904/905 and 906/907 Titrando

Intelligent potentiometric titrators
Karl Fischer titrators
STAT titrators

Metrohm

The intelligent all-rounders for the modern titration laboratory

Highlights

- Touch and titrate – Favorite icons for quick titration start
- Generates PDF files without a PC
- iConnect – mobile measuring input with digital data transmission
- iTrodes – intelligent sensors for automatic electrode recognition
- GLP-compliant electrode test
- Intelligent dosing elements
- Potentiometric, Karl Fischer and STAT titration
- Sample Processor control
- Client-server database with ***tiamo***™
- Parallel titration with ***tiamo***™
- Direct access to intranet and internet
- Liquid handling with the unique Dosino
- Complies with GMP/GLP and FDA Regulations such as 21 CFR Part 11
- USB interfaces for sample changer, printer, PC keyboard, barcode reader …
- Wireless communication via Bluetooth for printer and balance

Reagent dosing à la carte

In a strict sense, doing titration means dosing intelligently. The Titrando System gives you the choice. With the 905 and 907 Titrando you dose with Dosinos and Dosing Units that are attached directly onto the reagent bottle. With the 904 and 906 Titrando dosing is carried out by using Exchange Units. One of these is located on the 904 or 906 Titrando, which can control additional Dosimats with their Exchange Units. Mixed systems with Dosing and Exchange Units are possible. This means that your choice doesn't lead you down a blind alley – full flexibility is retained.

The 806 Exchange Unit – a time-proven concept with added intelligence

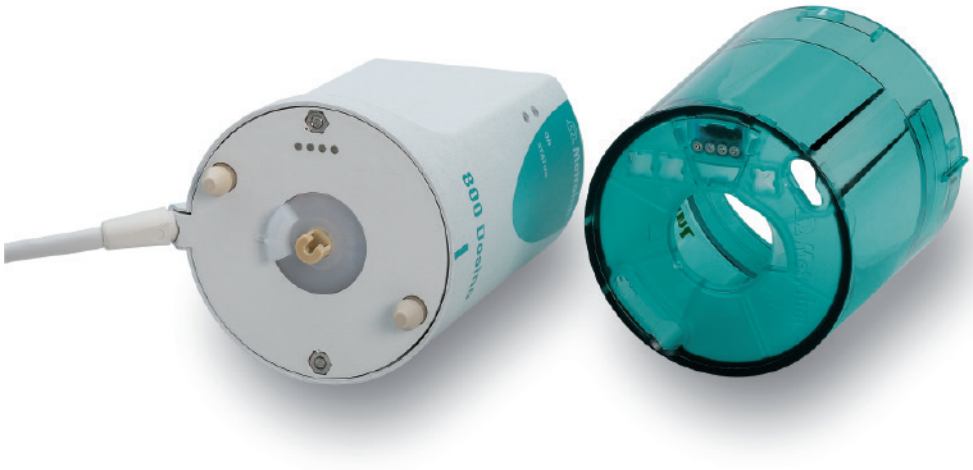
Since 1973 Metrohm has produced Exchange Units with automatic valve switching. The Exchange Unit has been continuously developed. The latest version is the 806 Exchange Unit. It dispenses reagents with a resolution of 20'000 steps per cylinder volume.

The space-saving Dosino

The patented Dosino with its Dosing Unit can be mounted directly onto the reagent bottle. This means that dosing requires no additional bench space. Thanks to adapters, any reagent bottle can be used directly. The Dosino houses the latest state-of-the-art electronics and micromechanics. The Dosing Unit can be exchanged within seconds. Thanks to its transparent housing any bubbles that may be present in the dosing cylinder can be seen and removed immediately and the valve position is always shown. Rinsing and preparation of the Dosing Unit can be carried out automatically; manual dismantling and rinsing are not necessary.

Smart dosing elements with certification

The Exchange or Dosing Units set new standards with regard to reliability. Intelligence «en miniature» in the form of an inconspicuous Data Chip makes this possible. This chip is present in every 806 Exchange unit / 807 Dosing Unit. The Titrando automatically reads from it all the data that it needs to carry out the titration properly, i.e. type of reagent, titer, last titer determination, shelf-life data and much more. In addition, the Titrando compares the data it has obtained with the selected method and carries out a plausibility test. If the result is negative then a clear error message appears.



Comparison of the two dosing systems

	806 Exchange Unit	807 Dosing Unit
Standard bottle thread	GL45	GL45
Adapters for bottle threads	S40, 40 mm, 32 mm, 28 mm	S40, 40 mm, 32 mm, 28 mm
Buret cylinders available	1, 5, 10, 20, 50 mL	2, 5, 10, 20, 50 mL
Surface area needed for two dosing elements	300 mm × 240 mm	150 mm × 240 mm
Flat stopcock made of	PCTFE/PTFE Ceramic as an option	ceramic
Cylinder made of	Glass	Glass for titrants ETFE for auxiliary solutions and aggressive media

iTrodes with 854 iConnect – the smartest sensors around

Metrohm iTrodes – electrodes with a brain
The electrode used for the titration is the most important component of any titration system. Until now the electrode was the last gap in traceability. The Titrando with 854 iConnect now closes this gap and therefore guarantees complete traceability of the analytical result to each component of the analytical system.

854 iConnect – Measuring input «on a chip»
Thanks to the most advanced electronics Metrohm has been able to reduce the measuring input to the size of a postage stamp. This means that the complete measuring input fits in the electrode cable head (the 854 iConnect). It is automatically recognized and identified by its serial number.

