Karl Fischer Titration

Karl Fischer Titrators

Compact Volumetric

Compact Coulometric

Titration Excellence

One Click™ Water Determination

Simple & Secure

METTLER TOLEDO

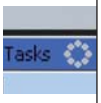
Know Your Water Content
in One Click™

How do you guarantee the quality and shelf life of your pharmaceutical products? What's the best way to check if a lubricant is still able to protect against wear? Water content can give you important information about your product. Karl Fischer titration is the specific standard method for the determination of water content and gives accurate and precise results within minutes. With the METTLER TOLEDO Karl Fischer titrators your operators need only to press one button to run a water determination!

One Click™ Burette Rinse
Press Shortcut to rinse the burette

Simple and fast operation thanks to One Click™ water determination
The Touchscreen user interface is optimized for direct access to routine tasks and provides clear information to the user. One unique Home Screen for each user with their own Shortcut buttons offers One Click™ access to all routine tasks. Users can choose their own language for the Touchscreen and for printouts. Everybody feels at home right from the start, which reduces learning time and increases data security.

The Home button always leads back to the Home Screen.



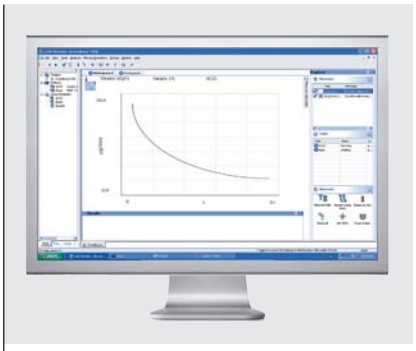
The Task button gives direct access to all ongoing and scheduled tasks.

If a task needs to be stopped the Reset button can be pressed for an immediate stop.

The Online help explains all parameters shown on the current screen.

One Click™ Solvent Exchange
Press Shortcut to exchange the solvent or reagents

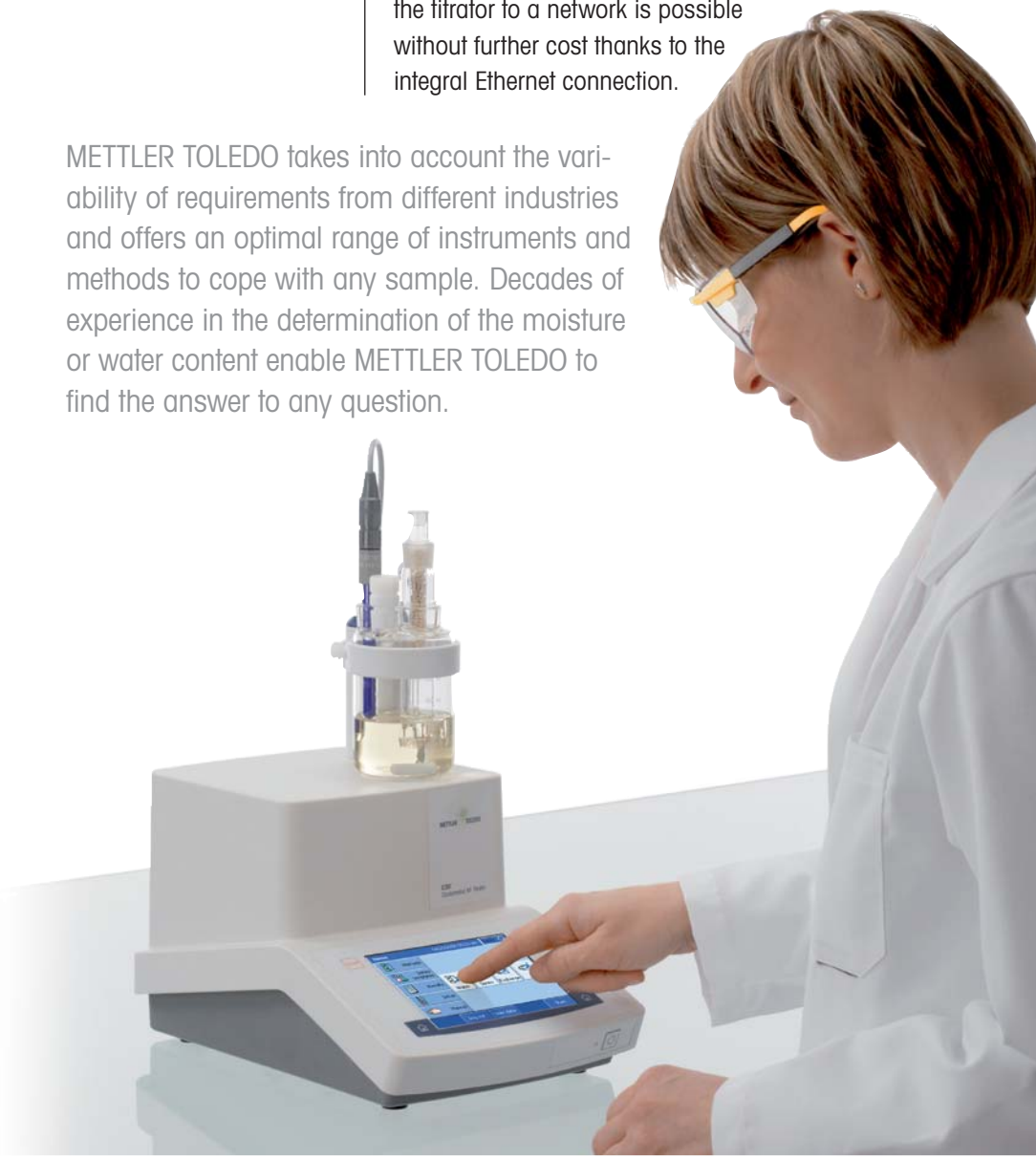
Safe handling of chemicals
Contact with Karl Fischer reagents should always be avoided. The Solvent Manager takes care of filling, draining and exchange of the reagents. It is fully controlled by the titrator which offers One Click™ access to all tasks; full security against overflows is guaranteed by the level sensor in the waste bottle.



