

**Full-range
moisture analysis
from a single source**
Infrared drying
Differential weighing
Coulometry
Microwave resonance
technology



The right analyzer for any application

Foods, chemical | pharmaceutical products, building materials or animal feed – you name it, the moisture or water content has a decisive impact on price, processability and quality, ranging from raw materials to final products. Determining this moisture content is one of the most common analyses in product development and in the manufacturing process. Here, the most diverse requirements on speed and resolution of the values measured or on the operating design of the moisture analyzers must also be considered in all cases. As a leading provider of moisture analysis equipment, Sartorius is thoroughly familiar with the needs of its customers and thus offers a wide range of equipment that is continuously being enhanced.

Infrared drying – fast and precise

A fast alternative to the classic oven drying method, infrared dryers from the Sartorius series of **moisture analyzers** are being increasingly used. These analyzers are compact and designed for routine operation in production and in applications involving incoming inspection. They feature the resolution of an analytical balance, and are ideal for research and development. Moreover, we supply these moisture analyzers in versions with an EC type-approval certificate for use in legal metrology. Sartorius offers a custom solution for nearly any requirements. A wide selection of infrared heat sources, such as a halogen lamp, a CQR quartz glass heater and a ceramic heating element, enable these moisture analyzers to be optimally adapted to the intended application.

Differential weighing

If the oven drying method is absolutely essential, the differential weighing program of the **LA Reference** series of balances from Sartorius efficiently manages large volumes of data and automatically calculates the differences between the tare weight, initial sample weight and backweights.

Coulometry – selective detection of water

If you need to determine not only the moisture, but also the water content of a sample, the coulometric Karl Fisher titration method is the most commonly used technique. A further advancement in KF filtration is the combination method incorporated in the **WDS 400 Water Detection System** from Sartorius. WDS 400 allows accurate measurements to be performed down to a detection limit of 1 µg of water. At the same time, it enables quantitative differentiation among surface water, capillary water, and water of crystallization. In addition, WDS 400 completely eliminates the need for using test reagents required in KF titration.

Microwave resonance technology

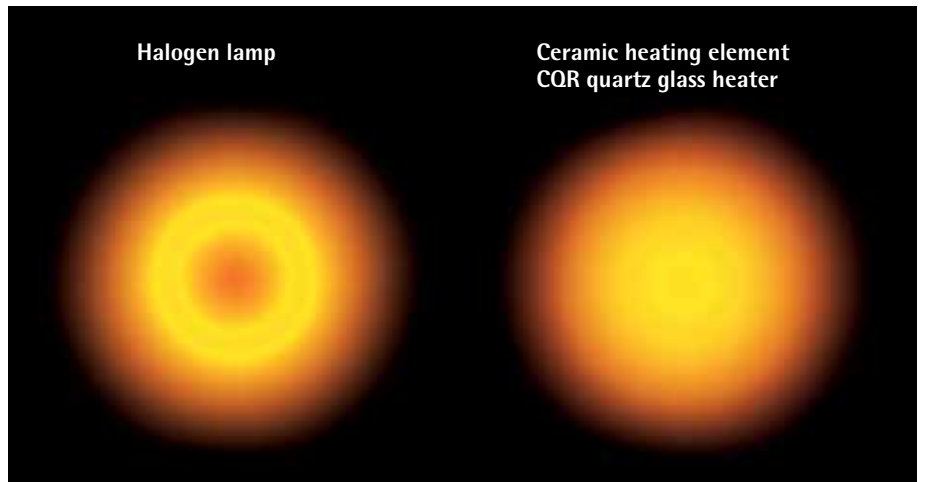
The microwave resonance method offers the advantage of particularly fast measurement below one second. At the same time, it is non-destructive, which means that samples can be further used for subsequent tests.

The basis of this new Sartorius product line is the LMA300P, a modular system. This system consists of a control and evaluation unit and a resonator module in which the moisture of a sample is measured. Applications for the LMA300P cover measurement of the moisture in pourable, granulated and viscous products with a moisture content between 0.1% and 85%.



Halogen lamp

Ceramic heating element
CQR quartz glass heater



Sartorius MA35: Easy ... very easy!

The MA35 is the new basic model in the **moisture analyzer** series from Sartorius. Its performance functions and operating concept are geared toward daily routine processes such as repetitive QC monitoring of samples as performed during in-process control and incoming goods inspection. To make the MA35 even more user-friendly, we have done away with seldom-used programming options without compromising flexibility or measurement accuracy.

