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KRÜSS
A.KRÜSS OPTRONIC
GERMANY

Refractometers

- DR6000 Series
- LabGuide
- AR2008
- AR4 and AR4D
- AR2 and AR2L
- DR301-95
- DR201-95 and DR201-95OE
- PR21
- IR10
- ER60 Series
- HR Series
- Refractometer Accessories

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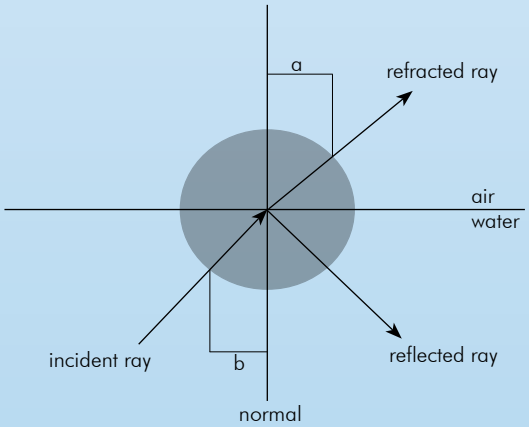
What is REFRACTOMETRY?

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:

$n1 \cdot \sin \partial 1 = n2 \cdot \sin \partial 2$,
where $\partial 1$ is angle a and $\partial 2$ angle b.



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. Ice has a refractive index of 1.31.
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 Bx Treacle "0.00015 per °C"

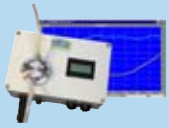
Temperature	Refractive index
20.0°C	1.39986
20.1°C	1.39985
21.0°C	1.39971

Paraffine Oil "0.00036 per °C"

Temperature	Refractive index
20.0°C	1.48001
20.1°C	1.47825
21.0°C	1.47644

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 | Digital Refractometer Series

The new series of A.KRÜSS Optronic Digital Refractometers are fitted with integrated Peltier thermostats for outstanding temperature control. Measurements are made with high accuracy and are not affected by colour or cloudiness.
The devices are intended for use in FDA regulated sectors due to their GLP compliance, integrated user management and full network support, for simple connection to the laboratory environment and an LIMS. 21 CFR Part 11 software is also available for the device.
All internal data (measurement values, parameters and methods) are organised in an SQL database. This can be accessed externally using SQL queries through a fixed interface (e.g. LIMS).
A self-explanatory touch screen with clear menu navigation and data output and USB/RS-232 interfaces fulfil all demands.
The instrument covers a large range of applications in the foodstuffs, sugar, beverage, chemistry, textiles, paper, metalworking and petrochemical industries.

Fields of application:

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

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

Features at a glance

- Large measurement range with high resolution
- User-friendly touch screen operation in 6 languages
- Data export (e.g. in Excel format) to a USB flash drive
- Various programmable measurement units
- Password protected user management (optional)
- User friendly RS-232, USB and Ethernet interfaces for direct connection to a PC
- Data display of all important settings and measurements
- 32-bit processor
- Integrated high-accuracy Peltier thermostat for temperature control without water.
  Rapid sample cool-down (T Series)
- SQL database
- High quality ceramic PT100 sensor
- NIST compliant calibration certificate
- Full GLP suitability

Specifications

Standard

	Range 1.3200-1.5800nD 0-95% Brix	Range 1.3200-1.7000nD 0-95% Brix	Accuracy 0.0001nD 0.1% Brix	Resolution 0.0001nD 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 1.32000-1.58000nD 0-95% Brix	Range 1.32000-1.70000nD 0-95% Brix	Accuracy 0.00002nD 0.02% Brix	Resolution 0.00002nD 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*

