DR6000 Series | Manual
Content

Introduction 7

About this manual
Instruction manual layout 7
Symbols 7
Locating information 7

Chapter 1 – Technical specifications 8
Specifications at a glance 8
Fields of application 9

Chapter 2 – Device description 10
2.1. Scope of delivery 10
2.2. Device images 11
Device image DR6000-T front 11
Device image DR6000-T back 11
Device DR6000 with thermostat 11
Device DR6000 with printer 12
Device DR6000T with LIMS connection 12
Device models 13
2.3. Screen descriptions 14
Main menu 14
Overview of submenus 15
2.4. Measurement principle 16
2.5. Basic operation 16

Chapter 3 – Initial start-up 17
3.1. Installation 17
Choosing an appropriate location 17
Connecting the power 17
Connecting the printer 17
Connecting the thermostat 18
3.2. Preparation 18
Cleaning the measurement surface 18
Chapter 4 – Normal operation

4.1. Preparing the device
Switching the device on
Logging in
Cleaning the measurement surface
Carrying out a zero balance
Selecting a method

4.2. Measurement settings
Opening the mode menu
Selecting a mode
Entering a sample number
Measuring QC samples
Saving settings

4.3. Carrying out measurements
Supplying the sample
Starting measurement
Measurement
After measurement

4.4. Measurement results
Measurement result display
Printing measurement results
Printing the measurement display
Printing stored measurement results
Exporting measurement results
Showing details of measurement results

Kapitel 5 - Settings

5.1. Mode menu
Opening the mode menu
Description of functions in the mode menu
Carrying out a zero balance
Quality control measurement

5.2. Method menu
Opening the method menu
Creating a new method
Editing method parameters
Entering the target temperature
Temperature compensation

5.3. System menu
Opening the system menu
Setting the date and time
Firmware update
Determining the tare
Clearing tare
Setting the display brightness
Temperature settings
Selecting a temperature unit
Entering the temperature tolerance
Device connections
Configuring the network
Defining a serial interface

5.4. Results menu
Opening the results list
Selecting results
Marking results
Filtering results
Configuring columns
Adding columns
Showing printing results
Printing results
Exporting results

5.5 User menu
Opening the user menu
User management
Creating a new user
Assigning user rights
Entering the period of validity
Editing users
Activating login

Chapter 6 – Maintenance and Care

6.1 Regular maintenance and care
Daily
Introduction

About this manual
Although the device is easy to use, you should read the Instruction Manual carefully so as to be able to properly and efficiently use all functions.

Instruction manual layout
- Chapter 1-2
  Device description
- Chapter 3-4
  Installation and normal operation
- Chapter 5
  Device settings
- Chapter 6 - 7
  Maintenance, care and troubleshooting

Symbols
The following symbols are used in this manual:

- List
- Instruction to do something
- Italic: Italicised text indicates text in a dialog window
- Reference to further information in the manual

Locating information
- Consult the Table of Contents.
- An overview of menus and possible settings can be found in Chapter 2 and Chapter 5.
- If an error occurs, see Chapter 7 for troubleshooting.
Chapter 1 – Technical specifications

DR6000 family refractometers are easy to use and 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. All data (measurement values, parameters and methods) are organised in an SQL database. Selected results may also be exported to a USB flash drive in Excel/HTML format, and firmware updates can be applied without difficulty using a USB flash drive as well. The user interface is available in six languages (German, English (US+UK), French, Italian, Portuguese and Spanish).

Specifications at a glance

- Large measurement range from 1.32000nD to 1.70000nD; 0.00%-95.00% Brix
- Resolution up to 0.00001nD; 0.01% Brix
- User-friendly touch screen operation
- Programmable: measurement unit, temperature compensation and tare
- Convenient user management
- Automatic device zero balance during boot process or as user function
- The prism can be cleaned easily and reduces the risk of sample carryover
- Only small sample quantities necessary, 0.5ml to 1ml
- Printer and PC connection
- RS232, network and USB interfaces
- Data display of all important settings and measurements
- High speed processor
- Integrated high-accuracy Peltier thermostat for temperature control
- High quality ceramic PT100 sensor
- NIST compliant calibration certificate
- Full GLP suitability

Fields of application

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

- Pharmaceutical industry
- Cosmetic industry
- Pulp and paper industry
- Chemical industry
- Beverage industry
- Food industry
- Sugar and sweetener industry
- Textiles industry
Chapter 2 – Device description

The following topics are covered in this chapter:

- Scope of delivery
- Device images with descriptions
- Device combinations (printer, LIMS, thermostat)
- Monitor description (touch screen)
- Overview of menus

2.1. Scope of delivery

2.2. Device images

Device image DR6000-T front

Device image DR6000-T back

Device DR6000 with thermostat
### Chapter 2 – Device description / 2.2. Device images

<table>
<thead>
<tr>
<th>Model</th>
<th>Device specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR6000-T</td>
<td>Refractometer with measurement surface and internal Peltier heating</td>
</tr>
<tr>
<td>DR6100-T</td>
<td>Refractometer with measurement surface, without internal Peltier heating (thermostat connectable)</td>
</tr>
<tr>
<td>DR6200-T</td>
<td>Refractometer with flow cell, without Peltier heating</td>
</tr>
<tr>
<td>DR6300-T</td>
<td>Refractometer with flow cell and internal Peltier heating</td>
</tr>
</tbody>
</table>

**Device models**

- Device DR6000 with printer
- Device DR6000T with LIMS connection
2.3. Screen descriptions

The following screens of the DR6000 refractometer family will be described in this chapter:

- Main menu
- Overview of submenus

Main menu

You can start measurement and view results in the main menu. The buttons lead to further submenus.