Digital data transfer
The analog/digital converter in the 854 iConnect converts the analog measuring signal into binary code. Digital data transmission means that the measuring signal is no longer susceptible to electrostatic influences. Interference-free transmission can now always be guaranteed, no matter how long the electrode cable.

Mobile measuring input
With the 854 iConnect the electrode and the measuring input are always calibrated together. The calibration data is stored in the electrode's head.

As the measuring input is no longer built into the instrument, the electrode (with the 854 iConnect) can be used on different titrators. The calibration procedure is no longer associated with a particular titrator.

Digital identification – no more mix-ups
The built-in memory chip allows the storage of such important sensor data as article and serial numbers, calibration data, calibration history, working life and calibration validity period.

All sensor data is read in automatically when the iTrode is connected to the Titrando. Mix-ups or editing errors are therefore eliminated.

The electrode is identified automatically. If the type of electrode is not the same as that defined in the method then the user is informed. This means that it is not possible to use the wrong electrode.

Storage of calibration data – outliers have no chance
Monitoring functions allow the exclusion of electrodes whose calibration data lies outside the limits or whose calibration period has already expired.

If the sensor is used with different instruments or if you wish to prevent inexperienced users from having to calibrate the electrode on their own instruments, then the electrode can be calibrated on a different instrument under defined conditions. The calibration data stored in the chip makes the electrode transferable; it does not need to be recalibrated each time that it is used with a different instrument.

Compatible with all existing sensors
Despite its new digital measuring interface and intelligent sensors, the Titrando with combined analog and digital measuring input also supports conventional sensors. This means that you can continue to use all your sensors.

The Titrando System at a glance

Thanks to its modular concept the Titrando System can be adapted to any application. It meets the requirements of FDA Regulation 21 CFR Part 11. Benefit from the system's intelligence and multiple communication options!

Straightforward operation: The Titrando accelerates method development and simplifies routine operation.

Superior intelligence: The Data Chip of the Exchange Unit and Dosing Unit contains all important titrant data. The intelligent sensor guarantees that no wrong or expired electrode is used.

iConnect and iTrodes – digital data transfer and automatic electrode recognition. The Data Chip of the intelligent sensors stores all important sensor data.

The automatic GLP-compliant electrode test allows an objective evaluation of the electrode and leaves nothing to chance. Reliable and reproducible results are therefore guaranteed.

Numerous worked-out methods and titration examples guarantee ease of use. Method templates and calculation formula templates are available for developing your own methods.

Safe reagent handling by either Exchange Unit or Dosing Unit.

More intelligence: The Data Chip of the Exchange Unit or Dosing Unit stores all important titrant data.

The 900 Touch Control provides access to the Intranet. Print your report on a network printer, save your report on a network drive or create forge-proof PDF reports – without a PC.

When combining ***tiamo***™ and Titrando, the user benefits from a client-server database.

Parallel titration – with ***tiamo***™ a Titrando can work with two titration cells at the same time.

The Titrando System can be fully automated including sample preparation (weighing, homogenization, filtration, pipetting).

The large color screen of the 900 Touch Control informs the user about the instrument condition and offers uniquely comfortable operator guidance, including one-touch titrations via favorite icons.

So smart – so easy to operate

Favorites for quick method start

Methods can be linked to favorite icons on the touch screen of the 900 Touch Control. Start your titration by a single touch of an icon!

Using our methods you benefit from our many years of experience in titration. All titration methods developed on Metrohm Titrinos can be converted into Titrando methods automatically using a PC.

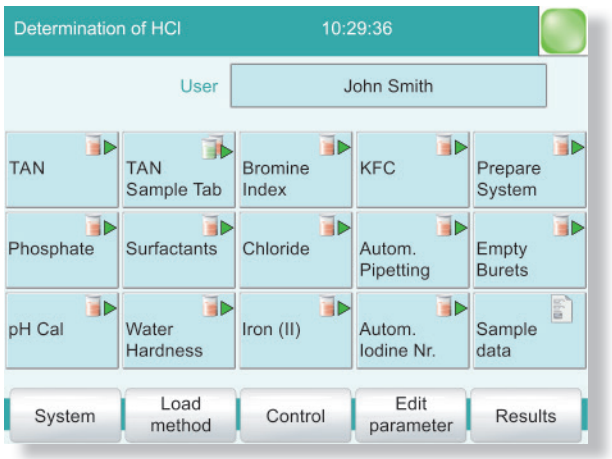
As storage media for your methods, sample data and results there are the Titrando itself, a USB memory stick or a PC with its numerous possibilities. This provides for complete storage security, with the prevention of method and data loss, plus an increase in operational security.

Intelligence creates transparency

Operating the Titrando System is simple and intuitive. The operator guidance system can be regarded as exemplary. In addition, the following tools provide for perfect ease of use:

- The «Quick Access» function (direct parameters) allows direct access to the parameters required for the given application. This means that it is no longer necessary to click your way through different program levels! «Quick Access» is invaluable for routine analysis.
- The «Help» fixed key shows a context-related help text in the display.
- The «Follow me» help function is available when working with a PC. Continuous explanations about the current surroundings are given in a separate window and further possible procedures are indicated.
- The standard user methods can be modified to suit your requirements. Method templates and calculation formula templates are available for developing your own methods. Methods can be stored under meaningful method names (32 characters) and structured directories can be used; this makes sorting, identification and searching much easier.
- Whereas in the expert dialog all settings are available, the routine dialog can be freely configured, i.e. it can be customized to meet the requirements of the particular user. This means that users can load their «profiles» from the personal Keycard and see only those keys that they actually need.

