

Refractometers

- DR6000 Series
- KRUESS Lab
- AR2008
- AR4 and AR4D
- PR21
- PRB21
- DR301-95
- DR201-95 and DR201-95OE
- DR101-60
- HR Series
- ER60-Series
- Refractometer Accessories

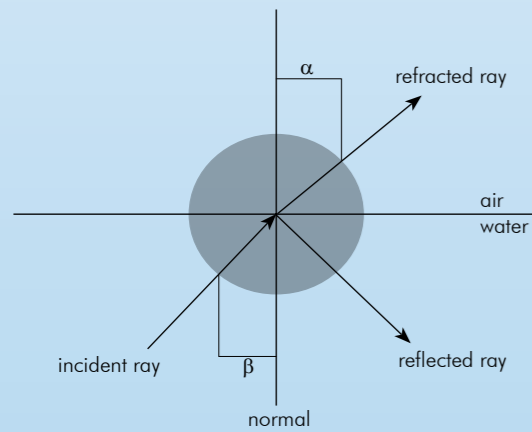


What is REFRACTOMETRY?

You've lost the key to your locker in the swimming pool. You spot it lying on the bottom of the shallow part of the pool, reach in to take it – and your hand misses. The refraction of light at the boundary of two different materials can be explained as easily as that. If the swimming pool was filled with salt water, the image of the key would have been shifted even more.

Light moves at different speeds in materials of different densities. In a vacuum, it reaches 299 792 458 m/s, however in water "only" 225 000 000 m/s. If a ray of light with a defined wavelength strikes a boundary between one medium to another at a fixed angle, the angle of the ray will change according to the refractive indices of the media. Snell's law describes this phenomenon:

$$n_1 \cdot \sin \delta_1 = n_2 \cdot \delta_2, \text{ where } \delta_1 \text{ is angle } \alpha \text{ and } \delta_2 \text{ angle } \beta$$



Under constant conditions with known material properties, the formula can be manipulated to calculate the refractive index of an unknown second medium. The angle of incidence and angle of refraction can be measured, the refractive index of one of the materials (the prism of the refractometer) is known, and so, after adjusting the formula, the refractive index of the unknown material is a matter of simple mathematics.

Measurement of the refractive index depends on the temperature and wavelength of the light. Determination of the refractive index can provide information on the purity of a substance, but not its exact composition.

The refractive index of water at 20 °C is 1.33 nD.

Ice has a refractive index of 1.31 nD.

Adding sugar to pure water changes the refractive index, depending on the amount added. Adding salt changes the refractive index as well, but in relation to the concentration.

This means that if pure water at 20 °C does not have a refractive index of 1.33, it has been "polluted" with some

other material. As a rule, determining the refractive index of a substance is a quick and reliable check of its purity.

Sun flower oil diluted with cheaper oil can be detected just as easily as the sugar content of marmalade during the production process.

Another example: cyclohexane at 20 °C has the same refractive index as a 52.9 % sugar solution. This shows that no statements on the composition or possible admixture of a substance can be made without knowing exactly what it is.

Temperature is one of the greatest factors which can influence the refractive index. Each substance reacts differently and specifically to temperature.

40 Brix Sugar Solution "0.00015 per °C"

| Temperature | Refractive Index |
|-------------|------------------|
| 20.0 °C | 1.39986 nD |
| 20.1 °C | 1.39985 nD |
| 21.0 °C | 1.39971 nD |

Paraffine Oil "0.00036 per °C"

| Temperature | Refractive Index |
|-------------|------------------|
| 20.0 °C | 1.48001 nD |
| 20.1 °C | 1.47997 nD |
| 21.0 °C | 1.47965 nD |

A temperature corrected scale in a refractometer must always be specific to a substance, and can never be considered to be universal.

A.KRÜSS Optronic Refractometers



DR6000 Series

Digital Refractometers

4



KRUESS Lab

Lims Software for your Lab

6



AR2008

Digital Abbe Refractometer

8



AR4 and AR4D

Abbe Refractometers

9



PR21-Series

Process Refraktometer

10



PRB21

Bypass Process Refractometer

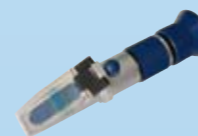
11



DR301-95
DR201-95
DR101-60

Digital Hand-held Refractometers

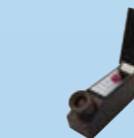
12



HR-Series

Hand-held Refractometers

14



ER60-Series

Gem Refractometers

16



Refractometer Accessories

17

DR6000 Series | Digital Refractometers

Digital laboratory refractometers from A. Krüss Optronic are setting new benchmarks on many counts. An intuitive touchscreen presents a clear overview of all data and functions and the integrated SQL database stores all data and allows external access via a network or standalone PC.

