

Operating manual ABBE refractometer

**KERN ORT 1RS Analogue
 Brix and nD**

Version 1.0
01/2015
GB





KERN ORT

Version 1.0 01/2015

Operating instructions ABBE refractometer

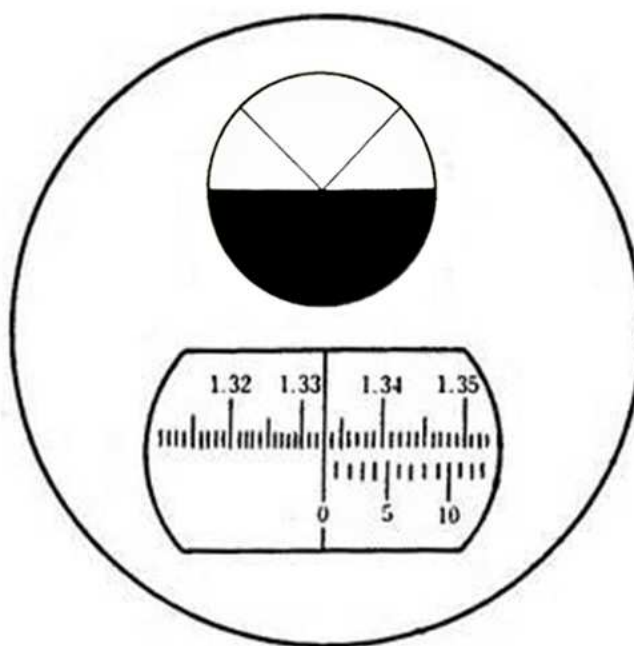
Contents

1	Technical data	3
2	Description	4
3	General information	5
3.1	Intended use	5
3.2	Warranty	5
4	Basic safety information	5
4.1	Follow the instructions in the operating manual	5
4.2	Warning	6
5	Supplied items	6
6	Before the first use	6
7	Use/measurement	7
7.1	Calibration with distilled water	7
7.2	Calibration with calibration block	8
7.3	Measuring procedure for liquids	9
7.4	Measuring procedure for solids	9
8	Cleaning and maintenance	10
9	Storage	10
10	Service	10
11	Disposal	10
12	Additional information	10
13	Brix to refractive index (nD) conversion table	11
14	Refractive index (nD) and dispersion of distilled Water (nF – nC) Subject to the temperature (°C)	12

Technical data

Model KERN	Scales	Measuring range	Accuracy	Division
ORT 1RS	Brix Refractive index	0 – 95% 1.3000-1.7000 nD	$\pm 0.1\%$ ± 0.0002 nD	$\pm 0.25 \%$ ± 0.0005 nD

Scale for the ORT 1RS

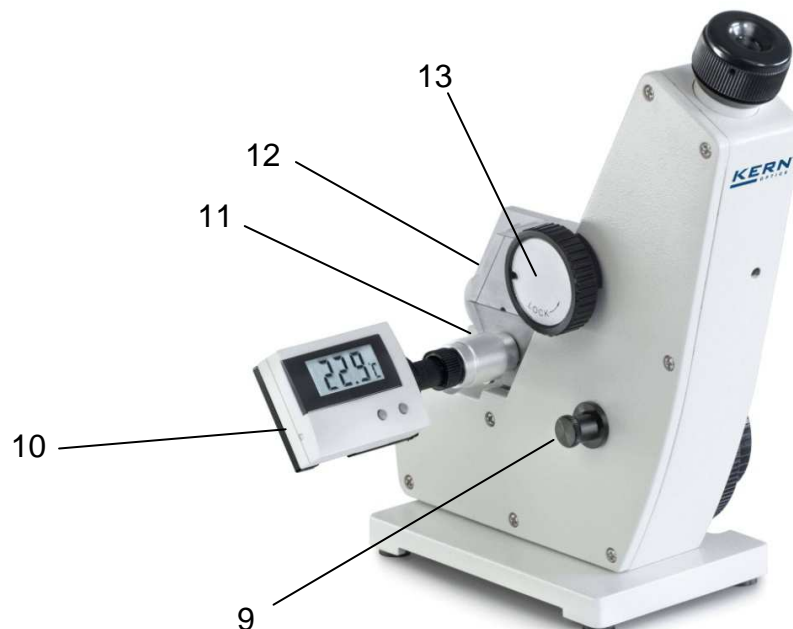


1 Description



- 1. Baseplate
- 2. Housing
- 3. Adjustment screw
- 4. Eyepiece

- 5. Illumination prism
- 6. Measuring prism
- 7. Scatter settings
- 8. Measuring range adjusting wheel



- 9. Condenser
- 10. Thermometer
- 11. Reflection mirror

- 12. Protective plate
- 13. Prism lock

2 General information

2.1 Intended use

The refractometer is a measuring instrument for determining the refractive index of translucent liquids, dispersions and emulsions. It is used to observe the behaviour of light as it passes from a prism with known properties to the substance being tested. Using the refractometer for other purposes is contrary to its intended use and may be hazardous. The manufacturer shall not be liable for any damages caused by improper use.

