DENSITY METERS

FAST, RELIABLE MEASUREMENTS USING THE OSCILLATING U-TUBE METHOD
A.KRÜSS Optronic is a leading manufacturer of high-precision 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. 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 Optrisches 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
Dr. Hugo Krüss’ handbook of electro-technical 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 the boundary and surface tension of liquids

1888
The heydays of the company boasting many innovations and inventions begin after Edmund Johann Krüss’ son, Hugo, took over the management. Dr. Hugo Krüss’ handbook of electro-technical photometry lays the groundwork for this subject
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2000
A.KRÜSS Optronic launches a refractometer featuring a fully automatic data acquisition

2003
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

2005
The daughter of Martina Krüss-Leibrock, Karin Leibrock, joins the management
A.KRÜSS Optronic is awarded the "Top 100" seal of approval for especially innovative mid-sized companies

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

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

2008
A.KRÜSS Optronic is the first manufacturer in Germany to offer density meters

A.KRÜSS Optronic offers solutions for controlling modified atmosphere packaging

2011
In addition to the existing ISO 9001 certification, A.KRÜSS Optronic now also boasts an ISO 14000 certified environmental management system

2013
With a new user interface, the digital devices from A.KRÜSS Optronic set the standard for user-friendliness

2014
With the gas analysers of the MAT1000 series, A.KRÜSS Optronic offers solutions for controlling modified atmosphere packaging

2015
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
SUCCESS FACTOR DENSITY MEASUREMENT

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 areometric, pycnometric and oscillating U-tube method –, the latter method best meets these requirements.

DENSITY MEASUREMENT METHODS

AREOMETER
The areometer 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 areometer 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 measurement 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 areometer. 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.
FOCUS ON QUALITY
WITH DENSITY METERS
FROM A.KRÜSS
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 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; 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.

The samples are supplied manually via syringe, semi-automatically via peristaltic pump or fully automatically via autosampler. Highly viscous samples are usually supplied with a syringe; low-viscous to slightly viscous samples can also be supplied with a peristaltic pump or an autosampler. We provide suitable density meter sets for any working method and any type of sample that include all the required accessories from tube sets to nozzles and adaptors to splash guards for the manual supply of aggressive substances.

Once 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, Brix, the concentration of alcohol or sulphuric acid 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. The drying unit DS7060 with its 3/2-way valve allows for a fully automatic drying.

Our 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 convenient user experience.

**YOUR ADVANTAGES**

- Suitable sets for all applications
- Intuitive operation via touch-screen display
- Optional user administration with two authorisations
- Easy, menu-guided adjustment
- Freely assignable shortcut keys
- Any number of freely configurable methods
- Predefined scales (density, relative density, Brix, concentration of alcohol and sulphuric acid)
- Any number of freely definable scales with conversions based on tables or formulas
- Requires only a small sample volume
- Measurements of highly viscous or very problematic samples
- Sample supply via syringe, peristaltic pump or autosampler
- Efficient Peltier temperature control
- Manual measurement time input or optimised measurement time thanks to automatic stability recognition
- Multiple measurements with averaging
- Compact, robust cast aluminium housing
- Chemical-resistant materials
- Interfaces for the convenient transfer of measured values
- Extensive connections for peripheral equipment
- Compliance with GMP/GLP, 21 CFR Part 11 etc.
- IQ/OQ/PQ by A.KRÜSS Optronic or one of our certified service partners
- Service, maintenance, calibration and adjustment on site
Manual sample supply with DS7800 via syringe

