salt on the sheet of paper and weigh 10 g

TIP Use a precision scale with an absolute error of +/- 0.1 g or less.

e) Take the sheet of paper with the salt from the scale and dump the salt into the reservoir with the distilled water.

Shake the distilled water to mix it with the salt.

TIP It is of key importance that you are as accurate as possible with the mixing of your calibration solution. If the calibration solution is inaccurate, in turn the calibrations and measurements taken using the calibration solution will also become less accurate.

10.6 Minimum mixture length for the conductivity measurement

Rule of thumb: L ≈ 50 × b

L … minimum mixture distance; b … width of the river

River width	Length of the mixture distance [m]	
[m]	little turbulence	very turbulent
1	75	50
2	150	100
5	300	250
10	500	300

NOTE Various factors determine the mixing distance, which are site and stage dependent. The site's geometrical constraints impose the global flow conditions, while high or low flow conditions can greatly alter the turbulence. The indicated factor of n-times the width of the water body is a rough starting point. The determining factor for establishing the mixing distance, which should follow the rule "as short as possible and as long as necessary," is the complete mixing of the tracer vertically and laterally across the measuring cross section.

Complete mixing is best determined by the deviation of the probes used for measurement. The probes must all be located in the same cross-section, never behind or in front of each other. However, they should be clearly separated from each other. It is best to place one probe in the main stream of the river and the other probe(s) at the side. In this case, the measurement curves will differ with regard to the beginning, maximum and end of the tracer passage. With complete mixing, the calculated discharges of the individual measurements are nevertheless almost identical and show a small deviation. In this case, the above rule of thumb is no longer valid.

A background probe for background level and change control is **recommended but optional**.

For limits with dilution of salt and other continuative information we recommend the book MORGENSCHWEIS, G. (2010): Hydrometrie. 2010. XIV, 582 pp., Springer

10.7 Salt & Fluorescence requirement

To estimate the necessary salt requirement, first the amount of discharge has to be estimated. With short mixture lengths and low background conductivity **normally 3-5 kg for an estimated discharge of 1000 liters/s are sufficient (rule of thumb)**. If we have base conductivity below **100 µS/cm then recommend 1 kg of salt per 1 cubic meter per second.**

Salt amount in kg in dependence of the base conductance and the estimated discharge.

Estimated discharge [l/s]	Salt requirement [kg]			
	< 250 µS/cm	< 500 µS/cm	< 1000 µS/cm	≥ 1000µS/cm
50	0,25	0,5	1,0	2,0
100	0,5	1,0	2,0	4,0
200	1,0	2,0	4,0	8,0

500	2,5	5,0	10	20
800	4,0	8,0	16	32
1000	5,0	10	20	40

For **fluorescein** and **rhodamine**, we recommend **1 g** per cubic meter per second. Before doing a measurement monitor the background levels for change before carrying out measurement.

To estimate the necessary fluorescence requirement, you could check:
ÖWAV Regelblatt 214 (2007) – rule sheet 214 of the Austrian Water and Waste Management Association.

