



**Sartorius WDS 400**  
Quantitative detection  
of trace amounts  
of water

# Sartorius WDS 400

## Selective detection of surface water, capillary water and water of crystallization

### Water, not moisture

Thermogravimetric methods, such as the oven-drying method, use the weight loss of a sample to determine the total content of all volatile components and not, however, the pure water content. As a rule, the latter task is performed using electrochemical techniques that are based on the principle of coulometry (coulomb = electric charge). The most commonly known methods are coulometric Karl Fisher titration for solid and liquid samples and the phosphorus pentoxide method for trace analysis of gases. However, both methods require complicated equipment; moreover, KF titration necessitates the use of additional chemicals in order to perform an analysis. The WDS 400 Water Detection System from Sartorius combines these three standard methods into a high-resolution and easy procedure for selective detection of water in solids and pastes.

### Get all three in one

The WDS 400 adopts the principle of convection heating from the oven drying method in order to drive out the entire moisture from a sample.

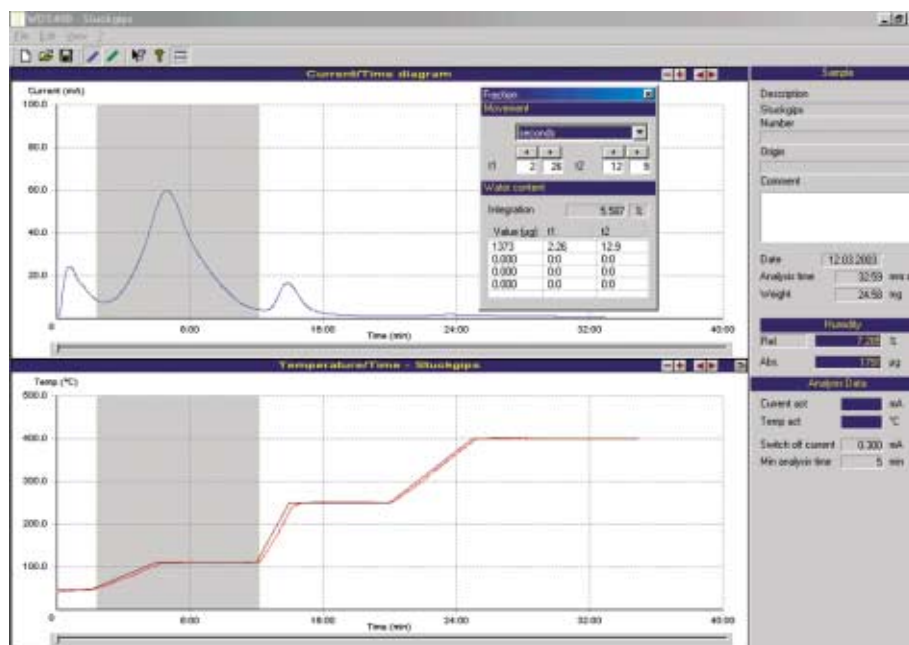
A ceramic disc coated with extremely hygroscopic phosphorus pentoxide  $P_2O_5$  completely absorbs the water from the resulting gas mixture and bonds water molecules to phosphoric acid  $H_3PO_4$  to the disc surface in a chemical reaction. By coulometry, i.e., by an electric current generated at the ceramic disc, phosphoric acid is broken down into phosphorus pentoxide  $P_2O_5$ , hydrogen H and oxygen O. Based on Faraday's law, it is known how much current is necessary in order to split off all hydrogen atoms from a chemical compound. Thus, the WDS 400 uses the amount of electric current to calculate the quantity of water driven out of a sample.

### Highly accurate and selective

This combination method works so accurately that it is even possible to detect one single microgram of water. Beyond that, the WDS 400 enables the water fractions to be differentiated according to surface water, capillary water and water of crystallization (the latter is chemically bound water).

