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"

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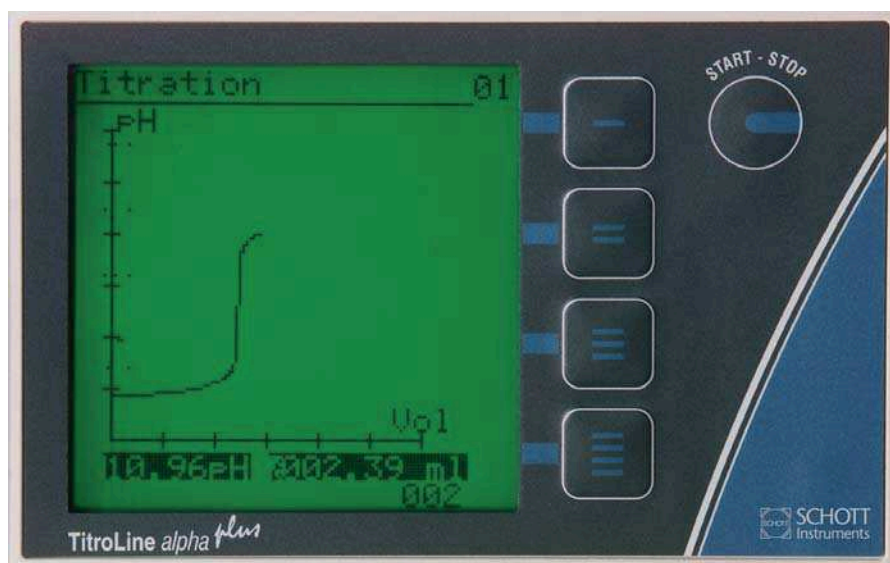
During the titration, you can watch the entire procedure in real time at the titration curve shown on the large display. In this way, you are always in control and don't have to wait for the curve printout.

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.

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**.

… 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 HNO_3. 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 pharmaceutics, 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.

Printer

TitroLine alpha *plus*

TITRONIC® 110 *plus*

TITRONIC® *universal*

PC

TW alpha/ TW alpha *plus*

Balance
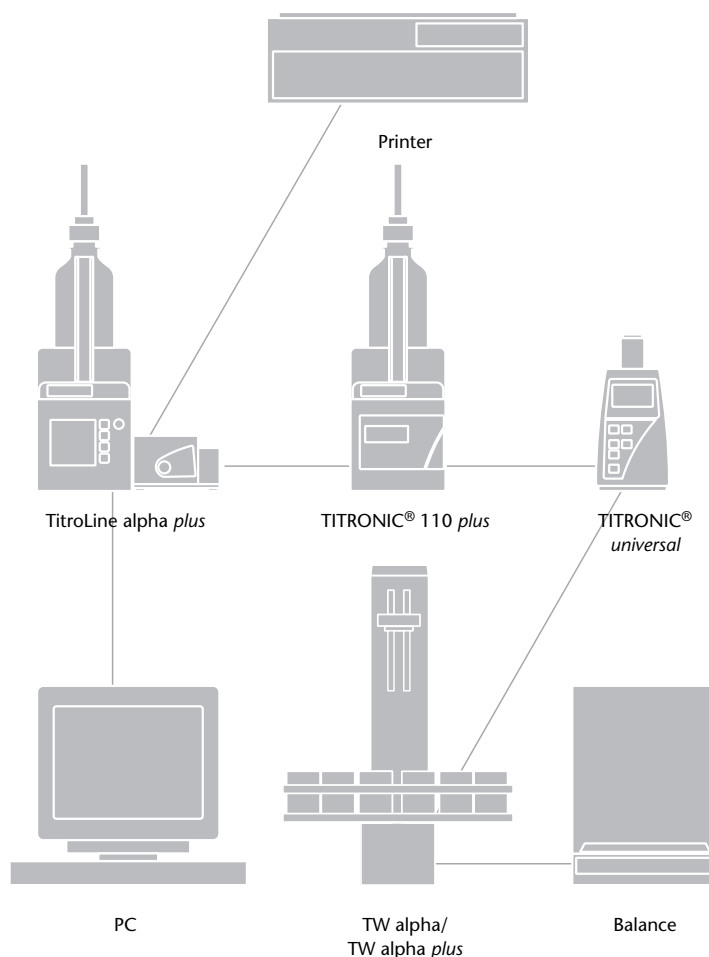
We are happy to support you with your applications

