

We reserve the right to make any changes that serve to improve the instrument.

Operating Manual

Spectrophotometer

XION 500



Dear Customer!

Congratulations on your purchase of the **XION 500 spectrophotometer**, and thank you for placing your trust in our products. The **XION 500** is a modern, high-quality analytical instrument that will be of considerable benefit in your laboratory.

The **XION 500** is a state-of-the-art instrument. It comes complete with a very efficient software package, which is simple to operate and requires only a short familiarization period. Nevertheless, you should read the general part of this Operating Manual very carefully to ensure that operating errors and misunderstandings are avoided from the very start.

The powerful software provides you with the option of supplementing your general routine analysis by programming your own tests for special tasks.

The extensive possibilities of programming, adapting and varying measurements and analyses are described in detail in the **XION 500** Operating Manual.

And, of course, you can contact your local Dr. Lange Agency at any time for comprehensive advice.

We wish you lots of success in your work with your **XION 500**!

Your

Dr. Bruno Lange GmbH & Co. KG

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1.1 Front and back view

Figure 1: Front view

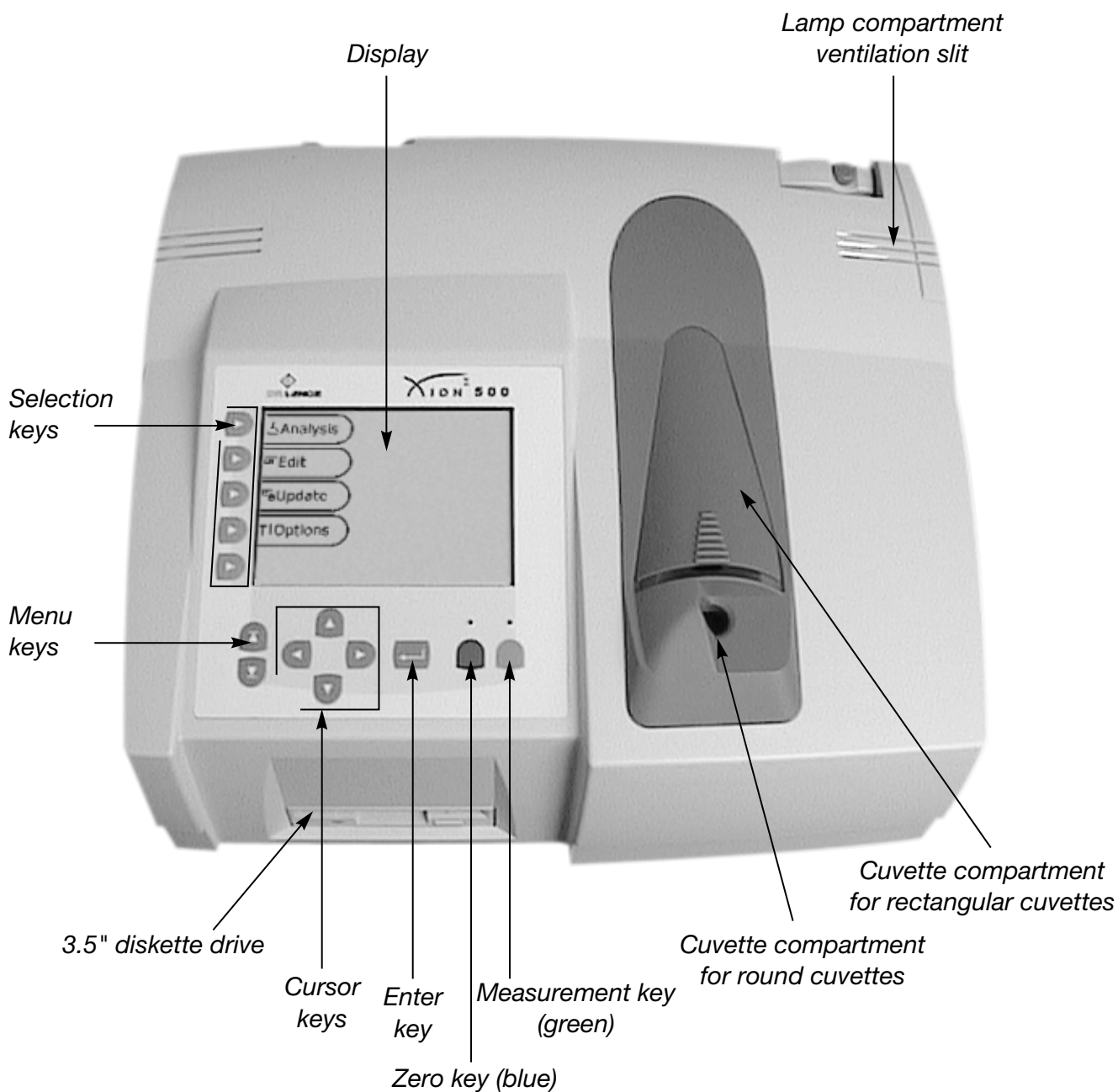
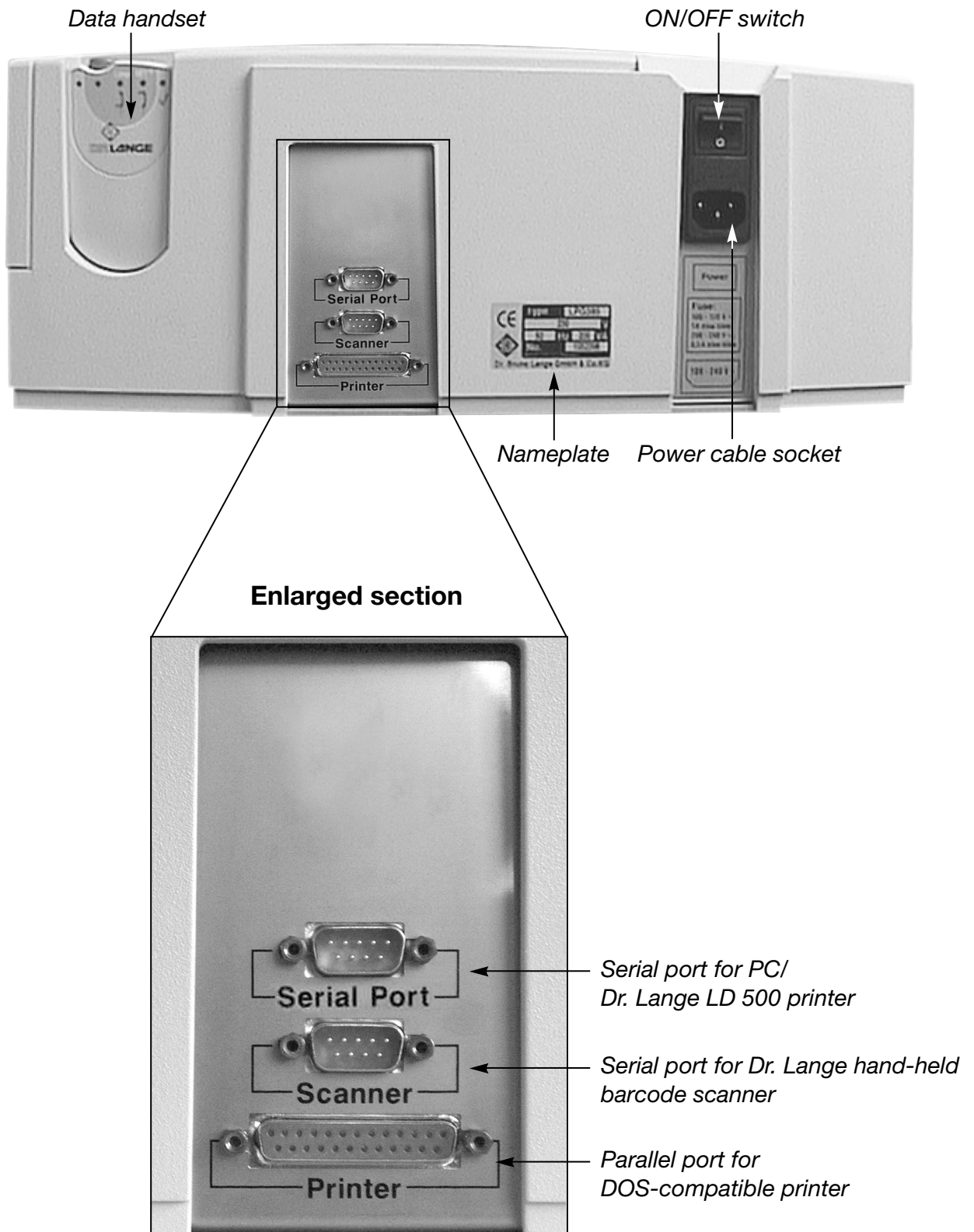


Figure 2: Back view



1.2 Setting up and switching on

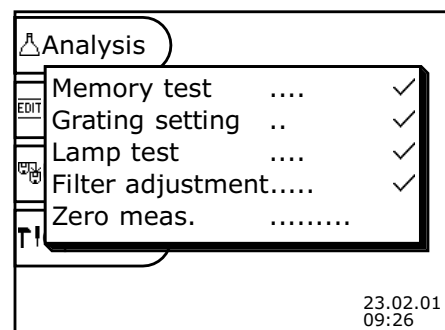
The **XION 500** should stand on a stable, level work surface where it is not exposed to direct sunlight. A power cable is supplied with instrument, with which it can be plugged into a mains socket (100 – 240 Volt / 50 – 60 Hz). Please use earthed sockets only and avoid using damaged power cords. The **XION 500** is switched on by pressing the toggle switch on the back of the instrument (see chapter 1, page 2, figure 2). Switching on and off in rapid succession should be avoided. Always wait at least **20 seconds** before switching on again, otherwise there is a risk that the instrument's electronic and mechanical systems could be harmed.

The **XION 500 spectrophotometer** complies with the applicable safety regulations. The user should, however, take note of the following safety information, both for his own protection and to avoid causing damage to the instrument.

The lamp compartment ventilation slit (see chapter 1, page 1, figure 1) serves to conduct heat away from the lamp and should therefore not be covered or obstructed in any way.

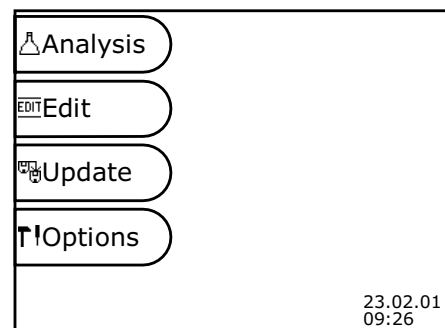
No objects of any kind should be placed on top of the instrument!

When the **XION 500** is switched on the display lights up. The instrument then calibrates itself automatically. This takes around **2 minutes**. When calibration is complete the instrument performs zero measurements at all wavelengths (340 to 900 nm).



Calibration

The **XION 500** is then ready for use. The **XION 500** is set to the correct language, date and time before it is shipped. If these values are not correct they can be changed under the menu item **Options** (see chapter 5.2, page 1).



The XION 500 is ready for use

1.3 Interfaces

The standard **XION 500** comes with 5 ports, which are located on the back of the instrument (see *chapter 1, page 2, figure 2*). They can be used to output data and graphics to printers, transfer data to a PC, and connect a sample changer, a sipper system and a hand-held barcode scanner.

1.3.1 RS-232C serial port (PC/LD 500)

This is a 9-pin SUB-D connector. The interface's standard setting (for documentation of analysis data and graphics) is for the **Dr. Lange LD 500 printer**. The **XION 500** can also be operated with a PC and the DATAtrans data transfer software. The interface's data protocol settings are defined with the help of menus, as described in *chapter 5.4, page 5*.

1.3.2 Serial port for scanner

This 9-pin SUB-D connector is used for the **Dr. Lange hand-held barcode scanner** (see *chapter 2, pages 13 ff.*).

1.3.3 Parallel port (Centronics-compatible)

This is a 25-pin SUB-D connector. The interface protocol and the pin assignments are permanently defined in accordance with the Centronics standard protocol. Commercial DOS-compatible printers with a parallel (Centronics) input can be connected to this port (see also *chapter 5.3, page 3*).

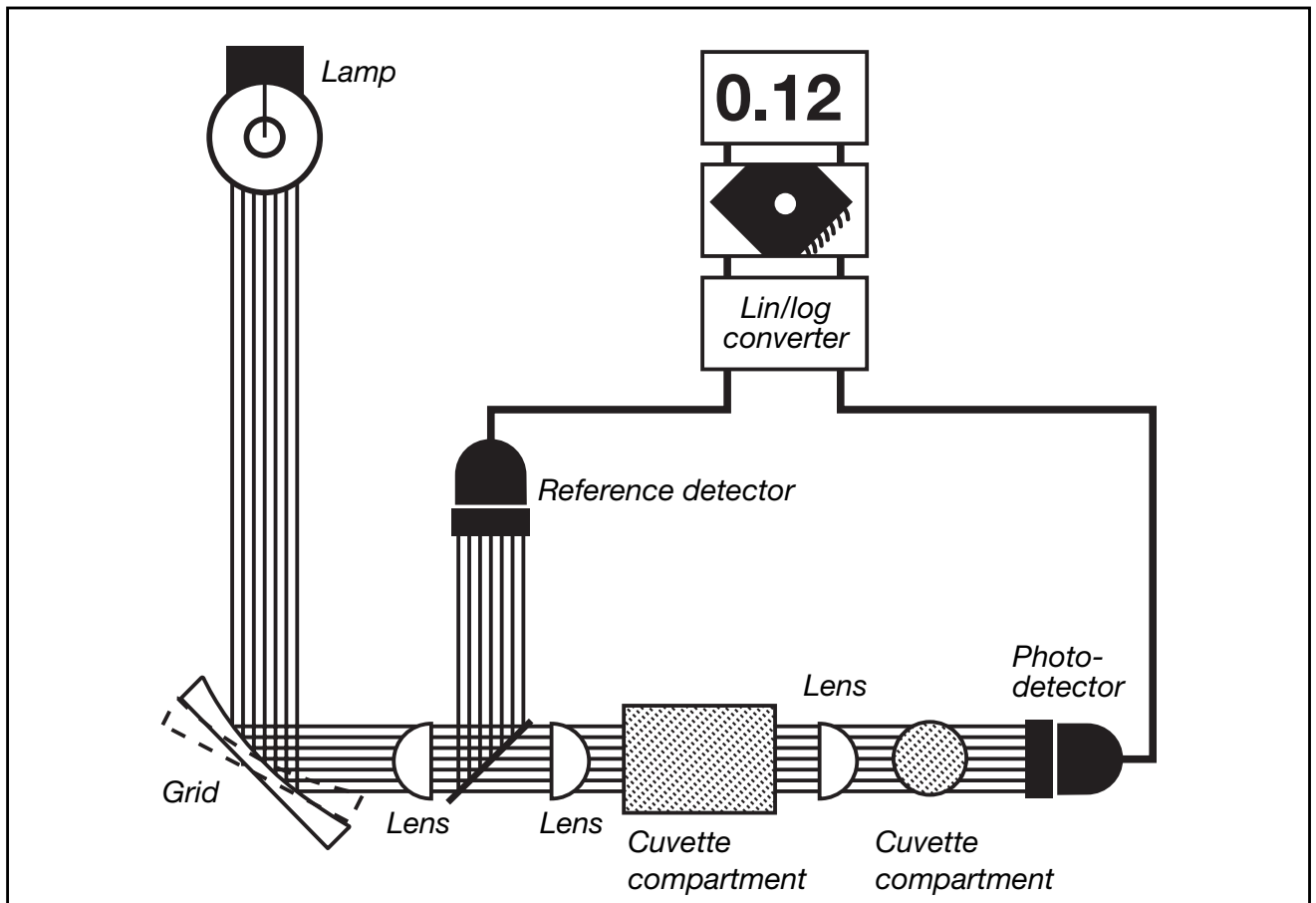
1.4 Printer output

If the **XION 500** is connected to a printer and the printer is also switched on, the analysis results are printed as well as displayed. Zero measurements, error messages and additional information are printed together with the analysis results. The reaction speed of the **XION 500** may be slower during printing in direct print mode. Direct print mode can be deactivated for measurements of Dr. Lange Cuvette Tests (with barcode). The analysis results are then printed after the cuvette is removed. This setting is described in detail in *chapter 5.3, pages 3 f.*

1.5 Beam path


















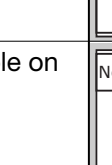



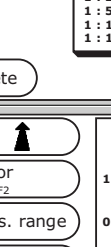


The following diagram shows the beam path of the XION 500.

Figure 3: Beam path



1.6 Display and keys

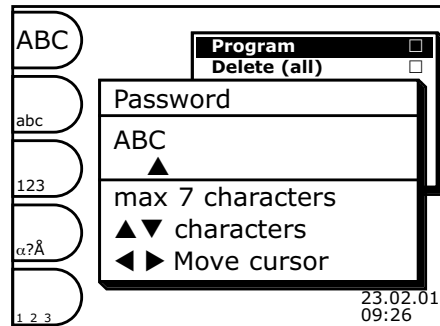
Representation of the keys and display outputs in the Operating Manual

	Meaning	Description
Selection keys and their functions	An option is displayed beside each select key . Select the required option by pressing the associated  key.	 Analysis  EDIT
Cursor keys	Press left, right, upper or lower cursor key .	   
Menu keys	Go one program step forward. Go one program step backward.	 
Enter key	Confirm by pressing the  key.	
Zero and measurement keys	Press blue key (blank measurements). Press green key (analysis measurements).	 Zero key (blue)  Measurement key (green)
Display and input zones	Display zone for current values, data and submenus, and input zone for the individual menu items. The input zone is identified by a window with input information and input indicator.	
Menu options	If a menu option is selected with the appropriate selection key , e.g.  Analysis  , another window opens containing more options.	 23.02.01 09:26
Navigation arrow in the menu windows	Indicates that more options are available on another page. Press the appropriate selection key to page up or down.	  User Dilution  23.02.01 09:26
Navigation arrow ▼ in a selection list	Indicates that more selection items are available on another page. Press the cursor key  to scroll up and press the cursor key  to scroll down.	New  Delete 23.02.01 09:26
Error messages	Errors are shown in a window in the display. Error messages must always be confirmed with the menu key  otherwise further operation is impossible.	 F2 for E*F1+F2 Meas. range Unit Save 1.000 0.000 – 17.00 mg/l The entries are incomplete. 23.02.01 09:26

1.6.1 Entering text with the cursor keys

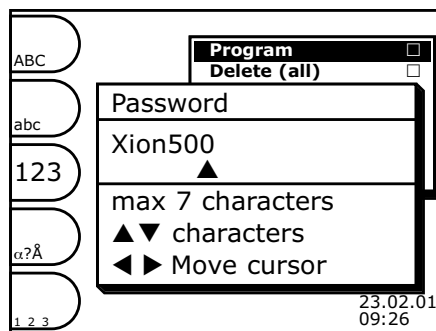
Press the appropriate **selection key** to indicate whether you want upper-case letters, lower-case letters, digits, special characters or numeric subscripts.

You can switch between these options during input by pressing the appropriate **selection key**. The selected character set is shown in larger type in the corresponding menu item.



Selected character set:
upper-case letters

▲ marks the input position. Using the **cursor keys** ▲ ▼ , the required character is selected in the underlying character set. When the position marker is shown inverted ▲ , a new character can be inserted or an entry can be deleted with the help of the **cursor keys** ▲ ▼ .



Text input window

Shows the maximum number of alphanumeric characters that can be entered. In this case a maximum of 7 characters can be entered.

Press the **cursor keys** ▲ ▼ to shift the position marked with ▲ or ▼ to the right or left.

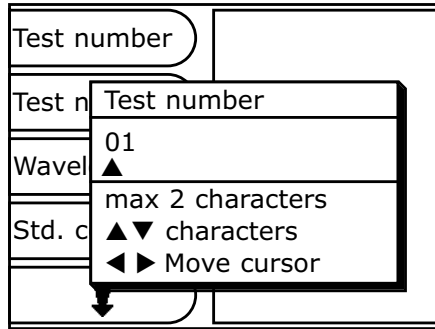
Confirm the text input by pressing the enter key ↵ .

