901 Titrando

Intelligent Karl Fischer titrator

Ω Metrohm

Highlights

- The Magic Touch – Favorites for quick titration start
- PC Control for operation via PC
- iConnect – mobile measuring input with digital data transfer
- iTrodes – intelligent sensors for automatic electrode recognition
- Intelligent dosing elements
- Karl Fischer and SET titration
- Sample Processor control
- Client-server database with **tiamo**™
- Parallel titration with **tiamo**™
- Lab Link for Intranet and Internet
- Liquid handling with the patented 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

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.

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.

The iodine drop indicates the KF reagent addition during conditioning.

Conditioning is finished and the sample can be added.

The electrode test and the newly created parameter «safety stop» prevent cell from runningover 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 new feature increases work safety in your laboratory.

The 803 KF Titration Stand

Use the 803 KF Titration Stand for stirring and manually exchanging the 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 and prevents direct contact with Karl Fischer reagents.

Automatic reagent change – so very easy!

Just as comfortable is the automatic reagent change with the Dosino dosing system. You define the point of time and the instrument carries out the change fully automatically.

Reagent dosing à la carte

Titrating means dosing intelligently. The Titrando System gives you the choice. With the 901 Titrando you dose with Dosinos and Dosing Units that are mounted directly onto the reagent bottle.

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 micro-mechanics. 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.
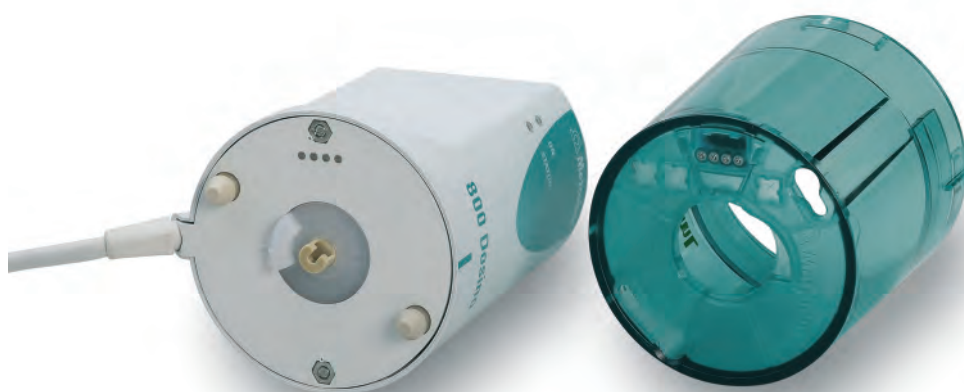
Smart dosing elements with certification

The Dosing Unit sets 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 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.

807 Dosing Unit

	807 Dosing Unit
Standard bottle thread	GL45
Adapters for bottle threads (option)	S40, 40 mm, 32 mm, 28 mm
Buret cylinders available	2, 5, 10, 20, 50 mL
Surface area needed for two dosing elements	150 mm x 240 mm
Flat stopcock made of	ceramic
Cylinder made of	Glass for titrants
	ETFE for auxiliary solutions and aggressive media

854 iConnect – green, digital and mobile

854 iConnect – Measuring input «on a chip»

The Metrohm green color has always meant leading edge technology. 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. It is automatically recognized and identified by its serial number.

Digital data transfer

Directly in the sensor, the analog/digital converter of the latest generation 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.

Just take the measuring input with you!

With the 854 iConnect the sensor and measuring input are always calibrated together and the calibration data is stored in the intelligent electrode. As the measuring input is no longer built into the instrument, the electrode and 854 iConnect can be used together with different titrators. The calibration procedure is no longer associated with a particular titrator.

The iTrodes – simply intelligent

The iTrodes of the new intelligent electrode generation confirm Metrohm's long-standing leadership position in the field of potentiometric titration.

The electrode used for the titration is the most important component of any titration system, and until now it has been just this electrode that has formed the last gap in traceability. The Titrando with iConnect now closes this gap and therefore guarantees complete traceability of the analytical result to each component participating in the analysis.

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 the 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 an incorrect 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.

Uniquely intelligent – easy to operate

Favorites for quick method start

Methods can be linked to a Favorite icon on the starting screen of the 840 Touch Control. Start your titration by pressing just one button.

