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Let's Solve Water

August 19, 2021

Webinar

Analysis of Fresh Water with Auto Titrators

SI Analytics® WTW®

House Keeping

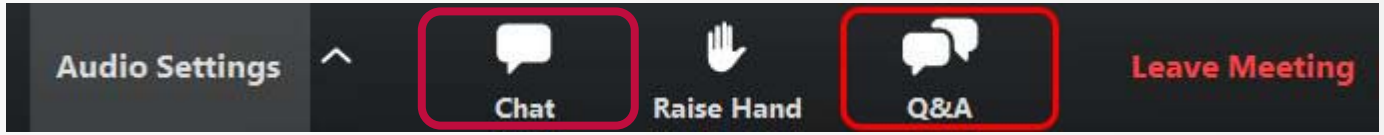
60 minute webinar

We are recording

Follow-up email

Presentation download

Webinar recording



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Our Presenters

Stefan Kaus

Titration Product Manager

- More than 30 years experience in titration application, automation and development of titrators

Dr. Jens Hillerich

Head of Titration Applications
PhD in Engineering

- 5 years of experience in titration applications, automation and development of titrators

Dr. Tao Su

Product Manager &
PhD in Environmental Sciences

- Responsible for product sales and promotion of WTW online products throughout North Asia with 3 years with Xylem (Analytics)

Poll Question #1

Do you have an automatic titration system in your laboratory or workplace?

Evolution of SI Analytics

Merge of four brands (WTW, Ebro, SI Analytics and Sensortechnik Meinsberg) to Xylem Analytics Germany

ITT acquires Nova Analytics

1937 1940 1973 1976 1979 2001 2003 2010 2011 2016

SCHOTT GERÄTE

Nova Analytics acquires SCHOTT-Geräte: SCHOTT Instruments

Spin-Off XYLEM Inc.

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SI Analytics Head Office

- Located in Mainz (South West Germany)
- 30 km to Frankfurt (Rhein-Main) Airport

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Xylem Analytics - SI Analytics®

- Site is on premises of Schott AG
- Production, R&D, order processing, sales and marketing
- 120 employees

SI Analytics® Product Overview

Electrodes and meters for lab, field and process

Piston burettes and automatic titrators

Capillary Viscometry & Automatic Viscosity Systems

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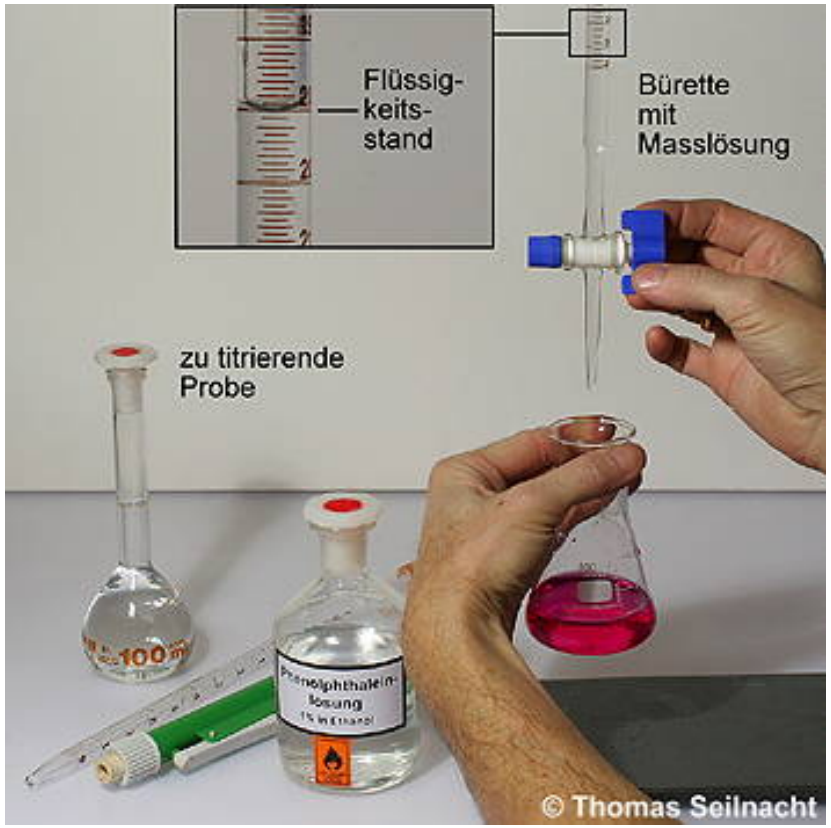
Why is Titration still used?