Common Specifications

Measurement modes	Single, Interval
Scales	Preset standard scales: Refractive Index [nD], %Brix (saccerose, inverted sugar, glucose, fructose). Temperature corrected [nD], temperature corrected [%Brix]. User defined scales can be initialized.
Calibration	1-point-calibration with any substance possible
Measurement time	~4 sec
Prism	Sapphire
Illumination	LED 590nm (est. life: >100.000 hours)
Housing	Cast aluminium, powder-coated
Analysis basin	Stainless steel
Display	LCD 5.7" 320x240 Pixel, TFT
Operation	Touch-screen
Interface	RS232, USB, Ethernet
Protection class	IP65 for analysis basin
Working voltage	90V...260V~, 50/60Hz, 60W

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°C - 80°C (optional)
Temp. accuracy	0.1°C
Temp. stability	0.05°C

KRÜSS LabGuide

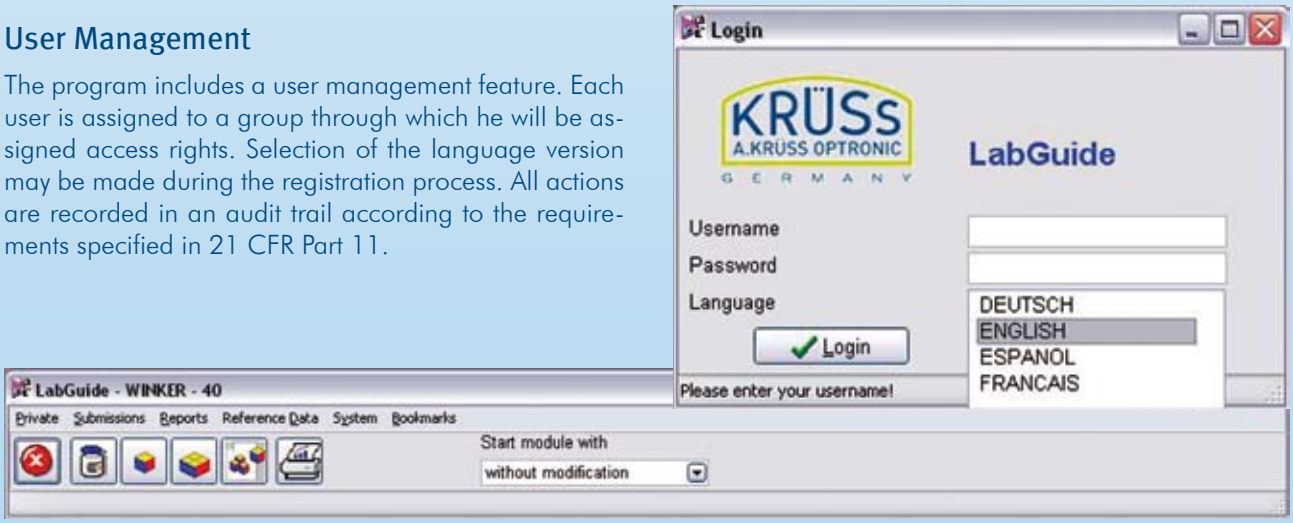
The program KRÜSS-LabGuide makes it easy for the laboratory technician to carry out measuring processes and find related documentations and values.
It replaces the current manual records in the form of electronic journals. All requirements in handling electronic records and electronic signatures (ER/ES) are met by the KRÜSS-LabGuide according to 21 CFR Part 11.
The development of the KRÜSS-LabGuide represents a collaborative effort between A. KRÜSS Optronic GmbH and iCD.GmbH on the basis of Laboratory Information/ Management-Systems (LIMS) LABS/Q.
Established 1796, A.KRÜSS Optronic in Hamburg, Germany has been developing and producing high precision optical measuring instruments for more than two centuries, now featuring state-of-the-art electronics.