Overview of submenus

- **Mode**
  - All settings for the next measurement are made in the mode menu. It is also possible to perform a zero balance. See Chap. 5.1

- **Methods**
  - Methods are called, defined, modified and deleted in the method menu. See Chap. 5.2

- **System**
  - All device settings such as date, language, etc. are set in the system menu. See Chap. 5.3

- **Results**
  - All results appear in the results menu. They can be filtered, sorted, printed and exported. See Chap. 5.4

- **User**
  - Users are defined and assigned rights in the user menu. See Chap. 5.5
Chapter 2 – Device description / 2.4. Measurement principle

2.4. Measurement principle
Measurement is based on the determination of a point of total reflection in a medium. The refractive index nD is determined through the use of an LED light source with a 590 nm wavelength. The refractive index nD changes with the concentration of the medium and the temperature.

2.5. Basic operation
The device is operated through a touch screen display. Operation is controlled through menus and submenus. The submenus can be reached through their respective buttons. You can return to the previous menu level using Cancel or OK.

OK: Temporarily saves the settings and leaves the submenu.

Choosing an appropriate location
▲ Place the device on a level and stable surface.

Important Note!
The location should be free of vibrations and shocks. Do not place the device in direct sunlight. Both will lead to incorrect measurement results.

Connecting the power
▲ Connect the power cable. Permitted power sources: 90V...240V, 50/60Hz

Connecting the printer
▲ Connect the printer to the serial port.

Note!
All further submenus below the main menu must be confirmed with OK before the settings are permanently saved.

Note!
Previously saved values in further submenus will also not be saved!

Chapter 3 – Initial start-up
The following topics are covered in this chapter:
• Installation
• Device presets
• Basic operation

3.1. Installation

Choosing an appropriate location

Connecting the power

Connecting the printer
Chapter 3 – Initial start-up / 3.2 Preparation

Connecting the thermostat
A thermostat can be connected for devices without internal heating.

Connecting the tubes
- Connect the thermostat and the refractometer using the hose connectors with the two supplied hoses.

Filling with water
- Fill the thermostats with water.
  An additive (water bath cleaner PT35) is recommended to prevent the build-up of algae.
  The operation of the thermostats is described in the instruction manual supplied with the thermostats.

Chapter 4 – Normal operation

The following topics are covered in this chapter:
- What to do after switching the device on
- How to prepare your device
- How to prepare the measurements
- How to start measurements
- How to print your results
- How to export your results

4.1 Preparing the device

Switching the device on
- Push the power switch.
  The device will boot.

Logging in
- If a login is requested, the login screen will appear first.
- Click on Login.
- Enter your username and password and confirm with OK.

Note!
Login can be activated on the device under Users > User Management > Activate login

How to activate/deactivate the login screen and define, modify and delete users, passwords and user rights is described in Chap. 5.5. To troubleshoot login problems, see Chap. 7.
The initial menu will appear after successfully logging in, requesting that the measurement surface be cleaned.

**Cleaning the measurement surface**

- Clean the measurement surface with distilled water or a suitable solvent for the sample.

**Important Note!**

It is absolutely necessary for the measurement surface to be clean!

After pushing Next, the device will initialise and carry out a zero balance.

Results will be incorrect if the measurement surface is dirty when the zero balance is carried out.

**Carrying out a zero balance**

- Push .

The device will initialise and carry out a zero balance.

**Important note!**

If the measurement surface was dirty or something else interfered with the zero balance, you can manually carry out a zero balance under Mode > Zero balance.

The device is now ready for use.

- Push again.

The main menu will appear. The last selected method will still be set.

**Choose method**

The desired method must be selected before measurement.

- Push .

The method menu will appear.

**Select the desired method using the ▼ button.**

**Save your selection with OK.**

The method menu will close and the main menu will appear.

For information on how to define, modify and delete methods, see Chap. 5.2.
4.2. Measurement settings

Prior to measurement, the following settings can be made in the mode menu.

- **Mode**, i.e. the type of measurement value recording (single / interval measurement)
- The interval settings (number of measurements / interval between measurements in seconds)
- The sample number
- **Measurement options**, i.e. the type of samples (quality control / normal sample)

Open the mode menu

- Push .
  The mode menu will appear.

Selecting a mode

The type of measurement value recording is specified by selecting the Mode: Single measurement or interval

- Select the mode.
  If you select interval measurement, the interval settings must be made as well.
  - Enter the number of measurements and the interval in seconds.

Entering a sample number

A sample number may also be entered if necessary, prior to measurement.

**Note!**
After switching the device on and then changing the method, the device will automatically begin with sample number 1 and increase this by 1 for every further measurement.

- Enter the desired sample number.