- Well known method
  The method is old (about 200 years!) and well known in the lab.
- Versatile
  Hundreds of methods exist for all ranges for contents from ppm up to the 100 % range.
- Cost-effective
  With a simple equipment you can already carry out a titration. Low purchase costs and low follow-up costs
- Fast and accurate
  The titration time is usually between 1-3 min. The reproducibility is often 0.1 % or even better



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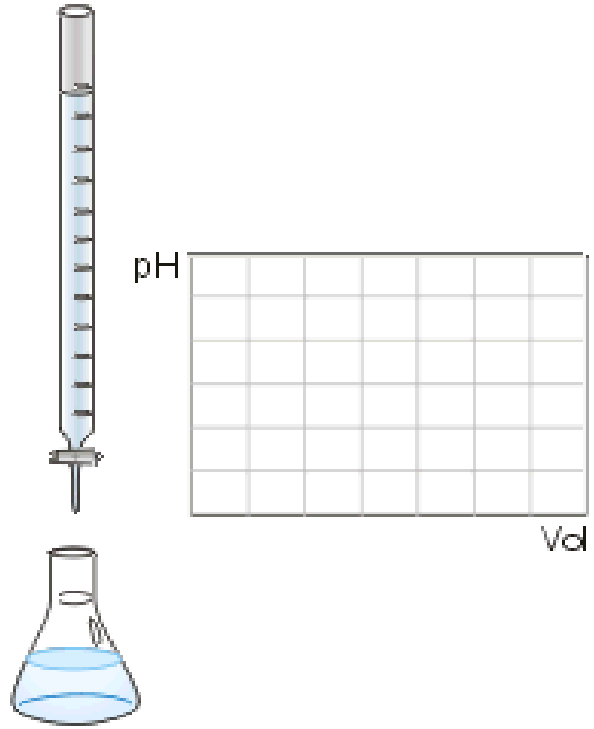
What is Titration?

- **Absolute method**
  The result is calculated directly from the consumption of the titrant.
  Cumbersome calibration is not necessary.
- **Quantitative analytical method**
  This means that you want to know how much is contained in a sample and not which substance. The substance is (mostly) known.
- **General principle**
  Titration is the addition of a liquid reagent of known concentration (titrant) to a sample of unknown concentration.

What is Titration?

- The sample is dissolved in water or another suitable solvent, such as ethanol, toluene, etc.
- A chemical reaction takes place during the addition of the titrant. This reaction is known, clear and always takes place in the same way.
- The end of the reaction is indicated by either a color indicator or a potential change (mV, pH, µA...).



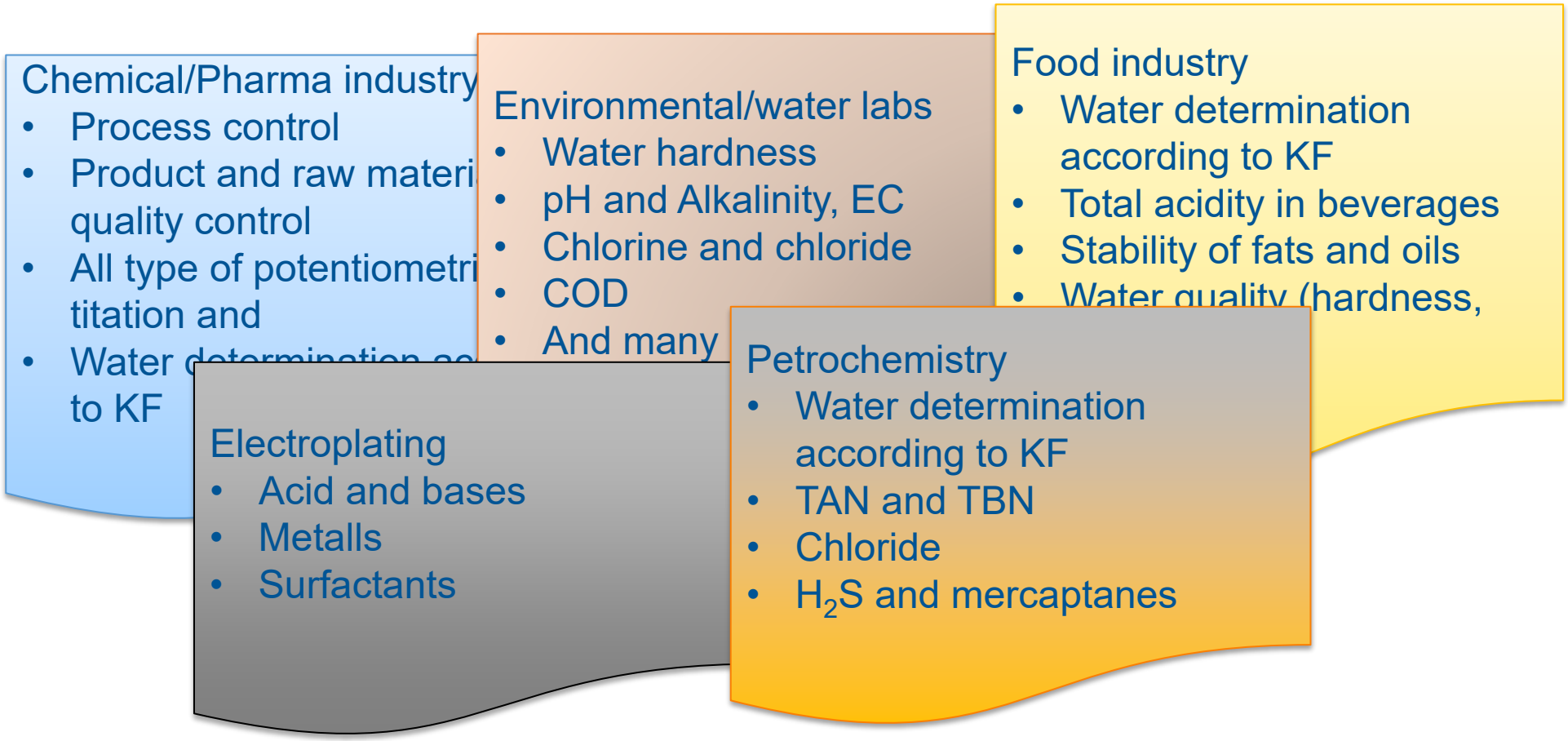
$$HCl + NaOH \longrightarrow NaCl + H_2O$$

