KRÜSS
A.KRÜSS OPTRONIC
GERMANY

DR6000 Series | Manual

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Content

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

Chapter 1 – Technical specifications

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

Touch screen pen

Protective device cover

1x Replacement fuse (2AT)

Power cable

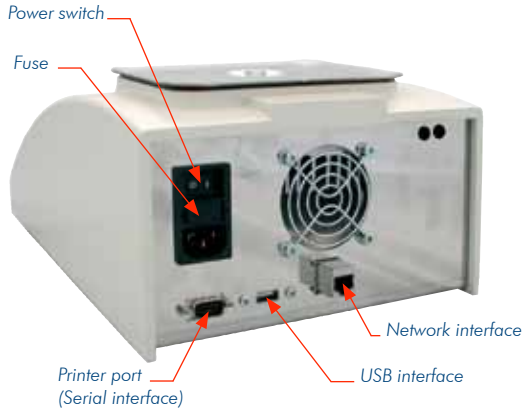
Manual

Measurement surface cover

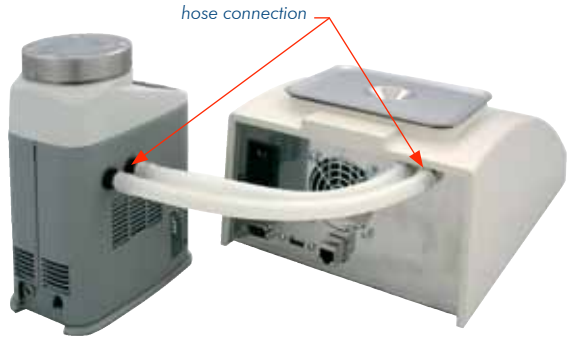
2.2. Device images

Device image DR6000-T front

Device image DR6000-T back



Device DR6000 with thermostat



Device DR6000 with printer

e.g. printer CBM910

Device DR6000T with LIMS connection

Device models

Model	Device specifications
DR6000-T DR6100-T DR6200-T DR6300-T	Refractometer with measurement surface and internal Peltier heating
DR6000 DR6100 DR6200 DR6300	Refractometer with measurement surface, without internal Peltier heating (thermostat connectable)
DR6000-F DR6100-F DR6200-F DR6300-F	Refractometer with flow cell, without Peltier heating
DR6000-FT DR6100-FT DR6200-FT DR6300-FT	Refractometer with flow cell and internal Peltier heating

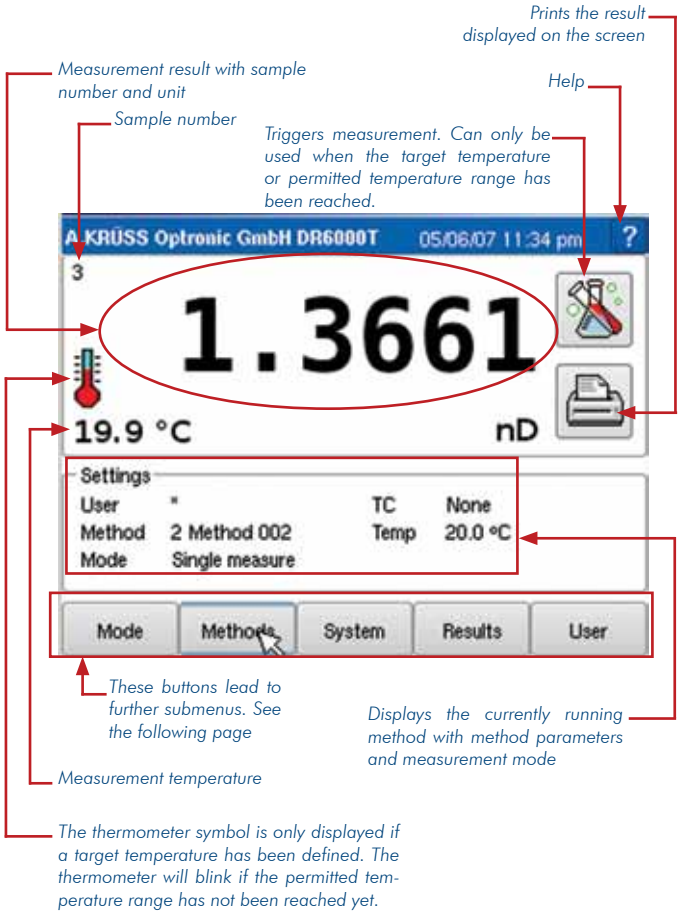
2.3. Screen descriptions

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

- Main menu
- Overview of submenus

Main menu

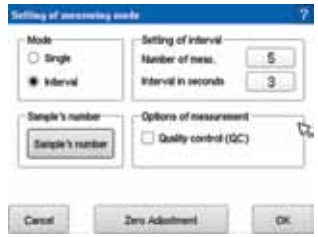
You can start measurement and view results in the main menu. The buttons lead to further submenus.



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

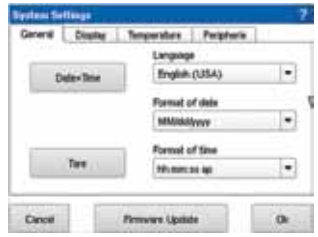


Methods

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

2.4. 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.

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

Cancel: Leaves the submenu without saving the settings

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

▶ 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.

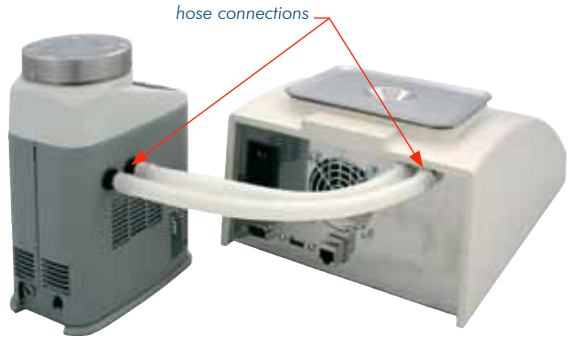
serial port

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.

3.2. Preparation

Cleaning the measurement surface

▶ Clean the measurement cell with distilled water.
▶ Dry the cell with a soft, lint-free cloth.

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 Continue .

