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Selection table titration

Overview table piston burettes

Application	TITRONIC® <i>basic</i>	TITRONIC® <i>universal</i>	TITRONIC® <i>110 plus</i>
Manual titration	■	■	■
Automatic titration ⁽¹⁾		■	■
Dosing of pre-selected volumes		■	■
Pre-titration		■	■
Variable dosing and filling speed		■	■
20 ml dosing unit	■	■	■
50 ml dosing unit		■	■
1, 5, 10, 20 and 50 ml changer units			■
Results output via RS 232	■	■	■
Remote control via RS 232		■	■

¹⁾ if piston burette is connected to a TitroLine alpha *plus* or TitriSoft

Overview table of titrators

Application	TitroLine <i>easy</i>	TitroLine <i>KF</i>	TitroLine <i>KF trace</i>	TitroLine <i>alpha plus</i>
pH/mV titration aqueous (acidity, hydrochloric acid, citric acid, "Kjeldahl", ammonia ...)	■			■
pH/mV titration non-aqueous (TAN/TBN, FFA, titrations with perchloric acid ...)				■
Redox titrations (iodometry, permanganometry ...) ⁽²⁾	■			■
Halogenide titrations (chloride, "salt", bromide ...)	■			■
H ₂ S and mercaptan				■
pH-stat applications (enzyme kinetics, soil samples, biotechnology)				■
Water analysis according to KF Volumetric method (10 ppm – 100 %)				■
Water analysis according to KF Volumetric method (0.01 % – 100 %)		■		■
Water analysis according to KF Coulometric method (1 ppm – 5 %)			■	
Bromine number				■
Titration with <u>more</u> than one end point or equivalence point (phosphoric acid ...)				■
Applications with several piston burettes				■
Applications with sample changer				■
Applications with TitriSoft				■

⁽²⁾ except COD and sulphuric acid (SO₂)

Dosing, titrating and water analysis according to Karl Fischer can be so easy

Innovative electrochemistry – right from the start

With the development of the glass electrode more than 70 years ago, we created the basis for the success of electrochemical measurement. Since then, with our range of efficient pH glasses, innovative electrodes and instruments such as pH meters, conductometers, oxygen measuring instruments, we have turned the electrochemical measurement into an indispensable, trouble-free and reliable procedure that is now being used throughout the world.

Building on this know-how, we have also developed a range of reliable laboratory instruments for dosing, titrating and Karl Fischer water analysis. The coulometric KF titrator TitroLine KF *trace* is the most recent instrument of this series.

KF titrators from SCHOTT Instruments combine ease of use with maximum accuracy, and the robustness required for daily operation in the laboratory. Benefits, which far outweigh the cost of these instruments.

For complex application such as difficult, nonaqueous titrations and for automatic measuring stations, the TitroLine alpha *plus* titration system is also available.

TITRONIC® and DURAN® are registered trademarks. Subject to technical modifications.

Just what you need to make your routine daily work simpler and even better

Like the TitroLine *easy* and TitroLine *KF* titrators, the TITRONIC® *basic* and TITRONIC® *universal* piston burettes are robust tools for dosing and titrating, which were designed specifically for daily routine use in the laboratory. Despite their robustness, these are high precision instruments. Even the simplest burette is equipped with an UV-protected precision glass cylinder made of DURAN® and a motor-controlled 3/2-way valve made of extremely resistant PTFE/ETFE. But we have also focussed our attention on the importance of easy, trouble-free operation – so a manual is something you may never need to use.



TITRONIC® basic

The burette with the ›Mouse‹

Anyone with a TITRONIC® basic in the laboratory will leave bottle-top burettes and classic glass burettes on the shelf. Manual titration can be performed more reliably and accurately with the TITRONIC® basic, and the results can be documented when required.

Operation is so easy

The titration process is carried out by pressing a button on the ›mouse‹ – the handheld device TZ 3680. You can monitor the dosed quantity conveniently on the large display. The TITRONIC® basic is equipped with an RS232-C serial interface so that you can document your results. Here, for example, you can also connect our small, practical TZ 3460 rollpaper printer or any other printer with a serial RS-232-C interface. Needless to say, you can also connect your PC to the TITRONIC® basic.

Precision is integrated

The accuracy of the TITRONIC® basic is guaranteed by the precision glass cylinder made of DURAN® borosilicate glass with its measurement deviation of less than 0.1 %. And the motor-driven, chemically resistant 3/2-way valve also provides its contribution for precise, reproducible values: It enables unpresurised drawing and dosing and therefore effectively prevents outgassing of liquids and vapour formation due to excessive vacuum pressure.

The magnetic stirrer is available as an accessory

The TM 96 magnetic stirrer is available as an accessory. It is connected directly to the burette, which provides the necessary power.



The complete workplace: precision analysis with no shaky compromises. With 8000-step resolution, precision glass cylinder with UV-protection, motor-controlled 3/2-way valve of extremely resistant PTFE/ETFE and an interface for documentation of the results. It's better to be on the safe side! (The bottle set must be ordered separately as an accessory.)

Technical data

Hand control element	miniature 4 pole round socket, conforming to DIN standards
RS-232-C	for connecting a printer with serial interface or PC for documentation
Display	four digit LCD display, 20 x 48 mm, height of digits: 12.7 mm
Volume display	0.01 ... 999.9 ml
Resolution	0.01 ml
Cylinder	20 ml DURAN® borosilicate glass cylinder with UV protection sleeve
Tubing	FEP with UV protection systematic error 0.1 %,
Dosing accuracy	random error 0.05 %, determined according to EN ISO 8655-6
Valve	3/2-port directional control valve made of PTFE/ETFE
Housing material	polypropylene and polyflamm RPP 371 NT, 20 % talcum
Front foil	polyester
Dimensions	135 x 310 x 205 mm (W x H x D), including dosing unit, without stirrer
Weight	approx. 2.1 kg
Ambient temperature	+10 ... +40 °C (for operation and storage)
Power supply	230 V~; 50/60 Hz or 115 V~; 50/60 Hz
Appliance safety	corresponds to Protection Class II in accordance with DIN EN 61010, part 1
Conformity	EN ISO 8655-3

TITRONIC® *universal*

Titration manually, dosing perfectly

The TITRONIC® *universal* is a perfect motor-driven burette for manual titration and an extremely precise dosing instrument for dosable liquids, solvents and titrating agents. However, the TITRONIC® *universal* not only first-rate as a stand-alone instrument – it also thrives as the heart of a computer-controlled dosing or titrating system.

Adjusting easily, dosing precisely

With the TITRONIC® *universal* you can preselect any dosing volume from 0.01 ml to 999.99 ml easily with the keypad and you can adjust the dosing speed to a continuously controllable setting. Furthermore, with the TITRONIC® *universal* you can define the waiting time between the volume steps, a useful tool for incremental dosing tasks. The dosing process is carried out precisely upon being called. This, by the way, is also extremely practical in the case of manual titration with the hand-held device: Using a precisely adjusting pre-titrating volume, which can be called up at the press of a button before each titration, you can reduce your titration times considerably.

Documenting results reliably

To document your results, simply connect our small, practical TZ 3460 rollpaper printer or any other printer with a serial RS-232-C interface.

The TITRONIC® *universal* gets on quite well with the PC

We have equipped the TITRONIC® *universal* with **two** serial RS-232-C interfaces. This allows you to not only connect a printer in order to document data in the stand-alone mode but also extends the available range of use of the TITRONIC® *universal* quite considerably. For instance, you can use a PC to control all functions of the TITRONIC® *universal* via one of the two serial interfaces. The

address is set automatically or manually. But the TITRONIC® *universal* can do a lot more: For complex dosing and titrating processes, up to 16 burettes can be connected in series whenever required. The burettes are connected to one another via the RS-232-C interfaces according to the daisy chain principle. Accordingly, each instrument can then be addressed separately and provides independent feedback data – without an additional data cable.



Technical data

Designed for maximum precision

All components of the TITRONIC® *universal* are designed for maximum precision. This begins with the dosing attachments, which are available in 20 ml or 50 ml volumes. The glass cylinders made of DURAN® borosilicate glass are precisely calibrated and provided with an UV protective coating. The dosing piston is driven by a step motor with a resolution of 8,000 steps. The motor-controlled 3/2-way valve is made of extremely resistant PTFE/ETFE. This 3/2-way valve enables unpressurised drawing and dosing so that outgassing of liquids is prevented as well as vapour formation due to excessive vacuum pressure.

Made for robust laboratory operation

All parts of the TITRONIC® *universal* that come into contact with liquids are made of chemically resistant materials. A polyester front foil protects the keypad and display, and the tubing is in FEP with UV protection.

The magnetic stirrer is available as an accessory

The TM 96 magnetic stirrer is available as an accessory. It is connected directly to the burette, which provides the necessary power.

Keyboard connection	miniature 4 pole round socket, conforming to DIN standards
Stirrer connection	plug-and-socket connection with integrated low-voltage power supply (15 V DC) for the TM 96 magnetic stirrer
RS-232-C-1	for connecting a printer with serial interface or a PC to document consumption in ml or for data backup
RS-232-C-2	connection of additional piston burettes TITRONIC® <i>universal</i> ('Daisy Chain')
Configuration of the RS-232-C interface	connection: miniature 4 pole round socket preset: 1 stop bit adjustable: baud rate: 1200, 2400, 4800 or 9600 baud word length: 7 or 8; parity: no, even or odd
Display	8-line LCD display, 69 x 39 mm, 64 x 128 pixel, with background illumination and contrast adjustment
Volume display	00.00 ... 999.9 ml
Display resolution	0.01 ml
Dosing volume	0.0 ... 999.99 ml
Dosing speed	0.1 ... 40 ml/min (with 20 ml dosing unit) 0.1 ... 100 ml/min (with 50 ml dosing unit)
Filling time	30 s to 999 s adjustable (100% in relation to the cylinder volume)
Pre-titrating volume	0.1 ml to 99.99 ml
Increment volume	0.01 ... 999.99 ml
Waiting time between the increments	0.1 ... 999.9 s
Cylinder	20 ml or 50 ml DURAN® borosilicate glass cylinder with UV protection sleeve
Dosing accuracy	systematic error 0.1 %, random error 0.05 %, determined according to EN ISO 8655-6
Valve	3/2-port directional control valve made of PTFE / ETFE
Tubing	FEP with UV protection
Housing material	polypropylen and polyflamm RPP371 NT, 20% talcum
Front foil	polyester
Dimensions	135 x 310 x 205 mm (W x H x D), including dosing unit, without stirrer
Weight	approx. 2.1 kg
Ambient temperature	+10 ... +40 °C (for operation and storage)
Power supply	230 V~; 50/60 Hz or 115 V~; 50/60 Hz
Power consumption	18 VA
Conformity	EN ISO 8655-3

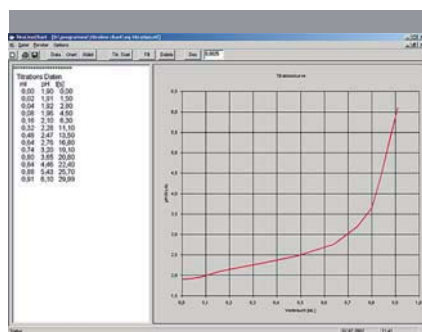
With the TITRONIC® *universal* in the stand-alone mode, you can use the keypad to input all settings conveniently on the instrument. The practical hand-held device can be used for manual titrations or to start and stop a dosing task. (The bottle set must be ordered separately as an accessory.)

TitroLine *easy*

The intelligent titrator for your routine daily work

Quick and easy as its name suggests

The TitroLine *easy* is the ideal titrator for your routine daily work. This instrument provides you with the perfect combination of a piston burette, a pH/mV meter and integrated intelligence. Ten titration methods for various applications are preinstalled and can be called up easily as required. The methods are pre-parameterised. You only need to select your titration procedure: with a self-searching end point, with a pre-set end point, or manual titration with the »mouse«. The titration process begins as soon as you press the start button. This saves you time and money.



With the TitroLine Chart software (option), the titration curve can be displayed on the monitor of a connected PC and the titration data can be processed.

Practical and compact: A complete measuring unit. The magnetic stirrer is included. It is connected to the TitroLine *easy*. The bottle set must be ordered separately as an accessory.

