



TITRONIC® and TitroLine®

The new titrators and burettes

SI Analytics

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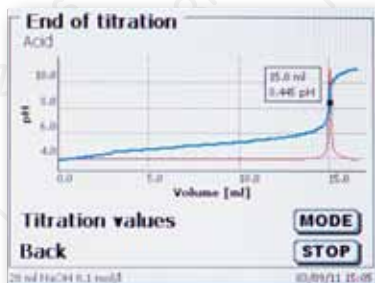
New from SI Analytics:
Simplicity without sacrificing accuracy or features

Introducing the new titrators

TitroLine® 6000 and 7000 and the new TITRONIC® 500 piston burette with innovative features for simple and easy operation-without sacrificing accuracy.



TitroLine® 6000/TitroLine® 7000 titrators



Titronic® 500 piston burette



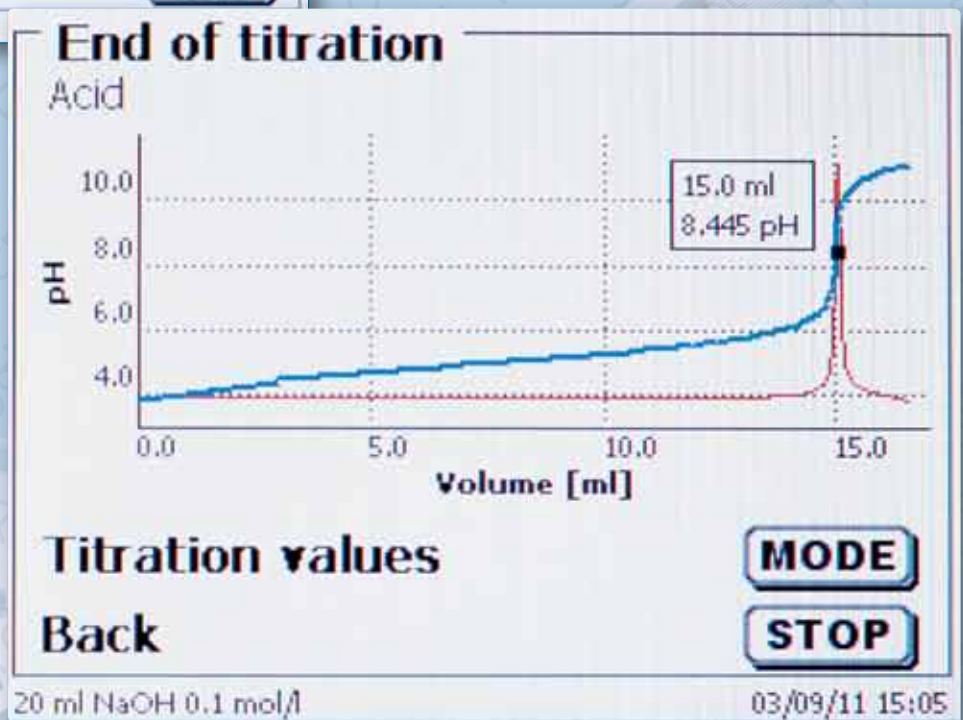
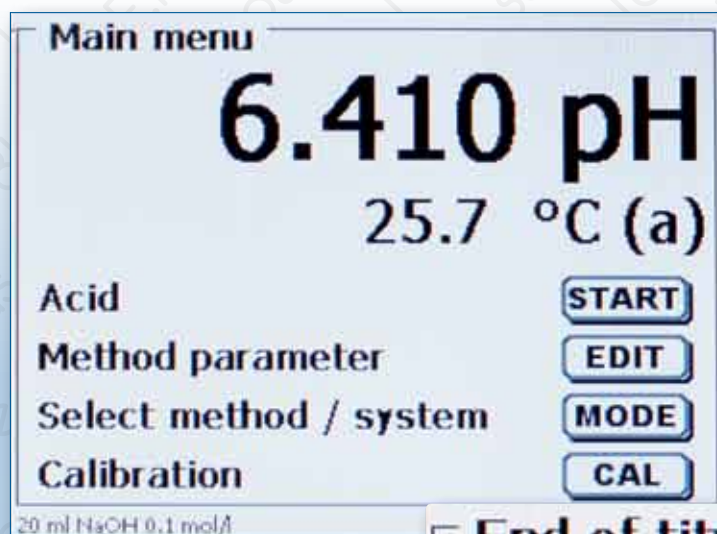
- ▶ ... High visibility, full color display that can be easily viewed from a distance and at extreme angles.
- ▶ ... Reagent data is securely stored in the intelligent and interchangeable modules.
- ▶ ... Automatic wireless recognition of SCHOTT® Instruments ID electrodes guarantees accurate calibration and measurements (TitroLine® 7000).
- ▶ ... Touch keypad interface for error free operation.
- ▶ ... Includes three USB and two RS232 ports for expansion and connection of devices such as USB storage of methods and data, stirrer, laboratory balance, PC and additional SI Analytics peripheral devices.
- ▶ ... Versatile and flexible for a variety of applications.

