

MEASURING QUALITY. SINCE 1796



## DENSITY METERS

FAST, RELIABLE MEASUREMENTS USING THE OSCILLATING U-TUBE METHOD

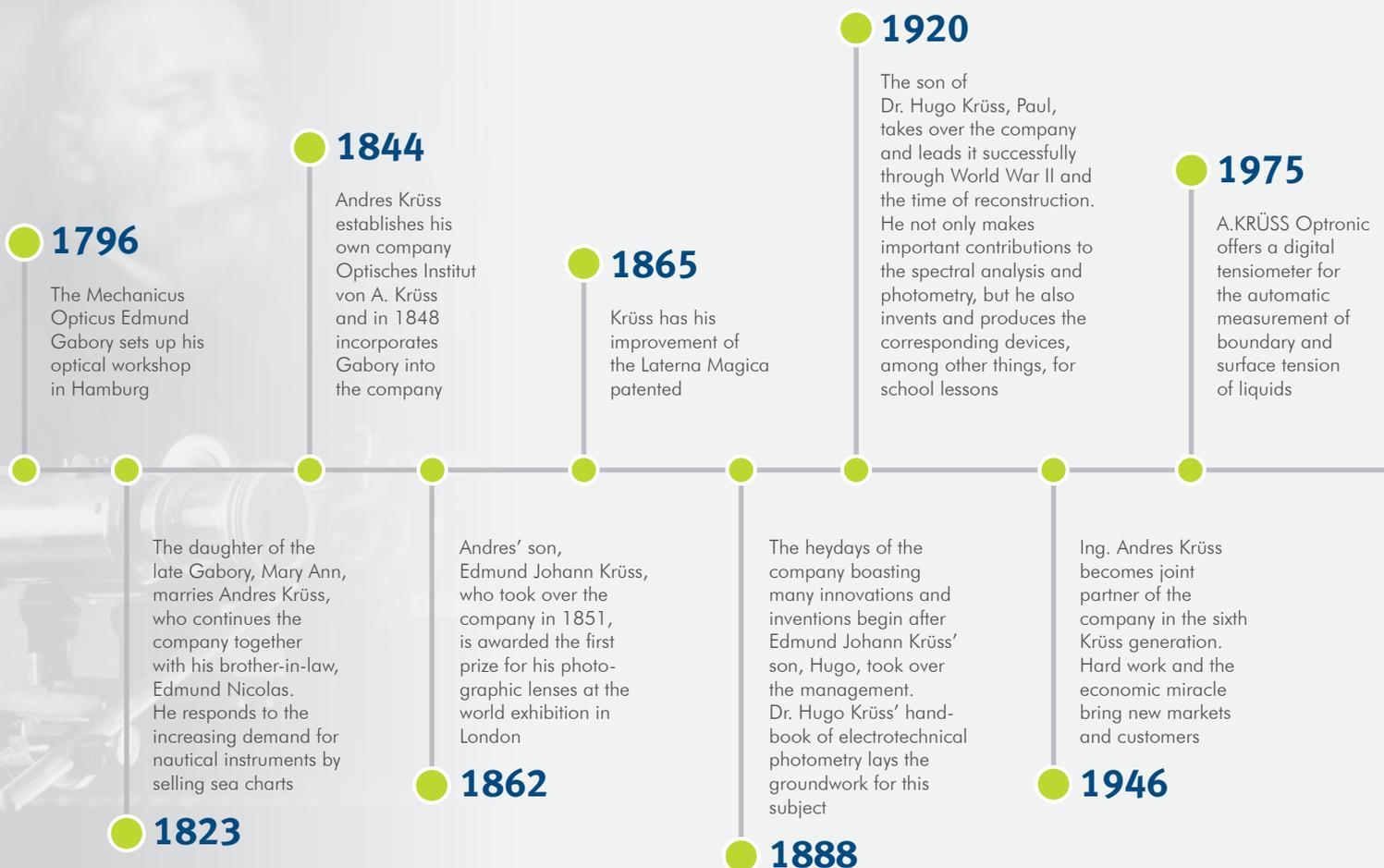


# A.KRÜSS OPTRONIC – CUTTING-EDGE TECHNOLOGY, MADE IN GERMANY

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



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**1980** Andres Krüss' 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

## 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 state-

ments 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/cm<sup>3</sup>.