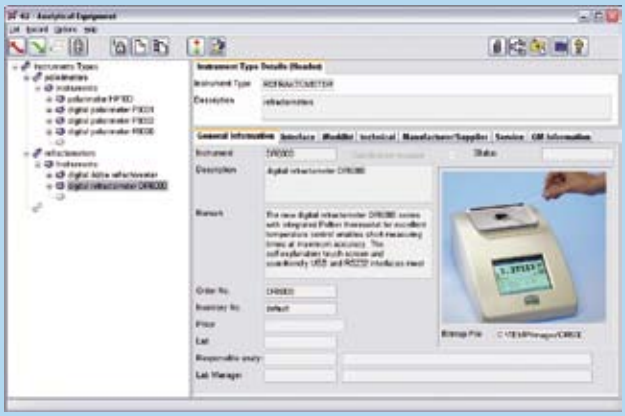
iCD GmbH specializes in the development of software and related consultations for laboratories in the processing industry, government agencies and for energy and water supply enterprises.

KRÜSS-LabGuide software is delivered with the new generation of equipment for digital polarimeters and refractometers. It is our aim to fulfill the particular requirements for documentation and data security serving the pharmaceutical industry. Aside from a multilingual user guide, the system also includes a standardized interface for data exchange with other systems.
A certified interface for SAP-QM is available as optional equipment.

User Management

The program includes a user management feature. Each user is assigned to a group through which he will be assigned access rights. Selection of the language version may be made during the registration process. All actions are recorded in an audit trail according to the requirements specified in 21 CFR Part 11.





Measuring Device Management

The supported laboratory devices are connected with each other via ethernet interface. The units will be automatically registered with KRÜSS-LabGuide and are available to the User for measuring- and test purposes.

Management of Measuring Methods

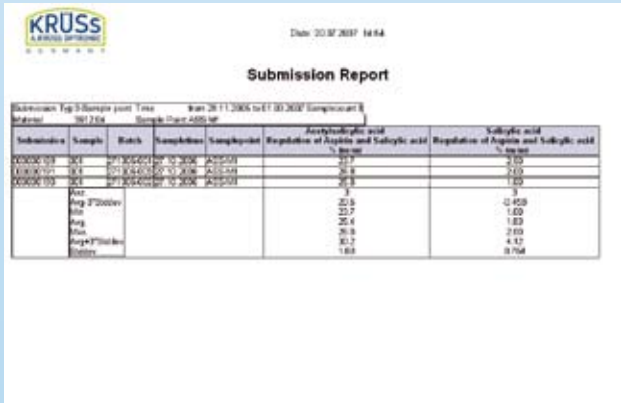
On the basis of prepared measuring methods for polarimeters and refractometers the User may set up and manage his own measuring methods with product-specific marginal values.

Evaluation and Reporting

Aside from the statistical print-outs of the recorded test data, the User has available to him various pre-established reports to print out results and test data. Individual reports may be obtained via external reporting tools with the use of a standardized data bank interface.

Scalability

LabGuide is a data bank based program.
It may be used at an individual work station together with a test device, as well as in a network as an intranet application with several test devices and a central data bank.



Interfaces

Aside from the standardized XML-Interface used to exchange measuring data between LabGuide and other systems, the system offers data exchange with SAP-QM over a certified interface, as an optional feature.

Expandability:

LabGuide may be expanded through a variety of modules, beginning with the connection to other units such as analysis scales, via the management of test devices all the way to a complete, high performance Laboratory Information/Management System (LIMS).

AR2008 | Digital Abbe Refractometer

Fields of application:

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

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

The AR2008 Digital Abbe Refractometer features electronic data evaluation. The refractive index or Brix value can be read from an LCD display, together with the temperature.
Automatic temperature compensation can be optionally activated.
The AR2008 has a thermostat connector for prisms.
Measurement values with the date and time of measurement can be transferred directly to a PC or printer via a serial interface.
A 589nm integrated light source for the prism is present.
The AR2008 is highly robust.
Delivery includes a glass calibration plate, contact fluid and a screwdriver.