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 <u>and</u> 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 *plus*, TITRONIC® 200 and TITRONIC® *universal*
	sample changer types TW 280, TW alpha und TW alpha *plus*
	TitroLine alpha *plus*: 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 *plus*	5.00 ml	± 0.003 mm	± 0.15 %	0.07 %
TA 10 *plus*	10.00 ml	± 0.003 mm	± 0.1 %	0.05 %
TA 20 *plus*	20.00 ml	± 0.003 mm	± 0.1 %	0.05 %
TA 50 *plus*	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 (PCl 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 Titri-Soft 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 TitriSoft 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".

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 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

Printer · PC · T 110 *plus* · T 110 *plus* · TW alpha *plus* · TitroLine alpha *plus* · Balance · T *universal* · T *universal* · TitroLine alpha *plus* · TitroLine *alpha* · TitroLine alpha *plus*

… 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.

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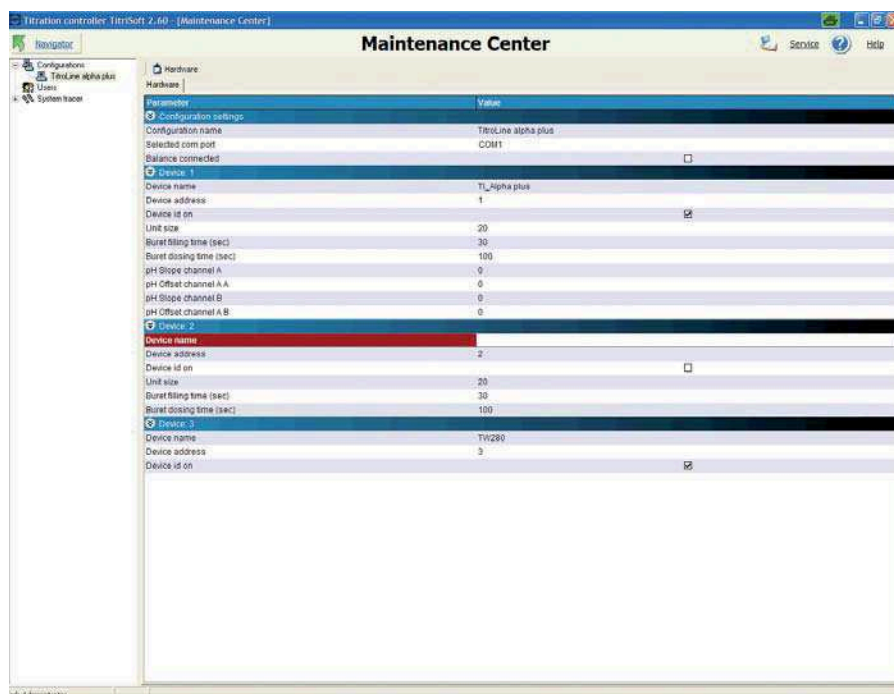
… clearly structured …
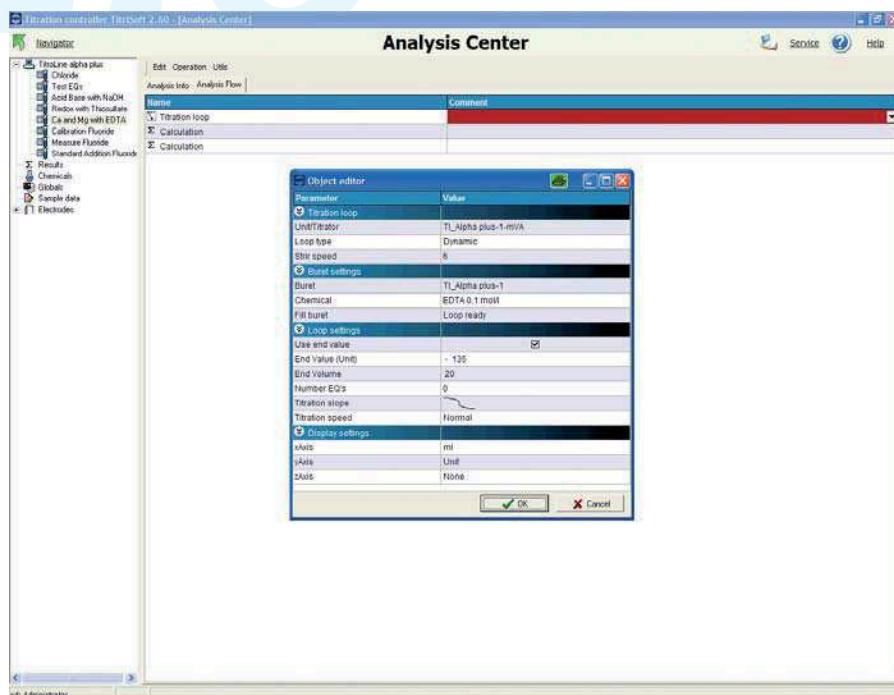
›Analysis Center‹, your method center