Note:

You can exit from the input window at any time without changing anything by pressing the **menu key** ▲ .

1.6.2 Entering numbers with the cursor keys

When numbers are entered with the **cursor keys** ▲ ▼ the position marked by ▲ in the input field is increased or decreased by 1 or the sign switches from + to - and decimal places (.) are shifted. When the position marker is shown inverted ▲, a new character can be inserted or an entry can be deleted with the help of the **cursor keys** ▲ ▼.



Test number input window

Shows the maximal number of alphanumeric characters that can be entered. In this case a maximum of 2 characters can be entered.



Press the **cursor keys** ◀ ▶ to shift the position marked with ▲ or ▲ to the right or left.

Confirm the numeric input by pressing the enter key ↵.

Note:

You can exit from the input window at any time without changing anything by pressing the **menu key** ⏏.

1.6.3 Marking a required item in a list of measurement results

The black bar indicates the selected item. The bar can be moved by pressing the **cursor keys**  . The selected item is confirmed by pressing the **selection key**. The item can be deselected by pressing the selection key again.

Chloride Name	*010 02.02.01 541	mg/l
	*010 02.02.01 542	mg/l
	*010 02.02.01 538	mg/l
Wastewater Sample	*010 02.02.01 600	mg/l
	*010 02.02.01 601	mg/l
	*010 02.02.01 100	mg/l
10.02.01-.. Sampling	*010 02.02.01 740	mg/l
	*010 02.02.01 741	mg/l
	*010 02.02.01 742	mg/l
Smith User	010 02.02.01 743	mg/l
	010 02.02.01 600	mg/l
	010 02.02.01 600	mg/l
	010 02.02.01 610	mg/l ▼
Mark		

1.6.4 Explanation of the displayed test selection list

Test number
Test name
EPROM version

Dr.	348 P205
	348 P205 total
	348 Phosph.-pho
Use	348 Phosph.-pho
	348 Phosphate
	348 Phosphate to

Test number	Test name	EPROM version
348	P205	45
348	P205 total	45
348	Phosph.-phosph. to	45
348	Phosph.-phosphorus	45
348	Phosphate	45
348	Phosphate total	45

1.6 Display and keys

1.6.5 Display of the results data stored in the results databases

Measurement date/
Sampling date
Measurement
result
Comments
Unit

Test number	Measurement date/ Sampling date	Measurement result	Comments
341	12.02.01	0.237	mg/l
341	12.02.01	0.251	mg/l
341	12.02.01	0.024	umg/l
341	12.02.01	0.250	mg/l
341	12.02.01	2.123	omg/l
341	12.02.01	0.251	mg/l
341	12.02.01	0.054	! mg/l
341	12.02.01	1.432	mg/l
341	12.02.01	1.519	◆mg/l
341	12.02.01	0.250	mg/l
341	12.02.01	0.310	mg/l
341	12.02.01	-0.051	-mg/l
341	12.02.01	0.251	mg/l
341	12.02.01	*****	+mg/l ▼

Select	341 12.02.
- Select	341 12.02.
Edit Select	341 12.02.
Output	341 12.02.
Delete	341 12.02.

← Inside measurement range

← Under measurement range

← Over measurement range

← Soiled cuvette, turbidity

← Calculated result after insertion of LCW 919 (sample blank value)

← Negative result

← Concentration too high (cannot be represented)

Display of measurement data from the Tests database

Measurement type
Comments
Wavelength
Factor

Measurement result	Measurement type	Comments	Wavelength	Factor
1.187	C		625 nm	5.000
0.092	A		860 nm	1.000
0.445	C		860 nm	5.000
57.8	T !		625 nm	
*****	T >		340 nm	
82.1	T		860 nm	
58.0	T		625 nm	
*****	T >		340 nm	
82.5	T		860 nm	
0.573	A		500 nm	1.000
0.214	A		625 nm	1.000
0.129	A		700 nm	1.000
*****	A >		340 nm	

Select	1.187 K
- Select	***** E
Edit Select	0.445 K
Output	57.8 T
Delete	***** T
	82.1 T
	58.0 T
	***** T
	82.5 T
	0.573 E
	0.214 E
	0.129 E
	0.092 E

← C = Concentration measurement

← ! = Soiled cuvette, turbidity

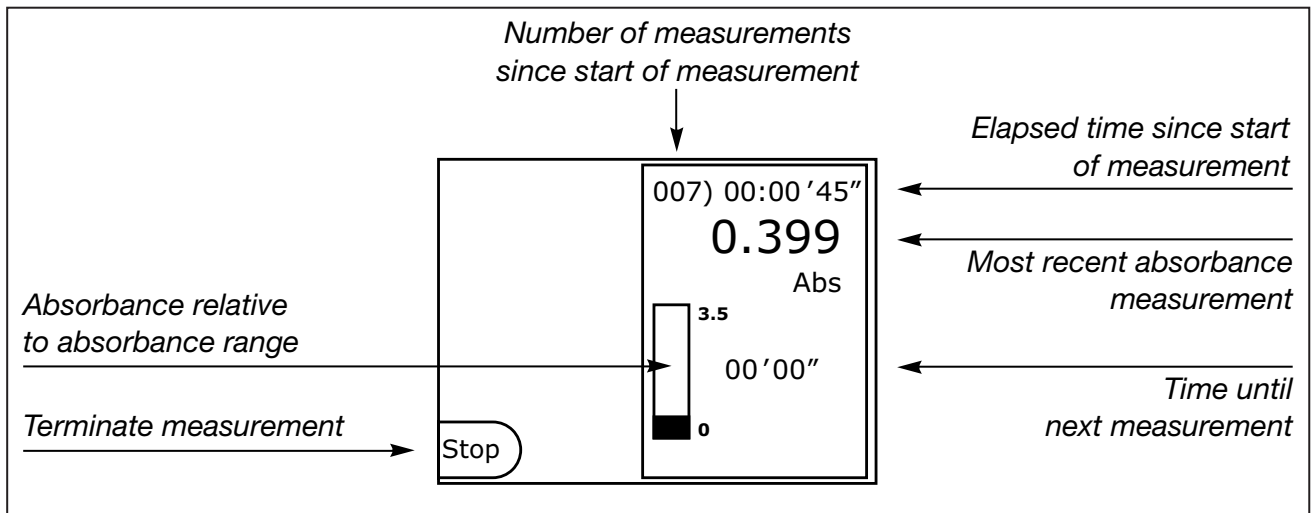
← T = Transmittance measurement

← A = Absorbance

← Absorbance > 3.5

Display of measurement results from the Abs/Trans database

1.6.6 Display during t-scan

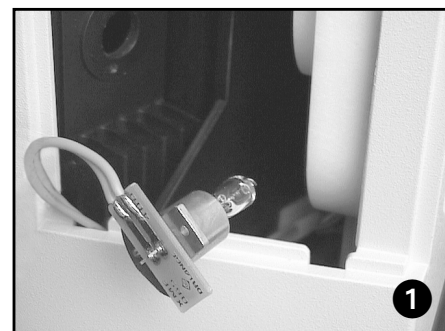
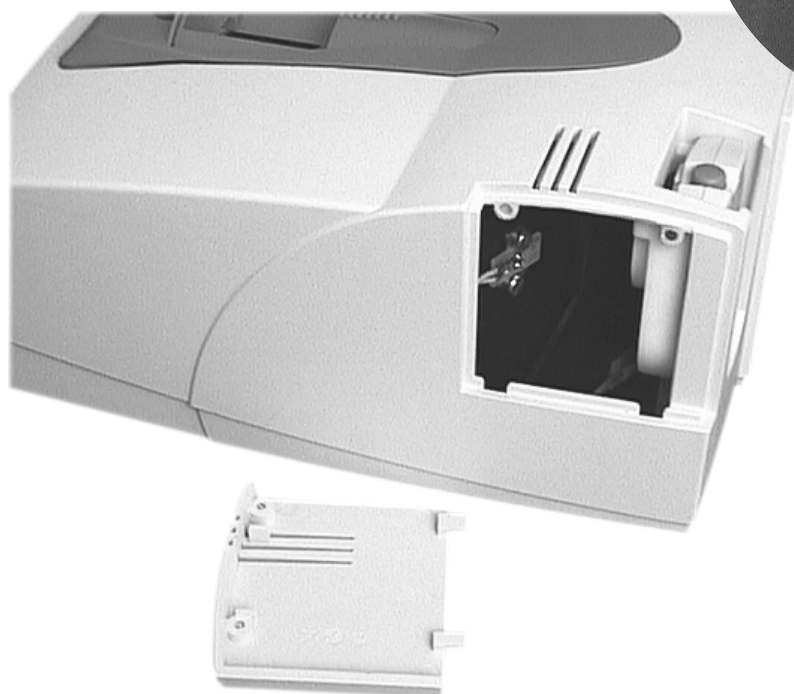


1.7 Lamp compartment

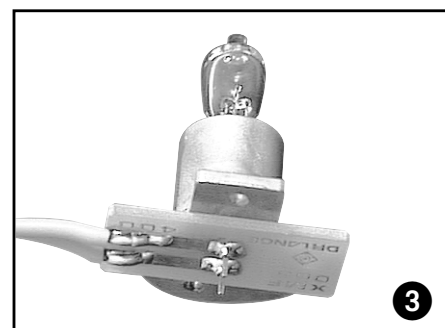
The lamp compartment is on the right beside the cuvette compartment and is provided with ventilation slits on the top of the instrument and in the side wall (see chapter 1, page 1, figure 1).

1.7.1 Changing the lamp

1. Switch off the **XION 500**.
2. Disconnect from the mains.
3. Carefully remove the lamp cover from the enclosure (pull the top edge of the cover away and down from the instrument and place it to the side).



4. Carefully remove both knurled screws and place them to the side.
5. Remove the lamp unit, including the plug-in board **1**.
6. Carefully unplug the lamp unit from the board **2**.
7. Plug new lamp (order number: LYW 966) unto the board. **(NB: Avoid any contact with the glass of the lamp!)** **3**
8. Insert lamp unit with the rounded part pointing down.
9. Fasten the unit with the two knurled screws and replace the lamp cover.

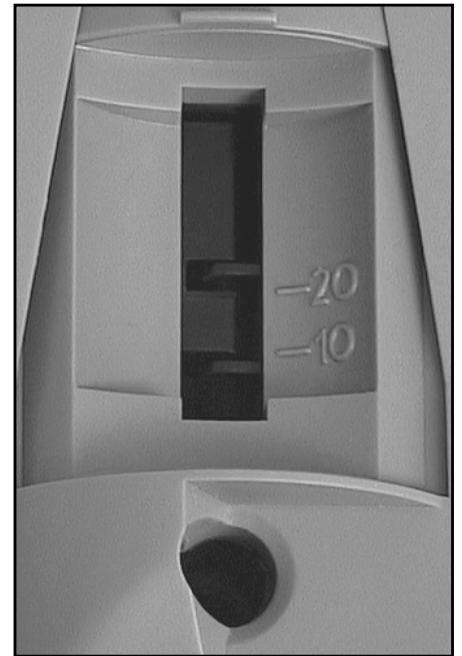


1.8 Cuvette compartment

The cuvette compartment of the **XION 500** can accommodate rectangular cuvettes with a path length of 10, 20 or 50 mm. Markings indicate how rectangular cuvettes with a path length of 10 or 20 mm should be properly positioned. Round cuvettes can be inserted in the round cuvette compartment.

 **Note:**

The cuvette compartment cover can be left open while a measurement is carried out. However, in dusty environments it is advisable to protect the samples by closing the compartment.



Cuvette compartment

1.9 Database

The **XION 500** has **4** databases in which results are stored. All measurement data are saved to these databases and can be called up or edited.

(See chapter 1.6.5, 11 and chapter 3.1, pages 1 ff.)

Database	Results from	Records
Tests	Measurements with Dr. Lange Cuvette Tests, Pipette Tests, Trace Analysis, "beta" tests, user tests.	2500
Abs/Trans	Absorbance and transmittance measurements	500



NB:

When the database is full, the oldest records are overwritten one by one, so the database always contains the most recent records.

Database	Results from	Records
λ - scan	λ - scan	3
t - scan	t - scan	3

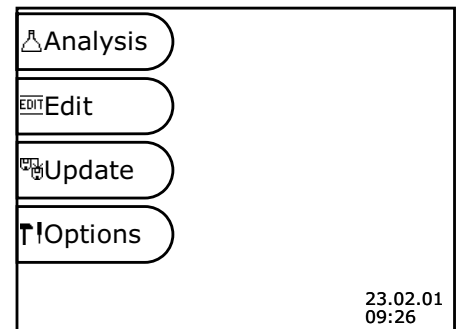


NB:

The data in the results databases can be edited after each measurement by pressing or , .

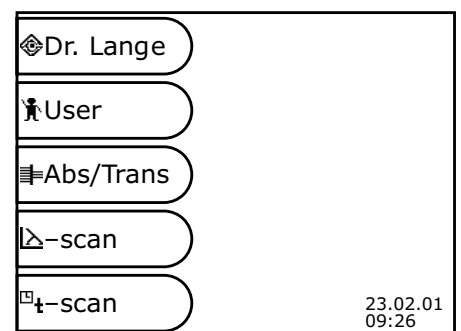
1.10 Menu options

Main menu



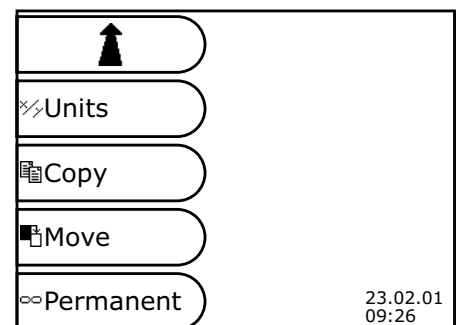
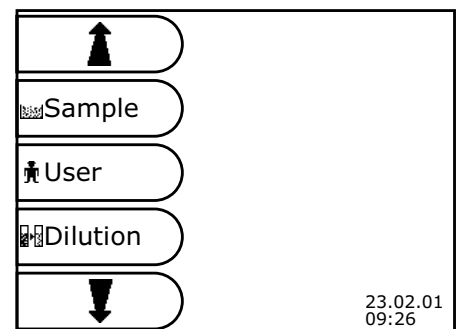
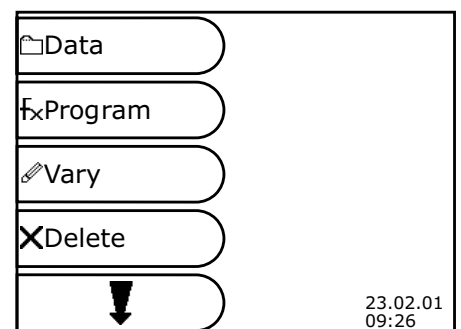
Analysis

- Analyses with Dr. Lange Tests (Pipette Tests, trace analysis, "beta" tests)
- User tests
- Absorbance and transmittance measurements
- Plots of absorbance spectra
- Time-dependent absorbance and transmittance measurements



Edit

- Editing measurement data
- Programming user tests
- Varying copied Dr. Lange Tests and user tests
- Deleting Dr. Lange Tests and user tests from User
- Creating selection lists
- Copying Dr. Lange Tests to User
- Moving Dr. Lange Tests (except Dr. Lange Cuvette Tests) to User
- Permanent → Changing the evaluation form of an analysis parameter.



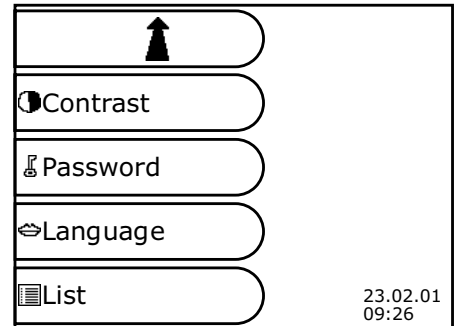
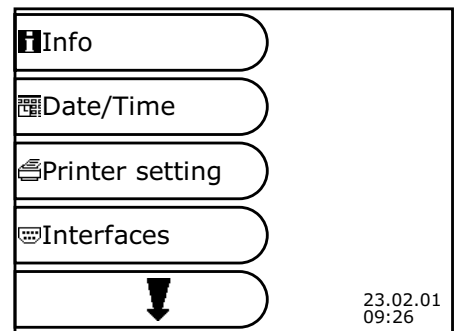
Update

- Updating data



Options

- Settings
- List function for printing test data



2.1 Evaluation and measurement




The **XION 500** provides a choice of **6** measurement programs.

a) Dr. Lange Cuvette Tests

The measurement program is called up automatically when a cuvette with a barcode label is inserted. This is also the case when the barcode of a user method that makes use of a Dr. Lange blank value cuvette LCW 906 is read.

The information in the barcode enables the instrument to automatically select the wavelength needed for the measurement and calculate the result with the help of the stored factors.

b) Dr. Lange Pipette Tests, Trace Analyses and "beta" tests

Starting in the main menu, press the **Analysis** and **Dr. Lange** selection keys. A selection list opens, showing all Dr. Lange Pipette Tests, Trace Analyses and "beta" tests in ascending test number order. Use the **cursor keys**   to select the required test from the list and press the **enter key**  to confirm your choice.

c) User tests

When the **XION 500** is shipped, the selection list under the menu option **User** is empty. The user can subsequently build up his own list. He can do this by:

- programming his own procedures
(see chapter 3.2, pages 13 ff.)
- copying Dr. Lange Tests and then adapting them to his own needs (see chapter 3.5, page 29)
- moving Dr. Lange Tests (only Pipette Tests, Trace Analyses and "beta" tests)
(see chapter 3.6, page 30).

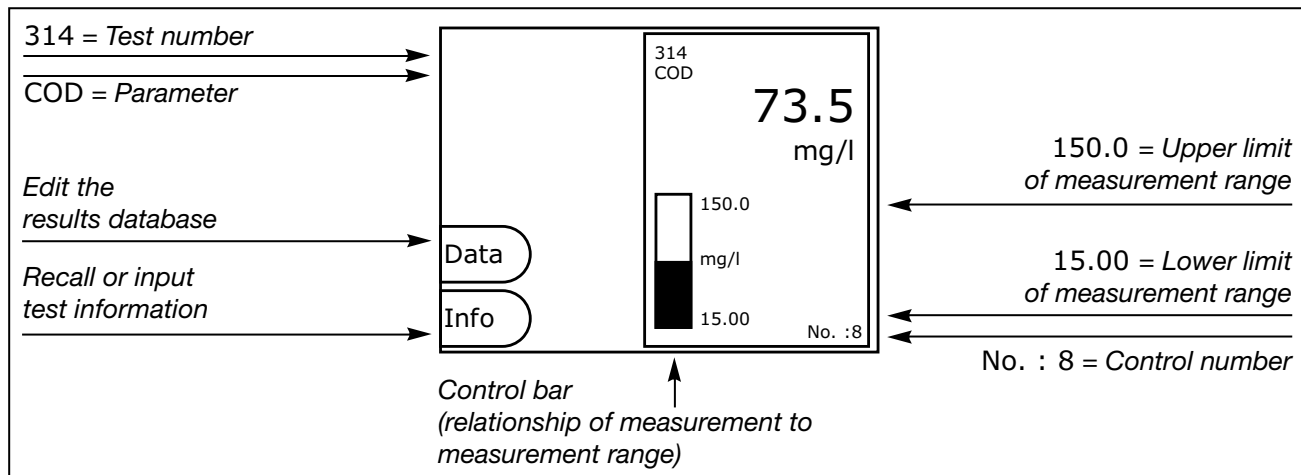
d) Absorbance/transmittance measurement (see chapter 2.5, pages 16 ff.)

e) λ -scan (absorbance spectra) (see chapter 2.6, pages 20 ff.)