The Titrando puts an end to puzzling out the meaning of coded error messages. It tells you what is going on in plain text. Moreover, it also suggests suitable measures for remedying any problems.



Routine Methods can be linked to favorite icons on the starting screen of the 900 Touch Control. Titrations are started by a single touch.

The Titrando in the modern laboratory

Data management is knowledge management
Data must always be available: either for direct information, for transfer to a data system, for further processing or for an audit. The data that your Titrando System provides you with can be printed out and stored on paper or on a USB memory stick.

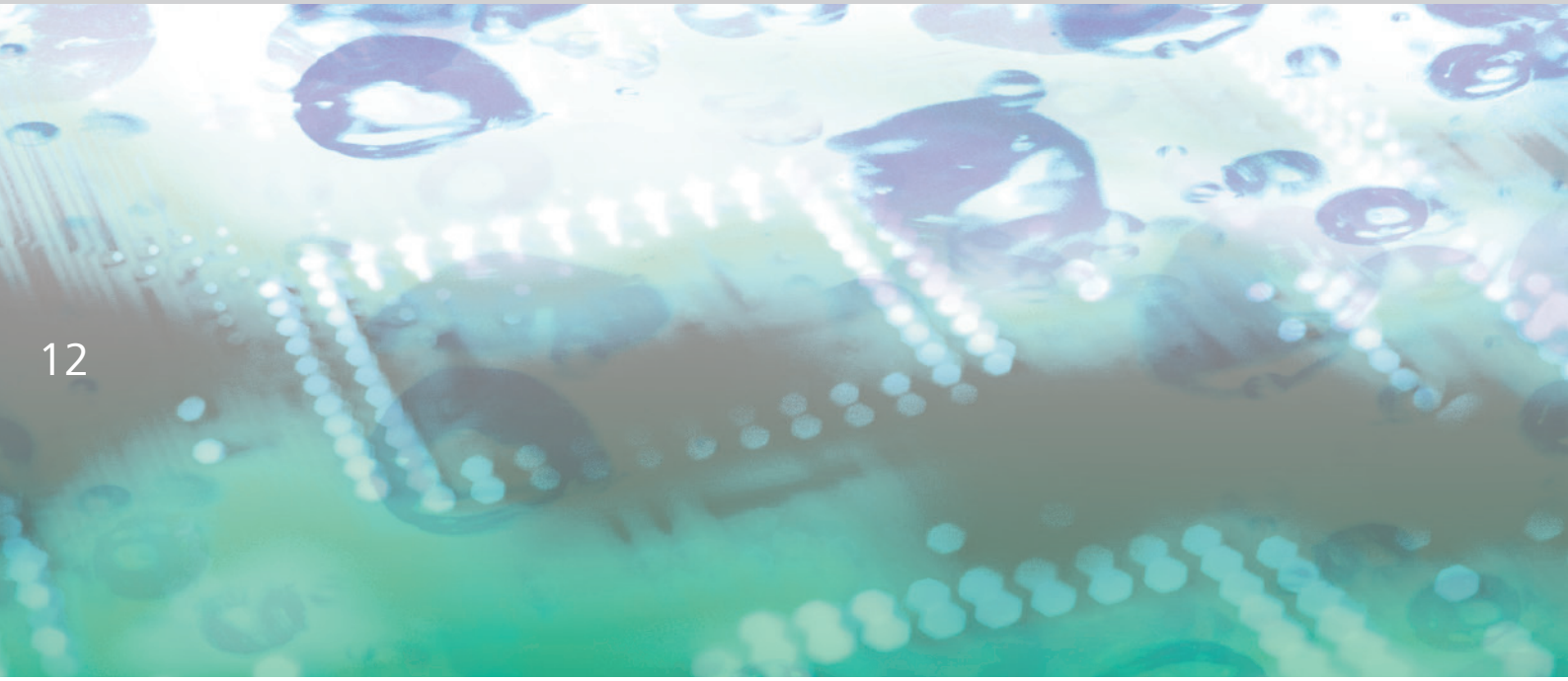
When you work with ***tiamo***™, you can use all the storage options offered by the digital world, for example hard drives, network drives, servers, Intranet ...

On request the Titrando can produce a machine-readable PC/LIMS report.

Ethernet connection
If you want to connect your Titrando System directly to a superior data system, there is nothing in the way: The 900 Touch Control opens up internal networks (Intranet, LIMS[1], LAN[2]) to the Titrando, with all that this implies. Network printers can be used for printing out analysis reports.

Never has integration into your LIMS structure been so easy!

[1] LIMS = Laboratory Information Management System
[2] LAN = Local Area Network



Compatibility and traceability

GLP, GMP and 21 CFR Part 11 are becoming increasingly important in day-to-day laboratory life. The Titrando System is entirely oriented towards quality management in the laboratory and offers the following possibilities:

- Each time that it is switched on, the Titrando System carries out a self-diagnosis.
- If it has been programmed accordingly, then the instrument will remind you about any validation or service work that is due.
- You can enter limits for results; their observance will be checked for each determination.
- The titer of the titrant can be monitored as a function of time in both tabular form or as a graph, similar to a control card.
- The calibration history of the sensors can be called up. This means, for example, that alterations to the sensor caused by aging can be recognized before they affect the results.
- All changes to the methods are documented; traceability is guaranteed.