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 sym-bolic 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.
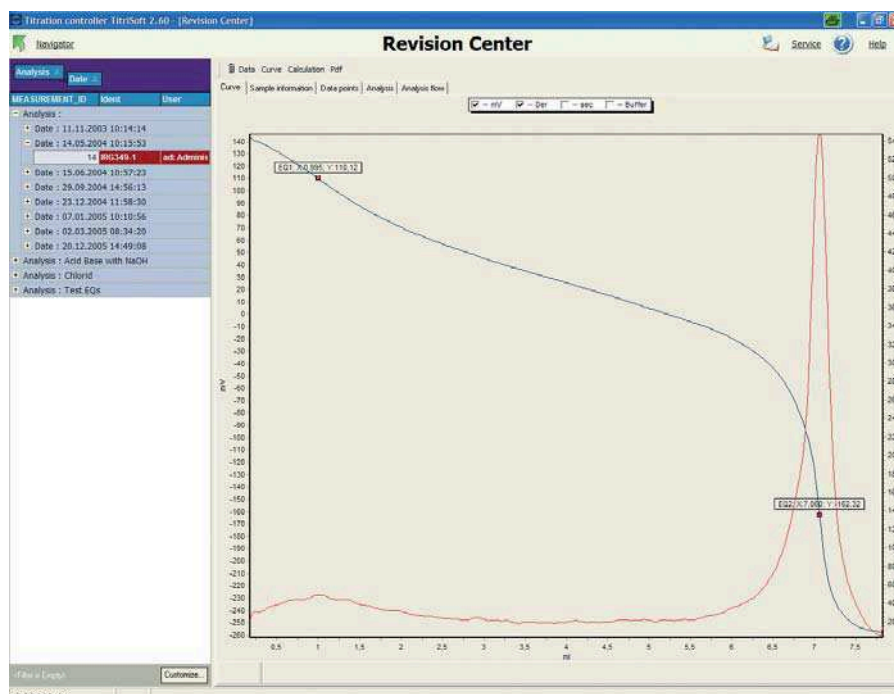
… highly productive: TitriSoft 2.6
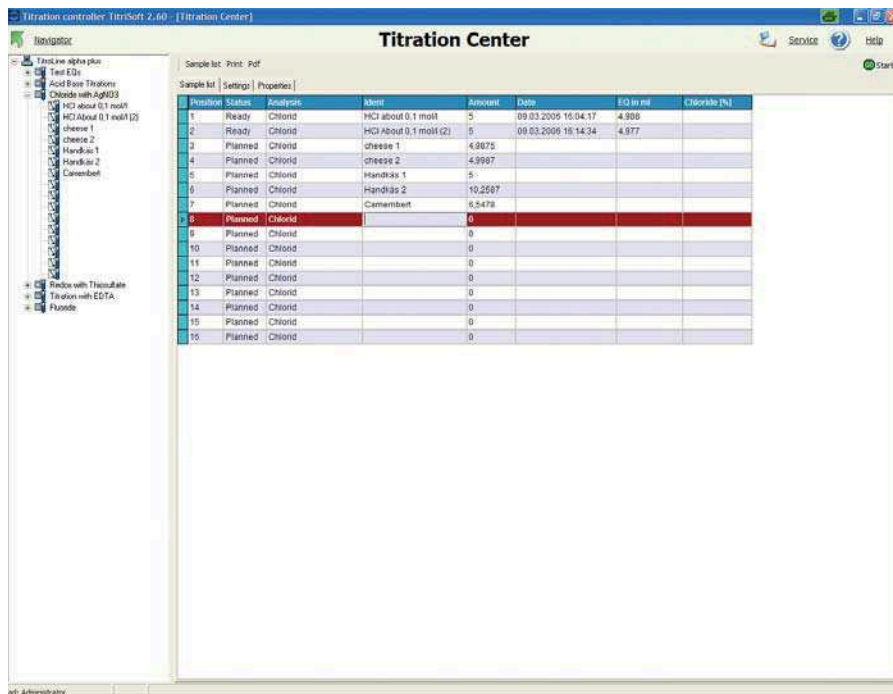
›Titration Center‹, your clearly structured workplace