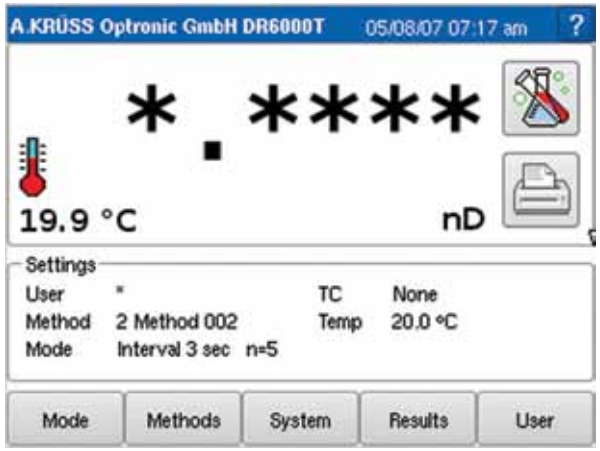
The device will initialise and carry out a zero balance.

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 Continue again.

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



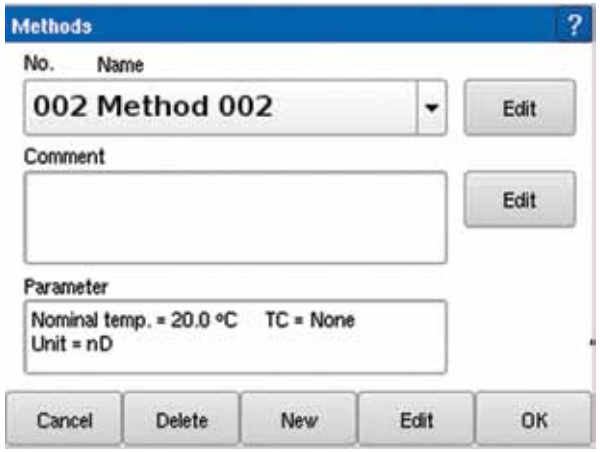
All settings necessary for a measurement can be made from this main menu.

Choose method

The desired method must be selected before measurement.

▶ Push Methods .

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

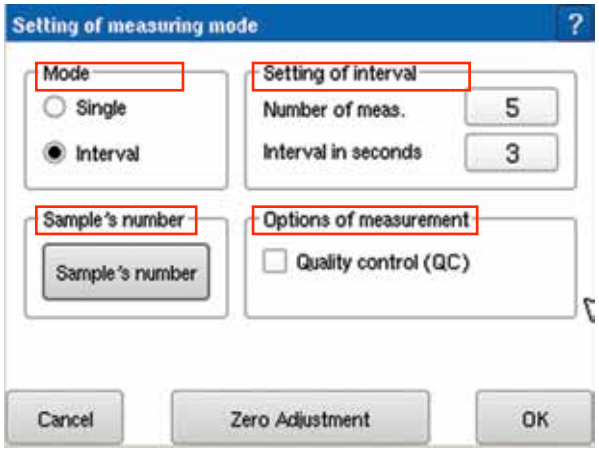
Prior to measurement, the following settings can be made in the mode menu.

- **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 menue

▶ Push Mode .

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

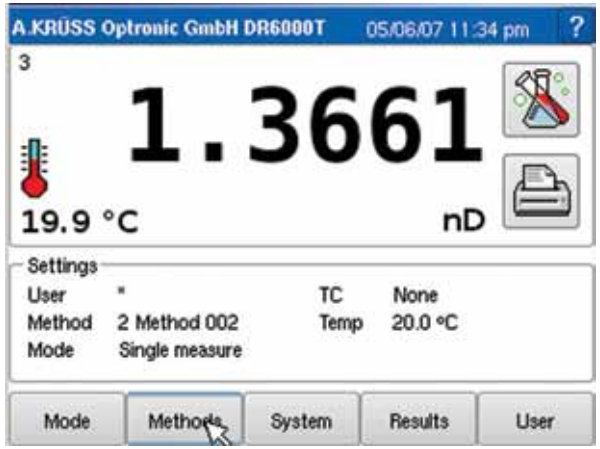
▶ Carefully clean the measurement surface with distilled water or a solvent suitable for the sample.

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

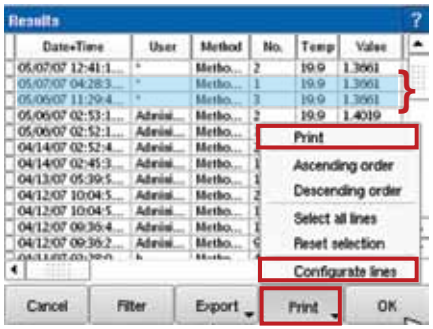
```
Date          =  10.10.2007
Time          =  09:40:23
User          =  Administrator

Method        =  Refractive Index
Sample        =  8
Temp.         =  25.0 C
Measurement   =  1.65085 nD
Group ID      =  24
Index         =  1
```

Printing stored measurement results

▶ Push 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 *Configurate columns*.



Marked result lines

▶ Select or filter the results to be printed.

▶ Push the 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

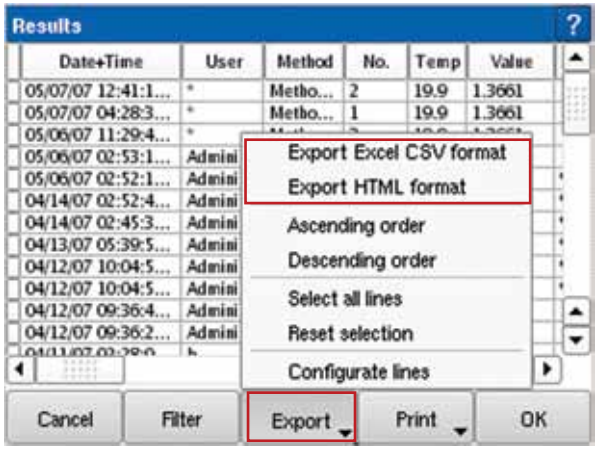
All, individual or filtered measurement results can be transferred to a USB flash drive:

▶ Insert the USB flash drive into the device.

▶ Push Results in the main menu.

The results menu will appear:

▶ Select or filter the results rows to be exported or filter the desired results.



▶ Push the Export button and select the export format from the drop-down menu.

The selected results will be transferred to the USB flash drive.