<table>
<thead>
<tr>
<th>SAMPLE SUPPLY</th>
<th>SET 1</th>
<th>SET 2</th>
<th>SET 3</th>
<th>SET 4</th>
<th>SET 5</th>
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</thead>
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<tr>
<td>RECOMMENDED FOR</td>
<td>Low sample volume</td>
<td>Moderate to high sample volume</td>
<td>High sample volume</td>
<td>Moderate to high sample volume</td>
<td>Low-viscous to slightly viscous samples</td>
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<tr>
<td>Any degree of viscosity</td>
<td>Highly viscous samples</td>
<td>Common samples</td>
<td>Aggressive samples</td>
<td>Common samples</td>
<td>Tube sets suitable for any kind of sample</td>
</tr>
<tr>
<td>ADVANTAGES</td>
<td>Common samples</td>
<td>Splash guard for the supply of aggressive samples</td>
<td>Tube sets suitable for any kind of sample</td>
<td>Tube sets suitable for any kind of sample</td>
<td>Tube sets suitable for any kind of sample</td>
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<tr>
<td>Economic</td>
<td>Semi-automatic sample supply and cleaning</td>
<td>Fully automatic sample supply and cleaning</td>
<td>Semi-automatic sample supply and cleaning</td>
<td>Fully automatic sample supply and cleaning</td>
<td>Fully automatic sample supply and cleaning</td>
</tr>
<tr>
<td>DENSITY METER</td>
<td>DS7700 with a measurement accuracy of ±0.001 g/cm³ or DS7800 with a measurement accuracy of ±0.0001 g/cm³</td>
<td>DS7700 with a measurement accuracy of ±0.001 g/cm³ or DS7800 with a measurement accuracy of ±0.0001 g/cm³</td>
<td>DS7700 with a measurement accuracy of ±0.001 g/cm³ or DS7800 with a measurement accuracy of ±0.0001 g/cm³</td>
<td>DS7700 with a measurement accuracy of ±0.001 g/cm³ or DS7800 with a measurement accuracy of ±0.0001 g/cm³</td>
<td>DS7700 with a measurement accuracy of ±0.001 g/cm³ or DS7800 with a measurement accuracy of ±0.0001 g/cm³</td>
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<tr>
<td>DRYING UNIT</td>
<td>DS7050 with 2/2-way valve</td>
<td>DS7060 with 3/2-way valve</td>
<td>DS7060 with 3/2-way valve</td>
<td>DS7060 with 3/2-way valve</td>
<td>DS7060 with 3/2-way valve</td>
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<tr>
<td>PERISTALTIC PUMP</td>
<td>Can be retrofitted</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
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<tr>
<td>AUTOSAMPLER</td>
<td>Can be retrofitted</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
<td>Can be retrofitted (requires drying unit DS7060)</td>
</tr>
<tr>
<td>TUBE SETS FOR SAMPLE SUPPLY AND DISCHARGE</td>
<td>DS7001 Small Tygon tube set</td>
<td>DS7001 and DS7003 Small Tygon and PTFE tube set</td>
<td>DS7002 Large Tygon tube set</td>
<td>DS7004 Large PTFE tube set</td>
<td>DS7004 Large PTFE tube set</td>
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</tbody>
</table>

*For a detailed overview of our density meter sets, please refer to page 14 f.
A STRONG PERFORMANCE PACKAGE

UNLIMITED NUMBER OF METHODS

- Create any number of methods and analyse each sample using the desired parameters
- Measurement modes: single, continuous or interval measurement
- Method parameters such as scales, temperature, sample supply, limit values, comments and many others
- Pre-defined scales such as density, relative density, Brix, concentration of alcohol and sulphuric acid
- Any number of freely definable scales with conversions based on tables or formulas such as m%, vol%, g/cm³ and many more

COMPLETE DATA RECORDING AND BACKUP

- Records all measured data as well as system or method selections in a tamper-proof measured data storage
- Documentation of all measured values of the last 999 measurements with consecutive numbering
- Audit trail for logging configuration changes
- Data reports with own logo

INTUITIVE OPERATION

- State-of-the-art touch-screen display
- Uniform operation of all A.KRÜSS laboratory devices
- Displays measured value in two measurement units
- Freely assignable speed buttons for the most important functions
- Easy to understand, menu-guided adjustment
- A choice of six languages (de, en, es, fr, it, pt)

FLEXIBLE DATA EXPORT

- Printout on serial ASCII printer (real paper)
- Printout on network printer in PDF or PS format
- Printout as PDF on USB flash drive or to network share
- Export in HTML or CSV format on USB flash drive or to network share
- Can be connected to a keyboard, mouse, barcode scanner or external PC in order to use the KrüssLab
- Easy integration into existing networks (DHCP-Client) or a LIMS
DENSITY METER SOLUTIONS FOR ANY NEED

- DS7700 with an measurement accuracy of ±0.001 g/cm³
- DS7800 with an measurement accuracy of ±0.0001 g/cm³
- Set 1 for manual sample supply
- Set 2 for manual s. s., also of aggressive samples
- Set 3 for semi-automatic sample supply
- Set 4 for fully automatic sample supply
- Set 5 for fully automatic s. s., also of aggressive samples