The refractive index can be a parameter in quantitative or qualitative analysis and quality assurance. Degrees of polymerisation can also often be monitored frequently, quickly and cost-efficiently without turbidity or the colour of the sample affecting measurement precision. There is no longer any elaborate preparation of samples necessary. The sample is simply placed on the measuring prism and the measurement process is started. The flat stainless steel plate is easy to clean and is highly resistant to aggressive substances.

As the refractive index depends on the temperature of the sample, the refractometer should be tempered. The DR6000 series is thus available with integrated electronic temperature control by means of a Peltier element. This type of temperature control is faster and more reliable than previous water bath thermostats which can be connected to the digital refractometer without Peltier temperature control. It is thus possible to carry on using an existing thermostat. For continuous measurements or series of measurements with many samples and high volumes of samples, devices with flow measurement cells are available. A sample can thus displace the previous one, nonetheless achieving an accurate measurement result without cleaning the measuring prism after every measurement. If a printer is connected to the RS-232 interface, the measurement result can be printed out either directly after the measurement or later. All stored measurement data can also be filtered according to different criteria and exported to a USB stick in .XLS (Excel) or .CSV format.



DR6000 with interfaces for external Thermostats

The integrated SQL database stores up to 99 user-defined measurement methods and the last 999 measurement results with all relevant data, such as date, time and user. An optional user management system with three authorization levels safeguards the settings against any inadvertent changes. The DR6000 series thus complies with all GLP requirements and is ideally suited for use in FDA-regulated areas. Refractometers can be connected to a PC via an Ethernet interface or integrated in an existing network. If there is access to the Internet, remote maintenance and fault diagnostics are also possible. DR6000 refractometers are sturdy, low-maintenance and also extremely quiet - a quality which is often underestimated when it comes to constant use in a laboratory.



Fields of application:

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management

Specifications

Standard

| | Range 1.3200 – 1.5800 nD 0-95 %Brix | Range 1.3200 – 1.7000 nD 0-95 %Brix | Accuracy 0.0001 nD 0.1 %Brix | Resolution 0.0001 nD 0.1 %Brix | Built-in Peltier Thermostat | Flow- through cell |
|------------|---|---|------------------------------------|--------------------------------------|-----------------------------------|--------------------------|
| DR6000 * | X | | X | X | | |
| DR6000-F * | X | | X | X | | X |
| DR6000-T | X | | X | X | X | |
| DR6000-FT | X | | X | X | X | X |
| DR6100 * | | X | X | X | | |
| DR6100-F * | | X | X | X | | X |
| DR6100-T | | X | X | X | X | |
| DR6100-FT | | X | X | X | X | X |

High accuracy

| | Range 1.32000 – 1.58000 nD 0-95 %Brix | Range 1.32000 – 1.70000 nD 0-95 %Brix | Accuracy 0.00002 nD 0.02 %Brix | Resolution 0.00002 nD 0.01 %Brix | Built-in Peltier Thermostat | Flow- through cell |
|------------|---|---|--------------------------------------|--|-----------------------------------|--------------------------|
| DR6200 * | X | | X | X | | |
| DR6200-F * | X | | X | X | | X |
| DR6200-T | X | | X | X | X | |
| DR6200-FT | X | | X | X | X | X |
| DR6300 * | | X | X | X | | |
| DR6300-F * | | X | X | X | | X |
| DR6300-T | | X | X | X | X | |
| DR6300-FT | | X | X | X | X | X |

* All models without internal temperature control can be connected with our external Peltier thermostat PT31 (see page 17)

Common Specifications

| | |
|-------------------|---|
| Measurement modes | Single, Interval |
| Scales | Preset standard scales: Refractive Index [nD], %Brix (saccharose, inverted sugar, glucose, fructose). Temperature corrected [nD], temperature corrected [%Brix]. User defined scales can be initialized. |
| Calibration | manufacturer's 4-point-calibration, user defined 1-point-calibration with any substance possible |
| Measurement time | ~4 s |
| Prism | Sapphire |
| Illumination | LED 590 nm (est. life: >100.000 hours) |
| Housing | Cast aluminium, powder-coated |
| Analysis basin | Stainless steel |
| Display | LCD 5.7" 320x240 Pixel, TFT |
| Operation | Touchscreen |
| Interface | RS-232, USB, Ethernet |
| Protection class | IP65 for analysis basin |
| Working voltage | 90 – 260 V~, 50/60 Hz, 60 W |

