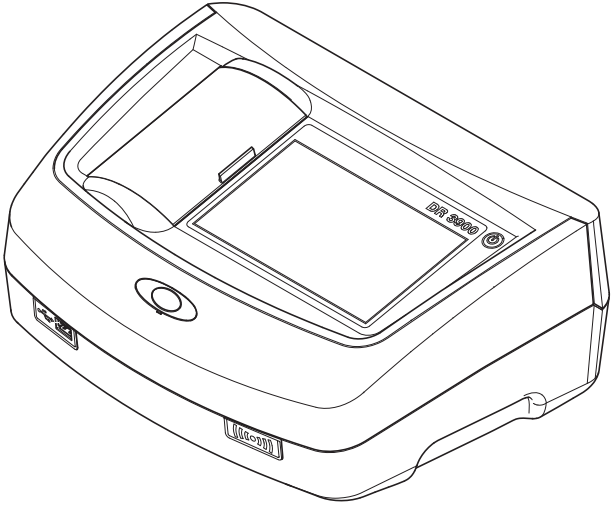
DOC022.98.90324

DR 3900

08/2031, Edition 12



Основно ръководство за потребителя **bg**
Základní uživatelská příručka **cs**
Grundlæggende brugervejledning **da**
Basis Bedienungsanleitung **de**
Βασικό Εγχειρίδιο Χρήστη **el**
Basic User Manual **en**
Manual básico del usuario **es**
Basic käyttöohjeet **fi**
Manuel d'utilisation de base **fr**
Osnovni korisnički priručnik **hr**
Alap felhasználói kézikönyv **hu**
Manuale utente di base **it**
основен прирачник за корисникот **mk**
Basisgebruikershandleiding **nl**
Podstawowa instrukcja obsługi **pl**
Manual do utilizador básico **pt**
Manual de bază al utilizatorului **ro**
Основное руководство пользователя **ru**
Základný návod na použitie **sk**
Osnovni uporabniški priročnik **sl**
Grundläggande bruksanvisning **sv**
Temel Kullanıcı Kılavuzu **tr**

Specifications

These are subject to change without notice!

Performance specifications	
Operating mode	Transmittance (%), Absorbance and Concentration
Source lamp	Halogen lamp
Wavelength range	320–1100 nm
Wavelength Accuracy	± 1,5 nm (wavelength range 340–900 nm)
Wavelength reproducibility	± 0,1 nm
Wavelength resolution	1 nm
Wavelength calibration	Automatic
Wavelength selection	Automatic, based on method selection
Scanning speed	≥ 8 nm/s (in steps of 1 nm)
Spectral bandwidth	5 nm
Photometric measuring range	± 3,0 Abs (wavelength range 340–900 nm)
Photometric accuracy	5 m Abs at 0,0–0,5 Abs 1 % at 0.50–2.0 Abs
Photometric linearity	< 0,5 % to 2 Abs ≤1 % at > 2 Abs with neutral glass at 546 nm
Stray light	< 0,1 % T at 340 nm with $NaNO_2$
Data log	2000 readings (Result, Date, Time, Sample ID, User ID)
User programs	100

Performance specifications	
Physical and environmental specifications	
Width	350 mm (13,78 in)
Height	151 mm (5,94 in)
Depth	255 mm (10,04 in)
Mass	4200 g (9,26 lb)
Ambient operating requirements	10–40 °C (50–104 °F), maximum 80 % relative humidity (without condensate formation)
Ambient storage requirements	–40–60 °C (–40–140 °F), maximum 80 % relative humidity (without condensate formation)
Additional technical data	
Power connector via external power supply	Input:100–240 V ±10 VAC/50–60 Hz Output: 15 V/40 VA
Interfaces	Use only shielded cable with maximum length of 3 m: 2× USB type A 1× USB type B Use only shielded cable (e.g. STP, FTP, S/FTP) with maximum length of 20 m: 1× Ethernet
Enclosure rating	IP40
Protection class	Class I
Altitude	2000 m
Pollution degree	2
Overvoltage category	II
Environmental conditions	Indoor use only
Power supply	External power supply

General Information

Safety information

Please read this entire manual before unpacking, setting up, or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To make sure that the protection provided by this instrument is not impaired, do not use or install this instrument in any manner other than that specified in these operating instructions.

⚠ DANGER

Indicates a potentially or imminently hazardous situation that, if not avoided, results in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation that, if not avoided, may result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation that, if not avoided, could result in damage to the instrument. Information that requires special emphasis.

Note: *Information that supplements points in the main text.*

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if this information is not observed.

A symbol, if noted on the instrument, will be included with a danger or caution statement in the operating instructions.

	This symbol, if noted on the instrument, references the user manual for operation and/or safety information.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the manufacturer for disposal at no charge to the user. ***Note:*** *For return for recycling, please contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment, manufacturer-supplied electrical accessories, and all auxiliary items for correct disposal.*

RFID module (not available on all models)

RFID technology is a radio application. Radio applications are subject to national conditions of authorization. In case of doubt, please contact the distributor.