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 verion "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	■	■

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.

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. TitriSoft 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.
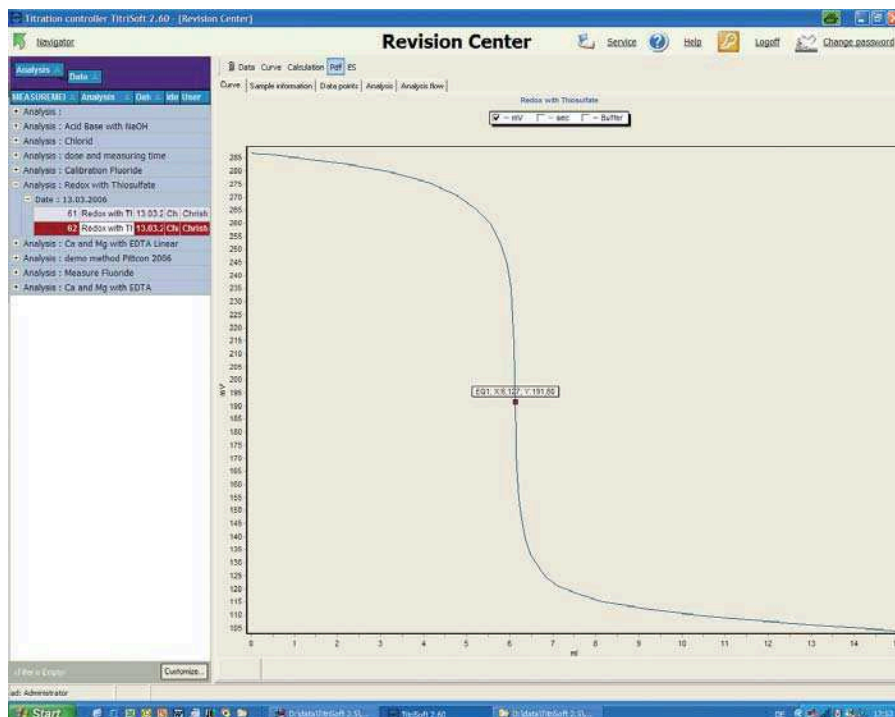
Electronic Records