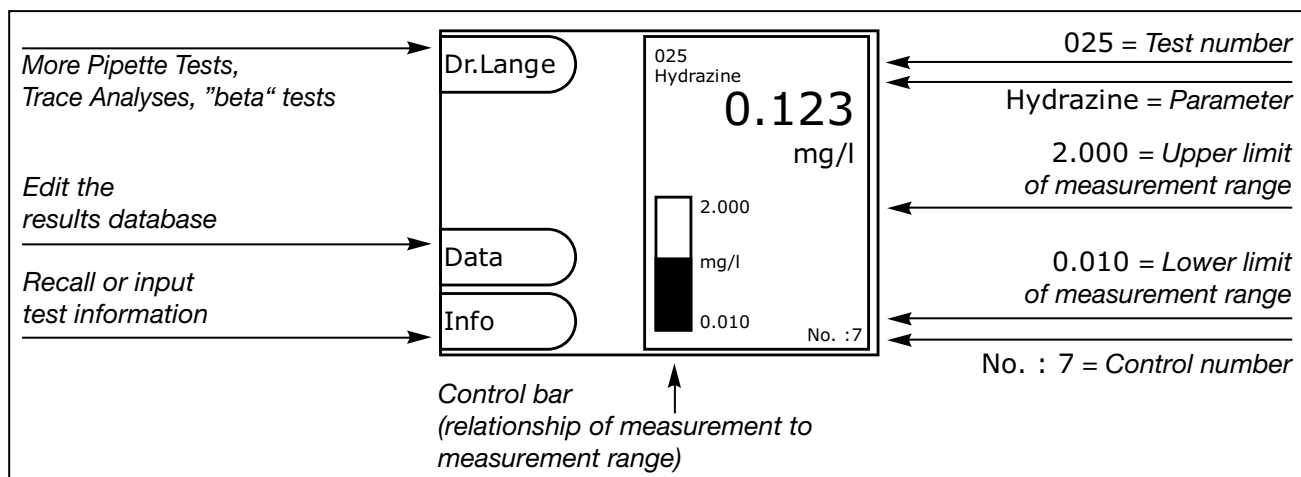
f) t-scan (time-dependent absorbance/transmittance measurements) (see chapter 2.7, pages 22 ff.)

2.2 The measurement procedure

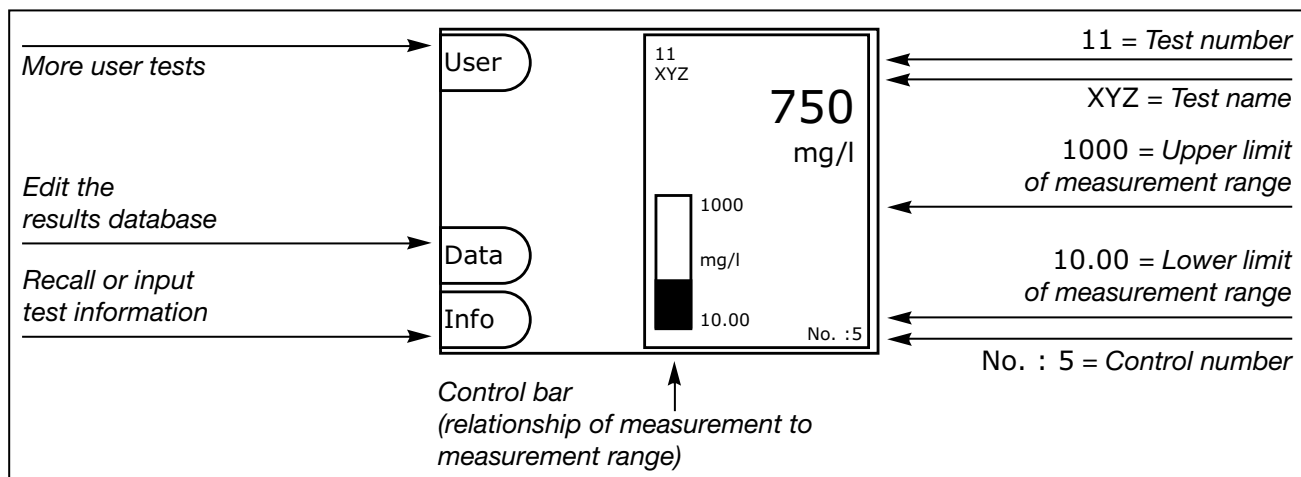
Prepare and evaluate the cuvettes in line with the Dr. Lange working procedures or the user-specific requirements.
The result is displayed.



Display output after a Dr. Lange Cuvette Test has been measured



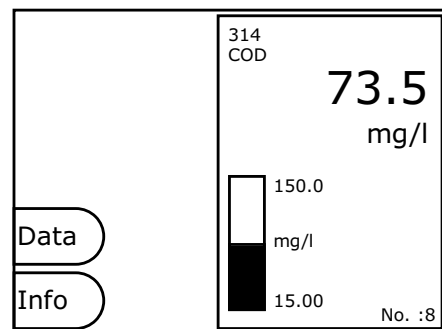
Display output after a Dr. Lange Pipette Test has been measured



Display output after a user test has been measured

2.2.1 Control bar (positioning within measurement range)

The control bar in the display window indicates the positioning of the measurement result within the measurement range. No account is taken of any dilution factor that may have been entered.

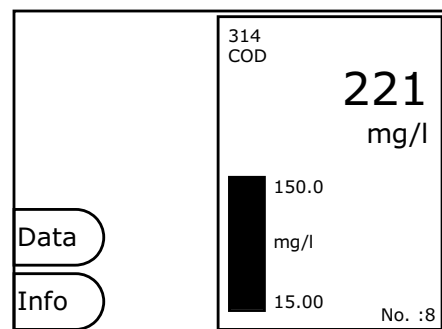


Measurement result lies within measurement range

An error message is displayed in the result window:

Over measuring range!

Press the **menu key**  to acknowledge the error message.

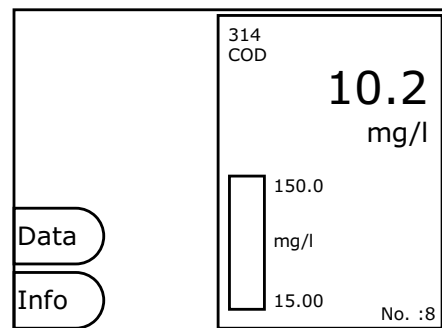


Measurement result lies above measurement range

An error message is displayed in the result window:

Under measuring range!

Press the **menu key**  to acknowledge the error message.



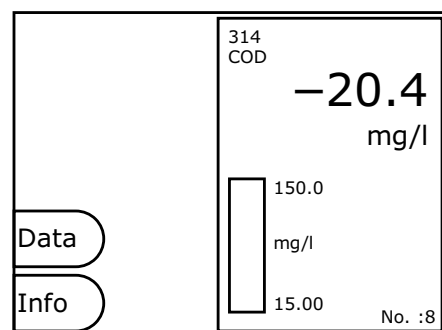
Measurement result lies below measurement range

An error message is displayed in the result window:

Negative result!

Press the **menu key**  to acknowledge the error message.

If a printer is connected to the **XION 500** the error messages are also printed out.



Negative measurement result

2.2.2 Dr. Lange Cuvette Tests with different evaluation options

Some Dr. Lange Tests provide a choice of evaluation options for a parameter. Use the **cursor keys** \uparrow \downarrow to select an evaluation form (see *chapter 1.6.4, page 10*) and press the **enter key** \rightarrow to confirm your choice.

If you want the selected evaluation form to apply permanently, press **selection key** . When this measurement is made again, the selection list is not displayed.

If is selected, the evaluation form selection list is always displayed when the test is called, as is the prompt **Permanent ?** , , .

If (without) is selected, the prompt **Permanent ?** , , is switched off permanently. This ensures that the evaluation form has to be defined anew for each measurement but no further prompts have to be responded to.



Tip:

If the analysis result is always expressed in the same way, it is advisable to select .



Tip:

If the form in which the analysis result is expressed often varies, select to avoid having to respond to any other prompts.

348	P205	45
348	P205 total	45
348	Phosph.-phosph.to	45
348	Phosph.-phosphorus	45
348	Phosphate	45
348	Phosphate total	45

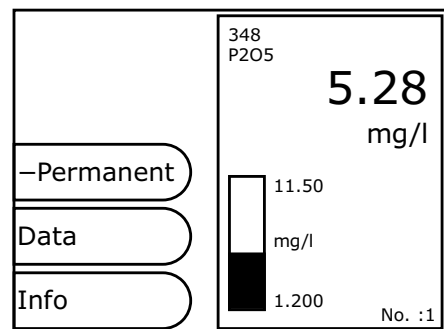
Evaluation forms of LCK 348

Options for defining the evaluation form

2.2.2.1 Resetting Permanent ? Yes and w/o

a) During a measurement

After a result has been displayed, press the **selection key** Permanent. When subsequent measurements are carried out, a choice can again be made between the different evaluation forms.



b) Before a measurement

Press the Edit and Permanent **selection keys**. A selection list appears, containing all parameters that are set to **Permanent ?** Yes or w/o. Use the **cursor keys** to select a parameter and confirm your choice by pressing the **enter key** . This confirmation causes the selected evaluation form to be automatically reset.

Note:

Parameters that are set to **Permanent ?** w/o are shown in the selection list with all available evaluation forms. Use the **cursor keys** to select an evaluation form from this "group" and confirm your choice by pressing the **enter key** . When subsequent measurements are carried out the menu options Yes, w/o and No are again available, so the evaluation form can be redefined.

Note:

Press the **menu key** to exit from the Edit, Permanent menus.

Resetting
Permanent ? Yes

348 Nitrite	45
341 Nitrite-nitrogen	45
341 Phosphate	45

Resetting
Permanent ? Yes and w/o

2.3 Creating selection lists

When the **selection key** is pressed a submenu appears (see diagram on right - Edit Menu).

Additional information about a measurement result can be input here. The information is stored automatically in the appropriate selection list.



Advantage:

The ability to select from individually created lists means there is no necessity to repeat inputs.



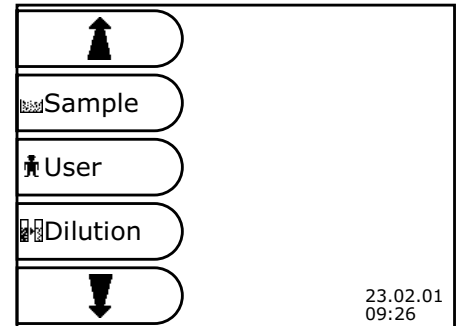
Tip:

The , and input data can be generated and printed with a commercially available barcode creation program and type selection code 39 or 128. These data can be read in by a Dr. Lange hand-held barcode scanner, so that they will subsequently be available in future in the appropriate selection list.

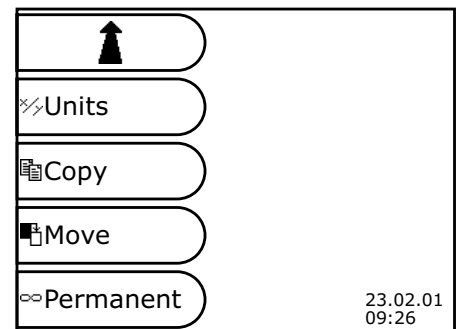


Tip:

Existing commercially available barcode labels (UPC/EAN, Code 39, Code 128, 2/5 Interleaved, 2/5 Industrial, 2/5 Matrix) can be coded with the , and input data, which can then be scanned in by the Dr. Lange barcode scanner.



Edit menu



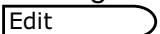
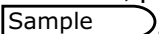


Edit menu

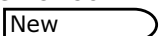

2.3.1 , enter sample name




This function can be used to enter additional sample names. Up to **20 sample names** can be accommodated in a selection list. The list contains two predefined sample definitions from Dr. Lange:

addista®	This sample name is used for measurements of standard solutions
-----	No sample name is assigned here

A sample name can be, for example, the exact name of the place where the sample was taken. The name can be up to **10 characters** long.

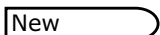
Starting in the main menu, press the **selection keys**  and . Use the **cursor keys**   to select a line in the selection list where the new sample name will be positioned.

Press the  **selection key**. An input window for the sample name appears (see *chapter 1.6.1, page 8* and *chapter 1.6.2, page 9*). To incorporate the sample name in the list, confirm the input by pressing the **enter key** . (**Exception: No** user-defined sample names can be inserted between the sample names predefined by Dr. Lange.)

Sample names that are no longer needed can be deleted or they can be selected with the **cursor keys**  , confirmed by pressing the **enter key** , and then overwritten.




Tip:

Press the  **selection key** when it does not matter where the new sample name is to be positioned in the selection list.



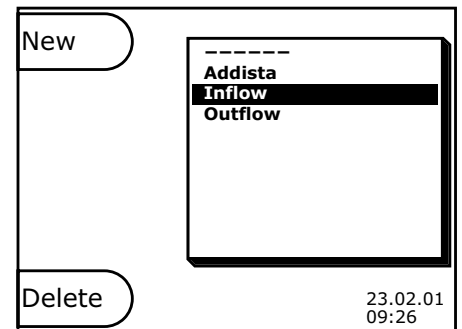
Note:

Press the **menu key**  at any time to exit from the input window without changing anything.

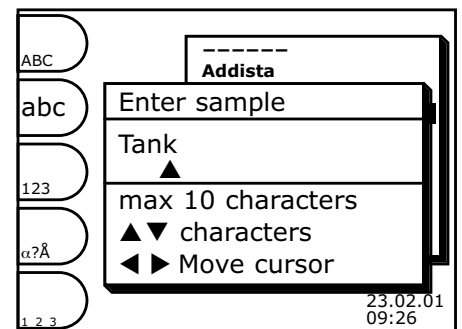


Tip:

If a scanner is connected, sample names can also be scanned in for inclusion in the selection list.



Sample menu



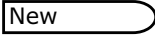
Sample name input window

**Tip:**



The Dr. Lange ProID system can also be used. This consists of hand-held barcode scanners, holders and the differently coloured ProID clips. A ProID clip is fitted to the top of the cuvette. Eight different clip colours represent up to 8 different sample identifiers, e.g. different sampling locations. The barcode on the clip is read with the scanner and assigned to a defined sample name in the **XION 500**. The following analysis of the cuvette is then documented with this sample name and no mix-ups can occur.

The exact description can be found in the operating manual of the Dr. Lange ProID system.

Short description of the menu options

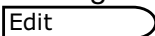
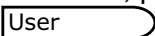


 = Input (through input window or scanner) of new sample names

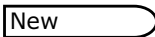
 = Delete sample names


 = Return to  menu




2.3.2 , enter user name

This function can be used to enter user names. Up to **20** user names, each with a length of **10 characters**, can be stored in a selection list.

Starting in the main menu, press the **selection keys**  and . Use the **cursor keys**   to select a line in the selection list where the new user name will be positioned.


Press the  **selection key**. An input window for the user name appears (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9).

To incorporate the user name in the list, confirm the input by pressing the **enter key** .

User names that are no longer needed can be deleted or they can be selected with the **cursor keys**  , confirmed by pressing the **enter key** , and then overwritten.




Tip:

Press the  **selection key** when it does not matter where the new user name is to be positioned in the selection list.



Note:

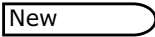
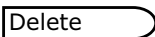


Press the **menu key**  at any time to exit from the input window without changing anything.

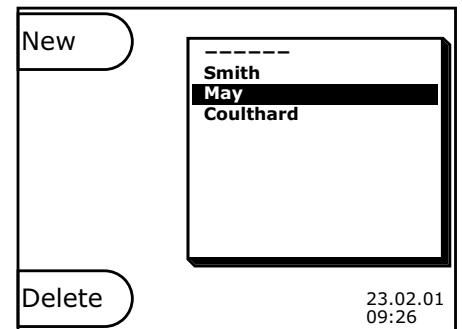


Tip:

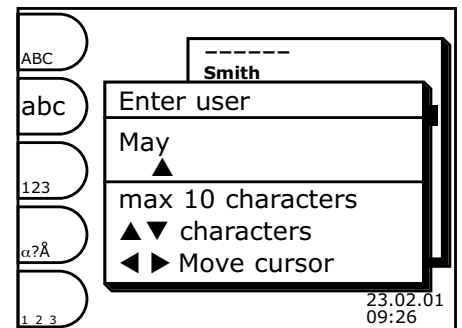
If a scanner is connected, user names can also be scanned in for inclusion in the selection list.

Short description of the menu options

-  = Input (through input window or scanner) of new user names
-  = Delete user names
-  = Return to  menu



User menu



User name input window

2.3.3 Dilution, enter dilution factor

This function can be used to enter additional dilution factors. Up to **19** dilution factors can be stored in a selection list. Of these, **9** are predefined by Dr. Lange.

Starting in the main menu, press the **selection keys** Edit and Dilution. Use the **cursor keys** \uparrow \downarrow to select a line in the selection list where the new dilution factor will be positioned.

Press the New **selection key**. An input window for the dilution factor appears (see chapter 1.6.2, page 9).

To incorporate the dilution factor in the list, confirm the input by pressing the **enter key** \leftarrow .

Dilution factors that are no longer needed can be deleted or they can be selected with the **cursor keys** \uparrow \downarrow , confirmed by pressing the **enter key** \leftarrow , and then overwritten.



Tip:

Press the New **selection key** when it does not matter where the new dilution factor is to be positioned in the selection list.

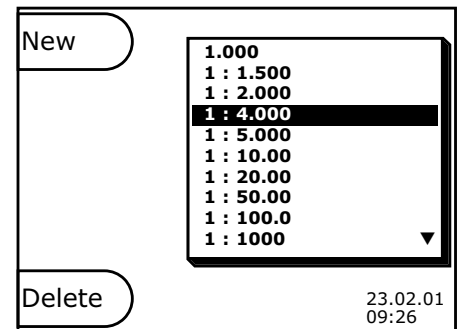


Note:

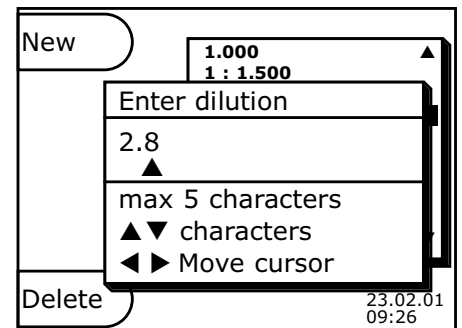
Press the **menu key** \square at any time to exit from the input window without changing anything.

Short description of the menu options

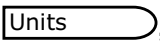
- New = Input of new dilution factors
- Delete = Delete dilution factors
- \uparrow = Return to Edit menu







Dilution menu

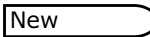






Dilution factor input window

2.3.4 , enter units

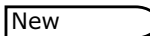
This function can be used to enter the unit in which the measurement result is expressed. Up to **20** units, each with a length of **10 characters**, can be stored in a selection list. Of these, **18** are predefined by Dr. Lange.

Starting in the main menu, press the **selection keys**  and . Use the **cursor keys**   to select a line in the selection list where the new unit will be positioned.


Press the  **selection key**. An input window for the unit appears (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9). To incorporate the unit in the list, confirm the input by pressing the **enter key** .

Units that are no longer needed can be deleted or they can be selected with the **cursor keys**  , confirmed by pressing the **enter key** , and then overwritten.

**Tip:**

Press the  **selection key** when it does not matter where the new unit is to be positioned in the selection list.


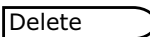


**Note:**

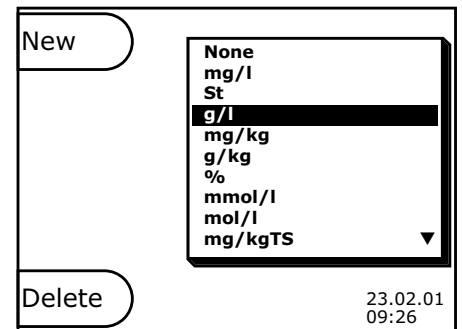
Press the **menu key**  at any time to exit from the input window without changing anything.