$$H_3O^+ + Cl^- + Na^+ + OH^- \longrightarrow 2\,H_2O + Cl^- + Na^+$$

Poll Question #2

Which industry are you working in?

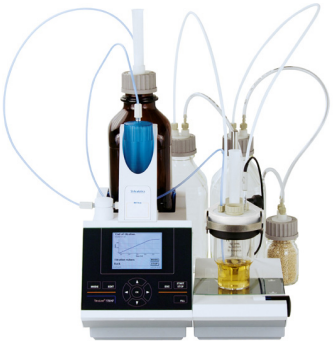
Where is Titration used?

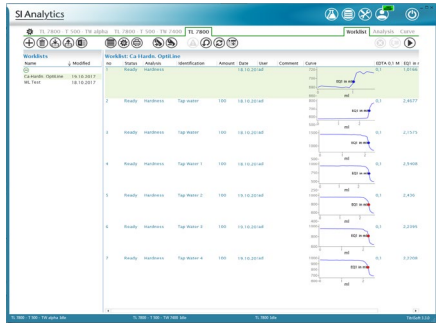


Main Applications in Fresh Water Analysis

- pH value: APHA 4500-H^+/DIN EN ISO 10523/ASTM D1293/EPA 150.1
- Electrical Conductivity ISO 7888/EN 27888/ASTM D1125/EPA 120.1
- Alkalinity: APHA 2320/DIN EN ISO 9963-1/ASTM D1067
- Calcium/Magnesium and total water hardness: ASTM D511, D1126/ISO 6058, ISO 6059, EPA 130.2
- Chlorine: ASTM 1253, EPA 330-1 and 330-2, DIN EN ISO 7393-1 and 7393-3
- Chloride: ASTM D 512, APHA 4500-Cl/D
- Fluoride: ASTM D 1179, EPA 340.2, ISO 10359-1
- Ammonium: ISO 5664, EPA 359.2, EPA 305.3, ASTM D1426

SI Analytics Titrators & Autosamplers





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Sample Changer TW 7200 – the flexible solution

- Various titration heads and sample trays from 12 up to 38 positions available for titration application.
- The beaker size varies from 50 ml up to 600 ml.
- A sample tray for COD titration vessels is also available for the TW 7200

Sample Changer TW 7450 – for high sample throughput

- Various titration heads and sample racks 2 with 42, 48 and 72 positions.
- The beaker size varies from 50 ml up to 250 ml.