Measuring QC samples

If the sample is a quality control sample which should be marked as QC in the results:

- Activate quality control.

**Note!**
Quality control is deactivated after a QC sample has been measured, i.e. you always need to reactivate quality control before measuring any further QC samples.

Saving settings

Once all settings in the mode menu are complete:

- Save your settings with OK.
  The main menu will appear.
  You can now begin measuring samples.
4.3. Carrying out measurements

Supplying the sample  ▶ Fill the sample into the measurement cell. A sample must wet the entire measurement surface, and should be free of streaks and gas.

Heating!
If no target temperature has been defined, the temperature will not be checked and measurement can be started at any time. If there is a significant difference between room and sample temperatures, wait a few moments before starting measurement. False results may be measured if the sample has not yet reached the correct temperature.

Starting measurement  ▶ Push .
The measurement will be carried out.

Measurement  ▶ Single: a single measurement will be made. Interval: the defined number of measurement points will be made, separated by the specified interval time.

After measurement  ▶ Carefully clean the measurement surface with distilled water or a solvent suitable for the sample.

Important note! Improperly cleaning the measurement surface will cause sample carryover and lead to incorrect results.

4.4. Measurement results

Measurement result display  ▶ The measurement result will be displayed.

All measurement results are stored in a results list.

Printing measurement results  Measurement results appearing on the display can be printed directly after measurement, or all and/or filtered results from the results list may also be printed on any printer.

Printing the measurement display  ▶ Push .
The measurement result on the screen will be printed.

Printout

Date = 19.10.2007
Time = 09:40:23
User = Administrator
Method = Refractive Index
Sample = B
Temp. = 25.0 °C
Measurement = 1.65095 aD
Group ID = 24
Index = 1
Chapter 4 – Normal operation / 4.4. Measurement results

Printing stored measurement results
► Push \( \text{Results} \) in the main menu. The results menu will appear. All results are listed in a table. The data returned for each measurement can be selected by the user under Configure columns.

► Select or filter the results to be printed.
► Push the \( \text{Print} \) button and select print from the drop-down menu. The selected or filtered results will be printed.

For information on how to filter, sort and configure results, see Chap. 5.4. For information on how to connect a printer, see Chap. 3.1.

Exporting measurement results
All, individual or filtered measurement results can be transferred to a USB flash drive:
► Insert the USB flash drive into the device.
► Push \( \text{Results} \) in the main menu. The results menu will appear:

► Push the \( \text{Export} \) button and select the export format from the drop-down menu. The selected results will be transferred to the USB flash drive.

For information on how to filter, sort and configure results, see Chap. 5.4.

Showing details of measurement results
If necessary, the details of a measurement can also be displayed:
► Double click on a results row. The detailed display menu will appear.

► Select or filter the results rows to be exported or filter the desired results.
Displaying single measurements

Select the Single value register.

Displaying statistics

Select the Statistics register.

Chapter 5 – Settings

The following topics are covered in this chapter:

- How to set the measurement mode.
- How to carry out a manual zero balance.
- How to call, modify and create methods.
- How to set date, time, language, etc.
- How to select, filter, export and print results.
- How to define and manage users.
- How to activate/deactivate login.

5.1 Mode menu

All necessary measurement options for the next measurement are made in the mode menu:

- Single / Interval
- Sample numbers
- Normal sample / quality control (QC)

Opening the mode menu

Push .
The mode menu will appear.
Description of functions in the mode menu

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode</strong></td>
<td>Selecting Single will record exactly one measurement value. Selecting Interval will record multiple measurement values in defined intervals. An average value will be established from the measurement values and shown on the display. The individual measurement values and associated raw values (nD) can be shown in the results list if necessary.</td>
</tr>
<tr>
<td><strong>Setting of interval</strong></td>
<td>The following additional Setting of interval are required for interval measurement.</td>
</tr>
<tr>
<td>Number of measurements</td>
<td>2 to 99 °C, integers</td>
</tr>
<tr>
<td>Interval in seconds</td>
<td>2 to 600 °C, integers</td>
</tr>
<tr>
<td><strong>Options of measurement</strong></td>
<td>Quality control (QC) activated. If the sample to be measured is a quality control sample, this can be additionally indicated in the result. The result will be displayed together with the words Quality control on the display. QC samples can then be filtered and printed or exported.</td>
</tr>
<tr>
<td>Zero Adjustment</td>
<td>The device will carry out a zero balance, the same process as when it is first switched on.</td>
</tr>
<tr>
<td><strong>Sample’s number</strong></td>
<td>The sample number is set to 1 after switching on the device, and increases by 1 after each measurement. Each method has its own range of numbers. Changing the method will either reset numbering to 1, or continue the numbering for the respective method. The numbering start point can be changed, or an arbitrary sample number may also be entered for each sample.</td>
</tr>
<tr>
<td><strong>Quality control (QC)</strong></td>
<td>If the sample to be measured is a quality control sample, this can be additionally indicated on the display and in the results list.</td>
</tr>
<tr>
<td>Save your settings</td>
<td>Saves the settings, closes the menu, and returns to the main menu.</td>
</tr>
<tr>
<td>Cancel</td>
<td>Leaves the menu without saving the settings.</td>
</tr>
</tbody>
</table>

**Zero Adjustment**
This function carries out a zero balance.
► Push in the main menu.
► Carefully clean the measurement surface.