Common Specifications		
Measurement range	Sugar scale	0-95% Brix
	Refractive index	1.3000-1.7200nD
	Temperatur	0-99°C
Resolution	0.0001nD	0.1% Brix
	Temperature	0.1°C
Accuracy	Refractive index	0.0002nD 0.1% Brix
Autom. Tempera-ture compensation	0-90°C	
Interface	serial RS-232 9600 Baud serial RS-422 9600 Baud	
Power supply	110/230V, AC, 50/60Hz, 40VA	

AR4 and AR4D | Abbe Refractometers

- Simple operation and low sample quantity requirements.
- Very robust. Supplied together with a glass calibration plate, contact fluid and a screwdriver
- Ideal for solid, viscous and liquid samples (transparent and opaque)
- Measurement of the refractive index nD, the dispersion nF-nC and the dry matter content in Brix is possible, and the prism is temperature controlled
- The measurement process is based on Abbe's law
- Includes digital thermometer
- Both devices comply with ASTM D1218

Fields of application:

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

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

Common Specifications

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

AR4

AR4D

AR2 and AR2L | Abbe Refractometers

- Top price-performance ratio
- Very robust. Delivery includes a glass calibration plate, contact fluid and a screwdriver
- Temperature controlled, includes digital thermometer
- The AR2L also includes LED illumination

Fields of application:

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

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

Common Specifications

Display	Readings via ocular
Illumination	AR2: without illumination
	AR2L: with LED illumination
Accuracy	0.2% Brix; 0.0003nD
Measurement range	0-95% Brix solids content (sugar scale); 1.300-1.700 nD
Power supply	without power supply
Scale division	0.5% Brix; 0.001 nD
Thermometer	Digital thermometer: -40° - 120°C
Dimensions	300 x 150 x 150mm
Weight	4.9 kg
Special features	Adjustable scale

AR2

DR301-95 and DR201-95 | Digital Hand-held Refractometer

DR301-95

- RS-232 serial interface
- Additional scales programmable
- Software for result evaluation
- Tolerance alarm (upper and lower threshold can be entered)
- Automatic turn-off, 3 min. after last input
- Powered by 9V battery (remaining battery power shown on display)
- Power supply optional
- Stainless steel sample plate
- Weight: 500g
- Dimensions: 180 x 100 x 60mm

DR301-95

Measurement unit	nD	%Brix	%Salinity
Measurement range	1.3330-1.5318	0-95	0-30
Accuracy	±0.00015	±0.1	±0.1
Resolution	0.0001	0.1	0.1

Temperature unit	°C	°F
Temp. compensation	5-40	41-104
Temp. range	0-40	32-104
Temp. accuracy	±1	±2
Temp. resolution	0.1	0.1

Fields of application (both devices):

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

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

DR201-95 and DR201-95OE

Compact hand-held digital refractometer for independent quality control in the food, beverages, pharmaceutical, petroleum, chemical industries and winegrowing industries (DR201-95OE).
Simple and accurate measurement over a broad measurement range (0-95% Brix), scale selection and simple calibration without a calibration norm facilitate user-friendly use.
The device features automatic temperature compensation, thus ensuring the accuracy of the concentration measurement.

DR201-95

Measurement unit	nD (DR201-95 only)	%Brix DR201-95 and DR201-95OE)	°Oechsle (DR201-95OE only)
Measurement range	1.3330-1.5318	0-95	0-250
Accuracy	±0.0003	±0.2	1.0
Resolution	0.0001	0.1	1.0

PR21 | Process Refractometer

This process refractometer has been developed for direct insertion into pipes and boilers and is ideal for process control in the food, beverage, pulp and paper, sugar and sweetener, and chemical industries, as well for separation of products.
There is no need to install a bypass line. This simplifies installation in pipes or boilers.