The DR 3900 contains an RFID module to receive and transmit information and data. The RFID module operates with a frequency of 13.56 MHz.

⚠ WARNING

The spectrophotometer may not be used in dangerous environments.

The manufacturer and its suppliers reject any express or indirect guarantee for the use with High Risk Activities.

Follow the following safety information, in addition to any local guidelines in force.

Safety information for the correct use of the instrument:

- Do not operate the instrument in hospitals or comparable establishments in proximity to medical equipment, like pace makers or hearing aids.

- Do not operate the instrument near highly flammable substances, such as fuels, highly combustible chemicals and explosives.
- Do not operate the instrument near combustible gases, vapors or dust.
- Do not vibrate or jolt the instrument.
- The instrument can cause interference in immediate proximity to televisions, radios and computers.
- Do not open the instrument.
- Improper use of the instrument voids the warrantee.

Chemical and Biological Safety

⚠ DANGER

Potential danger in the event of contact with chemical/biological materials.

Handling chemical samples, standards and reagents can be dangerous. Familiarise yourself with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.

Normal operation of this instrument may involve the use of hazardous chemicals or biologically harmful samples.

- Observe all cautionary information printed on the original solution containers and safety data sheet prior to their use.
- Dispose of all consumed solutions in accordance with national regulations and laws.
- Select the type of protective equipment suitable to the concentration and quantity of the dangerous material at the respective work place.

Overview of product

The DR 3900 is a VIS spectrophotometer with a wavelength range of 320 to 1100 nm. The instrument is delivered with a complete series of application programs and supports several languages.

The spectrophotometer DR 3900 contains the following programs and operating types:

- Stored programs (pre-installed tests)
- Barcode Programs
- User Programs
- Favorites
- Single Wavelength
- Multi Wavelength
- Wavelength Scan
- Time course

The DR 3900 Spectrophotometer provides digital readouts in direct concentration units, absorbance or percent transmittance.

When selecting a user-generated or programmed method, the menus and prompts serve to direct the user through the test.

This menu system can also generate reports, statistical evaluations of generated calibration curves and to report instrument diagnostic checks.

Installation

⚠WARNING

Electrical and fire hazards.
Only use the supplied benchtop power supply LZV844.

Only qualified experts may perform the tasks described in this section of the manual, while adhering to all locally valid safety regulations.

Unpack the instrument

The DR 3900 Spectrophotometer comes packaged with the following items:

- DR 3900 spectrophotometer
- Dust Cover
- USB dust cover, fitted as standard
- Benchtop power supply with power cord for EU
- Cell adapter A
- Light shield, fitted as standard in the DR 3900
- Operator RFID tag (not available on all models)
- Basic operating instructions DR 3900, operating instructions LINK2SC

Further information, detailed user manuals and documentation are available on the website of the manufacturer.

Note: *If any of these items are missing or damaged, please contact the manufacturer or a sales representative immediately.*

Operating environment

Note the following points so that the instrument will operate perfectly and have a long service life.

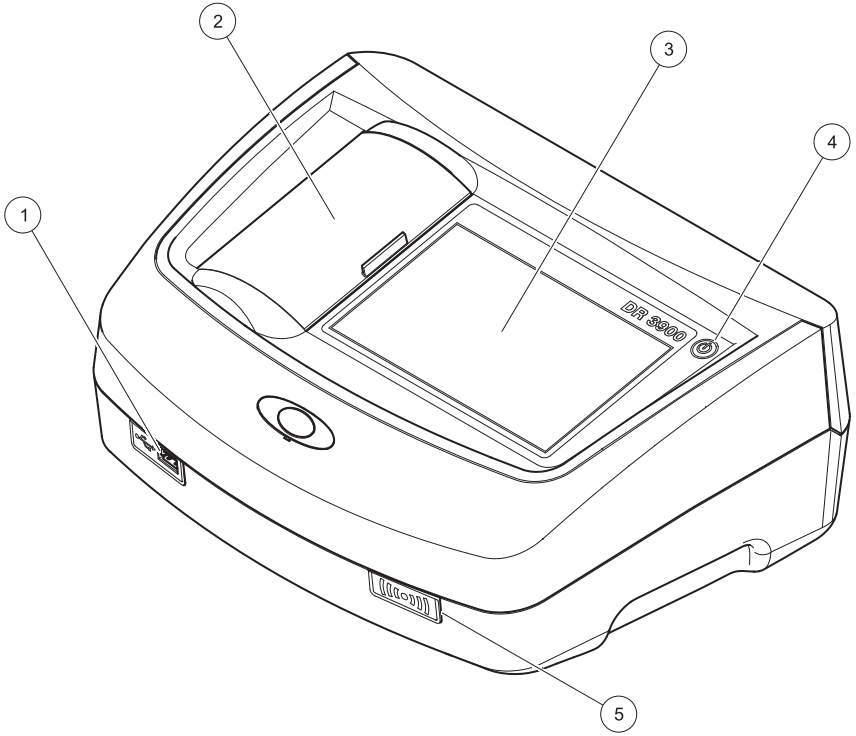
- Place the instrument firmly on an even surface. Do not push any objects under the instrument.
- The ambient temperature must be 10–40 °C (50–104 °F).
- The relative humidity should be less than 80 %; moisture should not condense on the instrument.
- Leave at least a 15 cm clearance at the top and on all sides for air circulation, to avoid overheating of electrical parts.
- Do not operate or store the instrument in extremely dusty, humid or wet locations.
- Keep the surface of the instrument, the cell compartment and all accessories clean and dry at all times. Immediately remove splashes or spilt materials on or in the instrument.

