

Water content and material characteristics

The water content of various materials frequently has a significant impact on the material characteristics.

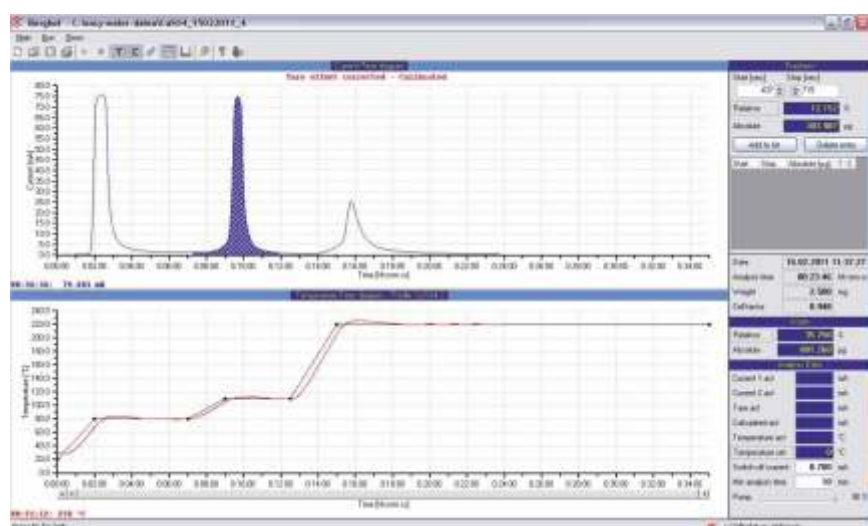
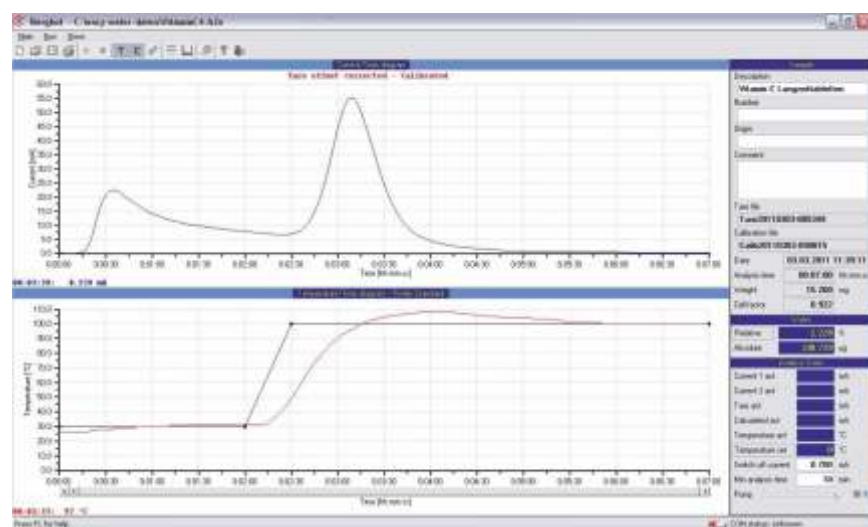
For example, the injection molding behavior of plastics, the stability of active pharmaceutical agents or simply the price of raw materials changes.

The distinction between free and bonded water

Evaporation of the water can be controlled via the programmable temperature profile up to 400°C. Slower heating rates - if necessary in steps at lower evaporation temperatures - facilitate discrimination of the different bonding forms of the water in the relevant sample. The software then enables the individual peaks to be evaluated and quantified.