Common Specifications

| | |
|----------------------------------|--------------------------------|
| Temperature measurement | 5 – 90 °C |
| Temperature resolution | 0.1 °C |
| Temperature measurement accuracy | ± 0.05 °C |
| Temperature compensation | ICUMSA User defined 3-Point |
| Temperature sensor | PT100 Sensor |
| Sample temperature | 10 – 80 °C |
| Ambient temperature | 15 – 35 °C |

Only T-Models

| | |
|---------------------|-----------------------|
| Temp. control range | 10 – 80 °C (optional) |
| Temp. accuracy | ± 0.1 °C |
| Temp. stability | 0.05 °C |

Our new KrüssLab software offers you ideal administration of your Krüss instruments: refractometers, polarimeters and density meters can now be comfortably remote-controlled. After an easy software installation via Windows Explorer, a set of function blocks provides administration, remote control and measurement reading from your central work station.

Your instrument can either be connected via an ethernet-cable to your intranet, or directly to your PC. It is identified via its personal IP-address. Our lab software reflects the intuitive touchscreen from your Krüss instrument, and it can be run directly from your PC.

Your measurements are imported directly from the instrument, and remain stored locally in the database. In this way you can also work with your data when your Krüss instrument is turned off.

Using various data filters, you can export exactly the data needed in an excel or HTML file to your printer or as a PDF document. It's now possible to run an unlimited number of Krüss instruments centrally, your work is made easier and you will have a better overview of your processes.



| Id | Datum | Benutzer | Methode | Probe | Messwert | Einheit |
|----|------------------|---------------|------------|-------|----------|---------|
| 1 | 01.01.2008 | Administrator | Methode 01 | 10001 | 1,4306 | mg/l |
| 2 | 02.01.2008 00:18 | Administrator | Methode 01 | 10002 | 1,45143 | mg/l |
| 3 | 03.01.2008 00:36 | Administrator | Methode 01 | 10003 | 1,43241 | mg/l |
| 4 | 04.01.2008 00:55 | Administrator | Methode 01 | 10004 | 1,42675 | mg/l |
| 5 | 05.01.2008 01:13 | Administrator | Methode 01 | 10005 | 1,44219 | mg/l |
| 6 | 06.01.2008 01:31 | Administrator | Methode 01 | 10006 | 1,46482 | mg/l |
| 7 | 07.01.2008 01:50 | Administrator | Methode 01 | 10007 | 1,45473 | mg/l |
| 8 | 08.01.2008 02:08 | Administrator | Methode 01 | 10008 | 1,46201 | mg/l |
| 9 | 09.01.2008 02:26 | Administrator | Methode 01 | 10009 | 1,42411 | mg/l |
| 10 | 10.01.2008 02:45 | Administrator | Methode 01 | 10010 | 1,45535 | mg/l |
| 11 | 11.01.2008 03:03 | Administrator | Methode 01 | 10011 | 1,45349 | mg/l |
| 12 | 12.01.2008 03:21 | Administrator | Methode 01 | 10012 | 1,46737 | mg/l |
| 13 | 13.01.2008 03:40 | Administrator | Methode 01 | 10013 | 1,44592 | mg/l |
| 14 | 14.01.2008 03:58 | Administrator | Methode 01 | 10014 | 1,41971 | mg/l |
| 15 | 15.01.2008 04:16 | Administrator | Methode 01 | 10015 | 1,42712 | mg/l |
| 16 | 16.01.2008 04:35 | Administrator | Methode 01 | 10016 | 1,46847 | mg/l |
| 17 | 17.01.2008 04:53 | Administrator | Methode 01 | 10017 | 1,42696 | mg/l |
| 18 | 18.01.2008 05:11 | Administrator | Methode 01 | 10018 | 1,45588 | mg/l |
| 19 | 19.01.2008 05:30 | Administrator | Methode 01 | 10019 | 1,45457 | mg/l |
| 20 | 20.01.2008 05:48 | Administrator | Methode 01 | 10020 | 1,45089 | mg/l |

AR2008 | Digital Abbe Refractometer



Fields of application:

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management

The digital Abbe refractometer AR2008 has an electronic data processing system. The refractive index or Brix value is shown on an LCD display together with the temperature. A serial interface allows measured values with date and time to be transferred directly to the PC or printer. An automatic temperature compensation feature is optionally selectable. The AR2008 has a thermostat connection for prisms and a built-in light source (589 nm) for the measuring prism. The AR2008 is extremely sturdy and is ideally suited for use in a harsh environment. It is supplied with a glass calibration plate, contact fluid and a screw-driver as well as a dust hood.