NOTICE

Protect the instrument from extreme temperatures from heaters, direct sunlight and other heat sources.

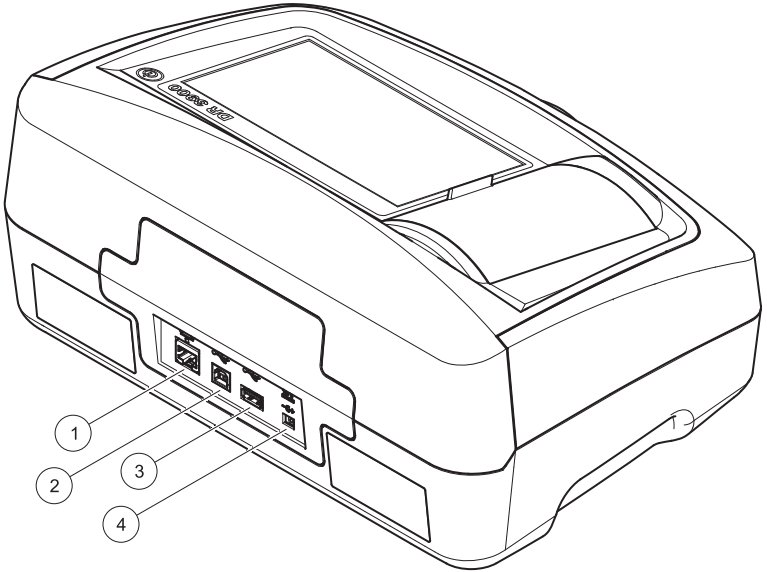
Front and back view

Figure 1 Front view



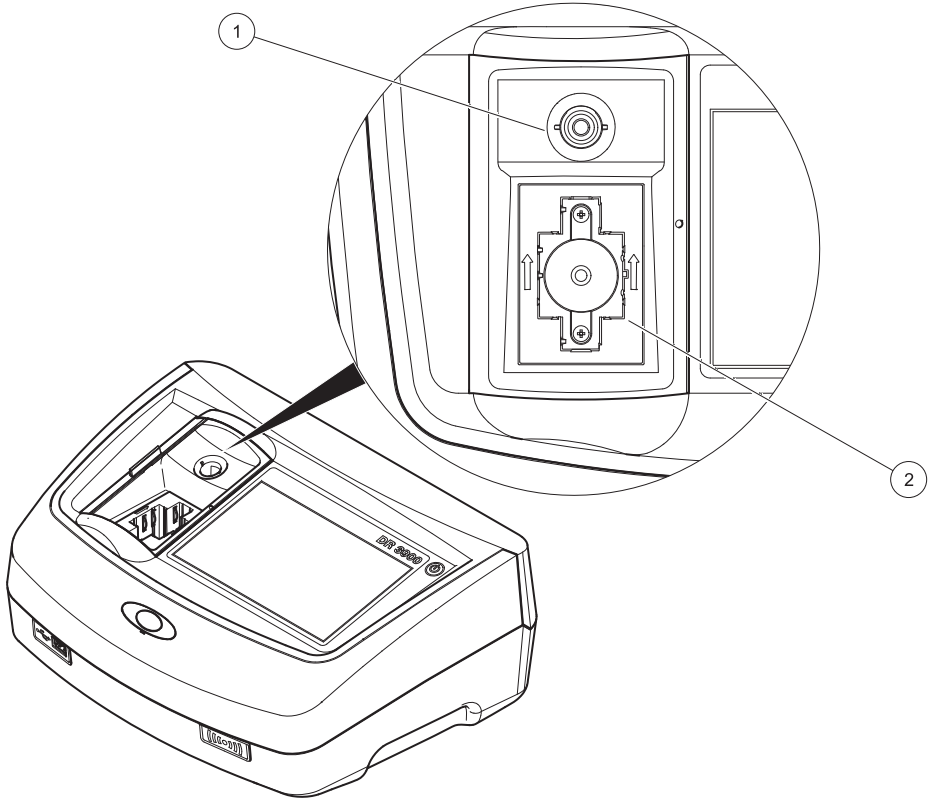
1	USB port type A	**4**	On/off switch
2	Cell compartment cover	**5**	RFID module (not available on all models)
3	Touch screen		

Figure 2 Back view



1	Ethernet port	**3**	USB port type A
2	USB port type B	**4**	Connection for benchtop power supply

Figure 3 Cell compartments



1	Cell compartment for round cells (1)	**2**	Cell compartment for rectangular cells (2)

Power connections

⚠WARNING

Electrical and fire hazards.
Only use the supplied benchtop power supply LZV844.