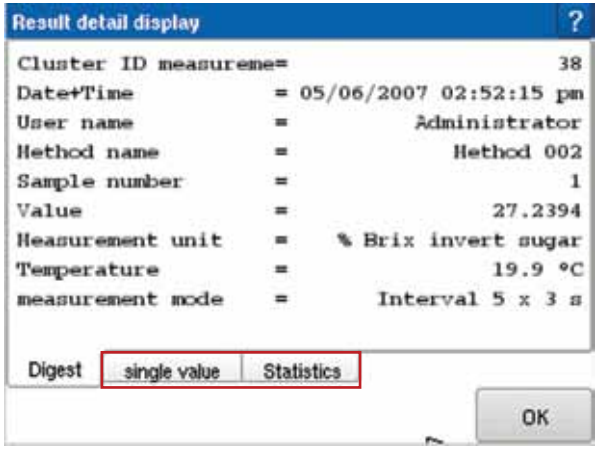
For information on how to filter, sort and configure results, see Chap. 5.4.

Showing details of measurement results

If necessary, the details of a measurement can also be displayed.

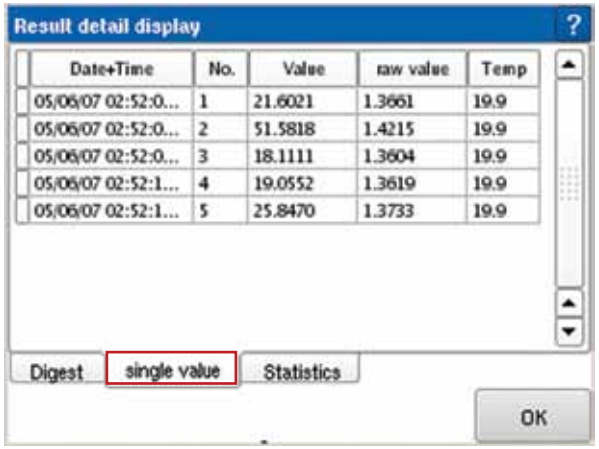
▶ Double click on a results row.

The detailed display menu will appear.



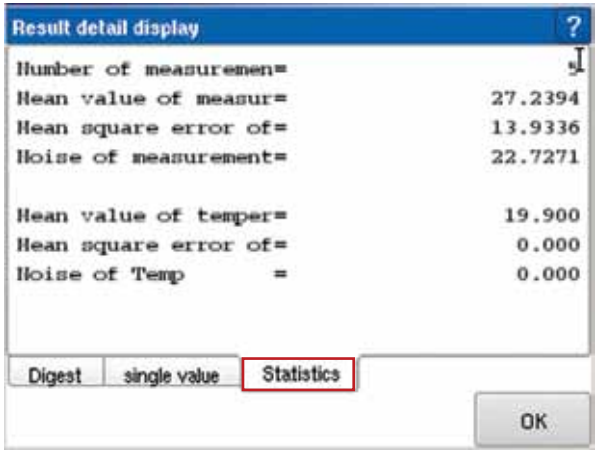
Displaying single measurements

▶ 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

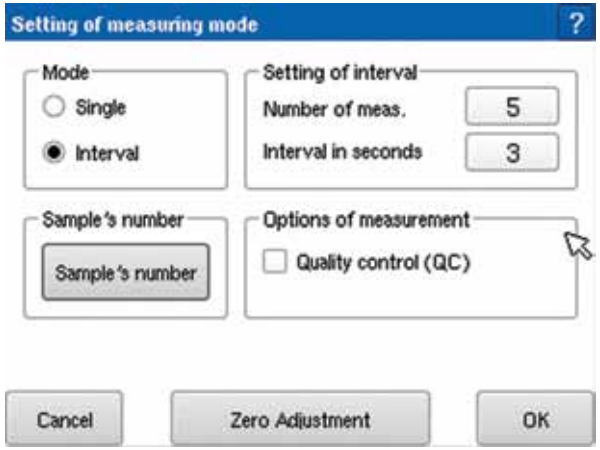
All necessary measurement options for the next measurement are made in the mode menu:

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

Opening the mode menu

▶ Push Mode .

The mode menu will appear.



Description of functions in the mode menu

Button	Description	
Mode	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.	
Setting of interval	The following additional Setting of interval are required for interval measurement.	
	Number of measurements	2 to 99 °C, integers
	Interval in seconds	2 to 600 °C, integers
Sample's number	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.	
Options of measurement	☒ 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.	
Zero Adjustment	The device will carry out a zero balance, the same process as when it is first switched on.	
Ok	Saves the settings, closes the menu, and returns to the main menu.	
Cancel	Leaves the menu without saving the settings.	

Zero Adjustment

This function carries out a zero balance.

- ▶ Push Mode 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 Zero Adjustment .

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 Mode in the main menu.
- ▶ Activate ☒ *Quality control (QC)*.
- ▶ Save your settings with Ok .

- ▶ 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

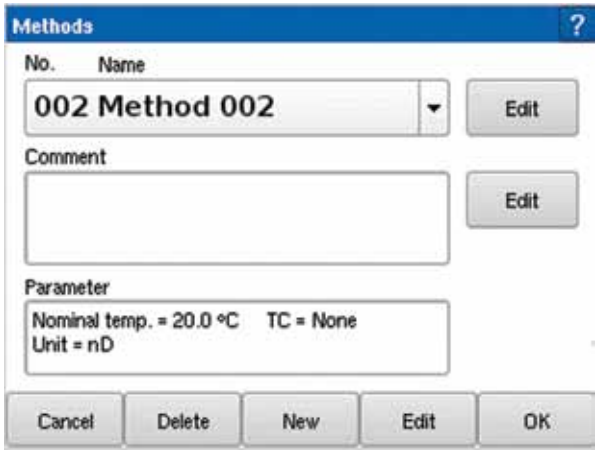
You can create new methods and define and modify the following method parameters in the method menu:

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

Opening the method menu

▶ Push Methods.

The method menu will appear.



Button	Description
New	Automatically creates a new method with a sequential No. and a Name (method). The No. Will be increased by 1 each time, and may not be modified. The Name of the method can be modified using Edit
Edit	Edits method parameters.
Delete	Deletes the currently displayed method after a confirmation query.
Ok	Saves the settings, closes the method menu, and returns to the main menu.
Cancel	Leaves the method menu without saving the settings.
Edit	Changes the name and/or comments for an existing method.

