

## Operating manual ABBE refractometer

### KERN ORT 1RS Analogue Brix und nD



Version 1.2 04/2019

#### KERN & Sohn GmbH

Ziegelei 1  
D-72336 Balingen  
E-Mail: info@kern-sohn.com

Tel: +49-[0]7433-9933-0  
Fax: +49-[0]7433-9933-149  
Internet: www.kern-sohn.com

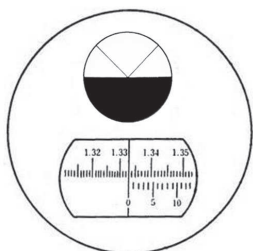
## CONTENTS

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

## 1. Technical data

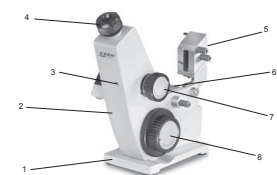
Model KERN	Scales	Measuring range	Accuracy	Division
ORT 1RS	Brix Refractive index	0 – 95 % 1,3000-1,7000 nD	± 0,1% ± 0,0002 nD	± 0,25% ± 0,0005 nD

Scale for  
ORT 1RS

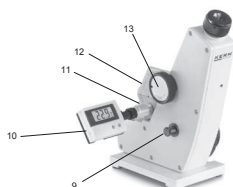


1

## 2. Description



1. Baseplate
2. Casing
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

## 3. General information

### 3.1 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.

### 3.2 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

## 4. Basic safety information

### 4.1 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.

### 4.2 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

## 5. 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 (1-Bromonaphthalene)

5

## 6. Before the first use

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

## 7. 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.



The refractometer cannot be used for the measurement of oil-based fluids.

6

**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!



**7.1 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 (1-Bromonaphthalene) 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 nD-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.

7

**7.2 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.

**7.3 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.

8

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.

**7.4 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].



9

**8. 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.

10

**9. Storage**

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

**10. 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.

**11. 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.

**12. 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.

11

**13. Brix to refractive index (nD) conversion table**

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

Refractive index nD	BRIX %	Refractive index nD	BRIX %
1.44109	60	1.38115	30
1.44420	61	1.38296	31
1.44450	62	1.38478	32
1.44481	63	1.38661	33
1.45113	64	1.38846	34
1.45348	65	1.39032	35
1.45584	66	1.39220	36
1.45821	67	1.39409	37
1.46061	68	1.39600	38
1.46303	69	1.39792	39
1.46546	70	1.39986	40
1.46792	71	1.40181	41
1.47037	72	1.40378	42
1.47285	73	1.40576	43
1.47535	74	1.40776	44
1.47787	75	1.40976	45
1.48040	76	1.41181	46
1.48295	77	1.41385	47
1.48552	78	1.41592	48
1.4881	79	1.41799	49
1.49071	80	1.42009	50
1.49333	81	1.42220	51
1.49597	82	1.42432	52
1.49862	83	1.42647	53
1.50129	84	1.42862	54
1.50398	85	1.43080	55
		1.43299	56
		1.43520	57
		1.43743	58
		1.43967	59
		1.44192	60

12

**14. 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			

**15. Annex**

Table 1: International Temperature Correction Table for °Brix (by sugar gradient) Correct the result by the following values (refractometer must be correctly calibrated at 20 °C).

Temperature °C	% Brix reading																	
	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	65.0	70.0	75.0	80.0	85.0
10.0	-0.33	-0.58	-0.59	-0.22	-0.21	-0.21	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.22
11.0	-0.49	-0.52	-0.54	-0.57	-0.59	-0.61	-0.63	-0.64	-0.65	-0.66	-0.67	-0.68	-0.68	-0.68	-0.67	-0.67	-0.66	-0.66
12.0	-0.44	-0.47	-0.49	-0.51	-0.53	-0.55	-0.56	-0.57	-0.58	-0.59	-0.60	-0.61	-0.61	-0.61	-0.60	-0.60	-0.60	-0.59
13.0	-0.40	-0.41	-0.43	-0.45	-0.47	-0.48	-0.50	-0.51	-0.52	-0.52	-0.53	-0.53	-0.53	-0.53	-0.53	-0.53	-0.52	-0.52
14.0	-0.34	-0.36	-0.38	-0.39	-0.40	-0.42	-0.43	-0.44	-0.44	-0.45	-0.45	-0.46	-0.46	-0.46	-0.45	-0.45	-0.44	-0.44
15.0	-0.29	-0.31	-0.32	-0.33	-0.34	-0.35	-0.36	-0.37	-0.37	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.37	-0.37	-0.37
16.0	-0.24	-0.25	-0.26	-0.27	-0.28	-0.28	-0.29	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31	-0.31	-0.31	-0.30	-0.30	-0.30
17.0	-0.18	-0.19	-0.20	-0.20	-0.21	-0.21	-0.22	-0.22	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.23	-0.22
18.0	-0.12	-0.13	-0.13	-0.14	-0.14	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
19.0	-0.06	-0.06	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07
20.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21.0	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07
22.0	0.13	0.14	0.14	0.14	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15
23.0	0.20	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.22
24.0	0.27	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.31	0.31	0.31	0.30	0.30
25.0	0.34	0.35	0.36	0.37	0.38	0.38	0.39	0.39	0.40	0.40	0.40	0.40	0.40	0.39	0.39	0.39	0.38	0.37
26.0	0.42	0.43	0.44	0.45	0.46	0.46	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.47	0.47	0.46	0.46	0.46
27.0	0.50	0.51	0.52	0.53	0.54	0.55	0.55	0.56	0.56	0.56	0.56	0.56	0.56	0.55	0.55	0.54	0.53	0.52
28.0	0.58	0.59	0.60	0.61	0.62	0.63	0.64	0.64	0.65	0.65	0.65	0.64	0.64	0.63	0.62	0.61	0.60	0.60
29.0	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.73	0.73	0.73	0.73	0.73	0.72	0.71	0.70	0.69	0.68	0.68
30.0	0.74	0.75	0.77	0.78	0.79	0.80	0.81	0.81	0.82	0.81	0.81	0.81	0.81	0.80	0.79	0.78	0.77	0.75

14