

# Karl Fischer Titration



## **Karl Fischer Titrators**

Compact Volumetric

Compact Coulometric

Titration Excellence



## **One Click<sup>®</sup> Water Determination**

## Simple & Secure

**METTLER TOLEDO**

# Know Your Water Content In One Click<sup>®</sup>

**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 METTLER TOLEDO Karl Fischer titrators your operators need only to press one button to run a water determination!**

## Simple and fast operation



The Touchscreen user interface is optimized for direct access to routine tasks and provides clear information to the user. One unique Homescreen for each user with their own Shortcut buttons offers One Click access to all routine tasks. It's easy to feel right at home from the start, which reduces learning time and increases data security.

## 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. LevelSens additionally increases security by monitoring solution and preventing overflow in the waste bottle.

## Flexible and secure data management



METTLER TOLEDO Titrators offer a broad range of possibilities to handle your data. Choose whether to export as CSV, PDF or XML files. Devices such as printers or memory sticks can be connected via the USB port and are automatically recognized. For full data security LabX<sup>®</sup> titration PC software supports the user in every action performed with the titrator. All results are stored in the LabX database.



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 moisture or water content enables METTLER TOLEDO an advantage in providing the answer to any question.

# The Generalists

## For Water Determination up to 100%

**The Volumetric Compact 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



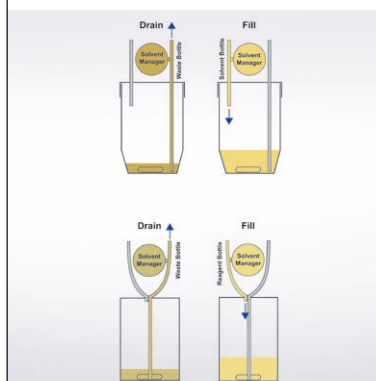
Improving the ease of use of an instrument means keeping the user fully informed on what is happening while offering all possible task choices as directly as possible. The online screen always shows the condition of the titration vessel and offers a direct One Click® for every important task. When a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

### Security with intelligent burettes



Is the correct titrant installed? Is the concentration right? Has the concentration determination expired? All this information is stored on the burette chip and the titrator automatically verifies all parameters when a titration is started. Errors occurring during the installation of resources are now a thing of the past. Be assured with the Plug & Play feature, safe titration could not get any simpler.

### 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 different parameters. 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 - determined easily with our Compact Volumetric KF Titrators**

Polyols are raw materials for the production of a big variety of polyurethane-based products obtained by polymerization reaction with Di-Isocyanates. An example is 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<sub>2</sub>. The CO<sub>2</sub> 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.

# The Specialist

## For Low Water Content Up to 5%

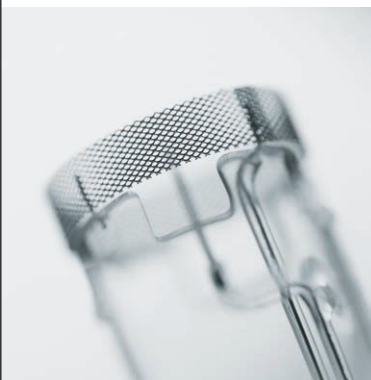
Accuracy and precision is improved further if the titrant is not added with a burette, but produced directly in the solution with a current applied by a generator cell. This also makes a titrant concentration determination obsolete. The Compact coulometric Karl Fischer Titrators offer particularly fast 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



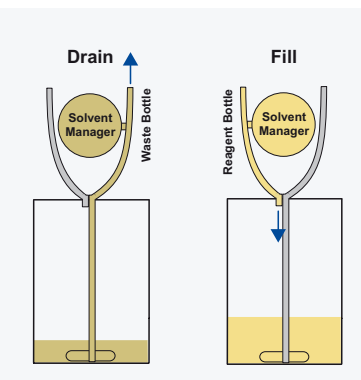
The Coulometer keeps the user informed on the cell condition and makes all tasks (e.g., sample and drift determination) available to be started with One Click®. If the expected water content is known, the optimum sample weight can be calculated. The Online Screen offers all ongoing information for the 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 generator 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 the important parameters so that once the maximum capacity is reached the user is prompted to replace the reagents. 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.

# The Universal Solution for Karl Fischer and Other Titration Applications

Titration varies 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.

## Efficient and secure titration solution



Whenever more than one person works on the same instrument, user security plays an important role. On Titration Excellence, specific rights can be assigned to different user groups. With a login password, only eligible users have the ability to work with the instrument. This high level of security makes working more efficient, as every user only sees the buttons he needs.