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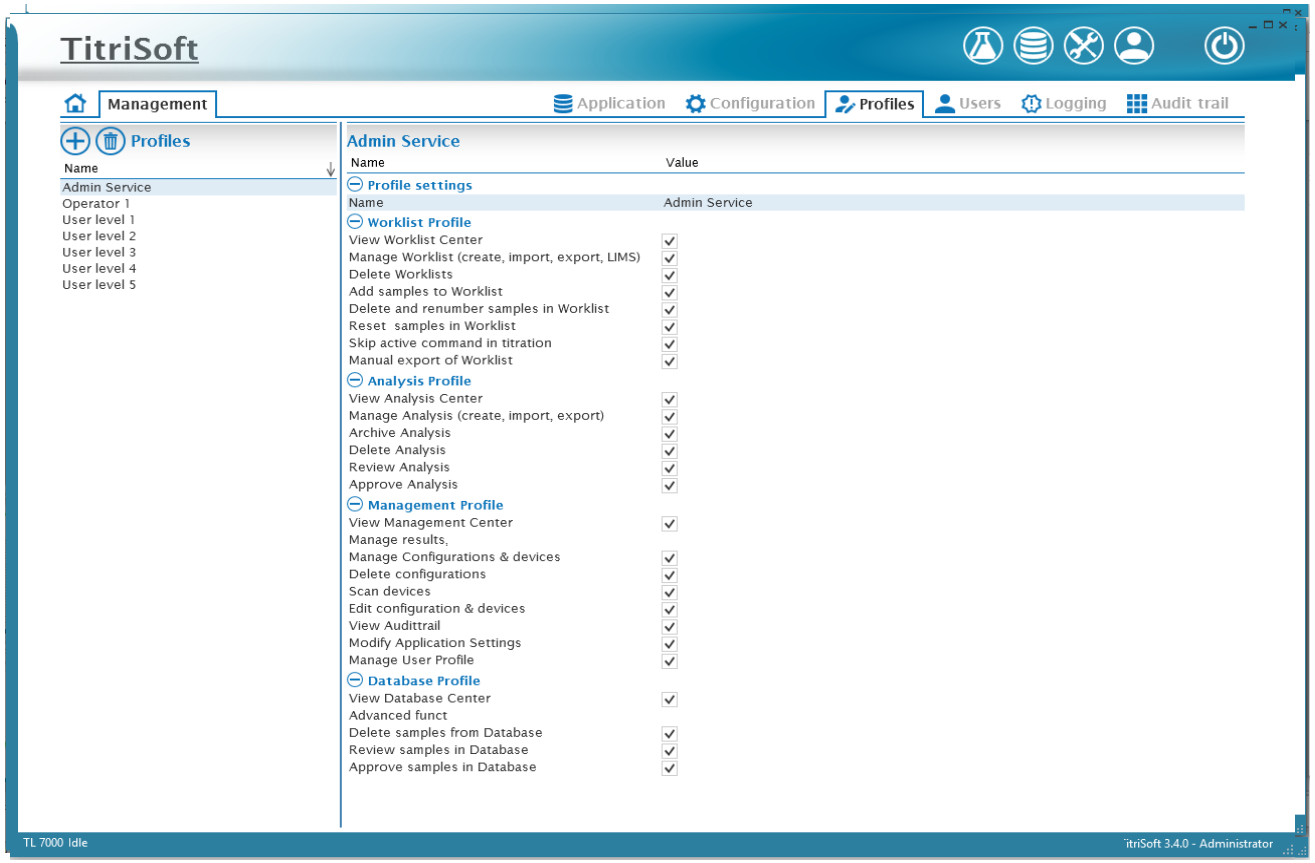
PC Software TitriSoft 3.5 & 3.5P

- The PC software for the TitroLine® 7000 and further titrators, piston burettes and autosampler
- With TitriSoft you have the full control of each part of the method. All settings are made with the software



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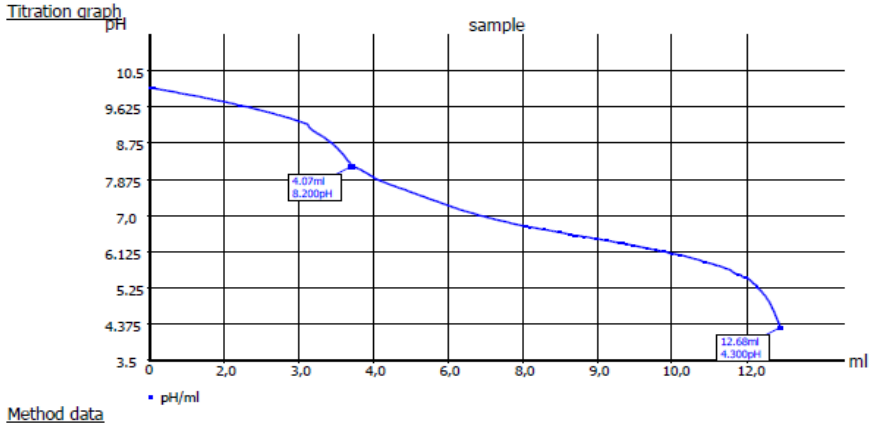
Alkalinity

- Determination of the carbonate and hydrogen carbonate hardness of water
- The water sample is titrated with HCl (0.01 – 0.1 mol/l) to two fixed pH endpoints 8.3 and 4.5 or inflection points