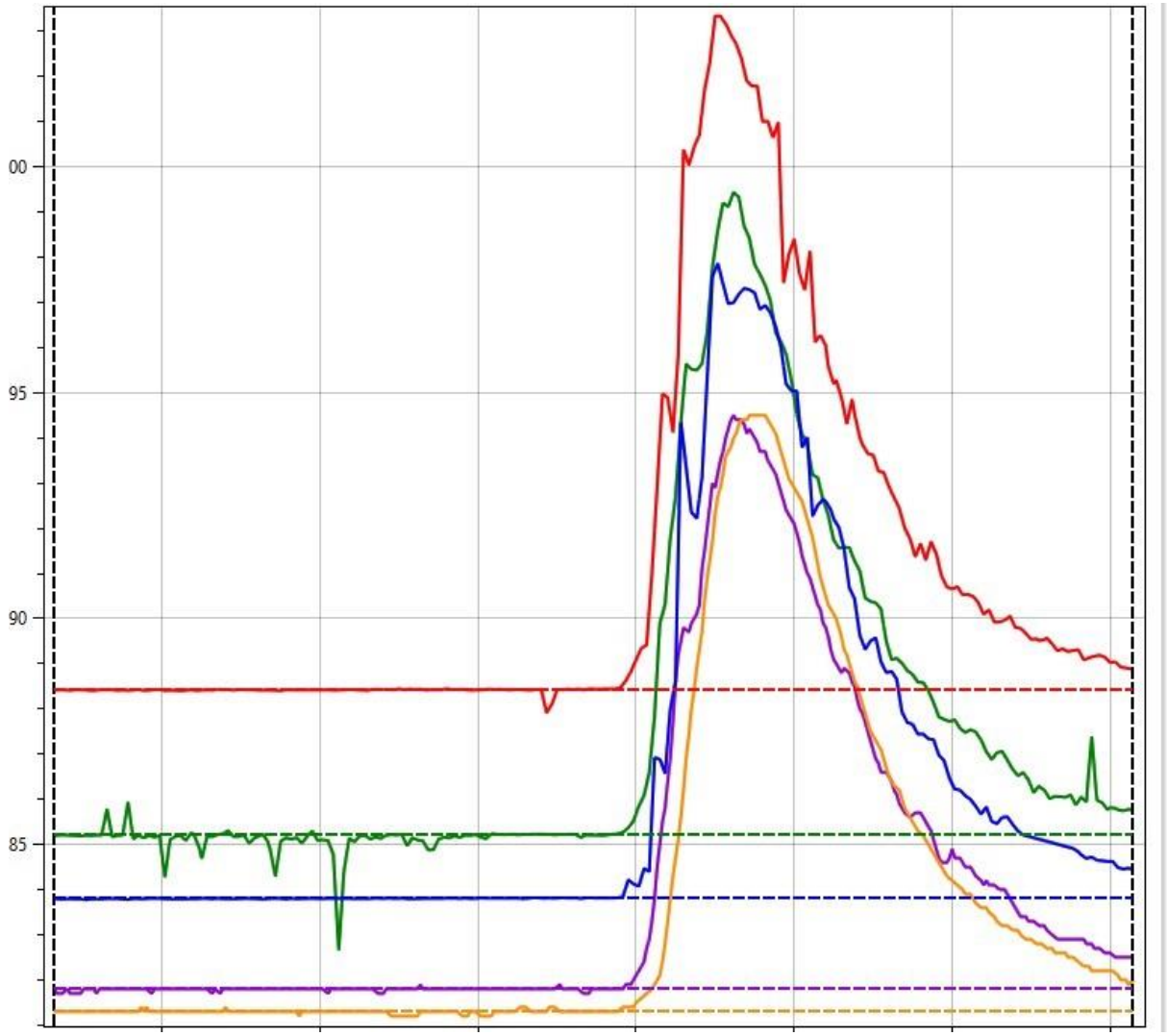
Only Uranin, Sulforhodamine B, Rhodamine B, Rhodamine WT tracer materials are compatible with the probes which are deliverable by Sommer Messtechnik.

If unsure about fluorescence tracers and compatibility with our TQ-Amp and probes, please get in touch with our Customer support team: [[[Undefined variable General.Support Email]]]

11 FAQ‘s

Below are some frequently asked questions regarding our TQ-Amp and probes.

FAQ 1: I have the below trace line on my measurement and it has lots of mini spikes what is the cause of this and what can i do to solve this issue?