Creating a new method

▶ Push New 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:

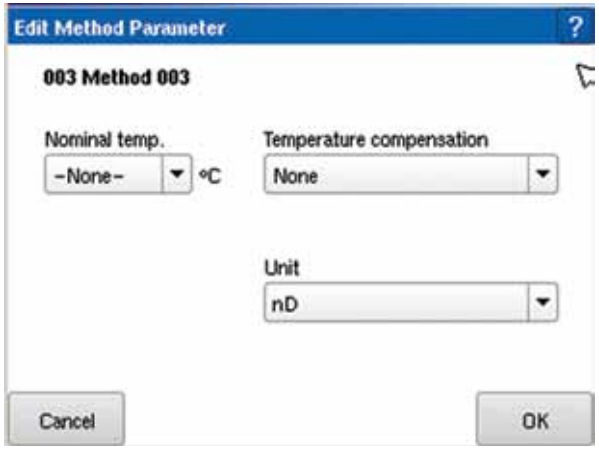
Entering the method name

▶ 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:



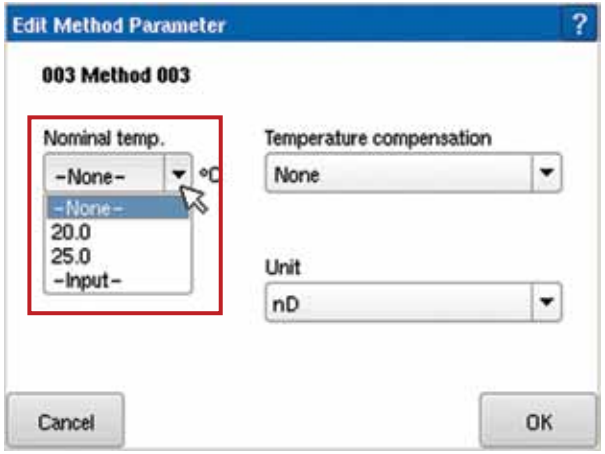
Editing method parameters

Method parameters can be brought up using the Edit 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.



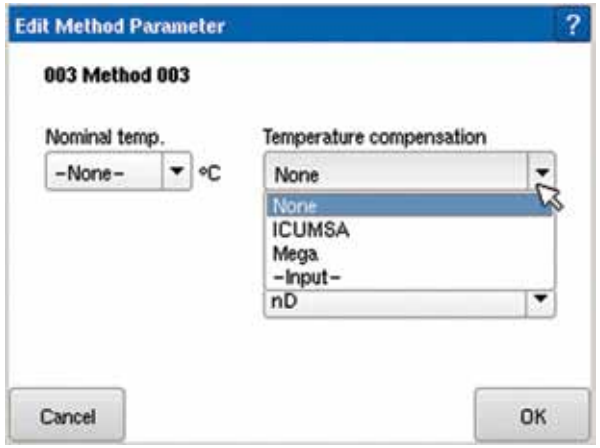
Nominal temperature	Description
None	No nominal temperature means device / room temperature. The temperature will not be monitored. Measurement can be started at any time.
20.0/25.0 °Celsius	Predefined nominal temperature. Constant monitoring and regulation of the temperature will be carried out. Measurement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

Note!
The temperature tolerance is specified under *System > Temperature*.

How and where you specify the temperature tolerance is described under Chap. 5.3.

Temperature compensation

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



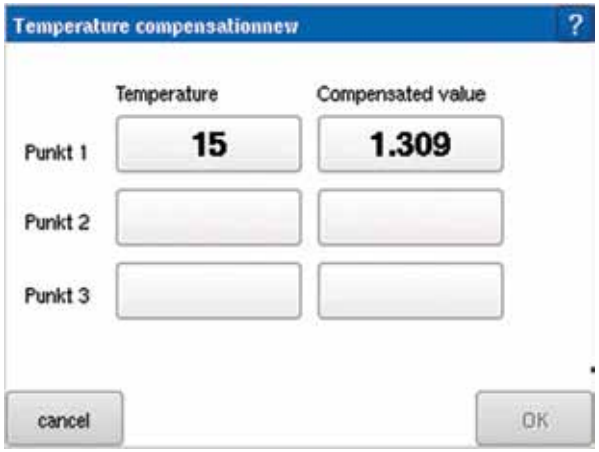
Temperature compensation	Description
None	No temperature compensation will be carried out.
ICUMSA	Temperature compensation for sucrose measurements according to the ICUMSA standard. The measurement unit must be set to Brix.
Input	User-defined input of temperature compensation. Three value pairs (temperature and associated compensation value) must be entered here. The coefficients for calculation are determined based on these value pairs.

Entering temperature compensation

▶ Select *Input* from the *Temperature compensation* ▼ drop down list.

▶ Firstly, enter a name for the temperature compensation.

After saving, the *Temperature compensation* dialog window will appear:

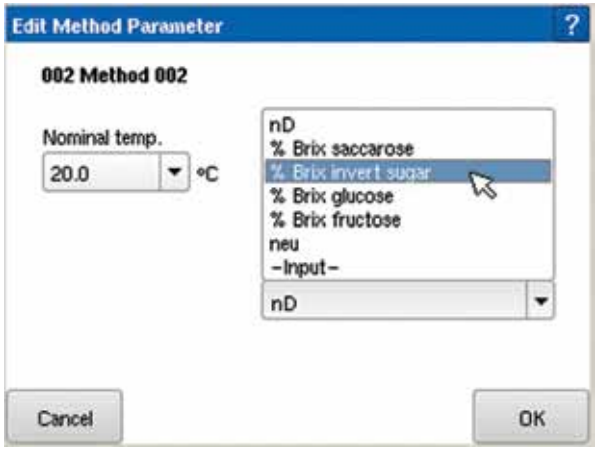


- ► Enter the temperature for points 1, 2 and 3, together with the associated compensated values.
- ► Confirm your input with **OK**.

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

Measurement unit

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



Unit	Description
nD	Predefined unit nD Refractive index (equivalent to the sodium D spectral line at wavelength 589.3)
% Brix Sucrose % Brix Invert sugar % Brix Glucose % Brix Fructose	Predefined units
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.