**Tip:**

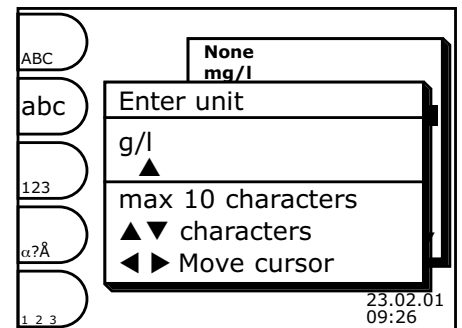
If a scanner is connected, units can also be scanned in for inclusion in the selection list.

Short description of the menu options

-  = Input (through input window or scanner) of new units
-  = Delete units
-  = Return to  menu



Unit menu



Unit input window

2.4 Assigning information to a measurement result

After each measurement of a Dr. Lange Cuvette Test (with barcode) the display output appears as shown on the right. One of the menu options shown on the left of the display is **Info**. This option can be used to input and recall all additional information (sample name, dilution, sample date, user name and notes).

If a measurement is carried out for a Dr. Lange Cuvette Test with just one evaluation form, or for a Dr. Lange Cuvette Test with more than one evaluation form when **Permanent ?** **Yes** is set, the cuvette has to be placed in the cuvette compartment again so that the additional information can be assigned to the measurement result, saved in the results database and printed.

If a measurement is carried out for a Dr. Lange Cuvette Test with more than one evaluation form when **Permanent ?** **No** or **w/o** is set, it is only possible to assign the additional information after a measurement if the **Interactive** print mode has been selected (see chapter 5.3, page 4).

In this instance, the analysis results are saved in the results database and printed after the barcode cuvette has been removed.



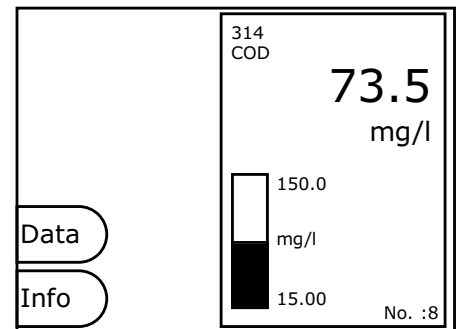
Tip:

Always set the print mode to Interactive for measurements of Dr. Lange Cuvette Tests.

Advantage:


Results and additional information are not saved in the results database and printed until the cuvette has been removed.

For all other measurements, the menu option **Info** can be selected **before the measurement** is carried out. The additional information is then saved **directly** in the results database and printed.

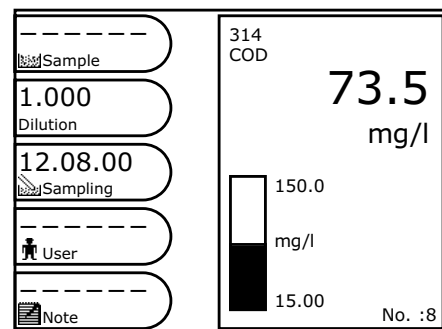


Display after a Dr. Lange Cuvette Test has been measured

2.4.1 Recall and input of sample name, dilution, sampling date, user name and notes










Press the  **selection key**.

Press the **selection key** for the required item of information.



Blank information fields

Short description of the menu options

Information field	Description	Input options
Sample	Assign sample name	Use cursor keys   to mark the entry in the selection list and confirm by pressing the enter key  . Scan in the sample name with the Dr. Lange barcode scanner without including it in the selection list. Use the Dr. Lange ProID system.
Dilution	Assign dilution factor	Use cursor keys   to mark the entry in the selection list and confirm by pressing the enter key  . Scan in the dilution factor with the Dr. Lange barcode scanner without including it in the selection list.
Sampling	Date and time when sample was taken	Enter the sampling date (see chapter 1.6.2, page 9).
User	Assign user name	Use cursor keys   to mark the entry in the selection list and confirm by pressing the enter key  . Scan in the user name with the Dr. Lange barcode scanner without including it in the selection list.
Note	User's notes (max. 60 characters)	Input through input window (see chapter 1.6.1, page 8) or Dr. Lange barcode scanner.



NB:

The information field "Dilution" is not available when absorbance/transmittance measurements, λ -scan und t-scan are carried out.

The selected information entries are displayed in the appropriate information field and are saved in the results database together with the associated measurement result.



Tip:

The entries for the information fields , , and can be created and printed with a commercial barcode creation program and the type selection code 39 or 128.

When you create your barcode, enter the following start code to ensure correct assignment:

% 1 for Sample

% 2 for User

% 3 for Note

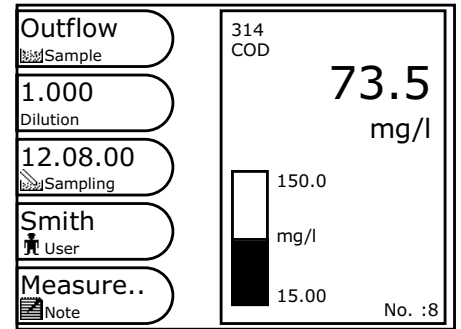
% 4 for Dilution

The start code enables the information to be scanned in directly without selecting the corresponding menu option.



Tip:

Existing commercially available barcode labels (UPC/EAN, Code 39, Code 128, 2/5 Interleaved, 2/5 Industrial, 2/5 Matrix) can be scanned in directly by the Dr. Lange barcode scanner. The information is written in the information field without having to select the menu option .



Information fields with entries

Entries in the information fields

Information fields	Action	Information entry
Sample	<ul style="list-style-type: none"> * Switch on * From measurement to measurement * When a parameter is modified * Change of program 	Without Without or selected sample name Without Without
Dilution	<ul style="list-style-type: none"> * Switch on * From measurement to measurement * When a parameter is modified * Change of program 	1.000 1.000 or selected dilution 1.000 1.000
User name	<ul style="list-style-type: none"> * Switch on * From measurement to measurement * When a parameter is modified * Change of program 	Without Selected user name Selection remains the same Selection remains the same
Sampling date	<ul style="list-style-type: none"> * Switch on * From measurement to measurement * When a parameter is modified * Change of program 	System date/time System date/time or own selection Selection remains the same Selection remains the same
Note	<ul style="list-style-type: none"> * Switch on * From measurement to measurement * When a parameter is modified * Change of program 	Without Without Without Without

2.5 Absorbance/transmittance measurements

2.5.1 General information on measuring absorbance and transmittance

The amount of light of a given wavelength that is absorbed by a solution increases in proportion to the concentration of the solution. This relationship is described by the Beer-Lambert law.

Lambert-Beer:

$$\text{Abs} = C * d * \epsilon = \log_{10}(I_0/I_n)$$

C = Concentration

d = Path length

ϵ = Molar absorptivity

I_0 = Light intensity of the zero measurement

I_n = **Light intensity of the analysis measurement**

Transmittance is the percentage of light of a given wavelength that passes through a solution. A weakly coloured solution (low concentration) allows a large percentage of light to pass through and thus has a high transmittance. A strongly coloured solution (high concentration) allows very little light to pass through and thus has a low transmittance. The relationship between transmittance and concentration is nonlinear.

$$\% \text{Trans} = (I_n/I_0) * 100$$

I_n = Light intensity of the analysis measurement

I_0 = Light intensity of the zero measurement

Transmittance values can be converted into absorbance values and vice versa.

$$\text{Abs} = \log_{10} (100 / \% \text{Trans})$$

$$\% \text{Trans} = 10^{-\text{Ext}} * 100$$

The table shows the relationship

Transmittance	Absorbance
100 %	0
90 %	0.05
80 %	0.1
70 %	0.15
60 %	0.22
50 %	0.3
40 %	0.4
30 %	0.52
25 %	0.6

Transmittance	Absorbance
20 %	0.7
15 %	0.82
10 %	1.0
5 %	1.3
2.5 %	1.6
1 %	2
0.5 %	2.3
0.1 %	3
0.05 %	3.3

2.5.2 Carrying out absorbance and transmittance measurements

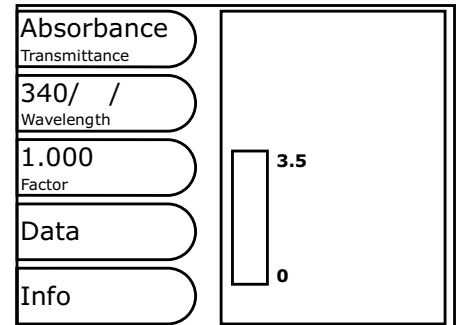
The menu item **Abs/Trans** can be used to measure the absorbance or transmittance of any given solution.

Starting in the main menu, press the **selection keys** **Analysis** and **Abs/Trans**.

Description of the menu options

Absorbance
Transmittance

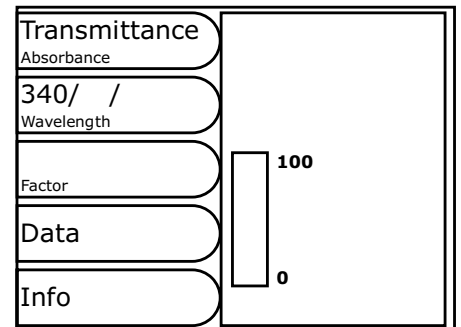
Measurements in absorbance mode at wavelengths from 340 to 900 nm. The option is selected by pressing the appropriate **selection key**. The selected setting **Absorbance** is shown in larger type.



Absorbance menu

Transmittance
Absorbance

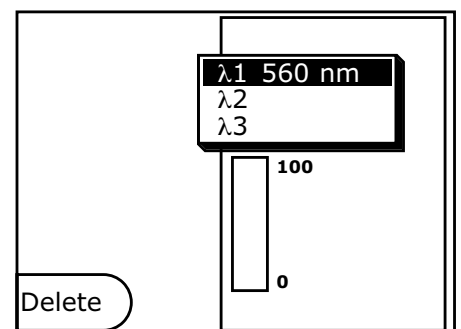
Measurements in transmittance mode at wavelengths from 340 to 900 nm. Switch from **Absorbance** to **Transmittance** by pressing the **selection key**. The selected setting **Transmittance** is shown in larger type.



Transmittance menu

Wavelength

Wavelength in the range from 340 to 900 nm at which the measurement is to be carried out. The option is selected by pressing the **Wavelength** **selection key**. A window opens, showing 3 possible wavelengths.



Wavelength menu

If, for example, λ **1** is selected with the **cursor keys** \uparrow \downarrow and confirmed with the **enter key** \rightarrow , a wavelength input window opens (see chapter 1.6.2, page 9). When the wavelength has been entered, pressing the **enter key** \rightarrow causes it to be included automatically in the selection list and displayed simultaneously in the menu item **Wavelength**. Pressing the **menu key** \uparrow causes the program to exit from the input window.

Tip:

Wavelengths that are no longer needed can be selected with the **cursor keys** \uparrow \downarrow and deleted by pressing the **Delete** **selection key**. (**Exception:** the setting entered under λ **1** cannot be deleted.)

Tip:

When up to **3** wavelengths are entered for inclusion in the selection list, **the next wavelength** is set and measured automatically **each time the green measurement key is pressed**.

Factor

Used to convert absorbance into concentration.

Conc (for concentration factor) is shown in the display instead of **Abs** if the factor is not equal to 1.000.

The factor can have any value from +/-0.000 to 99999.

Press the **Factor** **selection key**. Enter the factor (see chapter 1.6.2, page 9) and confirm by pressing the **enter key** \rightarrow . The input is automatically displayed in the menu item **Factor**.

Data

Edit measurement data.

Press the **Data** **selection key** (see chapter 1.9, page 15 and chapter 3.1, pages 1 ff.).

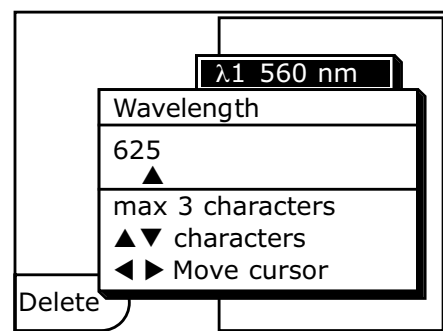
Press the **menu key** \uparrow to exit from this menu option.

Info

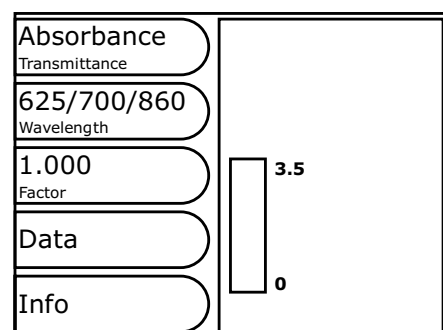
Select or input additional information about the measurement result (see chapter 2.4, pages 12 ff.).

Press the **Info** **selection key**.

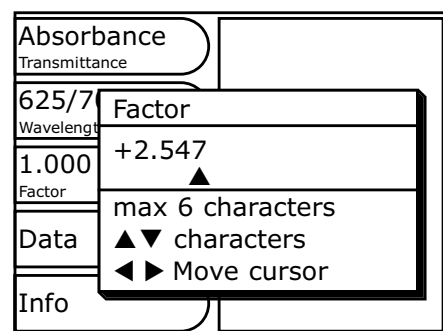
Press the **menu key** \uparrow to exit from this menu option.



Wavelength input window



Menu with wavelength entry



Factor input window


Measuring mode

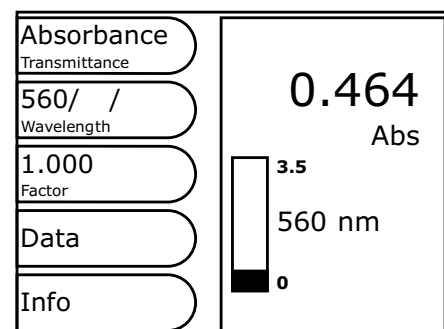
1. Insert the zero cuvette (blank value cuvette) and press the **blue zero key**.
2. Remove the zero cuvette, insert the sample cuvette and press the **green measurement key**.
3. Insert any further sample cuvettes, pressing the **green measurement key** each time.

The result is displayed.

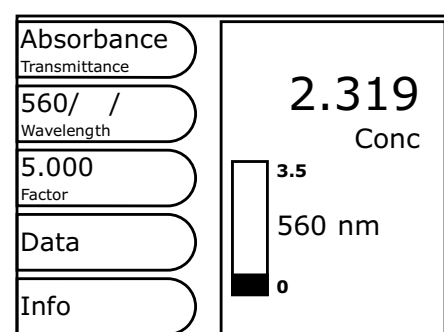
The control bar in the display shows the relationship of the measurement result to the maximal display range (0 – 3.5 Abs). The bar shows the measured result irrespective of any factor that may have been entered.

**NB:**

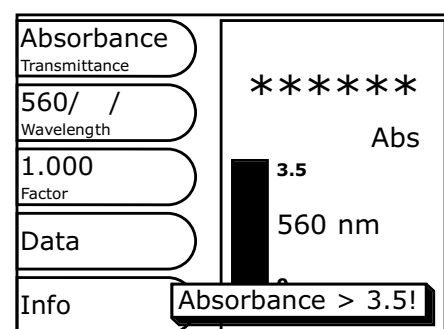
Absorbance values in excess of 3.5 are not measured. An error message is displayed. All error messages must be acknowledged by pressing the **menu key** , otherwise it is not possible to proceed.



Measurement result in absorbance mode without factor



Measurement result in absorbance mode with factor



The measured absorbance exceeds 3.5

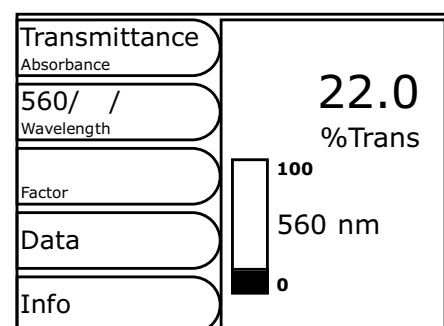
When transmittance measurements are carried out the control bar shows the maximal measurement range of 0 – 100% transmittance. It is not possible to carry out an evaluation with a factor during a transmittance measurement.

**Note:**

Zero measurements can be repeated at any time by pressing the **blue zero key**.

**Note:**

During a measurement series it is possible to switch between absorbance and transmittance measurements at any time.



Measurement result in transmittance mode

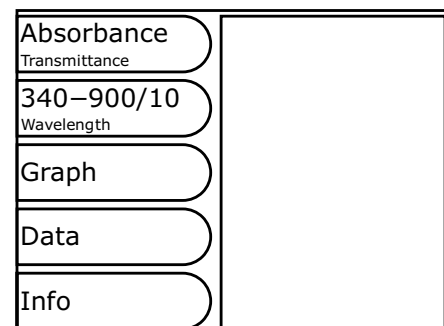
2.6 λ -scan, plotting absorbance and transmittance spectra

The menu option λ -scan enables the spectrum of any solution to be plotted. Starting in the main menu, press the **Analysis** and λ -scan **selection keys**.

Description of the menu options

Absorbance
Transmittance

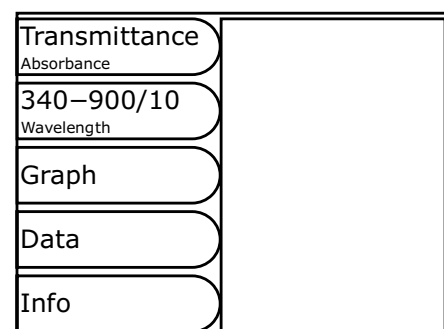
Plot of an absorbance spectrum at wavelengths from 340 to 900 nm. Select by pressing the appropriate **selection key**. The selected **Absorbance** setting is shown in larger type in the menu item.



Absorbance menu

Transmittance
Absorbance

Plot of a transmittance spectrum at wavelengths from 340 to 900 nm. Change the **Absorbance** setting by pressing the **selection key**. The selected **Transmittance** setting is shown in larger type in the menu item.

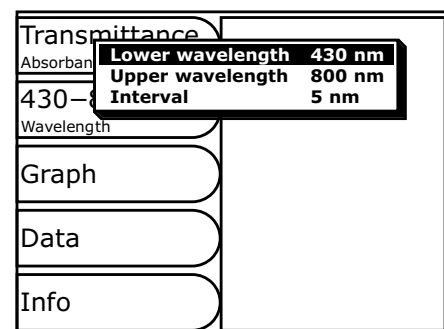


Transmittance menu

Wavelength

Select by pressing the appropriate **selection key**. A window opens, in which the lower and upper limits of the wavelength range (340 to 900 nm) and the measurement interval (interval between two measurement points of 1 to 10 nm) can be entered.

If **Lower wavelength** or **Upper wavelength** or **Interval** is selected with the **cursor keys** \uparrow \downarrow and confirmed with the **enter key** \rightarrow , an input window opens (see chapter 1.6.2, page 9). Press the **enter key** \rightarrow to confirm the input, which is then shown in larger type in the menu option. Press the **menu key** \uparrow to exit from the input window.



Input window for lower and upper wavelengths and measurement interval

 **NB:**

The lower wavelength must be smaller than the upper wavelength.

The lower wavelength is adjusted accordingly if the difference between the upper and lower wavelengths is not a multiple of the interval.

Example 1: Lower wavelength 430 nm
Upper wavelength 800 nm
Interval 5 nm

No change to the lower wavelength

Example 2: Lower wavelength 430 nm
Upper wavelength 800 nm
Interval 7 nm

The lower wavelength is adjusted to 429 nm


Graph

Press the appropriate **selection key** to display the graph.

Data

Editing the measurement data.


Press the appropriate **selection key** (see chapter 1.9, page 15 and chapter 3.1, pages 1 ff.).

Press the **menu key**  to exit from this menu item.

Info



Select or enter additional information about a measurement result (see chapter 2.4, pages 12 ff.).

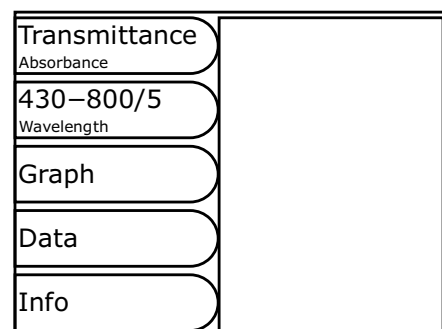
Select by pressing the appropriate **selection key**.

