MEASURING QUALITY. SINCE 1796

KRÜSS
A.KRÜSS OPTRONIC
GERMANY

# DENSITY METERS

FAST, RELIABLE MEASUREMENTS USING THE OSCILLATING U-TUBE METHOD


www.kruess.com

# A.KRÜSS OPTRONIC – CUTTING-EDGE TECHNOLOGY, MADE IN GERMANY

A.KRÜSS Optronic is a leading manufacturer of high-precision optoelectronic measuring devices and analytical instruments. The family enterprise founded in 1796 offers an extensive range of products and customised solutions for quality assurance in the pharmaceutical, chemical, petrochemical, food and beverage industry as well as for research and science. We also offer a wide variety of products for professional gemology. Whether it is a refractometer, polarimeter, density meter, gas analyser, flame photometer, melting point meter or microscope – our instruments meet the highest requirements in terms of speed, accuracy and reliability. Thanks to our strong R&D capacities, we are a driving force in the technology market setting the standards for functional scope and user-friendliness. A dense network of sales partners and certified service partners allows us to provide individual consultation as well as optimised service and support for our customers around the globe.

# OVER 200 YEARS OF PIONEERING SPIRIT AND SUCCESS

**1796**

The Mechanicus Opticus Edmund Gabory sets up his optical workshop in Hamburg

**1823**

The daughter of the late Gabory, Mary Ann, marries Andres Krüss, who continues the company together with his brother-in-law, Edmund Nicolas. He responds to the increasing demand for nautical instruments by selling sea charts

**1844**

Andres Krüss establishes his own company Optisches Institut von A. Krüss and in 1848 incorporates Gabory into the company

**1862**

Andres' son, Edmund Johann Krüss, who took over the company in 1851, is awarded the first prize for his photographic lenses at the world exhibition in London

**1865**

Krüss has his improvement of the Laterna Magica patented

**1888**

The heydays of the company boasting many innovations and inventions begin after Edmund Johann Krüss's son, Hugo, took over the management. Dr. Hugo Krüss' handbook of electrotechnical photometry lays the groundwork for this subject

**1920**

The son of Dr. Hugo Krüss, Paul, takes over the company and leads it successfully through World War II and the time of reconstruction. He not only makes important contributions to the spectral analysis and photometry, but he also invents and produces the corresponding devices, among other things, for school lessons

**1946**

Ing. Andres Krüss becomes joint partner of the company in the sixth Krüss generation. Hard work and the economic miracle bring new markets and customers

**1975**

A.KRÜSS Optronic offers a digital tensiometer for the automatic measurement of boundary and surface tension of liquids

# CONTENT



**1980**

Andres Krüss's daughter, Martina Krüss-Leibrock, is the seventh generation to take over the A.KRÜSS Optronic GmbH. She makes important advances in the internationalisation of the company

**2000**

A.KRÜSS Optronic launches a refractometer featuring a fully automatic data acquisition

**2003**

A.KRÜSS Optronic is the first company in this sector to offer measuring devices and analytical instruments with a touch-screen display

A.KRÜSS Optronic develops the P8000 series that are still the fastest polarimeters in the world

**2005**

The daughter of Martina Krüss-Leibrock, Karin Leibrock, joins the management

A.KRÜSS Optronic is awarded with the "Top 100" seal of approval for especially innovative mid-sized companies

**2008**

A.KRÜSS Optronic is the first manufacturer in Germany to offer density meters

**2011**

A.KRÜSS Optronic puts a flame photometer on the market – worldwide one of a kind to this day – allowing for a simultaneous high-precision measurement of up to five elements

**2013**

Thomas Schmauck joins the management and is now together with Karin Leibrock in charge of the operative business of A.KRÜSS Optronic

**2014**

With a new user interface, the digital devices from A.KRÜSS Optronic set the standard for user-friendliness

In addition to the existing ISO 9001 certification, A.KRÜSS Optronic now also boasts an ISO 14000 certified environmental management system