1. Connect the power cable to the benchtop power supply.
2. Plug the benchtop power supply cable into the back of the instrument (Figure 2, page 108).
3. Insert the power cable plug into a mains socket (100–240 V~/ 50–60 Hz).

Turn on the power button next to the display to turn on the power supply (Figure 1, page 107).

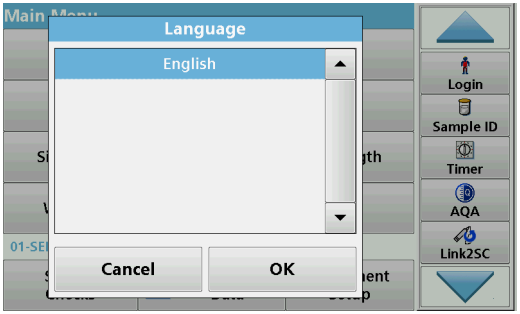
Startup

Switch on the instrument, startup process

1. Connect the power cable to the mains outlet.
2. Switch on the instrument by using the power button next to the display.
3. The instrument starts automatically with a startup process lasting approximately 45 seconds. The display shows the logo of the manufacturer. At the end of the startup process, a startup melody is heard.

Note: *Wait approximately **20 seconds** before switching on again so as not to damage the electronics and mechanics of the instrument.*

Language selection



The DR 3900 software includes several language options. The first time the instrument is switched on, the language selection screen will be shown automatically after the startup process.

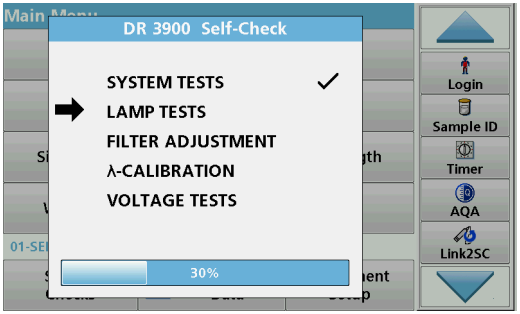
1. Select the required language.
2. Press **OK** to confirm the language selection. The self-check will then start automatically.

Change the language setting

The instrument functions in the selected language until the option is changed.

1. Turn the instrument on.
2. During the startup process, touch any point on the screen and maintain contact until the option for selecting a language is shown (approximately 45 seconds).
3. Select the required language.
4. Press **OK** to confirm the language selection. The self-check will then start automatically.

Self-check



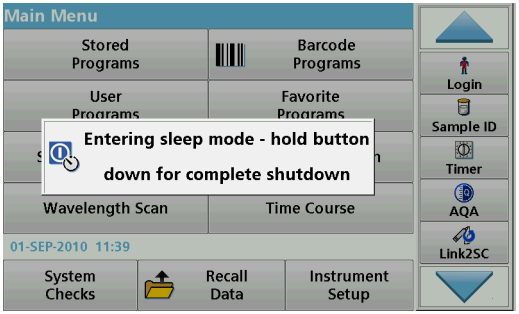
Each time the instrument is powered up, a test program begins.

This procedure, which takes approximately two minutes, checks the system, lamp, filter adjustment, wavelength calibration and voltage. Each test that functions correctly is marked accordingly.

The Main Menu is displayed when diagnostics are completed.

Note: *In the event of further error messages during the test program, refer to* *Troubleshooting, Seite 118**.*

Sleep mode



The instrument can be put into sleep mode.

1. Briefly press the power button next to the display.

   The "Sleep mode" message is shown. The display will then switch off automatically.

2. To switch on, press the power button next to the display.
   The self-check will start automatically.
   After that, the instrument is ready to use.

Power off the instrument

1. Press the power button next to the display for approximately 5 seconds.

Standard programs

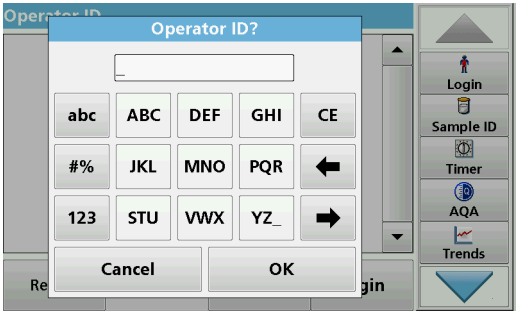
Tips for the use of the touch screen

The whole screen responds to touch. To choose an option, tap with a fingernail, fingertip, an eraser or a specialised stylus. Do not press the screen with a sharp object, such as the tip of a ballpoint pen.

- Do not place anything on top of the screen, to prevent damage or scratches on the screen.

- Press buttons, words or icons to select them.
- Use scroll bars to move up and down long lists very quickly. Press and hold the scroll bar, then move up or down to move through the list.
- Highlight an item from a list by pressing it once. When the item has been successfully selected, it will be displayed as reversed text (light text on a dark background).