COMPLIANCE WITH GLOBAL STANDARDS AND NORMS

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

FAST, RELIABLE MEASUREMENT

- Drying unit with regenerable silica gel for a high-precision adjustment
- 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

EASY FILLING AND CLEANING

- Manual, semi-automatic or fully automatic sample supply
- Including drop collector, splash guard optional
- Reliable filling check via inspection glass
- Chemical-resistant materials such as borosilicate glass and PTFE
- Freely configurable cleaning processes
- Semi-automatic or fully automatic drying (optional)

INTELLIGENT USER ADMINISTRATION

- Can be activated or deactivated as required
- Different authorisation levels
- Setup of user profiles
- Customized settings for different users or work groups
MAXIMUM EFFICIENCY THROUGH AUTOMATION

TYPES OF SAMPLE SUPPLY

MANUAL
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
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
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 SOLUTIONS

In case of low-viscous to slightly viscous samples, it is possible to perform a semi-automatic sample supply and cleaning of the U-tube oscillator using the peristaltic pump DS7070. This means higher efficiency and more safety if aggressive or harmful substances are analysed. It also improves the reproducibility of the measurement results and saves costs as syringes do not need to be resupplied. The drying unit DS7060 allows for a fully automatic drying: It is directly connected to the peristaltic pump, and via its 3/2-way valve, the flow of the sample or cleaning medium and the drying air is regulated. The DS7060 also has a high resistance to chemicals as the parts that come into contact with the sample are made of FFKM and PVDF. The drying unit DS7050, which is fitted with a 2/2-way valve, is suitable for cleaning procedures via displacement without a subsequent drying.

Peristaltic pump DS7070
- Inexpensive, durable peristaltic pump, especially for use with A.KRÜSS laboratory instruments
- For low-viscous to slightly viscous samples; the revolution speed can be precisely set on the density meter
- Pump tube made of TPE and highly resistant against many common samples, also aggressive samples such as dilute hydrochloric or sulphuric acid (at room temperature)
- Low-pulsation sample transfer thanks to 8-roller head
- Direct connection to drying unit DS7060 with 3/2-way valve so that a fully automatic drying is possible without having to interchange tubes
- With autosampler AS80 or AS90, it can be used for a fully automatic sample supply
- High-quality and robust metal housing
- Easy change of tubes within seconds
DATA MANAGEMENT WITH KRÜSSLAB

Our KrüssLab software allows you to conveniently control all of your A.KRÜSS devices on a PC. The KrüssLab can be easily installed via Windows Explorer. Your devices are connected to your local network via Ethernet or directly to your computer and identified via its IP address. The user-friendly interface that you already know from your A.KRÜSS devices will then appear on the PC monitor.

The KrüssLab allows you the following:

- Central user management; the user rights can be transferred to the individual devices
- Remote control of any number of devices
- Measured data can be saved in a database
- Access to measured data even if the measurement devices are switched off
- The selection of measured data with different filters
- The printout of measured data to any printer

FULLY AUTOMATIC SOLUTIONS

In working environments with a high sample throughput, fully automatic executions of the entire process - from the sample supply to the cleaning and drying - are useful if they are flexible, powerful and robust.

Our AS80 and AS90 autosamplers are the suitable products to meet these high requirements. Together with the peristaltic pump DS7070, they allow for an unsupervised measurement of up to 89 samples.

You can set any number of individual measurement methods, cleaning processes and sampler templates on the user interface of the density meters. The AS80 and AS90 models require very little space, are easy and fast to install and very durable. They come with a sample plate and a set of polypropylene or glass vials.

Autosampler AS80 and AS90

- Also suitable for aggressive and low-viscous samples
- Two options are available for each autosampler:
  - AS80-T18: 18 x 50 ml (42 mm x 43 mm) or
  - AS80-T36: 36 x 35 ml (28 mm x 65 mm);
  - AS90-T53: 53 x 16 ml (22 mm x 55 mm) or
  - AS90-T89: 89 x 6 ml (16 mm x 55 mm)
- Sets of polypropylene vials or glass vials are available
- Sample supply via peristaltic pump DS7070
- Integrated rinse port
- Optional model with a penetrable membrane
- Suitable for measuring stations with more than one analysis device (requires LIMS software)
- Control via the serial interface (RS-232) of the density meters
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

MAINTENANCE OF OUR DENSITY METERS

Our maintenance contracts include the following services:

- Response time of no more than 48 hrs 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 guarantee 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
- Guarantee extension from 12 to 36 months as a part of agreed maintenance services

CALIBRATION AND ADJUSTMENT

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 an adjustment are usually completed within a very short period of time so that any interference with the operational processes of our customers is minimised.
FEATURES AND TECHNICAL DATA OF OUR DENSITY METERS

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 deactivated depending on the requirements, with optional password protection and different user rights
- Easy, menu-driven 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
- Compact, robust cast aluminium housing
- Chemical-resistant materials (borosilicate glass and PTFE)
- Luer or UNF connections
- Drying unit included
- Integrated air pressure sensor
- 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)
- Compliance with GMP/GLP, 21 CFR Part 11, pharmacopoeias (USP, BP, JP, Ph. Eur.), FDA, ISO, HACCP, OIML, ASTM, ICUMSA, NIST

TECHNICAL DATA

<table>
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<th>SCALES</th>
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<th>MEASUREMENT ACCURACY</th>
<th>MEASUREMENT PERIOD</th>
<th>SAMPLE VOLUME IN CASE OF MANUAL INJECTION</th>
<th>AMBIENT TEMPERATURE</th>
<th>TEMPERATURE CONTROL RANGE</th>
<th>TEMP. MEASUREMENT ACCURACY</th>
<th>METHODS</th>
<th>MANUFACTURER’S CALIBRATION</th>
<th>ADJUSTMENT</th>
<th>HOUSING</th>
<th>INTERFACES</th>
<th>OPERATING VOLTAGE</th>
<th>POWER CONSUMPTION (OPERATION)</th>
<th>POWER CONSUMPTION (MAX.)</th>
<th>DIMENSIONS (W X H X D)</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Density [g/cm³], Relative Density, Brix [%Brix], Concentration of alcohol [vol%], Concentration of sulphuric acid [wt%]</td>
<td>User-defined</td>
<td>0–3 g/cm³</td>
<td>DS7700: ±0.001 g/cm³; DS7800: ±0.0001 g/cm³</td>
<td>10–40 °C</td>
<td>10–40 °C</td>
<td>±0.02 °C</td>
<td>A practically unlimited number of methods can be set</td>
<td>With air and water at 9 temperatures each</td>
<td>Automatic (menu-driven), with dried air and distilled water</td>
<td>5.7&quot; TFT touch-screen, 640 x 480 pixels</td>
<td>Aluminium cast, powder-coated</td>
<td>1x USB, 1x RS-232, 1x Ethernet</td>
<td>100–240 V, 47–63 Hz</td>
<td>25 W</td>
<td>120 W</td>
<td>220 mm x 220 mm x 430 mm</td>
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<td>ORDER NUMBER</td>
<td>SETS AND SET COMPONENTS</td>
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<tr>
<td>DS7700-1/DS7800-1</td>
<td>SET 1 FOR MANUAL SAMPLE SUPPLY, CONSISTING OF:</td>
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<tr>
<td>DS7700 or DS7800</td>
<td>Density meter with glass U-tube oscillator, measurement accuracy ±0.001 g/cm³ or ±0.0001 g/cm³</td>
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<tr>
<td>DS7050</td>
<td>Drying unit with 2/2-way valve</td>
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<tr>
<td>DS7001</td>
<td>Tygon tube set for use with Luer syringe, consisting of: air tube (320 mm); waste tube (320 mm); tube connection Luer, 2 pieces</td>
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<td>DS7019</td>
<td>PE waste container with lid, 600 ml</td>
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<td>Density meter with glass U-tube oscillator, measurement accuracy ±0.001 g/cm³ or ±0.0001 g/cm³</td>
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<td>DS7050</td>
<td>Drying unit with 2/2-way valve</td>
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<td>DS7009</td>
<td>Luer syringe, 2 ml, 10 pieces</td>
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<td>DS7019</td>
<td>PE waste container with lid, 600 ml</td>
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<td>Density meter with glass U-tube oscillator, measurement accuracy ±0.001 g/cm³ or ±0.0001 g/cm³</td>
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<td>DS7050</td>
<td>Drying unit with 3/2-way valve</td>
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<tr>
<td>DS7002</td>
<td>Tygon tube set for use with drying unit DS7060, consisting of: suction tube (320 mm); drain tube (320 mm); air tube (320 mm); waste tube (320 mm); tube connection Luer, 3 pieces</td>
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<td>DS7072</td>
<td>Tube set for peristaltic pump DS7070, consisting of: TPE pump tube (105 mm), 5 pieces; PTFE tube connection (olive), 2 pieces</td>
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<td>DS7005</td>
<td>Luer nozzle, 2 pieces</td>
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<td>DS7009</td>
<td>Luer syringe, 2 ml, 10 pieces</td>
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<td>DS7700-4/DS7800-4-4</td>
<td>SET 4 FOR FULLY AUTOMATIC SAMPLE SUPPLY, CONSISTING OF:</td>
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<td>Drying unit with 3/2-way valve</td>
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<td>Tygon tube set for use with drying unit DS7060, consisting of: suction tube (320 mm); drain tube (320 mm); air tube (320 mm); waste tube (320 mm); tube connection Luer, 3 pieces</td>
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<td>AS80 or AS90</td>
<td>Autosampler for 18 or 36 samples, including: sample plate 18x 50 ml (42 mm x 43 mm) or 36x 35 ml (28 mm x 65 mm) set polypropylene vials (50 ml) or glass vials (35 ml); other vials on request PTFE connecting tube</td>
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<td>Tube set for peristaltic pump DS7070, consisting of: TPE pump tube (105 mm), 5 pieces; PTFE tube connection (olive), 2 pieces</td>
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<td>DS7002</td>
<td>Luer nozzle, 2 pieces</td>
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<td>DS7009</td>
<td>Luer syringe, 2 ml, 10 pieces</td>
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### COMPONENT PART MATERIAL