Using our methods you can 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 you can use the Touch Control operation unit, a memory card[1] or a PC with its numerous possibilities. This allows complete storage security to be achieved, with the prevention of method and data loss, plus an increase in operational security.
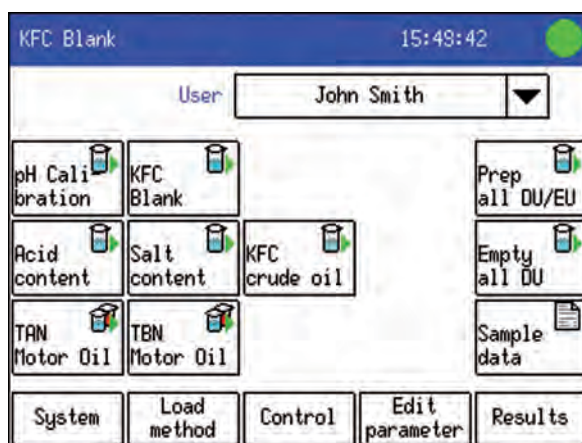
Intelligence provides transparency

Operating the Titrando System is simple and intuitive. The operator guidance system sets a new standard. In addition, the following tools make life easier for the Titrando user:

- The «Quick Access» function (direct parameters) allows direct access to the parameters required for the given application. These parameters may come from a wide range of different sections of the instrument program. This means that it is no longer necessary for you to click your way through different operating 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 operating elements that they actually need.

The Titrando puts an end to puzzling out the meaning of coded error messages. It tells you exactly where the error is in clear text. Not only this; it also suggests suitable measures for remedying any faults.

[1] Commercial Compact Flash Card; non-volatile, compact data memory that does not need any battery.

Routine Methods can be linked to a «Favorite» icon on the starting screen of the 840 Touch Control. Titrations are started by pressing just one button.

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 in a conventional manner. However, all advanced data management functions are available, for example storage on a PCMCIA card[2] that is simply inserted in the Touch Control, in the PCMCIA port of the PC or an appropriate card reader.

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

On request the Titrando can produce a machine-readable PC/LIMS report. There is no question: As for data storage and transfer, the Titrando is a state-of-the-art instrument.

Lab Link

If you want to connect your Titrando System directly to a superior data system, there is nothing in the way: The 847 USB Lab Link opens up internal networks (Intranet, LIMS[3], LAN[4]) to the Titrando, with all that this implies. Network printers can be used for printing out analysis reports. Or would you like to control your Titrando remotely? The 847 USB Lab Link provides access to your titrator from any PC.

Never has integration into your LIMS structure been so easy!

Unleash your printer!

Laboratory bench space is scarce and expensive. Most of the space required by a titration system is occupied by the printer. Its cable connection means that it has to be located near the Titrando. Wireless communication via Bluetooth now allows the printer to be placed at some distance (up to 10 meters) from the Titrando. This frees valuable bench space and has the additional advantage of removing the printer from the potentially hazardous effects of splash water and chemicals.

[2] A CompactFlash card with adapter is included in the standard accessories of the Touch Control. PCMCIA = Personal Computer Memory Card International Association
[3] LIMS = Laboratory Information Management System
[4] LAN = Local Area Network

Compatibility and traceability

GLP, GMP, 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 data are documented; traceability is guaranteed.

The Titrando allows strict control of rights of access using login and password. The requirements defined in FDA Regulation 21 CFR Part 11 regarding «electronic signature» and «electronic record» are fulfilled in the stand-alone system using the Touch Control operating unit as well as in the version controlled via PC. This also applies to the other points contained in this regulation, namely the protection of electronic records against accidental or intentional alteration and complete traceability. The Titrando with Touch Control is the only stand-alone titration system with Audit Trail.

Quality management at Metrohm
Quality has always been extremely important for Metrohm. On 5 November 1993 our company achieved the ISO 9001 certificate of quality. The Metrohm quality management system is continually being perfected and checked by both internal and external audits.

Integrated automation

Automation pays dividends!

Increasing sample numbers, time-consuming sample pre-paration steps and unattended overnight operation are good reasons for using sample changers. The Titrando has the necessary intelligence to control sample changers and offers – together with the 814 USB Sample Processor and 815 Robotic USB Sample Processor XL – a high de-gree of automation at low investment costs.

It's so simple

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

tiamo^{TM} – 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 to be found exactly where you expect them to be. 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 buttons 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 the parallel titration of two identical or two different samples with one single titrator.