**2015**

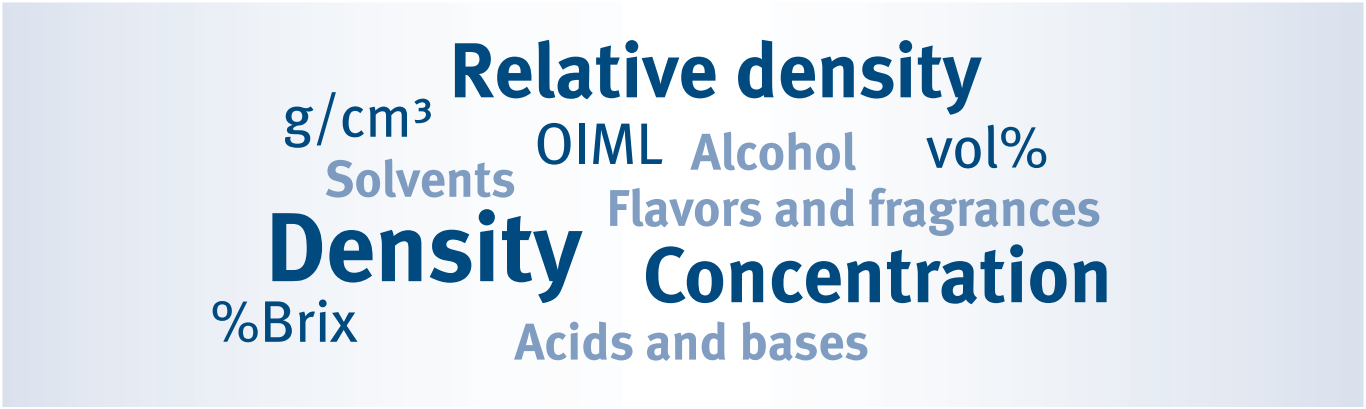
With the gas analysers of the MAT1000 series, A.KRÜSS Optronic offers solutions for controlling modified atmosphere packaging

# QUALITY ASSURANCE THROUGH DENSITY MEASUREMENTS

A comprehensive quality assurance covering the entire production process is a must in any industrial sector. Density measurements are frequently used for this purpose, especially in the pharmaceutical, chemical, petrochemical as well as the food and beverage industry. They allow the manufacturer to analyse raw materials, semi-finished and finished products as well as the manufacturing steps in terms of a number of factors.

Density can be used to identify substances, to determine their quality or purity and to measure their concentration in binary or quasi-binary mixtures. Substance conversions and reaction dynamics can also be inferred from it. In combination with other methods such as refractometry that measures the refractive index of substances, the density measurement allows you to make precise statements about the quality of each step of the production process. This requires that the measured samples are kept at an exact temperature as the density depends strongly on the temperature. A change by 0.1 °C would mean a deviation of the measurement value between 0.0001 and 0.0003 g/cm³.

However, reliable measurement results are not enough in today's general economic conditions. The ever increasing cost and efficiency pressure calls for density measurement solutions that can be easily integrated into any production process, manage with very little sample volumes and deliver fast results. Of the three density measurement methods used nowadays – the aerometric, pycnometric and oscillating U-tube method –, the latter method best meets these requirements.




## DENSITY MEASUREMENT METHODS

### AEROMETER

The aerometer works on the principle of buoyancy as a function of mass. The glass float sinks into the liquid sample until its mass-dependent weight force and the buoyancy force are in equilibrium. The density that corresponds to the depth of immersion is shown on the scale inside the float column. An aerometer is inexpensive but difficult to read in case of highly viscous or dark samples and very fragile. It also requires a sample volume of at least 100 ml and the maximum accuracy of 0.001 g/cm³ demands a lengthy exact temperature control.

### PYCNOMETER

The pycnometer – a glass flask whose inner volume can be very precisely determined and reproduced – is a device used for measuring the gravimetric density. You first weigh the empty flask and then the one filled with the liquid sample. The density is then calculated from the measured weight of the sample. A pycnometer can be used for a wide temperature and pressure range and is more accurate than an aerometer. However, the measurement takes several hours due to the elaborate weighing and requires skilled personnel.