Standard documentation

Titration graph



Method data

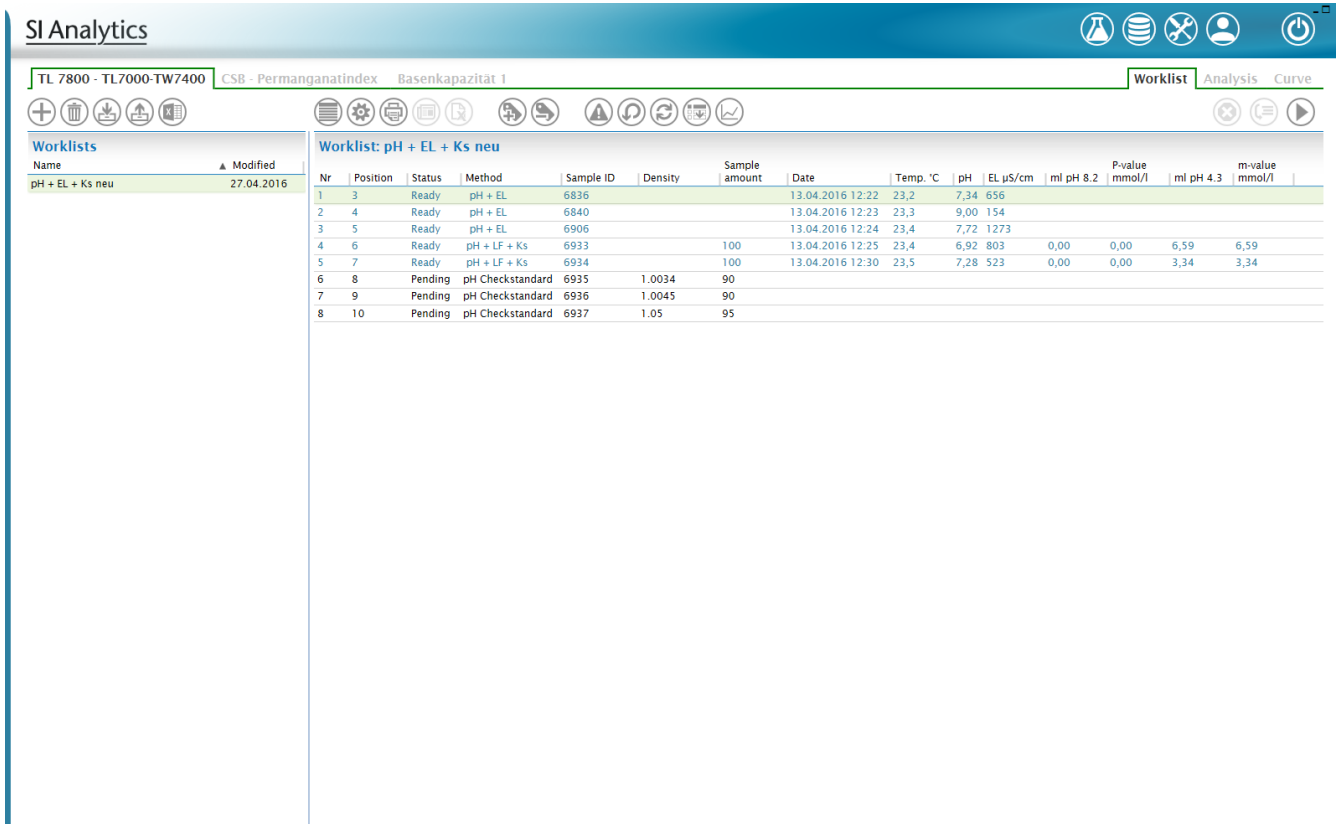
Method name:	Alkalinity (p+m)		
End date:	31.10.11		
End time:	13:43:16	Titration duration:	9 m 8 s

Titration data

Sample ID:	Without	Pattern:	110.0000ml
Start pH/temp:	pH10.076	End pH/temp:	pH4.274
start temperature:	25.0 °C (m)	end temperature:	25.0 °C (m)
Zero point:	pH 7.00 / 0.1 mV	Slope:	100.0% / -59.2 mV/pH
EP1:	4.073 ml/pH8.200	EP2:	12.684 ml/pH4.300
p-value:	3.70 mmol/l	m-value:	11.53 mmol/l

pH, Conductivity and Alkalinity (automation)

- With the TitroLine® 7800 you can measure all three parameters in one beaker one after another
- Public water labs with many sample are using autosamplers
- Preferred the x/y TW 7450-42 or 48 are used for this application but also the TW 7450-72 can be used
- First the EC, temperature and the pH is measured. Then the alkalinity is titrated with HCl



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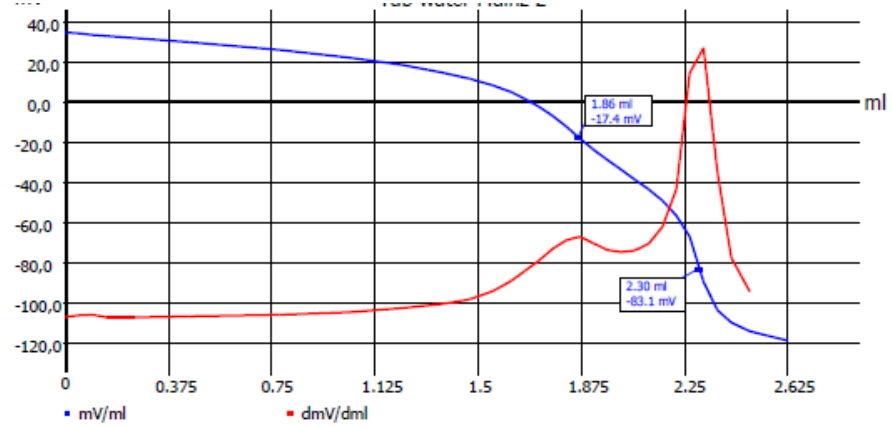
Determination of Total Hardness

- The total hardness is the sum of all alkaline earth metals (Ca, Mg…) in water
- After the addition of NH_4OH/NH_4Cl-buffer solution and an indicator the water sample is titrated with EDTA-Na_2 to one inflection point
- As sensor for the colorimeric indication we use the optical sensor OptiLine 6
- Also a Ca or Cu-ISE can be used to determine the total hardness. With a Ca-ISE is it also possible to titrate the Ca and the Mg- concentration with one titration.