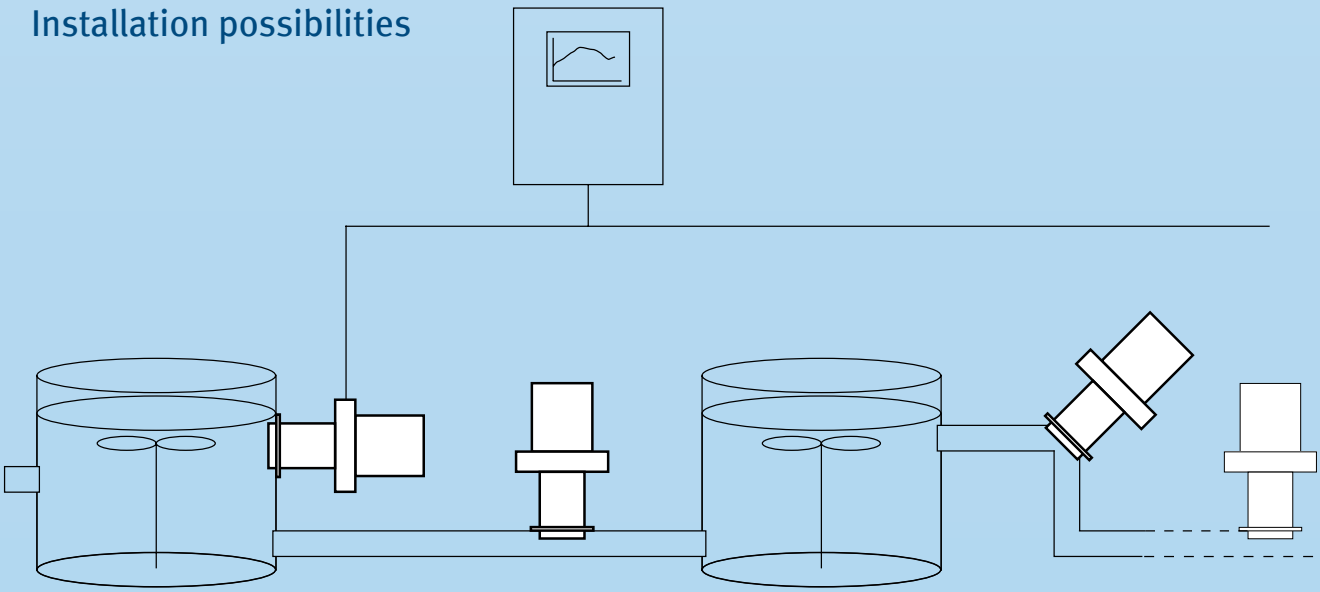
Installation of the process refractometer is simple and fast due to the use of standardized flanges.
Depending on the diameter of the pipe a T-piece or adapter has to be welded on.

Fields of application:

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

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

Installation possibilities



	Model / Article-No.	Refraction Index (nD)	Sugar Scale (% Brix)	Accuracy (nD) / Brix	Resolution (nD) / Brix	Linearity (nD) / Brix
PR21-Series High Precision	PR21-H1	1.32000nD...1.49000nD	0%...80%	+/-0.00002nD +/-0.02%	0.00001nD 0.01%	0.00002nD 0.02%
	PR21-H2	1.35500nD...1.53178nD	15%...95%			
	PR21-H3	1.39000nD...1.55000nD	35%...>95%			
	PR21-H4	1.45000nD...1.60000nD	-			
	PR21-H5	1.50000nD...1.65000nD	-			

	Model / Article-No.	Refraction Index (nD)	Sugar Scale (% Brix)	Accuracy (nD) / Brix	Resolution (nD) / Brix	Linearity (nD) / Brix
PR21-Series Standard Precision	PR21-S1	1.3200nD...1.4900nD	0%...80%	+/-0.0002nD +/-0.1%	0.0001nD 0.1%	0.0002nD 0.1%
	PR21-S2	1.3550nD...1.5317nD	15%...95%			
	PR21-S3	1.3900nD...1.5500nD	35%...>95%			
	PR21-S4	1.4500nD...1.6000nD	-			
	PR21-S5	1.5000nD...1.6500nD	-			