### U-TUBE OSCILLATOR

This method takes advantage of the fact that the oscillation frequency of a body is a function of its mass. A U-shaped capillary is filled with the liquid sample and piezoelectric or magnetic oscillations are induced. The mass and thus the density of the sample can be calculated from the resulting eigenfrequency of the U-tube oscillator. Density meters using the oscillating U-tube method allow for a highly accurate measurement at a controlled temperature and with easily reproducible results within minutes, require a sample volume of no more than 1 ml and are easy to handle.

# BEST RESULTS – WITH A.KRÜSS DENSITY METERS

# OUR DENSITY METERS OF THE DS7000 SERIES

In close cooperation with industry and science, we have developed digital density meters with U-tube oscillators that best meet the requirements in terms of accuracy, speed, required sample volume and ease of integration into the manufacturing process. They have stood the test for many years in numerous companies and different sectors for quality control in the laboratory as well as at the production line.

Our DS7000 density meters are available in two versions – DS7700 and DS7800. Their only difference lies in the measuring accuracy and the type of drying unit; all other characteristics are identical. The devices are very robust, compact and yet precise and suitable for nearly all liquids, emulsions, pastes etc. thanks to the chemical-resistant parts made of borosilicate glass and PTFE that are in contact with the sample.

A syringe, peristaltic pump or autosampler is used to supply the sample. Highly viscous samples are usually supplied with a syringe; low-viscous to slightly viscous samples can alternatively be drawn in with a peristaltic pump or supplied by an autosampler. The drying unit DS7060 integrated into the DS7800 with its 3/2-way valve allows for a higher degree of automation.

Once the sample has been added and the measurement has started, the measuring chamber and the sample will be maintained at the right temperature and the display will quickly show the measured values on the selected scales. Whether it is the density, the relative density, OIML, Brix, the concentration of acids, bases, saline solutions or other user-configured scales – the possibilities are almost unlimited.

The user can also choose between two measurement methods: the measurement with a manual measurement time input and an optimised measurement time thanks to automatic stability recognition. Our devices will always require a sample volume of less than 1 ml. The U-tube oscillator is cleaned by rinsing it with the appropriate medium supplied with a syringe or peristaltic pump. Just one keystroke is needed to have the drying unit eliminate all liquid residues.

Our DS7700 and DS7800 density meters feature a self-explanatory, well-arranged user interface, which makes it easy even for non-expert personnel to operate the device. A state-of-the-art TFT display ensures a clear, bright representation of all the information. The integrated touch-screen tops off the comfortable user experience.

| | DS7700 | DS7800 |
|---|---|---|
| ACCURACY | ±0.001 g/cm³ | ±0.0001 g/cm³ |
| MEASUREMENT RANGE | 0–3 g/cm³ | 0–3 g/cm³ |
| TEMPERATURE RANGE | 10–40 °C | 10–40 °C |
| SAMPLE SUPPLY VIA | Syringe<br>Peristaltic pump | Syringe<br>Peristaltic pump<br>Autosampler |
| DRYING UNIT DS7050<br>• 2/2-way valve<br>• Semi-automatic drying – drain tube and air tube need to be interchanged | Included | |
| DRYING UNIT DS7060<br>• 3/2-way valve<br>• Acid- and chemical-resistant<br>• Fully automatic drying – tubes do not need to be interchanged | | Included |
| PERISTALTIC PUMP DS7070<br>• Semi-/fully automatic sample supply and cleaning | Optional | Optional |
| AUTOSAMPLER AS80<br>• Fully automatic sample supply via peristaltic pump DS7070<br>• 2 types of sample plates:<br>18 x 50 ml (42 mm x 43 mm)<br>36 x 35 ml (28.1 mm x 65 mm) | Can be retrofitted<br>(requires drying unit DS7060) | Optional |
| AUTOSAMPLER AS90<br>• Fully automatic sample supply via peristaltic pump DS7070<br>• 2 types of sample plates:<br>53 x 16 ml (22 mm x 55 mm)<br>89 x 6 ml (16 mm x 55 mm) | Can be retrofitted<br>(requires drying unit DS7060) | Optional |


