

Determination of the Water Content in Fluids, Solids, Pasty Substances, Oils, and Gases according to the Karl-Fischer-Method

Just Water? Think again...

Surface Water...

Water of Crystallization...

Molecular Water...

Free Water...

Chemically Bonded Water...

Water produced by thermal decomposition...

Water has more than one face!

With the modular AQUA 40.00 you can really track down all kinds of water. And that's not even all - the Karl-Fischer-Titrator AQUA 40.00 has got a lot to offer:

- Exchangeable modules
- User-friendly software
- Precise analysis results even with problematic matrix
- Additional information on bonding strength of water

analytikjenaAG



ELEKTROCHEMIE HALLE



The Karl-Fischer-titration takes on a new face: AQUA 40.00

Basic Module

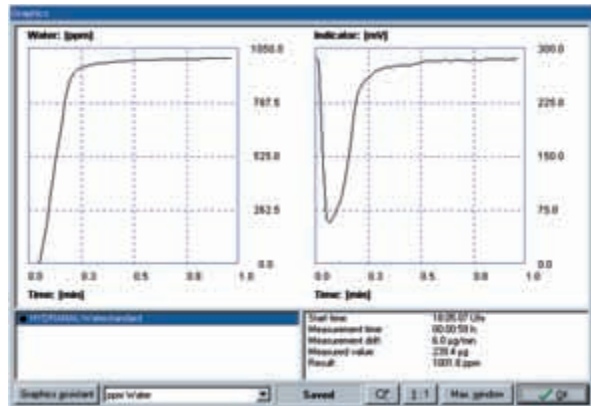


Precise Determination of the Water Content by Direct Dosing

The basic module is the essential device for coulometric Karl-Fischer-Titration. The sample to be analyzed is injected right into the measuring cell.

Features:

- Infinitely variable electrolysis current for very short analysis duration
- Adjustment of titration rate to current water amount to be titrated
- Optimized measuring cell with exceptionally low background drift
- Suitable for all commonly used Karl-Fischer-reagents. Many applications do not require a diaphragm in the generator electrode unit, therefore only one coulometric reagent is needed.



Typical example of a titration curve

Autosampler

Autosampler for Liquids



Features:

- Automatic dosing into the measuring cell
- Motor-driven dosing syringe with very high resolution (25.200 steps)
- Free selection of dosing volume ranging from 50 µl to 2 ml
- Multiple sample dosing with optimized dosing volume
- Options for standard addition, dilution and extraction in sample containers
- Exchangeable plate for different types of sample containers (2 ml, 6 ml, 10 ml)

Autosampler for Solids

Features:

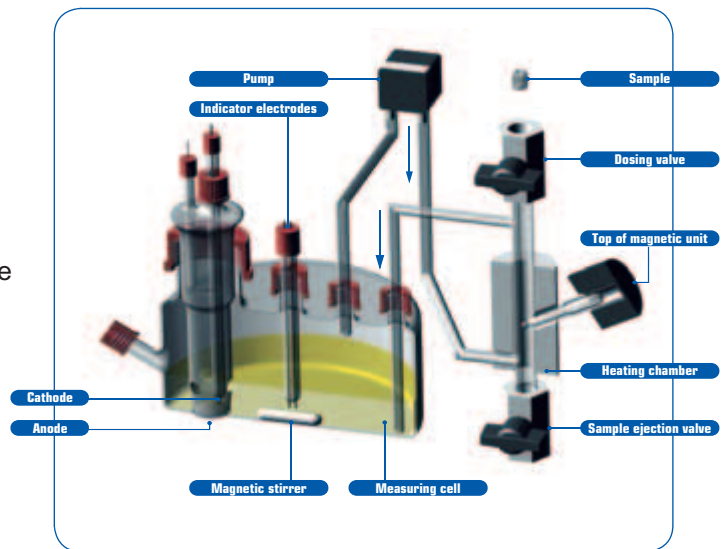
- Automatic feeding of sample containers
- Exchangeable plate for different types of sample containers
- Individual heating of each sample possible (constant temperature or temperature ramp)
- Purging gas supply
- Robust and compact design

Heating Modules

Gas extraction - the ideal method to handle oils, solid and pasty substances

We offer different types of heating modules that can be combined with the basic module. The sample heating is performed

- either isothermally at a freely definable temperature
- or by individually created temperature programs, e. g.
 - freely definable temperature gradients,
 - time-controlled temperature programs for step-by-step heating,
 - titration-controlled temperature programs depending on the water production



Principle of the gas extraction

The sample is placed in the heating chamber. The extraction gas coming from the measuring cell passes through the sample and is pumped back into the measuring cell. By this circulation system, separate inert gas drying is avoided.