Specifications

| Specifications | | |
|---------------------------------|--|--------------------|
| Measurement range | Refractive index | 1.3000 – 1.7200 nD |
| | Sugar scale | 0-95 %Brix |
| | Temperature | 0 – 99 °C |
| Accuracy | Refractive index | 0.0002 nD |
| | Sugar scale | ± 0.1 %Brix |
| Resolution | Refractive index | 0.0001 nD |
| | Sugar scale | 0.1 %Brix |
| | Temperature | 0.1 °C |
| Autom. Temperature compensation | 0 – 90 °C | |
| Interfaces | serial RS-232 9600 Baud serial RS-422 9600 Baud | |
| Power supply | 110/230 V~, 50/60 Hz, 40 W | |

AR4 and AR4D | Abbe Refractometers

The Abbe refractometer was developed in 1869 by Ernst Abbe and is used to determine the refractive index otherwise known as the index of refraction. It is based on the principle of total reflection which occurs at the boundary between the prism and the sample. The refractive index of the prism determines the upper limit of the measurement range, as it always has to be greater than that of the sample.

To determine the refractive index of solids, a contact liquid with an average refractive index is required. Abbe refractometers are characterised by their easy handling and minimal sample quantities. Samples in the form of solids or pastes can be measured just as easily as liquids. Furthermore, colouration or clouding scarcely affect the measurement result. Besides the refractive index, the solid content can be determined in %Brix.

The refractive index of a sample depends on the wavelength of the light used in measurement. That is why we supply our AR4 and AR4D with LED illumination for the measuring prism. This has the standard wavelength of 589 nm and has a very long service life (>100,000 h). Refractometers also have scale illumination.

The refractive index also depends on temperature. As the temperature increases, the refractive index drops. That is why our Abbe refractometers have thermostat connections on both the illumination prism as well as the measurement prism. A digital thermometer is included in the scope of supply.

Our Abbe refractometers can easily be checked and calibrated with the calibration plates provided and comply with all requirements of ASTM D1218.



AR4



AR4D

Specifications

| | | |
|-------------------|---|--------------------------------------|
| Measurement range | 1.3000 – 1.7000 nD 0-95 %Brix | |
| Accuracy | ± 0.0002 nD ± 0.1 %Brix | |
| Scale division | 0.0005 nD 0.25 %Brix | |
| Thermometer | Digital thermometer: -40–120 °C | |
| Illumination | Scale illumination, LED-illumination (590 nm) for prism | |
| Display | AR4D | Readings via scale window and ocular |
| | AR4 | Readings via ocular |
| Power supply | 110 V or 220 V, switchable | |
| Dimensions | AR4D | 230 x 110 x 270 mm |
| | AR4 | 140 X 100 X 235 mm |
| Weight | AR4D | 5.5 kg |
| | AR4 | 4.4 kg |
| Special features | Adjustable scale, prisms can be temperature-controlled, thermostat connections for prisms | |

Fields of application:

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management

PR21 | Process Refractometer



The process refractometer was developed for direct installation in pipelines and boilers, and is ideal for process monitoring, control and separation of products in the chemical, beverage, food, pulp and paper as well as sugar industries. As no bypass is necessary, it is much simpler to install the process refractometer in a pipeline or tank.

Standard connections enable the process refractometer to be assembled quickly and easily. Depending on diameter, a T-piece is inserted into the pipeline or an adapter welded on, as with the tank.

Fields of application:

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management

Common Specifications

| | |
|----------------------------|--|
| Measurement mode | Refractive index [nD], Sugar content [%Brix], User defined [%] |
| Measurement time | 3–60 s |
| Temperature sensor | PT100 |
| Temp. measurement | -10–200 °C |
| Temp. resolution | 0.1 °C |
| Temp. measurement accuracy | 0.2 °C |
| Temperature compensation | ICUMSA, arbitrary |
| Process temperature | -5–160 °C |
| Ambient temperature | 0–60 °C |
| Prism | Sapphire |
| Illumination | LED 590 nm |
| Housing | Edelstahl |
| Interfaces | Analog 0/4–20 mA, Ethernet, PROFIBUS (optional) |
| Protection class | IP65 |
| Explosion protection | optional |
| Power supply | 24 V |