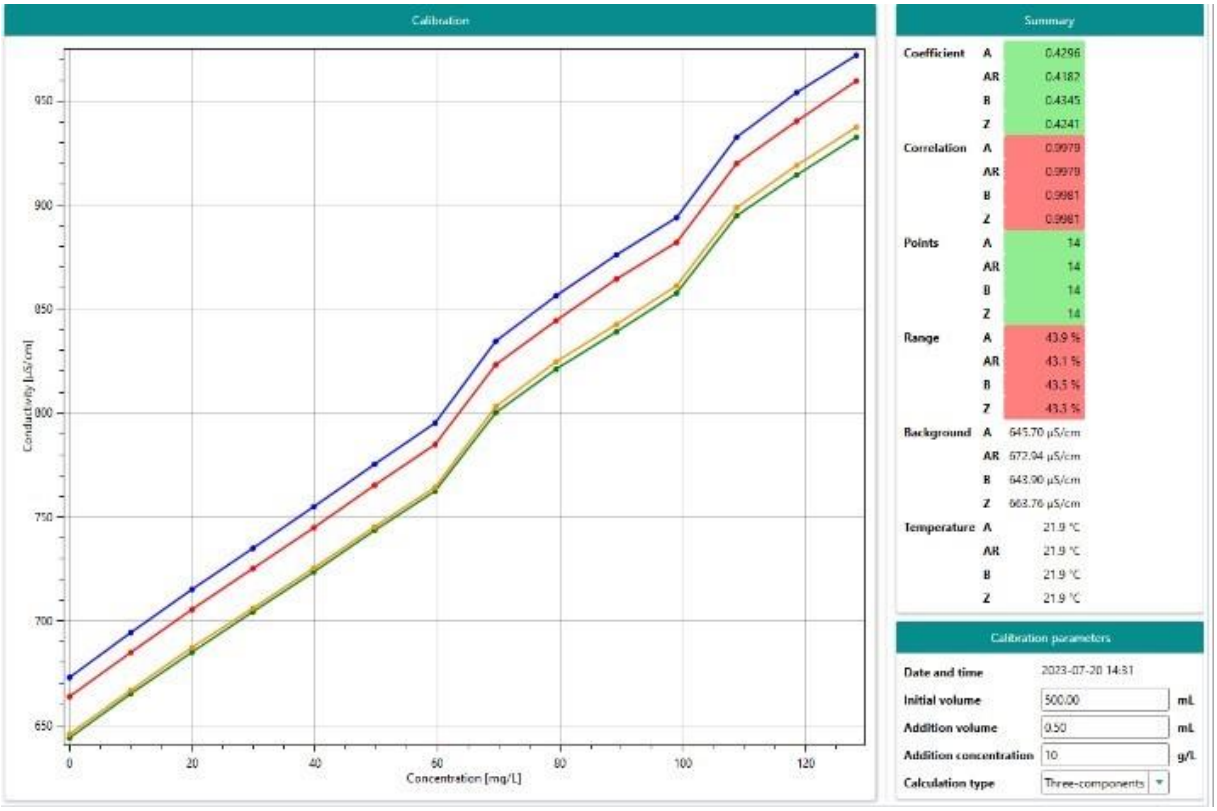
Answer: This is a common occurrence when air bubbles are being trapped within the probes. If there is a lot of turbid flow or the probes have been placed in water with some air trapped inside the metal housing, we can often see the above results in our data. It can also be caused by multiple cross directional flows hitting the probes. Try to replace the probes in the river at a different section and ensure there is no trapped air. Hanging the probes from a tagline or existing infrastructure like a bridge in the water so they are not lying on the river bed can help to eradicate this issue.

FAQ 2: My connection to the sensor is not working correctly and no sensor can be found when I search for the TQ-Amp via Bluetooth

Answer: Firstly, ensure the TQ-Amp is turned on and within range of the Bluetooth dongle in your laptop.