No need for programming

End-point determination is fully automatic. It is no longer necessary to program a shutoff parameter. The MA35 continuously monitors the drying process and stops the measurement as soon as the sample has reached a constant weight – i.e., when no more weight loss can be detected despite heating. A built-in weighing system provides the measurement accuracy required for this with 1-mg resolution that is optimized for use in high temperature ranges. For sample heating, the MA35 is equipped with two powerful metal tubular-shaped heating elements, providing 360 watts of power. These heating elements, also called dark radiators, are both rugged and durable. Compared to heating lamps made from glass, e.g. infrared lamps or halogen heaters, these are especially resistant to dirt and vibration. In addition, the MA35's metal heating elements can be used in accordance with the strict guidelines of the FDA and HACCP in cases where glass is prohibited in certain production processes.

Easy-to-understand and error-free moisture analysis

The operating design focuses on accuracy and ease of use. The concise display shows the user all important information at a single glance. Easy-to-understand icons guide you in three steps from taring the sample pan to starting the measurement. The MA35 has done away with the regular Program Selection menu, opting instead for a limited number of drying routines that can be saved in the non-volatile memory. All important operating parameters can be accessed and changed in seconds, giving you more flexibility.

The optional printer, YDP03-OCE, enables you to print analysis results on a short report to save on paper usage. If you need comprehensive documentation, you can also print out the sample analysis results as well as the weighing system and temperature calibration as a detailed GLP report.



Sartorius MA150: The compact class featuring maximum performance with minimum space requirements

For routine operation

A rugged design with low space requirements and easy operation are the major features of these analyzers. Fully automatic drying of a sample until a constant weight is reached eliminates the need for programming an endpoint shutoff parameter. Twenty drying routines can be saved to give you the flexibility you need when the moisture content of additional, "out-of-the-ordinary" samples of material has to be measured.

Customizable and fast

Sartorius offers you a choice of two different moisture analyzers that cover diverse requirements on moisture measurements. Whichever heat source you opt for, both analyzers deliver results within just minutes. For temperature-sensitive samples, a ceramic heating element ensures especially gentle heating over the entire surface. The other choice, a COR quartz-glass heater, optimizes the analysis time even further, which is already ultrafast for the analyzer featuring the ceramic heater.

Application-specific solutions

Practical accessories round off the entire lineup of Sartorius moisture analyzers. These include, for instance, an in-use dust cover that is included with the standard equipment supplied, type approval for applications in legal metrology, and a special version of the moisture analyzer without openly accessible glass components in compliance with the stringent FDA and HACCP requirements that ban the use of glass in production.



Sartorius MA100: Analytical precision, combined with flexibility and dynamics



As accurate as an analytical balance

The MA100 is the only infrared dryer in the world that features a built-in weighing system with 0.1-mg resolution and an EC type-approval certificate. A motorized heating unit moves over the sample to open or close the sample chamber. This reduces interfering effects when a sample is placed on the pan or a measurement is started. The pacesetting design enables the MA100 to achieve a measuring accuracy well beyond that provided by conventional infrared dryers.

Automatic adaptation to reference values

The acronym "SPRM" stands for "Swift Parameter Adjustment to a given Reference Method." This function enables the operating parameters of MA100 to be adapted to the results of an available reference method and to be saved as a drying routine. Optimization of operating parameters doesn't get any faster than this.

Flexible and modular

The Sartorius MA100 analyzers give you a choice of three different infrared heat sources: a halogen lamp for standard applications, a ceramic heating element for gentle heating of temperature-sensitive samples and a CQR quartz glass heater. The CQR combines the fast drying capability of a halogen lamp with the gentle heating capability of a ceramic heater for drying samples evenly over their entire surface. A printer that can be optionally integrated into the housing eliminates the tangle of cables so typical of an external printer, and helps tidy up your work area.

A clean solution

Did you accidentally spill a sample? Are there spatters of grease inside the sample chamber? No problem with the MA 100. The Plug & Dry® feature enables you to easily slide out the cover with the heater for thorough cleaning, without the risk of cleaning agent entering the inside of the housing.



Sartorius Reference LA: Efficient management of backweighing data

Management of extensive weighing data, such as those generated, for instance, in the classic oven drying method, is a powerful feature of the differential weighing function in the Sartorius **LA Reference** series of balances. For up to 999 samples, these balances save the tare weight, initial sample weight and the backweight, and use these data to calculate the final result.