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.
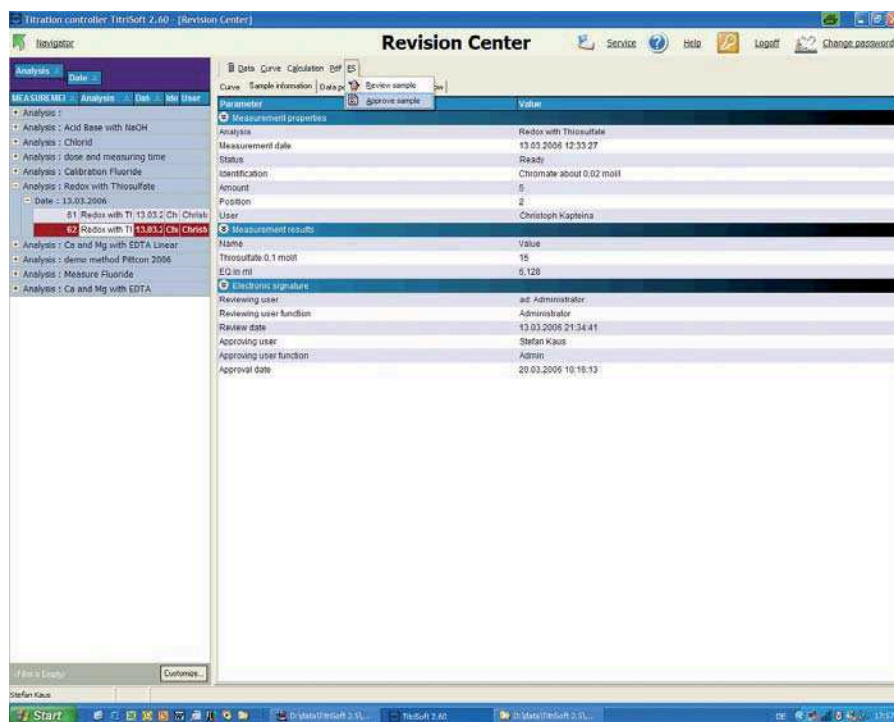
Ordering information TitroLine alpha *plus*

TitroLine alpha *plus*		Order no.
TitroLine alpha *plus*	TitroLine alpha *plus* basic unit <u>without</u> exchange unit, 230 V	285216952
TitroLine alpha *plus*	TitroLine alpha *plus* 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 *plus*	TitroLine alpha 05 *plus* with 5 ml exchange unit, (230 V)	285212934
TitroLine alpha *plus*	TitroLine alpha 10 *plus* with 10 ml exchange unit, (230 V)	285216944
TitroLine alpha *plus*	TitroLine alpha 20 *plus* with 20 ml exchange unit, (230 V)	285216977
TitroLine alpha *plus*	TitroLine alpha 50 *plus* with 50 ml exchange unit, (230 V)	285212983
TitroLine alpha *plus*	TitroLine alpha 05 *plus* with 5 ml exchange unit, (115 V)	285215467
TitroLine alpha *plus*	TitroLine alpha 10 *plus* with 10 ml exchange unit, (115 V)	285215475
TitroLine alpha *plus*	TitroLine alpha 20 *plus* with 20 ml exchange unit, (115 V)	285215631
TitroLine alpha *plus*	TitroLine alpha 50 *plus* 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 *plus*	TitroLine alpha KF 05 *plus* with 5 ml exchange unit, (230 V)	285212991
TitroLine alpha *plus*	TitroLine alpha KF 10 *plus* with 10 ml exchange unit, (230 V)	285213109
TitroLine alpha *plus*	TitroLine alpha KF 05 *plus* with 5 ml exchange unit, (115 V)	285215656
TitroLine alpha *plus*	TitroLine alpha KF 10 *plus* 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 *plus*	TITRONIC® 110 *plus* basic unit <u>without</u> exchange unit, 230 V	1007302
TITRONIC® 110 *plus*	TITRONIC® 110 *plus* 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 *plus*	Exchange unit with 5 ml glass cylinder incl. reagent bottle	285211038
TA 10 *plus*	Exchange unit with 10 ml glass cylinder incl. reagent bottle	285211046
TA 20 *plus*	Exchange unit with 20 ml glass cylinder incl. reagent bottle	285211054
TA 50 *plus*	Exchange unit with 50 ml glass cylinder incl. reagent bottle	285211062

Software TitriSoft		
TitriSoft 2.6	Titration software for TitroLine alpha *plus* 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 *plus* and TITRONIC® 110 *plus*	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 *plus* and TITRONIC® 110 *plus*	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"