Press the **menu key**  to exit from this menu item.

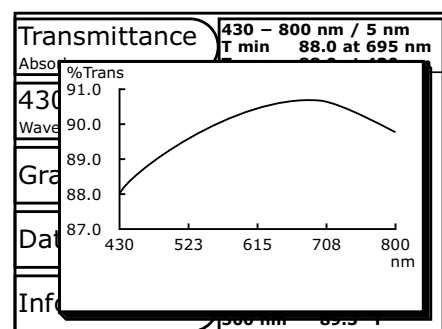
Measuring mode

Insert blank value cuvette and press the **blue zero key**. While the blank value is being measured a time bar is displayed, showing the duration of the zero measurement. The photometer subsequently switches automatically to measuring mode (the LED on the **green measurement key** lights up). Insert sample cuvette and press the **green measurement key** to start the wavelength-dependent absorbance or transmittance measurement. While the measurement is being carried out a time bar is displayed, showing its duration.

After the graph has been displayed, pressing the **menu key**  causes the values to be displayed as a table. Press the **menu key**  again to exit from the menu.



Measurement wavelength and measurement parameters menu



Display of results in the form of a graph

Transmittance		430 - 800 nm / 5 nm	
Absorbance		T min	88.0 at 695 nm
		T max	90.7 at 430 nm
430-800/5			
Wavelength			
	430 nm	88.0	T
	435 nm	88.1	T
	440 nm	88.2	T
	445 nm	88.3	T
	450 nm	88.4	T
	455 nm	88.5	T
	460 nm	88.6	T
	465 nm	88.7	T
	470 nm	88.8	T
	475 nm	88.9	T
	480 nm	89.0	T
	485 nm	89.0	T
	490 nm	89.1	T
	495 nm	89.3	T
	500 nm	89.3	T

Display of results in the form of a table

2.7 t-scan, time-dependent absorbance/transmittance measurement

The menu option **t-scan** enables the time-dependent absorbance spectrum of any solution to be plotted. Starting in the main menu, press the **Analysis** and **t-scan** **selection keys**.

Description of the menu options

Absorbance
Transmittance

Plot of an absorbance spectrum over time.

Select by pressing the appropriate **selection key**.

The selected **Absorbance** setting is shown in larger type in the appropriate menu item.

Transmittance
Absorbance

Plot of a transmittance spectrum over time.

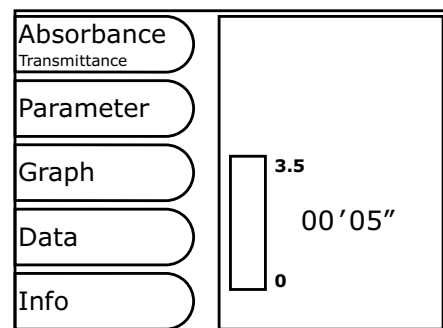
Change the **Absorbance** setting by pressing the **selection key**.

The selected **Transmittance** setting is shown in larger type in the appropriate menu item.

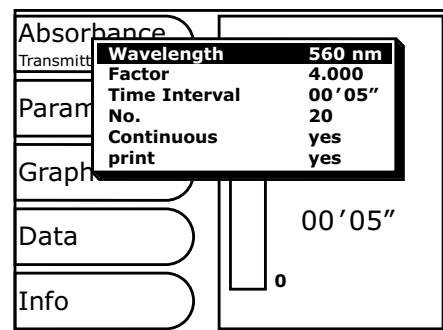
Parameter

Select by pressing the appropriate **selection key**.

A window opens, showing the parameters that can be set for the measurement.













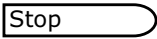








Absorbance menu



Measurement parameter input window

Parameter description

Display	Description	Options
Wavelength	Wavelength at which the measurement is to be carried out	340 – 900 nm Select with cursor keys   . Confirm with enter key  . Input (see chapter 1.6.2, page 9).
Factor	Conversion from absorbance to concentration Conc is displayed instead of Abs when the factor is not 1	+/- 0.000 – 99999 Select with cursor keys   . Confirm with enter key  . Input (see chapter 1.6.2, page 9).
Time interval	Interval between consecutive measurements ' = minutes " = seconds	00'05" – 59'59" Select with cursor keys   . Confirm with enter key  . Input (see chapter 1.6.2, page 9).
No.	Number of individual measurements	002 – 500 Select with cursor keys   . Confirm with enter key  . Input (see chapter 1.6.2, page 9).
Continuous	Continuous measurement of the samples in accordance with the number of individual measurements until the measurement is terminated manually by selecting the menu option 	Yes or No Select with cursor keys   . Confirm with enter key  Yes and No toggle.
print	Print the measured values and graphs during the measurement	Yes or No Select with cursor keys   . Confirm with enter key  Yes and No toggle. Continuous: Yes = Print the measurement results and graphs No = Print the graph Non-continuous: Yes = Print the measurement results No = Print the start and stop time


Graph

Press the appropriate **selection key** to display the graph.

Data

Editing the measurement data.


Press the appropriate **selection key** (see chapter 1.9, page 15 and chapter 3.1, pages 1 ff.).

Press the **menu key**  to exit from this menu item.

Info

Select or enter additional information about a measurement result (see chapter 2.4, pages 12 ff.).


Select by pressing the appropriate **selection key**.

Press the **menu key**  to exit from this menu item.

Measuring mode


Insert blank value cuvette and press the **blue zero key**. The photometer subsequently switches automatically to measuring mode (the LED on the on the **green measurement key** lights up).

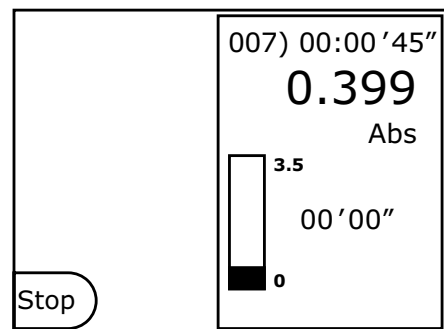
Insert sample cuvette and press the **green measurement key** to start the time-dependent absorbance or transmittance measurement (see chapter 1.6.6, page 12).

After the graph has been displayed, pressing the **menu key**  causes the values to be displayed as a table.

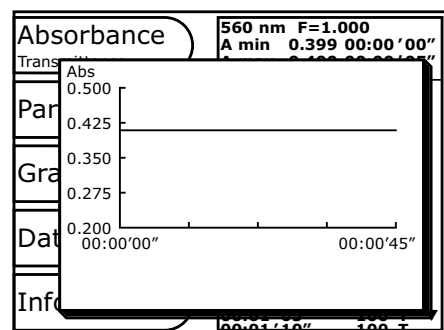
Press the **menu key**  again to exit from the menu.

 **Note:**

The measurement can be terminated at any time by pressing the menu item .



Display output during the t-scan



Display of results in the form of a graph

Absorbance		560 nm F=1.000	
Transmittance		A min	0.399 00:00'00"
Parameter		A max	0.400 00:01'05"
	00:00'00"	0.399 A	
	00:00'05"	0.399 A	
	00:00'10"	0.399 A	
	00:00'15"	0.399 A	
	00:00'20"	0.399 A	
	00:00'25"	0.399 A	
	00:00'30"	0.399 A	
	00:00'35"	0.399 A	
	00:00'40"	0.399 A	
	00:00'45"	0.399 A	
	00:00'50"	0.399 A	
	00:00'55"	0.399 A	
	00:01'00"	0.399 A	
	00:01'05"	0.400 A	

Display of results in the form of a table

3.1 Database function

The **XION 500** has 4 results databases:

Tests, Abs/Trans, λ-scan, t-scan

All measurement data are saved in the appropriate databases and can be edited, deleted and printed.

3.1.1 Editing the Tests and Abs/Trans databases

The menu shown on the right can be opened immediately after a series of measurements by pressing the **Data** selection key.

The data can also be edited, deleted and printed at a later time. Starting in the main menu, open the same menu by pressing the **Edit** and **Data** selection keys. If the **Tests** (measurement of Dr. Lange Cuvette Tests, Pipette Tests, Trace Analyses, "beta" tests, and user tests; see chapter 1, page 11) or the **Abs/Trans** (absorbance and transmittance measurement) menu option is selected by pressing the appropriate selection key, a menu with the options **Select**, **- Select**, **Edit Select**, **Output** and **Delete** also appears.

Select	031 12.02.01 0.156 mmol/l
- Select	031 12.02.01 0.156 mmol/l
Edit Select	341 12.02.01 0.793 mg/l
Output	341 12.02.01 -0.051 -mg/l
Delete	341 12.02.01 0.237 mg/l

Data menu after measurement of Dr. Lange Cuvette Tests, Pipette Tests, trace analysis, "beta" tests and user tests

◆ Tests
▣ Abs/Trans
▢ λ-scan
▣ t-scan
23.02.01 09:26

Menu after selecting Edit, Data

Short description of the menu options

Menu option	Description
Select	Select measurement results that match specific criteria (see chapter 3.1.1.1, pages 2ff.)
- Select	Nullify the selection criteria (see chapter 3.1.1.1, pages 2ff.)
Edit Select	Modify the additional information of all results or only the marked results (see chapter 3.1.1.3, pages 6ff.)
Output	Print all results or only the marked results or save them to diskette or transmit them to a PC with measurement data transfer software (see chapter 3.1.1.4, page 8)
Delete	Delete all results or only the marked results (see chapter 3.1.1.5, page 9)

3.1.1.1 Selecting measurement results that match specified criteria in the Tests and Abs/Trans databases

a) Selecting results that match entries in the information fields

To select measurements that match specified criteria, press the **Select** selection key.

A number of menu options are available and can be combined at will.

-----	010 02.02.01 600 mg/l
Name	010 02.02.01 605 mg/l
-----	341 12.02.01 0.943 mg/l
Sample	341 12.02.01 0.945 mg/l
-----	348 12.02.01 1.450 mg/l
Sampling	348 12.02.01 4.745 mg/l
-----	348 12.02.01 9.431 mg/l
User	028 20.02.01 0.015 mg/l
Mark	028 20.02.01 0.015 mg/l

Select menu

Choose the desired menu item by pressing the appropriate **selection key**, e.g. **Name**.

A selection list is displayed. Use the **cursor keys** (▲ ▼) to select a criterion, e.g. chloride, and confirm by pressing the **enter key** (↵). A selection list is now displayed which contains only measurement results for chloride. The criterion "Chloride" is also shown in the **Name** menu item.

Define any other desired selection criteria and then exit from this menu by pressing the **menu key** (▲).

Chloride	010 27.01.01 541 mg/l
Name	010 27.01.01 542 mg/l
-----	010 27.01.01 538 mg/l
Wastewater	010 27.01.01 600 mg/l
Sample	010 30.01.01 601 mg/l
-----	010 30.01.01 100 mg/l
27.01.01-..	010 30.01.01 740 mg/l
Sampling	010 30.01.01 741 mg/l
-----	010 01.02.01 742 mg/l
Smith	010 01.02.01 743 mg/l
User	010 01.02.01 600 mg/l
-----	010 02.02.01 600 mg/l
Mark	010 02.02.01 610 mg/l ▼

Measurement results after selection

Description of the individual menu items

Database	Options
Tests Results of Dr. Lange Cuvette Tests (with barcode), Pipette Tests, Trace Analyses, "beta" tests, and user tests	Name, Sample, User name: Select from the list with the cursor keys (▲ ▼) and confirm with the enter key (↵). Sampling date: Input (see chapter 1.6.2, page 9)
Abs/Trans Results of absorbance and transmittance measurements	Unit, Sample, User name: Select from the list with the cursor keys (▲ ▼) and confirm with the enter key (↵). Sampling date: Input (see chapter 1.6.2, page 9)

Tip:
The selection can be nullified by pressing the **Select** selection key. A list of all available measurement results is again displayed.

Tip:
A specified selection criterion can be cleared by selecting "-----" in the appropriate selection list.

b) Selection by marking measurement results

A list of individually specified measurement results can be compiled by pressing the and **selection keys**.

Use the **cursor keys** to select the required measurement result and then mark it by pressing the **selection key** (see chapter 1.6.3, page 10).

After all required measurement results have been marked, exit from the menu by pressing the **menu key** . A list containing only the marked results is then displayed.



Tip:

The selection can be nullified by pressing the **selection key**. A list of all available measurement results is again displayed.

<input type="button" value="-----"/>	*010 02.02.01 600	mg/l
Name	*010 02.02.01 610	mg/l
<input type="button" value="-----"/>	*010 16.02.01 514	mg/l
Sample	*010 16.02.01 516	mg/l
<input type="button" value="-----"/>	348 20.02.01 7.548	mg/l
Sampling	341 20.02.01 1.50	mg/l
<input type="button" value="-----"/>	032 22.02.01 2.33	mg/l
User	032 22.02.01 2.48	mg/l
<input type="button" value="-----"/>	*010 26.02.01 600	mg/l
Mark	*010 26.02.01 718	mg/l

List of marked measurement results

3.1.1.2 Modifying the additional information of an individual measurement result in the Tests or the Abs/Trans database

a) Before measurement results are selected

Select the menu item Data after a measurement or select the menu items Edit, Data, Tests or Abs/Trans. A list of measurement results is displayed. Use the **cursor keys** ▲ ▼ to select the result whose information is to be modified. A window opens, in which the changes can be entered.

Select	010 02.02.01 541	mg/l ▲
	010 02.02.01 542	mg/l
	010 02.02.01 538	mg/l
	010 02.02.01 600	mg/l
- Select	Meas.val.	0.087 mmol/l
	Name	CL
	Test no.	010
Edit Sele	Measuring	02.02.01 11:23
	Sampling	10.02.01 09:55
	Dilution	1.000
Output	Sample	Wastewater
	User	Smith
Delete	Note	Left tank
	Save	

Modifying a record before measurement results are selected

b) After measurement results have been selected

The additional information of the measurement results in a selection list produced as described in *chapter 3.1.1.1, pages 2 f.* can also be individually modified. Use the **cursor keys** ▲ ▼ to select the results whose information is to be modified. A window opens, in which the changes can be entered.

Chloride	010 27.01.01 541	mg/l
Name	010 27.01.01 542	mg/l
	010 27.01.01 538	mg/l
	010 27.01.01 600	mg/l
Wastew	Meas.val.	0.087 mmol/l
Sample	Name	CL
	Test no.	010
27.01.01	Measuring	02.02.01 11:23
Sampling	Sampling	10.02.01 09:55
	Dilution	1.000
Smith	Sample	Wastewater
User	User	
	Note	Left tank
Mark	Save	

Modifying a record after measurement results have been selected




NB:


If the changes are such that a result no longer matches the selection criteria (as shown in the menu items), the result will not appear in the selection list after it has been modified. It is of course still present in the database and can be displayed by pressing the Select **selection key** again and redefining the selection criteria.




Tip:

The selection can be nullified by pressing the - Select **selection key**. A complete list of all available results is then displayed.

Implementing the modification

Use the **cursor keys**   to select the additional information. Confirm by pressing the **enter key**  .

Confirm the selection or input (see *chapter 1.6.1, page 8 and chapter 1.6.2, page 9*) by pressing the **enter key**  .

To save the changes, use the **cursor keys**   to select **Save** and then confirm with the **enter key**  .

Press the **menu key**  to exit from this menu.

Display	Description	Options
Meas. val.	Measurement result	Cannot be changed
Name	Test name	Cannot be changed
Test no.	Specific test number with which the test was selected from the selection list	Cannot be changed
Measuring	Date of the measurement	Cannot be changed
Sampling	Period when the sample was taken	Can be changed
Dilution (not for absorbance and transmittance measurements)	Dilution of the sample	Can be changed
Sample	Sample name (e.g. addista)	Can be changed
User name	User name	Can be changed
Note	Notes about the sample	Can be changed
Wavelength (only for absorbance and transmittance measurements)	Measurement wavelength	Cannot be changed
Factor (only for absorbance measurements)	Factor for converting absorbance to concentration	Can be changed

3.1.1.3 Simultaneously modifying the additional information of a number of measurement results in the Tests and Abs/Trans databases

a) Before measurement results are selected

Select the menu item **Data** after a measurement or select the menu items **Edit**, **Data** and **Tests** or **Abs/Trans**. A list of measurement results is displayed. Press the **Edit Select** **selection key**. A window opens, in which the changes can be entered.

It is also possible to change the additional information of selected measurement results.

Select the menu item **Data** after a measurement or select the menu items **Edit**, **Data** and **Tests** or **Abs/Trans**. Press the **Select** **selection key**.

Use the **cursor keys** **▲** **▼** and the **Mark** **selection key** to select the measurement results that are to be simultaneously modified (see chapter 1.6.3, page 10).

Press the **menu key** **⏏** to exit from the selection list. Press the **Edit Select** **selection key**.

A window opens, in which the changes can be entered.

Implementing the modification

Use the **cursor keys** **▲** **▼** to select the additional information. Confirm by pressing the **enter key** **↵**.

Confirm the selection or input (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9) by pressing the **enter key** **↵**.

To save the changes, use the **cursor keys** **▲** **▼** to select **Save** and then confirm with the **enter key** **↵**.

The changes are now present in all the selected measurement results. Press the **menu key** **⏏** to exit from this menu.


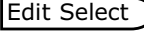
Select	010 02.02.01 600	mg/l
	010 02.02.01 610	mg/l
	010 16.02.01 514	mg/l
	010 16.02.01 516	mg/l
- Select	<ul style="list-style-type: none"> Sampling Dilution Sample User Note Save 	
Edit Select		
Output		
Delete		

Modifying **all** records before measurement results are selected



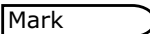
Select	*010 30.01.01 601	mg/l
	*010 30.01.01 100	mg/l
	*010 30.01.01 740	mg/l
	*010 30.01.01 741	mg/l
- Select	<ul style="list-style-type: none"> Sampling Dilution Sample User Note Save 	
Edit Select		
Output		
Delete		

Modifying all **marked** records before measurement results are selected

b) After measurement results have been selected

After the measurement results have been selected (see *chapter 3.1.1.1, page 2*), press the **menu key**  and the **Edit Select**  **selection key** to modify **all** the selected measurement results simultaneously. A window opens, in which the changes can be entered.




It is also possible to modify **marked** measurement results simultaneously after they have been selected (see *chapter 3.1.1.1, page 3*).


The measurement results that are to be modified are selected by using the **cursor keys**   and the **Mark**  **selection key** (see *chapter 1.6.3, page 10*).




Press the **menu key**  and select **Edit Select** .


A window opens, in which the changes can be entered.

Implementing the modification

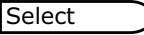
Use the **cursor keys**   to select the additional information. Confirm by pressing the **enter key** .

Confirm the selection or input (see *chapter 1.6.1, page 8* and *chapter 1.6.2, page 9*) by pressing the **enter key** .


To save the changes, use the **cursor keys**   to select **Save** and then confirm with the **enter key** .

The changes are now present in all the selected measurement results. Press the **menu key**  to exit from this menu.

NB:

If the changes are such that a result no longer matches the selection criteria, the result will not appear in the selection list after it has been modified. It is of course still present in the database and can be displayed by pressing the **Select**  **selection key** again and redefining the selection criteria.

Tip:

The selection can be nullified by pressing the **- Select**  **selection key**. A complete list of all available results is then displayed.

Chloride	010 27.01.01 541	mg/l
Name	010 27.01.01 542	mg/l
	010 27.01.01 538	mg/l
	010 27.01.01 600	mg/l
Wastew		
Sample	Sampling	
	Dilution	
27.01.01	Sample	
Sampling	User	
	Note	
Smith	Save	
User	010 01.02.01 600	mg/l
	010 02.02.01 600	mg/l
	010 02.02.01 610	mg/l ▼
Mark		

*Changing the additional information of **all** selected measurement results*

Chloride	*010 27.01.01 541	mg/l
Name	*010 27.01.01 542	mg/l
	*010 27.01.01 538	mg/l
	*010 27.01.01 600	mg/l
Wastew		
Sample	Sampling	
	Dilution	
27.01.01	Sample	
Sampling	User	
	Note	
Smith	Save	
User	*010 01.02.01 600	mg/l
	*010 02.02.01 600	mg/l
	*010 02.02.01 610	mg/l ▼
Mark		

*Changing the additional information of selected and **marked** measurement results*

3.1.1.4 Output from the **Tests** and **Abs/Trans** databases

Pressing the **Output** selection key enables all available or marked measurement results in the databases **Tests** and **Abs/Trans** to be sent to a specified output device.