It does not matter in which sequence the measured data are logged – **LA Reference** adapts to the individual needs of the user. A printout of all weights on the optionally available YDP03-OCE data printer is generated according to the sequence of the sample numbers.



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 on 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.

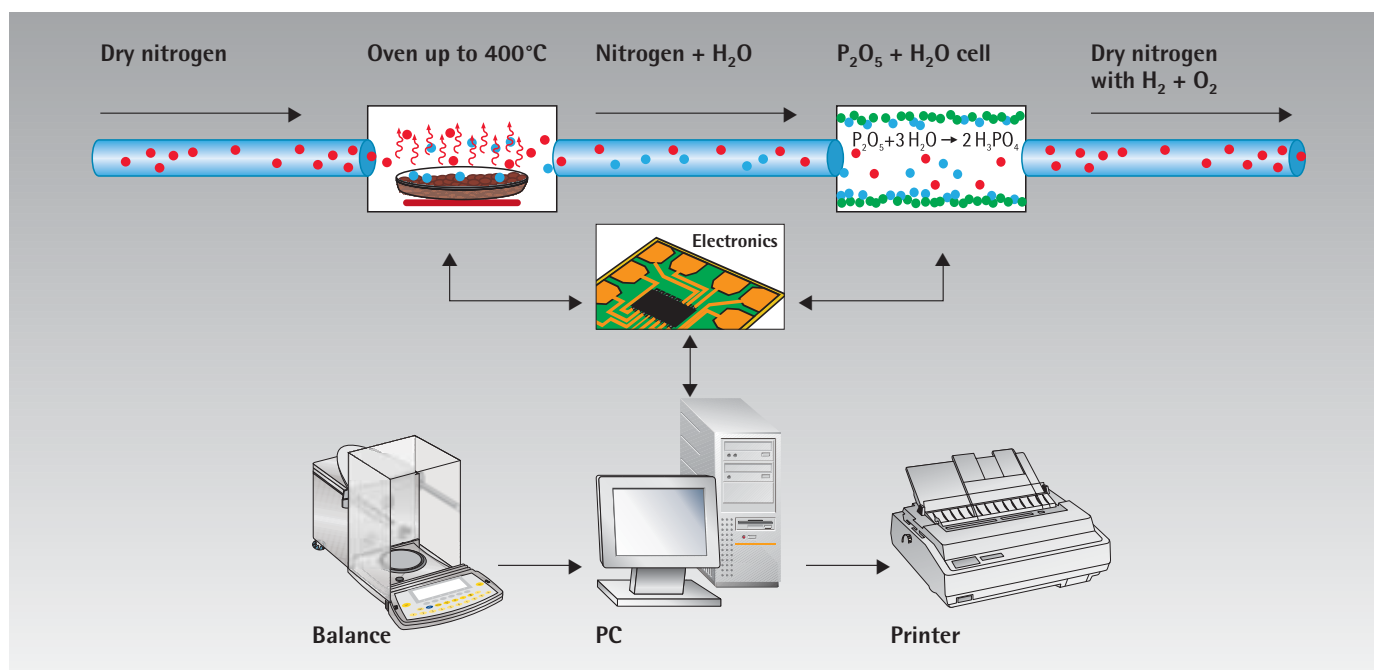
Highly accurate and selective

This combination method works so accurately that it is even possible to detect one single microgram of water. Beyond that, the WDS 400 enables 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.

For measurement of the water content, the user can choose the type of carrier gas, either nitrogen (Class 5.0) or room air. For using room air, the WDS 400 has a built-in pump and a drying unit.



Sartorius LMA300P: Moisture analysis within a split second

The **LMA300P** works with microwave resonance technology. In this indirect measurement method, a harmonic electromagnetic resonator field is built up by a microwave generator in a sensor (applicator). When the applicator is filled with a sample, the water in the sample interferes with the oscillation behavior (resonance) of the microwave, or interacts with the resonance field, changing the height and width of the resonance frequency peak.

Calibration

This change in resonance field is detected by a sensor, and the analyzer CPU calculates the moisture content of the sample based on the calibration previously carried out. The basic analyzer calibration required can be done by the classic oven drying method or, of course, using an infrared moisture analyzer from the Sartorius MA series.