Total security with PC software
LabX titration PC software supports the user in every action performed with the titrator. The Dual mode allows operation from the Touchscreen or from the PC (or from both). All results are stored in the LabX database, independent of where it was started. Integrating the titrator to a network is possible without further cost thanks to the integral Ethernet connection.

One Click™ Method Start
Press Shortcut to run the corresponding method

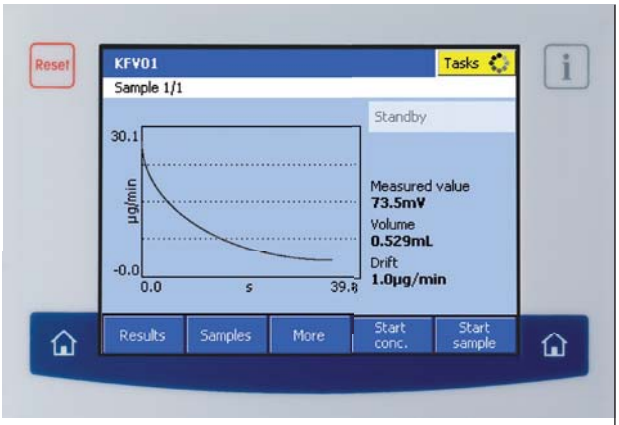
METTLER TOLEDO takes into account the variability of requirements from different industries and offers an optimal range of instruments and methods to cope with any sample. Decades of experience in the determination of the moisture or water content enable METTLER TOLEDO to find the answer to any question.



One Click™ Series Start
Press Shortcut to start a predefined sample series

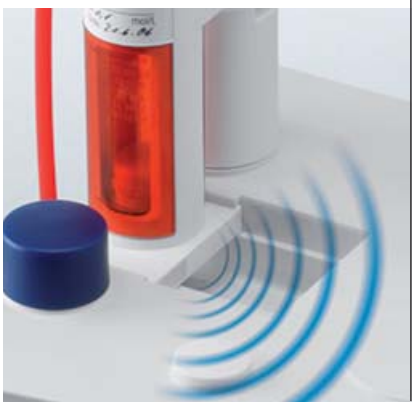
The Generalists
for Water Determination up to 100%