2.2 Warranty

The warranty is void in the event of:

Failure to observe the instructions in the operating manual

Use for purposes other than those described

Modifications or opening the device housing

Mechanical damage and/or damage resulting from media, liquids, natural wear and tear

3 Basic safety information

3.1 Follow the instructions in the operating manual



Carefully read through the operating manual even if you have prior experience with KERN refractometers.
Every language version includes a non-authoritative translation.
The original German document is the definitive version.

3.2 Warning

Do not let acids come into contact with skin or eyes. If acid comes into contact with skin, flush with copious amounts of water. Shower if larger areas of skin are affected.

If acid comes into contact with eyes, keep the eyelid open and flush the eye with running lukewarm water from the outer corner to the inner corner. Flush eyes for at least 15 minutes. Then consult a doctor or ophthalmologist immediately.

Thoroughly clean the refractometer after each use.

The refractometer must not be exposed to extreme temperatures, high mechanical stresses, strong direct sunlight or high humidity.

This refractometer is not a toy. Keep out of reach of children.

Make sure that you will not be hit by anything else while you are using the refractometer, as this could cause serious eye injuries

Do not touch the lenses with your fingers.

4 Supplied items

After unpacking and before using the device for the first time, check that all listed parts have been supplied. Replace damaged or faulty parts immediately and do not put them into operation.

- ⇒ Refractometer
- ⇒ Thermometer
- ⇒ Adjustment tool
- ⇒ Cleaning cloth
- ⇒ Calibration Block
- ⇒ Contact liquid (Alpha-Bromonaphtalene)

5 Before the first use

Remove the protective film (if present) from the prism surface [6].

6 Use/measurement

The refractometer can be used to quickly and accurately determine the refractive index of liquid, solid, and pasty samples. Please make sure your hands are dry before handling the measuring device. The protective plate [5] must be open during measuring procedure and after having finished must be reclosed.

The measured temperature can be read off with the aid of the thermometer provided. Both the measuring prism [6] and the illumination prism [5] can be connected to a water circuit. On the casing [2] and on the illumination prism [5] are connecting stubs for a water flow and return. Install the water circuit such that the water first passes through the two parts of the casing and then exits at the thermometer. This allows a more precise temperature reading. The water supply device is not included as part of the scope of delivery.

Important!



The ambient/room temperature and the sample temperature influence the refractometer measuring result.

The scales are designed for an ambient temperature of +20 °C!

6.1 Calibration with distilled water

Prior to any kind of measuring procedure a calibration should be effected.

Zero point calibration may be carried out by using distilled water. This is the more convenient way to calibrate the refractometer, but not as accurate as the calibration with block, described under 7.2. Open the illumination prism [5], apply some drops of distilled water to the measuring prism [6]. Close the illumination prism [5] and lock with the prism lock [13]. Open the protective plate [12] and close the reflection mirror [11]. Now look through the eyepiece and using the adjusting wheel [8] bring the scale to the 0% Value. If the image is not in focus, use the adjusting ring on the eyepiece [4] to focus it. The crosshairs in the upper display should now be congruent with the light/dark line. If the boundary line is not exactly in the centre of the crosshairs, it must be adjusted. With the aid of the screwdriver provided, move the adjusting screw [3]. If the boundary line and the crosshairs are congruent, the calibration is correct. Now clean the instrument, see point 8.

6.2 Calibration with calibration block

Prior to any kind of measuring procedure a calibration should be effected.

Zero point calibration has to be carried out using the calibration block which is part of the standard equipment. Open the illumination prism [5], apply some contact liquid (Alpha-Bromonaphtalene) to the measuring prism [6] and place the calibration block with the polished surface downwards on to the measuring prism[6]. There should be no air bubbles trapped between the calibration block and the prism. Slightly shade the calibration block and the illumination prism[5], by moving the illumination prism down as far as possible. Then open the reflection mirror [11] so that light can reach the measuring prism [6]. Now look through the eyepiece and using the adjusting wheel [8] bring the scale to the %Value which is written on top of the calibration block. If the image is not in focus, use the adjusting ring on the eyepiece [4] to focus it. The crosshairs in the upper display should now be congruent with the light/dark line. If the boundary line is not exactly in the centre of the crosshairs, it must be adjusted. With the aid of the screwdriver provided, move the adjusting screw [6]. If the boundary line and the crosshairs are congruent, the calibration is correct. Now clean the instrument, see point 8.

6.3 Measuring procedure for liquids

Make sure your hands are dry before handling the refractometer.
Open the illumination prism [5] by turning the locking mechanism [13].
Apply one or two drops of the liquid onto the measuring prism [6], then move the illumination prism [6] down again and secure using the locking [13] mechanism. Open the protective plate [12] and close the reflection mirror [11].
Focus the image by turning the adjusting wheel [7] right or left while looking through the eyepiece.
Then move through the measuring range turning the measuring range adjusting wheel [8] right or left. When the light/dark boundary in the upper window is congruent with the crosshairs, the value can be read off in the lower window.