Specifications PR21S and PR21H

Measurement mode	Refractive index, sugar concentration, user defined
Measurement unit	Refractive index [nD], sugar conc. [%Brix], user defined [%]
Measurement time	1 sec
Temp. measurement	-10...200°C
Temp. resolution	0.1°C
Temp. measurement accuracy	0.2°C
Temperature compensation	ICUMSA arbitrary
Temperature sensor	PT1000
Process temperature	-5...160°C
Ambient temperature	0...60°C
Prism	Sapphire
Illumination	LED 590nm

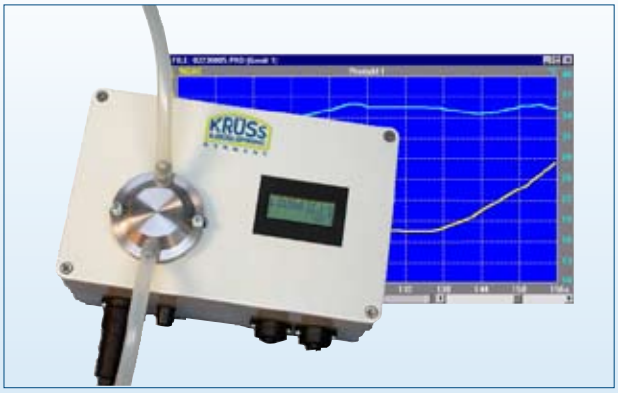
Sensor PR21S and PR21H

Explosion protection	optional
Housing	Stainless steel
Interface to control unit	CAN - Bus, Ethernet
Protection class	IP65
Working voltage	24V

PC Windows Software

With PC Windows software PR WIN, all measurement data can be graphically displayed, stored and analyzed on a PC, an ideal solution in any production department. Up to 16 process refractometers can be connected to one computer.

IR10 | Process Refractometer



The IR10 measures the refractive index with high accuracy and enables sophisticated process monitoring. Measurements are not influenced by color or turbidity. The IR10 provides a temperature-compensated reading to meet your process requirements. It covers a high range of applications in the food, sugar, beverage, chemical, textile, paper, metalworking and petrochemical industries. The instrument is also ideal for waste-water control and a number of other quality inspections.

Fields of application:

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

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

Features:

- Excellent price-performance ratio
- Wide measuring range 1.3300nD to 1.5600nD; 0% to 95% Brix
- User-friendly touch screen
- Only 2 seconds measuring time
- Password protected
- Easy-to-clean prism inside the test chamber
- Stainless steel test chamber, suitable for food samples
- User-friendly interfaces for direct connection to an SPS control system
- Small sample quantities needed
- Very easy to instal, no special requirements

Specifications IR10

Measurement range	1.3300nD - 1.5600nD 0% - 95% Brix
Accuracy	0.0002nD; 0.2%Brix
Resolution	0.0001nD; 0.1%Brix
Measurement units	Refractive index [nD] Saccarose [%Brix] Invert sugar [%Brix] Glucose [%Brix] Fructose [%Brix]
Measurement time	~2 sek.
Temperature measurement	-10 to 99.9°C
Temperature resolution	0.1°C
Temperature accuracy	0.2°C
Temperature compensation	ICUMSA
Temperature sensor	PT1000
Prism	Sapphire
Illumination	LED 590nm
Housing	Cast steel
Interfaces	RS232, analog 4-20mA / 0-20mA
Protection class	IP65
Working voltage	24V
Display	LCD 120x32 Pixel
Operation	Touchscreen
Output	1 Relay

ER60 Series | Table Gem Refractometers

Refractometers for the determination of the refractive index, quality control and categorization of gemstones. The A.KRÜSS Optronic Table Refractometer gives exceptionally crisp, sharp readings and a large field of view.

ER6010 and ER6012
Illumination not pictured

ER6010 and ER6012

Professional Table Gem Refractometer with polarisation filter.

Measurement range:	1.33 - 1.83nD
ER6010:	With LED illumination, with transformer 110-230V, without NA filter
ER6012:	Without LED illumination, with NA filter

ER6040 and ER6042
Illumination not pictured

ER6040 and ER6042

Standard Table Gem Refractometer with polarisation filter.