Suitable applications for the TitroLine *easy* include:

- salt content in foods
(cheese, soya sauce, ketchup)
- total acid in wine and beverages
- nitrogen according to Kjeldahl



Technical data

easv

Measuring amplifier	measuring input pH/mV electrode: pH-input with 12-bit converter for highly accurate resolution of the measuring signal during titration measuring range pH: 0.00 ... 14.00 measuring range mV: -1400 ... +1400 electrode socket according to DIN 19262 or BNC-socket and reference electrode 1 x 4 mm measuring input temperature sensor Pt 1000, measuring range: -30 ... +115 °C connection socket 2 x 4 mm and 1 x 2 mm
Keyboard connection	miniature 4 pole round socket, conforming to DIN standards
Stirrer connection	plug-and-socket connection with integrated low-voltage power supply (15 V DC) for the magnetic stirrer TM 96
RS-232-C interface	for connecting a printer with serial interface or PC for documentation
Configuration of the RS-232-C interface	preset: 4800 baud, 7-bit word length, 2 stop bits, no parity
Display	matrix-LCD display 69 x 39 mm, 64 x 128 Pixel background illumination and contrast adjustment
Volume display	00.00 ... 999.9 ml
Display resolution	0.01 ml
Cylinder	20 ml DURAN® borosilicate glass cylinder with UV protection
Dosing accuracy	systematic error 0.1 %, random error 0.05 % determined according to EN ISO 8655-6
Calibration	two-point calibration, selection of eight stored buffer solutions in conformity with DIN 19 266 and NBS
Valve	3/2-port directional control valve made of PTFE / ETFE
Tubing	FEP with UV protection
Housing material	polypropylene and polyflamm RPP 371 NT, 20 % talcum
Front foil	polyester
Dimensions	135 x 310 x 205 mm (W x H x D), including dosing unit, without stirrer
Weight	approx. 2.4 kg
Ambient temperature	+10 ... +40 °C (for operation and storage)
Power supply	230 V~; 50/60 Hz or 115 V~; 50/60 Hz
Power consumption	24 VA
Appliance safety	corresponds to Protection Class II in accordance with DIN EN 61 010, Part 1
Conformity	EN ISO 8655, part 3

The sensors – from SCHOTT Instruments

Suitable sensors include pH combination electrodes with or without integrated temperature sensors (Pt 1000), redox combination electrodes, Ag combination electrodes or separate measuring or reference electrodes.

Stored data: the buffer solutions

Data for 2.00 / 4.00 / 4.01 / 6.87 / 7.00 / 9.18 / 10.01 / 12.45 buffers, including temperature coefficients are already stored in the TitroLine *easy*.

Maximum precision for reproducible results

All components of the TitroLine *easy* are designed for maximum accuracy. The glass cylinders made of DURAN® borosilicate glass are precisely calibrated and provided with an UV protective coating. The motor-controlled 3/2-way valve is made of extremely resistant PTFE/ETFE. This 3/2-way valve enables unpressurised drawing and dosing so that outgassing of liquids is prevented as well as vapour formation due to excessive vacuum pressure.

As robust as required for laboratory operation

All parts of the TitroLine *easy* that come into contact with liquids are made of chemically resistant materials. A polyester front foil protects the keypad and display, and the tubing is in FEP with UV protection.

Karl-Fischer Titration – the method for determining water

Quite some experienced analyst will be unpleasantly reminded by the pyridine smell, when hearing the name Karl Fischer. However, modern reagents and most user friendly analysing instruments have definitely cleared that picture. Nowadays all applications can be handled and processed very easily, fast and accurate by using the **coulometric** and **volumetric** Karl Fischer titration instruments. Thanks to its selectivity and precision, the Karl Fischer titration has achieved to be established as the most important method for determining water and humidity.

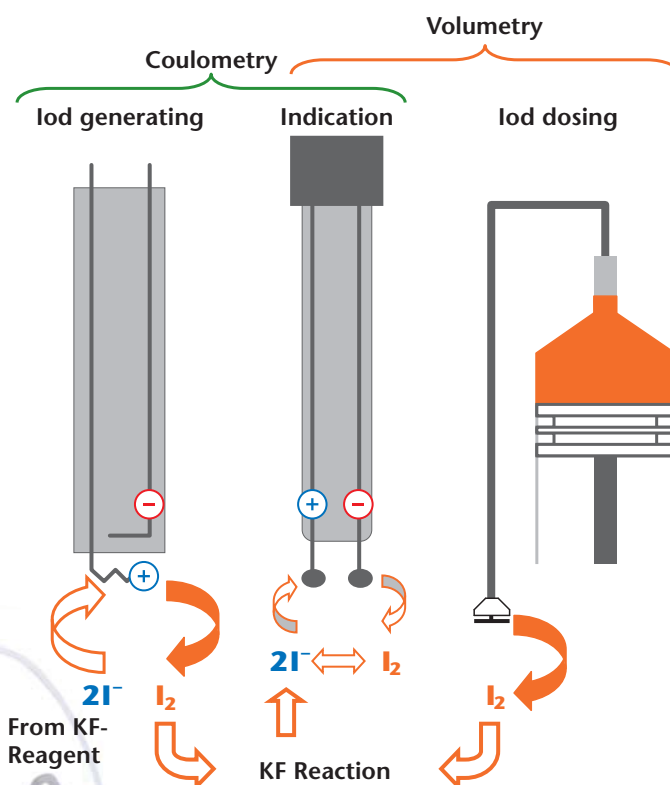
In the following, we would like to ease your decision for either the coulometric (TitroLine KF trace) or the volumetric (TitroLine KF) KF titrator a little.

The basic principle of the water determination according to Karl Fischer (short: **KF**) is a reaction of iodine with water in an alcoholic solution with presence of sulfurous acid and a base.

With the **volumetric** method the iodine can be accurately added through a piston burette or **coulometric** directly produced in the reaction vessel. The

difference between the volumetry and coulometry mainly exists in the manner of dosing the iodine for the titration.

The illustration shows the different types of dosing:



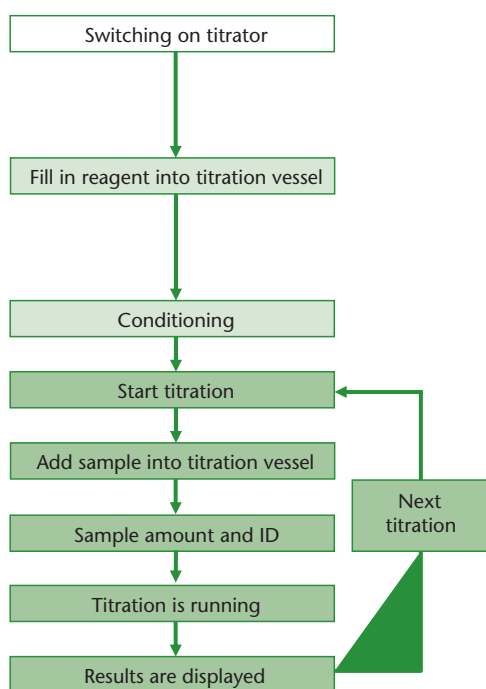
TitroLine KF



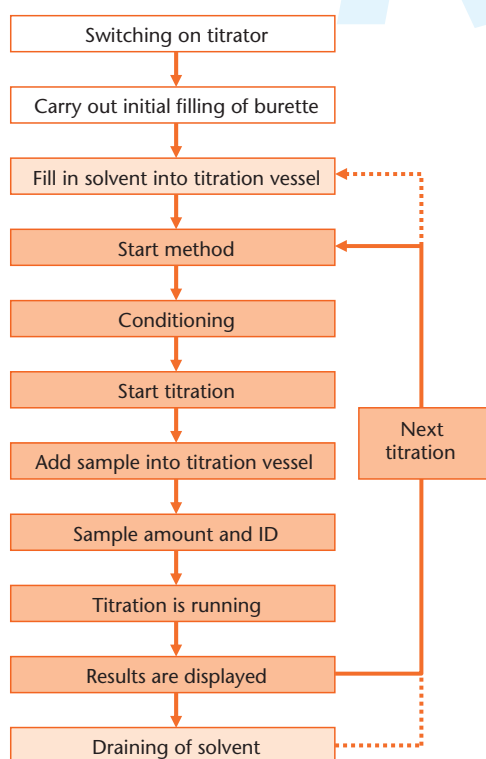
TitroLine KF trace

In practice small differences occur between the two methods which are displayed in the table. The advantages of the volumetry lie in the different types of sample adding and solvent variations, offering more flexible operation potentials. Where on the other hand the coulometry can handle yet lower detection limits and score with the even simpler handling. The compared work flow with coulometry and volumetry are shown with the following illustration. The clearly shorter and easier sequence is noticeable with the coulometry.

Coulometric KF titration



Volumetric KF titration



Comparison: Coulometric and volumetric Karl-Fischer-titration

Property	Coulometry	Volumetry
Water amount and sample amount	Small water amount Small sample amounts	Medium and large water amounts Adapted sample amount
Sample types	Liquid Gaseous (i.e. KF oven) Solid samples with oven	Solid Liquid
Sample addition and preparation	Direct with syringe Gas inlet with oven External extraction Solid samples are evaporated with an oven	Solid samples are added directly Sample preparation with homogenisator Working at higher temperature Direct with syringe
Working method	Very fast Very simple	Fast Simple
Working range	µg range 10 µg up to 5 mg water	mg range 200 µg up to 50 mg water
Trueness	Pretty good for small water amounts > 400 µg Wasser (± 0,5%)	Pretty good for water amounts > 5 mg water (± 0,5%, standardization required!)
Reproducibility	Typical RSD of appr. 1% for water > 400 µg	Typical RSD of appr. 1% for water > 5 mg

TitroLine KF *trace*

In dialogue the coulometric Karl Fischer Titration is quite easy!

Karl Fischer titrations made easy

With the new TitroLine KF *trace* the coulometric water determination according to Karl Fischer you cannot go wrong:

The large display shows every work step ahead in a dialogue structure. The pre-parameterized methods are easily recalled and enhance the total work process. Also the versatility makes the both KF titrators a trouble-free KF measuring place for nearly all areas in the industry, such as for pharmaceutical, chemical and petroleum industry.

The coulometric Karl Fischer titrator TitroLine KF *trace* is the dedicated instrument for determining even smallest water content in your samples. As the coulometric determination of water does not require a standardisation of a titrant, the handling is easier compared with the volumetric titration: Once the instrument is installed, the reagents are inserted into the titration cell and the instrument is switched-on. The TitroLine KF *trace* starts to operate immediately. The conditioning is triggered in the background and automatically determines the drift. Only few minutes later the TitroLine KF *trace* is ready for the first samples.

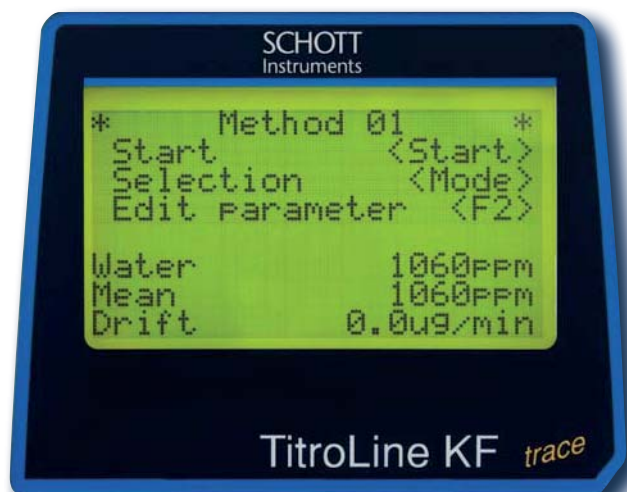


Conveniently with methods

The TitroLine KF is already programmed with the following methods: sample titration, titre water, titre liquid standard, titre tartrate dihydrate, blank value open and blank value solvent. The methods for titre determination cease to apply for the TitroLine KF *trace*. All methods are already set with the commonly used parameters. However, should it become necessary, the parameters can of course be changed.

Parameterization – just in case it will be necessary

The large display gives a clear overview of the next steps in process. Parameterization using the arrow key and the enter/F1 and ESC/F4 key is fairly easy. Taking a look into the operating manual is almost not necessary.



