

TitriC Vario pro



Multi parameter analysis by titration and ion chromatography combined

TitriC Vario pro – the dream team for comprehensive ion analysis

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Comprehensive analysis of ionic components in liquid samples such as water involves four analytical techniques:

- Direct measurement
- Titration
- Ion chromatography
- Voltammetry

Each of these techniques has its particular strengths. However, applying them one after the other on discrete systems is a rather complex task that takes its time.

It is good to know that there is a way to do it much easier, faster, and more reliably, too: TitriC. TitriC stands for direct measurement, titration, and ion chromatography combined in a single system. Ever since Metrohm introduced the first TitriC system in 1998, it was constantly developed further.

With TitriC Vario pro we are proud to present the most flexible, reliable and easy to use TitriC system ever.



Highlights

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- Unique combination of titration, direct measurement and ion chromatography
- Minimum space required
- Fully automated analysis of all ionic components
- Easy to control with MagIC Net software
- Use titration or ion chromatography alone or both techniques combined
- All analytical results in one report
- Fast analysis, reliable and reproducible results
- Unique calculation of the ionic balance
- Cost efficient
- State-of-the-art database for storage and management of results
- Just one sample changer needed for three analytical techniques
- Fully compatible with Metrohm Inline Sample Preparation (MISP) techniques
- TitrIC Vario pro is FDA compliant



Application areas of TitrIC Vario pro

- Municipal water authorities
- Desalination plants
- Environmental institutes
- Food industry
- Pharmaceutical industry
- Metal working industry
- Automotive industry
- ...

TitriC Vario pro – the details

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Easy to use

Whether sequential, chemical or without suppression, TitriC Vario pro allows for fully automated, unattended operation from the moment you have filled in the determination table. TitriC Vario pro is self-monitoring. The system tells you when it is time to calibrate the electrodes, determine the titer, and when to change the solutions.

If any system parameter is out of spec, TitriC lets you know by an error message sent to your mobile or e-mail account. On your command, the system is shut down immediately.

Perfect reliability

TitriC Vario pro automatically injects check standards after any number of samples defined by the user. The system is automatically recalibrated, if any check is out of specs.

Complete traceability

Results of titration, direct measurement, and ion chromatography are available in user-defined reports. All data generated can always be reviewed; complete traceability is guaranteed so you are prepared for even the toughest audits.

Highly flexible

TitriC Vario pro is hard to beat when it comes to flexibility. The system can be upgraded at any time with unique, time and work saving accessories for Inline Sample Preparation, e.g. for Inline Dilution.

Furthermore, many additional features and parameters can be added and determined, respectively.



You decide what to do

It is always yours to decide for each sample whether to do just a titration and determine conductivity, only use ion chromatography, or whether to run the full program including ion chromatography. It is easy. In the sample table, simply use the drop-down menu and mark for each sample what you would like to do.



Made to measure

If any Metrohm methods and/or instrumentation are already being used in your lab, there is no need for you to spend extra money. We will find a way to integrate them and get the most out of your Metrohm instruments and methods.

TitrIC Vario pro – numerous possibilities in ion analysis ...

... through the unique combination of titration and ion chromatography

TitrIC Vario pro combines the three analytical methods titration, direct measurement and ion chromatography (IC) in a unique system that only Metrohm is able to offer. Metrohm's experience in both titration and ion chromatography has resulted in a complete system that can be used for many different kinds of analysis. All ionic components are determined rapidly, reliably and reproducibly. The results are stored in the integral database and processed into a single report.

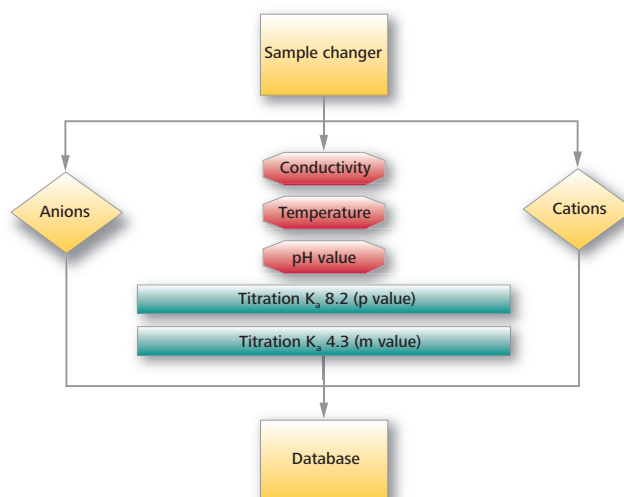
Automation saves money

TitrIC Vario pro is completely automated. After the samples have been placed on the rack, MagIC Net takes over and can work seven days a week for 24 hours per day. Intelligent control and thoroughly tested technology guarantee reliable analyses. Up to 100 samples can be determined without any manual intervention. The high degree of automation reduces costs and increases the precision of the analysis.