Individual measurement results can also be edited (see chapter 3.1.1.2, page 4).

Diskette	010 02.02.01 541 mg/l
	010 02.02.01 542 mg/l
	010 02.02.01 538 mg/l
	010 02.02.01 600 mg/l
LD500	010 02.02.01 601 mg/l
	010 02.02.01 100 mg/l
	010 02.02.01 740 mg/l
PC	010 02.02.01 741 mg/l
	010 02.02.01 742 mg/l
	010 02.02.01 743 mg/l
Printer	010 02.02.01 743 mg/l
	010 02.02.01 600 mg/l
	010 02.02.01 600 mg/l
	010 02.02.01 610 mg/l ▼

Output menu

Short description of the menu options

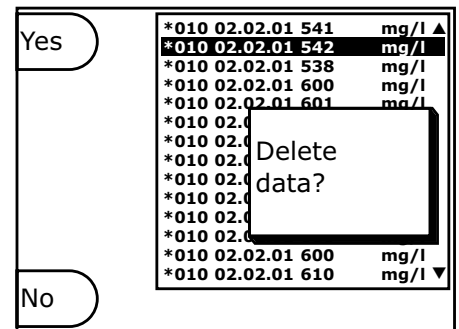
Display	Description	Options
Diskette	<p>Save the measurement results to Tests :</p> <p>The data are saved under the name TESTERG.dbf.</p> <p>Save the measurement results to Abs/Trans :</p> <p>The data are saved under the name EXTERG.dbf.</p>	<p>Press the Diskette selection key to save all available or marked measurement results to diskette. The data are saved in a D-Base 3 format and can be processed with a PC and an appropriate program, e.g. Excel.</p> <p>_TEST = Test number _SYMBOL = Symbol _VERSION = EPROM version _NO. = Control number _RESULT = Measured value _DILUTION = Dilution _UNIT = Unit _NAME = Parameter name _M.DATE = Measurement date _S.DATE = Sampling date _SAMPLE = Sample name _OPERATOR = User name _COMMENT = Note</p>
LD 500	Print the measurement results on the Dr. Lange printer.	Press the LD 500 selection key to print all available or marked measurement results.
PC	Send the measurement results to a PC with measurement data transfer software (DATAtrans).	Press the PC selection key to send all available or marked measurement results to a PC.
Printer	Print the measurement results on a printer with a parallel port.	Press the Printer selection key to print all available or marked measurement results.

3.1.1.5 Deleting measurement results from the and databases

Press the **selection key**. The menu shown on the right appears.

Press the **selection key** to delete **all** available or **marked** measurement results.

Pressing the **selection key** causes the system to return to the menu , , , , .



Deleting marked measurement results

3.1.2 Editing the λ -scan and t-scan databases

After completion of a series of measurements, press the **Data** selection key. The menu shown on the right appears.

The data can also be edited and printed at a later time. Starting in the main menu, press the **Edit**, **Data** and λ -scan or t-scan selection keys. A menu appears, with the options **Graph**, **Table**, **Output** and **Save**.

Up to **3** scans are displayed with their dates and times. Each newly plotted scan is shown at first under **ACTUAL** and is subsequently assigned to its storage location by selecting **SCAN 1**, **SCAN 2** or **SCAN 3** with the cursor keys Δ ∇ . Select the menu option **Save** to activate the assignment and write the scan over an already existing scan.



NB:

When a t-scan is carried out in **continuous** measurement mode, only the latest measurement results are saved.

Graph	SCAN1 02.02.01 08:20
Table	SCAN2 09.02.01 09:50
Output	SCAN3 30.01.01 13:40
Save	ACTUAL 21.02.01 17:10

Data menu

\diamond Tests
\equiv Abs/Trans
Δ λ -scan
\square t-scan
23.02.01 09:26

Menu after selecting Edit, Data

3.1.2.1 Modifying the additional information of measurement result in the λ -scan or the t-scan database

Use the **cursor keys** (▲ ▼) to select a scan, e.g. **SCAN 1**. Confirm by pressing the **enter key** (↵). A window opens, in which the changes can be entered.

Use the **cursor keys** (▲ ▼) to select the additional information. Confirm by pressing the **enter key** (↵). Confirm the selection or input (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9) by pressing the **enter key** (↵). To save the changes, use the **cursor keys** (▲ ▼) to select **Save** and then confirm with the **enter key** (↵). Press the **menu key** (⏏) to exit from this menu.

Graph	<table border="1"> <tr><td>SCAN1</td><td>02.02.01</td><td>08:20</td></tr> <tr><td>SCAN2</td><td>09.02.01</td><td>09:50</td></tr> <tr><td>SCAN3</td><td>30.01.01</td><td>13:40</td></tr> <tr><td>ACTUAL</td><td>07.02.01</td><td>15:30</td></tr> </table>	SCAN1	02.02.01	08:20	SCAN2	09.02.01	09:50	SCAN3	30.01.01	13:40	ACTUAL	07.02.01	15:30						
SCAN1	02.02.01	08:20																	
SCAN2	09.02.01	09:50																	
SCAN3	30.01.01	13:40																	
ACTUAL	07.02.01	15:30																	
Table	<table border="1"> <tr><td>Wavelength</td><td>430 – 900 nm</td></tr> <tr><td>Interval</td><td>5 nm</td></tr> </table>	Wavelength	430 – 900 nm	Interval	5 nm														
Wavelength	430 – 900 nm																		
Interval	5 nm																		
Output	<table border="1"> <tr><td>Measuring</td><td>02.02.01</td><td>08:20</td></tr> <tr><td>Sampling</td><td>02.02.01</td><td>08:20</td></tr> <tr><td>Sample</td><td>-----</td><td></td></tr> <tr><td>User</td><td>-----</td><td></td></tr> <tr><td>Note</td><td></td><td></td></tr> <tr><td>Save</td><td></td><td></td></tr> </table>	Measuring	02.02.01	08:20	Sampling	02.02.01	08:20	Sample	-----		User	-----		Note			Save		
Measuring	02.02.01	08:20																	
Sampling	02.02.01	08:20																	
Sample	-----																		
User	-----																		
Note																			
Save																			
Save																			

Record containing additional information

Display	Description	Options
Wavelength	Measurement wavelength	Cannot be changed
Interval (λ -scan only)	Interval between two measurement points	Cannot be changed
Time interval (t-scan only)	Time between two measurement points	Cannot be changed
Factor (t-scan only)	Factor for converting from absorbance to concentration	Can be changed
Measuring	Date of the measurement	Cannot be changed
Sampling	Date and time when the sample was taken	Can be changed
Sample	Sample name	Can be changed
User	User name	Can be changed
Note	Notes about the sample	Can be changed

3.1.2.2 Output from the λ -scan and t-scan databases

Pressing the **Output** selection key enables all available measurement results in the databases λ -scan and t-scan to be sent to a specified output device. Use the **cursor keys** \uparrow \downarrow to select the desired scan.

The data can also be edited (see chapter 3.1.2.1, page 11).

Press the **LD 500** selection key to print the measurement results on the Dr. Lange printer or **Printer** to print them on a printer with a parallel port.

SCAN1	02.02.01	08:20
SCAN2	09.02.01	09:50
SCAN3	30.01.01	13:40
ACTUAL	21.02.01	15:30

Graph
Table
Graph&Table

Selection window for results display

Short description of the menu options

- Graph** = Display results in the form of a graph
- Table** = Display the results in the form of a table
- Graph & Table** = Display the results in both graphic and tabular form
- \uparrow = Exit from menu

NB:

When a t-scan is carried out in **continuous** measurement mode, only the latest measurement results are saved.

To print all measurement results, select Print Yes (measurement results and graph) or No (graph only) (see chapter 2, page 23)

Tip:

Pressing the **Diskette** selection key enables all measurement results in the databases λ -scan to be saved to a diskette. The data are saved in a D-Base 3 format and can be processed with a PC and an appropriate program, e.g. Excel.

- _LAMD A** = Wavelength
- _RESULT** = Measured value
- _UNIT** = Unit
- _DATE/TIME** = Date/Time
- _SAMPLE** = Sample name
- _OPERATOR** = User name

3.2 Programming user tests

3.2.1 General

The list under menu item is empty when the instrument is shipped. It can be built up by the user to suit his own specific requirements. The analysis procedure must be formulated precisely before it can be programmed, i.e. the user must define or determine the program sequences, calculation formulas, measurement wavelengths, factors, measurement range limits, etc. The steps are as follows.

3.2.2 Help in developing user methods

A test method is usually calibrated and measured at the maximum of the absorbance spectrum of the appropriate solution. The analysis measurements are carried out against a suitable zero solution (e.g. distilled water, reagent blank value, solvent or air).

Determining the absorbance maximum

Starting in the main menu, press the and **selection keys**.

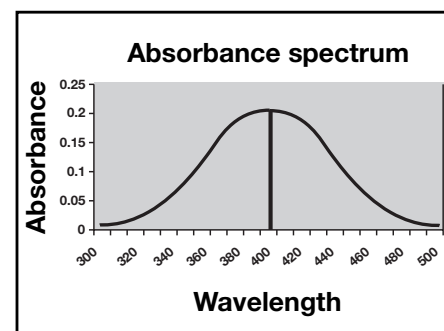
1. Insert the zero cuvette and press the **blue zero key**.
2. Insert the sample cuvette and press the **green measurement key**.
3. Determine the absorbance maximum.

Calibrating the method

The method is calibrated by determining the absorbance values of several standard solutions of known concentrations against the zero solution.

Starting in the main menu, press the and **selection keys** (see chapter 2.6, pages 20 ff.).

Press the **selection key**. Press the **selection key** and enter the absorbance maximum determined above (see chapter 1.6.2, page 9).



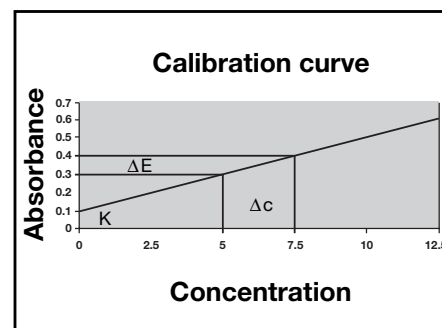
Absorbance spectrum

Measuring mode

1. Insert blank value or zero cuvette and press the **blue zero key**.
2. Insert cuvette containing standard solution 1 and press the **green measurement key**.
3. Insert cuvette containing standard solution 2 and press the **green measurement key**, etc.
4. Note the absorbance values of standard solutions **1 to n**.

If the measured absorbance values are now plotted against the concentration values, this gives the calibration curve (provided the Beer-Lambert law applies). The reciprocal of the gradient of this line is the factor $F1$ ($\Delta c/\Delta E$) with which the absorbance values of the solution that is to be analysed are automatically converted by the **XION 500** into the corresponding concentrations in line with the straight-line equation.

The intercept with the y-axis (**K**) multiplied by **-F1** gives the constant **F2**, which is an additive term in the straight-line equation.



Straight-line equation: $c = E * F1 + F2$

The wavelengths, factors and constants are programmed into the **XION 500** under the menu option **Program** (see chapter 3.2.3.2, pages 20 ff.).

Procedure

Starting in the main menu, press the **Edit** and **Program** **selection keys**.

Enter the number, name, wavelength, etc. of the test that is being programmed.

In this example the wavelength is:

400 nm

Select the formulas. In this example the formula is

$E * F1 + F2$

Enter the factors. In this example the factors are:

F1 = 25

F2 = -2.5

Enter the measurement range limits.

Select the unit from the selection list.

Save and print the test.

3.2.3 Programming user tests

3.2.3.1 Principle

Starting in the main menu, press the **Edit** and **Program** selection keys.

A menu opens, showing the available program processes (see chapter 3.2.3.2, page 19ff).

Example of how to program a user test

Selecting a process

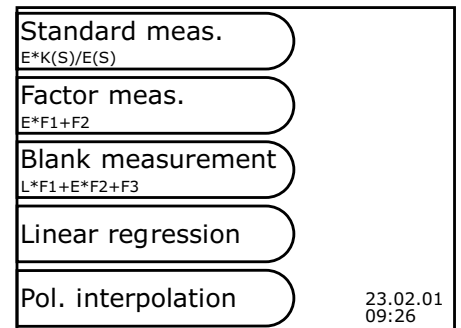
Press a selection key to select the program process. (In this case **Factor meas. E*F1 + F2**).

Entering a test number

Press the **Test number** selection key.

The test number of the parameter that is to be analysed is entered here (see chapter 1.6.2, page 9).

Press the **enter key** to confirm and display the entry.



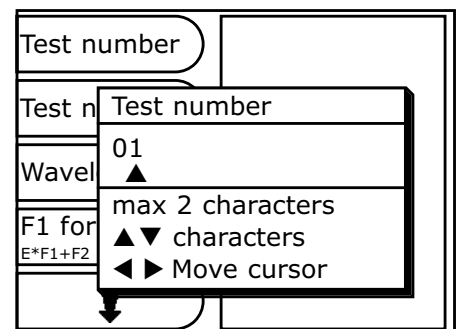
Process options

Tip:

Users can program their own barcoded applications with the help of the Dr. Lange LCW 906 blank value cuvettes. To do this the first digit of the test number must be defined as **9**. The following display appears automatically on the screen:

Test number: 906

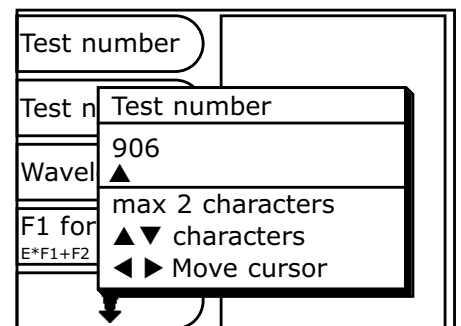
A **maximum of 12** user tests can be assigned to this number. The control number of each test programmed under **906** is automatically calculated by the **XION 500** and is displayed during the measurement.



Test number input window

NB:


A **test number** can **only** be assigned **once!** (The barcoded programs using LCW 906 are an **exception**; in their case **the test name has to be used to identify the test unambiguously**)



Test number for barcoded user tests

Entering the test name


Press the **Test name** *selection key*.

Enter the name of the parameter that is to be analysed (see chapter 1.6.1, page 8). Press the **enter key**  to confirm and display the entry.

Entering the wavelength

Press the **Wavelength** *selection key*.


Enter the wavelength (see chapter 1.6.2, page 9).

Press the **enter key**  to confirm and display the entry.


Entering the factors

Press the **F1 for E*F1 + F2** *selection key*.

Enter the first factor (see chapter 1.6.2, page 9).


Press the **enter key**  to confirm and display the entry.

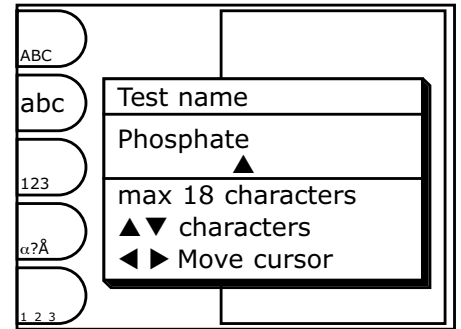
Then press the **F2 for E*F1 + F2** *selection key*.

Enter the second factor (see chapter 1.6.2, page 9). Press the **enter key**  to confirm and display the entry.

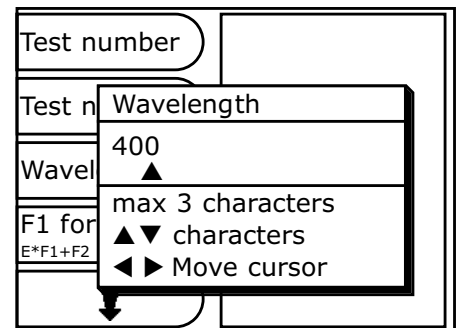
Entering the measurement range

Press the **Meas. range** *selection key*.

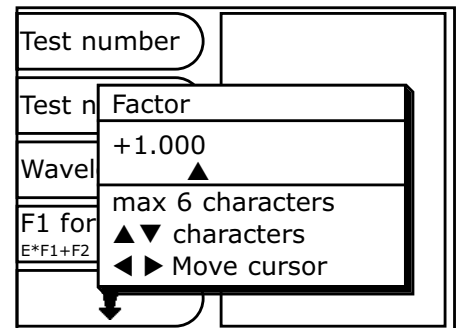
Enter the lower and upper limits of the measurement range (see chapter 1.6.2, page 9). Press the **enter key**  to confirm and display the entries.



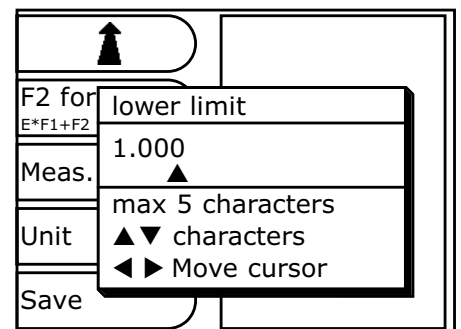
Test name input window



Wavelength input window






Factor input window



Input window for the lower and upper limits of the measurement range

Selecting the unit of measurement

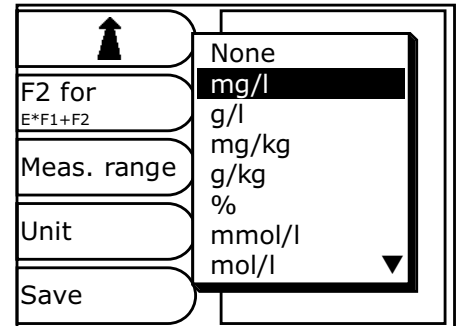
Press the **selection key**.

Use the **cursor keys**   to select the unit in which the measurement result will be expressed. Press the **enter key**  to confirm and display your choice.

Saving the program

Press the **selection key**.

This completes the programming sequence. If a printer is connected the program will automatically be printed. The test can be accessed under the menu option .




Unit selection window


Note:

If a parameter is not entered during the programming sequence the following message appears:

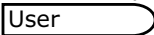
The entries are incomplete.

Press the **menu key**  to acknowledge the message, then check the entries.

Tip:

You can press the **menu key**  at any time to escape from the programming sequence. Press the **selection key** (escape) or the **selection key** (continue programming).

Short description of the menu options

Display	Description	Options
Factor meas. E * F1 + F2	Exact definition of the evaluation formula with which the test result will be calculated.	See chapter 3.2.3.2, pages 19 ff.
F1 for E * F1 + F2	Input of the factors. The number of factors displayed depends in the selected formula.	Factors: +/- 0.000 to 99999
Test number	Specific test number with which the test can subsequently be called from the  selection list.	1 to 2 digits, e.g. 01 (00 to 89 tests) Test numbers higher than 89 are automatically displayed as 906 (LCW 906). Evaluation via barcode. A maximum of 12 tests can be assigned.
Test name	Chemical symbol or the name of the analysis parameter (only appears in the selection list).	1 to 18 characters, e.g. NO ₃ -N, Nitrate nitrogen
Wavelength	Wavelength at which the measurement will be carried out.	340 to 900 nm
Meas. range	Input of the lower and upper limits of the measurement range.	Measurement range limits: 0.000 to 99999
Unit	Unit in which the measurement result will be expressed.	Selection list containing all valid units

3.2.3.2 Program process options

Standard meas.
E*K(S)/E(S)

Within the range of applicability of the Beer-Lambert law the concentration **c** of the sample can also be determined by comparison with a standard solution of known concentration **E(S)** (standard) with the help of the following equation:

$$\text{Concentration of sample} = E(\text{sample}) * \frac{K(S)}{E(S)}$$

E = Absorbance of the sample

K(S) = Concentration of the standard

E(S) = Absorbance of the standard

This method requires the concentration of the standard to be close to the anticipated concentration of the sample.