Use of the alphanumeric keypad



This display is used to enter letters, numbers and symbols as needed when programming the instrument. Unavailable options are disabled (grayed out). The icons on the right and left of the screen are described in Table 1.

The central keypad changes to reflect the chosen entry mode. Press a key repeatedly until the desired character appears on the screen. A space can be entered by using the underscore on the **YZ_** key.

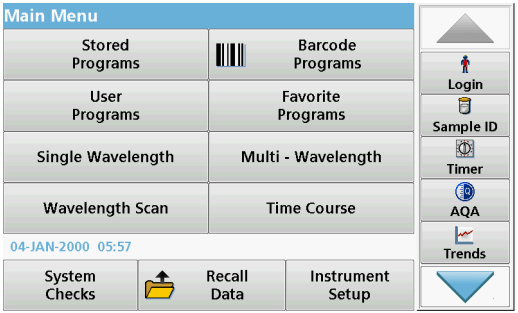
Press **Cancel** to cancel an entry, or press **OK** to confirm an entry.

Note: *It is also possible to use a USB keyboard (with US keyboard layout) or a hand-held USB barcode scanner.*

Table 1 Alphanumeric keypad

Icon / key	Description	Function
ABC/abc	Alphabetic	Toggles the character input mode between upper and lower case.
# %	Symbols	Punctuation, symbols and numerical sub- and superscripts may be entered.
123	Numeric	For entering regular numbers.
CE	Clear Entry	Clear the entry.
Left Arrow	Back	Deletes the current character and goes back one position.
Right Arrow	Next	Navigates to the next space in an entry.

Main menu



A variety of modes may be selected from the Main Menu. The following table briefly describes each menu option.

There is a toolbar on the right-hand side of the screen. Press to activate the various functions.

Table 2 Main Menu options

Option	Function
Stored Programs / Barcode Programs (HACH-LANGE programs)	Stored programs are pre-programmed methods that make use of HACH chemicals and HACH-LANGE pipette tests. The working procedures for HACH-LANGE tests are included in the test packs. Further information, as well as illustrated, step-by-step process instructions for analyses using HACH programs, are available on the website of the manufacturer.
User Programs	User programs make "made to measure analysis" possible: • Users can program methods they have developed themselves • Existing HACH and LANGE methods can be stored as user programs. The HACH-LANGE tests can then be modified to suit the user's requirements.
Favorites	List of methods/tests created by the user to suit his own requirements.
Single Wavelength	Single wavelength readings are: **Absorbance readings:** The light absorbed by the sample is measured in absorbance units. **Transmittance reading (%)**: Measures the percent of the original light that passes through the sample and reaches the detector. **Concentration readings:** A concentration factor can be entered to enable the measured absorbance values to be converted into concentration values.
Multi Wavelength	In the Multi Wavelength mode, absorbance (Abs) or percentage transmittance (%T) is measured at up to four wavelengths and absorbance differences and absorbance relationships are calculated. Simple conversions into concentrations can also be carried out.
Wavelength Scan	A wavelength scan shows how the light from a sample is absorbed over a defined wavelength spectrum. This function can be used to determine the wavelength at which the maximum absorbance value can be measured. The absorbance behavior is displayed graphically during the scan.
Time course	The time scan records the absorbance or % transmittance at a wavelength over a defined time.

Table 2 Main Menu options

Option	Function
System checks	The "System check" menu offers a number of options, including optical checks, output checks, lamp history, instrument update, service time, settings for analytical quality assurance and instrument backup.
Recall measurement data	Stored data can be called up, filtered, sent and deleted.
Instrument Setup	In this mode, user-specific or method-specific settings can be entered: operator ID, sample ID, date & time, sound, PC & printer, password, energy-saving mode and stored data.

Save, recall, send and delete data

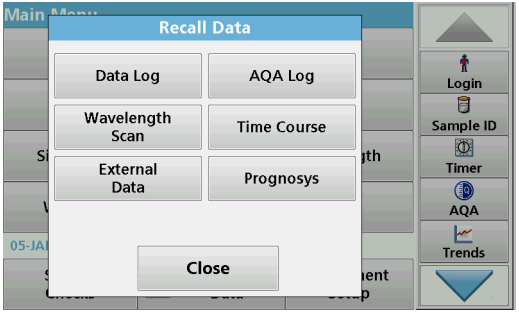
The data log

The data log can store up to 2000 readings saved by the following programs:

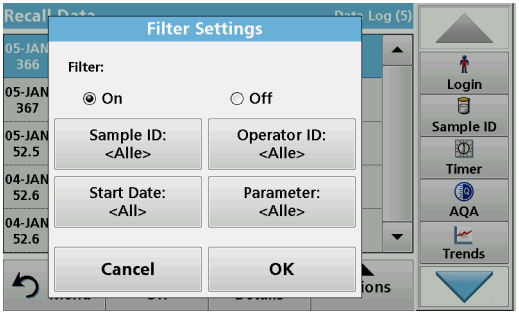
- Stored Programs,
- Barcode Programs,
- User programs,
- Favorites,
- Single Wavelength and
- Multi Wavelength.