Particular attention has been given to keeping space requirements to a minimum. TitrIC Vario pro profits from the synergies between titration, direct measurement and ion chromatography, all made by Metrohm. All the methods use the same liquid handling units and a common sample changer. This helps to save both costs and bench space – a rapid return on investment is assured.

Flexibility for a wide variety of application areas

The combination of the extremely flexible MagIC Net software with *tiamo*TM allows the performance of any titration or direct measurement as well as any type of anion or cation determination by IC. This is why TitrIC Vario pro is not only the system of choice for water analysis but is also ideal for applications in the foods, electroplating, automotive and pharmaceutical industries.



TitriC Vario pro determines the following parameters

Direct measurements with TitriC Vario pro

- pH value
- Temperature
- Conductivity

Titration with TitriC Vario pro

- p value (titration to pH = 8.2)
- m value (titration to pH = 4.3)
- Calcium
- Magnesium
- ...

Anion IC with TitriC Vario pro

- Fluoride
- Chloride
- Bromide
- Nitrite
- Nitrate
- Phosphate
- Sulfate
- ...

Cation IC with TitriC Vario pro

- Lithium
- Sodium
- Ammonium
- Potassium
- Calcium
- Magnesium
- ...

Calculations with TitriC Vario pro

- Molar concentrations of all cations
- Molar concentrations of all anions
- Ionic balance
- Total water hardness
- ...



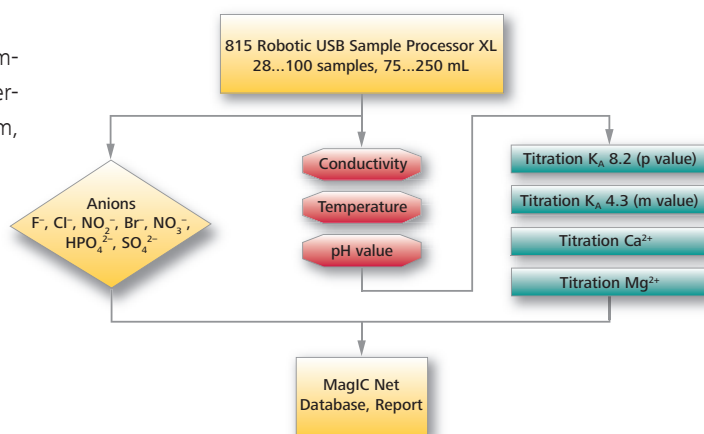
TitriC Vario pro – the customized analytical system

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TitriC Vario pro can be adapted to suit any analytical requirement. The application determines the parameters of interest. This means that different methods and procedures can be combined. TitriC Vario pro is available in three main versions.

TitriC Vario pro I – the basic system

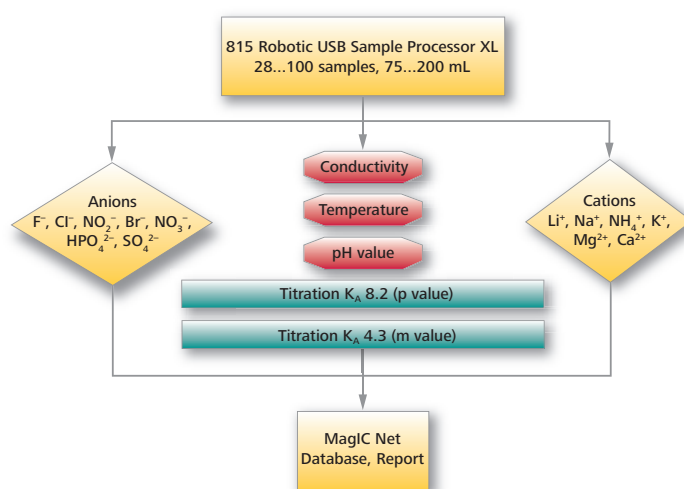
Fully automated system for direct measurement of temperature, conductivity and pH value, the titrimetric determination of the p and m values, calcium and magnesium, and the ion chromatographic determination of anions.