Benefits
TitroLine®
TITRONIC®

Loaded with features, the TITRONIC® 500, TitroLine® 6000 and 7000 for routine titrations

High visibility graphic display

- ▶ Exceptional high visibility graphic display for viewing even at extreme angles.
- ▶ Clear graphic representation of titration curves and the first derivative curve.
- ▶ Equivalence point values are displayed in the titration curve.



New intelligent, interchangeable modules

- ▶ Size options of 5, 10, 20 and 50 ml.
- ▶ Compact, space saving footprint for when bench space is a premium.
- ▶ All relevant reagent and unit data are stored in the integrated RFID-chip including:
 - Burette size (ml)
 - Titrant name
 - Titrant concentration or titer value of solution
 - Date of manufacturing or expiration date of the reagent.



Flexible configuration features

Expand and customize your workstation using the three USB and two RS232 ports for a total of five connection options for:

- ▶ Magnetic stirrer
- ▶ Manual controller
- ▶ Printer (HP-PCL)
- ▶ Keyboard
- ▶ Storage device
- ▶ USB expansion hub
- ▶ Balance
- ▶ Personal computer
- ▶ Plus, additional SI Analytics devices such as sample changers and peripherals.

USB-manual controller



printer



Potentiometric titrator: TitroLine® 6000 ideal for food, water, wastewater and environmental applications

The simple and easy-to-use TitroLine® 6000 does not sacrifice performance when doing potentiometric titrations. It is the perfect choice for analysis in food, water, wastewater and environmental applications. Thanks to the high-resolution and precise pH/mV and "dead-stop" measuring interface, it is possible to determine a wide range of parameters quickly, reliably and accurately.



Features of the TitroLine® 6000 include:

- High resolution pH/mV electrode and temperature inputs for pH, ISE, redox or photometric titrations.
- Polarizable electrode input for set endpoint applications.
- Available standard methods such as FOS/TAC, alkalinity, total acidity in soft drinks.
- Linear (fixed increment) and dynamic equivalence point titration modes.
- Titrations to pH, mV and μA end point.
- Manual titration mode and routine dosing tasks are also available.

Application "Total acidity in drinks"

Typical applications of the water/wastewater and environmental analysis:

- pH-value, alkalinity ("p+m-value")
- Permanganate index
- COD
- Total Kjeldahl nitrogen
- FOS/TAC (See application example)
- Chloride in wastewater
- Free and Total Chlorine in drinking water
- Total hardness (Sum of Ca^{+} and Mg^{+})
- Dissolved oxygen according to "Winkler" method.

Application example for the water/wastewater and environmental analysis: FOS/TAC (Total volatile fatty acids/Total inorganic carbon, also total alkalinity)

An important parameter for monitoring the fermentation process of biogas plants is a titration method commonly known as FOS/TAC value. The TAC value is determined using 20 ml of a centrifuged sample from the fermenter titrated to pH 5.0 with 0.05 mol/l sulfuric acid. The FOS value is determined by a titration of the same sample to a pH of 4.4. Both titrated ml values are then used in the following calculation formula.

$$\text{TAC} = \text{ml H}_2\text{SO}_4 \text{ to pH } 5.0 \times 250$$

$$\text{FOS} = (\text{ml H}_2\text{SO}_4 \text{ from pH } 5.0 \text{ to pH } 4.4 \times 1.66 - 0.15) \times 500$$

A different sample volume could also be considered. The FOS/TAC value is the average calculated value. The method and all parameters and calculation formulas are stored as a standard method in the TitroLine®6000 and 7000.