Fast measurement

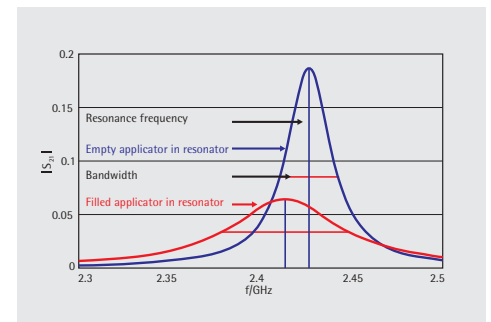
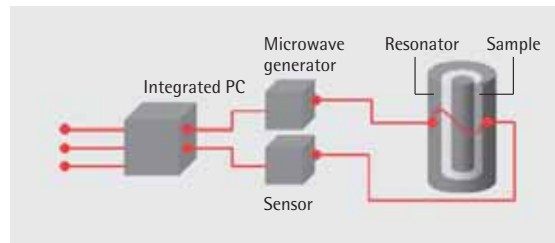
The microwave resonance method offers the advantage of particularly fast measurement in under one second. At the same time, it is non-destructive, which means that samples can be further used for subsequent tests. Changes in the color and surface structure of the sample, as is frequently the case, for instance, in natural raw materials, does not have any effect on calibration or thus on the measured result, unlike near infrared spectroscopy. The microwave resonance method is not limited to measurement of the surface moisture; rather, it also determines the core moisture thanks to its operating principle.

Application areas

The **LMA300P** can be used for nearly all pourable and granulated products as well as viscous liquids, such as whitewash and other similar materials. The measuring range is between approx. 0.1–85% moisture. The prerequisite for operating the analyzer is to calibrate measurements on the basis of a measurement procedure providing absolute accuracy. The major application area for the **LMA300P** is incoming and in-process quality control.

Design

The LMA300P is a modular-designed system consisting of a control and evaluation unit, **LMA300PA**, and a resonator module, **LMA300PR**. This type of modular design allows a different resonator type to be used (available on request), and enables the analyzer to be easily adapted to customer-specific applications.



Specifications for MA35 | MA100 | MA150

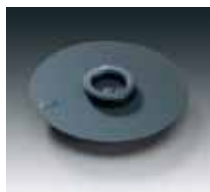
	MA35	MA100	MA150
Max. weighing capacity (g)	35	100	150
Accuracy of the weighing system (mg)	1	0.1	1
Weighing system with EC type-approval certificate		•	
Repeatability, average (%)			
– for initial sample weight approx. ≥ 1 g	± 0.2	± 0.1	± 0.2
– for initial sample weight approx. ≥ 5 g	± 0.05	± 0.02	± 0.05
Readability (%)	0.01	0.001	0.01
Display mode for results			
– % moisture	•	•	•
– % dry weight (solids)	•	•	•
– % RATIO	•	•	•
– g residue	•	•	•
– g/kg residue		•	•
– g/l residue			•
– mg weight loss		•	•
– Calculated value (measured value \times factor)		•	
Temperature range and settings			
– from 40°C–160°C, adjustable in 1-degree increments	•		
– from 30°C–230°C, adjustable in 1-degree increments		•	
– from 40°C–220°C, adjustable in 1-degree increments			•
Heating mode			
– Standard drying	•	•	•
– Quick drying		•	
– Gentle drying		•	•
– Phase drying		3 \times 0.1–999 min.	1 \times 0.1–999 min.
Analysis mode			
– Fully automatic	•	•	•
– Semi-automatic		1–50 mg/5–300 sec. 0.1–5.0%/5–300 sec.	1–50 mg/5–300 sec. 0.1–5.0%/5–300 sec.
– Timer settings	1 \times 0.1–99 min.	3 \times 0.1–999 min.	1 \times 0.1–99 min.
– Timer mode + fully/semi-automatic		2 \times 0.1–999 min. + automatic	
SPRM® mode for parameter recognition		•	
Heating unit			
– Ceramic IR heating element (infrared)		•	•
– Halogen lamp (infrared)		•	
– CQR heater (coiled quartz radiator)		•	•
– Metal tubular-shaped heating element (infrared dark radiator)	•		
Later exchange of the heating unit by Plug & Dry®*		•	
Access to the sample chamber			
– via hinged, flip-up cover	•		•
– via motorized cover		•	
Optional version compliant with FDA HACCP regulations**	•		•
Built-in calibration weight		•	
Operator guidance features			
– Context-sensitive menu with alphanumeric interactive prompts and symbols (icons)	•	•	•
– Text input for sample identification using soft-key prompts		•	
– Numeric keypad for sample identification and parameter input		•	
– Parameter input using soft-key prompts		•	
reproTEST for determining the repeatability of the weighing system		•	
Number of program memories	1	30	20