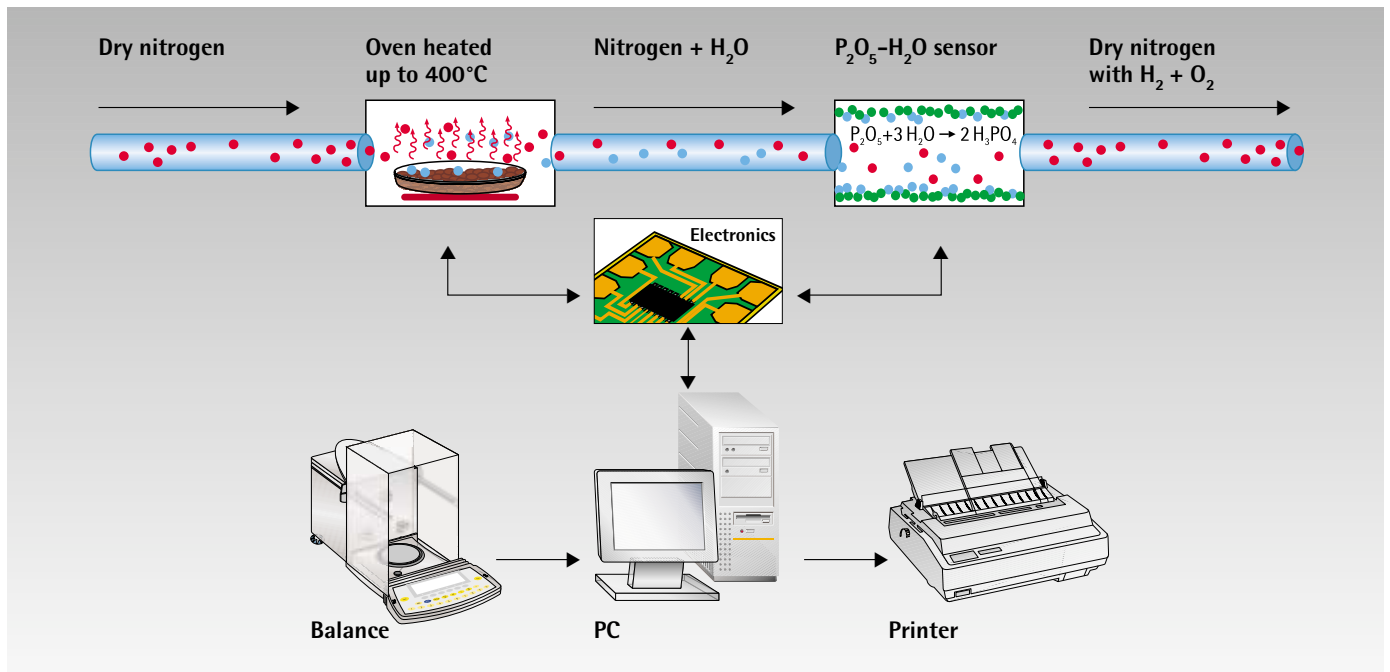
### Easy operation

All the user has to do is just weigh-in a sample. The WDS 400 does not require any complicated handling of detection reagents, many of which are toxic.



On-screen graphics from left to right showing peaks for surface water, capillary water and water of crystallization. The second peak is shown as a fraction for quantitative calculation.





WDS 400 principle of operation (schematic)

### Technical specifications

Moisture analysis method	Thermal analysis followed by coulometric measurement
Sample heating	In the built-in stainless steel oven (convection heating) - From room temperature up to 400°C - Adjustable in increments of 1°C
Detection limit	1 µg of water
Reproducibility	± 2% of absolute water value measured (depends on sample)
Measuring range	1 ppm to approx. 40% water (depends on sample)
Sample weight, average	5–2,000 mg
Display	ppm/% and µg water
Analysis time	Average: 10–20 min   adjustable in increments of 1 min–10 h
Operator guidance   Software	English, for Windows® 2000   NT   XP
Data storage	On the hard drive of the interfaced PC
Number of measuring programs	Limited only by the PC's hard drive memory
Power supply	230V ± 10%
Frequency	50 ... 60 Hz
Carrier gas	Nitrogen N <sub>2</sub> (class 5.0) or oil-free, dry air of the same quality
Gas prepressure	1 bar (15 psi)
Gas consumption	100–200 ml/min
Power consumption	Standby 100 W   At full power 600 W
Dimensions (W × D × H)	500 × 500 × 180 mm
Weight	20 kg



P<sub>2</sub>O<sub>5</sub> electrochemical cell



## Recommended balance models

### Semi-microbalances

		ME235S	ME235P	CP225D
Weighing range structure		SuperRange	PolyRange	DualRange
Weighing capacity	g	230	60   110   230	80   220
Readability	mg	0.01	0.01   0.02   0.05	0.1   0.01   0.01



### Microbalances

		SE2	ME5	MC21S	CP2P
Weighing range structure		SuperRange	SuperRange	SuperRange	PolyRange
Weighing capacity	g	2.1	5.1	21	0.5   1   2
Readability	µg	0.1	1	1	1   2   5



### Accessories

Regeneration kit for electrochemical cell	69MA0224
Calibration standard	69MA0225
Particle-removing filter made of PTFE	69MA0228
Nickel scoops for weighing samples	69MA0232
Electrochemical cell, uncoated	69MA0232
Temperature calibration unit for the oven	6740-86

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