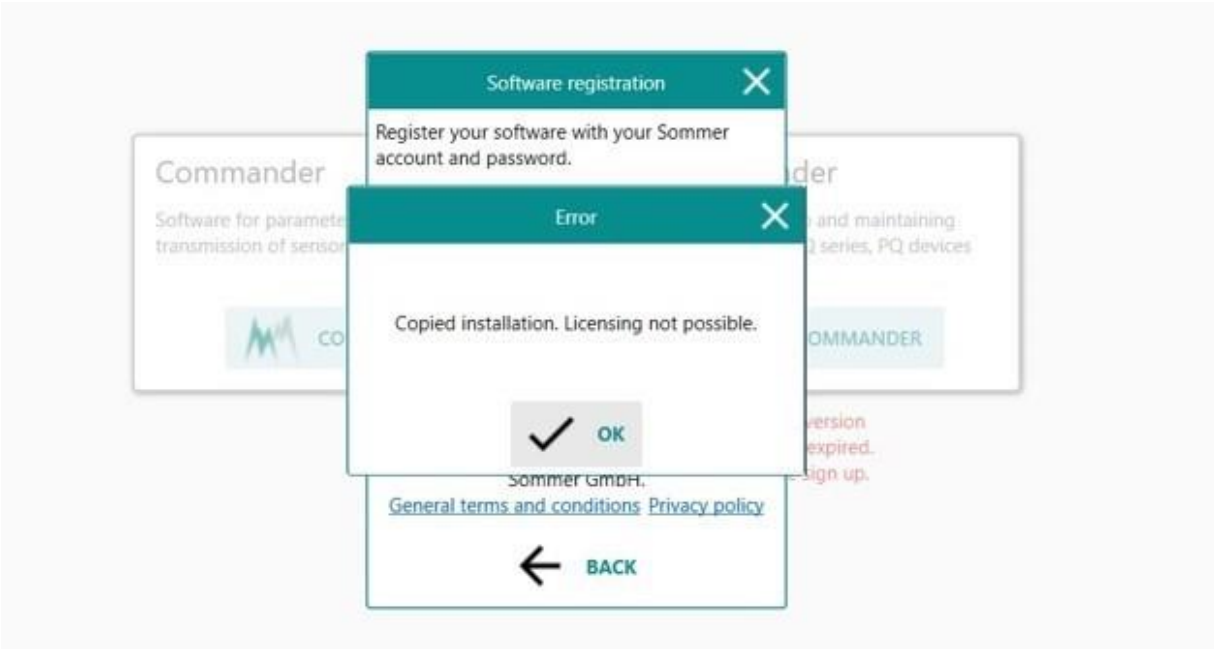
Also ensure that the internal Bluetooth of your device is turned off and that the USB Bluetooth dongle is the active Bluetooth that your laptop is using. (Optimizing the Bluetooth range) for further support

FAQ 3: I have completed my calibration however the line is not straight. Is this ok to move on to the measurement step?



Answer: The above calibration line is not straight. This is caused due to the concentration additions that have being added have not been completed correctly. Ensure that you are following the pipette guidance and that you are accurately adding the correct concentration amounts over each of the calibration steps. The above graph shows that twice the additions were not accurately added from the concentration solution into the mixing beaker. It is not advised to move forward on to measurement until there is a good calibration line with correctly added concentration solutions to get solid measurement results. If the calibration line looks like the above example, it is important to repeat the calibration process. The calibration correlation needs to be better than 0.9994, if the correlation is below it is recommended to repeat the calibration.