Method data

Method name:	Ca and Mg	Titration duration:	5 m 10 s
End date:	23.11.12	End time:	16:11:23

Titration data

		Pattern:	100.00000 ml
Start mV:	34.6 mV	End mV:	-118.9 mV
EQ1:	1.863 ml / -17.4 mV	Calcium:	74.7 mg/l
EQ2:	2.303 ml / -83.1 mV	Magnesium:	10.7 mg/l

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Analysis of fresh water with auto titrators

Live demo of pH + EC + Alkalinity and Total hardness parallel on two titration systems

Poll Question #3

Which titration application would you like to see us cover in our next webinar?

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Let's Solve Water

August 19, 2021

Process & Treatment Manager, North Asia

Dr. Tao Su

Webinar

Analysis of Fresh Water with WTW Products

WTW

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Dr. Tao Su

BACKGROUND

PhD in Environmental Sciences
University of Tokyo

- Xylem Product Manager
- Responsible for product sales and promotion of WTW online products throughout North Asia.
- 3 years with Xylem (Analytics)

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Topics

- Parameters to validate for fresh water and drinking water
- How WTW lab products can help you

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Poll Question #4

In your routine water quality analysis, which parameters do you usually measure by electrode and meter?

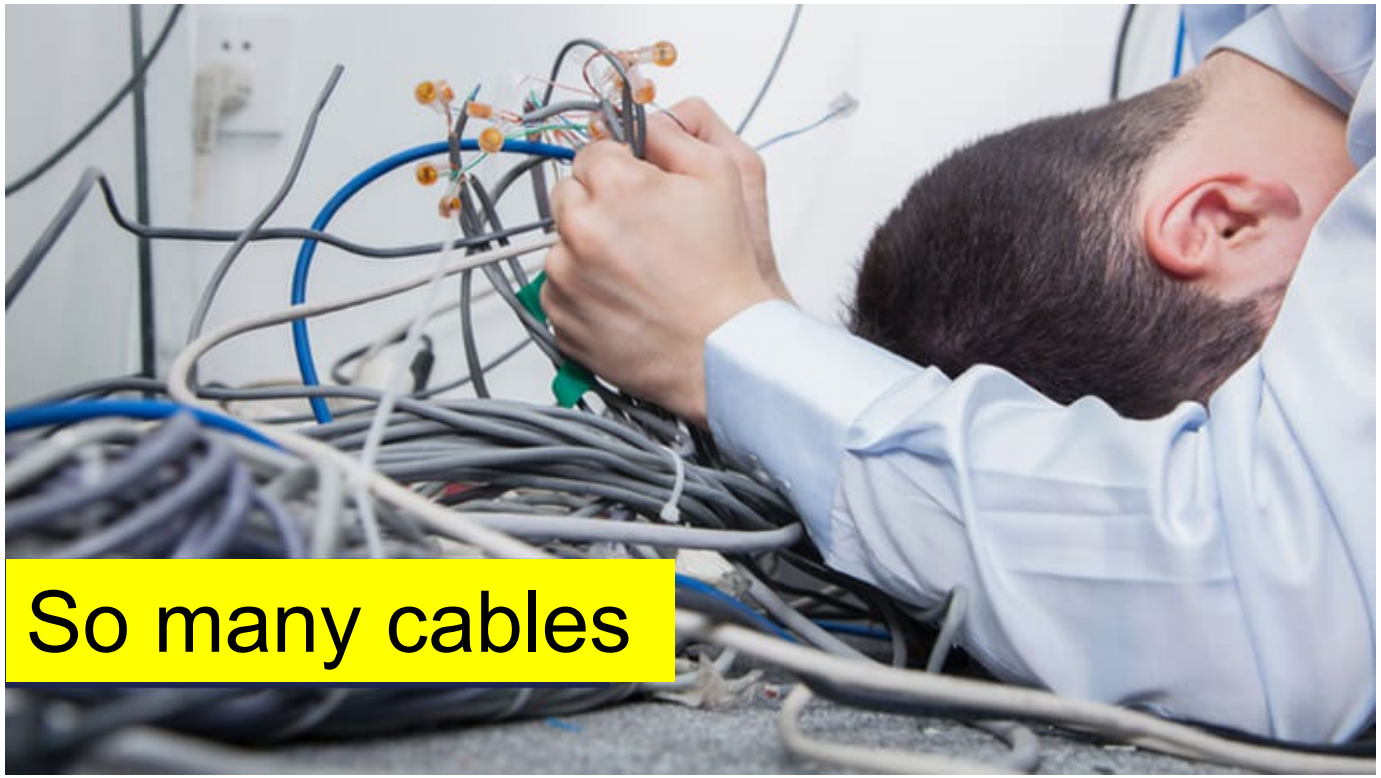
Water Quality Parameters

	Physical parameters	Chemical parameters
1	Turbidity	pH
2	Temperature	Acidity
3	Color	Alkalinity
4	Taste and odor	Chloride
5	Solids	Chlorine residual
6	Electrical conductivity (EC)	Sulfate
7		Nitrogen
8		Fluoride
9		Iron and manganese
10		Copper and zinc
11		Hardness
12		Dissolved oxygen
13		Biochemical oxygen demand (BOD)
14		Chemical oxygen demand (COD)
15		Toxic inorganic substances
16		Toxic organic substances