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.

**Relative density**  
g/cm<sup>3</sup> **Density**  
Solvents OIML Alcohol vol%  
Flavours and fragrances  
Concentration  
%Brix Acids and bases

### 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 accuracy of 0.001 g/cm<sup>3</sup> 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 A.KRÜSS DENSITY METERS**



## OUR DENSITY METER SETS

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 auto-sampler. 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-driven 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

### SET 1

	FOR MANUAL SAMPLE SUPPLY
SAMPLE SUPPLY POSSIBLE VIA	• Syringe
RECOMMENDED FOR	• Low sample volume • Any degree of viscosity
ADVANTAGES	• Semi-automatic drying (requires interchange of tubes)
DENSITY METER	
DRYING UNIT	DS7050 with 2/2-way valve
PERISTALTIC PUMP	Can be retrofitted
AUTOSAMPLER	Can be retrofitted (requires drying unit DS7060)
TUBE SETS FOR SAMPLE SUPPLY AND DISCHARGE	DS7001 Small Tygon tube set
ORDER NUMBERS*	DS7700-1/DS7800-1

\*For a detailed overview of our density meter sets, please refer to page 14 f.



Manual sample supply via syringe

**SET 2**

**SET 3**

**SET 4**

**SET 5**

FOR MANUAL SAMPLE SUPPLY	FOR SEMI-AUTOMATIC SAMPLE SUPPLY	FOR FULLY AUTOMATIC SAMPLE SUPPLY	FOR FULLY AUTOMATIC SAMPLE SUPPLY
<ul style="list-style-type: none"> <li>• Syringe</li> </ul>	<ul style="list-style-type: none"> <li>• Syringe</li> <li>• Peristaltic pump</li> </ul>	<ul style="list-style-type: none"> <li>• Syringe</li> <li>• Peristaltic pump</li> <li>• Autosampler</li> </ul>	<ul style="list-style-type: none"> <li>• Syringe</li> <li>• Peristaltic pump</li> <li>• Autosampler</li> </ul>
<ul style="list-style-type: none"> <li>• Low sample volume</li> <li>• Highly-viscous samples</li> <li>• Aggressive samples</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate to high sample volume</li> <li>• Low-viscous to slightly viscous samples</li> </ul>	<ul style="list-style-type: none"> <li>• High sample volume</li> <li>• Low-viscous to slightly viscous samples</li> </ul>	<ul style="list-style-type: none"> <li>• High sample volume</li> <li>• Low-viscous to slightly viscous samples</li> <li>• Aggressive samples</li> </ul>
<ul style="list-style-type: none"> <li>• Splash guard for the supply of aggressive samples</li> <li>• Tube sets suitable for any kind of sample</li> <li>• Semi-automatic drying (requires interchange of tubes)</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-automatic sample supply and cleaning</li> <li>• Semi-automatic drying (requires interchange of tubes)</li> </ul>	<ul style="list-style-type: none"> <li>• Fully automatic sample supply and cleaning</li> <li>• Fully automatic drying (no interchange of tubes required)</li> </ul>	<ul style="list-style-type: none"> <li>• Tube sets suitable for any kind of sample</li> <li>• Fully automatic sample supply and cleaning</li> <li>• Fully automatic drying (no interchange of tubes required)</li> </ul>
DS7700 with a measurement accuracy of $\pm 0.001$ g/cm <sup>3</sup> or DS7800 with a measurement accuracy of $\pm 0.0001$ g/cm <sup>3</sup>			
DS7050 with 2/2-way valve	DS7050 with 2/2-way valve	DS7060 with 3/2-way valve	DS7060 with 3/2-way valve
Can be retrofitted	DS7070	DS7070	DS7070
Can be retrofitted (requires drying unit DS7060)	Can be retrofitted (requires drying unit DS7060)	AS80 or AS90, each with 1 of 2 types of sample plates and suitable polypropylene or glass vials	AS80 or AS90, each with 1 of 2 types of sample plates and suitable polypropylene or glass vials
DS7001 and DS7003 Small Tygon and PTFE tube set	DS7002 Large Tygon tube set	DS7002 Large Tygon tube set	DS7004 Large PTFE tube set
DS7700-2/DS7800-2	DS7700-3/DS7800-3	DS7700-4/DS7800-4	DS7700-5/DS7800-5