Accurate results without compromise

The TitroLine® 6000 is the ideal choice for food and beverage applications such as QA/QC, R&D, food science and nutritional evaluation.

Application:
Chemical Oxygen Demand (COD)



Typical applications of food analysis:

- Salt content (chloride, sodium chloride).
- pH-value, total acidity in wine, beverages and food products such as condiments.
- Formol number in fruit and vegetable juices.
- Ascorbic acid (Vitamin C).
- Calcium in milk and dairy products.
- Protein determination (Kjeldahl-nitrogen) in milk and dairy products.
- Reducing sugar in wine and juices.
- Iodine number, peroxide number, free fatty acids and saponification number¹⁾.
- Determination of free and total sulfurous acid (H₂SO₃) in wine and must. Further detail is available in the application example.

¹⁾ The use of Free fatty acids and saponification number has to be tested in each individual case.

Application example for food analysis: Determination of free and total sulphurous acid (SO₂) in wine.

Since ancient time, "sulfur" (sulfurous acid) has been added to wine as a preservative. Sulfurous acid inhibits the oxidation process and prevents the growth of unwanted microorganisms, extending the life and preserving the quality of wine.

Free and total sulfur (sulfur dioxide) content is determined by the titration of a 10-50 ml sample after the addition of sulfuric acid and potassium iodide with an iodine solution as titrant (0.025 mol/l) and using a double platinum electrode as indicator electrode. The free SO₂ is titrated directly. Total SO₂ is titrated after the hydrolysis with sodium hydroxide which converts the bound SO₂ into the free form.

The method with all parameters and calculation formulas is a standard method in the TitroLine® 6000 and 7000.

Featuring enhanced automation and additional methods

TitroLine® 7000

More methods

Do you require simple and easy titration but need more features? The TitroLine® 7000 offers storage of up to 50 user methods.



Measuring and calibrating with highest accuracy

The wireless sensor recognition automatically recognizes SCHOTT® Instruments ID electrodes and instantly stores dedicated sensor data-eliminating measurement and calibration errors.



Ports

Perfect for non-aqueous titrations

Eliminate the need for special electrodes (e.g. separate indicator, reference and auxiliary electrodes) with the built-in amplifier-ideal for titrations in non-aqueous solvents such as:

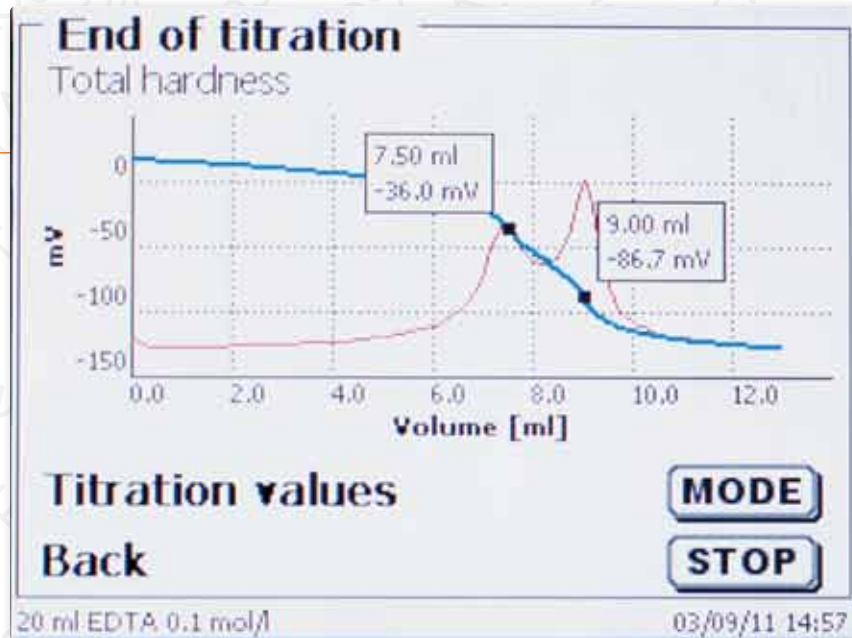
- Acid and base numbers in oils.
- Titrations in glacial acetic acid with perchloric acid.
- Hydroxyl, NCO (Isocyanate) number and further specific values.

pH Stat Titrations

With a pH stat application, a given pH is first adjusted and then kept constant during the analysis with an acid or a base. The pH stat titration is often applied to:

- Determination of the enzyme activity (ex. Lipase).
- pH stat elution of soil sample at pH 4.
- Monitoring of the pH value during chemical syntheses.