17		Radioactive substances

* Nayla Hassan Omer, Water Quality Parameters, Water Quality - Science, Assessments and Policy

WTW – leading you into the future

Are you getting tangled in your cables?



WTW wireless solution

IDS Wireless Sensor

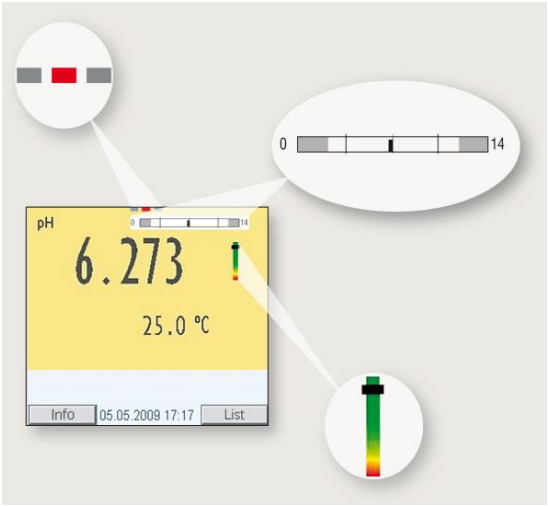
PH	FDO	Turbidity	Cond. & TDS & Salinity

IDS WLM Kit

- **Measure everywhere**: Under laminar flow benches, laboratory hoods, glove boxes, out door (Range around 10 m)
- **Continuous operating times**: pH/ORP 60 h, conductivity 30 h, D.O. 9 h, turbidity 5 h
- **Waterproof IP 66** rated for outdoor applications

Handheld and Benthtop IDS Meters – wireless ready

Channel display



CMC (Continuous measurement Control)
monitoring the correct measuring range: gives indication if the current value is inside the calibration range and warning if it is outside

QSC (Quality Sensor control)
function for IDS pH electrodes, It evaluates the condition of an IDS-pH sensor individually and with a very fine grading.from 0~100 (from green to red)

GMP/GLP
User administration with different access levels

- Three galvanically isolated inputs for fail safe signals
- Brilliant color graphic display for clear information
- 1 meter with +10 parameters
- Wireless ready

WTW Photometer

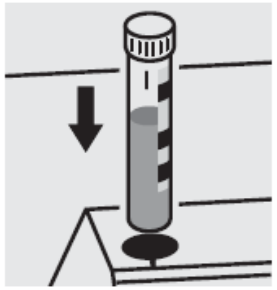
Chemical parameters
pH
Acidity
Alkalinity
Chloride
Chlorine residual
Sulfate
Nitrogen
Fluoride
Iron and manganese
Copper and zinc
Hardness
Dissolved oxygen
Biochemical oxygen demand (BOD)
Chemical oxygen demand (COD)
Toxic inorganic substances
Toxic organic substances
Radioactive substances

Photolab 7600

Pipette 4.0 ml of **AC-1** into a round cell.

Add 1.0 ml of the sample with pipette, close the cell with the screw cap, and mix.

Add 0.50 ml of **AC-2** with pipette, close the cell with the screw cap, and mix.