**Important note!**
Results will be incorrect if the measurement surface is dirty when the zero balance is carried out.

► Push .
The device will run through the same initialisation cycle as when it was switched on.
The device is now ready for use.

**Quality control (QC)**
If the sample to be measured is a quality control sample, this can be additionally indicated on the display and in the results list.
► Push in the main menu.
► Activate .
► Save your settings with .

► Start measurement with .
The result will be displayed together with the words Quality control on the display. QC samples can then be filtered and printed or exported.

For information on how to filter, print and export QC results, see Chap. 5.4.
5.2 Method menu
You can create new methods and define and modify the following method parameters in the method menu:

- Method names
- Target temperature
- Temperature compensation
- Measurement unit

Opening the method menu
Push  .
The method menu will appear.

Creating a new method
Push  in the method menu.
A new method with a sequential No. and a Name (Method XXX) will be automatically created and the window to enter the name will appear:

Entering the method name

Enter the desired method name.
Save your input with OK.
The parameters menu will then open for the input of parameters.
You can now define parameters such as the target temperature, temperature compensation and the measurement unit for the new method:
Editing method parameters

Method parameters can be brought up using the button, and edited in the parameter menu.

Entering the nominal temperature

The nominal temperature at the measurement cell can be selected from a list or entered by the user. This nominal temperature is regulated constantly, and measurement is only possible once this temperature has been reached. The nominal temperature has a tolerance, i.e. a permitted deviation of min. 0.1 °C. This tolerance can be defined by the user in the system settings.

If a nominal temperature is not specified, the temperature will not be monitored at all. Measurement can be started at any time.

Select the desired nominal temperature from the drop-down list using the button.

<table>
<thead>
<tr>
<th>Nominal temperature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No nominal temperature means device / room temperature. The temperature will not be monitored. Measurement can be started at any time.</td>
</tr>
<tr>
<td>20.0/25.0 °Celsius</td>
<td>Predefined nominal temperature. Constant monitoring and regulation of the temperature will be carried out. Measurement can only be started once the nominal temperature has been reached.</td>
</tr>
<tr>
<td>Input</td>
<td>User-defined nominal temperature. Value range: min. 10 °C- 80 °C</td>
</tr>
</tbody>
</table>

Temperature compensation

If the results always deviate from the specified temperature by a specific amount, the results can be automatically corrected using temperature compensation.

Select Input from the Temperature compensation drop down list.

Firstly, enter a name for the temperature compensation.
Measurement unit

Both pre-defined and user-specific units are available.

<table>
<thead>
<tr>
<th>Unit Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>nD</td>
<td>Refractive index (equivalent to the sodium D spectral line at wavelength 589.3)</td>
</tr>
<tr>
<td>% Brix Sucrose</td>
<td>Predefined units</td>
</tr>
<tr>
<td>% Brix Invert sugar</td>
<td></td>
</tr>
<tr>
<td>% Brix Glucose</td>
<td></td>
</tr>
<tr>
<td>% Brix Fructose</td>
<td></td>
</tr>
</tbody>
</table>

Input

User-defined unit with associated calibration curve. The name and unit of three value pairs (nD value and associated scale value) must be entered here. The coefficients for calculation are determined based on these value pairs.

After saving, the Temperature compensation dialog window will appear:

- Enter the temperature for points 1, 2 and 3, together with the associated compensated values.
- Confirm your input with OK.

The coefficients for the temperature compensation will be determined based on these value pairs.

Chapter 5 – Settings / 5.2. Method menu

Entering a user-defined measurement unit

- Select Input from the Measurement unit drop-down list.
- Push .
- Enter the name of the unit and save by pushing OK.

After saving, the User scale dialog window will appear:

- Enter the nD values and associated concentrations, one after the other.
- Confirm your input with OK.

The coefficients for the result calculation will be determined based on these value pairs.
5.3 System menu

The following device settings can be made in the system menu:

- Date and time
- Date and time format
- Language
- Display brightness
- Temperature unit (Celsius/Fahrenheit)
- Temperature tolerance
- Peripherals (printer, network e.g. LIMS)
- Firmware update
- Tare

Opening the system menu

Push System. The system menu will appear:

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Time</td>
<td>Sets the date and time.</td>
</tr>
<tr>
<td>Language</td>
<td>Select the desired language from the drop-down list:</td>
</tr>
<tr>
<td>Date format</td>
<td>Select the desired date format from the drop-down list:</td>
</tr>
<tr>
<td>Time format</td>
<td>Select the desired time format from the drop-down list:</td>
</tr>
<tr>
<td>Ok</td>
<td>Applies the settings, closes the system menu and returns to the start menu.</td>
</tr>
<tr>
<td>Cancel</td>
<td>Closes the system menu without saving your input and returns to the start menu.</td>
</tr>
<tr>
<td>Firmware Update</td>
<td>Carries out a software update from a USB flash drive.</td>
</tr>
<tr>
<td>Tare</td>
<td>Serves to determine an offset (tare), which is then automatically integrated in the result calculation. The target value (nD) of the supplied sample is entered, together with the number of measurements with which the sample is to be measured. An average value will be established from the measurements, and the difference between the measured result and the target value will be determined. This difference is then automatically incorporated into all further sample measurements.</td>
</tr>
</tbody>
</table>
Setting the date and time

- Push [Date-Time].
- The Date + Time dialog will appear.
- Set the current date and time.
- Save your input with OK.