Titration curve:
Total hardness (Calcium and Magnesium hardness)



Typical application example for two equivalence points: Titration of amino hydrochlorides (method according Ph. EUR).

Up to now the amino hydrochlorides were dissolved in glacial acetic acid, the amines released through the addition of mercuric acetate and titrated with perchloric acid in glacial acetic acid.

According to the environmentally friendly method of the European Pharmacopoeia the amino hydrochlorides are dissolved in ethanol and being dosed with exact 5.00 ml of a 0.01 mol/l HCl. This mixture is then titrated with NaOH 0.1 mol/l. Most titration curves show two equivalence points. The result is calculated from the difference between the first and second equivalence point.

This method, with all parameters and calculation formulas, comes standard in the TitroLine® 7000 and can be used after the input of equivalent substance weight.

More equivalence points to expand application possibilities

Yes, it is now possible to detect and calculate up to two equivalence points during one titration with the TitroLine®7000. It is possible to determine both the calcium and magnesium hardness individually in a single step, instead of the total hardness combined.

Simple and accurate dosing with the new TITRONIC® 500 piston burette

The TITRONIC® 500 is the ideal piston burette for manual titrations, accurate dosing applications as well as the preparation of solutions. When used with TitriSoft 3.0, it acts as a titration burette or with the TitroLine®7000 and TitriSoft 3.0, it is an automatic dosing unit perfect to pre-dose a titrant.

Important features:

- ▶ Intelligent interchangeable modules with 5, 10, 20 and 50 ml volume capacity.
 - ▶ Connect to a printer and/or an analytical balance.
 - ▶ Remote control access via RS232 or USB interface.
 - ▶ Connect up to 16 devices using the two RS232 ports.
- The first burette is connected to one PC RS232 or USB port.



Dosing, preparing solutions and performing manual titrations

Manual Titration

It is true that the automatic titration is gaining ground, but manual titration remains one of the standard cost effective applications in the lab. Everywhere high precision and flexibility are required; a piston burette with an interchangeable dosing module is the best choice.

Important features:

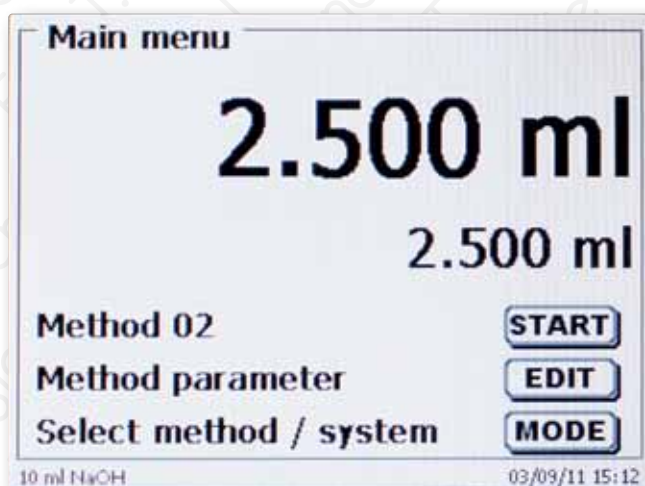
- Titration using the manual controller dosing buttons.
- Titration rate can be adjusted to optimize titration speed and accuracy.
- Programmable automatic calculations, printer ready.
- Automatic weight recording when balance is connected.

Dosing

Besides titration, there are various routine dosing tasks that must be performed in the lab.

Important features:

- Control dosing using the manual controller and the dedicated keypad.
- Adjustable dosing and filling rates optimize speed and accuracy.
- Store dosing methods with different parameters.