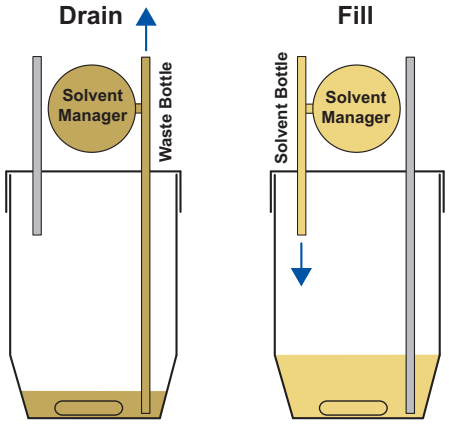
The Compact Volumetric Karl Fischer Titrators have been designed for a wide range of water content applications: determinations from 100 ppm to 100% water – fast and precisely. The titration vessel is optimized to retain a low drift value and offers the possibility to determine the water content of liquid, solid and gaseous samples.



Full information and direct access
Improving the ease of use of an instrument means keeping the user fully informed on what's happening while offering all possible task choices as directly as possible. The online screen always shows the condition of the titration vessel and offers a direct One Click™ for every important task, e.g. start of sample or concentration determination. When a method is started the user can easily type in the sample size and can see immediately how much water has already been titrated. Clear information and direct operation are key factors for simple and secure operation.

Security guaranteed by intelligent burettes
Is the correct titrant installed? Is the concentration right? Has the concentration determination expired? All this information is stored on the RFID burette chip and the titrator automatically verifies all parameters when a titration is started.





Simple and secure solvent monitoring

The solvent needs to be replaced regularly in order to guarantee consistently correct results. The Solvent Control supports the user by monitoring three different parameters. For example, if only ten samples are soluble in 100 mL of the solvent the Solvent Control reminds the user after 10 samples to exchange the solvent and offers this with a One Click™ task button. Even when an instrument is running on Standby the Solvent Control is active and automatically starts conditioning of the fresh solvent after exchange. With minor user interaction the system is always kept in optimum condition ready to ensure a quick, accurate result whenever required.

Water regulates the product characteristics

Polyols are raw materials for the production of a big variety of polyurethane-based products obtained by polymerization reaction with Di-Isocyanates. An example are foams, which can be used for sound insulation. It is important to know the exact water content of the polyol, since the water reacts with the isocyanate groups to form CO_2. The CO_2 regulates the degree of expansion of the foam, i.e. it determines the product characteristics. Therefore the water content is an important indicator, which can be easily and precisely determined by volumetric Karl Fischer titration.

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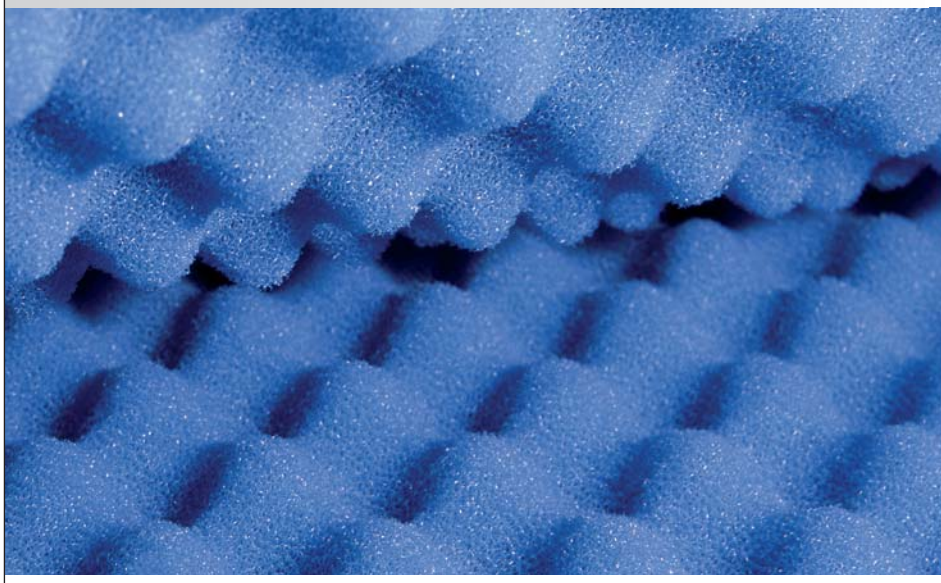
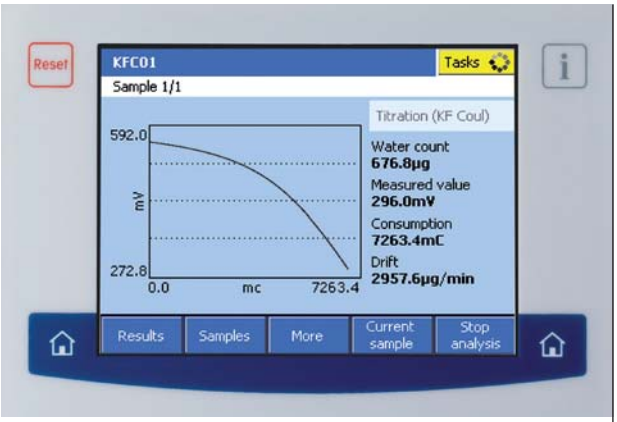