Live titration process

The TitroLine KF *trace* allows watching over the titration by displaying a real-time measuring curve. With just a keystroke you have the option to switch between the standard or graphic display.

Documentation – exactly the way you require it

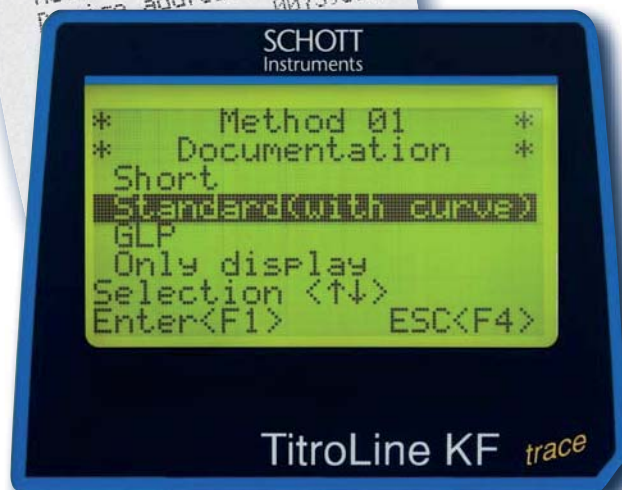
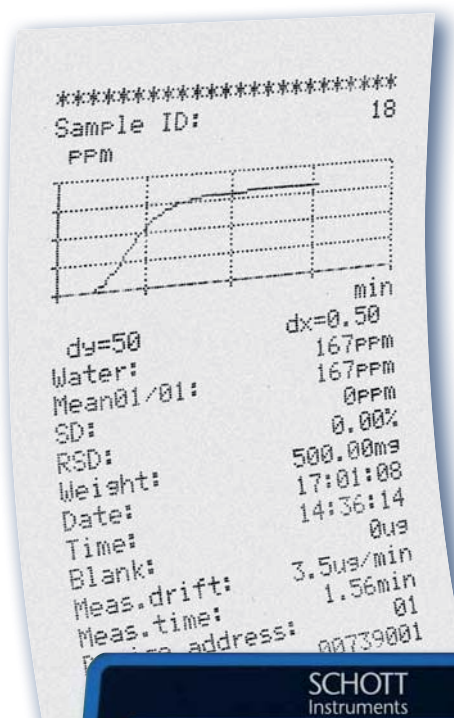
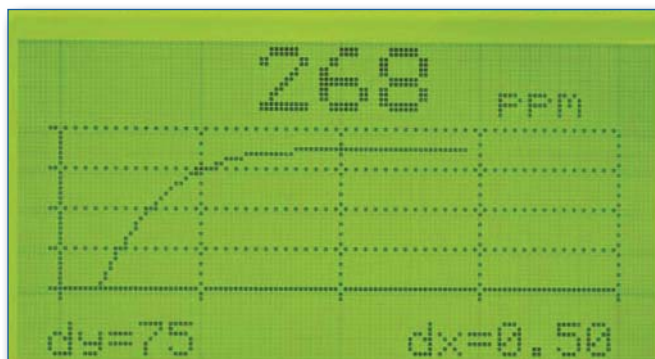
You can decide if you want to print the results in either a short form, as standard form with a curve (only TitroLine KF *trace*) or as complete GLP printout including all method parameters. Of course all results are also indicate with the mean value and the drift on the display.

Automatic selection of the correct calculation formula

Two different may be used to calculate the results. When choosing the method, the correct formula is automatically selected and pre-assigned with the corresponding values. Measurement units for the result can be selected from %, ppm, mg, mg/l, mg/pc (pc= piece) μg (TitroLine KF *trace*) or ml (TitroLine KF). The blank value is calculated in ml or μg and automatically subtracted from the sample titration result.

Statistics

For the statistical evaluation of the analysis the mean value, standard deviation or the relative standard deviation can be determined. The mean value of the titre at the TitroLine KF is the automatic reference for the calculation of the sample result.



Titration stand and titration vessel: Accessories made to match

Titrated samples can be extracted through pushing a button on the titration stand TM KF (standard with TitroLine KF and KF *trace* Module 2 + 4). A further keystroke provides a new reagent. An integrated magnetic stirrer in TM KF takes care of the balanced distribution of reagents and sample.



The titration vessels are hermetically sealed and avoid the penetration of moisture extensively (low drift!). The removable glass vessel from the TitroLine KF is available in two sizes and it is easy to clean. For the TitroLine KF *trace* are to be used two different glass vessels with 3 and 5 openings. Both have a very low drift.

Connection of analytical balances, printers, PC KF oven ...

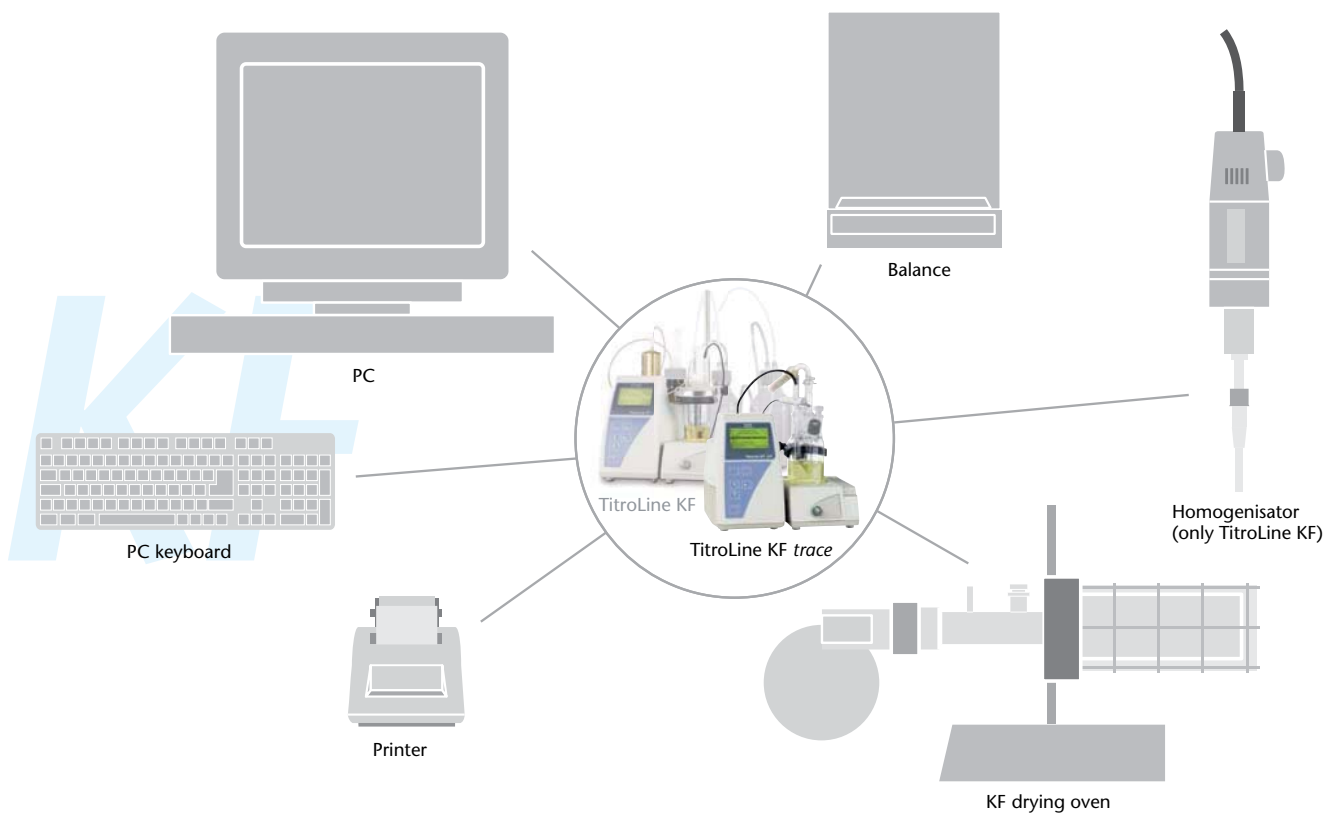
The two RS-232C interfaces and one USB-port* allow you to connect a balance and for automatic transfer of the weighing data and a printer at the same time. It is also possible to connect a PC via the additional USB-port*.

* only TitroLine KF trace

PC control

Both titrators can be easily connected at a PC. The software "KF-Soft"* allows an easy transfer of the data and titration curve on a PC and store it in the integrated database. *

* only TitroLine KF



Technical Specifications TitroLine KF / TitroLine KF *trace*

Hardware

	TitroLine KF	TitroLine KF <i>trace</i>
Display	High contrast 8-lines LCD with 64 x 128 pixel and background illumination ; contrast adjustable	High contrast 8-lines LCD with 64 x 128 pixel and background illumination ; contrast adjustable
Interfaces	2 x RS232 for PC or printer, balance and further devices („daisy chain“)	2 x RS232 for PC or printer, balance and further devices („daisy chain“) 1 x USB („slave“) for PC
Indicator electrode	Dual platinum electrode Connection 2 x mm socket	Dual platinum electrode Connection 2 x mm socket
Generator electrode		Generator electrode Connection 2 x mm socket
Keyboard	5-pole DIN-socket for PC-keyboard	For PC-keyboard with PS/2-plug such as TZ 2835
Stirrer/pump	Stirrer TM 135 respectively stirrer and pump of the titration stand TM KF	Stirrer TM 135 respectively stirrer and pump of the titration stand TM KF
Cylinder	20 ml made out of DURAN®	
Valve	Motor driven 3/2 way valve made out of PTFE/ETFE	
Dimensions	310 x 265 x 205 mm (h x w x d), height with titration stand and titration vessel	200 x 265 x 205 mm (h x w x d) with titration stand TM 135/TM KF 310 x 265 x 205 mm (h x w x d), height with titration vessel
Weight	2,1 kg for basic unit; appr. 3,2 kg for complete unit with titration stand TMKF	Appr. 1,4 kg for basic unit; appr. 2,5 kg for complete unit with titration stand TMKF (module 2 and 4)
Casing	Polypropylene	Polypropylene
Front foil	Polyester	Polyester
Temperature	Ambient temperature: + 10 ... + 40 C for operation and storage	Ambient temperature: + 10 ... + 40 C for operation and storage
Power supply	Mains 230 V, 50/60 Hz or 115 V ; 50/ 60 Hz power drain: 30 VA	Universal power adapter 100-140 V; 50/60 Hz, power drain: 30 VA

Software

	TitroLine KF	TitroLine KF <i>trace</i>
Measuring range	100 ppm – 100 %	10 µg – 100 mg / 1 ppm – 5 % (recommended)
Number of methods	8 (3 x sample, 3 x ritre, 2 x blank value)	10 (9 x sample, 1 x blank value)
Conditioning	On start, automatic drift correction	Automatic after switch on, drift correction
End criteria	End point delay, drift	Drift, drift stop tolerance
Autostart after sample addition	Only after conformation of sample weight	■
Statistic	Mean value, standard deviation and rel. relative standard deviation	Mean value, standard deviation and rel. relative standard deviation
Recalculation	After new weighted sample or sample volume has been entered Erasing of one result from a series of measurement	After new weighted sample or sample volume has been entered Erasing of one result from a series of measurement
Online curve		■
Documentation	GLP	GLP + curve print out
Result output	%, ppm, mg, mg/l, mg/pc (pc= piece), ml	%, ppm, mg, mg/l, mg/pc (pc= piece, µg
Password		■
Update software	EPROM-change	Update via RS232 and USB