## General and Karl Fischer titration in one device



More than 500 general titration applications can be combined with volumetric and coulometric Karl Fischer. With Titration Excellence T9 you are able to execute different analysis in parallel on the same instrument. Titration Excellence means a two-in-one instrument and offers the utmost application power with simplest operation and 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 maximum security and full GLP-compliance. Special chemicals for extraction are avoided using the Homogenizer for grinding.





### **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 T9 system takes care of the complete analysis, thanks to its parallel Titration feature. The water content value is saved in the Result Buffer and automatically used for the calculation of the API content.

# 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.**

### Gas phase extraction

This approved application 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

### Improved productivity in less space



Modern and extremely compact, the new InMotion KF Oven Autosampler allows up to 26 samples to be placed on a rack of only 25 cm. The Temperature Scan functionality speeds up the analysis of unknown samples by determining, in just one single run, the optimum temperature for heating the sample.

### The simple solution



METTLER TOLEDO's DO308 drying oven allows safe and easy oven application for single samples. The manual oven DO308 assures accurate water determination combined with simple handling.



**Precise and efficient**

The InMotion KF Oven Autosampler allows for up to 26 samples to be analyzed using the gas extraction technique. Sample preparation is simplified by the innovative one-piece cap, which does not necessitate the use of extra tools or adhesive membranes. Gas flow is controlled electronically, allowing you to monitor the amount of dried gas entering the titration cell. Together with LabX<sup>®</sup> software, which ensures full data traceability, these attributes help laboratories meet the most demanding regulatory standards.

# Reliable Results Through the Entire Life Cycle

The foundation for reliable results is laid out long before operation starts: evaluation and selection of the correct system, as well as proper installation and training, is essential. Regular maintenance and calibration means ongoing accuracy and repeatability, and supports the increasing demands of regulatory requirements. For every step of the way, METTLER TOLEDO accompanies you and offers competent support with the right tools to ensure that your investment is secure and the risks are minimized.



**GTP™**  
Good Titration Practice™

## Evaluation and Selection

- 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: is automation necessary?
- What are the best reagents for the sample?
- Which accessories make sense?

METTLER TOLEDO has expert knowledge in moisture and water content determination, and offers the right products to fulfill every analytical 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

## Installation and Qualification

Professional installation and appropriate user training are key factors in achieving good titration results from day one. Our equipment qualification and software validation products ensure that both your equipment and operators have the perfect start, and that your regulatory needs are properly fulfilled.



- **Comprehensive Qualification:** The EQPac service supports the highest level of regulatory compliance providing IQ, OQ, PQ recommendations, maintenance proposals and initial calibration. Comprehensive documentation fulfills all your auditory requirements.

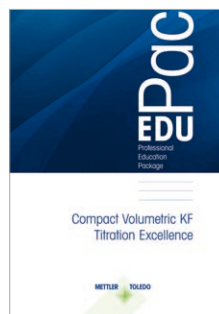
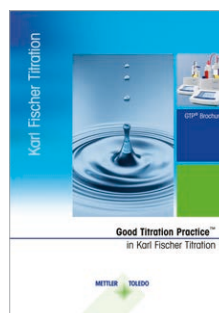


- **Standard Qualification:** The IPac service provides professional installation including IQ, OQ, PQ recommendations, maintenance proposals and system performance tests. Our standard documentation supports regularly requirements.
- **Software Validation:** The LabX<sup>®</sup> validation service provides complete and comprehensive software validation. The documentation contains all the evidence required to satisfy any regulatory body.

## Routine Operation

Achieving good titration results relies on three key parameters: the instrument, correct operation and regular service. With the support of METTLER TOLEDO, you've selected the best instrument. Now let us support you in correct operation and regular service:

- **EduPac:** Supplement the Qualification Pacs with our EduPac training. The professional training material provides easy-to-follow guidance and practical exercises to support the correct operation of your KF titrator. Together with the expert tuition of a specialist, learn how to perform routine analysis with confidence! In addition, the publication "Good Titration Practice™ in Karl Fischer Titration" gives valuable tips and tricks.
- **Preventive Maintenance and Calibration:** Regular service means confidence in your results, as well as fulfilling quality requirements. Our fully-compliant calibration procedures are documented with professional, easy-to-read certificates. Combined with our Preventive Maintenance service, pre-planned periodic calibration ensures reliable performance, regulatory compliance, avoids unexpected downtime and protects your budget.