Head-Space-Module

The head-space-module has been specifically designed for solid, pasty or oily material that changes its water content if brought into contact with ambient air. The sample containers are sealed and brought into a special heating chamber where the sample is heated up. The released water is led to the measuring cell by a needle system. Neither before nor after the analysis procedure, the sample has contact with ambient air.

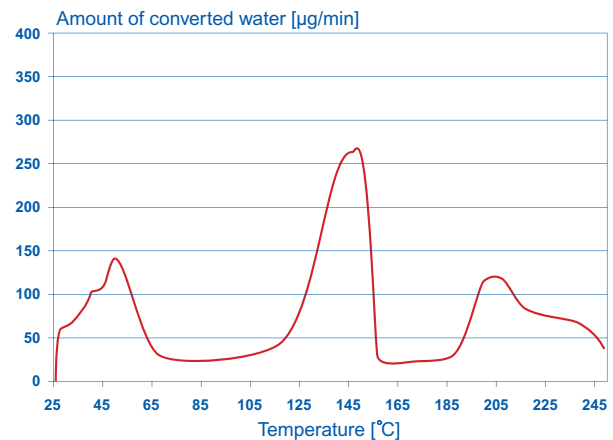
Applications:

- Lyophilized cultures
- Hygroscopic plastics and oils



Heating Chamber for Solids

Solid or pasty samples are weighed in into the sample containers and brought into the heating chamber. After the measuring process has been completed, the sample waste is disposed of by unlocking the magnetic lock. The device system is then ready for the next analysis procedure.



Example for temperature-programmed heating of a hydrate water-containing salt sample

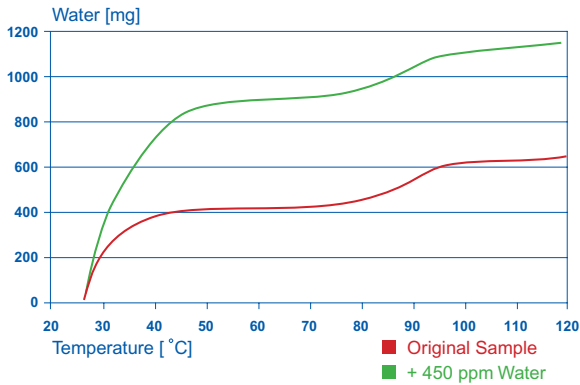
During the first step, adsorptively bonded surface water is desorbed. As temperature increases the chemically bonded hydrate water is gradually released.

Applications:

- Inorganic salts
- Fertiliser
- Colorants
- Fats
- Wood and timber
- Plastics
- Food
- Paper
- Pharmaceuticals
- Pigments
- Soaps
- Tar products

Heating Chamber for Oils

Oil samples are injected right into the heating chamber by means of an injector syringe. It is possible to apply sample volumes up to 10 ml. The high sensitivity of the AQUA 40.00 allows precise detection of the water contained in the sample down to amounts of 1 ppm. After analysis the oil sample waste flows off through the now opened discharge valve.



Example for water determination of a silica oil suspension
 With rising heating temperature (temperature program), the original sample gradually desorbs water. By adding water to the oil suspension, the amount of water dissolved in oil increases. At temperatures ranging between 70 °C and 100 °C, however, the amount of desorbed water remains the same.



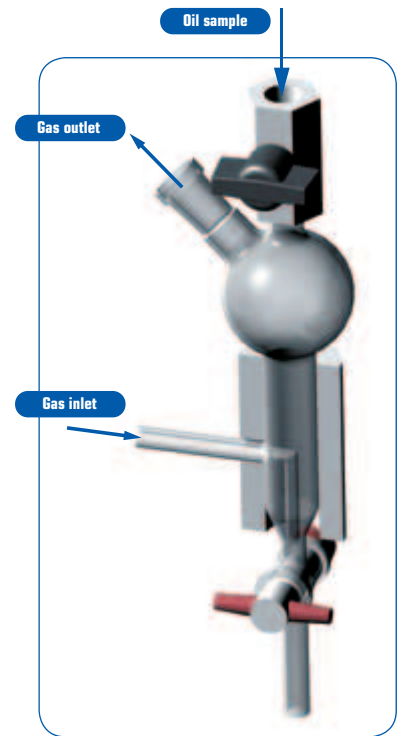
1500 °C



1000 °C

Applications:

- Biological oils
- Hydraulic oils
- Motor oils
- Silica oils
- Lubricating oils
- Transformer oils