The Fast and Most Precise Solution
for Very Low Water Content

Accuracy and precision is improved further if the titrant is not added with a burette, but produced directly in the solution with a current applied by a generator cell. This also makes a titrant concentration determination obsolete. The Compact coulometric Karl Fischer Titrators offer particularly fast and precise titration of samples with a low water content from 1 ppm to 5%. The titration vessel is made completely from glass which ensures a uniquely low drift and hence makes the most accurate and precise results possible.

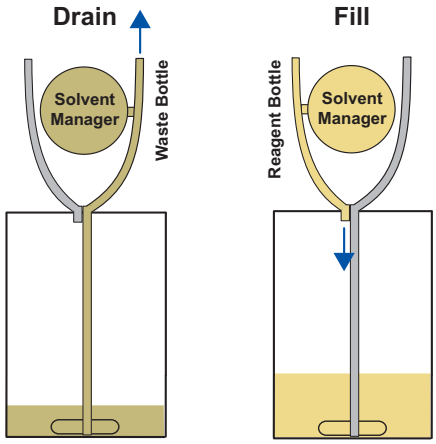


Fast results and direct operation with large Touchscreen

The Coulometer keeps the user informed on the cell condition and makes all tasks (e.g. sample and drift determination) available to be started with One Click™. If the expected water content is known the optimum sample weight can be calculated. The Online Screen offers all ongoing information for the titration and direct access to all data and tasks that further accelerates the complete workflow.

Most convenient without diaphragm

Handling of different reagents for catholyte and anolyte can be complicated and expensive. For most samples the cell without diaphragm offers more convenience in use. No catholyte is needed and the anolyte can be exchanged with the Solvent Manager on One Click™. Only a few samples still require a cell with diaphragm, which is clearly explained in the METTLER TOLEDO applications brochure.



Always in good shape thanks to Reagent Control

The reagents play an important role in the coulometric Karl Fischer titration. The Reagent Control keeps an eye on three parameters so that once the maximum capacity is reached the user is prompted to replace the reagents. The Control offers the possibility to start the exchange with One Click™ even when a method is running on Standby and the fresh reagent will immediately start being conditioned. Contact with any of the reagents is avoided and the user always has an optimal system, ready to use and prepared to generate correct, repeatable results.

Low water content of oils
– easy with the METTLER TOLEDO Coulometers

In the Service department of an engine producer all oils, lubricants and fuels used in the engine are tested for water content. If the result exceeds 500 ppm (0.05%) the parts in contact with the liquid are checked for corrosion. The simple water content determination saves significant time and money, as only the risky parts need further investigation. The prevention of corrosion protects the engine from failure, which is crucial, for example, in aircraft.