A complete record of the analysis is stored, including the Date, Time, Results, Sample ID and Operator ID.

Recall stored data from the data log

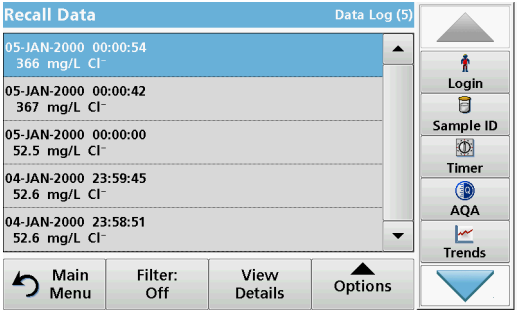


1. Press **Recall Data** in the Main Menu.
2. Press **Data Log**.
   A listing of the stored data is displayed.



3. Press **Filter: On/Off**.
   The function **Filter Settings** is used to search for specific items.
4. Activate **On**. The data can now be filtered using the following selection criteria.
   - Sample ID
   - Operator ID
   - Start Date
   - Parameter

   or any combination of the four.



5. Press **OK** to confirm the selection.
   The chosen items are listed.
6. Press **View Details** to get more information.

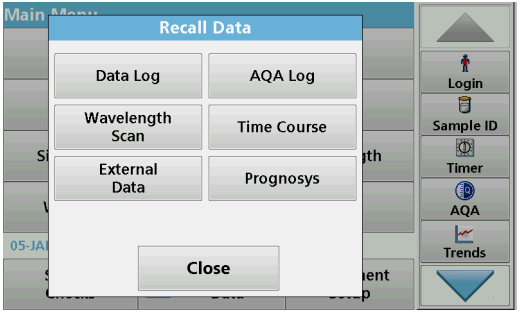
Send data from the data log

NOTICE

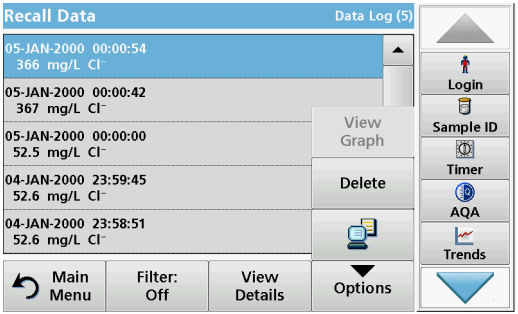
Network and access point security is the responsibility of the customer that uses the wireless instrument. The manufacturer will not be liable for any damages, inclusive however not limited to indirect, special, consequential or incidental damages, that have been caused by a gap in, or breach of network security.

Data is sent from the internal data log as an XML (Extensible Markup Language) file or as a CSV (Comma Separated Value) file, to a directory with the name DataLog on a USB mass storage device or a network drive. The file can then be processed using a spreadsheet program. The

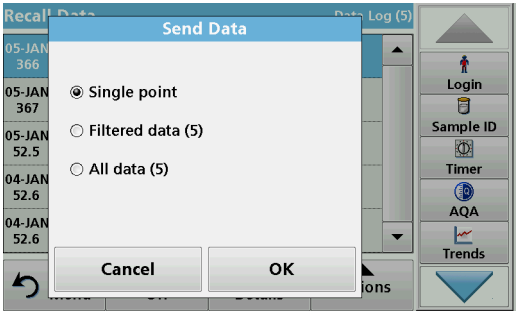
file name has the format: DLYear-Month-Day_Hour_Minute_Second.csv or DLYear-Month-Day_Hour_Minute_Second.xml.



1. Plug the USB storage device into the USB type A port on the DR 3900, or connect the DR 3900 to a network drive.
2. Press **Recall Data** from the Main Menu.
3. Select the data category to be transferred, e.g. **Data Log**.
   A list of the selected measurement data is displayed.



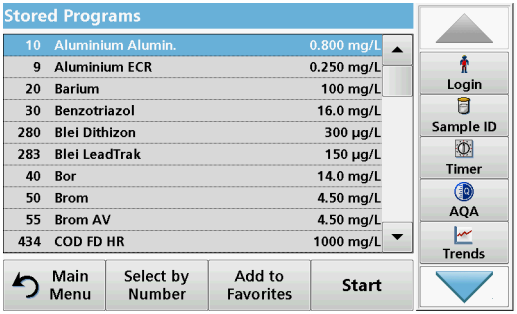
4. Press **Options** and then the **PC & Printer** icon.



5. Select the data to be sent.
   The following options are available:
   - **Single point**: only this selected reading will be sent
   - **Filtered data**: only readings that correspond to the set filters will be sent
   - **All data**: all data in the selected data category will be sent.
6. Press **OK** to confirm.

Note: *The number in parentheses is the total number of data sets assigned to this selection.*

Stored Programs



1. Press **Stored Programs** in the Main Menu to view an alphabetical list of stored programs with program numbers.

   The "Stored Programs" list will appear.