TitriC Vario pro I: The system consists of an 856 Conductivity Module, four 800 Dosinos, an 802 Stirrer, a 905 Titrand, an 815 Robotic USB Sample Processor XL and an 830 Compact IC Flex with sequential suppression.

TitriC Vario pro II – for complete anion and cation analysis

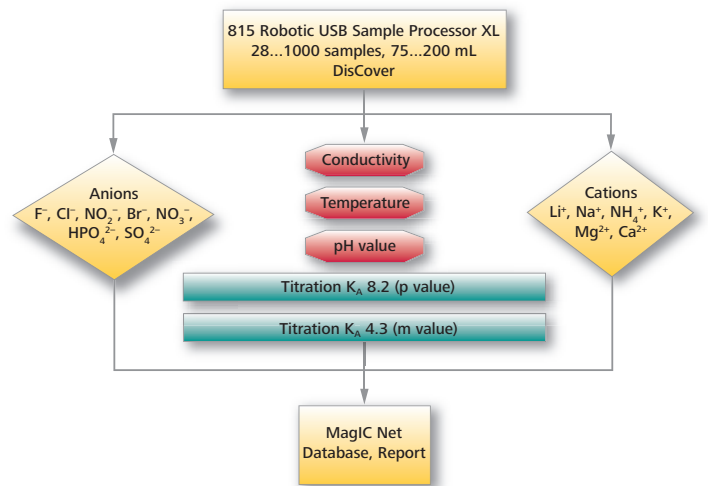
Fully automated system for the direct measurement of temperature, conductivity and pH value, the titrimetric determination of p and m values, the ion chromatographic determination of cations including calcium and magnesium, as well as the ion chromatographic determination of anions.



TitriC Vario pro II: The system consists of an 856 Conductivity Module, two 800 Dosinos, an 802 Stirrer, a 905 Titrando, an 815 Robotic USB Sample Processor XL, and two 930 Compact IC Flex.

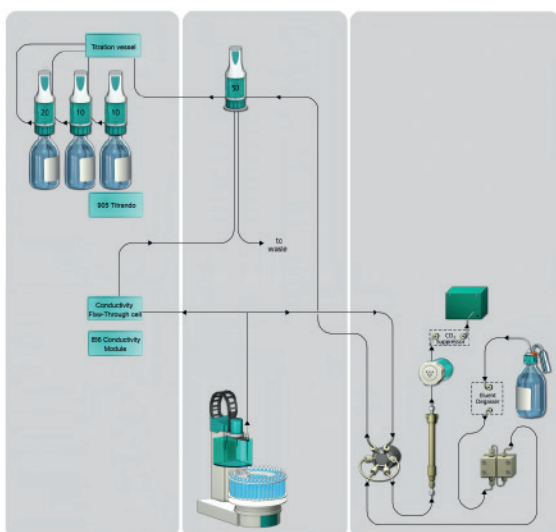
TitriC Vario pro III – the professional solution with sealed sample vessels

Fully automated system for the direct measurement of temperature, conductivity and pH value, the titrimetric determination of p and m values and the ion chromatographic determination of cations including calcium and magnesium, as well as the ion chromatographic determination of anions. The sample changer is equipped with the DisCover function for the automatic removal of the covers from the sealed sample vessels.



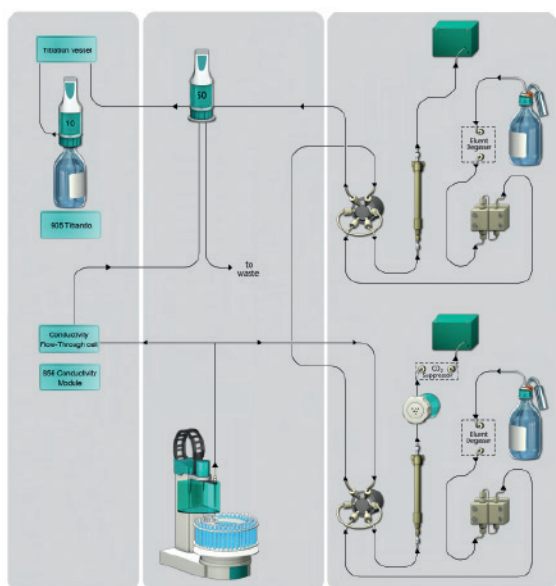
TitriC Vario pro III: The system consists of an 856 Conductivity Module, two 800 Dosinos, an 802 Stirrer, an 815 Robotic USB Sample Processor XL and an 940 Professional IC Vario for anions and cations.