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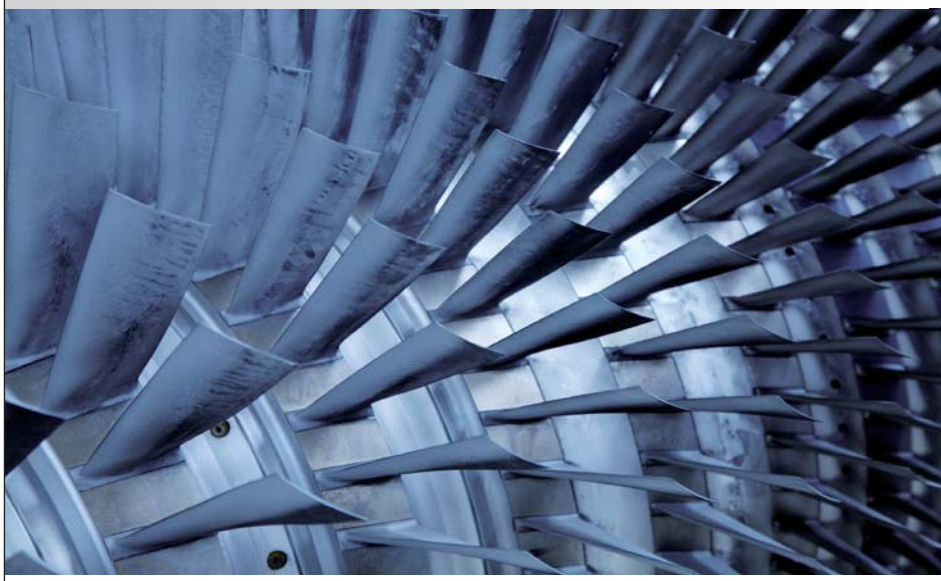
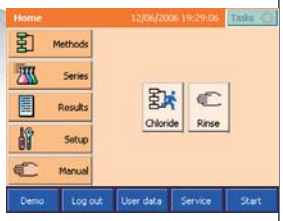


The Universal Solution for Karl Fischer and other Titration Applications

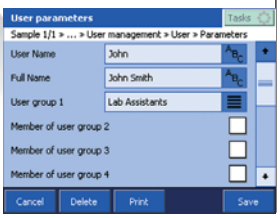
Titrations vary much between different users, applications or industries. The Titration Excellence line has been designed with the utmost modularity in mind so that it can even match unique requirements perfectly. Each piece of the titration system can be chosen and combined into an easy to use, powerful and compact instrument. With the METTLER TOLEDO Excellence titrators modularity is not just a slogan, but a clear concept that includes simple and secure water determination as well as any of titration.

"Simple operation thanks to One Click™ user interface."



"Efficient titration by professional automation."

"Secure handling through intelligence."



Flexible and modular titration solution

The modular hardware concept enables the Excellence Titrator to suit every user's needs perfectly. Whenever more than one person works on the same instrument user security plays an important role; the Titration Excellence user management system offers maximum security. Different rights can be assigned to different user groups and a login password can be enforced to guarantee that only users who log in have the ability to work with the instrument. This high level of security also makes working easier, as every user only sees the buttons he needs.

Excellence in Karl Fischer titration combined with general titration

More than 500 general titration applications can be combined with volumetric Karl Fischer titration and have the possibility to be run in parallel on the same instrument. Titration Excellence means a two-in-one instrument and offers the utmost application power with simplest operation using minimum bench space.

Controlled Homogenization

Solid samples which do not dissolve in the Karl Fischer solvent can be added to the titration vessel and ground with a Homogenizer. The Homogenizer speed is controlled by the Excellence titrator via the RS-interface and documented; this guarantees a maximum of security and full GLP-compliance. Special chemicals for extraction are avoided using the Homogenizer for grinding.

Application

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Powerful parallel titration of active ingredient and water content

The content determination of many pharmaceutical substances is analyzed using titration and often corrected with the water content. The Titration Excellence T90 system takes care of the complete analysis, e.g. Titration for Aspartame content is performed with perchloric acid and at the same time water content can be determined with a Karl Fischer titration running in parallel on the same instrument. The water content value is saved in the Result Buffer and automatically used for the calculation of the Aspartame content. Much time is saved as the water determination is fast and the calculations are automatically done by the titrator.