Firmware Update

New device software is transferred in the “update” folder by email.

- Enter the target value of the sample in nD, together with the number of measurements with which the sample is to be measured.
- Fill the sample into the measurement cell and push [Measure].
- The offset (tare) will be calculated and displayed.
- Save the value with [Save].
- Leave the window with [OK].
- The value will appear in red text in the main menu.

Determining the tare

- Enter the target value of the sample in nD, together with the number of measurements with which the sample is to be measured.
- Fill the sample into the measurement cell and push [Measure].
- The offset (tare) will be calculated and displayed.
- Save the value with [Save].
- Leave the window with [OK].
- The value will appear in red text in the main menu.
Note!
This tare value will be incorporated into the calculation for all measurement results.

Clearing tare

Push

The tare offset will be set to 0.0000.

Save the value with

The tare offset has now been deleted.

Setting the display brightness

Select the Display tab.

Change the brightness using the slider.

Save your setting with OK.

Temperature settings

On the Temperature tab, you can specify

- the temperature unit and
- the temperature tolerance.

The temperature tolerance refers to the specified temperature target value and holds in equal measure for all methods.

Select the Temperature tab.

Selecting a temperature unit

Select the ° Celsius or ° Fahrenheit unit and save your selection with OK.

Entering the temperature tolerance

Push the temperature button and enter the permitted deviation from the target temperature. The value must be higher than 0.1° C.

Save your input with OK.

Device connections

Interfaces for connected devices can be defined on the Peripherals tab:

- Connection to a local Network (e.g. LIMS)
- Printer connection on the Serial port.

Select the Peripherals tab.
Configuring the network

Push **Network**.
The network connection interface can be configured in the following dialog:

Enter the **IP Address** and **Subnet mask**.
Save your settings with **OK**.

Defining a serial interface

Any printer can be connected to the serial interface.

Push **Serial Interface**.
The following dialog will appear:

- All settings can be made using the drop-down menus and then saved with the **OK** button.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>1200/2400/4800/9600/19200/38400/115200</td>
</tr>
<tr>
<td>xon/xoff</td>
<td>Flow control on/off</td>
</tr>
<tr>
<td>Data Bits</td>
<td>7/8</td>
</tr>
<tr>
<td>Stop Bits</td>
<td>1/2</td>
</tr>
<tr>
<td>Parity</td>
<td>N0/ODD/EVEN</td>
</tr>
</tbody>
</table>

**Note!** If a LIMS is connected, an additional device has to be entered.
5.4 Results menu

All measured values are stored in the results list. However, what is actually displayed in this list can be selected by the user. The list can be exported and printed in full or filtered form.

Opening the results list

Push \( \text{results} \) in the main menu.

The results menu will appear:

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filters results. Opens the Filter for Measurement Results dialog, in which the results can be filtered by date + time, method + user and QC.</td>
<td>Filter</td>
</tr>
<tr>
<td>Exports the selected results from the results list to a USB flash drive. A drop-down menu will appear:</td>
<td>Export</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Excel CSV format</td>
<td>Initiates the process.</td>
</tr>
<tr>
<td>Export HTML format</td>
<td>Sorts the results list by date.</td>
</tr>
<tr>
<td>Ascending order</td>
<td>Selects and deselects all results.</td>
</tr>
<tr>
<td>Descending order</td>
<td>Selects values for output</td>
</tr>
</tbody>
</table>

Selecting results

In order to output results, they must first be selected. Results can be selected by:

- Selecting
- Filtering

Marking results

Click on the result rows to be selected for output. The selected results can then be printed using \( \text{Print} \) or exported using \( \text{Export} \).
Filtering results

If only certain results with shared characteristics are to be selected for output, they can be filtered using the following criteria:
- By day, period (from – to), time
- Only QC results
- By method
- By user

The filters can be used individually or in combination. The filter selection will no longer be active after leaving the results menu.

Filtering by date and time

If only results from a particular period or day are to be selected for output:

- Push .
- Select the Date + Time tab.
- Enter the date directly or select it from the calendar .
- Enter the time if necessary.
- If the time is 00:00, all results from an entire day will be selected for export.
- Confirm your input with OK.

The results filtered by date and time will be displayed, and can now be exported with or printed with .

Filtering by method and user

If only results from a single method are to be selected for output, filtered by user:

- Select the Methods + Users tab.
- Select the desired method and user.
- Confirm your input with OK.

QC filtering

If only QC results are to be selected for output:

- Select the Other tab.
- Activate the Quality control check box.
- Confirm your input with OK.
Chapter 5 – Settings / 5.4 Results menu

Configuring columns

Additional data to be shown in the results list can be selected on a user-specific basis. The following data is available:

Add the following in the Results columns menu:
- Date and time
- User
- Method
- Sample number
- Measurement value
- Unit
- Unit user factor X1
- Unit user factor X2
- Unit user factor X3
- Unit user factor K1
- Unit user factor K2
- Unit user factor K3
- Temperature (actual)
- Target temperature
- Temperature compensation user factor X1
- Temperature compensation user factor X2
- Temperature compensation user factor X3
- Temperature compensation user factor K1
- Temperature compensation user factor K2
- Temperature compensation user factor K3

The filtered QC results will be displayed, and can now be exported with Export or printed with Print.