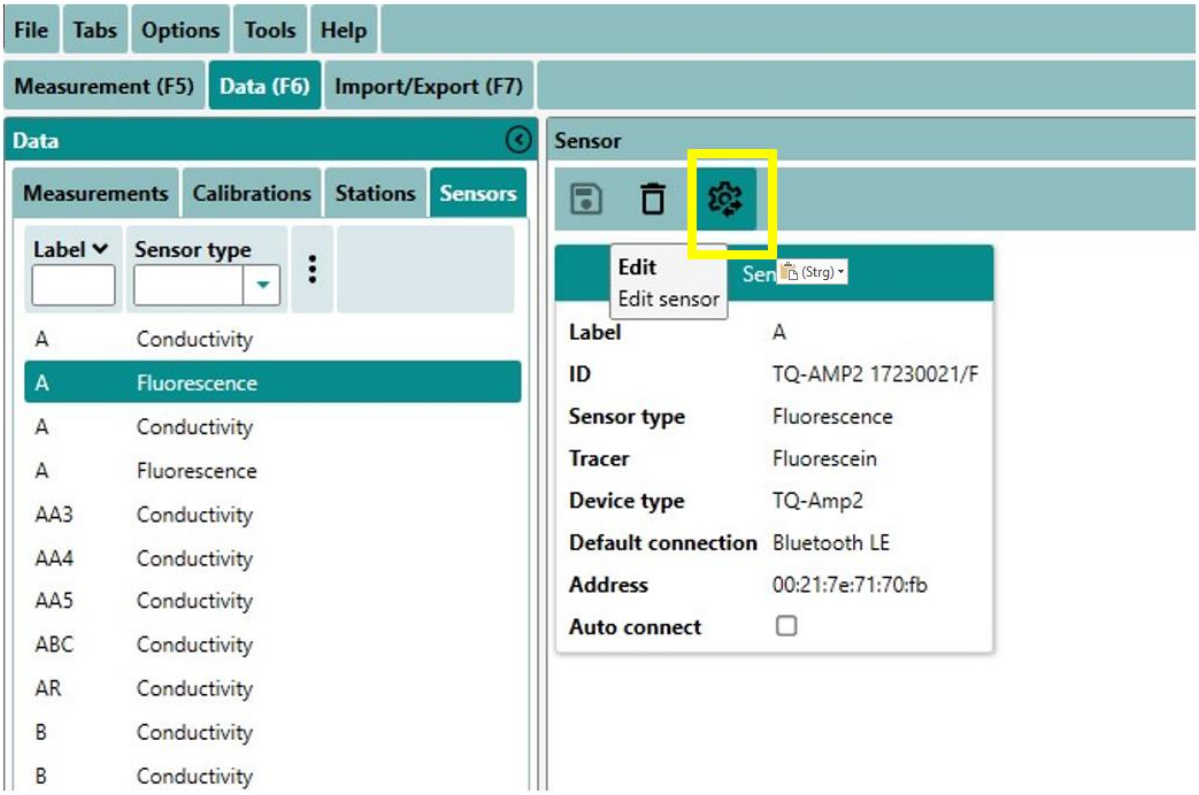
FAQ 4: I have downloaded the TQ Commander software from the provided USB stick. However, I cannot access the menus and I am being asked to register software?