Ordering information TitroLine KF and TitroLine KF *trace*

TitroLine KF and TitroLine KF <i>trace</i>		Order no.
TitroLine KF <i>trace</i> M1 Complete module for coulometric Karl-Fischer titration	Scope of delivery: TitroLine KF <i>trace</i> basic unit, magnetic stirrer TM 135, generating electrode TZ 1752 without diaphragm, titration vessel TZ 1751, micro dual platinum-electrode KF 1150, connection cable generating electrode	285212258
TitroLine KF <i>trace</i> M2 Complete module for coulometric Karl-Fischer titration	Scope of delivery: TitroLine KF <i>trace</i> basic unit, titration stand with pump TM KF, generating electrode TZ 1752 without diaphragm, titration vessel TZ 1754, micro dual platinum-electrode KF 1150, connection cable generating electrode	285212268
TitroLine KF <i>trace</i> M3 Complete module for coulometric Karl-Fischer titration	Scope of delivery: TitroLine KF <i>trace</i> basic unit, magnetic stirrer TM 135, generating electrode TZ 1753 with diaphragm, titration vessel TZ 1751, micro dual platinum-electrode KF 1150, connection cable generating electrode	285212278
TitroLine KF <i>trace</i> M4 Complete module for coulometric Karl-Fischer titration	Scope of delivery: TitroLine KF <i>trace</i> basic unit, titration stand with pump TM KF, generating electrode TZ 1753 with diaphragm, titration vessel TZ 1754, micro dual platinum-electrode KF 1150, connection cable generating electrode	285212288
TitroLine KF-230 V Volumetric KF-Titrator	Scope of delivery: titration unit, titration stand with integrated stirrer and pump TM KF, titration vessel TZ 1770, micro dual platinum-electrode KF 1100 and starter kit	285212248
TitroLine KF-115 V Volumetric KF-Titrator	Scope of delivery: titration unit, titration stand with integrated stirrer and pump TM KF, titration vessel TZ 1770, micro dual platinum-electrode KF 1100 and starter kit	285212231

Accessories for TitroLine KF and TitroLine KF *trace*

TZ 2835	PC-keyboard (with PS2/DIN-adapter for TitroLine KF)	1007852
TZ 1052	Evaporation oven for water determination according to Karl-Fischer	285214721
TZ 1060	Accessory for Evaporation oven TZ 1052	285218115
TZ 2073	KF-Soft for TitroLine KF	285221733
TZ 3460	RS-232-C printer for TitroLine KF, incl. connection cable TZ 3090, 230 V	285225608
TZ 3461	RS-232-C printer for TitroLine KF <i>trace</i> , incl. connection cable TZ 3090, 230 V	285225610
TZ 3465	RS-232-C printer for TitroLine KF, incl. connection cable TZ 3090, 115 V	285225657
TZ 3466	RS-232-C printer for TitroLine KF <i>trace</i> , incl. connection cable TZ 3090, 115 V	285225660

Ordering information TITRONIC[®], TitroLine

TITRONIC[®] basic and TITRONIC[®] universal	Order no.
TITRONIC [®] basic module 1, (230 V)	285212572
TITRONIC [®] basic module 2, same as module 1, with magnetic stirrer TM 96, (230 V)	285212823
TITRONIC [®] universal 20 ml module 1, (230 V)	285212429
TITRONIC [®] universal 20 ml module 2, same as module 1, with magnetic stirrer TM 96, (230 V)	285212437
TITRONIC [®] universal 50 ml module 1, (230 V)	285212445
TITRONIC [®] universal 50 ml module 2, same as module 1, with magnetic stirrer TM 96, (230 V)	285212494
TITRONIC [®] basic module 1, (115 V)	285212564
TITRONIC [®] basic module 2, same as module 1, with magnetic stirrer TM 96, (115 V)	285212815
TITRONIC [®] universal 20 ml module 1, (115 V)	285211921
TITRONIC [®] universal 20 ml module 2, same as module 1, with magnetic stirrer TM 96, (115 V)	285211962
TITRONIC [®] universal 50 ml module 1, (115 V)	285211979
TITRONIC [®] universal 50 ml module 2, same as module 1, with magnetic stirrer TM 96, (115 V)	285211987
TitroLine easy	
TitroLine easy module 1 without electrode, (230 V)	285212597
TitroLine easy module 2 for pH titration, same as module 1, with one pH-electrode and buffer set, (230 V)	285212848
TitroLine easy module 3 for halogenide titration, same as module 1, with one silver combination electrode, (230 V)	285212864
TitroLine easy module 2 for pH titration, same as module 1, with one pH-electrode and buffer set, (115 V)	285212831
TitroLine easy module 3 for halogenide titration, same as module 1, with one silver combination electrode, (115 V)	285212856
Accessories for TITRONIC[®] basic, TITRONIC[®] universal and TitroLine easy	
TZ 2005, bottle top adapter, GL 45	285221055
TZ 2008, bottle top adapter, S 40	285221088
TZ 2004, bottle top adapter GL 45, with 1 L reagent bottle, brown	285221047
TZ 3460, RS-232 printer including data cable, (230 V)	285225608
TZ 2074, TitroLine Chart for TitroLine easy	1015738

Easier Titration at any level of complexity:

TitroLine alpha *plus*

Innovative electrochemistry – from the very beginning

By developing the glass electrode more than 70 years ago, we laid the foundation for the success of electrochemical measurement. With high-performance pH glasses, innovative electrodes and electrochemical measuring instruments such as pH meters, conductometers, oxygen measuring instruments, piston burettes and titrators we have since made sure that electrochemical measurement today is an indispensable, trouble-free and reliable procedure all over the world.

Based on this know-how we have developed the automatic titrator **TitroLine alpha *plus*** which combines the ease-of-use of its predecessor TitroLine alpha with the robustness of the TITRONIC® 110 and TITRONIC® 200 precision piston burettes and exceeds the performance of the now almost legendary TPC 2000 titration system.

The right choice for simple and complex titrations

The **TitroLine alpha *plus*** is compact, flexible, very robust and universally applicable. Its capabilities range from simple end-point titrations (EP), such as the determination of the total acid in wine, to complex and difficult, non-aqueous titrations such as the determination of the acid and base numbers in oils (TAN/TBN). Of course, the automatic titrator **TitroLine alpha *plus*** is also the ideal choice for pH-stat applications such as the determination of the enzyme activity or for “dead-stop” titrations such as water determination according to Karl Fischer (KF).



Whatever your titration needs are, it will be worth your while to take a closer look at the **TitroLine alpha plus**, especially if your tasks include one of the following applications.

Environmental and water analytics

- Chloride in tap water and sewage water
- Calcium and magnesium hardness
- pH values
- Alkalinity (“p and m values”)
- Permanganate index
- COD

Foodstuff and beverages

- Salt content (NaCl) in soya sauce, cheese, ketchup, spices and other foodstuff
- Peroxide number, saponification number, iodine and acid numbers in fats and oils
- Formol number in fruit juices
- Calcium in milk products
- Ascorbic acid (Vitamin C)
- Alpha acids in hop



The addition of up to five piston burettes for dosing and titrating transforms the stand alone instrument into a team player.

Galvanics

- Determination of copper, zinc, nickel and aluminium with Cu-selective electrode
- Boric acid and chloride in nickel baths
- Alkali in degreasing baths

Petrochemistry

- Acid and base number (TAN and TBN)
- Bromine index
- Water determination according to Karl Fischer (KF)

Pharmaceutics

- Content determination of pharmaceutical products with perchloric acid in pure acetic acid
- Chloride
- Water determination according to Karl Fischer (KF)

General chemistry and plastics

- Titration of strong acids and alkaline solutions
- Epoxy number, isocyanates, acid number, hydroxyl number and saponification number
- Amino end groups
- Carboxyl end groups

Paper industry

- “White, green and black liquor”

plus

The right electrode for your titration application

The applicable electrode for the titration application is a decisive factor for the accuracy and reproducibility of the results. In order to support you with selecting the appropriate electrode, we have summarized the according electrodes for the most important applications in the following.



Application	Electrode (w.o. temp.-sensor)	Electrode with integrated. temp.-sensor
Acid-base-titrations		
Aqueous, general strong acid and bases	A 7780	–
Kjeldahl	A 7780	–
Alkalinity	N 62, N 61	N 1052 A, N 1051 A
Aqueous, difficult applications	IL-pH-A120MF IL-pH-A170MF	IL-pHT-A120MF-DIN-N IL-pHT-A170-DIN-N
Low ionic liquids	IL-pH-A120MF IL-pH-A170MF	IL-pHT-A120MF-DIN-N IL-pHT-A170-DIN-N
Small sample amounts	N 5900 A	A 157 IL-MICRO-pHT-A-DIN-N
Titration with sample changer (100 – 250 ml vessels)	N 65	N 1051 A IL-pHT-A170-DIN-N
Titration with sample changer (50 ml vessels, micro)	N 5900 A	–
Non aqueous acid base-titrations		
TAN (ASTM 664)	N 6480 eth	–
OH-No, NCO-No, FFA saponification No. ...	N 6480 eth	–
TBN (ISO 3771/ASTM 2896)	N 6480 eis	–
Epoxy value	N 6480 eis	–
Titrations with perchloric acid/acetic acid	N 6480 eis	–
Precipitation titrations		
Halogenides (chloride, "salt")	AgCl 62	–
Halogenides, sample changer	AgCl 65	–
Pseudo halogenides (cyanide ...)	Ag 6280	–
Detergents	TEN 1100*	–
Redox titrations		
General, iodometric, permanganometric, cerimetric	Pt 62 Pt 6280	–
Iodine number, peroxid number	Pt 61	–
COD	Pt 61	–
Sample changer, general	Pt 6580	–
Sample changer, COD	Pt 5901	–
Dead stop (SO ₂ bromine no. ...) general	Pt 1200	–
Dead stop (SO ₂ bromine no. ...) sample changer, general and titration vessels	Pt 1400	–
Dead stop (SO ₂ bromine no. ...) sample changer micro	KF 1100	–
KF-titrations	KF 1100	–
Complexometric titrations		
Water hardness (Ca/Mg separated)	Ca 1100 A*	–
Water hardness, total	Cu 1100 A*	–
Copper, zinc, nickel, alumina ...	Cu 1100 A*	–

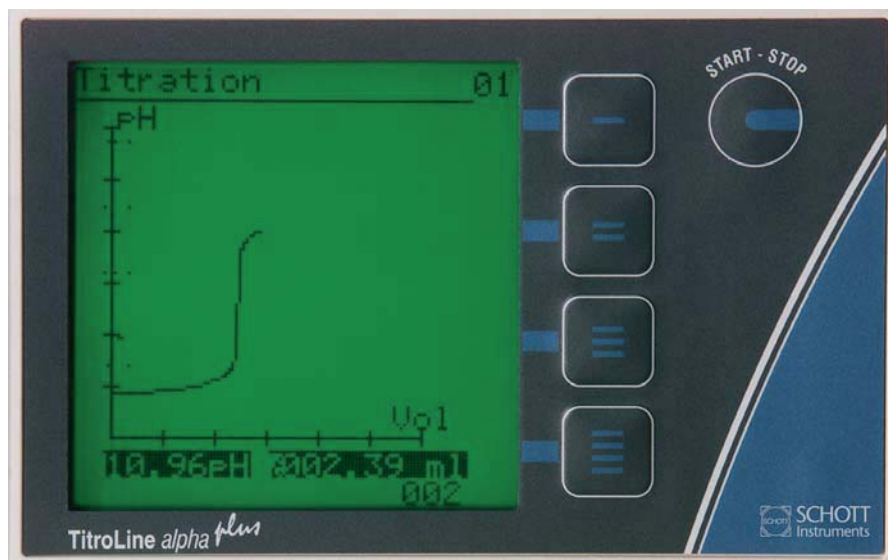
* An applicable reference electrode is required: B 2920+ respectively. B 3520+

TitroLine alpha plus: So adaptable ...

Working with the TitroLine alpha plus is so easy

Take a closer look at the large graphical display to see how easy it is to work with the TitroLine alpha plus. Everything you need to know is visible in clear text. Just press a few buttons to select the desired function: the method, the log you want, the kind of output ...

Two arrow buttons are enough to navigate you through the self explanatory menu. Use the enter button to confirm your selection and press ESC to leave a menu item. After set up, start your titration with the separate start/stop button. Parameterize your method from a connected keyboard.



During the titration, you can watch the entire procedure in real time at the titration curve shown on the large display. In this way, you are always in control and don't have to wait for the curve printout.

The TitroLine alpha plus adapts itself to your applications

For optimal adaptation of the titration to your application, the TitroLine alpha plus provides an extensive database with the most important titration methods pre-programmed. From this database of 100 methods you can download up to 50 methods into the free method memory and modify each method as required to meet your own specific needs. Needless to say you can also enter and save your own tried and tested methods. Our application database in the internet is a useful source of methods and informations which are available for free download.