2. Highlight the required test.

   Hinweis: *Select the program by name or scroll through the list using the arrow keys. Highlight the program or press* ***Select by No.*** *to search for a specific program number. Press* ***OK*** *to confirm.*

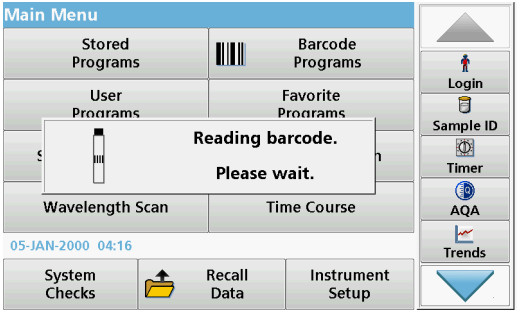
3. Press **Start** to run the program. The respective measurement window is displayed.

   Hinweis: *All corresponding data (wavelength, factors and constants) is already preset.*

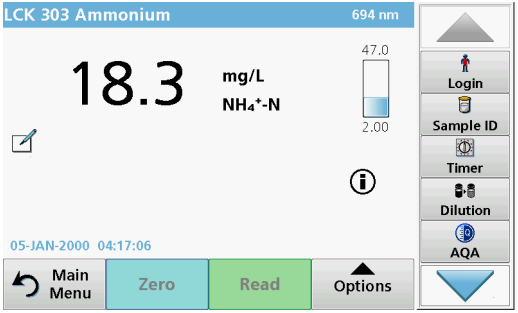
4. Follow the instructions for chemical procedures in the relevant procedures manual. Further information are available on the website of the manufacturer.

   Hinweis: *To display the procedural instructions in the display, press the info icon. Not all programs have this option.*

Complete a barcode test



1. Insert the light shield into cell compartment (2).
2. Prepare the barcode test according to the process specification, and insert the cell in cell compartment (1).
   - When a coded cell is placed in cell compartment (1) (Figure 3, page 109), the corresponding reading program is automatically activated in the Main Menu.
   - Otherwise, press **Barcode Programs** in the Main Menu and insert a zero cell (depending on process specification) into cell compartment (1).



The reading is started automatically and the results are displayed.

To evaluate other cell tests and other parameters, insert the prepared cell into the cell compartment and read off the result.

Note: *The control bar displayed on the right of the screen shows the relationship of the reading result to the measuring range. The black bar shows the measured result independently of any dilution factor that was entered.*

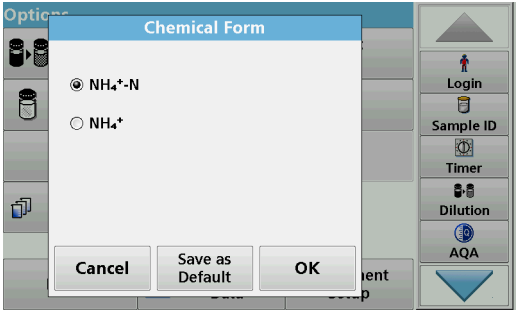
Select the chemical evaluation form

The chemical form of the test result of a number of parameters can be selected individually.

1. In the result display, press the unit (e. g. mg/L) or the chemical representation of the evaluation form (e. g. PO_4^{3-}–P).

   A list of available evaluation forms appears.
2. Select the required form from the list. Press **OK** to confirm.

Another way of changing the standard setting is:



1. In the result display, press **Options>More>Chemical Form**.

   A list of available evaluation forms appear.
2. Select the required chemical form and press **OK** to confirm.

   Hinweis: *The selected chemical form is displayed, but does not become the default. To change the default, refer to section Change of the default setting of the chemical form.*

Change of the default setting of the chemical form

1. Insert the zero cell or sample cell (corresponding to the process specification) into the cell compartment.
2. In the result display, press **Options>More>Chemical Form**.
3. A list of available evaluation forms appear. Select the new default setting.
4. Press **Save as Default**.

The current result and all further readings will be displayed in the new chemical form.

Troubleshooting

Error displayed	Definition	Resolution
Attention! **Please insert the light shield.**	Readings with barcode cuvettes generally require the light shield.	Insert the light shield. Press **OK**.
Barcode label not read	Barcode faulty	Reinsert the cell. If the barcode is not recognised, contact the manufacturer or his representative.
An error occurred when uploading the instrument data.		Start the procedure again or contact the manufacturer or his representative.
An error occurred when reading from the USB memory stick.		Start the procedure again or contact the manufacturer or his representative.
An error occurred when writing to the USB memory stick.		Start the procedure again or contact the manufacturer or his representative.
Please check on the current update file.	Error during update.	Check the USB memory stick.
Please contact Customer Services.	Error during update.	
Please check network configuration.		
Please check the connection.		
Please close the cover.		Close the cover.