Flow charts for the three main TitrIC Vario pro systems

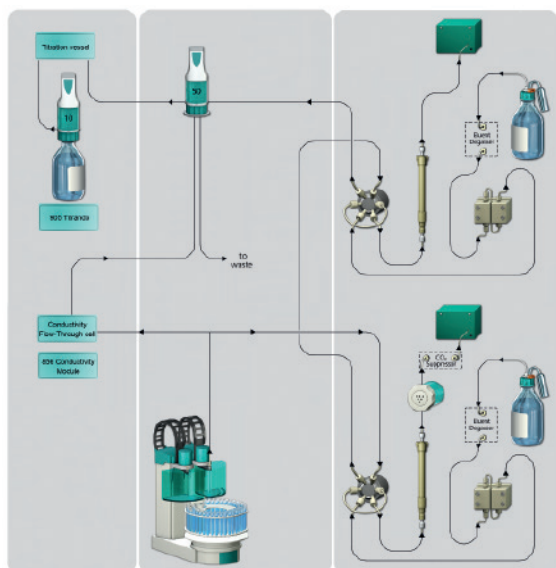


In the left block the titration part is depicted, in the middle rectangle the liquid handling is shown, and on the right the IC part can be seen.

TitrIC Vario pro I: The sample path is split after the sample changer to feed the titration side and the ion chromatography side separately with the help of an 800 Dosino. Ca^{2+} & Mg^{2+} analysis completes the alkalinity, pH, conductivity, and temperature measurements performed by titration. Standard anions are measured with sequential suppression and IC conductivity detection.



TitrIC Vario pro II: The sample path is split after the sample changer to feed the titration side and the ion chromatography side separately with the help of an 800 Dosino. Alkalinity, pH, conductivity and temperature measurements are performed with titration. Standard anions are measured after sequential suppression, cations directly by IC conductivity detection.



TitrIC Vario pro III: The sample path is split after the sample changer to feed the titration side and the ion chromatography side separately with the help of an 800 Dosino. Alkalinity, pH, conductivity and temperature measurements are performed by titration. Standard anions are measured after sequential suppression, cations directly by IC conductivity detection. To protect the samples from contact with the ambient air, the sample vessels are covered with a magnetic cap that is removed only shortly before analysis.

TitriC Vario pro – upgrade kits

TitriC Vario pro can easily be upgraded with predefined accessory kits for Metrohm logical Inline Dilution or Metrohm intelligent Partial Loop Injection Technique (MiPT).

TitriC Vario pro: Dilution Kit (6.5338.100)

Metrohm logical Inline Dilution provides for accurate results while saving the user from manual sample preparation. First, the conductivity of the sample is measured. From the measured value, a dilution factor is calculated automatically by the MagIC Net software. The sample is then diluted accordingly in an external vessel, guaranteeing results within the calibration range with just a single injection of sample. Moreover, no sample is wasted as

the conductivity value is measured during the transfer of the sample into the titration vessel.

Logical Inline Dilution not only allows the analysis of a wide range of sample concentrations without the need of any manual intervention but also the performance of a multi-point calibration from a single multi-ion standard.

For Metrohm logical Inline Dilution, TitriC Vario pro has to be ordered with the TitriC Vario pro Dilution Kit and additionally an 800 Dosino, an 741 Magnetic Stirrer and, in some cases, an 804 Ti Stand.



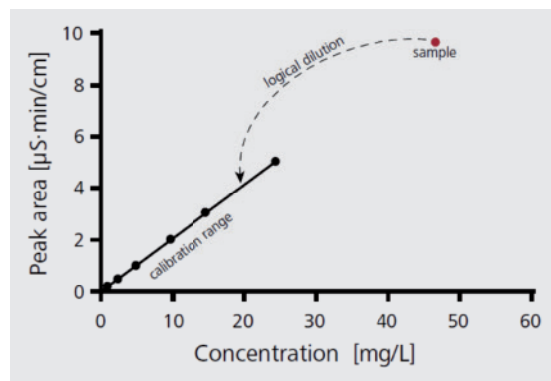
TitriC Vario pro I: Setup with added MiPT Kit

TitriC Vario pro: MiPT Kit (6.5338.110)

With Metrohm intelligent Partial Loop Injection Technique (MiPT) it is possible to inject different sample volumes with just one fixed injection loop. MiPT enables analyzing a wide range of sample concentrations, and performing a multi-point calibration from just one multi-ion standard is possible.