Model overview

| Model / Article-No. | Measurement accuracy | Resolution | Product Temperature | Ambient temperature |
|---------------------|----------------------|------------|---------------------|---------------------|
| PR21S | 0.0002 nD | 0.0001 nD | < 60 °C | < 40 °C |
| PR21S-T | 0.2 %Brix | 0.1 %Brix | < 160 °C | < 60 °C |
| PR21H | 0.00002 nD | 0.00001 nD | < 60 °C | < 40 °C |
| PR21H-T | 0.02 %Brix | 0.01 %Brix | < 160 °C | < 60 °C |

PRB21 | Bypass Process Refractometer



The bypass process refractometer PRB21 fills the gap between the DR6000 series of digital laboratory refractometers and the process refractometer PR21. The sample is directed through a bypass to the measurement chamber which is made of stainless steel, while the actual prism is made of sapphire and is thus particularly scratch-resistant. The PRB21 is usually connected to a PLC and is used for continuous process monitoring. The measurement interval is adjustable (>3 s) and the measurement result is not affected by either the colour or the turbidity of the sample. The PRB21 has various interfaces and can also be supplied with PROFIBUS on request. A display is also available for visual monitoring. The internal temperature sensor allows automatic temperature compensation and the measured temperature to be sent to the PLC.

Specifications

| | | |
|--------------------------|-------|---|
| Measurement range | | 1.3300 nD–1.5600 nD 0–95 %Brix |
| Accuracy | PRB-H | 0.00002 nD; 0.02 %Brix |
| | PRB-S | 0.0002 nD; 0.2 %Brix |
| Resolution | PRB-H | 0.00001 nD; 0.01 %Brix |
| | PRB-S | 0.0001 nD; 0.1 %Brix |
| Measurement units | | Refractive Index [nD] Saccarose [%Brix] Invert Sugar [%Brix] Glucose [%Brix] Fructose [%Brix] |
| Measurement time | | 3–60 s |
| Temperature measurement | | -10–99.9 °C |
| Temperature resolution | | 0.1 °C |
| Temperature accuracy | | 0.2 °C |
| Temperature compensation | | ICUMSA |
| Temperature sensor | | PT100 |
| Prism | | Sapphire |
| Illumination | | LED 590 nm |
| Housing | | Cast steel |
| Interfaces | | RS-232, analog 0/4–20 mA |
| Protection class | | IP65 |
| Working voltage | | 24 V |
| Display | | LCD 120x32 Pixel |
| Operation | | Touchscreen |
| Output | | 1 Relay |

Fields of application:

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management

Features:

- Excellent value for money
- Wide measurement range from 1.3300–1.5600 nD / 0–95 %Brix
- Just 3 seconds measurement time
- Password-protected
- Prism in the sample chamber is easy to clean
- Stainless steel sample chamber is suitable for food samples
- User-friendly interfaces for direct connection to a PLC
- Minimal sample quantities required
- Very easy to install, no special requirements

DR301-95, DR201-95 and DR101-60 Digital Hand-held Refractometers

DR301-95

The digital handheld refractometer DR301-95 has more functions than a simple handheld refractometer and at the same time is more cost-effective than a desktop unit. Besides the refractive index, sugar and salt scales, up to two other user-defined scales can be programmed. To do this, the handheld refractometer can be connected to a PC via a serial interface. The software supplied with it allows results to be managed and printed out. While the instrument can be operated as a mobile unit with a 9 V block battery, the optionally available power supply unit turns the DR301-95 into a small laboratory refractometer. The sample plate is made of stainless steel and is so flat that it can be cleaned quickly and easily. The instrument is calibrated simply with distilled water and has an optional temperature compensation feature. For incoming goods control applications, an upper and lower tolerance alarm can be entered.



DR301-95

DR201-95 und DR201-95OE

The DR201-95 is a compact digital handheld refractometer which eliminates any user-related reading errors of manual handheld refractometers. Specially developed for fast and easy quality control and process control, it has a wide measuring range for a refractive index scale and a sugar scale. One DR201-95 can thus often replace several existing instruments. For wine-growing, a special model is available with an Oechsle scale instead of a sugar scale. Both instruments are low-maintenance and are calibrated simply with distilled water. The 1.5 V battery lasts for over 1000 measurements.



DR201-95

DR101-60

As an entry-level model in digital refractometry, the DR101-60 covers many areas of application where the wide measurement range of the DR201-95 is not required. It offers excellent value for money, in terms of both procurement and operation. Calibration is also with distilled water. The waterproof case allows the DR101-60 to be rinsed under running water. This digital handheld refractometer also has an automatic temperature compensation feature, of course.