Principle of gas extraction for oil samples

Fan Module

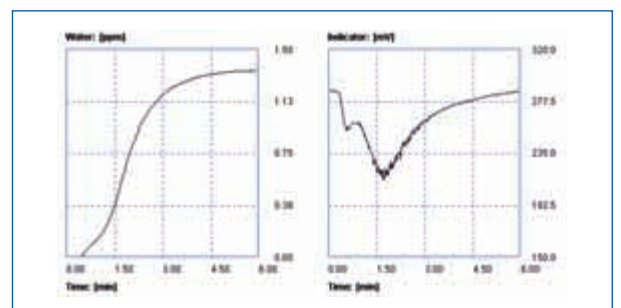
The fan module (aerator) realizes fast cooling of the heating chamber after the measuring procedure. The starting temperature for the following measurement (e. g. if working with temperature programs) is reached within a very short time. The fan module is to be combined with a heating module for solids or oils.

High-Temperature-Furnace

With this module, the sample can be heated up to a temperature of 1500 °C. A special valve system leads the sample into the furnace without interrupting the gas current.

Application

- Inorganic salts
- Building material
- Metal and alloy
- Molecular sieves
- Oxides/hydroxides
- Cement



Example for water determination in zeolite (molecular sieve)

Heating at constant temperature $T = 600\text{ °C}$

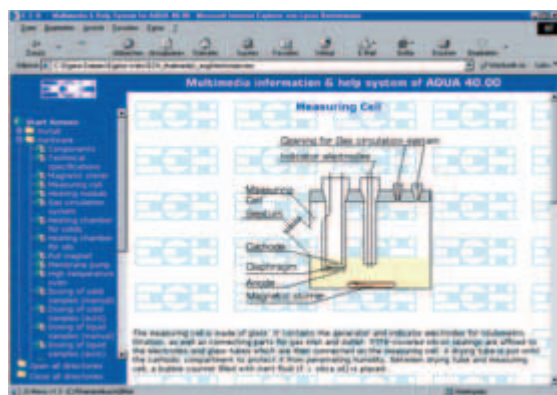
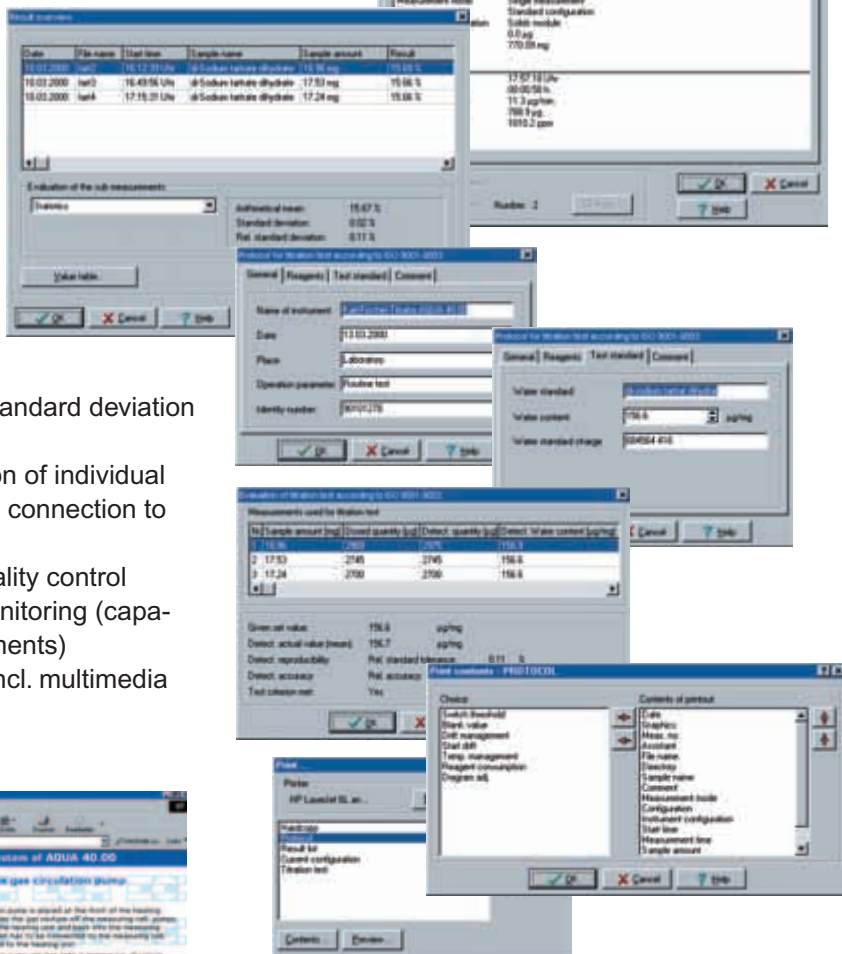
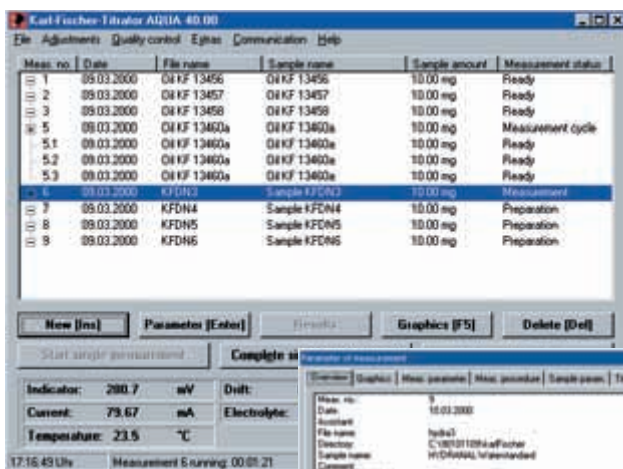
Software