For MiPT, TitriC Vario pro has to be ordered with the TitriC Vario pro MiPT Kit and additionally an 800 Dosino.

Typically, the MiPT method is used for analysing components at $\mu\text{g/L}$ - mg/L levels, while the sample is diluted when dealing with higher (mg/L - $\%$) concentrations.



For both techniques, a measuring range of 1:10'000 is achieved; from just a single standard!

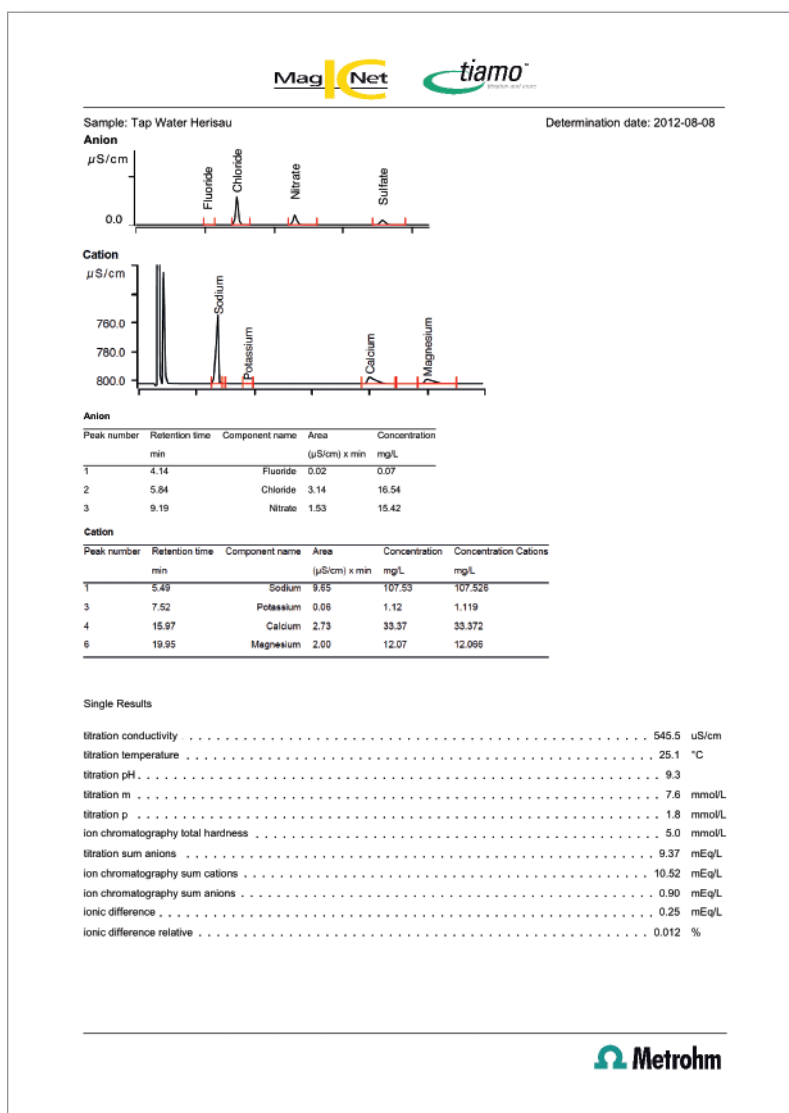
TitriC Vario pro – software solution

As titration and ion chromatography are two entirely different techniques, it is difficult to combine both in one and the same software. We have met this challenge with a most elegant solution. TitriC Vario pro is controlled by Metrohm's standard software for ion chromatography, while the software for titration is running in the background.

The full potential of MagIC Net can be used and all functions are available for reprocessing and recalculating of the IC results. Titration results are simply transferred to the corresponding determination in MagIC Net and are thus available in the database. The complete data are available for professional data management and are FDA compliant. Results are shown in one and the same table for both systems and a joint report is given out at the end.

To be more precise, in TitriC Vario pro, MagIC Net controls **tiamo**[™]. This brings virtually unlimited versatility to TitriC Vario pro, as any MagIC Net method can be combined with any **tiamo**[™] method. In other words, you do your daily work with MagIC Net, which serves as the master software, while **tiamo**[™] is running in the background as a slave.