The Titrando allows strict control of access rights using login and password. The requirements defined in FDA Regulation 21 CFR Part 11 regarding «electronic signature» and «electronic record» are met in the stand-alone system (using the 900 Touch Control) as well as in the version controlled via PC (using the ***tiamo***™ software). This also applies to the other points contained in FDA 21 CFR Part 11, namely the protection of electronic records against accidental or intentional alteration and complete traceability.

The Titrando with 900 Touch Control is the only stand-alone titration system with audit trail.

Quality management at Metrohm

Metrohm has been certified according to ISO 9001 since 1993. The Metrohm quality management system is continually being perfected and checked by both internal and external audits.

Straightforward automation

Perfect modularity

The possibilities for upgrading the Titrando System are amazing. First the bare figures: The basic unit consists of a Titrando with one measuring interface. This basic unit can be upgraded to form a super-titrator that controls 12 burets and boasts 6 galvanically separated measuring interfaces. Between these two extremes lies the whole spectrum of Titrando possibilities. Among them you will certainly find a Titrando System that meets the demands of your particular application. Your Titrando System meets ever new and more complex challenges as it can be upgraded at any time.

Automation pays dividends!

Increasing sample numbers, time-consuming sample preparation steps and unattended overnight operation are good reasons for using sample changers. Your Titrando features the necessary intelligence to control sample changers and offers (in combination with the 814 USB Sample Processor, the 815 Robotic USB Sample Processor XL or the 898 XYZ Sample Changer) a high degree of automation at a reasonable price.

Connect the sample changer to the Titrando's USB port and the world of automation opens up to you.

Water determination with the Titrando

Karl Fischer titration with the Titrando

Karl Fischer water determination is one of the most frequently applied laboratory methods. In contrast to other water determination methods, it is specific, fast and requires no expensive equipment. With an application range of 0.1% to 100% water, volumetric Karl Fischer titration is used in a wide variety of fields. No matter whether you determine the water content in food, cosmetics or pharmaceutical products, the Titrando is always the right instrument.

In addition to the potentiometric titration modes SET, DET and MET, the 906/907 Titrando systems come with a special Karl Fischer mode whose sophisticated control algorithm, combined with the precision of our intelligent Exchange Units or Dosing Units, guarantees highly precise results.

Like the other modes, the KF mode excels with easy and intuitive user guidance. Just one example: The KF icons show you at a glance whether the instrument is still busy conditioning or whether you can start the water determination.

KF reagent addition during conditioning.

Conditioning is finished and the sample can be added.

The electrode test and the parameter «safety stop» prevent the titration cell from running over during conditioning. If, for example, the electrode is not connected correctly or the titration cell is very humid, conditioning is stopped after a given time or a given volume of KF reagent added. This feature increases work safety in your laboratory.