DR101-60

Fields of application (DR301-95 | DR201-95 | DR101-60):

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management

Model Overview

| Model / Article-No. | DR301-95 | DR201-95 | DR201-95-OE | DR101-60 |
|---------------------------------|--|--------------------------------|------------------------------|--------------------------------|
| Measurement range | 1.3330–1.5318 nD 0–95 %Brix | 1.3330–1.5318 nD 0–95 %Brix | 0–250 °Oechsle 0–95 %Brix | 1.3330–1.4419 nD 0–60 %Brix |
| Accuracy | 0.00015 nD 0.1 %Brix | 0.0003 nD 0.2 %Brix | 1 °Oechsle 0.2 %Brix | 0.0005 nD 0.25 %Brix |
| Resolution | 0.0001nD 0.1 %Brix | 0.0001nD 0.1 %Brix | 1 °Oechsle 0.1 %Brix | 0.0001nD 0.1 %Brix |
| Temperature measurement | 5–40 °C 41–104 °F | 0–40 °C | 0–40 °C | 0–40 °C |
| Temperature accuracy | 0.5 °C | 0.5 °C | 0.5 °C | 0.5 °C |
| Temperature compensation | 5–40 °C | 10–40 °C | 10–40 °C | 10–40 °C |
| Prism | Optical glass | | | |
| Housing | Plastic | | | |
| Dimensions | 180 x 100 x 60 mm | 130 x 80 x 40 mm | | 110 x 62 x 32 mm |
| Weight | 500 g | 200 g | | 160 g |
| Power supply | 9 V battery (adaptor available separately) | 1.5 V battery | | 1.5 V battery |

HR-Serie | Manual Hand-held Refractometers

Manual handheld refractometers are for fast everyday use. They are particularly easy to use and very sturdy. Various scales and additional functions ensure that there is exactly the right handheld refractometer for many application areas. This makes for reliability when reading, as the measured value does not first have to be converted.

Some models have an automatic temperature compensation feature, which increases measurement precision for measurements which are performed at 10–40 °C instead of 20 °C. For calibration, distilled water is required, or else a small calibration plate is provided.

Fields of application:

Determination of mixing ratios, quality and quantity inspection in the following industries:

- Pulp and paper industries
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
- Pharmaceutical industry
- Chemical industry
- Petrochemical industry
- Metalworking industry
- Wastewater management