*Sample supply via syringe*

## EASY OPERATION, FAST MEASUREMENTS, HIGH SAFETY STANDARD

Our density meters offer many advantages:

- Self-explanatory, well-arranged user interface and touch-screen display
- User administration that can be activated or deactivated depending on the requirements, with optional password protection and different user rights
- Easy, menu-guided adjustment
- Freely assignable shortcut keys for the most important functions
- Freely configurable methods and scales for many different applications
- Concentration tables, for example, for sugar, sulphuric acid and alcohol; any number of tables can be added
- Freely definable formulas and parameters for complex conversions
- Requires only a small sample volume
- Samples are supplied via syringe, peristaltic pump or autosampler
- Measurements of highly viscous or very problematic samples with suspended matters, air bubbles etc.
- Efficient Peltier temperature control
- Measurements with manual measurement time input or optimised measurement time thanks to automatic stability recognition
- Multiple measurements of a sample or identical samples with averaging
- Traceability and reproducibility of all measured data
- Interfaces for the convenient transfer of measured values
- Extensive connections for peripheral equipment
- Compact design in robust cast aluminium housing
- Chemical-resistant materials
- Proper tube sets for any type of sample
- Compliance with global standards such as GMP/GLP and 21 CFR Part 11
- IQ/OQ/PQ by A.KRÜSS Optronic or certified service partners
- Service, maintenance, calibration and adjustment on site

# A STRONG PERFORMANCE PACKAGE

## CLEARLY LAID-OUT INFORMATION

- Freely assignable shortcut keys for the most important functions
- Measured values can be viewed at a glance
- Optional secondary scale to display a second measured value
- Method selection with only two clicks

## INTELLIGENT USER ADMINISTRATION

- Can be activated or deactivated depending on the requirements
- Two authorisation levels
- Optional setup of user profiles
- Customised settings for different users or work groups

## COMPLETE DOCUMENTATION OF MEASURED VALUES

- Complete recording of all measured data as well as system or method settings in a tamper-proof data storage
- Consecutive numbering of the measurements
- Documentation of all measured values of the last 999 measurements


## FLEXIBLE DATA EXPORT

- Print-out on serial ASCII printer
- Print-out on network printer in PDF or GS format
- Print-out as PDF on USB flash drive or to network share
- Export in HTML or CSV format on USB flash drive or to network share
- Easy integration into existing networks (DHCP Client) or a LIMS

## UPGRADE THE SYSTEM ACCORDING TO YOUR REQUIREMENTS

- Two different drying units selectable
- Optional peristaltic pump for semi-/fully automatic sample supply and cleaning
- Two different optional autosamplers
- Extensive accessories

## MAXIMUM OPERATING COMFORT

- Self-explanatory, well-arranged user interface and touch-screen display
- Easy, menu-guided adjustment
- Can be connected to a keyboard, mouse, barcode scanner or external PC in order to use the KrüssLab software
- A selection of six languages (de, en, fr, es, it, pt)


## EASY FILLING AND CLEANING

- Manual, semi-automatic or fully automatic sample supply
- Reliable filling check via inspection glass
- Parts in contact with sample made of borosilicate glass and PTFE
- Freely configurable cleaning procedures
- Semi-automatic or fully automatic drying

## FAST MEASUREMENT

- Efficient Peltier temperature control
- Measurement with manual measurement time input or optimised measurement time thanks to automatic stability recognition
- Preview of measured values updated every second

## CREATE YOUR OWN METHODS

- Create any number of methods and analyse each sample using the desired parameters
- Method parameters: scales, sample supply, temperature, limit values, comment and many more
- Measurement modes: single, continuous or interval measurement
- Concentration tables, for example, for sugar, sulphuric acid and alcohol; any number of tables can be added