Procedure:

- Starting in the main menu, press the **Edit**, **Program** and **Standard meas. E*K(S)/E(S)** **selection keys**.
- Press the **Test number**, **Test name**, **Wavelength**, **Meas. range** and **Unit** **selection keys** in sequence and key in the required entry or required option.
- Press the **Std. conc.** **selection key** and enter the standard concentration (see chapter 1.6.2, page 9). Complete the programming sequence by pressing the **Save** **selection key**.
- Starting in the main menu, press the **Analysis** and **User** **selection keys** and select the programmed test.
- Press the **blue zero key** without inserting a cuvette in the cuvette compartment (zeroize against air).
- Insert standard cuvette and press the **blue zero key** again. **E1** (E1 is the absorbance of the standard).
- Insert a sample cuvette and press the **green measurement key**.
- Insert further sample cuvettes, pressing the **green measurement key** in each case.

Test number	11
Test name	XYZ
Wavelength	540 nm
Std. conc.	8
	↓

	↑
Meas. range	100.0 - 1000
Unit	mg/l
Save	

Factor meas.

 $E * F1 + F2$

Single point measurements can be carried out with the sequence on which this formula is based. The blank value is constant for all samples (and can thus be set to zero). The absorbance of the sample is measured and the analysis result is calculated from the formula.

E = Absorbance of the sample

F1 = Factor with which **E** is multiplied

F2 = compensation for axis intercept

Procedure:

- Starting in the main menu, press the **Edit**, **Program** and **Factor meas. $E * F1 + F2$** **selection keys**.
- Press the **Test number**, **Test name**, **Wavelength**, **Meas. range** and **Unit** **selection keys** in sequence and key in the required entry or required option.
- Press the **F1 for $E * F1 + F2$** **selection key** and enter the factor **F1**. Then press the **F2 for $E * F1 + F2$** **selection key** and enter the factor **F2**. Complete the programming sequence by pressing the **Save** **selection key**.
- Starting in the main menu, press the **Analysis** and **User** **selection keys** and select the test.
- Insert the blank value or zero solution cuvette and press the **blue zero key**.
- Insert a sample cuvette and press the **green measurement key**.
- Insert further sample cuvettes, pressing the **green measurement key** in each case.



Note:

Another zero measurement can be carried out at any time.

Test number	12
Test name	XYZ
Wavelength	400 nm
F1 for $E * F1 + F2$	25.00
↓	

↑	
F2 for $E * F1 + F2$	-2.500
Meas. range	0.000 - 1000
Unit	mg/l
Save	

Blank measurement
 $L * F1 + E * F2 + F3$

This formula is used to calculate the results of most routine analysis procedures. The sequence on which this formula is based enables single point measurements to be carried out against a measured blank value. The absorbance blank value is measured first at a given wavelength. The absorbance of the sample is then measured and the analysis result is calculated from the formula.

- L** = Absorbance blank value
F1 = Factor with which L is multiplied
E = Absorbance of sample
F2 = Factor with which E is multiplied
F3 = Compensation for axis intercept

Procedure:

- Starting in the main menu, press the **Edit**, **Program** and **Blank measurement $L * F1 + E * F2 + F3$** **selection keys**.
- Press the **Test number**, **Test name**, **Wavelength**, **Meas. range** and **Unit** **selection keys** in sequence and key in the required entry or required option.
- Press the **F1 for $L * F1 + E * F2 + F3$** **selection key** and enter the factor **F1**. Then press the **F2 for $L * F1 + E * F2 + F3$** **selection key** and enter the factor **F2**. Finally press the **F3 for $L * F1 + E * F2 + F3$** **selection key** and enter the factor **F3**. Complete the programming sequence by pressing the **Save** **selection key**.

Test number	13
Test name	XYZ
Wavelength	562 nm
F1 for $L * F1 + E * F2 + F3$	-1.430
↓	

↑	
F2 for $L * F1 + E * F2 + F3$	3.248
F3 for $L * F1 + E * F2 + F3$	2.371
Meas. range	10.00 – 5000
↓	

↑	
Unit	mg/l
Save	

4. Starting in the main menu, press the **Analysis** and **User** *selection keys* and select the test.
5. Press the **blue zero key** e.g. without inserting a cuvette in the cuvette compartment (zeroize against air).
6. Insert blank value cuvette and press the **blue zero key** again.
7. Insert a sample cuvette and press the **green measurement key**.
8. Insert further sample cuvettes, pressing the **green measurement key** in each case.

Note:

Another zero measurement can be carried out at any time.

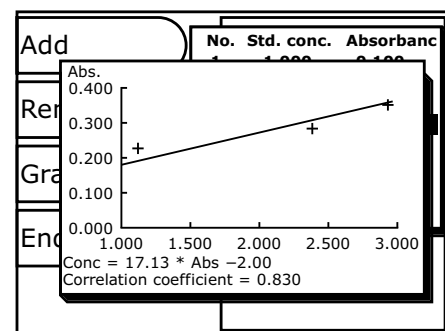
■ Evaluation of linear standard series

Measuring the samples with the help of a reference curve (calibration curve)

Linear regression

If the analysis obeys the Beer-Lambert law the evaluation can be carried out with the help of linear regression. The **XION 500** then gives not only the regression straight lines but also the associated linear formula

Conc = a * Abs + b and the correlation coefficient **r**.



Curve with formula

■ Evaluation of nonlinear standard series

Measuring the samples with the help of a reference curve (calibration curve)





Pol. interpolation

Analyses that are based on nonlinear calibration curves can be evaluated by polygonal interpolation in log-log space. The **XION 500** then displays a graph of the calibration curve. All entered standard values lie on the calibration curve.

■ Entering standard concentrations and entering or measuring standard absorbance values

Instead of entering factors, standard concentrations and standard absorbance values are entered and measured for **linear regression** and **polygonal interpolation**:

a) The absorbance values at standard concentrations are measured **beforehand** in the menu **Abs/Trans**:

1. Starting in the main menu, press the **Edit**, **Program** and **Linear regression** or **Pol. interpolation** **selection keys**.
2. Press the **Test number**, **Test name** and **Wavelength** **selection keys** in sequence and key in the required entry or required option.
3. Press the **Val. pairs** **selection key**. With the **cursor keys**   select the appropriate line in the display, confirm with the **enter key**  and overwrite the predefined standard concentration (see chapter 1.6.2, page 9). A window then opens, in which the standard absorbance can be entered (see chapter 1.6.2, page 9).
4. Press the **Graph** **selection key** to display the calibration curve. Press the **menu key**  to blend out the graph and press the **End** **selection key**.
5. Press the **Meas. range** and **Unit** **selection keys** in sequence and key in the required entry or required option.
6. Save by pressing the **Save** **selection key**.




NB:

Measurement range limits cannot be entered if polygonal interpolation is selected.









Note:

Standard concentrations should be entered in ascending order, otherwise it is not possible to calculate the curve.

Test number	14
Test name	XYZ
Wavelength	500 nm
Val. pairs	4
	

Add	<table border="1"> <thead> <tr> <th>Nr.</th> <th>Std. conc.</th> <th>Absorbanc</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.000</td> <td>0.100</td> </tr> <tr> <td>2</td> <td>1.500</td> <td>0.150</td> </tr> <tr> <td>3</td> <td>2.000</td> <td>0.200</td> </tr> <tr> <td>4</td> <td>2.500</td> <td>0.250</td> </tr> </tbody> </table>	Nr.	Std. conc.	Absorbanc	1	1.000	0.100	2	1.500	0.150	3	2.000	0.200	4	2.500	0.250
Nr.	Std. conc.	Absorbanc														
1	1.000	0.100														
2	1.500	0.150														
3	2.000	0.200														
4	2.500	0.250														
Remove																
Graph																
End	3															

	
Meas. range	0.000 – 2.500
Unit	mg/l
Save	

- b) The absorbance values at the standard concentrations should be measured **during** the programming:
1. Starting in the main menu, press the **Edit**, **Program** and **Linear regression** or **Pol. interpolation** **selection keys**.
 2. Press the **Test number**, **Test name** and **Wavelength** **selection keys** in sequence and key in the required entry or required option.
 3. Press the **Val. pairs** **selection key**.
 4. Insert the blank value cuvette and press the **blue zero key**.
 5. With the **cursor keys**   select the appropriate line in the display, confirm with the **enter key**  and overwrite the predefined standard concentration (see chapter 1.6.2, page 9). Press the **menu key**  to close the window in which the standard absorbance can be entered.
 6. Insert standard cuvette and press the **green measurement key**. The measured absorbance is automatically incorporated in the table.
 7. Press the **Graph** **selection key** to display the calibration curve.
Press the **menu key**  to blend out the graph and press the **End** **selection key**.
 8. Press the **Meas. range** and **Unit** **selection keys** in sequence and key in the required entry or required option.
 9. Save by pressing the **Save** **selection key**.

**NB:**

Measurement range limits cannot be entered if polygonal interpolation is selected.

**Note:**

Standard concentrations should be entered in ascending order, otherwise it is not possible to calculate the curve.



Tip:

The entered or measured values can be overwritten again by using the **cursor keys** to select an existing line (standard concentration and absorbance) and then pressing the **enter key** to confirm.



Tip:

If new absorbance values are to be measured for a given standard concentration, use the **cursor keys** to select the corresponding line in the display window and then press the **green measurement key**. The measured absorbance is automatically written to the selected line.

Overview of the program steps

Display	Description	Options
Test number Test name Wavelength Meas. range Unit	See chapter 3.2.3.1, pages 15 ff.	
Val. pairs	The corresponding absorbance is assigned to one of the entered standard concentrations (enter or measure)	Use the cursor keys to select the appropriate line in the display. Press the enter key to confirm. Enter or measure standard absorbances to overwrite all predefined standard concentrations and absorbances one after the other (see chapter 1.6.2, page 9).
Add	Extend the table to a maximum of 10 value pairs	Use the cursor keys to select an existing line and press the Add selection key . An additional line is inserted under the selected line.
Remove	Reduce the table to a minimum of 3 value pairs	Use the cursor keys to select an existing line and press the Remove selection key . The selected line is deleted.
Graph	Display the calibration curve	Press the appropriate selection key . Press the menu key to return to the display of the values in the form of a table.

3.3 Varying user tests

This function can be used to change user tests.

Starting in the main menu, press the **Edit** and **Vary** *selection keys*.

A selection window opens, containing all user tests and copied Dr. Lange Tests, sorted in ascending order of test number.

Use the *cursor keys* \uparrow \downarrow to select the test that is to be changed. Press the *enter key* \rightarrow to confirm.

Press the **Parameter**, **Unit**, **Meas. range** and **Variables** *selection keys*, selecting the required options to change the test.

Finally save the changed test by pressing the **Save** *selection key*. The test is then available under the menu option **User**.



NB:

When a copied Dr. Lange Test is to be changed, a window opens after the **Unit** and **Meas. range** *selection keys* have been pressed, in which the original name of the test is also shown. (The original name is the name under which the original Dr. Lange Test is shown in the selection list of the menu option **Select**.)

010 Chloride	45
014 COD	45
100 Standard 5	
301 Aluminium	45
348 Phosphate 2	

Selection list of tests for varying









Parameter	348 XYZ-Phosphate
Unit	mg/l
Meas. range	2.500 - 60.00
Variables	3
Save	

Implemented change

Parameter	348 Phosphate
Unit	PO4
Meas. range	2.500 - 60.00
Variables	3
Save	

PO₄, name of test remains unchanged

Short description of the menu options

Display	Description	Options
Parameter	Detailed description of the analysis parameter	Enter new name, e.g. Nitrate-N (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9).
Unit	Definition of the unit in which the result is expressed	Use the cursor keys   to select the desired unit from the selection list. Press enter key  to confirm. Press the menu key  to exit from the input window.
Meas. range	Input of lower and upper limits of measurement range	Enter the lower and upper limits of the measurement range (chapter 1.6.2, page 9). Press the menu key  to exit from the input window.
Variables	Mathematical element of an evaluation formula (e.g. F1). Wavelength at which the measurement is carried out (W1).	Use the cursor keys   to select the desired factor F1 or F2 or W1 . Enter the variable (chapter 1.6.2, page 9.) Press the menu key  to exit from the input window.

3.4 Deleting user tests

This function can be used to delete user tests (programmed, varied, moved and copied tests) from the menu option

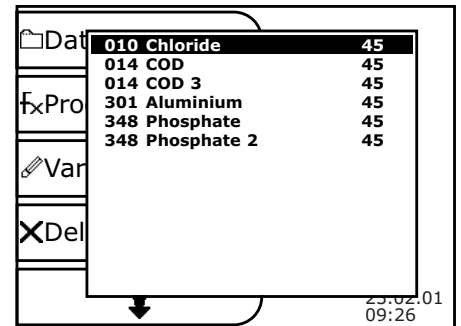
User

Starting in the main menu, press the and **selection keys**.

A selection list is displayed, containing all programmed, varied, moved and copied tests, sorted in ascending order of test number.

Use the **cursor keys** to select the test that is to be deleted. Press the **enter key** to confirm.

Respond to the precautionary query by pressing the or **selection key**. Press the **menu key** to exit from the selection list.



Delete menu

NB:

If a moved test is accidentally deleted from the selection list of the menu option , it is automatically available again in the selection list of the menu option .

3.5 Copying Dr. Lange Cuvette Tests and Dr. Lange Tests

This function is used to copy Dr. Lange Cuvette Tests and Dr. Lange Tests (Pipette Tests, Trace Analyses and "beta" tests) into the selection list of menu option **User**, where they can be changed to suit the user's requirements. Users can thus take advantage of already existing measurement sequences.

Starting in the main menu, press the **Edit** and **Copy** selection keys. A selection list is displayed, containing all Dr. Lange Cuvette Tests and Dr. Lange Tests, sorted by ascending order of test number.

Use the **cursor keys** \uparrow \downarrow to select the test to be copied. Press the **enter key** \rightarrow to confirm.

The copied test is subsequently available in the selection list of the menu option **User**. Press the **menu key** \uparrow to exit from the selection list.

010 Chloride	49
014 COD	49
014 HT-COD	49
025 Hydrazine	49
028 Silicic acid	49
028 Silicon	49
032 Manganese 10	49
032 Manganese 50	49
049 P2O5	49
049 Phosph.-phosphorus	49
049 Phosphate	49
053 Sulphide	49
054 Sulphite	49
058 Hydrogen Peroxide	49
114 COD	49

Copy menu



NB:

Copies of original Dr. Lange Cuvette Tests and Dr. Lange Tests are **not** changed when the original tests are updated.

3.6 Moving Dr. Lange Tests (Pipette Tests, Trace Analyses and "beta" tests)

This function is used to move Dr. Lange Tests into the selection list of the menu option **User**, so that an individual specific selection list can be created.

Starting in the main menu, press the **Edit** and **Move** **selection keys**.

A selection list of Dr. Lange Tests is displayed, sorted in ascending order of test number.

Use the **cursor keys** \uparrow \downarrow to select the test that is to be moved. Press the **enter key** \leftarrow to confirm.

The moved test is subsequently available in the selection list of the menu option **User**. Press the **menu key** \uparrow to exit from the selection list.



NB:

Moved tests can no longer be selected from the selection list of the menu option **Dr. Lange**. However, if a moved test is deleted from the selection list of the menu option **User** it automatically becomes available again in the selection list of the menu option **Dr. Lange**.



Note:

When an update is carried out, moved tests are also automatically changed and become available again under the menu option **Dr. Lange**.



Note:

Moved tests **cannot** be changed by the user.

Test Number	Test Name	Value
010	Chloride	49
025	Hydrazine	49
028	Silicic acid	49
028	Silicon	49
032	Manganese 10	49
032	Manganese 50	49
053	Sulphide	49
054	Sulphite	49
058	Hydrogen Peroxide	49
313	Chrom.-VI Trace	49
313	Total Chrom.Trace	49
325	Formaldehyde Trace	49
349	P2O5 Trace	49
349	P2O5 Trace total	49
349	Phosph.-P Trace to	49

Move menu

4.1 Updating with the LangeNET/Dr. Lange Call Centre

Dr. Lange provides an update service in the form of the LangeNET/Dr. Lange Call Centre.

Updates to existing tests

Improvements to Dr. Lange Tests usually involve changes to factors.

New Tests

New Dr. Lange Tests that are not yet installed on your instrument can also be downloaded.

4.1.1 Requesting data and updates from the LangeNET/Dr. Lange Call Centre


a) Updating and installing Dr. Lange Cuvette Tests with barcode

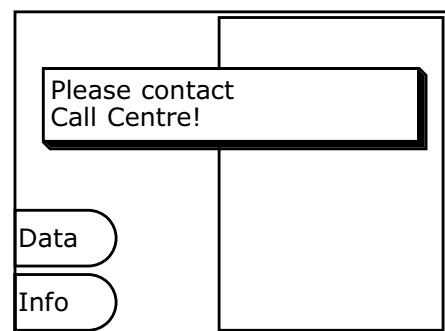
The barcode reader reads the coding on the cuvette label as the cuvette rotates. The instrument uses the barcoded information to automatically select the wavelengths and factors needed for the measurement. If the instrument finds that the barcoded data differ from its own data or that the test is not installed, the message shown on the right is displayed.

Data can be requested (*for data exchange see chapter 4.1.2, pages 4 ff.*).



Tip:

The data request can be terminated by pressing the **menu key** .

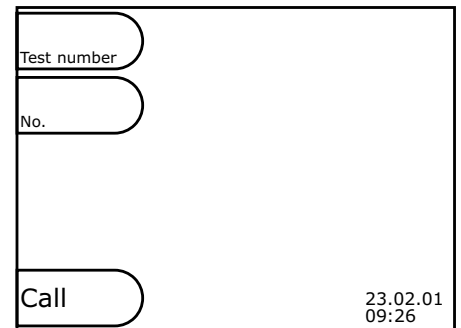


Prompt to dial the Call Centre and download new test data

b) Updating or installing a Dr. Lange Test (Pipette Test, Trace Analysis, "beta" test)

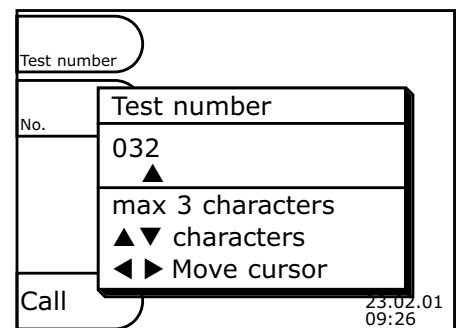
When you open a new test package, compare the control number on the package leaflet with the control number shown in the result display. If the control numbers are not identical, update the test by selecting the following menu options.

Starting in the main menu, press the **Update** and **LangeNET** selection keys.



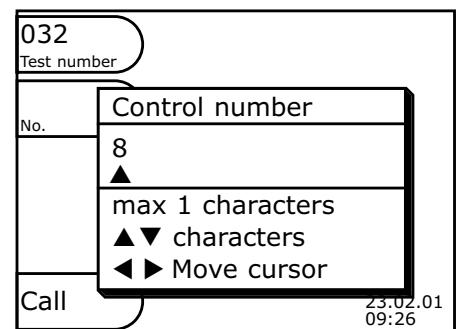
LangeNET menu for updating and installing Dr. Lange Tests

Press the **Test number** selection key.
Enter the test number, e.g. 032 (see chapter 1.6.2, page 9).
The previous menu is then displayed again automatically, with the test number shown in larger type in the menu option **032 Test number**.