Reliable results

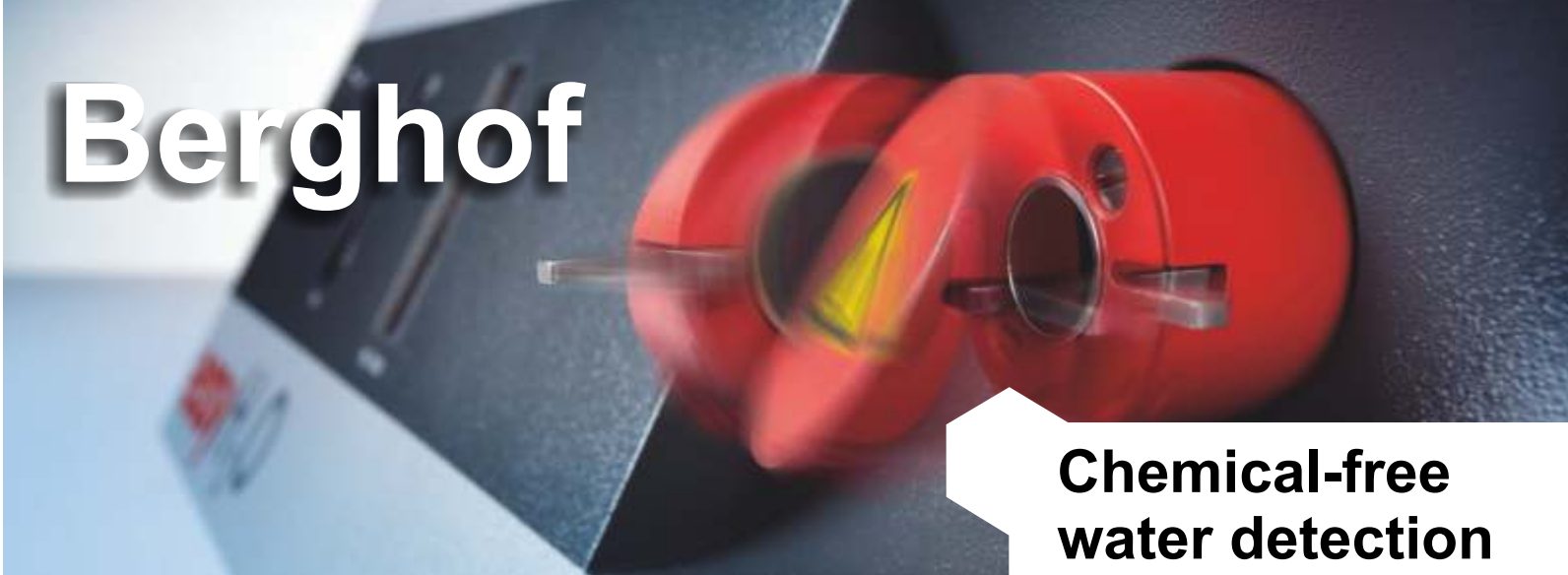
The phosphorus pentoxide sensor is a standard method of detecting water in gases such as hydrogen, oxygen, nitrogen, argon and helium. This method was first described and standardized in 1987, in DIN 50450. The sensor principle is also applied to the determination of water in natural gas (ASTM D 5454 and ISO 11541:1997).



Technical data

easyH₂O[®] one

Voltage	115 / 230 V ±10 %
Frequency	50 – 60 Hz
Max. power consumption	400 W
Fuse	4 A
Protection class	1
Oven temperature	Room temperature – 400°C
Max. heating rate	40°C/min
Measuring time	5 – 600 min
Sensitivity	1 µg water
Reproducibility	≤ 2%
Water content of sample	0,01 – 15 %
Display	ppm – 99,99 %
Max. sample volume	3 cm ³
Ambient temperature	10 – 35°C
Air humidity	10 – 90%, non-condensing
Dimensions	500 x 180 x 500 [mm] H x W x D
Weight	Approx. 20 kg
Carrier gas	Indoor air via built-in pump, Option: nitrogen (4.0 oder 5.0) or argon (4.0 oder 5.0)
Gas flow rate	100 – 200 ml/min
Initial gas pressure	0,5 bar
Conformity	CE, EN 61326-1, EN 61326-2, EN 61010
Balances	Sartorius, Mettler-Toledo
Accessories	Software, Sodium tungstate calibration standard Coating solution, Ni sample boats, pincers, brush, particle filter, spatula
PC requirements	1 x RS 232
Software requirements	Windows XP, Windows 7



Chemical-free water detection

easyH₂O[®] one



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Knowledge for a cutting edge

Exact knowledge of material characteristics at an early stage amounts to protection from financial consequences owing to defective raw materials and products. Knowledge of the quantity and bonding forms of the water, coupled with the awareness of the release temperature of unknown substances - or of those which have not yet been examined - leads to a cutting edge in terms of knowledge. In Research & Development the easyH₂O therefore makes an equally valuable contribution to assuring competitiveness as it does for quality control.

Ready to operate at all times

The measuring cell of the Berghof easyH₂O regenerates itself and is not spent. No chemicals are required and the system is permanently rinsed with dried air. This precludes blank value inputs from the environment. The analyzer is ready for operation at all times.

Automatic, PC-controlled processes; complete documentation

The Berghof easyH₂O is controlled by a PC. If the analysis is started in the program, a dialog begins which requests the operator to input relevant data and perform the next steps of the process. The sample weight is automatically faultlessly transmitted from the connected balances. During the measuring process the sensor current and the actual and target temperature profiles are represented graphically. The accumulated water content, the sensor current and other characteristics are displayed numerically in real time. The measuring procedure is under control at all times and the operator can intervene as need be. All of the data, temperature programs etc. are logged in compliance with ISO and GLP and can then be printed or read-in again.



Chemical-free and environmentally friendly P₂O₅ measuring cell

No special or toxic chemicals are required to operate the phosphorus pentoxide measuring cell. Hence the system is environmentally friendly and the operator profits considerably.