Error displayed	Definition	Resolution
Please insert the USB memory stick.		Insert a USB memory stick into a USB A port on the instrument.
Please check the connection and contact the administrator.	Network setup or FTP error	
Blank value correction not possible!	Blank value correction not possible with LCW919.	
File for instrument update missing.	Error during update.	Check the USB memory stick.
File for instrument update is faulty.	Error during update.	Save the update file again and repeat the procedure.
It's recommended to execute a Full System Check	Check of the air values failed	Switch the instrument of and then back on again. If the system check is not successful, contact the manufacturer or his representative.
Entry invalid!	Password incorrect	Forgotten your password? Contact the manufacturer or his representative.
Absorbance > 3.5!	The measured absorbance exceeds 3.5	Dilute sample and measure again
Fault **Barcode check number?** **Please update program data!**	Deviation to the stored data	Data updating
Error when calling up the local IP address.	Network setup: DHCP client has no connection to the DHCP server	Enter the IP address again.

Error displayed	Definition	Resolution
Error during default gateway setup.	Network setup: default gateway cannot be set for fixed IP address	Try to create the connection again.
Error during network drive setup!	Error during network setup	Check the settings.
Error during subnet mask setup.	Network setup: Subnet mask cannot be set for fixed IP address	Enter the subnet mask again.
Error copying from USB memory stick.	Error during update	Start the procedure again or contact the manufacturer or his representative.
Error in FTP connection.	FTP error	Make sure that the instrument is connected to the network.
Fault **Program not accessible.** **Please update program data!**	Barcode test not present	Data updating
Fault **Clean cuvette!**	The cuvette is soiled or there are undissolved particles in the cuvette	Clean the cuvette; allow the particles to settle
Fault **Test program stopped!** **Please check lamp** **Close the lid.** **Error [xx]**	Test program stops when the instrument is started	Check the lamp and replace it if necessary. Close lid. Press **Start Again**.
Fault **Test program stopped!** **Please remove the cuvette** **Close the lid.**	Test program stops when the instrument is started	Remove the cuvette/ sample cell from the cell compartment. Press **OK**.

Error displayed	Definition	Resolution
Error **Selfcheck stopped.** **Hardware error.** **Error [x]**	Electronic defect	Contact the manufacturer or a sales representative and indicate the error number
Error **Too much ambient light!** **Move instrument into shade** **or close the lid**	The instrument sensors detects too much ambient light.	Decrease ambient light. (Avoid direct sunlight.) Close lid.
No help function is available for this program.		
Shelf life exceeded! Use chemicals?		The analysis is possibly erroneous. Use new chemicals
No evaluation!	Error in the test database / user database	Check programming Contact the manufacturer or a sales representative
No barcode!	No barcode found	Reinsert the cell. If the barcode is not recognised, contact the manufacturer or his representative.
No instrument backup present!		Check the USB memory stick.
No valid data for these parameters!	Data analysis not possible, no measurement data	Change the selection.
No valid data found!	View Data not possible in data log	Change the selection.
No help function present.		

Error displayed	Definition	Resolution
No measurement data present!	Data analysis settings cannot be configured without measurement data.	Change the selection.
Control range not reached!	Data analysis limits not reached	This is a warning notice. The control limit set was not reached.
Control range exceeded!	Data analysis limits exceeded.	This is a warning notice. The control limit was exceeded.
Concentration too high!	Calculated concentration is higher than 999999	Dilute sample and measure again
Over measuring range	The measured absorbance is above the calibration range of the test	Dilute sample and measure again
Under measuring range	The measured absorbance is below the calibration range of the test	If possible, select a test with a lower reading range or use a cuvette with a longer path length
Possible interference by:	Interference Check	The analysis is possibly erroneous due to interferences.
Possible interference from:	Interference Check	The analysis is possibly erroneous due to interferences.
Next service is due!		Contact the manufacturer or his representative for an inspection of the instrument.
Negative result!	The calculated result is negative	Check concentration of sample
Network switched off.	Network setup off, when access to instruments homepage via sidebar	Activate the online connection.

Error displayed	Definition	Resolution
Remote server cannot be reached.	Error during network setup	Make sure that the instrument is connected to the network.
Unstable lighting conditions!		Avoid direct sunlight at the measuring location.
Insufficient memory for update.	Error during update.	Select a memory with more space.
System check incorrect!	Measurement of air values failed	Switch the instrument of and then back on again. If the system check is not successful, contact the manufacturer or his representative.
Temperature too high. Measurement not possible!		Switch of the instrument and allow it to cool for a few minutes. If necessary, move it to a cooler place.
Update file is faulty.	Error during update.	Save the update file again and repeat the procedure.
USB memory stick is not connected.	Update not possible.	Check the USB memory stick.
Web server cannot be reached.	Instruments homepage cannot be reached.	Try the connection again later.

Replacement Parts

Description	Cat. No.
Halogen lamp	LPZ440.99.00007
Cell adapter A for 1-cm rectangular and 1-inch round cells	LZV846
Cell adapter B for 3-cm rectangular cells, China only	LZV847
Light shield	LZV849
Bench top power supply	LZV844
Power cord EU	YAA080
Power cord CH	XLH051
Power cord UK	XLH057
Power cord US	XLH055
Power cable China/Australia	XLH069
Dust Cover	LZV845
Cell compartment	LZV848