6.4 Measuring procedure for solids

Make sure your hands are dry before handling the refractometer.
Open the illumination prism [5] by turning the locking mechanism [13].
Apply a drop of the contact liquid to the measuring prism [6] and place the flat surface of the solid sample on the prism. Press only slightly. No air bubbles should be trapped between the block and the prism. Shade the object being examined slightly.
Move the illumination prism [5] down until it touches the block. Open the reflection mirror [11] and forward light directly to the measuring prism [6].

Focus the image by turning the adjusting wheel [7] right or left while looking through the eyepiece.
Then move through the measuring range turning the measuring range adjusting wheel [8] right or left. When the light/dark boundary in the upper window is congruent with the crosshairs, the value can be read off in the lower window.

Important!



After every measurement, use a lint-free, absorbent cloth to remove the fluids from the prism surface [4]. Then carefully clean the prism and prism cover using a cloth moistened with water or if necessary alcohol, and dry both parts using a soft, dry and lint-free cloth. Avoid rubbing the prism [4].

7 Cleaning and maintenance

Clean the refractometer by using a soft, lint-free cloth moistened with water, or if necessary use pure alcohol. Do not use any aggressive or abrasive cleaning agents. Never immerse the device in water or hold it under running water. Never handle the device with wet or damp hands.

Never touch the measuring prism [6] with hard tools made from plastic, wood, rubber, metal, glass etc. Hard objects can quickly damage the relatively soft prism glass, resulting in measurement errors.

The refractometer is maintenance-free.

The refractometer should be cleaned immediately before and after each use. This promotes long refractometer life and an accurate measurement result.

8 Storage

Store the refractometer in a dry, non-corrosive environment, preferably between 10 °C and 30 °C.

9 Service

After reading this operating manual, if you have any questions about setting up or using the refractometer, or if any unexpected problem occurs, please contact your dealer. The device housing may only be opened by trained service technicians authorised by KERN.

10 Disposal

The packaging consists of environmentally friendly materials which can be disposed of via local recycling facilities.

The device and storage box should be disposed of by the operator in accordance with applicable national or regional regulations at the place of use.

11 Additional information

The product may differ slightly from the illustrations. We reserve the right to make changes to reflect technical advancements, decorations not included.

Avoid exposing the refractometer to direct sunlight!

Never bring the refractometer into contact with solvents.

12 Brix to refractive index (nD) conversion table

BRIX %	Refractive index nD	BRIX %	Refractive index nD	BRIX %	Refractive index nD
0	1.33299	30	1.38115	60	1.44193
1	1.33442	31	1.38296	61	1.44420
2	1.33586	32	1.38478	62	1.44650
3	1.33732	33	1.38661	63	1.44881
4	1.33879	34	1.38846	64	1.45113
5	1.34026	35	1.39032	65	1.45348
6	1.34175	36	1.39220	66	1.45584
7	1.34325	37	1.39409	67	1.45822
8	1.34476	38	1.39600	68	1.46061
9	1.34629	39	1.39792	69	1.46303
10	1.34782	40	1.39986	70	1.46546
11	1.34937	41	1.40181	71	1.46792
12	1.35093	42	1.40378	72	1.47037
13	1.35250	43	1.40576	73	1.47285
14	1.35408	44	1.40776	74	1.47535
15	1.35568	45	1.40978	75	1.47787
16	1.35729	46	1.41181	76	1.48040
17	1.35891	47	1.41385	77	1.48295
18	1.36054	48	1.41592	78	1.48552
19	1.36218	49	1.41799	79	1.4881
20	1.36384	50	1.42009	80	1.49071
21	1.36551	51	1.42220	81	1.49333
22	1.36720	52	1.42432	82	1.49597
23	1.36889	53	1.42647	83	1.49862
24	1.37060	54	1.42862	84	1.50129
25	1.37233	55	1.43080	85	1.50398
26	1.37406	56	1.43299		
27	1.37582	57	1.43520		
28	1.37758	58	1.43743		
29	1.37936	59	1.43967		

Data from "ICUMSA" International Commission for Uniform Methods of Sugar Analysis, at 20 °C and 589 nm wavelength.

**13 Refractive index (nD) and dispersion of distilled Water (nF – nC)
Subject to the temperature (°C)**

°C	nD	nF - nC	°C	nD	nF - nC
10	1,33369	0,00600	26	1,33240	0,00596
11	1,33364	0,00600	27	1,33229	0,00595
12	1,33358	0,00599	28	1,33217	0,00595
13	1,33352	0,00599	29	1,33206	0,00594
14	1,33346	0,00599	30	1,33194	0,00594
15	1,33339	0,00599	31	1,33182	0,00594
16	1,33331	0,00598	32	1,33170	0,00593
17	1,33324	0,00598	33	1,33157	0,00593
18	1,33316	0,00598	34	1,33144	0,00593
19	1,33307	0,00597	35	1,33131	0,00592
20	1,33299	0,00597	36	1,33117	0,00592
21	1,33290	0,00597	37	1,33104	0,00591
22	1,33280	0,00597	38	1,33090	0,00591
23	1,33271	0,00596	39	1,33075	0,00591
24	1,33261	0,00596	40	1,33061	0,00590
25	1,33250	0,00596			