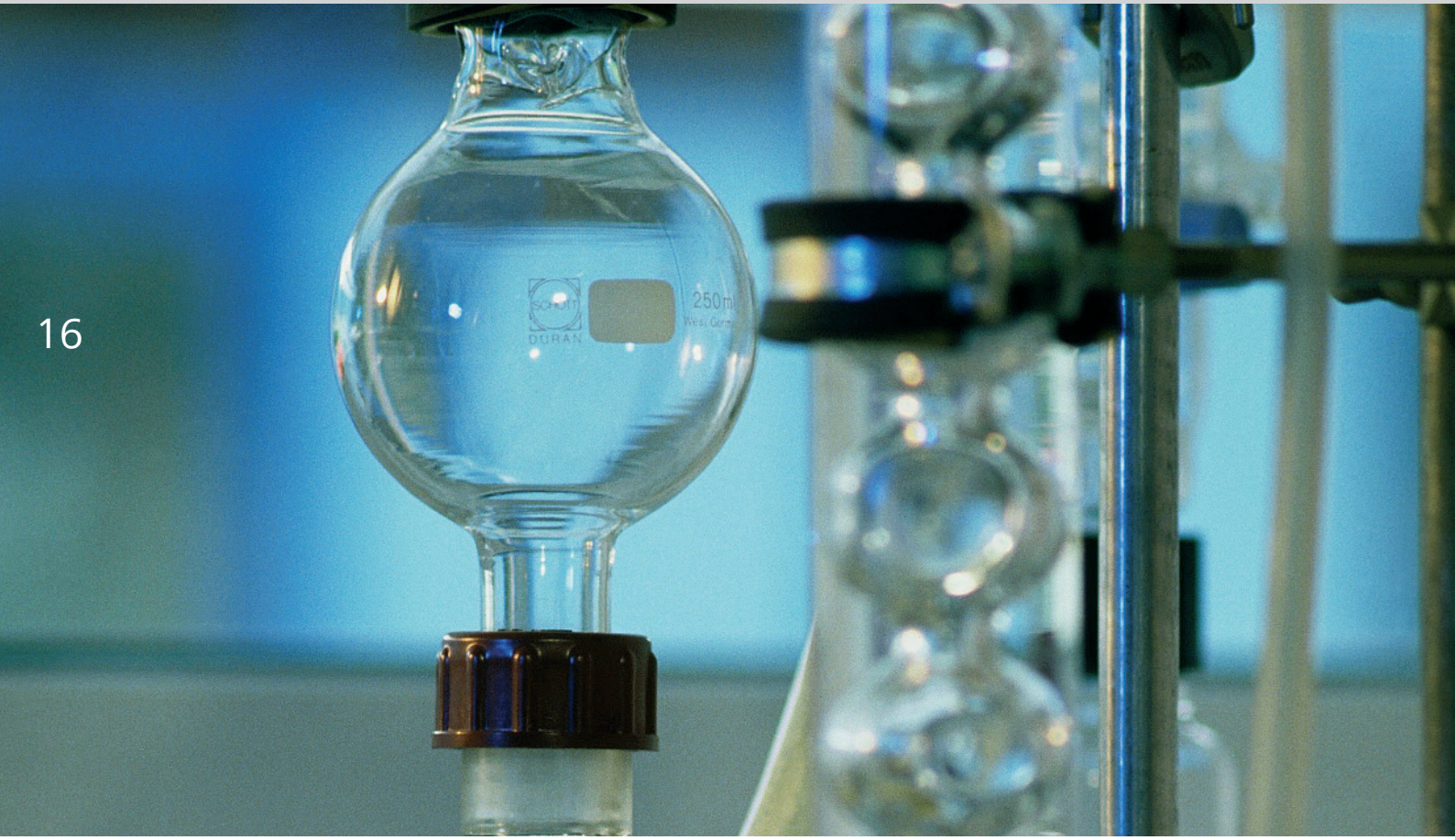
The 803 KF Titration Stand

Use the 803 KF Titration Stand for stirring and manual exchange of spent titration vessel contents. With the integrated membrane pump, solvent can be aspirated or added without the cell having to be opened. This translates into vastly reduced conditioning times.

Automatic reagent change

An even more comfortable option is the automatic reagent change with the 800 Dosino. You simply trigger the change, which is then carried out automatically by the instrument.

Fluka
Analytical
20 mL
Metrohm
On
Status
906 Titrando
iTrode ready
Metrohm
swiss made
6.1415.220
803 Ti Stand
Metrohm
swiss made
Metrohm
Touch Control



STAT titration

The determination of enzyme activity (lipase, trypsin, etc.) or the release kinetics of antacid tablets require a titrator that rapidly adjusts to a preset pH value and keeps it constant for an extended period of time. The controller of the Titrando has been optimized for this task and is one of the best on the market. It can also be used to determine the kinetics of acid-base or redox reactions.

Tandem dosing

Tandem dosing is a feature that prevents dosing interruptions when the buret is refilled during the titration – a second buret immediately takes over. In this way rapid reactions with a high reagent consumption can be monitored with maximum accuracy. Tandem dosing is also available for simple and monitored dosing.

The Titrando in the synthesis laboratory

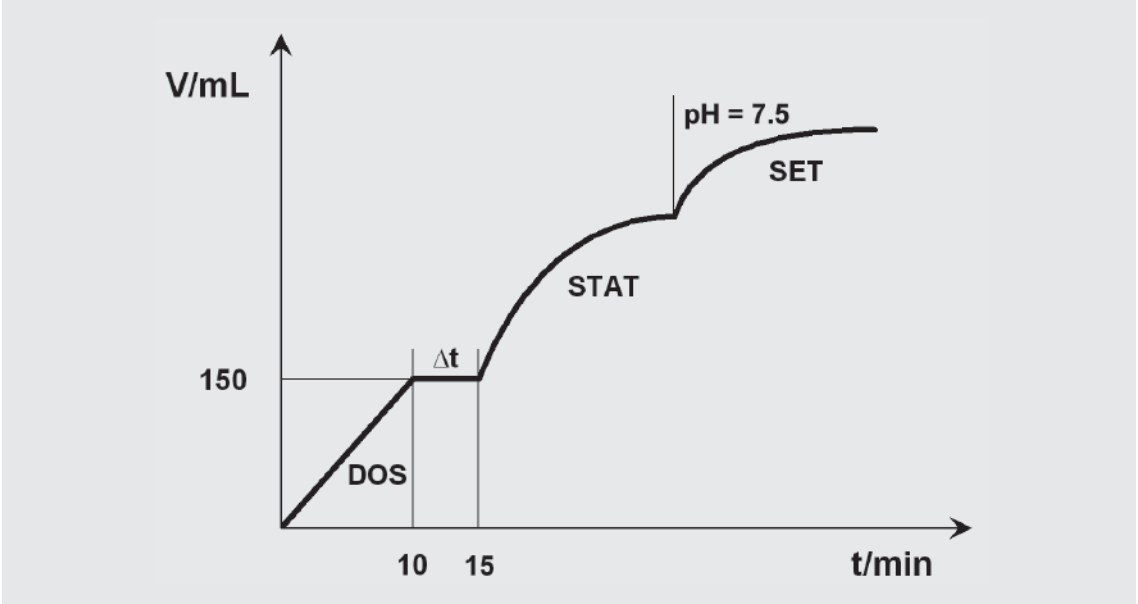
In the synthesis laboratory different challenges are faced to those encountered in titration. Here a particular pH value must be kept constant or multiple dosing has to be carried out under exactly defined conditions. This means that a certain volume of a solution must be added within a fixed time. In addition to controlled dosing, the parameters pH (or potential) and temperature have to be continuously recorded, thus providing complete documentation of the synthesis procedure.

Everything under control

If a monitored parameter should infringe the set limits, the user can decide whether dosing should be continued or interrupted and then continued manually or automatically, again observing the limits.

Controller

As an innovation the Titrando can perform control tasks. External devices can be controlled by means of freely programmable TTL signals or communication via RS 232 interface. This means that it is possible to run the external heating and cooling devices, pumps or similar equipment by remote control.