The right titration control for any method

Reagent can be added after a fixed waiting period or drift-controlled, in linear titration steps or with dynamic adaptation to the curve slope. Additionally, you can select other forms of control for end-point titrations for pH, mV and μA , and for KF and pH-stat titrations.

Up to five equivalence points can be preselected for **turning-point titrations**, and up to three end points for **end-point titrations**.



Use the arrow buttons (centre keys) to navigate up and down in the menu, and confirm your selection with Enter (lower key). Use ESC (upper key) to leave a menu item.

plus

... as precise and robust as you need it.

Correct results – good documentation

To calculate the results, you can choose from eight preset formulas. Additionally, the formula editor allows the creation of your own formulas. 50 variables are available, for example to store blank values, titre and means for other calculations and applications.

You can generate your own logs to document the measured results:

The **Brief Log**

contains the result, originally weighed-in quantity, sample name, date and time.

The **Standard Log**

in addition to the above also includes the titration curve with first derivation.

The **Detailed Log**

in addition to the above also includes the calculation formula, calibration data, dates of preparation and change of the method.

The **GLP Log**

includes all titration parameters of the method.

Method link to solve complex tasks

For complex tasks, the TitroLine alpha *plus* facilitates easy combination of methods. For example, in a first method you can determine the alkalinity (“m” value) with an end-point titration to pH 4.3 with HNO₃. Following this, a second method can be automatically started (“linked”) to determine the chloride content with silver nitrate.



Unlock ...



... take off ...



... everything under control!

Most precise and robust – the exchangeable dosing units.

The TitroLine alpha *plus* is available with a choice of five exchangeable units for the reagents, with volumes of 1, 5, 10, 20 and 50 ml. The dosing cylinders of the exchangeable units are made of high-precision calibrated Duran®. This is a speciality which enables you to dose your reagents with the highest accuracy. As only highly resistant materials (PTFE/PCTFE, FEP and FPA) are used for all other wetted parts, you can use practically any measurable liquids (except HF).

Changing the reagents on the TitroLine alpha *plus* is really child’s play: Simply press the unlock button on the left side of the unit, and you can remove the unit with a flick of the wrist. Thanks to the robust design, you’ll always have a firm grip even on well-filled bottles.

Fitting a new unit is just as easy. Not only does the unit lock itself automatically but the logical encoding corresponding to the volume is also automatically transferred to the titrator or piston burette. There’s no need to adjust the titrator. And, by the way, the units of the TITRONIC® 100, TITRONIC® 110 and TITRONIC® 200 piston burettes are compatible with each other and can be used when working with the TitroLine alpha *plus*.

Water determination according to Karl Fischer – starting at 10 ppm with the TitroLine alpha *plus* KF

Just add a few accessories and your TitroLine alpha *plus* becomes a precise KF Titrator

The TMKF KF titration stand featuring solvent addition at the push of a button and automatic discharge of titrated samples, the TZ 1770 KF titration vessel and the KF 1100 double platinum electrode will transform your TitroLine alpha *plus* into a fully functional, most powerful volumetric titrator for water determination according to Karl Fischer (KF).

KF titration parameters – exactly as required

All parameters required to optimally adapt the method to your sample are available for your KF titration: extraction time, drift stop, endpoint delay, stop current (μA), adjustable pole voltage, maximum and minimum titration time. The drift determined can be automatically corrected.

Versatile and very precise

The TitroLine alpha *plus* KF is a perfect choice for all volumetric KF applications in the fields of pharmaceuticals, chemistry, petrochemistry, foodstuff and plastics industry. The very high precision of its 5 ml and 10 ml dosing units allow determination of water contents from as low as 10 ppm with excellent reproducibility. The upper limit is 100%.



The KF drying oven extends the range of applications

Using the TZ 1052 drying oven allows you to analyse samples which cannot be titrated directly, e.g. samples of plastic or oil containing additives.

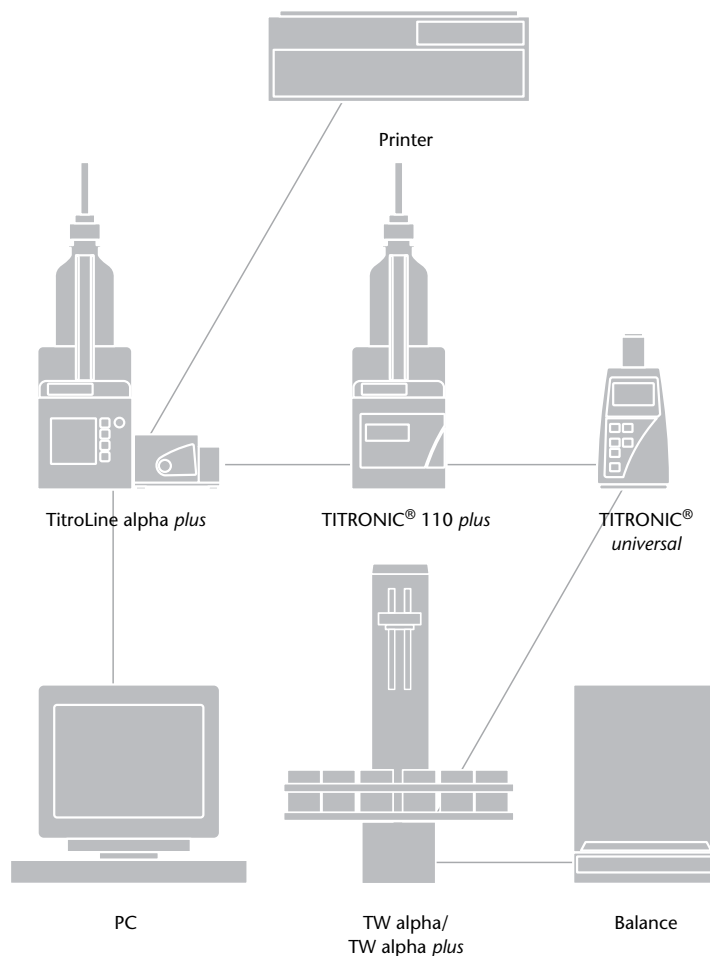
The TitroLine alpha *plus* gets along with everyone

The TitroLine alpha *plus* is well connected

The TitroLine alpha *plus* is top as a stand-alone device but it rises above itself a team member with the support of two RS 232 interfaces, combined with the possibility of concatenation (Daisy chain) of titrator, piston burettes and sample changer and a Centronics interface.

For example, the two RS-232-C interfaces allow simultaneous connection of a PC and a balance to automatically enter the weight of the sample. On the second RS-232-C interface you can connect additional TITRONIC® type piston burettes (except TITRONIC® *basic*), a sample changer and a balance.

Your Epson and HP-compatible printer (see Technical data) can be connected to the Centronics interface.



We are happy to support you with your applications

The staff in our Application Laboratory will be glad to assist you and impart their many years of practical experience.

You can also find much of this practical experience in our application database on the internet:

www.schottinstruments.com

Support for device qualification

In connection with quality management systems, more and more importance is being given to the traceability of analysis. We support your needs with a logbook that provides you with forms for **IQ** (Installation Qualification), **OQ** (Operational Qualification) and **PQ** (Performance Qualification). Using these instruments you can effectively document commissioning, routine work and inspections of the TitroLine alpha *plus*.

TITRONIC® 110 – the piston burette with the *plus*

Titrating and dosing

The TITRONIC® 110 *plus* is the piston burette for your precise dosing and titration. It can be used as stand-alone device, in combination with a titrator and additional piston burettes or in connection with a PC.

The TR 160 manual controller allows manual titrations to visual end point or in combination with a pH meter.

Very precise and robust

The resolution of 10,000 steps, the high-precision calibrated DURAN® glass cylinders – one of our specialities – the quick and easy to change units and the high-quality workmanship make the TITRONIC® 110 *plus* a piston burette unrivalled in accuracy and robustness.

Exchangeable units compatible

By the way, the exchangeable dosing units are compatible with those of the TitroLine alpha *plus* titrator and the TITRONIC® 100, TITRONIC® 110 and TITRONIC® 200 piston burettes.

As dosing and titration burette with TitroLine alpha *plus* and TitrISOft

You can also use the TITRONIC® 110 *plus* as a dosing burette for exact dispensing of reagents, as a titration burette in combination with the TitroLine alpha *plus*, or as a dosing and titration burette within the TitrISOft titration system.



PC control and concatenation (Daisy Chain)

All functions of the TITRONIC® 110 *plus* can be controlled via a PC serial interface, so the TITRONIC® 110 *plus* can be used within systems of other manufacturers, e.g. as dosing and titration burette. For complex applications, concatenation (Daisy chain) of up to 16 devices is possible. The devices are simply connected via the second serial interface. In this way, each device can be addressed separately and reply on its own without the need for an additional data line to the PC.

Special dosing applications

With the use of PC keyboard, dosing tasks can be performed at the push of a button. You can optimize dosing and filling speed for precise measurement even with very viscous liquids such as concentrated sulphuric acid, making the TITRONIC® 110 *plus* most suitable for sample preparation in viscometry.

Technical data

TitroLine alpha *plus* and TITRONIC® 110 *plus*

Conformity	ISO 8655, mark of conformity
CE sign	
Valve	motor-driven 3/2-way valve made of PTFE/ETFE
Hoses	FEP with UV protection
Keyboard	PS2 socket for connection of a PC keyboard. Connection TZ 2825 possible with adapter
RS-232-1	PC, input for concatenation of several devices (Daisy chain)
RS-232-2	piston burettes types TITRONIC® 110, TITRONIC® 110 <i>plus</i> , TITRONIC® 200 and TITRONIC® <i>universal</i> sample changer types TW 280, TW alpha und TW alpha <i>plus</i> TitroLine alpha <i>plus</i> : balances (Mettler, Sartorius, Kern, Ohaus, others on request)
Power supply	mains: 230 V~, 50 / 60 Hz; or 115 V~; 50 / 60 Hz, power consumption: 43 VA
Housing	polypropylene
Front foil	polyester
Housing dimensions	145 x 260 x 270 mm (W x H x D), only exchangeable unit 145 x 360 x 295 mm (W x H x D) height inclusive of exchangeable unit
Weight	basic device approx. 4.1 kg, complete device with exchangeable unit approx. 5.1 kg
Climate	ambient temperature: + 10 ... + 40 °C for operation and storage
Units	1, 5, 10, 20 and 50 ml units with calibrated glass cylinder made of DURAN® (borosilicate glass) size coding allows automatic detection of unit
Burette resolution	1/10,000, smallest step 0.1 µl with 1 ml burette size
Dosing accuracy	trueness: 0.1 ... 0.3 %, referred to nominal volume (in dependence on burette size) precision: 0.05 ... 0.1 % (in dependence on burette size)

Achievable accuracies in the entire system with exchangeable unit

Exchangeable unit	Volume	Tolerances of inside diameter of the glass cylinder	Dosing error referred to 100 % volume	Reproduce- ability
TA 01	1.00 ml	± 0.003 mm	± 0.3 %	0.10 %
TA 05 <i>plus</i>	5.00 ml	± 0.003 mm	± 0.15 %	0.07 %
TA 10 <i>plus</i>	10.00 ml	± 0.003 mm	± 0.1 %	0.05 %
TA 20 <i>plus</i>	20.00 ml	± 0.003 mm	± 0.1 %	0.05 %
TA 50 <i>plus</i>	50.00 ml	± 0.003 mm	± 0.1 %	0.05 %

TitroLine alpha *plus* only

Display	matrix LCD display, 69 x 69 mm, with background illumination, contrast adjustable via keyboard
Measuring input A	pH/mV input with electrode socket in accordance with DIN 19 262/or BNC
Measuring input B	pH/mV input with electrode socket in accordance with DIN 19 262/or BNC, galvanic separated
Measuring input KF/µA	Karl-Fischer (dead-stop) connection for double-platinum electrode (connection sockets: 2 x 4 mm), polarization voltage adjustable
Measuring input Pt 1000	temperature sensor connection of resistance thermometer Pt 1000 (connection sockets: 2 x 4 mm)
Printer connection	centronics interface for connection of an Epson (ESC/P2 and Raster) and HP (PCI 3) -compatible printers

TITRONIC® 110 *plus* only

Display	LCD display, 4-digit with floating point
I/O multifunction port	15-pole sub D-socket for connection of the TR 160 manual controller for manual titration Special applications on request
Volume display	00.00 ... 9.999 ml
Indication resolution	0.000 ... 9.999 ml
Dosing volume	0.01 ... 9.999 ml
Dosing speed	0.01 ml/h ... 100 ml/min (in dependence on burette size)
Filling speed	30 ... 999 s, freely selectable

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TW alpha *plus* sample changer – automatic titration in series

The number of samples to be processed is growing constantly while at the same time the demands on reliability are increasing in accordance with GLP and ISO 900X standards. The TW alpha *plus* sample changer by SCHOTT Instruments helps you meet these increased requirements and relieve qualified employees from routine work.