Both softwares is available in several different languages.



Example report of a TitriC Vario pro system

Ordering information

a.) Main packages

- TitriC Vario pro I** The basic TitriC Vario pro system. Anion concentrations are determined via ion chromatography; alkalinity and calcium and magnesium concentrations by titration. Direct analysis of conductivity, pH and temperature of the samples are also included.
- TitriC Vario pro II** The advanced TitriC Vario pro system. Anion and cation concentrations are determined via ion chromatography; alkalinity by titration. Direct analysis of conductivity, pH and temperature of the samples are also included.
- TitriC Vario pro III** The high-end version of a TitriC Vario pro system. Anion and cation concentrations are determined via ion chromatography with the 940 Professional IC Vario system; alkalinity by titration. Direct analysis of conductivity, pH and temperature of the samples are also included. As a further improvement, the sample changer is equipped with the DISCOVER function, where a magnetic cap covers the vials, to prevent the solutions from evaporating and/or absorbing CO₂, which would result in a changed pH value. Only right before the analysis the cap is removed automatically.

b.) Accessories

Sample racks

- 6.2041.800 Sample rack 100 × 75 mL¹
- 6.2041.810 Sample rack 34 × 150 mL¹
- 6.2041.820 Sample rack 28 × 250 mL¹
- 6.2041.830 Sample rack 28 × 200 mL
- 6.2041.840 Sample rack 59 × 120 mL

Sample beakers

- 6.1432.210 Sample beaker 75 mL made of glass (for 6.2041.800)¹
- 6.1432.320 Sample beaker 250 mL made of glass (for 6.2041.820)¹
- 6.1432.250 Sample beaker 250 mL made of polypropylene (for 6.2041.820)¹
- 6.1459.300 Sample beaker 120 mL made of polypropylene (250 pieces) (for 6.2041.840)

Electrodes

- 6.0277.300 iAquatrode plus with Pt 1000²
- 6.0510.100 Combined polymermembrane electrode Ca³
- 6.0915.100 Five-ring conductivity measuring cell, $c = 0.7 \text{ cm}^{-1}$, with Pt 1000²

Separation columns

- 6.1006.510 Metrosep A Supp 5 - 100/4.0
- 6.1006.520 Metrosep A Supp 5 - 150/4.0
- 6.1006.500 Metrosep A Supp 4/5 Guard/4.0
- 6.1030.410 Metrosep A Supp 15 - 100/4.0
- 6.1030.420 Metrosep A Supp 15 - 150/4.0
- 6.1030.500 Metrosep A Supp 15 Guard/4.0
- 6.1050.410 Metrosep C 4 - 100/4.0
- 6.1050.420 Metrosep C 4 - 150/4.0
- 6.1050.500 Metrosep C 4 Guard/4.0

Suppressor rotors

6.2832.000	MSM Rotor A
6.2842.000	MSM-HC Rotor A
6.2844.000	MSM-LC Rotor A
6.2842.200	MSM-HC Rotor C
6.2842.020	Adapter Vario to MSM and MSM-LC

c.) Optional accessories**Additional kits for IC**

6.5338.100	<p>TitriC Vario pro: Dilution kit</p> <p>Has to be ordered with an 2.800.0010 Dosino, an 2.741.0010 Magnetic Stirrer and an 2.804.0010 Ti-Stand for the TitriC Vario pro I and II versions. For TitriC Vario pro III, only the 2.800.0010 and 2.741.0010 have to be ordered.</p>
6.5338.110	<p>TitriC Vario pro: MiPT kit</p> <p>Has to be ordered with an 2.800.0010 Dosino.</p>

Inline Eluent Preparation

2.941.0010	941 Eluent Production Module
2.800.0010	800 Dosino
6.5330.090	IC Equipment: Additional Eluent on the Eluent Production Module
6.2769.110	Sensor EMPTY for 2 L bottles

Titration equipment

6.2307.230	Buffer solutions pH 4, 7, and 9 ²
6.2324.000	Conductivity standard 500 mL (100 $\mu\text{S}/\text{cm}$) ²
6.2301.060	Conductivity standard (12.88 mS/cm)
6.2065.000	Stacking frame for 846 Dosing Interface. 856 Conductivity Module, 905 Titrand

¹ Suitable for the DIS-Cover function of TitriC Vario pro III

² Included in the delivery package of TitriC Vario pro I, II, and III

³ Included in the delivery package of TitriC Vario pro I



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