Example of a neutralization process:

1. DOS Addition of 150 mL reagent in 10 min with temperature monitoring
2. Pause 5 min under stirring
3. STAT Adjust pH = 7.5 with temperature monitoring
4. SET Post reaction, for example, during 10 min; endpoint pH = 7.5

tiamo™ – titration and more!

tiamo™ is a control and database software for titrators, dosing devices and sample changers that allows complete laboratory automation. This is why the name ***tiamo***™ stands for «titration and more» – ***tiamo***™ can do much more than just titrate.

Easy to use

The modern user interface makes it easy for users to familiarize themselves quickly with ***tiamo***™. All commands and controls are located exactly where you expect them on the screen. The layout manager can be used to configure the screen view individually for each user. This means that the users see only those windows or keys that are required for their work. This shortens the familiarization period for routine users to a minimum.

Parallel titration

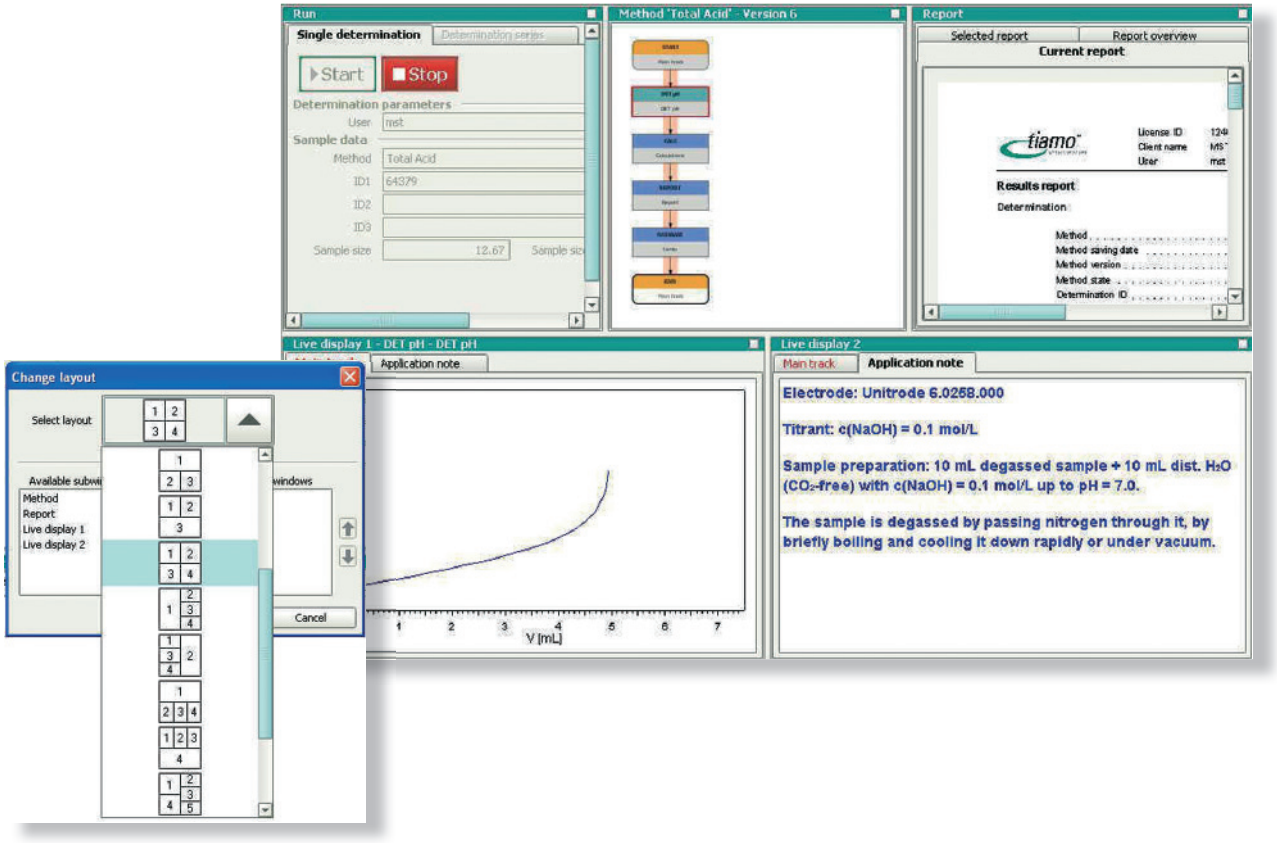
Both measuring inputs and all the Dosinos connected to a Titrando can be controlled independently of each other. In combination with ***tiamo***™ this allows parallel titration of two identical or two different samples with one single titrator.

Easy data management

The ***tiamo***™ database provides a wealth of tools for the management, searching and grouping of results. Quick filters allow the user to search through thousands of results in a matter of seconds and show the searched-for information in a clear way. Chart plots provide a rapid overview of the chronological sequence of results. A multitude of possibilities for re-calculation and re-evaluation is at the user's disposal.

LIMS & Co.

The acceptance of PC-controlled analytical systems depends largely on the possibility of simple and inexpensive integration in existing laboratory information systems, central databases and long-term archiving systems. Data generated in ***tiamo***™ is exported in the CSV or XML format. This enables the simple connection to most of the LIMS products found on the market. Analysis reports can be generated simply and flexibly with the new report generator, which allows the free definition of report templates. In this way one or more determinations can be shown at any time with a freely selectable layout in PDF format or as a paper printout.