Control and evaluation software for all types of application

Simply start your PC - and the rest is done for you by the AQUA 40.00 program. The comfortable software for Windows 95/98/NT automatically identifies currently working modules and adjusts operation to the user-specific device version.

Features

- Full control of the AQUA 40.00 by software
- Automatic module identification
- Representation of titration in real time
- Documentation of all relevant data
- Individual creation of routines
- Statistics module incl. calculation of averaged value, standard deviation and coefficient of variation
- Extensive methods for creation of individual protocols, for data export and connection to LIMS
- Integrated titration test for quality control and reagent consumption monitoring (capacity, life, number of measurements)
- Detailed online help system incl. multimedia support



Multimedia Information and Help System

You don't get any further with your samples?

Are you looking for different applications?

Have you got any questions about the AQUA 40.00?

With our comprehensive information and help system nothing can get in your way. The system offers problem solution and detailed answers to your questions. Illustrations, descriptions, video clips and animations make the Karl-Fischer-titration by AQUA 40.00 child's play!

Technical Specification

Basic Module

| | |
|------------------------|---|
| Measuring range: | 1 µg...100 mg |
| Resolution: | 0,1 µg |
| Reproducibility: | +/- 3 µg at 10...1000 µg 0,3 % at > 1 mg |
| Generator current: | infinitely variable within 0...250 mA |
| Indication: | biamperometrically polarisation with square-wave voltage |
| Cell volume: | 100 ml |
| Duration of analysis: | approx. 5 min (depending on water content) |
| Results in: | µg, µg/l, mg/l, ppm, %, mC, formula generator |
| Power supply: | 230 V, 50 Hz |
| Dimensions: | approx. 100 (W) x 400 (H) x 200 (D) mm |
| Weight: | approx. 5 kg |
| Serial interface: | RS 232 |
| Connection to balance: | RS 232 |

Extension Modules

Heating chamber for solid samples

| | |
|----------------|---|
| Sample dosing: | in sample containers |
| Temperature: | up to 300 °C, isothermal or with temperature program |
| Sample volume: | up to approx. 1 g |

Heating chamber for oil samples

| | |
|----------------|---|
| Sample dosing: | with injector syringe |
| Temperature: | up to 300 °C, isothermal or with temperature program |
| Sample volume: | up to 10 ml |

Head-space-module

| | |
|----------------|---|
| Sample dosing: | in head space vials |
| Temperature: | up to 300 °C, isothermal or with temperature program |
| Sample volume: | up to approx. 6 ml |

Fan module

| | |
|-----------|----------------------------|
| Gas flow: | up to 30 m ³ /h |
|-----------|----------------------------|

High-temperature-furnace

| | |
|----------------|--|
| Sample dosing: | in sample containers |
| Gas flow: | up to 500 ml/min |
| Temperature: | up to 1500 °C, isothermal or with temperature program |
| Sample volume: | approx. 1 g |

Feel free to ask for more information, or order your personal package. Just call or send a fax - our team will be pleased to give an expert advice.

ECH Elektrochemie Halle GmbH

Weinbergweg 23
D-06120 Halle (Saale)
Tel.: +49-345-5583-711
Fax: +49-345-5583-710
E-Mail: Elektrochemie-Halle@t-online.de
Internet: <http://www.ech.de>

analytikjenaAG

Konrad-Zuse-Straße 1
D-07747 Jena
Tel.: +49-3641-77-70
Fax: +49-3641-77-9279
E-Mail: info@analytik-jena.de
Internet: <http://www.analytk-jena.de>