- Reduced operating and disposal costs
- Operating staff do not need special training on how to handle toxic chemicals
- Reduced blank value input regarding chemicals

Selective water detection

The Berghof easyH₂O selectively registers the water in the sample by means of thermo- coulometric determination. Unlike the gravimetric moisture-measuring techniques, the result is not distorted by substances which evaporate out of the sample together with the water. It therefore delivers reproducible, accurate results and facilitates separate identification of free surface and capillary water as well as bonded water. Even strongly-bonded water is released and quantified via temperature programs up to 400°C.

Easy to handle, low operating costs

The Berghof easyH₂O is extremely simple to handle and there are just 3 steps to be carried out:



1. Start the automatic measuring program.



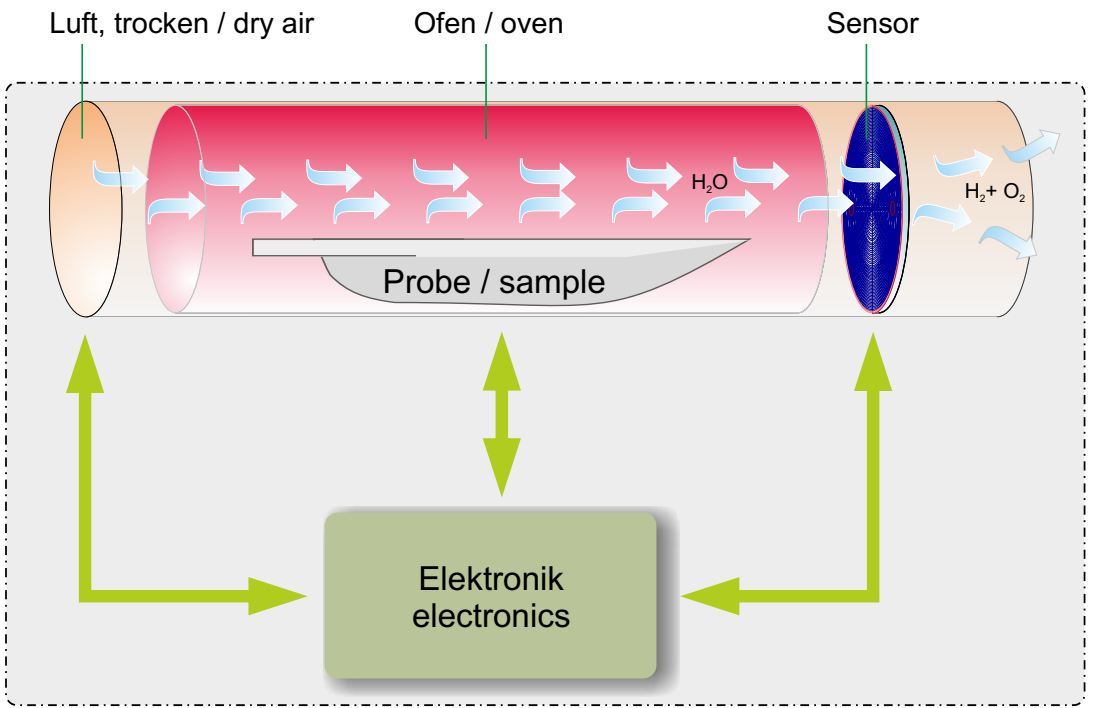
2. Weighing – weight is automatically transferred.



3. Insert sample, start analysis.

Selective thermo- coulometric detection of water

The Berghof easyH₂O combines thermal evaporation of water with a selective, electrochemical water sensor to create an innovative method of water analysis. The water is evaporated out of the sample in a programmable oven and is fed to the sensor by means of a carrier gas flow stream. The water is slowly evaporated using the temperature profile of the heating program and the bonding forms of the water are differentiated. The ambient air is sucked-in and dried to be used as the carrier gas. Therefore, no special chemicals or carrier gases are required to operate it. Nitrogen can be used as an alternative carrier gas, for example in order to prevent decomposition reactions with oxygen. The entire process is software-controlled and runs automatically.



Coulometric P₂O₅ sensor

The core of the device is the coulometric sensor with a hygroscopic phosphorus pentoxide coating (P₂O₅) which absorbs the water transported in the carrier gas.

A voltage is applied to 2 platinum electrodes and the water is broken down by means of electrolysis into hydrogen (H₂) and oxygen (O₂). The amount of electrical charge required for this is proportional to the quantity of water and is determined.

The amount of charge can be directly converted into the amount of water by means of Faraday's Law. Therefore, measurement is an absolute measurement which can be carried out without calibration. In practice it is nevertheless

advisable to perform a calibration measurement for the purpose of quality control. This ensures that water is detected selectively. The P₂O₅ coating reforms and thus the sensor regenerates itself. The device is therefore always ready to use.

Sensor-schematic