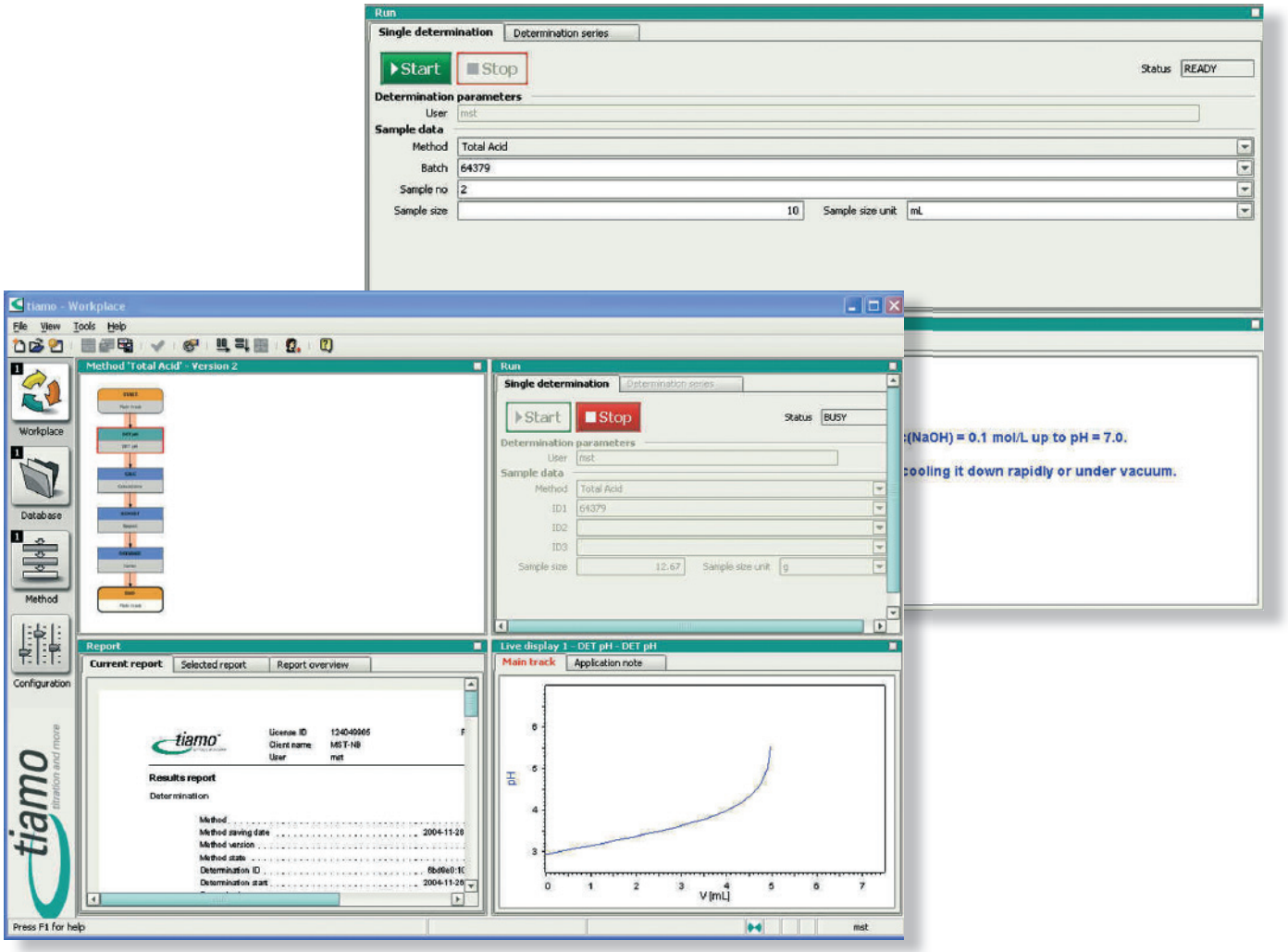


tiamo™ means more efficiency

The graphical method editor gets more out of your titration system. Methods can be drawn up easily and quickly by using the numerous templates. You can program and link actions that are to be carried out simultaneously. ***tiamo***™ is flexible and adapts itself to your analytical sequences – not the other way around.

All requirements met

tiamo™ also sets new standards regarding compliance with GMP, GLP and FDA requirements. ***tiamo***™ has been consistently oriented to comply with FDA Regulation 21 CFR Part 11 and its customer-specific interpretations.



Technical specifications

	904 Titrando	905 Titrando	906 Titrando	907 Titrando
Dosing elements	1 integrated Dosimat with 806 Exchange Unit	Space for two 800 Dosinos with 807 Dosing Unit	1 integrated Dosimat with 806 Exchange Unit	Space for two 800 Dosinos with 807 Dosing Unit
Attachment of additional dosing elements	Up to 9 x 805 Dosimat with 806 Exchange Unit Up to 12 x 800 Dosino with 807 Dosing Unit			
Intelligent Exchange Unit/Dosing Unit with integral Data Chip	yes			
Dosing steps per cylinder volume (resolution)	904 Titrando with 805 Dosimat: 20'000	905 Titrando with 800 Dosino: 10'000	906 Titrando with 805 Dosimat: 20'000	907 Titrando with 800 Dosino: 10'000
Operation, dialog	Touch Control or ***tiamo***™			
Stirrers, titration stand	4 × 801 Magnetic Stirrer or 4 × 802 Rod Stirrer with 804 Titration Stand or 803 KF Titration Stand			
Attachment of Dosimats, Dosinos, stirrers	4 MSB connectors (Metrohm Serial Bus, Daisy Chain)			
Sample Changer attachment	1 sample changer via USB			
Attachment of balances, printer, PC, PC keyboard, barcode reader	Via 2 USB Slave Ports, RS-232/USB Box (option)			
Attachment of additional measuring modules (867 pH Module or 856 Conductivity Module)	yes			
Temperature sensor	Pt 1000 or NTC			
Differential amplifier	Option			
Real-time curve display on Touch Control (90 mm × 120 mm) or PC screen	yes			
DET Dynamic Equivalence-point Titration	yes			
MET Monotonic Equivalence-point Titration	yes			
SET Titration to a preset end-point with automatic conditioning	yes			
KF Volumetric Karl Fischer titration with automatic conditioning	no		yes	
STAT Titration to a preset control point and maintaining the corresponding measured value	no		yes	
MEAS Measuring mode for pH, U/mV, T/°C	Resolution: 0.001 pH, 0.1 mV, 0.1 °C; Measuring interval: 100 ms			
MEAS CONC Direct measurement using ISE and calculation of concentration	yes			
CAL Calibration with automatic buffer recognition	yes			