Control by titrator or by PC

You can control the sample changer from the TitroLine alpha *plus* titrator or from a PC with the TitrSoft software.

Higher flexibility due to exchangeable sample racks

With four sample racks for up to 24 samples and titration head fittings for a variety of beaker and titrator vessels you get the flexibility your lab needs. A mere flick of the wrist is sufficient to change the sample racks and titrator heads. The size of the rack can be selected in the TitroLine alpha *plus* or in the ›Titration Center‹ of the TitrSoft software.

Stirring from “above” or “below”

As standard, the TW alpha *plus* comes with an integrated magnetic stirrer to stir the samples from “below”. Alternatively, you can use a rod stirrer which enables stirring from “above”.



plus



Washing the electrode and the titration tip

To ensure accuracy of the results, the electrodes and the titration tips are rinsed after each titration. This can, for example, be done by immersing the electrodes and titration tips into a wash-ing solution. The number of rinsing positions to be used (up to a maximum of three) and the rinsing time are set in the method. Direct and fast rinsing of the electrodes and titration tips can be ensured by using the MP 25 washing unit that rinses directly after the titration. In addition to this, a waiting position may also be used for example to immerse the pH electrodes into a KCl solution.

Up to 24 samples in 50 ml glass beakers or 16 samples in 250 ml glass beakers will fit in the rotating sample tray. A sample tray for 24 COD containers is also available.

TitriSoft 2.6 – convincingly simple ...

The TitriSoft 2.6 titration software is the optimum solution for your titration tasks. The software can be used with WINDOWS 98/ME and WINDOWS 2000/XP/Vista and supports your daily work procedures during sample preparation, titration and evaluation of the results. The software has been developed to be clear, logical and user-friendly.

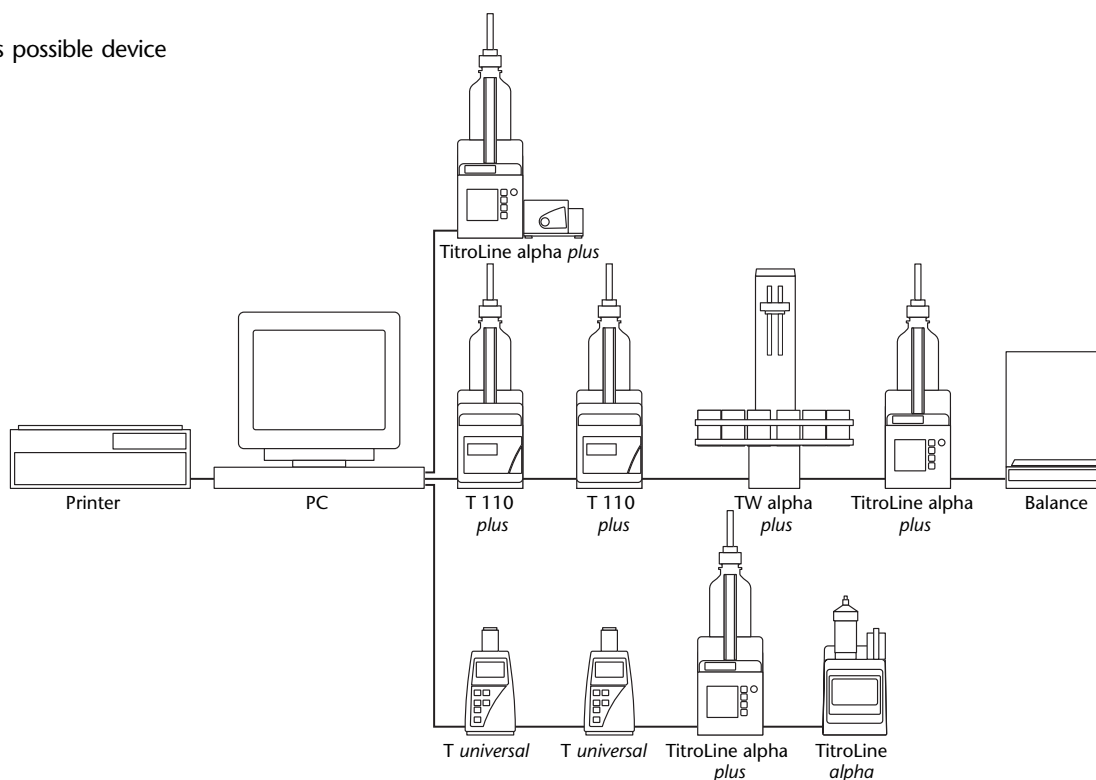
Connection possibilities

Using TitriSoft 2.6 you can control the following devices from a PC:

- **Titrators** (TitroLine alpha *plus*, TitroLine alpha, TR 250)
- **Sample changers** (TW alpha *plus*, TW alpha, TW 280)
- **Piston burettes** (TITRONIC® 110 *plus* and TITRONIC® universal, TITRONIC® 110, TITRONIC® 200)
- **Balances**

You can connect the titration hardware to any of your PC's available serial interfaces. Each of the serial interfaces allows different combinations of devices (configurations). To automate a titration procedure the software may be used to control the TitroLine alpha *plus* in connection with the TW alpha *plus* sample changer. For more complex titration tasks with sample preparation you can dose with piston burettes followed by titration with a TitroLine alpha *plus*. Of course, you can also use the software for dosing only.

The image below shows possible device configurations.



System requirements

For optimal and fast working with the TitriSoft 2.6 software your system should be equipped as shown below:

Interface: 1 free serial RS-232-C interface per configuration

Computer: Pentium II or higher

Operating system: WINDOWS 98/ME, WINDOWS 2000/XP or Vista

RAM: minimum 256 MB

Hard disk: minimum free storage place 100 MB

Graphics card: minimum resolution 1024 x 768

... strong benefits ...



›Navigator, the main menu

The different software tasks are assigned to four different centers:

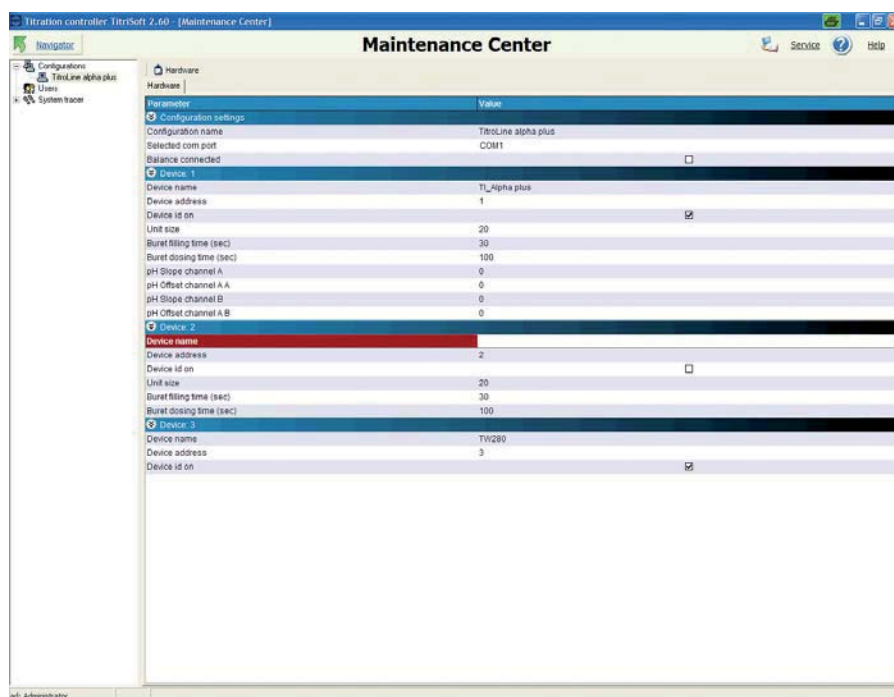
- the Maintenance Center,
- the Revision Center,
- the Analysis Center and
- the Titration Center.

The centers can be accessed from the main menu, the Navigator.

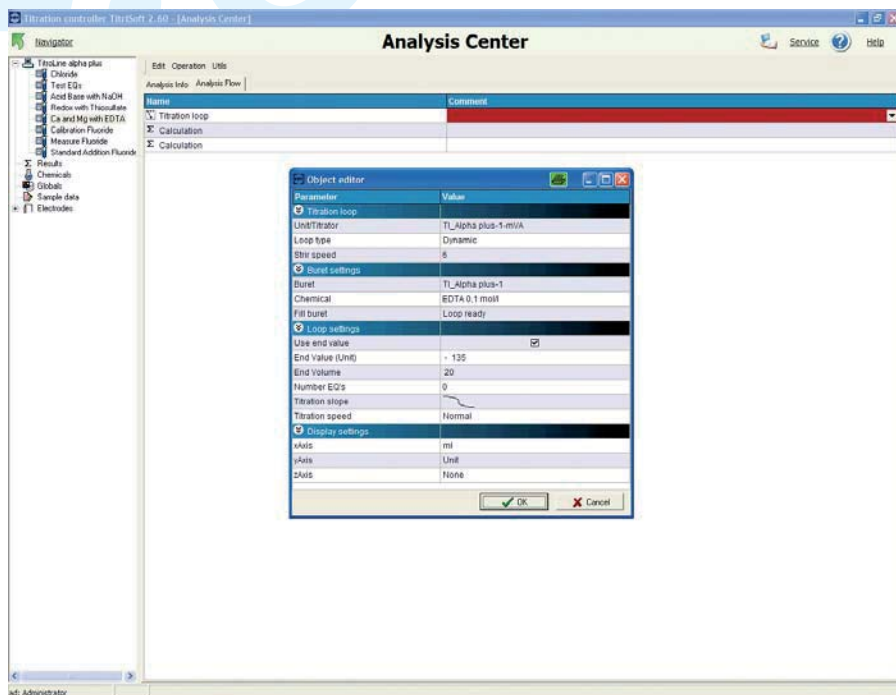
›Maintenance Center, the system configuration

In the Maintenance Center, the software is set up for operation prior to running the first application, i.e. a configuration is set up with the connected hardware. The configuration of the attached hardware is automatically detected in a hardware scan. Each of these hardware configurations allows any number of “methods” and “work lists”. Different configurations can work in parallel (see Connection Possibilities).

All TitriSoft users can be listed by their names. TitriSoft supports three user types. The Administrator has access to all configuration and software operation options. The “Administrator” has access to all configuration and software operation options. The “User” or “Advanced User” has the same rights as the Administrator but is not allowed to delete results, methods and worklists. Users are restricted to operation of the Titration Center which very much simplifies matters.



... clearly structured ...