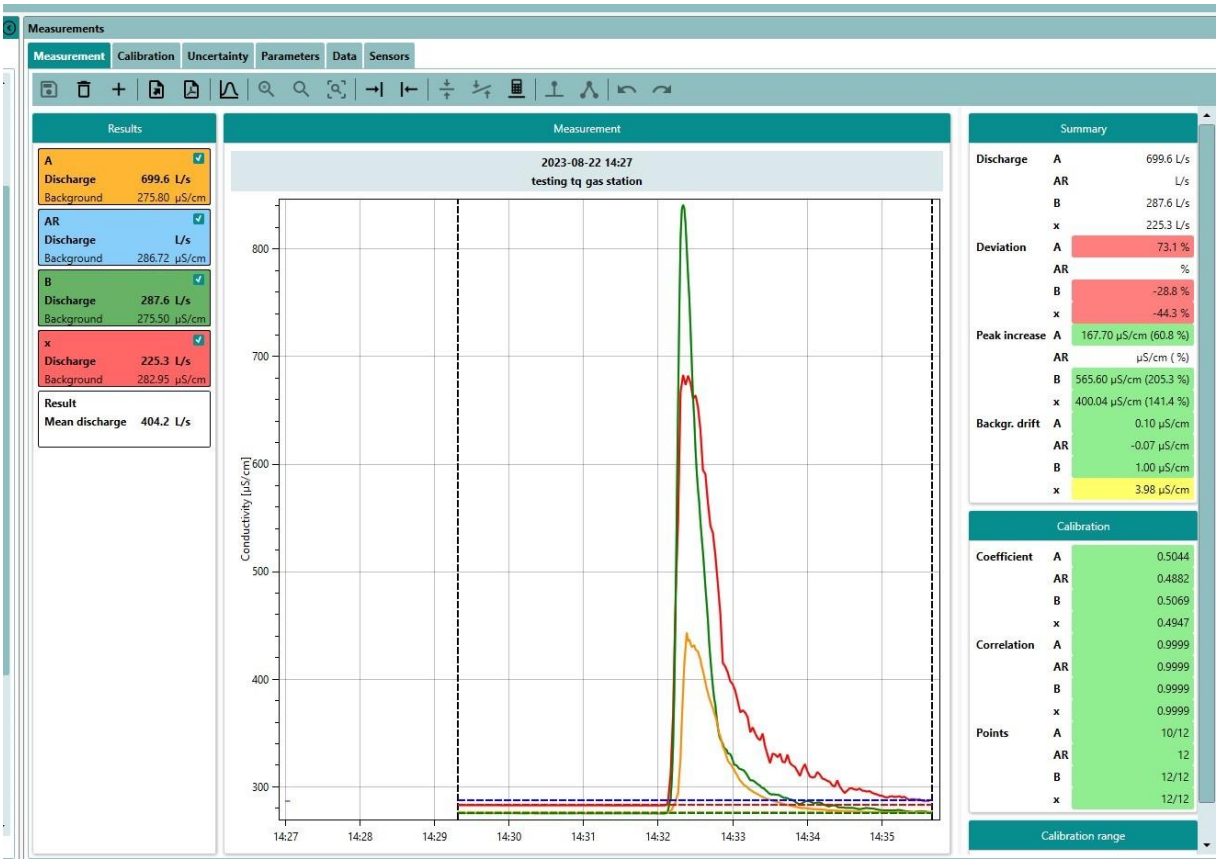
Answer: Ensure that you have installed the correct up to date version of the Commander software and that it is not a demo version. If you have been supplied with a demo version previously, please ensure that you have downloaded the correct full version from the USB stick. Also ensure you have registered a Sommer account and password before trying to access the software with the TQ-Amp and sensors. TQ-Commandersoftware does not work on a remote desktop or on a terminal server.

FAQ 5: I have two TQ-Amp with the same device address, when I am look at the data in post processing it is hard to tell which sensor is which line on the graph. When I initially connected to the TQ-Amp I forgot to change the device address of the TQ-Amp and they are both the same.

Answer: If there is an issue with the address of the TQ-Amp and probe the below menu. Select the Data (F6) then sensors and select the sensor. Once selected you can then edit the settings of the sensor. Once this has been changed there should it will remain the same when reconnecting to the TQ-Amp at another time or date.



FAQ 6: I have performed my measurement and each of the sensors is showing a different shape of measurement curve. One of the measurement curves is much smaller than the others. My measurement results look like the below example.



Answer: If the above measurement graph appears like the above example then it is more than likely that the mixing distance is poor. Please ensure that your tracer is properly mixed before input to the river. Also refer to the table in (Minimum mixture length for the conductivity measurement) regarding mixing distances.

FAQ 7: I was taking flow measurements and there were some periods where the probes disconnected, creating data gaps. How i can restore missing data?

Answer: Yes, all data stored on TQ-Amp can be uploaded to TQ-Commander (see Reloading data from TQ-Amp).

But make sure that your PC has one of the latest versions of the **FTDI driver** installed. It is responsible for the USB connection to the TQ-Amp.

Now, when you turn on TQ-Amp and plug-in USB cable to PC you should see the connection to the TQ-Amp in the device manager as a **COM port**.

FAQ 8: How long is the measurement data stored on the TQ-Amp?

Answer: There is no time limit on the storage of data in the TQ-Amp. However, it should be remembered that the TQ-Amp memory can store about 7 days of measurements lasting (approximately 160 hours). And accordingly, new measurements erase the oldest ones. Therefore, depending on how long are the measurements and how often you take it, the less old data remains on the device.