Solutions preparation

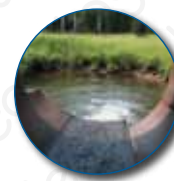
A special sample preparation mode is available on the TITRONIC® 500 where a reagent is dosed into a sample until the required concentration is reached. The sample is weighed, the dosing volume is determined. The volume can then be automatically added to the sample.

Important features:

- Adjustable dosing and filling speed.
- Dosing volume is automatically calculated without additional PC software.
- Automatic weight recording when balance is connected.

Applications Overview

Water and Wastewater Analysis



Application	TITRONIC® 500 (manual)	TitroLine® 6000 (manual or automated)	TitroLine® 7000 (manual or automated)
Alkalinity (p+m-value)	■	■	■
COD	■	■	■
Permanganate index	■	■	■
FOS/TAC	■	■	■
Kjeldahl-nitrogen/ammonia (after distillation)	■	■	■
Chloride in drinking and wastewater	■	■	■
Chlorine in drinking water	■	■	■
Calcium and magnesium hardness (2 equivalence points)	■	-	■
Total hardness (Sum Ca/Mg; 1 equivalence point)	■	■	■

Food



Application	TITRONIC® 500 (manual)	TitroLine® 6000 (manual or automated)	TitroLine® 7000 (manual or automated)
Total acidity in wine and soft drinks	■	■	■
Total acidity in food (ketchup, salad dressing)	■	■	■
Acidity in bread and sourdough	■	■	■
Ash alkalinity	■	■	■
Chloride ("salt") in food and mineral water	■	■	■
Sulfurous acid (SO ₂), free and total	■	■	■
Volatile acids	■	■	■
Titrateable acidity in milk (Soxlet Henkel (SH) index)	■	■	■
Reducing sugars	■	■	■
Ascorbic acid (vitamin C)	■	■	■
Calcium in milk and dairy products	■	■	■
Calcium and magnesium in mineral water	■	-	■
Formol index	■	■	■
Nitrite in pickling salt	■	■	■
Iodine number	■	■	■
Peroxide number	■	■	■
Saponification number	■	■	■
Acidity (FFA) in fats and oils	■	■	■



Industrial Products

Application	TITRONIC® 500 (manual)	TitroLine® 6000 (manual or automated)	TitroLine® 7000 (manual or automated)
Titration of strong acids and bases (1 equivalence point)	■	■	■
Phosphoric acid (2 equivalence points)	■	-	■
Hydroxyl number	■	■	■
NCO (Isocyanate) number	■	■	■
Epoxy number	■	■	■
Acid number in resins and other industrial products	■	■	■
Acidity in oils (TAN, max. 2 equivalence points)	■	-	■
Total base number (TBN) in oils	■	-	■



Miscellaneous Applications

Application	TITRONIC® 500 (manual)	TitroLine® 6000 (manual or automated)	TitroLine® 7000 (manual or automated)
Surfactants	■	■	■
Metals (redox)	■	■	■
Metals (zinc, copper..., complexometric)	■	■	■
Titrations with perchloric acid (non aqueous titrations)	■	■	■
Potentiometric titration to 1 equivalence point (general)	■	■	■
Potentiometric titration to 2 equivalence points (general)	■	-	■

- Excellent application suitability.
- Manual titration must be evaluated for this application.
- Titration is possible for this application with restrictions and must be evaluated.

Features Overview

The most important features of TitroLine® 6000, TitroLine® 7000 and TITRONIC® 500 at-a-glance

Features	TITRONIC® 500	TitroLine® 6000	TitroLine® 7000
pH/mV measuring input with reference input	–	1	1
Wireless electrode recognition	–	–	■
Dead stop measuring input (2 x 4 mm connector)	–	■	■
Temperature measuring input (2 x 4 mm connector)	–	■	■
Interfaces	(2) USB Host, (1) USB-Slave (2) RS232	(2) USB Host, (1) USB-Slave (2) RS232	(2) USB Host, (1) USB-Slave (2) RS232
Balance connection	RS232	RS232	RS232
Burette resolution	10,000	10,000	10,000
Intelligent interchangeable modules	■	■	■
Titration to mV and pH end points	–	2 EP	2 EP
Dynamic and linear titration to inflection point (EQ), mV and pH	–	1 EQ	2 EQ
Particularly suitable for non aqueous titrations	–	–	■
Dead-stop titration	–	■	■
pH-stat titration	–	–	■
Manual titration	■	■	■
Dosing applications	■	■	■
Solution preparation (manual or automatic when connected to balance)	■	■	■
Standard formulas for miscellaneous calculations	■	■	■
Standard methods	■	■	■
Number of user methods	15	15	50
Connection and control of autosamplers	–	–	■
Can be controlled with TitrSoft 3.0	■	–	■