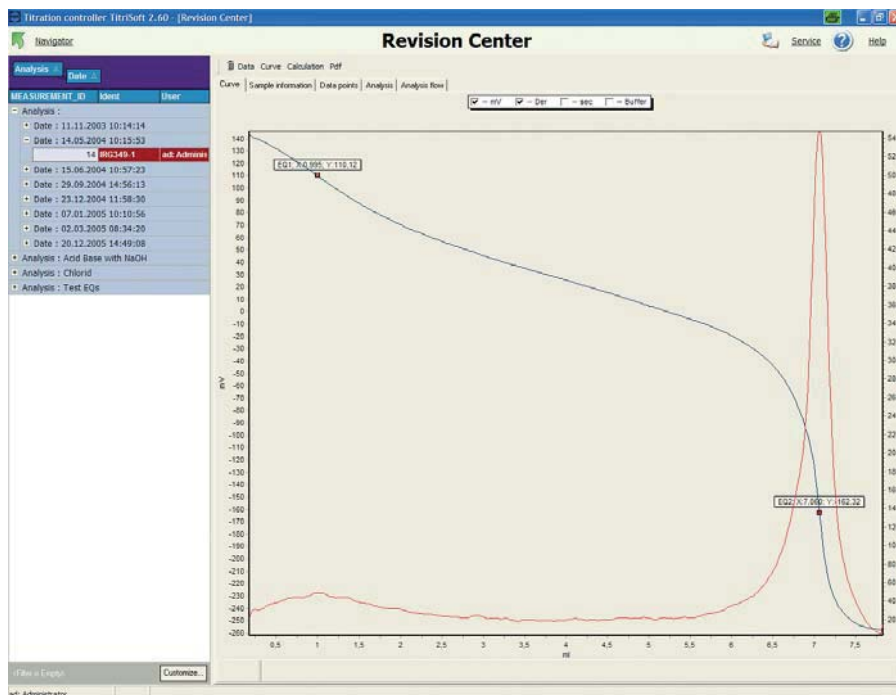
›Analysis Center‹, your method center

This is where you set up and save your titration methods. Even complex methods can be installed with a few mouse clicks. Adjustment of the titration parameters is facilitated by the use of symbolic slide controls. Functions such as waiting time, IF loops, repetition, do-sings and measurements in addition to the titration parameters and calculation formulas provide virtually unlimited options for method procedures.

›Revision Center‹, your database

Titration curves, results, measured values and used methods of all titrations ever carried out are stored in the database. These data can be selected by sample name, date, user and method and loaded in a few seconds.

Information on titrations performed can be displayed in the form of a diagram, results list or measured value list. You can optimize stored titration information in accordance with your requirements, e.g. add and store subsequent calculations or analyze titration curves and print it out together. Additionally, an export of the data to Excel and ASCII is also available.



... highly productive: TitrSoft 2.6

Position	Status	Analysis	Name	Amount	Date	EQ in ml	Chloride (%)
1	Ready	Chlorid	HCl about 0.1 mol/l	5	09.03.2009 15:04:17	4.988	
2	Ready	Chlorid	HCl About 0.1 mol/l (2)	5	09.03.2009 16:14:34	4.977	
3	Planned	Chlorid	cheese 1	4.9875			
4	Planned	Chlorid	cheese 2	4.9987			
5	Planned	Chlorid	Hardkäse 1	5			
6	Planned	Chlorid	Hardkäse 2	10.2597			
7	Planned	Chlorid	Camembert	5.5478			
8	Planned	Chlorid		0			
9	Planned	Chlorid		0			
10	Planned	Chlorid		0			
11	Planned	Chlorid		0			
12	Planned	Chlorid		0			
13	Planned	Chlorid		0			
14	Planned	Chlorid		0			
15	Planned	Chlorid		0			
16	Planned	Chlorid		0			

›Titration Center‹, your clearly structured workplace

The ›Titration Center‹ is the place where you carry out your daily jobs, i.e. select methods, enter sample names and origin weighed-in quantities, start the work list and display (and print if desired) the results at the end of a titration. The work list shows the individual samples with the associated methods and their characteristics such as sample name, number, status, date, time, results and events and other freely configurable sample data, e.g. density.

During the titration you can observe the titration process in an on-line diagram. You can, however, simply allow the samples to be processed in the background and use the PC for other tasks or start an additional titration with another configuration in parallel.

When working with the TW alpha *plus* sample changer, you can adjust various settings such as skip empty items, rinse and waiting options.

Documentation, which is in accordance with GLP and ISO 9000 directives, can be produced in a number of different forms; tables, lists, curves or individual print-outs with curves. In addition results can be saved in ASCII or CSV format, external documentation programs may be accessed and results transferred directly, e.g. into a LIMS.

TitriSoft 2.6 P – simply safe ...

In this case, the “P” does not mean “professional”, but rather “pharmaceutical”. Nevertheless, the performance of the “P” version is of course just as good and as professional as that of the standard version “TitriSoft 2.6”. Additionally to the standard version, the TitriSoft 2.6 P fully meets all requirements of the FDA 21 CFR Part 11 regulation regarding „Electronic Records“, „Electronic Signature“ and „Audit Trail“.

The FDA (i. e. Food and Drug Administration of the USA) 21 CFR Part 11 regulations describe how to deal with electronically stored data („Electronic Records“) and how to prepare electronic signatures („Electronic Signature“). These regulations are binding for all companies offering medical, pharmaceutical or food products and services in the USA.

System requirements

For optimal and fast working with the TitriSoft 2.6 P software your system should be equipped as shown below:

Interface: 1 free serial RS-232-C interface per configuration

Computer: Pentium II or higher

Operating system: WINDOWS 2000 and XP Pro/Vista

RAM: minimum 256 MB

Hard disk:
minimum free storage place 100 MB

Graphics card:
minimum resolution 1024 x 768

Comparison between TitriSoft 2.6 and 2.6 P

Functions	TitriSoft 2.6	TitriSoft 2.6 P
Electronic Record		■
Electronic Signature		■
Audit Trail		■
Controlled Access		■
Copies of Records		■
Manual with forms for SOP's, IQ, OQ, PQ and validation reports		■
Straightforward procedure	■	■
All types of titrations	■	■
Comfortable worklists	■	■
Online titration curves	■	■
Clear documentation	■	■
Perfect titration control by PC	■	■

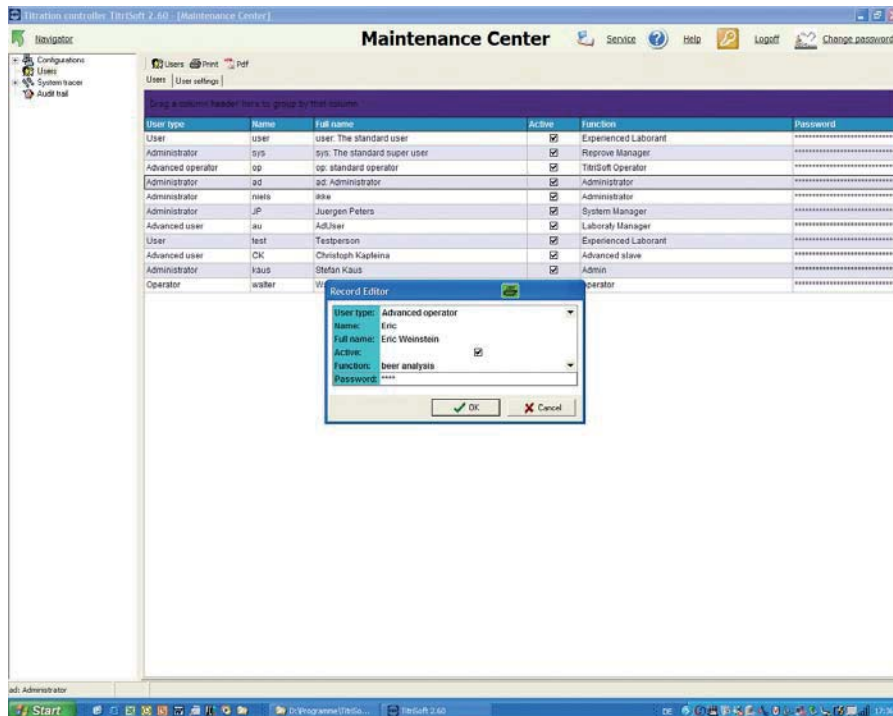
TitriSoft

Controlled Access

The controlled access guarantees that only authorized individuals have access to the software functions, according to your company's security policy and the FDA requirements.

TitriSoft 2.6 P has 5 different access levels: The "Operator" level does only allow to carry out the routine titrations, whereas the "Advanced User" level is entitled to approve the methods. The highest level, the "Administrator" may set up the users and assign them the user rights. He even has the permission to delete records, but only after a copy of the database has been generated.

2.6 P



Titration controller: TitrSoft 2.60 - [Maintenance Center]

Navigator

Maintenance Center

Service Help Logoff Change password

Print PDF Audit trail Build trail to pdf

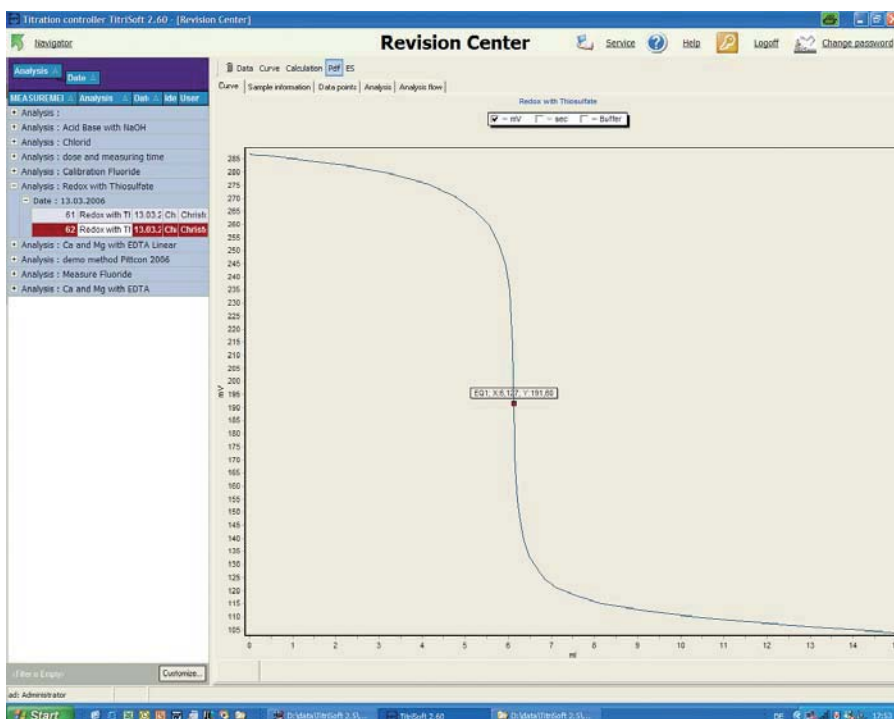
ID	User	Date	Time	Timezone	Database action	Description	Comment
703	ad: Administrator	18.03.2006	19:45:19	GMT +1	Added	Analysis dose and measuring time added to configuration 1	new method
702	ad: Administrator	18.03.2006	20:00:27	GMT +1	Added	Analysis time-measure added to configuration 1	new method
688	ad: Administrator	13.03.2006	21:49:51	GMT +1	Added	Analysis demo method Pittcon 2006 added to configuration 1	new method khlksh
279	Christoph Kapteina	18.03.2006	11:21:13	GMT +1	Added	Analysis pH-Trend 20 added to configuration 1	new methode
751	ad: Administrator	15.03.2006	15:47:20	GMT +1	Edited	An analysis with name pH-Trend has been updated in configuration 1	no changes
801	Stefan Kaus	20.03.2006	08:45:35	GMT +1	Edited	An analysis with name time-measure has been updated in configuration 1	review from Kaus
443	Christoph Kapteina	18.03.2006	12:59:34	GMT +1	Edited	An analysis with name Acid Base with NaOH has been updated in configuration 1	save
456	Christoph Kapteina	18.03.2006	13:31:34	GMT +1	Edited	An analysis with name Acid Base with NaOH has been updated in configuration 1	save
481	Christoph Kapteina	13.03.2006	11:35:08	GMT +1	Edited	An analysis with name Redox with Thiosulfate has been updated in	save
513	Christoph Kapteina	13.03.2006	14:22:07	GMT +1	Edited	An analysis with name Ca and Mg has been updated in configuration 1	save
461	Christoph Kapteina	13.03.2006	09:22:53	GMT +1	Edited	An analysis with name Calibration Fluoride has been updated in	save new conc.
518	Christoph Kapteina	13.03.2006	14:27:56	GMT +1	Edited	An analysis with name Ca and Mg with EDTA has been updated in configuration 1	use end value
442	Christoph Kapteina	18.03.2006	12:58:37	GMT +1	Edited	An analysis with name Acid Base with NaOH has been updated in configuration 1	änderung

• Table : Configuration
 • Table : Electrode
 • Table : Measurement
 • Table : prg_user
 • Table : property
 • Table : worlist

ad: Administrator

Audit Trail

The 21 CFR Part 11 prescribes that each creating, saving oder modifying of records (e.g. creating methods, modifying passwords or saving results), generates an entry in the Audit Trail. TitrSoft 2.6 P automatically generates an entry in the Audit Trail table as soon as an access to the database has taken place. The local time and the GMT are automatically stored together with this entry in the Audit Trail. Each entry also asks for a comment. The Audit trail or parts of it can be printed out, or a "human" readable digital copy of it, e.g. a PDF file can be generated.