Entering a user-defined measurement unit

- ► Select *Input* from the *Measurement unit* ▼ drop-down list.
- ► Push [New] .
- ► 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

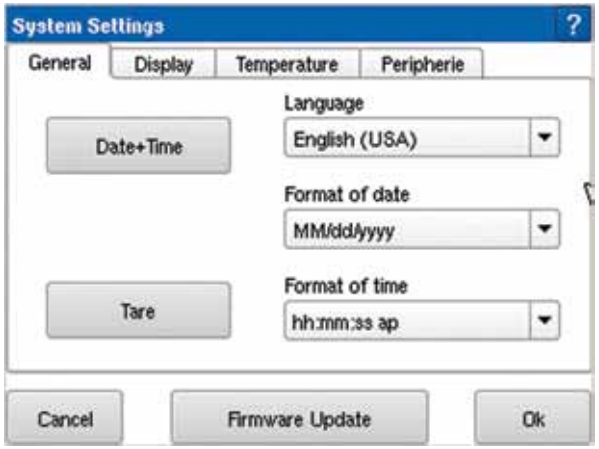
The following device settings can be made in the system menu:

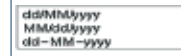
- Date and time
- Date and time format
- Language
- Display brightness
- Temperature unit (Celsius/Fahrenheit)
- Temperature tolerance
- Peripherals (printer, network e.g.LIMS)
- Firmware update
- Tare

Opening the system menu

► Push System .

The system menu will appear:

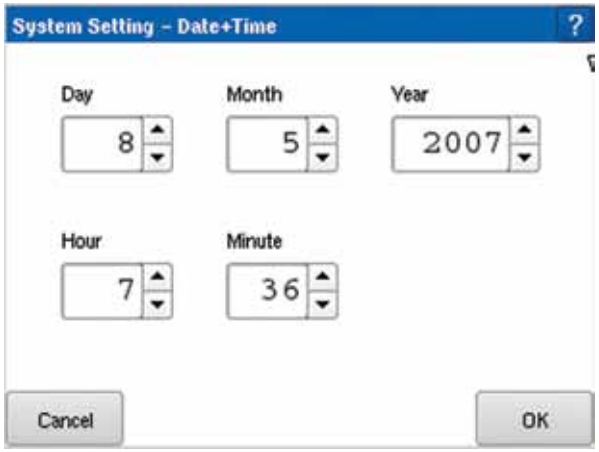


Button	Description	
Date+Time	Sets the date and time.	
Language	Select the desired language from the drop-down list ▼:	
Date format	Select the desired date format from the drop-down list ▼:	 *dd (day)* *MM (month)* *yyyy (year)*
Time format	Select the desired time format from the drop-down list ▼:	 *hh (hour)* *mm (minutes)* *ss (Seconds)* *ap (12-h-displ.)*
Ok	Applies the settings, closes the system menu and returns to the start menu.	
Cancel	Closes the system menu without saving your input and returns to the start menu.	
Firmware Update	Carries out a software update from a USB flash drive.	
Tare	Serves to determine an offset (tare), which is then automatically integrated in the result calculation. To do so, 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.	

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.

Save result data!
Save or export your result data before carrying out a firmware update. Updating the software overwrites the database, thus deleting all results.

▶ Copy or save the "update" folder onto a USB flash drive.

▶ Attach the USB flash drive with the new software to your device.

▶ Open the firmware update window using the Firmware Update button and start the update using Start firmware update .

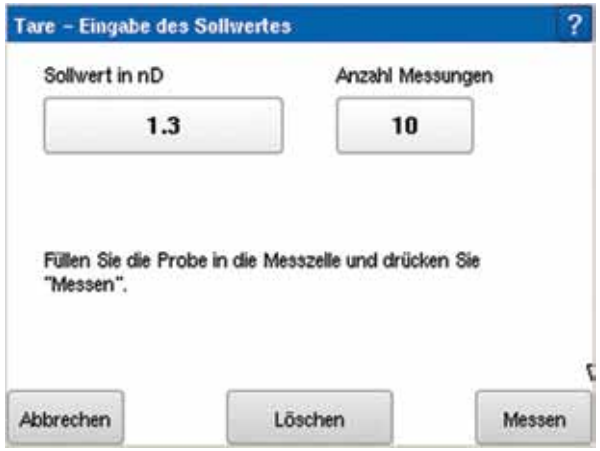
The firmware update will be carried out.

▶ Remove the USB flash drive once the procedure is complete.

Determining the tare

▶ Push Tare .

The dialog window to input the target value and the number of measurements for the sample will appear:



▶ Enter the target value of the sample in nD, together with the number of measurements with which the sample is to be measured.

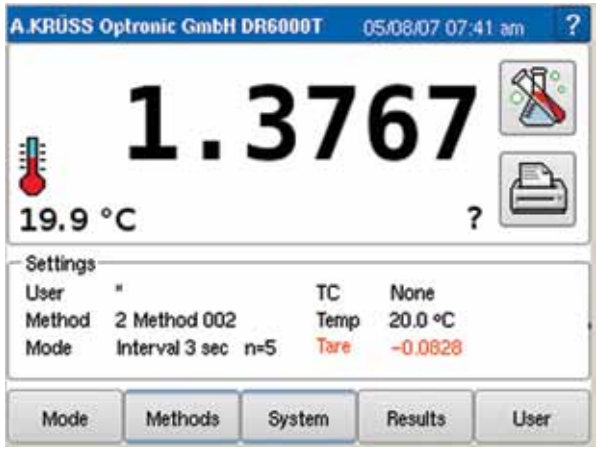
▶ Fill the sample into the measurement cell and push Messen .

The offset (tare) will be calculated and displayed.

▶ Save the value with Speichern .

▶ 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.

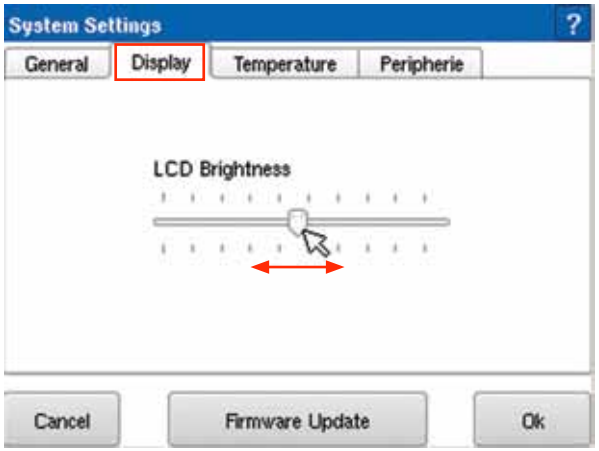
Clearing tare

► Push
System > Tare > Delete .
The tare offset will be set to 0.0000.