	MA35	MA100	MA150
Memory for data storage			
– Statistics of the last 9,999 measurements		•	
– End point up to the next moisture analysis run	•	•	•
Parameter settings password-protected against unauthorized access		•	•
Manual input of tare weights		•	
Data printer			
– Integratable (optionally retrofittable)		•	
– External (optional)	•	•	•
Printout			
– GLP-compliant, user-configurable		•	•
– GLP-compliant, inalterable standard configuration template	•		
– Short record	•		
Data interface port			
– RS-232C unidirectional	•	•	•
– RS-232C bidirectional		•	
Bar code scanner can be connected		•	
In-use dust cover for keypad		•	•
Housing dimensions (mm) W×D×H	224×366×191	350×453×156	213×320×180,5
Weight. approx. (kg)	5.8	8.0	5.5

* Does not apply to the CQR heater

** Not available with halogen lamp or CQR quartz glass heater

Accessories for MA35 | MA100 | MA150



Accessories	MA35	MA100	MA150
Disposable sample pans, 80 units, aluminum, round, 90 mm \varnothing	6965542	6965542	6965542
Glass fiber filters, 80 units, for analysis of liquid, pasty and fatty samples	6906940	6906940	6906940
Panel replacement set Aluminum panels for replacing glass panels to meet FDA HACCP regulations (conversion kit)	YDS05MA	YDS03MA	YDS04MA
Windows® 2000 NT XP-compatible software for data collection and for programming drying programs incl. interface cable, 9 25-pin		YMW02MA	YMW02MA
Carrying case		YDB03MA	YDB05MA
Data printer – Integratable – External	YDP03-OCE	YDP01MA YDP03-OCE	YDP03-OCE
Ink ribbon cartridge for data printer	6906918	6906918	6906918
Paper rolls for data printer, 5 rolls, 50 m each	690693	690693	690693
External calibration weight – 100 g (E2) – 30 g \pm 0.3 mg – 50 g (E2)	YSS43	YCW452-00	YCW512-00
Temperature adjustment set with manufacturer's certificate	YTM01MA	YTM03MA	YTM03MA
Standard operating procedure (SOP)	YSL02MA	YSL02MA	YSL02MA

Are you interested in receiving further information on our moisture analyzers?

At www.sartorius.com you will find our applications database packed with information on which analyzer is suitable for which particular application and which Sartorius operating parameters are recommended. Moreover, numerous scientific articles are available for downloading as PDF files.

Specifications | Accessories for LA Reference

Model	Readability	Weighing capacity
LA120S	0.1 mg	120 g
LA230S	0.1 mg	230 g
LA230P	0.1 0.2 0.5 mg 60 120	230 g
LA310S	0.1 mg	310 g
LA130S-F balance for weighing filters	0.1 mg	150 g
LA1200S	0.001 g	1,200 g
LA620S	0.001 g	620 g
LA220S	0.001 g	200 g
LA2000P	0.001 0.01g	1,010 2,000 g
LA620P	0.001 0.002 0.005 g	120 240 620 g
LA5200D	0.001 0.01g	1,010 5,000 g
LA3200D	0.001 0.01 g	1,000 3,200 g
LA6200S	0.01 g	6,200 g
LA8200S	0.01 g	8,200 g
LA4200S	0.01 g	4,200 g
LA2200S	0.01 g	2,200 g
LA820	0.01 g	820 g
LA420	0.01 g	420 g
LA2200P	0.01 0.02 0.05 g	400 800 2,200 g
LA5200P	0.01 0.02 0.05 0.1 g	1,200 2,400 3,800 5,200 g
LA8200P	0.01 0.02 0.05 g	2,000 4,000 8,200 g

Performance features of the differential weighing program:

- Memory capacity for 999 samples in up to 100 lots
- Alphanumeric input of lot and sample names
- Taring, sample weighing and backweighing with up to 30 backweighs per sample
- Automatic and manual weight storage
- Evaluation of results with residue and loss (weight unit and %), calculation factor, RATIO values
- List function with display pages for lots, samples, measured values and results
- Statistical evaluation with statistics display page
- Printout as individual, backweighing or statistics record
- User-specific, configurable printout
- Interface port for bar code scanner