# MAXIMUM EFFIENCY THROUGH AUTOMATION

## TYPES OF SAMPLE SUPPLY

### MANUAL SAMPLE SUPPLY

If work is performed manually, the sample and the medium for cleaning the U-tube oscillator will be supplied with a Luer syringe. While the sample is added, you can check for air bubbles by looking through the inspection glass. A suitable medium is injected for the cleaning until all sample residues have been dissolved and removed. The drying unit will then remove all liquid residues.

### SEMI-AUTOMATIC SAMPLE SUPPLY

The semi-automatic process requires the peristaltic pump DS7070, which will draw the required volume of the sample or the cleaning medium into the U-tube oscillator. Depending on which integrated drying unit is used, there is no need to interchange the drain tube and air tube when you switch from the sample supply or cleaning to the drying process.

### FULLY AUTOMATIC SAMPLE SUPPLY

Together with the peristaltic pump DS7070, the AS80 and AS90 autosamplers allow for a fully automatic process. The samples on the Autosampler's rotating plate are removed successively by the suction needle and drawn into the U-tube oscillator by the peristaltic pump. If desired, the system can be automatically rinsed and dried after each measurement.


*Semi-automatic sample supply via peristaltic pump DS7070*

## SEMI-AUTOMATIC SOLUTIONS

The semi-automatic sample supply and cleaning of the U-tube oscillator with the peristaltic pump DS7070 – for low-viscous to slightly viscous samples – means improved efficiency and improved safety in case of aggressive or harmful substances. It also improves the reproducibility of the measurement results and saves costs as the peristaltic pump no longer requires a re-supply of syringes.
The drying unit DS7060 can make the drying fully automatic: It is connected to the peristaltic pump and the flow of the sample or cleaning medium as well as the drying air is controlled via its 3/2-way valve. The drying unit DS7050, which is fitted with a 2/2-way valve, is suitable for cleaning procedures via displacement without a subsequent drying.

### Density meter DS 7700 with peristaltic pump DS7070 and drying unit DS7050

- Semi-automatic drying – drain tube and air tube need to be interchanged
- Recommended for cleaning procedures via displacement without subsequent drying
- Not suitable for aggressive organic substances

### Density meter DS7800 with peristaltic pump DS7070 and drying unit DS7060

- Fully automatic drying – tubes do not need to be interchanged
- Complex cleaning procedures with drying possible
- Also suitable for organic solvents, fuels, aliphatic hydrocarbons, acids and bases etc.

## FULLY AUTOMATIC SOLUTIONS

Working environments involving a high sample throughput require flexible, powerful and robust solutions for a fully automatic execution of the entire process from the sample supply to the cleaning and drying. Our AS80 and AS90 autosamplers meet these high requirements. Together with the peristaltic pump DS7070, they allow for an unsupervised measurement of up to 89 samples. You can create any number of individual measurement methods and cleaning procedures as well as sampler templates on the density meter's user interface. The AS80 and AS90 models require very little space, are easy and fast to install and very durable.

### Autosampler AS80 and AS90

- Also suitable for aggressive and slightly viscous samples
- Can each be fitted with sample plates of two different sizes
- Set of polypropylene vials or glass vials included
- Robust suction needle
- Sample supply via peristaltic pump DS7070
- Integrated rinse port
- Optional design for use with vials with a penetrable membrane
- Suitable for measuring stations using more than one analysis device (requires LIMS software)
- Control via the density meter's serial interface (RS-232)


*Fully automatic sample supply via autosampler AS90*

Our AS80 and AS90 autosamplers can each be fitted with two sample plates of different sizes. One of them is included together with the corresponding vials in the scope of delivery. The sample plates as well as the vials can also be ordered separately.