► Save the value with Speichern .
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**.

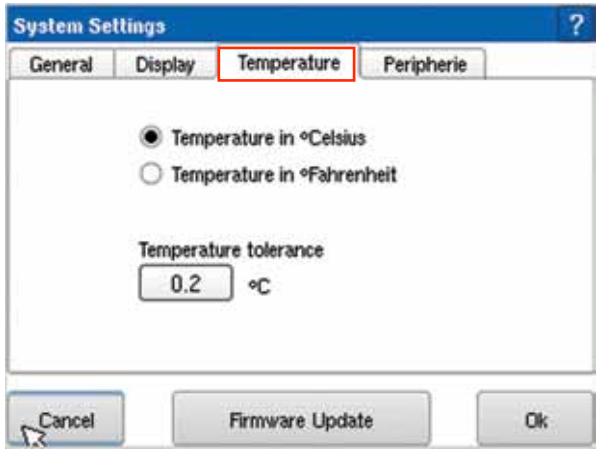
Temperature settings

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

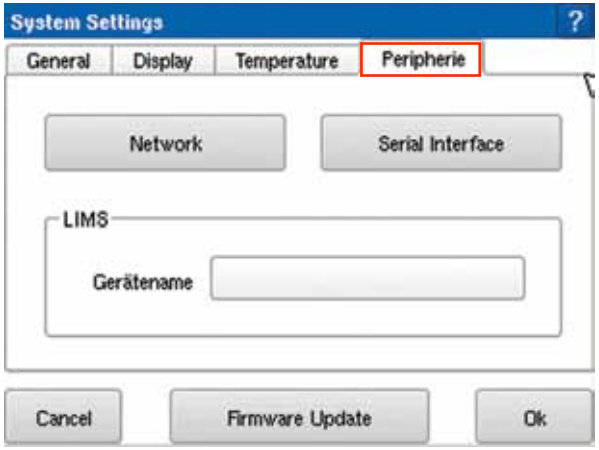
► Push the temperature button and enter the permitted deviation from the target temperature. The value must be higher than 0.1° C.
► Save your input with **OK**.

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.

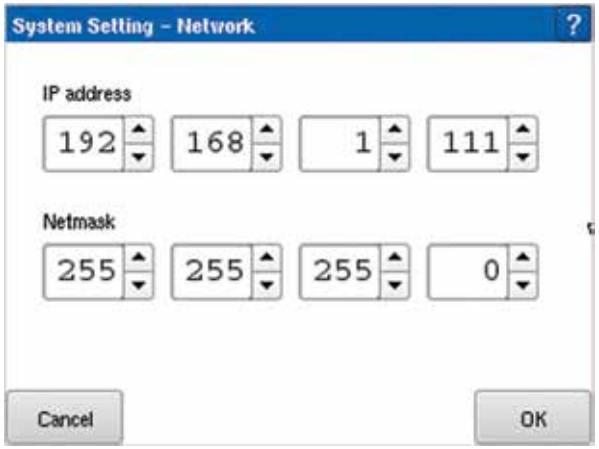
► Select the *Peripherals* tab.



Configuring the network

▶ Push Network .

The network connection interface can be configured in the following dialog:



Defaulteinstellung

▶ Enter the *IP Address* and *Subnet mask*.

▶ Save your settings with **OK**.

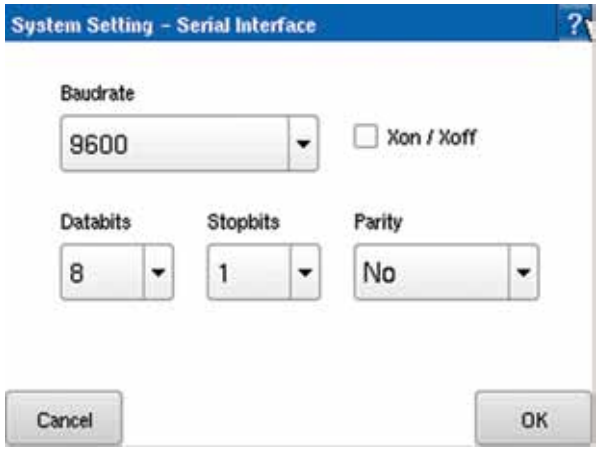
Note!
If a LIMS is connected, an aditional device has to be entered.

Defining a serial interface

Any printer can be connected to the serial interface.

▶ Push Serial Interface

The following dialog will appear:



Default adjustment

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

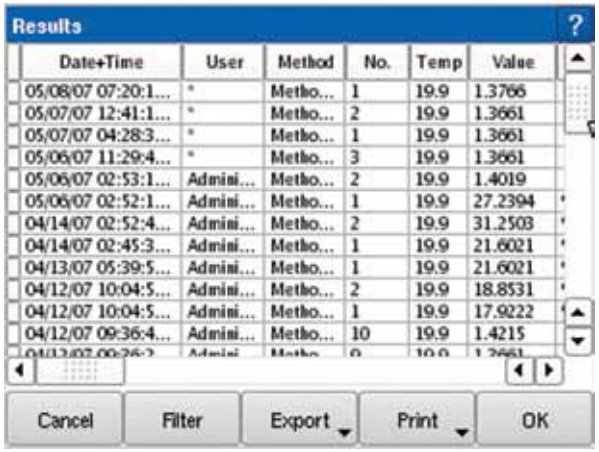
Baud rate	1200/2400/4800/9600/19200 /38400/115200
xon/xoff	Flow control on/off
Data Bits	7/8
Stop Bits	1/2
Parity	N0/ODD/EVEN

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 Results in the main menu.
The results menu will appear:



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

Export Excel CSV format Export HTML format	*Initiates the export process.*
Ascending order Descending order	*Sorts the results list by date.*
Select all lines Reset selection	*Selects and deselects all results.*
Configurate lines	*Selects values for output*

Button	Description
Print	Prints the selected results from the results list. A drop-down menu will appear:

Print	*Initiates the printing process.*
Ascending order Descending order	*Sorts the results list by date.*
Select all lines Reset selection	*Selects and deselects all results.*
Configurate lines	*Selects values for output*

Ok	Saves the settings, closes the results menu, and returns to the main menu.
Cancel	Leaves the results menu without saving the settings.