Measurement range:	1.33 - 1.81nD
ER6040:	With LED illumination with transformer 110-230V, without NA filter.
ER6042:	Without LED illumination, with NA filter.

HR-Series | Manual Hand-held Refractometers

These are precision instruments for determining the solid contents dissolved in liquids, such as sugar, salt, serumprotein in blood and starch. A few drops of the sample is placed on the refractometer prism and the index of refraction is measured. From this, dissolved solids can be determined in seconds.

This method is very useful for process or quality control of beet or cane sugar, fruit juices, jam, vegetable juices, soft drinks, and canned foods to name a few applications. The hand refractometer fits in every pocket! Delivered in a handy storage case with conversion tables.

Fields of application:

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

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

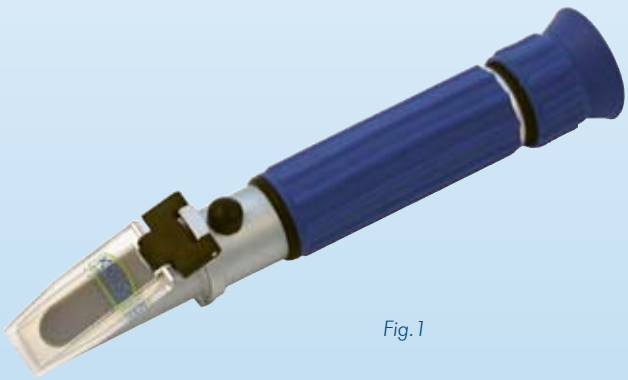


Fig.1

Fig.2

Fig.3

Fig.4

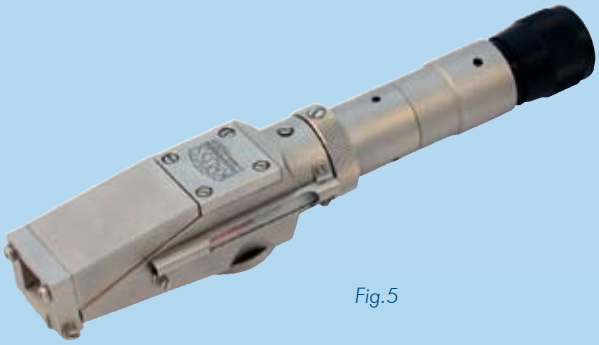


Fig.5

Manual Hand-held Refractometers

Model	Fig. No.	Measurement range	Accuracy	Scale division	Temperature-compensation	Thermo-meter	Application
HR10	Fig. 1	0-10 %Brix	0.1 %	0.1 %	-	-	For sugar concentration in fruit juces, soft drinks, vegetables, foods and cooling lubricants
HR18-01	Fig. 1	0-18 %Brix	0.1 %	0.1 %	-	-	For sugar concentration in fruit juces, soft drinks, vegetables, foods and cooling lubricants
HRKL32	Fig. 1	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
HR20	Fig. 1	0-20 %Brix	0.2 %	0.2 %	-	-	For sugar concentration in fruit juces, soft drinks, vegetables, foods and cooling lubricants
HRN32	Fig. 2	0-32 %Brix	0.2 %	0.2 %	-	-	For sugar concentration in fruit juces, soft drinks, vegetables, foods and cooling lubricants
HRT32	Fig. 2	0-32 %Brix	0.2 %	0.2 %	automatic	-	For sugar concentration in fruit juces, soft drinks, vegetables, foods and cooling lubricants
HRN62	Fig. 3	28-62 %Brix	0.2 %	0.2 %	-	-	For analysing chemical and technical liquids, such as oils, fats, coolants, lubricants
HRT62	Fig. 3	28-62 %Brix	0.2 %	0.2 %	automatic	-	For analysing chemical and technical liquids, such as oils, fats, coolants, lubricants
HRN82	Fig. 3	45-82 %Brix	0.5 %	0.5 %	-	-	For analysing chemical and technical liquids, such as oils, fats, coolants, lubricants
HR92	Fig. 3	58-92 %Brix; 38-45° Baume; 17-27 % Water	0.5 %	0.5 % 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. 3	12-30 % water content in honey	0.1 %	0.1 %	-	-	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 %	0.2 %	-	10-40 °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
HR901	Fig. 5	1.333-1.517 nD	0.0005 nD	0.0005 nD	-	10-40 °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