### Autosampler AS80

- Sample plate AS80-T18: 18 x 50 ml (42 mm x 43 mm)
- Sample plate AS80-T36: 36 x 35 ml (28.1 mm x 65 mm)
- Set of polypropylene vials (50 ml) or glass vials (35 ml)

### Autosampler AS90

- Sample plate AS90-T53: 53 x 16 ml (22 mm x 55 mm)
- Sample plate AS90-T89: 89 x 6 ml (16 mm x 55 mm)
- Set of polypropylene vials (16 or 6 ml)

### The following needs to be considered when selecting the sample plate:

- Larger vials allow for multiple measurements of a sample from the same vial and thus for a better reproducibility of the measurement results through averaging
- In case of larger sample volumes, a sample can be displaced by the following one so that an intermediate cleaning is not necessary. This applies, for example, to beverage samples
- Larger vials are necessary if several analytical devices are to be filled in one work step
- Smaller vials allow for more samples per plate and thus for a longer unsupervised measurement operation
- Smaller vials are well suited for expensive samples, for example, flavours and fragrances

# EXTENSIVE RANGE OF SERVICES

## YOUR BENEFITS AS AN A.KRÜSS CUSTOMER

- IQ/OQ/PQ by A.KRÜSS Optronic or certified service partners
- Service, maintenance, calibration and adjustment on site
- Calibration and adjustment with certified calibration liquids
- Training and application consulting on site
- Spare parts and accessories directly from the manufacturer
- Customer-specific customisation of devices
- Efficient support thanks to a fast confirmability of the customer's situation based on extensive reports

## CALIBRATION AND ADJUSTMENT OF OUR DENSITY METERS

We recommend to have our density meters DS7700 and DS7800 calibrated and adjusted once a year exclusively by A.KRÜSS Optronic or by one of our certified service partners. Our calibration protocols and certificates are GMP-/GLP-compliant and thus one component that ensures a GMP-/GLP-compliant work. For the calibration and adjustment of our density meters, we use certified, PTB-traceable calibration liquids (PTB = Physikalisch-Technische Bundesanstalt, The National Metrology Institute of Germany). A calibration and adjustment is usually completed within a very short period of time so that any interference with the operational processes of our customers is minimised.

## MAINTENANCE OF OUR DENSITY METERS

Our maintenance contracts include the following services:

- Response time of no more than 48 hours and phone support during office hours, e. g. technical support in case of faults
- Maintenance of the devices named in the maintenance contract including functional check and safety inspection, cleaning of all components important for the proper function as well as calibration with certified calibration liquids and, if necessary, adjustment
- Provision of the required certified calibration liquids as well as measuring, control and special tools
- Firmware updates if they are required for the functionality of the devices
- Should repairs be required within the scope of maintenance work, we will charge for the required spare parts separately. We will grant a one year warranty on replacement and spare parts
- Provision of rental equipment to bridge the time required for maintenance, calibrations, adjustments and repairs. Maintenance customers will have preferential rights on rental equipment
- Preparation of GMP-/GLP-compliant maintenance and calibration protocols
- Warranty extension from 24 to 36 months when registered at www.kruess.com within three months after purchase

## FEATURES

- Measurement based on U-tube oscillation
- Easy operation thanks to self-explanatory, well-arranged user interface and touch-screen display
- User administration that can be activated or de-activated depending on the requirements, with optional password protection and different user rights
- Easy, menu-guided adjustment
- Any number of measurement methods for monitoring the measurement process according to method, batch, product and/or production line incl. limit value monitoring
- Measurement modes: single, continuous or interval measurement
- Measurement procedures: measurement with manual measurement time input or optimised measurement time thanks to automatic stability recognition
- Requires only a small sample volume
- Samples are supplied via syringe, peristaltic pump or autosampler
- Efficient Peltier temperature control
- Short measurement period
- Tamper-proof data storage (saves the last 999 measurements)
- Customised layout of the result reports
- Interfaces for the convenient transfer of measured values (USB, Ethernet, RS-232)
- Compact design in robust cast aluminium housing
- Chemical-resistant materials (borosilicate glass and PTFE)
- LUER or UNF connections
- Drying unit included
- Integrated air pressure sensor