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 Print or exported using Export .

Filtering results

If only certain results with shared characteristics are to be selected for output, they can be filtered using the following criteria:

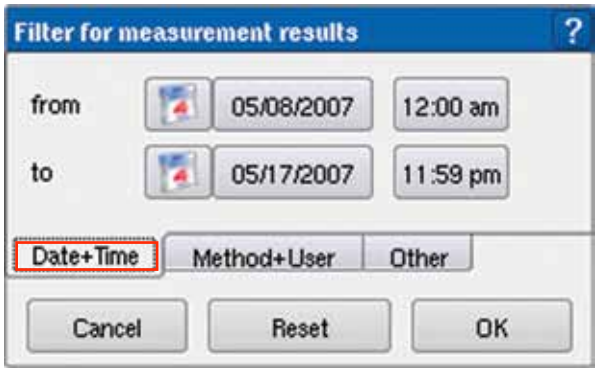
- By day, period (from – to), time
- Only QC results
- By method
- By user

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 Filter .



▶ 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 Export or printed with Print .

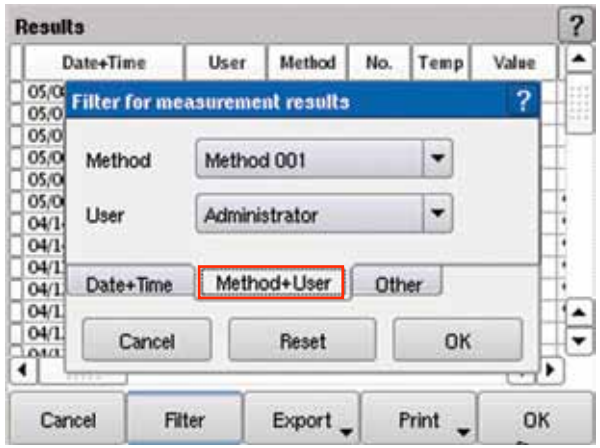
Filtering by method and user

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**.



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

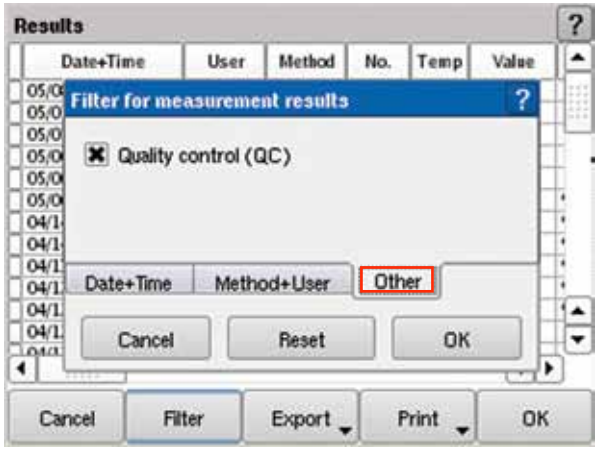
QC filtering

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**.



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

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:

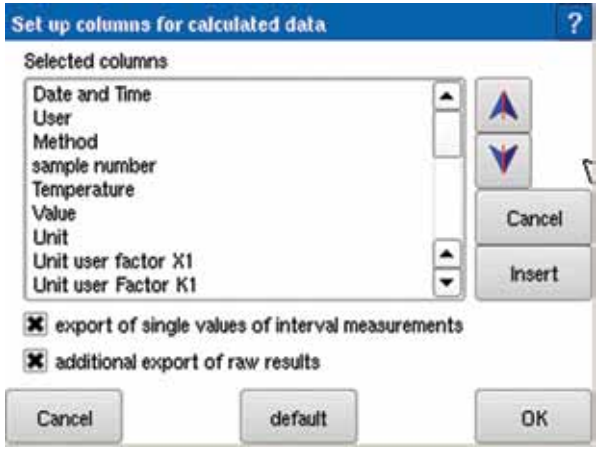
- ☒ *Date and time*
- ☒ *User*
- ☒ *Method*
- ☒ *Sample number*
- ☒ *Measurement value*
- ☒ *Unit*
- ☒ *Unit user factor X1*
- ☒ *Unit user factor X2*
- ☒ *Unit user factor X3*
- ☒ *Unit user factor K1*
- ☒ *Unit user factor K2*
- ☒ *Unit user factor K3*
- ☒ *Temperature (actual)*
- ☒ *Target temperature*
- ☒ *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*

- ☒ *Measurement mode*
- ☒ *Measurement interval*
- ☒ *Number of measurements*
- ☒ *Sample type*
- ☒ *Tare*

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.



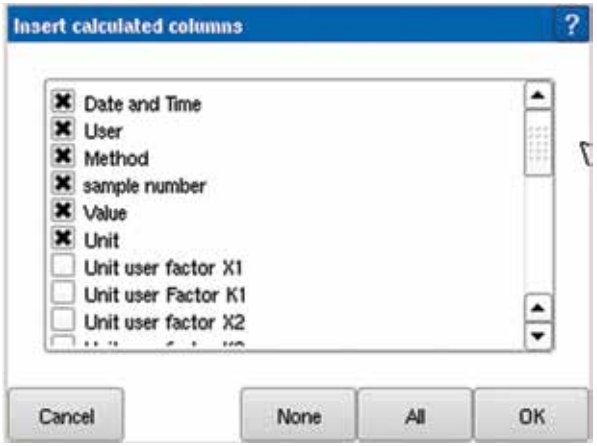
Button	Description
Delete	Deletes the selected column.
Hinzufügen	Opens a menu in which more columns can be added to the results list.
Default	Resets the previously selected columns to: • Date and time • User • Method • Number • Temperature (actual) • Measurement value
Individual values for interval 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.
Ok	Applies the settings, closes the system menu and returns to the start menu.
Cancel	Leaves the menu without saving the settings.

Adding columns

To add more columns to the currently selected columns:

▶ Push Hinzufügen .

The menu with all available columns will appear.



▶ Activate ☒ the desired options (columns).

To specify all columns for output in the results list:

▶ Push **All**.

You can deactivate all columns with **None**.

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 Results .

▶ Select or filter the desired results.

▶ Push 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 Results

▶ Select or filter the desired results.

▶ Push 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 Cancel in the results menu.

You may now remove the USB flash drive.