#### Density meters DS7700, DS7800
- **Measuring cell**: Borosilicate glass
- **Luer/UNF nozzles**: PTFE

#### Drying unit DS7060
- **3/2-way valve**: FFKM, PVDF

#### Autosampler AS80, AS90
- **Vials**: PP/glass
- **Connecting tube**: PTFE

#### Tube sets DS7001, DS7002
- **Tubes**: Tygon
- **Tube connections Luer**: PP

#### Tube sets DS7003, DS7004
- **All parts in contact with the sample**: PTFE

#### Luer syringes DS7009, DS7010
- **–**: PE/PP

#### Waste container DS7019
- **–**: PE

#### Splash guard DS7020
- **–**: PTFE

#### Adaptors DS7021, DS7023
- **–**: ETFE

#### Tube sets DS7071, DS7072
- **Pump tube**: TPE
- **Tube connections UNF (or olive)**: PTFE

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### ORDER NUMBER | CALIBRATION LIQUIDS

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<td>DAkkS-certified density standard high-purity water, 0.9982 g/cm³ at 20 °C (second point at 15 °C), 10 ml</td>
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<td>DS7012</td>
<td>DAkkS-certified density standard isooctane, 0.6900 g/cm³ at 20 °C (second point at 15 °C), 10 ml</td>
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<td>DS7013</td>
<td>DAkkS-certified density standard n-nonane, 0.7200 g/cm³ at 20 °C (second point at 15 °C), 10 ml</td>
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<td>DS7014</td>
<td>DAkkS-certified density standard dichlorotoluene, 1.2500 g/cm³ at 20 °C (second point at 15 °C), 10 ml</td>
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<td>DS7015</td>
<td>DAkkS-certified density standard tetrachloroethene, 1.6200 g/cm³ at 20 °C (second point at 15 °C), 10 ml</td>
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### MATERIAL OF OUR PRODUCTS IN CONTACT WITH SAMPLES

We offer suitable solutions for any type of sample. Refer to the table to see of which materials the parts in contact with the samples are made of. We will gladly assist you in the selection of the products.

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<tr>
<th>COMPONENT</th>
<th>PART</th>
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<td>Density meters DS7700, DS7800</td>
<td>Measuring cell</td>
<td>Borosilicate glass</td>
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<td>Drying unit DS7060</td>
<td>3/2-way valve</td>
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<td>Tubes</td>
<td>Tygon</td>
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<td>Tube sets DS7003, DS7004</td>
<td>All parts in contact with the sample</td>
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<td>PE/PP</td>
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<td>Waste container DS7019</td>
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<td>Adaptors DS7022, DS7023</td>
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<td>Pump tube</td>
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<td>Tube connections UNF (or olive)</td>
<td>PTFE</td>
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