## COMPLIANCE WITH GLOBAL STANDARDS

- GMP/GLP
- 21 CFR Part 11
- Pharmacopoeia (USP, JP, Ph. Eur.)
- FDA, ISO, HACCP, OIML, ASTM, ICUMSA, NIST

## TECHNICAL DATA

| | |
|---|---|
| ACCURACY | DS7700: ±0.001 g/cm³; DS7800: ±0.0001 g/cm³ |
| MEASUREMENT RANGE | 0–3 g/cm³ |
| TEMPERATURE RANGE | 10–40 °C |
| ACCURACY OF TEMPERATURE CONTROL | ±0.02 °C |
| AMBIENT TEMPERATURE | 10–40 °C |
| METHODS | A practically unlimited number of methods can be set |
| SAMPLE VOLUME IN CASE OF MANUAL INJECTION | 0.9 ml |
| MEASUREMENT PERIOD | Typically 1–3 minutes including temperature control |
| ADJUSTMENT | Automatic (menu-guided), with dried air and distilled water |
| MANUFACTURER'S CALIBRATION | With air and water at 9 temperatures each |
| HOUSING | Aluminium cast, powder-coated |
| CONTROL | 5.7" TFT touch-screen, 640 x 480 pixels |
| INTERFACES | 1x USB, 1x RS-232, 1x Ethernet |
| OPERATING VOLTAGE | 100–240 V, 47–63 Hz |
| POWER CONSUMPTION (MEASUREMENT OPERATION) | 25 W |
| POWER CONSUMPTION (MAX.) | 120 W |
| DIMENSIONS (W x H x D) | 220 mm x 220 mm x 430 mm |
| WEIGHT | 5.3 kg |

# OVERVIEW OF MODELS, ACCESSORIES AND CONSUMABLES

| ORDER NUMBER | MODELS |
|---|---|
| DS7700 | Density meter with glass U-tube oscillator, accuracy ±0.001 g/cm³ |
| DS7800 | Density meter with glass U-tube oscillator, accuracy ±0.0001 g/cm³ |

| ORDER NUMBER | ACCESSORIES AND CONSUMABLES |
|---|---|
| DS7001 | PTFE tube set for use with drying unit DS7060, consisting of:<br>suction tube (280 mm); drain tube (400 mm); connecting tube (340 mm); waste tube (280 mm);<br>PEEK hollow screw, flanged and mounted, 6 pieces |
| DS7002 | Tygon tube set for use with drying unit DS7050, consisting of:<br>suction tube (320 mm); drain tube (320 mm); air tube (320 mm); waste tube (320 mm);<br>tube connection Luer, 3 pieces |
| DS7003 | PTFE tube set for use with Luer syringe, consisting of:<br>drain tube (400 mm); waste tube (280 mm); PEEK hollow screw, flanged and mounted, 3 pieces |
| DS7004 | Tygon tube set for use with Luer syringe, consisting of:<br>air tube (320 mm); waste tube (320 mm); tube connection Luer, 2 pieces |
| DS7005 | Luer nozzle, 2 pieces |
| DS7006 | UNF nozzle, 2 pieces |
| DS7007 | Luer, UNF nozzle, 1 piece each |
| DS7008 | Adaptor set, consisting of:<br>tube adaptor Luer > UNF; tube adaptor UNF > Luer |
| DS7009 | Luer syringe, 2 ml, 10 pieces |
| DS7010 | Luer syringe, 10 ml, 10 pieces |
| DS7019 | PE waste container with lid, 600 ml |
| DS7020 | PTFE splash guard |
| DS7050 | Drying unit with 2/2-way valve |
| DS7060 | Drying unit with 3/2-way valve |
| DS7070 | Peristaltic pump |
| DS7071 | Tube set for peristaltic pump DS7070, consisting of:<br>TPE pump tube (105 mm), 5 pieces; PTFE tube connection UNF, 2 pieces |
| DS7072 | Tube set for peristaltic pump DS7070, consisting of:<br>TPE pump tube (105 mm), 5 pieces; PTFE tube connection (olive), 2 pieces |
| AS80 | Autosampler for 18 or 36 samples, including:<br>sample plate 18 x 50 ml (42 mm x 43 mm) or 36 x 35 ml (28.1 mm x 65 mm)<br>set polypropylene vials (50 ml) or glass vials (35 ml); other vials on request<br>PTFE connecting tube |
| AS90 | Autosampler for 53 or 89 samples, including:<br>sample plate 53 x 16 ml (22 mm x 55 mm) or 89 x 6 ml (16 mm x 55 mm)<br>set of polypropylene vials (16 or 6 ml); other vials on request<br>PTFE connecting tube |
| AS80-T18 | Sample plate 18 x 50 ml (42 mm x 43 mm) |
| AS80-T36 | Sample plate 36 x 35 ml (28.1 mm x 65 mm) |
| AS90-T53 | Sample plate 53 x 16 ml (22 mm x 55 mm) |
| AS90-T89 | Sample plate 89 x 6 ml (16 mm x 55 mm) |
| BC876 | Barcode scanner |
| KB876DE | Mini keyboard with German layout |
| KB876EN | Mini keyboard with English layout |
| KB876F | Protective cover for mini keyboard KB876DE/KB876EN |