Moreover, all LA Reference balances offer the following features:

- Backlit graphic display with full text support and variable digit sizes
- Fully automatic calibration|adjustment function, isoCAL
- Memory for ISO|GLP-compliant calibration|adjustment records
- 4 user-programmable lines, e.g., for entering the company's address
- Standard equipped with application programs for counting, weighing in percent, checkweighing, animal weighing, formulation, totalizing, calculation of weight values, density determination and statistics, time-controlled functions, such as automatic data printout at intervals according to a preset time

Accessories	Order No.
Data printer with date, time, statistics functions	YDP03-OCE
Ink ribbon cartridge for data printer	6906918
Paper rolls for data printer, 5 rolls, 50 m each	690693

Technical Specifications | Accessories for Water Detection System WDS 400



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 the absolute water value measured (depends on sample)
Measuring range	1 ppm to approx. 40% water (depends on sample)
Sample weight, average	15–2,000 mg
Display	ppm/% and µg water, mA current
Analysis time	Average: 10–20 min adjustable in increments of 1 min–10 h
Operator guidance Software	English, for PCs with 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	115 230 V ± 10%
Frequency	50 ... 60 Hz
Carrier gas	– Dry room air (using integrated air pump with molecular sieve) – Nitrogen, N ₂ (Class 5.0)
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

Accessories

Regeneration kit for electrochemical cell	69MA0224
Calibration standard	69MA0225
PTFE particle-removing filters starting from serial no. 19070049	69MA0226
PTFE particle-removing filters up to serial no. 19170000	69MA0292
Nickel scoops for weighing samples	69MA0228
Electrochemical cell, uncoated	69MA0232
Temperature calibration unit for the oven	6740-86
Molecular sieve for drying unit	69MA0293
Flexible gas tubing, stainless steel, for external gas supply	69MA0229

Recommended balance models

Semi-microbalances	ME235S	ME235P	CP225D		
Weighing range structure	SuperRange	PolyRange	DualRange		
Weighing capacity in g	230	60 110 230	80 220		
Readability in mg	0.01	0.01 0.02 0.05	0.1 0.01 0.01		
Microbalances	SE2	ME5	ME36S	CP2P	LE26P
Weighing range structure	SuperRange	SuperRange	SuperRange	PolyRange	PolyRange
Weighing capacity in g	2.1	5.1	31	0.5 1 2	5 21 g
Readability in µg	0.1	1	1	1 2 5	2 10 g

Specifications | Accessories for LMA300P

Specifications*

Measuring range (%)	Approx. 0.1–85
Readability (%)	0.01
Measuring accuracy (%) (depends on calibration and type of sample)	± 0.05
Measuring time (s)	< 1
Display	% moisture, % dry weight (solids)
Measurement method	Microwave resonance technology
Allowable sample temperature (°C)	Approx. 0–70
Operator guidance	Touch screen with demand-driven menu based on alphanumeric prompts (dialogue text and symbols)
Memory for number of measurement programs	40
Data printer	External (option)
GLP-compliant report	Yes, with optionally available external printer, YDP03-OCE
Interface port	2 × RS-232 C for printer and PC USB port + 128 MB USB memory stick
Line voltage	110–230 V AC
Frequency	50 ... 60 Hz
Power consumption	60 VA max.
Housing dimensions (in mm) W × D × H	
Control unit, LMA300PA	500 × 430 × 200
Sensor module, LMA300PR	370 × 390 × 280
Weight approx. (kg)	
Control unit, LMA300PA	11.5
Sensor module, LMA300PR	11.0

* In addition to the LMA300PR sensor module, other sensors are also available on request. Depending on the desired application, however, the technical specifications will have to be agreed on with a Sartorius applications technician.

Optional Accessories:	Order no.
Data printer for external connection	YDP03-OCE
Ink ribbon cassette for YDP03-OCE	6906918
Printer paper, 5 rolls, each with 50 m, for YDP03-OCE	690693
Applicator, 60 mm	69MA0294
Applicator, 140 mm	69MA0295

Sartorius AG
Weender Landstrasse 94-108
37075 Goettingen, Germany
Phone +49.551.308.0
Fax +49.551.308.3289
www.sartorius.com

Specifications subject to change
without notice.
Printed in Germany on paper that has been
bleached without any use of chlorine.
W/sart-215 - G
Publication No.: W--1039-e06102
Order No.: 98649-001-11