## A STRONG PERFORMANCE PACKAGE

### 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
- Can be connected to a keyboard, mouse, barcode scanner or external PC in order to use the KrüssLab software
- Easy integration into existing networks (DHCP Client) or a LIMS

### COMPLETE DOCUMENTATION OF MEASURED VALUES

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

### 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

### UNLIMITED NUMBER OF METHODS

- Create any number of methods and analyse each sample using the desired parameters
- Method parameters: scales, temperature, sample supply, limit values, comment and many more
- Measurement modes: single, continuous or interval measurement
- 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



## DENSITY METER SOLUTIONS FOR ANY NEED

- DS7700 with an accuracy of  $\pm 0.001$  g/cm<sup>3</sup> and DS7800 with an accuracy of  $\pm 0.0001$  g/cm<sup>3</sup>
- Set 1 for manual sample supply
- Set 2 for manual sample supply, also of aggressive samples
- Set 3 for semi-automatic sample supply
- Set 4 for fully automatic sample supply
- Set 5 for fully automatic sample supply, also of aggressive samples



## COMPLIANCE WITH GLOBAL STANDARDS

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

## INTUITIVE OPERATION

- State-of-the-art touch-screen display
- Secondary scale for displaying a second measured value
- Freely assignable shortcut keys for the most important functions
- Easy, menu-driven adjustment
- A selection of six languages (de, en, es, fr, it, pt)

## 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

- Sample supply via syringe, peristaltic pump or autosampler
- Including drop collector, splash guard optional
- Reliable filling check via inspection glass
- Chemical-resistant materials
- Freely configurable cleaning procedures
- Semi-automatic or fully automatic drying

# MAXIMUM EFFICIENCY 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

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 KRÜSS devices, density meters as well as refractometers or polarimeters, on a PC. The software can easily be installed via Windows Explorer. Your measurement device is connected to your local network via Ethernet or directly to your computer and identified via its IP address. The user-friendly interface that you are familiar with from your KRÜSS devices is mirrored on the PC monitor. The KrüssLab software allows you the following:

- a central user management. The user right settings can be transferred to the individual devices

- the remote control of any number of devices
- saving any number of measurements in a database. There is no storage limitation to the last 999 measurements as is the case with our devices. The database can be stored in your company network so that it is included in your data backup
- access to measured data even if the measurement device is switched off
- the selection of measured data with different filters
- the print-out of measured data on any printer
- the backup of device settings



Fully automatic sample supply via autosampler AS90

## 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 require very little space, are easy and fast to install and very durable. For both autosamplers, the scope of delivery includes one of two types of sample plates with a corresponding set of polypropylene or glass vials.

### Autosamplers AS80 and AS90

- Also suitable for aggressive and slightly viscous samples
- Can each be fitted with two types of sample plates:  
AS80-T18: 18x 50 ml (42 mm x 43 mm) or  
AS80-T36: 36x 35 ml (28 mm x 65 mm)  
AS90-T53: 53x 16 ml (22 mm x 55 mm) or  
AS90-T89: 89x 6 ml (16 mm x 55 mm)
- Set of polypropylene or glass vials included
- 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)

## OUR 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 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.

### 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 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](http://www.kruess.com) within three months after purchase