| ORDER NUMBER | CALIBRATION LIQUIDS |
|---|---|
| DS7011 | DAkkS certified density standard high-purity water, 0.9982 g/cm³ at 20 °C (second point at 15 °C), 10 ml |
| DS7012 | DAkkS certified density standard isooctane, 0.6900 g/cm³ at 20 °C (second point at 15 °C), 10 ml |
| DS7013 | DAkkS certified density standard n-nonane, 0.7200 g/cm³ at 20 °C (second point at 15 °C), 10 ml |
| DS7014 | DAkkS certified density standard dichlorotoluene, 1.2500 g/cm³ at 20 °C (second point at 15 °C), 10 ml |
| DS7015 | DAkkS certified density standard tetrachloroethene, 1.6200 g/cm³ at 20 °C (second point at 15 °C), 10 ml |

## MATERIALS OF OUR PRODUCTS IN CONTACT WITH THE SAMPLE

We offer suitable solutions for any type of sample. Refer to the following table to see what the parts of our products that are in contact with the sample are made of. We will gladly assist you with the selection of our products.

| | | |
|---|---|---|
| Density meters DS7700, DS7800 | Measuring cell | Borosilicate glass |
| | Luer/UNF nozzle | PTFE |
| Tube set DS7001 | Suction tube | PTFE |
| | Drain tube | PTFE |
| | Connecting tube | PTFE |
| | Waste tube | PTFE |
| Tube set DS7002 | Suction tube | Tygon |
| | Drain tube | Tygon |
| | Air tube | Tygon |
| | Waste tube | Tygon |
| | Tube connection Luer | PP |
| Tube set DS7003 | Drain tube | PTFE |
| | Waste tube | PTFE |
| Tube set DS7004 | Air tube | Tygon |
| | Waste tube | Tygon |
| | Tube connection Luer | PP |
| Adaptor set DS7008 | Tube adaptor Luer > UNF | PTFE |
| | Tube adaptor UNF > Luer | PTFE |
| Drying unit DS7060 | 3/2-way valve | FFKM, PVDF |
| Tube set DS7071 | Pump tube | TPE |
| | Tube connection UNF | PTFE |
| Tube set DS7072 | Pump tube | TPE |
| | Tube connection (olive) | PTFE |
| Autosampler AS80, AS90 | Vials | PP/Glass |
| | Connecting tube | PTFE |
| Other | Luer syringe, 2 ml, 10 ml | PE/PP |
| | Splash guard | PTFE |
| | Waste container | PE |

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