Ordering information

Type No.	Order no.	Product	Description
T 500-M1	285220210	TITRONIC® 500 with magnetic stirrer	TITRONIC® 500 basic unit with magnetic stirrer (TM 235), with stand rod (TZ 1510), electrode clamp (Z 305), manual controller (TZ 3880), power supply 100-240 V
T 500-M2/20	285220220	TITRONIC® 500 with magnetic stirrer and 20 ml interchangeable module	TITRONIC® 500 basic unit with magnetic stirrer (TM 235) and 20 ml interchangeable module (WA 20), with stand rod (TZ 1510), electrode clamp (Z 305), manual controller (TZ 3880), power supply 100-240 V
TL 6000-M1/10	285220050	TitroLine® 6000 with magnetic stirrer and 10 ml interchangeable module	TitroLine® 6000 basic unit with magnetic stirrer (TM 235) and 10 ml interchangeable module (WA 10), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TL 6000-M1/20	285220060	TitroLine® 6000 with magnetic stirrer and 20 ml interchangeable module	TitroLine® 6000 basic unit with magnetic stirrer (TM 235) and 20 ml interchangeable module (WA 20), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TL 6000-M1/50	285220070	TitroLine® 6000 with magnetic stirrer and 50 ml interchangeable module	TitroLine® 6000 basic unit with magnetic stirrer (TM 235) and 50 ml interchangeable module (WA 50), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TL 6000-M2/20	285220080	TitroLine® 6000 with 20 ml interchangeable module and pH electrode	TitroLine® 6000 basic unit with magnetic stirrer (TM 235) and 20 ml interchangeable module (WA 20), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip. With pH combination electrode and buffer set.
TL 7000-M1/10	285220140	TitroLine® 7000 with magnetic stirrer and 10 ml interchangeable module	TitroLine® 7000 basic unit with magnetic stirrer (TM 235) and 10 ml interchangeable module (WA 10), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TL 7000-M1/20	285220150	TitroLine® 7000 with magnetic stirrer and 20 ml interchangeable module	TitroLine® 7000 basic unit with magnetic stirrer (TM 235) and 20 ml interchangeable module (WA 20), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TL 7000-M1/50	285220160	TitroLine® 7000 with magnetic stirrer and 50 ml interchangeable module	TitroLine® 7000 basic unit with magnetic stirrer (TM 235) and 50 ml interchangeable module (WA 50), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TL 7000-M2/20	285220170	TitroLine® 7000 with 20 ml interchangeable module and pH electrode	TitroLine® 7000 basic unit with magnetic stirrer (TM 235) and 20 ml interchangeable module (WA 20), with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip. With pH combination electrode and buffer set.
WA 05	285220300	Interchangeable module	5 ml interchangeable module with integrated chip for reagent data, with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
WA 10	285220310	Interchangeable module	10 ml interchangeable module with integrated chip for reagent data, with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
WA 20	285220320	Interchangeable module	20 ml interchangeable module with integrated chip for reagent data, with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
WA 50	285220350	Interchangeable module	50 ml interchangeable module with integrated chip for reagent data, with brown glass bottle for titrant, (GL 45) and (S 40)-bottle adapter, tubes, drip tube and titration tip
TM 235	285220400	Magnetic stirrer	Magnetic stirrer with stand rod (TZ 1510), for vessels up to 500 ml, agitator speed infinitely adjustable from 500 - 2000 r/min, for the connection to TitroLine® 6000/7000 and TITRONIC® 500
TZ 3835	285220410	PC keyboard	PC keyboard with USB-plug for connection to TitroLine® 6000, TitroLine® 7000 and TITRONIC® 500

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