Abb.1



Abb.2



Abb.4

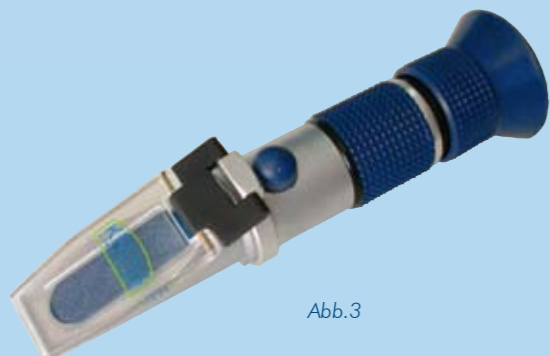


Abb.3



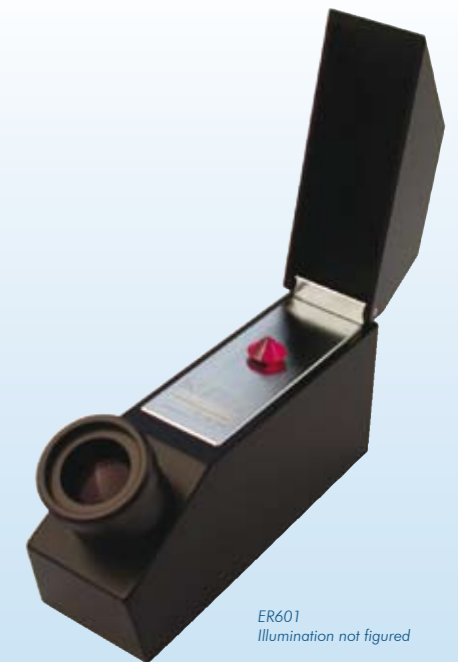
Abb.5

Manual Hand-held Refractometers

| Model | Fig. No. | Measurement range | Accuracy | Scale division | Temperature compensation | Thermometer | Field of application |
|----------|----------|--|--|--|--------------------------|-------------|--|
| HR10 | Fig. 1 | 0-10 %Brix | 0.1 %Brix | 0.1 %Brix | - | - | For sugar concentration in fruit juices, soft drinks, vegetables, foods and cooling lubricants |
| HR18-01 | Fig. 1 | 0-18 %Brix | 0.1 %Brix | 0.1 %Brix | - | - | For sugar concentration in fruit juices, soft drinks, vegetables, foods and cooling lubricants |
| HRKL32 | Fig. 2 | 0-32 %Brix 0-140 °Oechsle 0-27° KMW BaBo | 0.2 %Brix 1 °Oechsle 0.2° KMW BaBo | 0.2 %Brix 1 °Oechsle 0.2° KMW BaBo | - | - | For the measurement of Brix and alcohol content in must by either oechsle and Klosterneuburg scale |
| HRN20 | Fig. 2 | 0-20 %Brix | 0.2 %Brix | 0.2 %Brix | - | - | For sugar concentration in fruit juices, soft drinks, vegetables, foods and cooling lubricants |
| HRN32 | Fig. 2 | 0-32 %Brix | 0.2 %Brix | 0.2 %Brix | - | - | For sugar concentration in fruit juices, soft drinks, vegetables, foods and cooling lubricants |
| HRT32 | Fig. 3 | 0-32 %Brix | 0.2 %Brix | 0.2 %Brix | automatically | - | For sugar concentration in fruit juices, soft drinks, vegetables, foods and cooling lubricants |
| HRN62 | Fig. 3 | 28-62 %Brix | 0.2 %Brix | 0.2 %Brix | - | - | For analysing chemical and technical liquids, such as oils, fats, coolants, lubricants |
| HRT62 | Fig. 3 | 28-62 %Brix | 0.2 %Brix | 0.2 %Brix | automatically | - | For analysing chemical and technical liquids, such as oils, fats, coolants, lubricants |
| HRN82 | Fig. 3 | 45-82 %Brix | 0.2 %Brix | 0.2 %Brix | - | - | For analysing chemical and technical liquids, such as oils, fats, coolants, lubricants |
| HR92 | Fig. 3 | 58-90 %Brix 38-43 °Baume 12-27 %Water | 1 %Brix 0.5 °Baume 1 % Wasser | 1 %Brix 0.5 °Baume 1 % Water | - | - | For examination of highly concentrated sugars, determination of water content in honey and analysing fats, lubricants and cooking oil |
| HRH30 | Fig. 2 | 12-30 % water content in honey | 0.1 %Wasser | 0.1 %Water | - | - | For examination of highly concentrated sugars, determination of water content in honey and analysing fats, lubricants and cooking oil |
| HR900 | Fig. 5 | 0-90 %Brix | 0.2 %Brix | 0.2 %Brix | - | 6-36 °C | Universal hand refractometer with stage switch for all ranges. Adjustable prisms for sharp contours, direct and indirect light guidance for measurement of clear and opaque substances. With thermometer |
| HR901 | Fig. 5 | 1.333-1.517 nD | 0.0005 nD | 0.0005 nD | - | 6-36 °C | Universal hand refractometer with stage switch for all ranges. Adjustable prisms for sharp contours, direct and indirect light guidance for measurement of clear and opaque substances. With thermometer |
| HR27-100 | Fig. 2 | 1.000-1.070 d ₂₀ ²⁰ 0-100 ‰Salinity | 0.001 d ₂₀ ²⁰ 1 ‰Salinity | 0.001 d ₂₀ ²⁰ 1 ‰Salinity | - | - | For salinity analysis |
| HRS16 | Fig. 1 | 1.333-1.373 nD 0-160 ‰Salinity | 0.001 nD 2 ‰Salinity | 0.001 nD 2 ‰Salinity | - | - | For salinity analysis |
| HR146 | Fig. 2 | 1.3330-1.3834 nD 0-28 ‰Salinity | 0.001 nD 0.1 ‰Salinity | 0.001 nD 0.1 ‰Salinity | - | - | For salinity analysis |
| HRM18 | Fig. 2 | 0-12 g/dl 1.333-1.360 nD 1.000-1.050 UG | 0.2 g/dl 0.0005 nD 0.002 UG | 0.2 g/dl 0.0005 nD 0.002 UG | - | - | For the measurement of serum protein and specific urine weight |
| HRMT18 | Fig. 2 | 0-12 g/dl 1.333-1.360 nD 1.000-1.050 UG | 0.2 g/dl; 0.0005 nD; 0.002 UG | 0.2 g/dl; 0.0005 nD; 0.002 UG | automatically | - | For the measurement of serum protein and specific urine weight |
| HRO32 | Fig. 2 | 0-32 %Brix 30-130 °Oe 4.4-19 %Alkohol | 0.2 %Brix 1 °Oe 0.1 %Alkohol | 0.2 %Brix 1 °Oe 0.1 %Alkohol | - | - | For the measurement of Oechsle, Brix and alcohol content in must |
| HROT32 | Fig. 3 | 0-32 %Brix 30-130 °Oe 4.4-19 % Alkohol | 0.2 %Brix 1 °Oe 0.1 % Alkohol | 0.2 %Brix 1 °Oe 0.1 % Alkohol | automatically | - | For the measurement of Oechsle, Brix and alcohol content in must |
| HRKFZ1 | Fig. 3 | Frostschutz: 50-0 °C Batteriesäure: 1.10-1.30 g/cm ³ | Ethylen-Propylen: 5° Batteriesäure: 0.01 | Ethylen-Propylen: 5° Batteriesäure: 0.01 | - | - | Anti freeze and battery fluid tester |
| HR25-800 | Fig. 4 | 0-80 %Brix | 0.5 %Brix | 0.5 %Brix | - | - | Universal hand refractometer with stage switch for all ranges. Adjustable prisms for sharp contours, direct and indirect light guidance for measurement of clear and opaque substances |