	904 Titrando	905 Titrando	906 Titrando	907 Titrando
Second, galvanically separated measuring interface for pH, U/mV, T/°C	Option			
I_{pol} & U_{pol} – integrated programmable Polarizer	yes			
Additional possibilities of titration-curve evaluation: fixed endpoints, pK values (HNP), minimum/maximum, break point (photometry or conductometry)	yes			
Sequences can be freely programmed by the user	yes			
Method and sample data memory, result memory, data base	yes			
Dialog languages 900 Touch Control: English, German, Spanish, French, Chinese, Portuguese, Russian, Korean, Polish, Italian Dialogue languages ***tiamo***™: German, English, Spanish, French, Chinese, traditional Chinese, Portuguese, Russian, Slovakian, Italian	yes			
Comprehensive GLP functions; meets requirements of FDA 21 CFR Part 11	yes			
Intelligent dosing devices	yes			
Intelligent electrodes «iTrodes»	yes			
GLP-compliant electrode test	yes			
Check for result limits	yes			
Access control by means of login with password protection; Electronic Signature	yes			
Liquid handling with expanded dosing instructions for the 800 Dosino	yes			

Ordering information

904 Titrando

2.904.0010 904 Titrando with built-in buret drive and one combined analog/digital measuring input
2.904.0020 904 Titrando with built-in buret drive and two combined analog/digital measuring inputs

905 Titrando

2.905.0010 905 Titrando with one combined analog/digital measuring input
2.905.0020 905 Titrando with two combined analog/digital measuring inputs

Moreover, the 905 Titrando is available with several different packages focusing on the requirements of particular industries. Each package includes everything im terms of instrument, accessories, and applications to meet the needs of the respective industry. Besides ***tiamo***™ light this includes a compilation of methods described in detail as well as the complete accessories for your titrations. More information is available from **www.metrohm.com**

906 Titrando

2.906.0010 906 Titrando with built-in buret drive and one combined analog/digital measuring input
2.906.0020 906 Titrando with built-in buret drive and two combined analog/digital measuring inputs

907 Titrando

2.907.0010 907 Titrando with one combined analog/digital measuring input
2.907.0020 907 Titrando with two combined analog/digital measuring inputs

Options

2.800.0010	800 Dosino for 905 and 907 Titrando and as additional dosing device for 904 and 906 Titrando
2.801.0040	801 Magnetic Stirrer
2.802.0010	802 Rod Stirrer
2.803.0010	803 KF Titration Stand
2.804.0040	804 Ti Stand
2.805.0010	805 Dosimat as additional dosing device for 904 and 906 Titrando (and 905 and 907 Titrando)
2.854.0010	854 iConnect for connection of intelligent electrodes «iTrodes»
2.846.0010	846 Dosing Interface as extension for four additional Dosing Elements
2.856.0010	Conductivity Module as additional measuring input for conductivity measurements
2.867.0010	pH Module as additional measuring input for pH measurements
2.900.0010	900 Touch Control

6.2148.010	Remote Box MSB
6.2148.020	RS-232/USB Box
6.2151.000	Cable USB A plug – Mini-DIN plug, 8 pins
6.2151.010	Extension cable Mini-DIN socket – Mini-DIN plug, length 2 m
6.2151.020	Cable USB A plug – USB B plug, length 1.8 m
6.2151.030	Cable USB A plug – USB B plug, length 30 cm
6.5104.030	Differential amplifier equipment with line adapter 230 V, EU plug
6.5104.040	Differential amplifier equipment with line adapter 115 V, US plug
6.2061.010	Reagent Organizer, holds two 1 L bottles; for dosing with Dosinos and Dosing Units

Intelligent 807 Dosing Units for 800 Dosino; equipped with Data Chip; with glass cylinder, including accessories and two buret tips, one of them with micro outlet valve

6.3032.120	Intelligent Dosing Unit 2 mL
6.3032.150	Intelligent Dosing Unit 5 mL
6.3032.210	Intelligent Dosing Unit 10 mL
6.3032.220	Intelligent Dosing Unit 20 mL
6.3032.250	Intelligent Dosing Unit 50 mL

Intelligent 806 Exchange Units for 904/906 Titrando and 805 Dosimat; equipped with Data Chip; with glass cylinder and flat PCTFE/PTFE stopcock

6.3026.110	Intelligent Exchange Unit 1 mL
6.3026.150	Intelligent Exchange Unit 5 mL
6.3026.210	Intelligent Exchange Unit 10 mL
6.3026.220	Intelligent Exchange Unit 20 mL
6.3026.250	Intelligent Exchange Unit 50 mL

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Subject to change
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