The following options can be activated in the Configure results columns menu:
- Export individual values for interval measurements
- Additionally export raw measurement values

Push Export or Print.

Select Configure column from the drop-down menu. The menu with the currently selected columns will appear.
Adding columns

To add more columns to the currently selected columns:

- Push \textbf{Hinzufügen}.

The menu with all available columns will appear.

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delete</td>
<td>Deletes the selected column.</td>
</tr>
<tr>
<td>\textbf{Hinzufügen}</td>
<td>Opens a menu in which more columns can be added to the results list.</td>
</tr>
</tbody>
</table>
| Default | Resets the previously selected columns to:
  - Date and time
  - User
  - Method
  - Number
  - Temperature (actual)
  - Measurement value |

Individual values for interval measurements

- \textbf{X} When activated, the individual values of the method-specific unit will also appear in the results list.

Additionally showing raw measurement values

- \textbf{X} When activated, the unmodified measured values (nD) will also appear in the results list.

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Button Description</td>
<td></td>
</tr>
<tr>
<td>\textbf{Cancel}</td>
<td>Leaves the menu without saving the settings.</td>
</tr>
</tbody>
</table>

Button Description

- Deletes the selected column.
- Opens a menu in which more columns can be added to the results list.
- Resets the previously selected columns to:
  - Date and time
  - User
  - Method
  - Number
  - Temperature (actual)
  - Measurement value

Individual values for interval measurements

- When activated, the individual values of the method-specific unit will also appear in the results list.

Additionally showing raw measurement values

- When activated, the unmodified measured values (nD) will also appear in the results list.

Adding columns

To add more columns to the currently selected columns:

- Push \textbf{Hinzufügen}.

The menu with all available columns will appear.

Showing printing results

If details as e.g. the statistics of an interval measurement and the corresponding raw value shall be indicated:

- Doubleclick on the desired result.
  - The details of the results are indicated.

Printing results

- Open the results list in the main menu with \textbf{Results}.
- Select or filter the desired results.
- Push \textbf{Print}.
  - The selected results will be printed.

Exporting results

- Insert the USB flash drive into the device.
- Open the results list in the main menu with \textbf{Results}.
- Select or filter the desired results.
- Push \textbf{Export} and select the export format (Excel/HTML).
  - Selecting the format initiates the export process.
  - The selected results will be transferred to the USB flash drive in the selected format.

Note!

- Only remove the USB flash drive once you have returned to the main menu.

- Push \textbf{Cancel} in the results menu.
  - You may now remove the USB flash drive.
5.5 User menu

The following settings can be made in the user menu:

- Create device users
- Assign user rights
- Specify user validity periods
- Activate / deactivate login during device start-up
- Logout

Opening the user menu

Push *User* in the main menu.

The user menu will appear:

![User menu](image)

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Management</td>
<td>Here, you can define users and assign rights.</td>
</tr>
<tr>
<td>Logout</td>
<td>The user will be logged out, and the login screen will appear.</td>
</tr>
<tr>
<td>Ok</td>
<td>Saves the settings, closes the user menu, and returns to the main menu.</td>
</tr>
<tr>
<td>Cancel</td>
<td>Leaves the user menu without saving the settings.</td>
</tr>
</tbody>
</table>

User management

- **Activate login**
  - The device can only be operated after a valid login (username and password).
  - The device can be operated without entering a username and password.

- **Logout**
  - Logs the user out and displays the login screen.

- **Create a new user**
  - Creates a new user.

- **Delete**
  - Deletes the selected user after a confirmation query.

- **Save settings, close user menu, return to main menu**

- **Cancel**
  - Leaves the user menu without saving the settings.

Creating a new user

To create a new user:

- Push *User Management* in the main menu.
- Push *New*.
- Enter the user’s name, the login name and the password, one after the other.
- Confirm your input with **OK**.
The user rights are now selected:

Assigning user rights

There are three users with different levels of rights:

- **Admin**
  The Administrator has access rights to all functions.

- **User**
  The User can carry out measurements, select methods, the measurement mode and operate all results functions. He **cannot** make changes to method settings or system settings.

- **Guest**
  The Guest can carry out measurements, select methods, make limited adjustments to the measurement mode and operate all results functions. He **cannot** make changes to method settings or system settings.

- **Important note!**
  Take careful note of the administrator password! If lost, the password **cannot** be recovered. Please contact the device manufacturer if you lose the password.

Make a selection from the Rights ▼ drop-down list.

**Important note!**
If no certain date is entered, the authorization will only be valid for one day.

Entering the period of validity

A validity period can be specified if the rights should only be assigned for a limited period of time.

- Enter the date directly or select it from the calendar.
- Confirm your input with **OK**.

The user will be created and assigned the rights for the specified time period.

- Leave the window with **OK**.