5.5 User menu

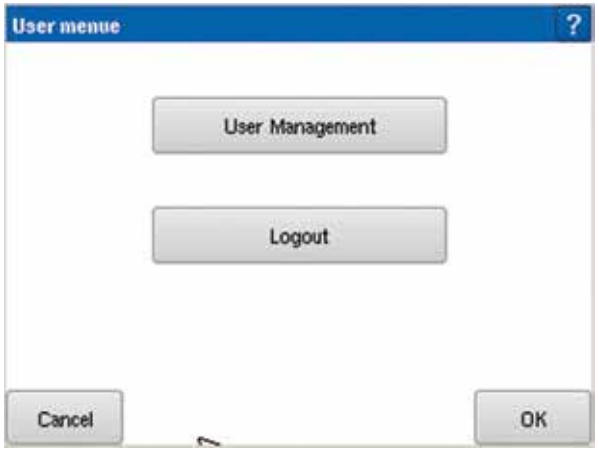
The following settings can be made in the user menu:

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

Opening the user menu

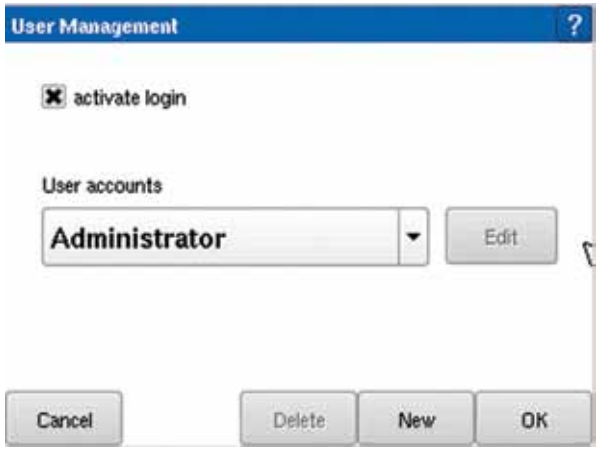
▶ Push User in the main menu.

The user menu will appear:



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

User management



Button	Description
Activate login	☒ The device can only be operated after a valid login (username and password). ☐ The device can be operated without entering a user-name and password.
Edit	Logs the user out and displays the login screen.
New	Creates a new user.
Delete	Deletes the selected user after a confirmation query.
Ok	Saves the settings, closes the user menu, and returns to the main menu.
Cancel	Leaves the user menu without saving the settings.

Creating a new user

To create a new user:

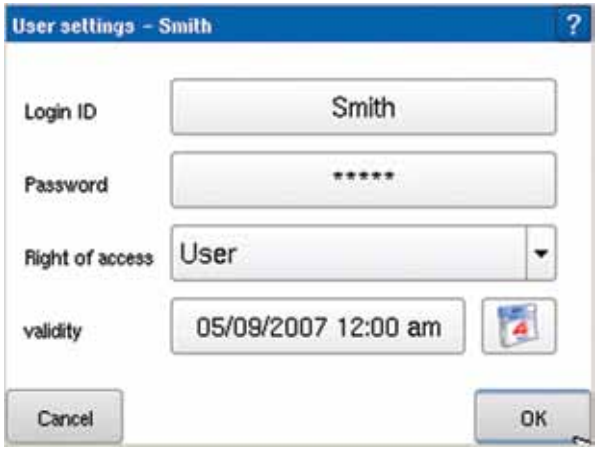
▶ Push User Management in the main menu.

▶ Push New .

▶ Enter the user's name, the login name and the password, one after the other.

▶ Confirm your input with **OK**.

The User settings menu will appear:



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.

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.

- **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.

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

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**.

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

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

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

Glossary

NIST	National Institute of Standards and Technology
GLP	Good Laboratory Practice (QA System)
LIMS	Labor - Informations - Management - System.
FDA	Food and Drug Administration
ICUMSA	International Commission for Uniform Methods of Sugar Analysis

Appendix

Technical data

	Range 1.3200-1.5800nD 0-95% Brix	Range 1.3200-1.7000nD 0-95% Brix	Precision 0.0001nD 0.1% Brix	Resolution 0.0001nD 0.1% Brix	Built-in Peltier Thermostat	Flow-thru 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

	Range 1.32000-1.58000nD 0-95% Brix	Range 1.32000-1.70000nD 0-95% Brix	Precision 0.00002nD 0.02% Brix	Resolution 0.00002nD 0.01% Brix	Built-in Peltier Thermostat	Flow-thru 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 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

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

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, in 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.

A.KRÜSS Optronic GmbH
Alsterdorfer Strasse 276–278
22297 Hamburg / Germany

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Email: service@kruess.com

Declaration of conformity

EG-Konformitätserklärung
EC-Declaration of Conformity

KRÜSS A.KRÜSS OPTRONIC GERMANY

Produktbezeichnung: **Digital Refraktometer DR 6000-6300-T**
Name of the product, type or model *Digital Refractometer 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 regulation of European Council:

Nummer / Kurztitel *Number / Titel*	**Eingehaltene Vorschriften** *Observed regulations*	
89/336/EWG EMV-Richtlinie *EMC-Directive*	**EN 50081-1**	**Fachgrundnorm Störfestigkeit (Wohnbereich)** *Generic immunity standard, Residential, commercial and light industry*
	IEC 61000-4-2	**Störfestigkeit gegen die Entladung statischer Elektrizität** *Electrostatic discharge requirements*
	IEC 61000-4-4	**Störfestigkeit gegen schnelle transiente Störgrößen / Brust** *Electrical fast transient/burst immunity test*
	IEC 61000-4-5	**Störfestigkeit gegen Stoßspannungen** *Surge immunity requirements*
	EN 55011	**Norm für Störaussendung** ***Standard for emitted interference***
	EN 61000-3-2/3	**Norm für Netzrückwirkungen** *Standard for system perturbation*
73/23/EWG EMV-Richtlinie *EMC-Directive*	**EN 61010-1**	**Sicherheitsbestimmung für elektrische Laborgeräte** *Safety regulation for electrical laboratory instruments*

Ort, Datum: **Hamburg, 10.11.2005**
Place, date

Konformitätsbeauftragter: **Karin Leibrock (Leiterin Qualitätsmanagement)**
Representative for conformity *(Director Qualitymanagement)*

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, beinhaltet jedoch keine Zusicherung von Eigenschaften. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
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.

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Stand: Okt. 2007