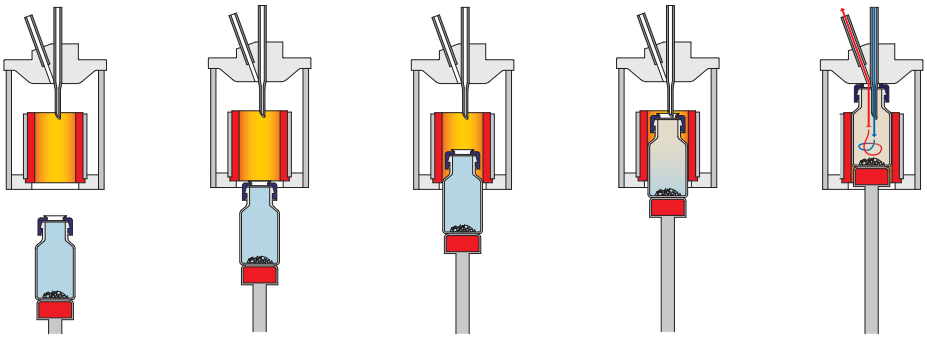
Elegant Automation
for Many Kinds of Samples

Gas phase extraction is the perfect solution for samples that are unable to be directly added into the titration vessel. In this process samples are placed into a sample boat or vial and moved to the oven or sample rack. When heated to the sample specific temperature (up to 300 °C) the water evaporates and is transported into the titration vessel by a constant flow of dry air or nitrogen.

Automation gains time and improves repeatability
The Stromboli Karl Fischer sample changer enables 14 samples to be titrated in an unattended operation mode. The unit is fully controlled by the titrator and automatically recognized whenever connected to the titrator. A predefined method can easily be started for a simple series measurement. For a combination of multiple blank vials, different sample series at different temperatures, and check samples, the titrator's method editor allows full flexibility and easy programming. Stromboli is the compact and flexible friend to every user who wants to use his time for other work rather than just changing samples.

Gas phase extraction allows easy and accurate water determination of solid or viscous samples, for example:

- Substances releasing water only at elevated temperatures: plastics in powder or granular form
- Substances causing side reactions with Karl Fischer reagents: oxidizing inorganic salts
- Substances causing problems in the titration vessel due to their consistency: fibrous or pasty substances
- Substances poorly soluble or insoluble: lubricants, wool, dough, tar or coal



Simple, clever mechanism
The robust design of Stromboli's sample handling mechanism ensures trouble-free processing of samples and correct results. The sample vial is lifted from the turntable with a heating plate and moved up into the oven. Inside the oven the vial is constantly heated from all sides to assure an even temperature distribution. The foil between the rubber seal and the vial is pierced by the glass capillary. The water released by the sample is transferred to the titration vessel via the applied gas flow. The specially designed rubber seal ensures that no vapors can escape.

The simple solution
The manual oven DO308 allows safe oven applications with single samples using manual sample addition.

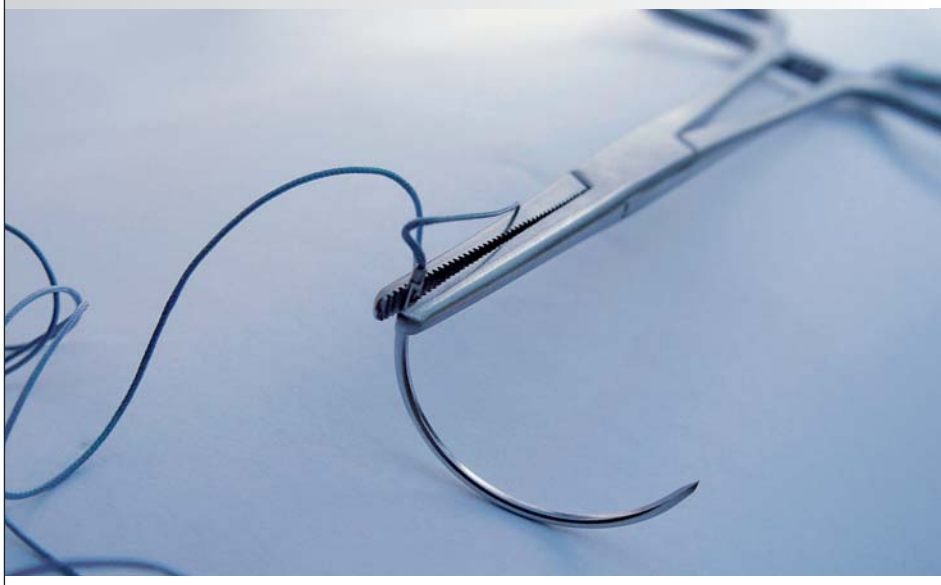
Application

Application

Application

Application

Safe surgical operations require reliable analysis
For closing wounds after surgery, fibers made of PGA (Polyglycolic acid) are used; the so called sutures completely degrade into water soluble monomers after 17 to 21 days and thus avoid further surgery to be removed since they simply disappear. If the water content of the PGA exceeds 400 ppm the suture can degrade too fast leading to severe complications. The water content of PGA fibres is determined with the Stromboli oven sample changer and the C30 Coulometer. Several samples are heated to 180 °C and the evaporated water is transferred into the coulometer cell. If the water content exceeds 400 ppm the fibres cannot be used for surgery.