**Editing users**

To make changes to a user:

- Push **User Management**.
- Select the desired user from the user list with ▼ and push **Edit**.
- Make your changes and confirm with **OK**.
- To finally apply your entries, leave the menu by pushing the **OK** button.

**Activating login**

To specify that the device should only be operable through user login:

- Push **User Management** in the user menu.
- Activate **Activate login**.
- Save your input with **OK**.
- To finally apply your entry, leave the menu by pushing the **OK** button.
Chapter 6 – Maintenance and Care

The following topics are covered in this chapter:

- Daily / weekly tasks
- Changing the fuse
- Maintenance through service

6.1 Regular maintenance and care

In principle, the device maintenance free. The casing and display should be regularly cleaned.

Daily

► Clean the measurement surface with distilled water or a suitable solvent for the sample.

Weekly

► Clean the display and case with standard cleanser or disinfectant.

6.2 Changing the fuse

note!

Unplug the power cable before changing the fuse.

► Unplug the power cable.
► Change the fuse above the power switch.
► Reconnect the power cable.

6.3 Maintenance through service

The DR6000 refractometer family does not require regular maintenance by a service team. If the device malfunctions, please contact:

A.KRÜSS Optronic GmbH
Alsterdorfer Strasse 276–278
22297 Hamburg / Germany
Tel. +49 -(0) 40-514317-0
Fax. +49 -(0) 40-514317-60
Internet: www.kruess.com
Email: service@kruess.com
Chapter 7 – Troubleshooting table

This chapter can help you to quickly correct any errors which may occur.

7.1 List of errors

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect measurement result</td>
<td>• Measurement surface dirty</td>
<td>• Clean the measurement surface</td>
</tr>
<tr>
<td></td>
<td>• Measurement surface was dirty during zero balance</td>
<td>• Carrying out a zero balance. See Chap. 5.3.</td>
</tr>
<tr>
<td>Poor precision</td>
<td>• Measurement surface not cleaned properly between sample measurements</td>
<td>• Clean the measurement surface carefully after each measurement</td>
</tr>
<tr>
<td>Measurement cannot be started</td>
<td>• Target temperature has not been reached</td>
<td>• Wait for heating</td>
</tr>
<tr>
<td></td>
<td>• Temperature tolerance value is too low</td>
<td>• Increase the temperature tolerance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Chap. 5.3.</td>
</tr>
<tr>
<td>Login no longer possible</td>
<td>• Validity period expired</td>
<td>• Contact the administrator. The administra-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tor is authorised to modify the time period.</td>
</tr>
<tr>
<td></td>
<td>• Incorrect username</td>
<td>• Enter the correct user name and/or password.</td>
</tr>
<tr>
<td></td>
<td>• Incorrect password</td>
<td>Contact the administrator if necessary.</td>
</tr>
<tr>
<td>No display</td>
<td>• Fuse blown</td>
<td>• Change the fuse. See Chap. 6.2.</td>
</tr>
<tr>
<td></td>
<td>• Power cable loose</td>
<td>• Plug power cable in properly</td>
</tr>
</tbody>
</table>

Glossary

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
</tr>
<tr>
<td>GLP</td>
<td>Good Laboratory Practice (QA System)</td>
</tr>
<tr>
<td>LIMS</td>
<td>Labor - Information - Management - System</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration</td>
</tr>
<tr>
<td>ICUMSA</td>
<td>International Commission for Uniform Methods of Sugar Analysis</td>
</tr>
</tbody>
</table>
Appendix

Technical data

<table>
<thead>
<tr>
<th>Model</th>
<th>Range 1.3200-1.5800 nD</th>
<th>Range 1.3200-1.7000 nD</th>
<th>Precision 0.0001 nD</th>
<th>Resolution 0.0001 nD</th>
<th>Built-in Peltier Thermostat</th>
<th>Flow-thru Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR6000</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6000-F</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6000-T</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6000-FT</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6100</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6100-F</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6100-T</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DR6100-FT</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

All standard devices can be connected to our external Peltier thermostat PT31

General specifications

Measurement modes
Single / Interval measurement

Scales
Standard preset scales: Refractive index (nD), % Brix, Sucrose, Invert sugar, Glucose, Fructose, temperature corrected (nD), temperature corrected (% Brix). User-defined scales can be initialised.

Measurement time
Approx. 1 sec.

Prism
Sapphire

Light source
LED 590nm (lifespan approx. >1000 hrs.)