ER60-Serie | Gem Refractometers

Gemstone refractometers are used for the classification and quality control of gemstones. The gemstone to be examined is simply placed on the prism with a drop of contact fluid. The refractive index of the gemstone is read through the ocular of the refractometer. The refractive index is an important parameter in classifying a mineral or gemstone. Each mineral has its typical refractive index, due to its chemical composition and crystalline structure. Our gemstone refractometers are characterised by their particularly sharp image and good readability. With the sodium filter that only lets through light with a wavelength of 589 nm, the refractometer can be used as a mobile unit with an ordinary light source or with sufficient ambient lighting. LED illumination is also available with a wavelength of 589 nm.



ER601
Illumination not figured



ER604
Illumination not figured

Model overview

| | Standard Gem Refractometer | | Professional Gem Refractometer | |
|---------------------|----------------------------|------------------|--------------------------------|--------------|
| Model / Article-No. | ER604 | ER604-LED | ER601-NA | ER601-LED |
| Measurement range | 1.33–1.81 nD | 1.33–1.81 nD | 1.33–1.83 nD | 1.33–1.83 nD |
| Resolution | 0.01 nD | 0.01 nD | 0.01 nD | 0.01 nD |
| Monochromator | Na-Filter 589 nm | Na-Filter 589 nm | Na-Filter 589 nm | – |
| Illumination | – | LED 589 nm | – | LED 589 nm |
| Power supply | – | 100–240 V | – | 100–240 V |
| Prism | Optical glass | | | |
| Housing | Cast aluminium | | | |

Refractometer accessories

PT31 | Peltier thermostat



This electronic water-bath thermostat with Peltier element is a versatile, high-performance instrument. In one application, for example, it can be used to set the correct refractometer temperature. It is extremely robust, compact and easy to operate. Because it is so small it does not take up valuable space in the laboratory.

| Specifications PT31 | |
|----------------------|-----------------------------------|
| Resolution | 0.1 °C |
| Heating power | 30 W |
| Cooling power | 15 W |
| Pump pressure | 2000 Pa |
| Pump performance | 20 l/h |
| Temperature | 8–40 °C (continuously adjustable) |
| Temperature accuracy | ±0.2 °C |
| Power supply | 115-230 V |
| Dimensions | 140 x 80 x 210 mm |
| Weight | 1.5 kg |

CBM910 | Printer



24 character normal paper printer for Digital Refractometers from the DR6000 series and the Digital Abbe Refractometer (AR2008), as well as for our Digital Polarimeters (P8000 series) and Density Meters (DS7000 series).

AR15 | Flow-through cell with funnel



Flow-through cell with funnel upgrade for AR4 and AR2008.

AR16 | Flow-through cell



Flow-through cell upgrade for continuous measurement with AR4 and AR2008.

Refractometer calibration solutions



- **RI34** calibration solution 1.3400 nD (5 %Brix)
- **RI39** calibration solution 1.3900 nD (35 %Brix)
- **RI43** calibration solution 1.4300 nD (55 %Brix)
- **RI48** calibration solution 1.4800 nD (76 %Brix)
- **RI65** calibration solution 1.6500 nD

All bottles contain 30cc and are supplied with a certificate.

A.KRÜSS Optronik GmbH
Alsterdorfer Straße 276–278
22297 Hamburg | Germany
Telefon +49-(0)40-51 43 17-0
Fax +49-(0)40-51 43 17-60
eMail info@kruess.com
Web www.kruess.com