Reliable Results
Through the Complete Life Cycle

The basis of reliable results is set long before the daily routine: evaluation and selection of a suitable titration system as well as proper installation and training on correct operation. Appropriate maintenance and regular calibration guarantee accuracy and repeatability on a long term as well as fulfilling the increasing demands of regulatory requirements. At each phase METTLER TOLEDO accompanies you and offers competent support and the right tools to ensure that your investment is lasting and risks are minimized.

Good Evaluation

- Which is the parameter of interest: moisture or water content or dynamic vapor sorption analysis?
- Is volumetric or coulometric titration appropriate?
- Is combination with general titration needed?
- Which application, which method?
- How many samples are to be determined: is automation necessary?
- What reagents are ideal for this sample?
- Which accessories make sense?

METTLER TOLEDO has an excellent knowledge in any kind of moisture and water content determination, therefore offers the appropriate products to fulfill every analysis task.

Moisture determination by Halogene Moisture Analyzers

Moisture determination by loss on drying method

Water determination by Karl Fischer Titration

Dynamic vapor sorption by TGA Sorption Analyzer System

Good Installation

Proper installation, professional implementation into operation and user training are key factors for good titrations right from the start. Equipment qualification and/or validation accompanied by the suitable documentation are reasonable complements in many cases. METTLER TOLEDO supports you with a variety of service products and services for these purposes:

- **IPac:** Initial Qualification Package comprising: Installation Qualification (IQ), Operational Qualification (OQ), recommendation for Performance Qualification (PQ) and the definition of the Maintenance Qualification (MQ).

- **EQPac:** Equipment Qualification Package containing: comprehensive IQ, OQ, definition of PQ, establishing of MQ as well as the expandable logbook for monitoring the equipment and keeping the instrument records through the entire lifetime.

- **Software Validation:** The LabX validation manuals I&II make system validation straightforward and complete. The two manuals contain all the information, instructions and forms you need in order to satisfy any regulatory body.

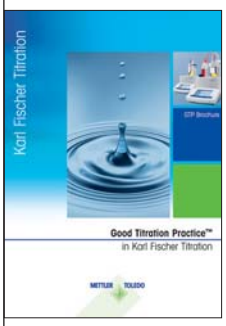
Good Routine

Achievement of good titration results relies on three key parameters: the instrument, its correct operation and service:

- The instrument's intelligence checks its own parameters as concentration limits, solvent and reagent lifetime or service intervals and reminds the user if any action is necessary. User interference is reduced to the minimum.

- Users are trained in sample preparation, operation and maintenance, what is recorded e.g. in the qualification documentation. The monograph "Good Titration Practice™ in Karl Fischer Titration" gives valuable tips and hints. The Karl Fischer Applications brochure and the user information magazine UserCom give additional information about samples and applications.

- METTLER TOLEDO offers tailored service contracts to maintain the system, to make sure the results remain reliable for years and to support you in fulfillment of regulatory requirements.



ServiceXXL
Tailored Services

For Every Purpose the Perfect Match

Model Overview

V20 – Routine Volumetric
Everything you need for Routine Volumetric Karl Fischer Titration from 100 ppm up to 100% water is included. Measure sample after sample with the standard method or one of five user methods.

V30 – All-round Volumetric
Additional security with Solvent Control, user management Expert–Routine, automation with Stromboli and more. Ready-to-use and complete.

C20 – Routine Coulometer
Everything you need for Routine Coulometric Karl Fischer Titration from 1 ppm up to 5% water is included. Measure sample after sample with the standard method or one of five user methods. Includes cell with or without diaphragm.