Case
Cast Aluminium

Sample receptacle
Stainless steel

Display
LCD 5.7” 320x240 pixel, TFT

Operation
Resistive touch screen

Interfaces
RS232, USB, Ethernet

IP Code
IP65 for sample receptacle

Operating voltage
90V ... 240V, 50/60Hz 60W

Temperature measurement
0 - 100°C

Temperature resolution
0.1°C

Temperature measurement accuracy
0.1°C

Temperature compensation
ICUMSA and user-defined 3-point calibration

Temperature sensor
PT100 - high-class sensor

Sample temperature
10 - 80°C

Environmental temperature
10 - 40°C

Result memory
999 results

Measurement value calibration
4 - 10 sample points, 3rd degree polynomial

Temperature calibration
4 sample points, 2nd degree polynomial
### Ordering information

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain paper printer</td>
<td>24 character</td>
<td>CBM910</td>
</tr>
<tr>
<td>Paper roll</td>
<td>For CBM910 printer</td>
<td>CBM910P</td>
</tr>
<tr>
<td>Ink ribbon</td>
<td>For CBM910 printer</td>
<td>CBM910F</td>
</tr>
<tr>
<td>Peltier Thermostat</td>
<td>8°C - 40°C infinitely variable, temperature accuracy +/-0.2°C, resolution 0.1°C, includes tubes</td>
<td>PT31</td>
</tr>
<tr>
<td>Water bath cleaner</td>
<td>Additive for thermostat with water</td>
<td>PT35</td>
</tr>
</tbody>
</table>

### Warranty conditions

A.KRÜSS Optronic guarantees the materials and workmanship of the DR6000 Digital Refractometer Family for a period of 24 months from the date of shipping. A.KRÜSS Optronic will repair or replace defective devices within this period, given that they fall under terms of the guarantee. The device must be sent back to A.KRÜSS Optronic for warranty repairs or service. Shipping from the customer is at the expense of A.KRÜSS Optronic for warranty repairs or service. Shipping to the customer is at the expense of A.KRÜSS Optronic for any other case at the customer’s expense.

A.KRÜSS Optronic guarantees that the hardware specified by A.KRÜSS Optronic for use with this device will function without error if used according to our manufacturer guidelines.

A.KRÜSS Optronic does not guarantee error-free and uninterrupted operation of the device or the accuracy of this instruction manual. A.KRÜSS Optronic is not liable for consequential damage.

**Warranty limitations:**

This warranty does not cover errors and damage arising due to improper handling, the use of software not provided by A.KRÜSS Optronic, through modification, misuse, operation above and beyond the specified environmental conditions or through unauthorised maintenance.

Further claims will not be accepted or recognised. A.KRÜSS Optronic expressly provides no guarantee of the workability or economic use in specific application cases.

A.KRÜSS Optronic reserves the right to make changes to this instruction manual and the technical data of the device in question at any point in time.

This digital refractometer may only be transported when properly packed in the complete original packaging including the moulded plastic protectors. Request replacement packaging from your supplier if necessary.

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**A.KRÜSS Optronic GmbH**  
Alsterdorfer Strasse 276–278  
22297 Hamburg / Germany  
Tel. +49-(0) 40-514317-0  
Fax. +49-(0) 40-514317-60  
Internet: www.kruess.com  
Email: service@kruess.com
EG-Konformitätserklärung
EC-Declaration of Conformity

Produktbezeichnung: Digital Refraktometer DR 6000-6300-T
Name of the product, type or model: Digital Refraktometer DR 6000-6300-T

Hersteller: A. KRÜSS OPTRONIC GmbH
Manufacturer

Anschrift: Alsterdorfer Straße 220
Address: 22297 Hamburg / Germany

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Richtlinien überein:
The indicated product is in correspondence with the following regulations of European Council:

<table>
<thead>
<tr>
<th>Nummer / Kurztitel</th>
<th>Eingehaltene Vorschriften</th>
</tr>
</thead>
<tbody>
<tr>
<td>89/336/EWG EMV-Richtlinie</td>
<td>EN 50081-1 Fachgrundarum Störfestigkeit (Wohnbereich)</td>
</tr>
<tr>
<td></td>
<td>Generic immunity standard: Residential, commercial and light industry</td>
</tr>
<tr>
<td></td>
<td>IEC 61000-4-2 Störfestigkeit gegen die Entladung statischer Elektrizität</td>
</tr>
<tr>
<td></td>
<td>Electrostatic discharge requirements</td>
</tr>
<tr>
<td></td>
<td>IEC 61000-4-4 Störfestigkeit gegen schnelle transienten Störgrößen / Brust</td>
</tr>
<tr>
<td></td>
<td>Electrical fast transient/burst immunity test</td>
</tr>
<tr>
<td></td>
<td>IEC 61000-4-5 Störfestigkeit gegen Stoßspannungen</td>
</tr>
<tr>
<td></td>
<td>Surge immunity requirements</td>
</tr>
<tr>
<td>73/23/EWG EMV-Richtlinie</td>
<td>EN 55011 Norm für Störaussendung</td>
</tr>
<tr>
<td></td>
<td>Standard for emitted interference</td>
</tr>
<tr>
<td></td>
<td>EN 61000-3-2/3 Norm für Netzrückwirkungen</td>
</tr>
<tr>
<td></td>
<td>Standard for system perturbation</td>
</tr>
<tr>
<td></td>
<td>EN 61010-1 Sicherheitsbestimmung für elektrische Laborgeräte</td>
</tr>
<tr>
<td></td>
<td>Safety regulation for electrical laboratory instruments</td>
</tr>
</tbody>
</table>

Ort, Datum: Hamburg, 19.11.2005
Place, date

Konformitätsbeauftragter: Karin Leibrock (Leiterin Qualitätsmanagement)
Representative for conformity (Director Quality management)

This declaration certifies the compliance with the indicated regulations, it doesn’t guarantee attributes. Pay attention to the security advices of the relevant product information.