## 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

SCALES	Density [g/cm <sup>3</sup> ] Relative Density Brix [%Brix] Concentration of alcohol [vol%] Concentration of sulphuric acid [wt%] User-defined
MEASUREMENT RANGE	0–3 g/cm <sup>3</sup>
ACCURACY	DS7700: ±0.001 g/cm <sup>3</sup> ; DS7800: ±0.0001 g/cm <sup>3</sup>
MEASUREMENT PERIOD	Typically 1–3 minutes including temperature control
SAMPLE VOLUME IN CASE OF MANUAL INJECTION	0.9 ml
AMBIENT TEMPERATURE	10–40 °C
TEMPERATURE RANGE	10–40 °C
ACCURACY OF TEMPERATURE CONTROL	±0.02 °C
METHODS	A practically unlimited number of methods can be set
MANUFACTURER'S CALIBRATION	With air and water at 9 temperatures each
ADJUSTMENT	Automatic (menu-driven), with dried air and distilled water
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

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## OVERVIEW OF DENSITY METER SETS AND CONSUMABLES

ORDER NUMBER	SETS AND SET COMPONENTS
<b>DS7700-1/DS7800-1</b>	<b>SET 1 FOR MANUAL SAMPLE SUPPLY, CONSISTING OF:</b>
DS7700 or DS7800	Density meter with glass U-tube oscillator, accuracy $\pm 0.001 \text{ g/cm}^3$ or $\pm 0.0001 \text{ g/cm}^3$
DS7050	Drying unit with 2/2-way valve
DS7001	Tygon tube set for use with Luer syringe, consisting of: air tube (320 mm); waste tube (320 mm); tube connection Luer, 2 pieces
DS7005	Luer nozzle, 2 pieces
DS7009	Luer syringe, 2 ml, 10 pieces
DS7010	Luer syringe, 10 ml, 10 pieces
DS7019	PE waste container with lid, 600 ml
<b>DS7700-2/DS7800-2</b>	<b>SET 2 FOR MANUAL SAMPLE SUPPLY, CONSISTING OF:</b>
DS7700 or DS7800	Density meter with glass U-tube oscillator, accuracy $\pm 0.001 \text{ g/cm}^3$ or $\pm 0.0001 \text{ g/cm}^3$
DS7050	Drying unit with 2/2-way valve
DS7001	Tygon tube set for use with Luer syringe, consisting of: air tube (320 mm); waste tube (320 mm); tube connection Luer, 2 pieces
DS7003	PTFE tube set for use with Luer syringe, consisting of: drain tube (400 mm); waste tube (280 mm); PEEK hollow screw, flanged and mounted, 3 pieces
DS7020	PTFE splash guard
DS7021	Adaptor Olive/UNFa for sample discharge through Tygon tube via UNF nozzle
DS7007	Luer, UNF nozzle, 1 piece each
DS7009	Luer syringe, 2 ml, 10 pieces
DS7010	Luer syringe, 10 ml, 10 pieces
DS7019	PE waste container with lid, 600 ml
<b>DS7700-3/DS7800-3</b>	<b>SET 3 FOR SEMI-AUTOMATIC SAMPLE SUPPLY, CONSISTING OF:</b>
DS7700 or DS7800	Density meter with glass U-tube oscillator, accuracy $\pm 0.001 \text{ g/cm}^3$ or $\pm 0.0001 \text{ g/cm}^3$
DS7050	Drying unit with 2/2-way valve
DS7070	Peristaltic pump
DS7002	Tygon tube set for use with drying unit DS7050, consisting of: suction tube (320 mm); drain tube (320 mm); air tube (320 mm); waste tube (320 mm); tube connection Luer, 3 pieces
DS7072	Tube set for peristaltic pump DS7070, consisting of: TPE pump tube (105 mm), 5 pieces; PTFE tube connection (olive), 2 pieces
DS7005	Luer nozzle, 2 pieces
DS7009	Luer syringe, 2 ml, 10 pieces
DS7010	Luer syringe, 10 ml, 10 pieces
DS7019	PE waste container with lid, 600 ml
<b>DS7700-4/DS7800-4</b>	<b>SET 4 FOR FULLY AUTOMATIC SAMPLE SUPPLY, CONSISTING OF:</b>
DS7700 or DS7800	Density meter with glass U-tube oscillator, accuracy $\pm 0.001 \text{ g/cm}^3$ or $\pm 0.0001 \text{ g/cm}^3$
DS7060	Drying unit with 3/2-way valve
DS7070	Peristaltic pump
AS80 or AS90	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 or Autosampler for 53 or 89 samples, including: sample plate 53x 16 ml (22 mm x 55 mm) or 89x 6 ml (16 mm x 55 mm) set polypropylene vials (16 or 6 ml); other vials on request PTFE connecting tube
DS7002	Tygon tube set for use with drying unit DS7050, consisting of: suction tube (320 mm); drain tube (320 mm); air tube (320 mm); waste tube (320 mm); tube connection Luer, 3 pieces
DS7072	Tube set for peristaltic pump DS7070, consisting of: TPE pump tube (105 mm), 5 pieces; PTFE tube connection (olive), 2 pieces
DS7021 (2x)	Adaptor olive/UNFa for connecting the Tygon tubes to the drying unit DS7060
DS7022 (optional)	Adaptor UNFi/Luer for the sample supply with autosampler AS80 or AS90 via Luer nozzle
DS7005	Luer nozzle, 2 pieces
DS7009	Luer syringe, 2 ml, 10 pieces
DS7010	Luer syringe, 10 ml, 10 pieces
DS7019	PE waste container with lid, 600 ml