HR27-100	Fig. 2	0-100 ‰ Salt	0.1 %	0.1 %	-	-	For salinity analysis
HRS16	Fig. 2	0-160 ‰ Salt; 1.333-1.373 nD	0.2 %	0.2 %	-	-	For salinity analysis
HR146	Fig. 2	0-28 % Salt	0.2 %	0.2 %	-	-	For the measurement of serum protein and specific urine weight
HRM18	Fig. 2	0-12 g/dl; 1.333-1.360 nD; 1.000-1.050 UW	0.2 g/dl; 0.0005 nD; 0.02 UW	0.2 g/dl; 0.0005 nD; 0.02 UW	-	-	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 UW	0.00	0.2 g/dl; 0.0005 nD; 0.02 UW	automatic	-	For the measurement of serum protein and specific urine weight
HRO32	Fig. 2	0-32 %Brix; 30-130 °Oechsle; 4.4-18.5 % Alcohol	0.2 %	0.2 %Brix; 1° Oechsle; 0.1 % Alcohol	-	-	For the measurement of oechsle and alcohol content in must
HROT32	Fig. 2	0-32 %Brix; 30-130 °Oechsle; 4.4-18.5 % Alcohol	0.2 %	0.2 %Brix; 1° Oechsle; 0.1% Alcohol	automatic	-	For the measurement of Brix, oechsle and alcohol content in must
HRKFZ1	Fig. 2	0-50 °C; 1.10-1.30 Battery fluid; Ethylene- and propylenglycol	Ethylene-Propylen: 5° Battery fluid: 0.01	Ethylene-Propylen: 5° Battery fluid: 0.01	-	-	Anti freeze and battery fluid tester
HR25-800	Fig. 4	0-80 %Brix	1 %	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

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 extremly robust, compact and easy to operate. Bacause it is so small it does not take up valuable space in the laboratory.

Specifications PT31	
Resolution	0.1°C
Heating power	30W
Cooling power	15W
Power supply	115-230 VAC
Pump performance	2000 Pa
Pump pressure	20l/h
Temperature	8° to 40°C (continuously adjustable)
Temperature accuracy	±0.2°C
Dimensions	L/B/H 140x80x210mm
Weight	1.5kg

CBM910 | Printer

24 character normal paper printer for digital refractometers from the DR6000 Series and the AR2008 Abbe Digital Refractometer, as well as for our P8000 Series Digital Polarimeters

AR15 | Funnel Flow Cell Bulb

Funnel Flow Cell Bulb upgrade for AR4 and AR2008

AR16 | Flow Cell Bulb

Flow Cell Bulb upgrade for continuous measurement with the AR4 and AR2008

Refractometer calibration solutions

- **RI34** calibration solution 1.3400nD (=5% Brix), for calibration of HR10, HR18, HRN/HRT32, HR25/800 and HR900/901
- **RI39** calibration solution 1.3900nD (35% Brix), for calibration of HRN/T62, HR25/800, HR900/901 and Abbe refractometers
- **RI43** calibration solution 1.4300nD (55% Brix), for calibration of Abbe refractometers and HRN/HRT62
- **RI48** calibration solution 1.4800nD (76% Brix), for calibration of Abbe refractometers and HRN82 and HR92
- **RI65** calibration solution 1.6500nD for calibration of Abbe refractometers

  All bottles contain 30cc and are supplied with a certificate

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