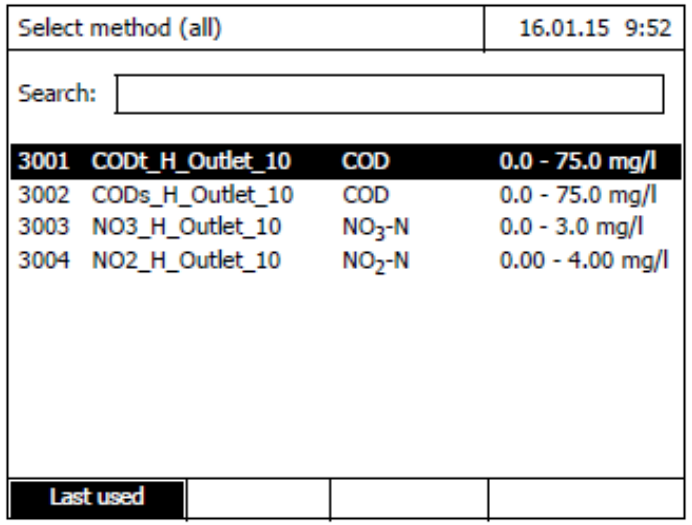


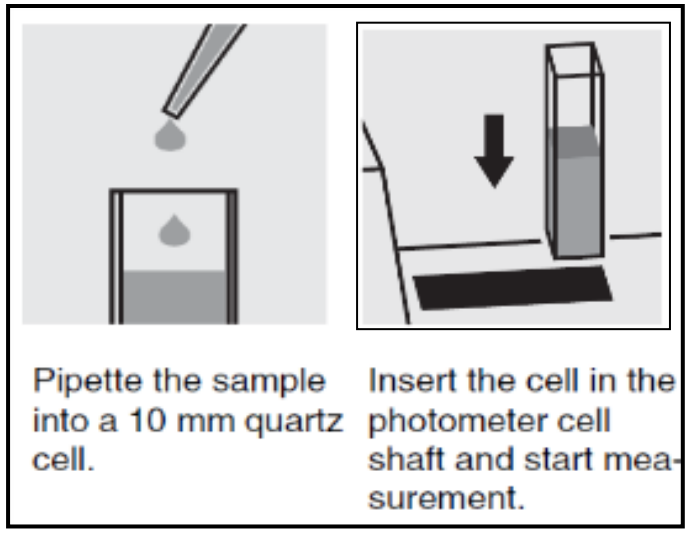
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

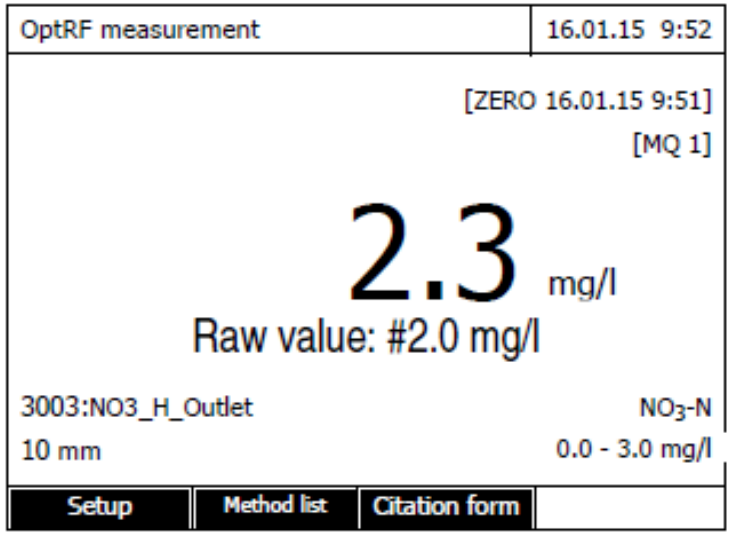
Pioneering online procedures transferred to the Lab!

Optical Reagent-Free Measurement OptRF

COD, NO_3, NO_2 - Just measure!







- *Faster* than any digestion (COD standard method: 2.5 hrs.)
- *Cost free* no need of chemicals
- *Ecofriendly* no potassium Dichromate, Mercury…
- *Non-hazardous*, *non carcinogenic*

Turbidity

PhotoFlex® Turb

- **Photometer, pH, Turbidity, ORP**

Turb® 750

- High precision measurement procedure: **IRPC**
- Fast and easy handling including quick routine

Q&A Session

Poll Question #5

Would you like our product specialists to contact you with more information?

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Questions?

CONTACT US

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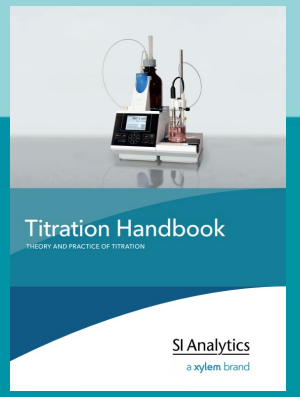
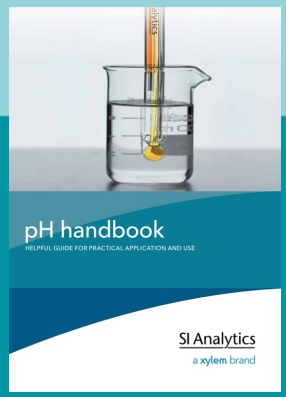
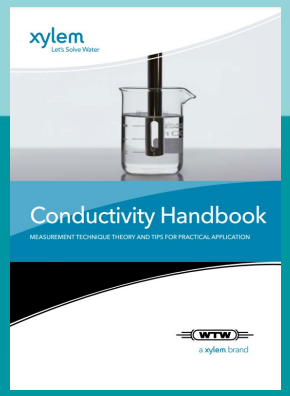
Automated Titration vs. Manual Titration



Titration *Handbook*



pH *Handbook*



Conductivity *Handbook*

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