DS7700-5/DS7800-5	SET 5 FOR FULLY AUTOMATIC SAMPLE SUPPLY, CONSISTING OF:
DS7700 or DS7800	Density meter with glass U-tube oscillator, accuracy $\pm 0.001$ g/cm <sup>3</sup> or $\pm 0.0001$ g/cm <sup>3</sup>
DS7060	Drying unit with 3/2-way valve
DS7070	Peristaltic pump
AS80 or AS90	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 or Autosampler for 53 or 89 samples, including: sample plate 53x 16 ml (22 mm x 55 mm) or 89x 6 ml (16 mm x 55 mm) set polypropylene vials (16 or 6 ml); other vials on request PTFE connecting tube
DS7004	PTFE tube set for use with drying unit DS7060, consisting of: suction tube (280 mm); drain tube (400 mm); connecting tube (340 mm); waste tube (280 mm); PEEK hollow screw, flanged and mounted, 6 pieces
DS7071	Tube set for peristaltic pump DS7070, consisting of: TPE pump tube (105 mm), 5 pieces; PTFE tube connection UNF, 2 pieces
DS7023	Adaptor Luer/UNFa for the sample supply with syringe via UNF nozzle
DS7006	UNF nozzle, 2 pieces
DS7009	Luer syringe, 2 ml, 10 pieces
DS7010	Luer syringe, 10 ml, 10 pieces
DS7019	PE waste container with lid, 600 ml

ORDER NUMBER	CALIBRATION LIQUIDS
DS7011	DAkKS-certified density standard high-purity water, 0.9982 g/cm <sup>3</sup> at 20 °C (second point at 15 °C), 10 ml
DS7012	DAkKS-certified density standard isooctane, 0.6900 g/cm <sup>3</sup> at 20 °C (second point at 15 °C), 10 ml
DS7013	DAkKS-certified density standard n-nonane, 0.7200 g/cm <sup>3</sup> at 20 °C (second point at 15 °C), 10 ml
DS7014	DAkKS-certified density standard dichlorotoluene, 1.2500 g/cm <sup>3</sup> at 20 °C (second point at 15 °C), 10 ml
DS7015	DAkKS-certified density standard tetrachloroethene, 1.6200 g/cm <sup>3</sup> at 20 °C (second point at 15 °C), 10 ml

## INFORMATION ON THE 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.

COMPONENT	PART	MATERIAL
Density meters DS7700, DS7800	Measuring cell	Borosilicate glass
	Luer/UNF nozzles	PTFE
Drying unit DS7060	3/2-way valve	FFKM, PVDF
Autosamplers 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
Adaptor DS7021	–	ETFE
Adaptors DS7022, DS7023	–	PTFE
Tube sets DS7071, DS7072	Pump tube	TPE
	Tube connections UNF or (olive)	PTFE



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