C30 – All-round Coulometer
Additional security with Reagent Control, user management Expert–Routine, automation with Stromboli and more. Ready-to-use and complete, includes cell with or without diaphragm.

Feature comparison table		V20	V30	C20	C30
One Click Titration™	User specific Home Screen with Shortcuts	•	•	•	•
	Shortcuts per user	4	12	4	12
	Solvent or Reagent Control	-	•	-	•
Hot Plug & Play	Solvent Manager	•	•	•	•
	Burette recognition with titrant and titer	•	•	-	-
	External Dosing Unit	-	•	-	-
	USB printer	•	•	•	•
	Memory stick	•	•	•	•
	USB barcode reader	•	•	•	•
Automation	Stromboli oven sample changer	-	•	-	•
User Management	"Expert – Routine" user groups	-	•	-	•
	Fully flexible	-	-	-	-
Methods and series	General titrations	-	-	-	-
	External Extraction / Dissolution	-	•	-	•
	Bromine Index determination	-	-	-	•
	"if…then" conditions in methods	-	-	-	-
	Number of samples per series	120	120	120	120
	Preprogrammed METTLER TOLEDO methods	-	11	-	11
	Max. number of user methods	5	120	5	120
	User defined calculations	-	•	-	•
Task list	Number of tasks	-	10	-	10
	Number of tasks running in parallel	-	-	-	-
Online Help		•	•	•	•
Parallel titration		-	-	-	-
Languages		English / German / French / Spanish / Italian /			
PC software	LabX titration connectivity light and pro	•	•	•	•
	LabX pro FDA 21 CFR part 11 support	-	•	-	•
Homogenizer		-	TTL	-	-

T70 – Universal titrator
For volumetric Karl Fischer and general titration. Modularity, security and application possibilities with the One Click™ user interface. Fully modular and flexible.

T90 – Unlimited power
Runs volumetric Karl Fischer and general titration in parallel. Maximum applications power and automation capability in a modular and tailored system.

T70	T90
•	•
12	12
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-	-
-	•
120	120
>50	>50
120	120
•	•
10	30
7	8
•	•
-	•
Chinese / Russian / Polish / Korean	
•	•
•	•
RS / TTL	RS / TTL

Accessories Overview

Software

PC software
LabX titration pro
LabX titration light

Printer

USB printer

USB-P25
compact paper roll printer

Analytical balances

XP or XS series
analytical balances

Burettes

DV1000 series
with volumes of 1, 5, 10 or 20 mL

External Dosing Unit
to add auxiliary reagents

Gas phase extraction ovens

DO308
manual oven

Stromboli
oven sample changer

Homogenizer

Adapter Set
for Kinematica or IKA Homogenizers

TBox DR42
for use of a homogenizer controlled by TTL

Sampling device

Visco Spoon™
for viscous samples

Thermostatable vessel

For KF titration at elevated or reduced temperature

Titration Excellence Karl Fischer kit

Including Solvent Manager, titration stand, vessel, sensor, tubes and all accessories (only for T70/T90)

Titration Excellence

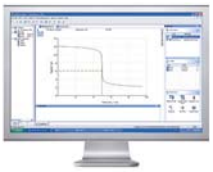
One Click Titration™ for any application – simple, efficient, secure and modular. Choose a tailored system which matches your requirements perfectly and that offers perfect results for all kinds of titrations in just One Click™.

Titration Sensors

The sensor is the key to every titration analysis. METTLER TOLEDO offers a comprehensive range of powerful and reliable sensors for every application. Plug & Play means all sensor and calibration data is sent to the Excellence titrator when plugged in.

Titration Automation

Titration puts a high demand on automation due to the large range of sample types and numbers. METTLER TOLEDO automation solutions can run the entire analysis process automatically - from sample preparation to the titration itself and then finally through cleaning/conditioning of the sensor and accessories.



LabX PC software

This market approved titration software offers full control over your titration systems, secure database archiving, efficient result management with control charts and individual search filters, rapid and clear method development for new applications, and complete traceability by providing user management, audit trail, method history and electronic signature.

www.mt.com

For more information

Quality certificate. Development, production and testing according to ISO 9001.

Environmental management system according to ISO 14001.

"European conformity". The CE conformity mark provides you with the assurance that our products comply with the EU directives.