► [www.mt.com/gtp](http://www.mt.com/gtp)



# For Every Purpose the Perfect Match

## Model Overview



**Compact Volumetric  
KF Titrators**



**Compact KF Coulometers**

Feature comparison table		V10S	V20S	V30S	C10S	C20S
		The Individualist	The Routine Titrator	The KF Specialist	The Individualist	The Routine Titrator
<b>One Click® Titration</b>	User specific Homescreen with Shortcuts	•	•	•	•	•
	Shortcuts per user	4	12	12	4	12
	Solvent or Reagent Control	-	-	•	-	-
<b>Hot Plug &amp; Play</b>	Solvent Manager	•	•	•	•	•
	Burette recognition with titrant and titer	•	•	•	-	-
	External Dosing Unit	-	-	•	-	-
	USB printer	•	•	•	•	•
	Memory stick	•	•	•	•	•
	USB barcode reader	•	•	•	•	•
<b>Security</b>	LevelSens	-	-	•	-	-
	LogStraight Fingerprint Reader	-	-	•	-	-
<b>Automation</b>	InMotion KF Oven Autosamplers	-	-	•	-	-
<b>User Management</b>	"Expert – Routine" user groups	•	•	•	•	•
	Fully flexible	-	-	-	-	-
<b>Methods and series</b>	Potentiometric titrations	-	-	-	-	-
	External Extraction / Dissolution	-	-	•	-	-
	Bromine Index determination	-	-	-	-	-
	"if...then" conditions in methods	-	-	-	-	-
	Number of samples per KF series	120	120	120	120	120
	Preprogrammed METTLER TOLEDO methods	-	-	11	-	-
	Max. number of user methods	5	5	150	5	5
<b>Task list</b>	User defined calculations	-	-	•	-	-
	Number of tasks	-	-	10	-	-
	Number of tasks running in parallel	-	-	-	-	-
<b>Online Help</b>		•	•	•	•	•
<b>Parallel titration</b>		-	-	-	-	-
<b>Status Light™</b>		-	-	-	-	-
<b>Data Export / Printing</b>	USB, Ethernet, PDF	•	•	•	•	•
<b>Languages</b>		English / German / French / Spanish / Italian / Chinese				
<b>PC software</b>	LabX® Titration Express and Server	-	•	•	-	•
<b>Homogenizer</b>		-	-	TTL	-	-
<b>Service</b>	IPAC	•	•	•	•	•
	EQPAC	-	•	•	-	•

## Accessories Overview

### Software



**PC software**  
LabX® Titration Server  
LabX® Titration Express

### Printer



**USB printer**



**USB-P25**  
compact paper roll  
printer

### Analytical balances



**XPE or XSE series**  
analytical balances

### Burettes



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



**External Dosing Unit**  
to add auxiliary  
reagents

### Security



**LogStraight**  
Fingerprint Reader



**LevelSens**  
Prevents from waste  
overflow and warns  
the user when  
bottles run dry.

### Gas phase extraction ovens



**D0308**  
manual oven



**InMotion KF**  
Oven Autosamplers

### Homogenizer



**Adapter Set**  
for Kinematica or  
IKA Homogenizers



**TBox DR42**  
for use of a homoge-  
nizer 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

(Volumetric or  
Coulometric)



Including Solvent Manager, titration stand,  
vessel, sensor, tubes and all accessories  
(only for Titration Excellence)



**Titration Excellence**

C30S The KF Spe- cialist	T5 Convenient & Versatile	T7 Flexible & Expandable	T9 Intelligent & Powerful
•	•	•	•
12	24	24	24
•	•	•	•
•	•	•	•
-	•	•	•
-	•	•	•
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-	•	•	•
•	-	•	•
•	•	•	•
-	-	-	•
120	303	303	303
11	>30	>40	>40
150	150	150	150
•	•	•	•
10	10	10	30
-	-	7	8
•	•	•	•
-	-	-	•
-	•	•	•
•	•	•	•
/ Russian / Polish / Korean / Portuguese			
•	•	•	•
TTL	TTL	RS / TTL	RS / TTL
•	•	•	•
•	•	•	•



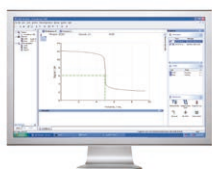
### Service and Support

Feel secure in the knowledge that your Titration Excellence system is installed and qualified according to the quality standards that apply in your company. Ask for one of the qualification products offered by your local METTLER TOLEDO representative in the form of service and accompanying documentation.



### 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/titration](http://www.mt.com/titration)

For more information

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LabX is a Registered Trademark of METTLER TOLEDO in Switzerland, USA, China, Germany and a further 13 countries.

#### METTLER TOLEDO Group

Laboratory Division  
Local contact: [www.mt.com/contact](http://www.mt.com/contact)



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