Electronic Records

The 21 CFR Part 11 prescribes how to safeguard and store the generated results over a long timespan. Besides regularly making backup copies of the complete database, is it possible to generate readable digital copies of the results, methods, worklists, the Audit Trail, the user administration and the configuration(s). For that purpose, a PDF writer is already integrated in the software. The purchase of expensive third-party software for generating PDF files ist not necessary.

Of course the database is password protected against unauthorized access.



Electronic Signature

Digital analysis results have to be as reliable as classical, manually checked results with a handwritten signature. A digital signature, which is as safe as a handwritten one, can be placed to approve all electronic records. The approver has to enter the name and an additional password. The electronic signature is stored together with the signer's function, the reason of signing and the date and time.

The screenshot shows the 'Revision Center' window in Titrisoft 2.60. The interface includes a menu bar with 'Data', 'Curve', 'Calculation', and 'Diff'. Below the menu is a toolbar with buttons for 'Curve', 'Sample information', 'Data pt', 'Revision sample', and 'Approve sample'. The main content area is divided into two sections: 'Measurement properties' and 'Measurement results'. The 'Measurement properties' section contains a table with the following data:

Parameter	Value
Analysis	Redox with Thiosulfate
Measurement date	13.03.2006 12:33:27
Status	Ready
Identification	Chromate about 0,02 mol/l
Amount	5
Position	2
User	Christoph Kapteina

The 'Measurement results' section contains a table with the following data:

Name	Value
Thiosulfate 0.1 mol/l	15
EQ in ml	6,120

Below the measurement results is the 'Electronic signature' section, which contains a table with the following data:

Parameter	Value
Reviewing user	act Administrator
Reviewing user function	Administrator
Review date	13.03.2006 21:34:41
Approving user	Stefan Kaus
Approving user function	Admin
Approval date	20.03.2009 10:16:13

The bottom of the window shows a taskbar with the Windows Start button, several application icons, and the system tray with the date and time (13:57).

Ordering information TitroLine alpha *plus*

TitroLine alpha <i>plus</i>		Order no.
TitroLine alpha <i>plus</i>	TitroLine alpha <i>plus</i> basic unit <u>without</u> exchange unit, 230 V	285216952
TitroLine alpha <i>plus</i>	TitroLine alpha <i>plus</i> basic unit <u>without</u> exchange unit, 115 V	285216969

Scope of delivery: TitroLine alpha *plus* incl. stand rod with holder, titration clamp, PC keyboard TZ 2835.

TitroLine alpha <i>plus</i>	TitroLine alpha 05 <i>plus</i> with 5 ml exchange unit, (230 V)	285212934
TitroLine alpha <i>plus</i>	TitroLine alpha 10 <i>plus</i> with 10 ml exchange unit, (230 V)	285216944
TitroLine alpha <i>plus</i>	TitroLine alpha 20 <i>plus</i> with 20 ml exchange unit, (230 V)	285216977
TitroLine alpha <i>plus</i>	TitroLine alpha 50 <i>plus</i> with 50 ml exchange unit, (230 V)	285212983
TitroLine alpha <i>plus</i>	TitroLine alpha 05 <i>plus</i> with 5 ml exchange unit, (115 V)	285215467
TitroLine alpha <i>plus</i>	TitroLine alpha 10 <i>plus</i> with 10 ml exchange unit, (115 V)	285215475
TitroLine alpha <i>plus</i>	TitroLine alpha 20 <i>plus</i> with 20 ml exchange unit, (115 V)	285215631
TitroLine alpha <i>plus</i>	TitroLine alpha 50 <i>plus</i> with 50 ml exchange unit, (115 V)	285215648

Scope of delivery: As TitroLine alpha *plus* basic unit with 5, 10, 20 or 50 ml exchange unit, incl. brown glass bottle for titrant, GL 45 bottle adapter, hoses, drip glass and titration tip.

TitroLine alpha KF *plus*

TitroLine alpha <i>plus</i>	TitroLine alpha KF 05 <i>plus</i> with 5 ml exchange unit, (230 V)	285212991
TitroLine alpha <i>plus</i>	TitroLine alpha KF 10 <i>plus</i> with 10 ml exchange unit, (230 V)	285213109
TitroLine alpha <i>plus</i>	TitroLine alpha KF 05 <i>plus</i> with 5 ml exchange unit, (115 V)	285215656
TitroLine alpha <i>plus</i>	TitroLine alpha KF 10 <i>plus</i> with 10 ml exchange unit, (115 V)	285215664

Scope of delivery: As TitroLine alpha *plus* basic unit with 5 or 10 ml exchange unit, incl. brown glass bottle for titrant, GL 45 bottle adapter, hoses, drip glass and titration tip, titration stand TMKF incl. supply and waste bottle, micro-double-platinum electrode KF 1100, titration vessel TZ 1770.

TITRONIC® 110 *plus*

TITRONIC® 110 <i>plus</i>	TITRONIC® 110 <i>plus</i> basic unit <u>without</u> exchange unit, 230 V	1007302
TITRONIC® 110 <i>plus</i>	TITRONIC® 110 <i>plus</i> basic unit <u>without</u> exchange unit, 115 V	1007303

Scope of delivery: TITRONIC® 110 *plus* incl. stand rod with holder and titration clamp

Exchange units for TitroLine alpha *plus* and TITRONIC® 110 *plus*

TA 01	Exchange unit with 1 ml glass cylinder incl. reagent bottle	285211313
TA 05 <i>plus</i>	Exchange unit with 5 ml glass cylinder incl. reagent bottle	285211038
TA 10 <i>plus</i>	Exchange unit with 10 ml glass cylinder incl. reagent bottle	285211046
TA 20 <i>plus</i>	Exchange unit with 20 ml glass cylinder incl. reagent bottle	285211054
TA 50 <i>plus</i>	Exchange unit with 50 ml glass cylinder incl. reagent bottle	285211062

Software TitriSoft

TitriSoft 2.6	Titration software for TitroLine alpha <i>plus</i> and TitroLine alpha	285221717
TitriSoft 2.6 P	Titration software according to CFR 21 Part 11	285221720

Accessories for TitroLine alpha *plus* and TITRONIC® 110 *plus*

TZ 2835	PC keyboard for TitroLine alpha <i>plus</i> and TITRONIC® 110 <i>plus</i>	1007852
TM 135	Magnetic stirrer	285211013
TM 128	Titration clamp/rod stirrer combination	285215167
TMKF	Titration stand Karl-Fischer with suction pump and stirrer incl. supply and waste bottle	285216611
TZ 1770	KF titration vessel 30 - 150 ml	285216677
TZ 1772	KF titration vessel 80 - 200 ml	285216693
TZ 1052	Drying oven for water determination according to Karl-Fischer, 230 V	285214721
TZ 1060	Accessory for drying oven TZ 1052	285218115
Z 303	Titration clamp for TL alpha <i>plus</i> and TITRONIC® 110 <i>plus</i>	1007304

Ordering information TW alpha plus

Sample changer TW alpha plus		Order no.
TW alpha plus	Sample changer basic unit, 230 V	1007290
TW alpha plus	Sample changer basic unit, 115 V	1007291

Scope of delivery: Sample changer basic unit TW alpha plus with integrated magnetic stirrer and connection cable TZ 1581 for rod stirrer.

TW alpha plus 12	TW alpha plus basic unit with sample rack TZ 1452 for 12 samples, incl. titration head TZ 1463, connection cable and 20 beakers 250 ml, 230 V	1007292
TW alpha plus 16	TW alpha plus basic unit with sample rack TZ 1459 for 16 samples, incl. titration head TZ 1463, connection cable and 20 beakers 150 ml, 230 V	1007294
TW alpha plus 24	TW alpha plus basic unit with sample rack TZ 1454 for 24 samples, incl. titration head TZ 1462 and 30 beakers 50 ml, 230 V	1007296
TW alpha plus COD	TW alpha plus basic unit with sample rack TZ 1444 for 24 COD vessels in accordance with DIN, incl. titration head TZ 1461, rod stirrer TZ 1846, redox electrode Pt 5901, titration tip TZ 1648 and connection cable, 230 V	1007298
TW alpha plus MP	TW alpha plus basic unit with sample rack TZ 1459 for 16 samples, incl. titration head TZ 1467, membrane pump MP 25, connection cable and 20 beakers 150 ml, 230 V	1007305
TW alpha plus 12	TW alpha plus basic unit with sample rack TZ 1452 for 12 samples, incl. titration head TZ 1463, connection cable and 20 beakers 250 ml, 115 V	1007293
TW alpha plus 16	TW alpha plus basic unit with sample rack TZ 1459 for 16 samples, incl. titration head TZ 1463, connection cable and 20 beakers 150 ml, 115 V	1007295
TW alpha plus 24	TW alpha plus basic unit with sample rack TZ 1454 for 24 samples, incl. titration head TZ 1462 and 30 beakers 50 ml, 115 V	1007297
TW alpha plus COD	TW alpha plus basic unit with sample rack TZ 1444 for 24 COD vessels in accordance with DIN, incl. titration head TZ 1461, rod stirrer TZ 1846, redox electrode Pt 5901, titration tip TZ 1648 and connection cable, 115 V	1007299
TW alpha plus MP	TW alpha plus basic unit with sample rack TZ 1459 for 16 samples, incl. titration head TZ 1467, membrane pump MP 25, connection cable and 20 beakers 150 ml, 115 V	1007306

Accessories for TW alpha plus

TZ 1444	Sample rack for 24 COD vessels in accordance with DIN 38 409	285213836
TZ 1452	Sample rack for 12 sample vessels, incl. 20 beakers 250 ml	285214927
TZ 1454	Sample rack for 24 sample vessels, incl. 30 beakers 50 ml	285213844
TZ 1459	Sample rack for 16 sample vessels, incl. 20 beakers 150 ml	285213166
TZ 1461	Titration head for COD sample rack TZ 1444	285213621
TZ 1462	Titration head for 24-sample rack TZ 1454	285213639
TZ 1463	Titration head for 12- (TZ 1452) and 16-sample rack (TZ 1459)	285213647
TZ 1467	Titration head for 12- (TZ 1452) and 16-sample rack (TZ 1459) incl. splash shield with membrane pump MP 25	285213671
MP 25	Membrane pump MP 25 with accessories for rinsing, 230 V	285216005
TZ 1847	Glass stirrer rod for 12-, 16- and 24-sample rack	285215175
TZ 1846	Glass stirrer rod for COD sample rack	285215134
TZ 1545	Magnetic stirring rods (10 pcs.)	285214232

Data cable

TZ 3088	Data cable TitroLine alpha plus, TW alpha plus or TITRONIC® 110 plus ↔ PC, 5 m	1007972
TZ 3089	Data cable TitroLine alpha plus, TW alpha plus or TITRONIC® 110 plus ↔ PC, 10 m	1007973
TZ 3084	Data cable TitroLine alpha plus, TW alpha plus, TITRONIC® 110 plus ↔ TitroLine alpha plus, TW alpha plus, TITRONIC® 110 plus, 1.5 m	1007974
TZ 3086	Data cable TitroLine alpha plus, TW alpha plus, TITRONIC® 110 plus ↔ TitroLine alpha, TW alpha, TITRONIC® 110/ TITRONIC® 200, 1.5 m	1007975
TZ 3087	Data cable TitroLine alpha plus, TW alpha plus, or TITRONIC® 110 plus ↔ TITRONIC® universal, 1.5 m	1007976
TZ 3082	Data cable TitroLine alpha plus, TW alpha plus, or TITRONIC® 110 plus ↔ Sartorius balances, 5 m	1007977
TZ 3083	Data cable TitroLine alpha plus, TW alpha plus, or TITRONIC® 110 plus ↔ Mettler AT, PM balances, 5 m	1007978
TZ 3081	Data cable TitroLine alpha plus, TW alpha plus, or TITRONIC® 110 plus ↔ Mettler AB-S, PG balances, 5 m	1007979

Informations on electrodes for titration and other sensors see section "Laboratory electrodes"