Overcomes limits

The *tiamo*™ database provides all the important 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. The user can utilize all the possibilities for re-calculation and re-evaluation.

LIMS & Co.

The acceptance of PC-controlled analytical systems depends largely on the possibility of simple and affordable integration in existing laboratory information systems, central databases and long-term archiving systems. Data generated in *tiamo*™ is exported in CSV or XML format. This makes possible the simple connection to all the usual 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.

The layout of the screen view can be configured as desired and required

tiamo™ increases 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 at the same time. *tiamo*™ is flexible and adapts itself to your analytical sequences – not vice versa.

All requirements met

tiamo™ also sets new standards with respect to complying 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.
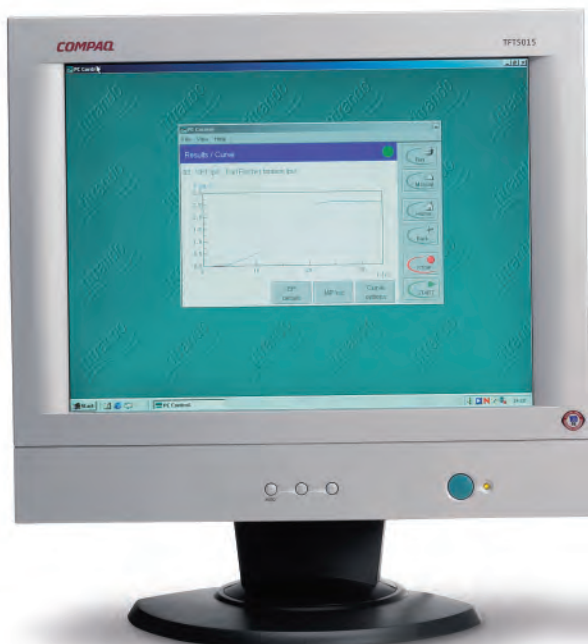
Live curve and progress of the titration can be followed in real time

Technical specifications

	901 Titrando
Dosing elements	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)	with 800 Dosino: 10,000
Operation, dialog	Touch Control or PC Control (from 6.0) / *tiamo*™ (from 2.0)
Stirrers, titration stand	4 x 801 Magnetic Stirrer or 4 x 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 and/or Lab Link	Via 2 USB Slave Ports, RS-232/USB Box (option)
Attachment of additional measuring modules (867 pH Module or 856 Conductivity Module)	yes
PCMCIA memory-card port for methods, results, Keycard (user identification), backup; CompactFlash Card with a large number of user methods	yes (Touch Control)
Temperature sensor	Pt 1000 or NTC
Real-time curve display on Touch Control (90 mm x 120 mm color graphics LCD) or PC screen	yes
DET Dynamic Equivalence-point Titration	no
MET Monotonic Equivalence-point Titration	no
SET Titration to a preset end point with automatic conditioning	yes
KF Volumetric Karl Fischer titration with automatic conditioning	yes
STAT Titration to a preset control point and maintaining the corresponding measured value	no
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	no
CAL Calibration with automatic buffer recognition	yes

	901 Titrando
I_{pol} & U_{pol} – integrated programmable Polarizer	yes
Sequences can be freely programmed by the user	yes
Method and sample data memory, memory, result memory, data base	yes
Dialog languages: English and German; additional languages can easily be added	yes
Comprehensive GLP/GMP 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

901 Titrando

2.901.0010   901 Titrando with double Pt-wire electrode, titration vessel and additional accessories for Karl Fischer titration

Options

2.840.0100	Touch Control for Titrando
6.6050.500	PC Control software for Titrando, including Hardware Dongle
6.6056.201	*tiamo*™ 2.0 light
6.6056.202	*tiamo*™ 2.0 full
6.6056.203	*tiamo*™ 2.0 multi
2.800.0010	800 Dosino
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
2.847.0010	847 USB Lab Link
2.854.0010	854 iConnect for connection of intelligent electrodes «iTrodes»

6.2051.030	Holder for 840 Touch Control
6.2148.010	Remote Box MSB
6.2148.020	RS-232/USB Box

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

6.3032.120	Buret volume 2 mL
6.3032.150	Buret volume 5 mL
6.3032.210	Buret volume 10 mL
6.3032.220	Buret volume 20 mL
6.3032.250	Buret volume 50 mL

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