Input window for the number of the test to be updated/installed

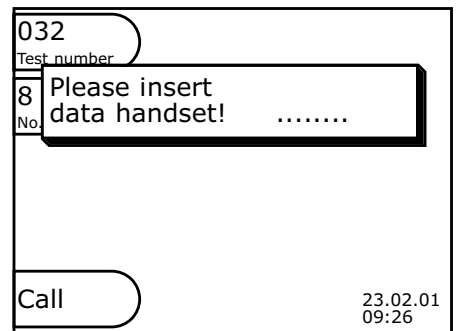
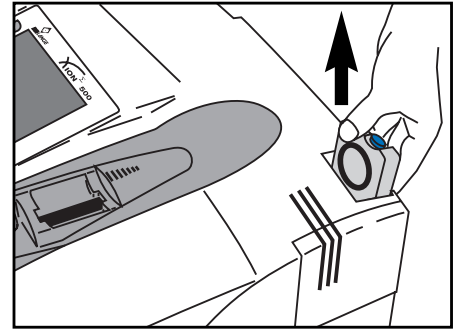
Press the **No.** selection key.
Enter the control number, e.g. 8 (see chapter 1.6.2, page 9).
The previous menu is then displayed again automatically, with the control number shown in larger type in the menu option **8 No.**



Input window for the control number of the current working procedure

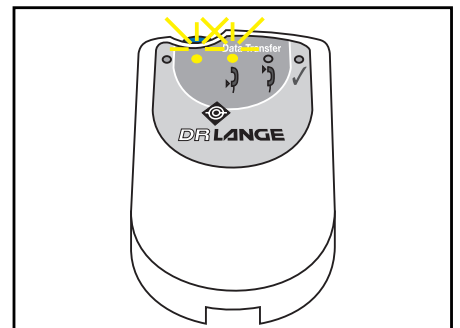
4.1.2 Exchanging data with a data handset after a data request

Take the data handset from its compartment in the **XION 500**.

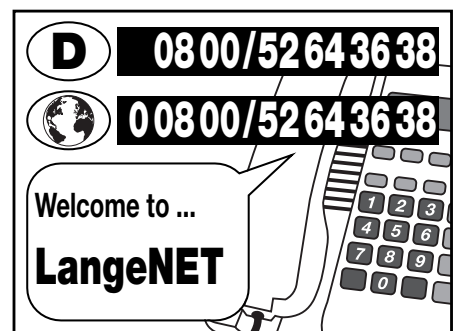


Display during the data exchange

The **2nd** and **3rd LEDs** of the data handset **flash yellow**.



Dial the Call Centre.



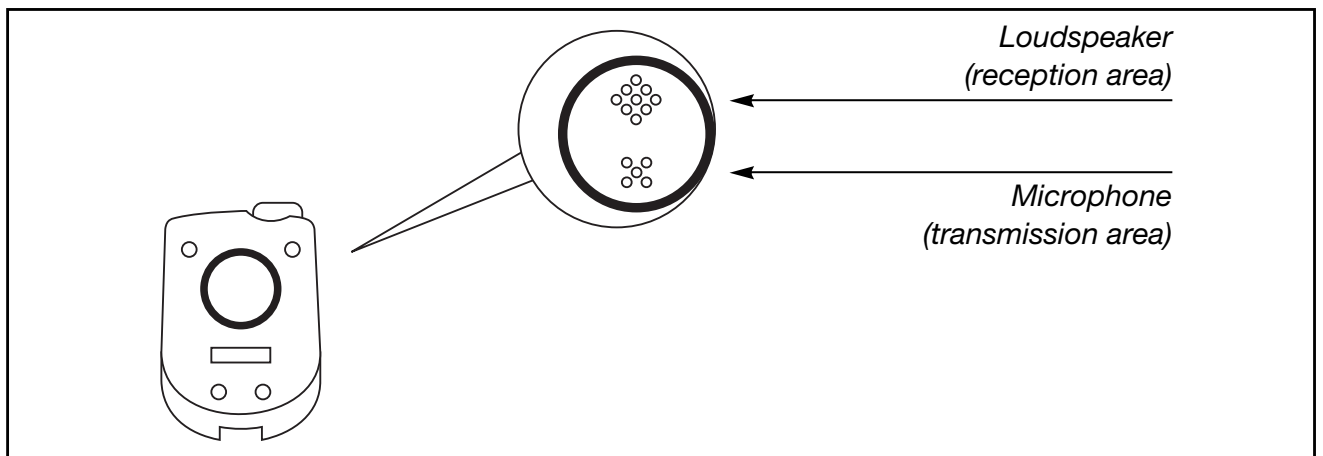
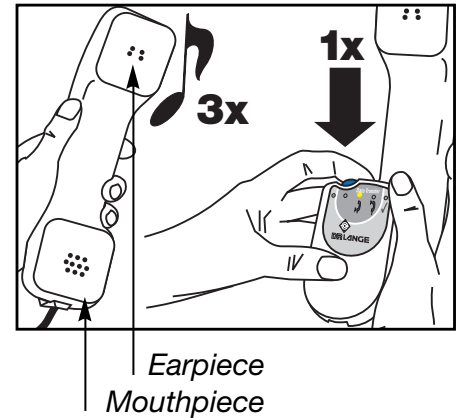
4.1 LangeNET/Dr. Lange Call Centre

After the welcome message **3 tones** are heard, **signalling readiness to receive the data request**.

Hold the data handset to the **mouthpiece of the telephone** and **press the blue key of the data handset once**.


The data request is transmitted to the **Dr. Lange Call Centre**.

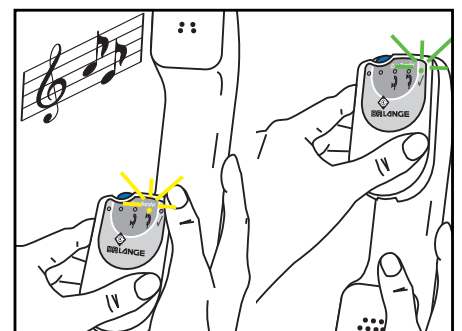
Position the **rubber ring** on the mouthpiece of the telephone in such a way that the **slits in the mouthpiece are exactly over the slits in the loudspeaker** of the data handset (see diagram).



During transmission the colour of the **3rd LED** above the symbol  is **yellow**.

Hold the data handset to the mouthpiece until a **melody is emitted** from the earpiece, signalling that **the data request has been successful and transmission is complete**.

From now on the **4th LED** above the symbol  is **yellow**.



When the **melody ceases** the data handset must be held to the **earpiece to receive the requested data**.

Position the **rubber ring** on the earpiece of the telephone in such a way that the **slits in the earpiece are exactly over the microphone** of the data handset (see figure on page 5).

When all the data have been received the **5th LED** above the symbol ✓ is **green**.

Return the data handset to its compartment.



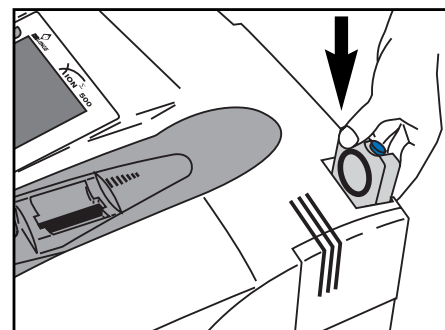
NB:

A mobile phone cannot be used to request data.



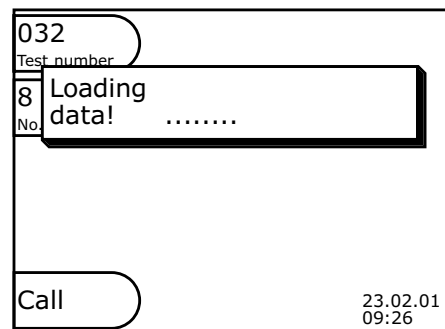
Tip:

If data reception is interrupted, simply put the telephone on the hook and press the blue key to go back to the start situation (2nd and 3rd LEDs are yellow) and start the data exchange again.



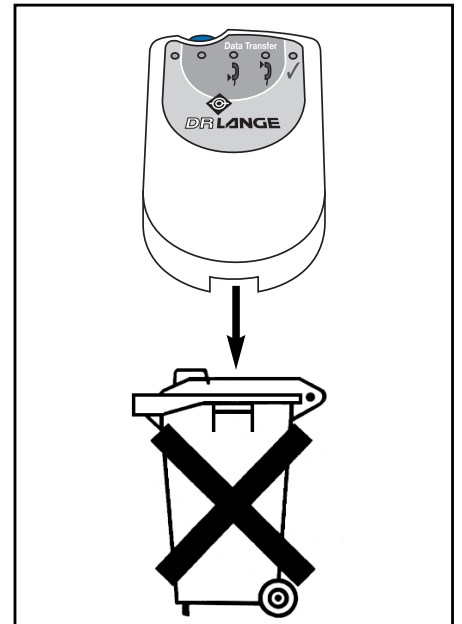
Short description of the LangeNET

	Meaning
Contact Call Centre	Test has been updated or the test data are not present
LED 2 and 3 are yellow	Ready to transmit
Press blue key	Send data request to Dr. Lange Call Centre
LED above ☺ is yellow	Data request is being transmitted
LED above ☺ is yellow	Requested data are being received
LED above ✓ is green	Data request complete
Downloading	Data transfer occurs automatically



4.1.3 Recycling the battery of the data handset

We wish to draw your attention to the fact that the data handset contains batteries. There is usually no need to replace these batteries. Should you no longer wish to use the data handset, please return it to your local Dr. Lange agency to ensure that the batteries are disposed of in an environmentally compatible manner.



4.2 Updating from a diskette

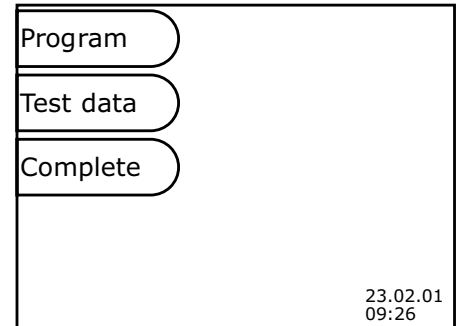
You can update your software and test data from a diskette.

Insert a 3.5 inch diskette and, starting in the main menu, press the **Update** and **Diskette** *selection keys*.

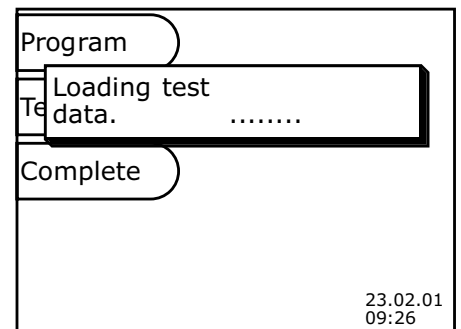
Press the **Program** (program only) or **Test data** (test data only) or **Complete** (test data and program) *selection key*. The data transfer starts automatically.

Note:

A time bar is shown in the window while the data are being transferred. This shows the progress of the transfer operation. After the program has been updated the **XION 500** automatically restarts it.



Update, Diskette menu

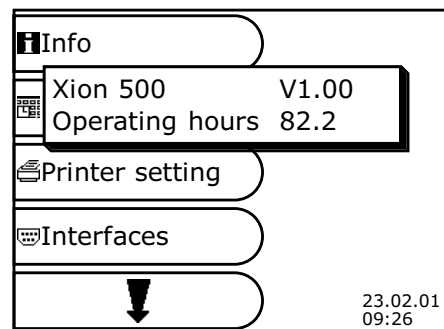


Test data update menu

5.1 Viewing the instrument status

Starting in the main menu, press the **Options** and **Info** selection keys.

Press the **menu key** to exit from the menu.



Instrument status display

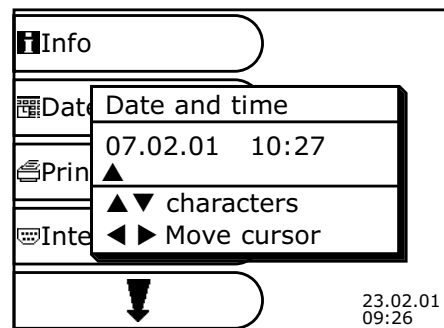
5.2 Setting the date and time

Starting in the main menu, press the **Options** and **Date/Time** selection keys. A window opens, in which the existing date and time settings can be overwritten (see chapter 1.6.2, page 9).

Press the **menu key** to exit from the input window.

Tip:

The **menu key** can be pressed to exit from the input window without changing the date or time.



Date/Time input window

5.3 Printer setting

This function is used to select printers and set them to the required output form.

Starting in the main menu, press the **Options** and **Printer setting** *selection keys*.

Description of the menu options

Meas. date	<input type="checkbox"/>
Sampling date	<input type="checkbox"/>
Dilution	<input type="checkbox"/>
Sample	<input type="checkbox"/>
User	<input type="checkbox"/>
Note	<input type="checkbox"/>
Signature	<input type="checkbox"/>

To conform to GLP (good laboratory practice), each printed analysis result must be accompanied by the time of the measurement, the sampling date and time, the sample name and a space for the operator's signature. The display window therefore shows a selection list of additional information, each item of which is marked in the control field to indicate that it should be printed.

To obtain a less detailed printout, use the *cursor keys* Δ ∇ to select the required additional information in the display field.

Pressing the *enter key* \leftarrow removes the mark in the control field (the control field is then blank). This additional information will then not be printed.

Pressing the *enter key* \leftarrow again causes the mark to be restored to the control field and the additional information will then be printed again.

Epson
hp

A printer with a parallel port, such as an Epson or HP printer, is selected by pressing the appropriate *selection key*. The chosen printer is shown in larger type in the menu option.

Epson	
hp	
	Meas. date <input type="checkbox"/>
	Sampling date <input type="checkbox"/>
	Dilution <input type="checkbox"/>
	Sample <input type="checkbox"/>
	User <input type="checkbox"/>
	Note <input type="checkbox"/>
	Signature <input type="checkbox"/>
Print now	
Interactive	23.02.01 09:26

Options, Printer setting menu

Print now
Interactive

Press the **selection key** to set the print mode. The print mode setting is shown in larger type.

In the direct print mode, all measurement results and additional information are saved and printed at the same time as they are displayed.



When a Dr. Lange Cuvette Test with only one evaluation form is measured, e.g. COD, P₂O₅ (permanent yes), the evaluation program starts at once after a cuvette with a barcode is inserted. The result is immediately displayed, saved and stored. For this reason the additional information cannot be called until the measurement has been completed. After the information has been assigned, the same cuvette must be measured again.

In the case of cuvette tests with various evaluation forms, e.g. NO₃, NO₃-N, only the measurement result is printed if the **Permanent ?** setting is or . To save and print the additional information the print mode must be set to .

Interactive
Print now

In the interactive print mode, all measurement results and additional information are not saved in the results database and printed until the cuvette is removed from the cuvette compartment.

 **Note:**

The measurement results are not lost if the user forgets to remove the cuvette and exits by pressing the **menu key** . The **XION 500** saves and prints the results immediately after the **menu key**  is pressed or the menu option is selected.

 **Tip:**

Always select the print mode when carrying out measurements of Dr. Lange Cuvette Tests.

Hardware description of the parallel interface

PIN	Signal
1	Strobe -
2	D0
3	D1
4	D2
5	D3
6	D4
7	D5
8	D6
9	D7
10	ACK -

PIN	Signal
11	BUSY (not active)
12	P.END
13	SELECT (connected to GND)
14	AUTOFEED (connected to GND)
15	ERROR
16	INITIALIZE PRINTER
17	SELECT INPUT (connected to GND)

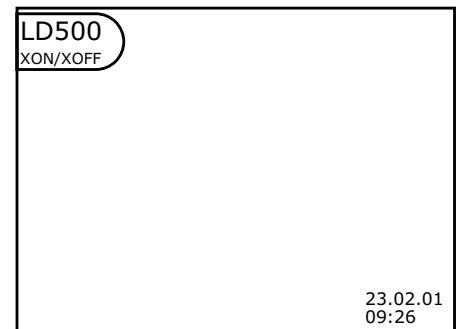
PIN	Signal
18	GND
19	GND
20	GND
21	GND
22	GND
23	GND
24	GND
25	GND

5.4 Interfaces, setting the serial interface

This function sets the serial interface for the **Dr. Lange LD 500** or a PC provided with measurement data transfer software.

Hardware description of the serial interface

PIN	Signal
1	NC
2	RxD
3	TxD
4	NC
5	Gnd
6	NC
7	NC
8	NC
9	NC



LD 500 menu

Starting in the main menu, press the **Options** and **Interfaces** **selection keys**.

Press the appropriate **selection keys** to select the interface settings. The selected settings are shown in larger type in the menu options.

If **XON/XOFF** is selected, another menu opens to enable the parameters to be set for the measurement data transfer software.

Press the appropriate **selection key** and use the **cursor keys** **▲** **▼** to select the appropriate interface parameters. Press the **enter key** **↵** to confirm. The selected parameter is shown in larger type in the menu option.



NB:

Non-settable interface parameters are 8 data bits and 2 stop bits.

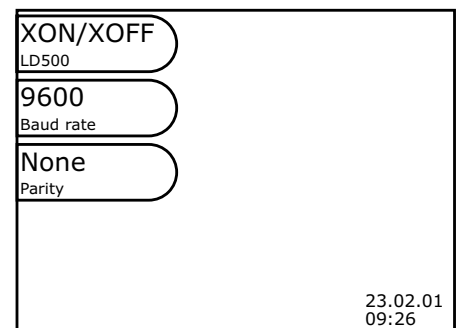


Note:

To use the Dr. Lange DATAtans software, set the interface parameters as follows:

Baud rate: 9600

Parity: None



XON/XOFF menu

5.5 Password

A password can be defined in order to provide certain functions of the **XION 500** with password protection.

Starting in the main menu, press the **Options** and **Password** *selection keys*.

A display window opens, showing the functions that can be provided with password protection.

Use the *cursor keys* **▲** **▼** to select the required function. Press the *enter key* **↵** to confirm. A mark appears in the control field. Pressing the *enter key* **↵** again removes the mark (control field is blank). When the menu options that are to be password-protected have been marked, press the **Password** *selection key*.

A window opens, in which a password can be entered (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9). Press the *enter key* **↵** to activate password protection.

In the *menu option* **Inactive** **Active**, **Active** will now be displayed in larger type. Exit from this menu by pressing the *menu key* **▲**.

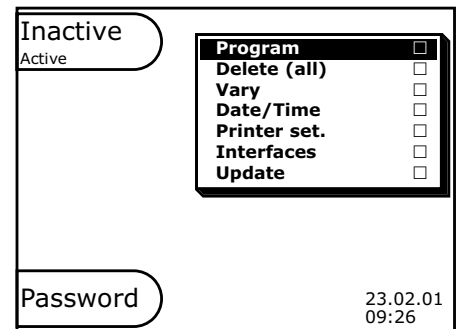
NB:

After a password has been defined, the password-protected functions can only be used when the password has been entered. Similarly, the password also has to be entered before the **Password** menu option can be used.

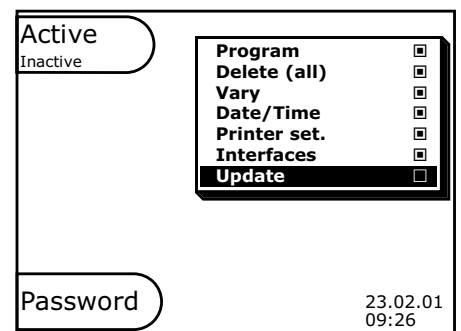
To change the selected password-protected functions, press the **Active** **Inactive** *selection key*.

This toggles the setting so that **Inactive** is shown in larger type.

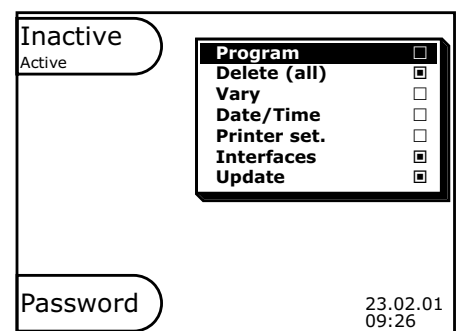
The functions can be released again by using the *cursor keys* **▲** **▼** to select them and pressing the *enter key* **↵** to confirm (the control field is blank). Then activate them by pressing the **Password** *selection key* and entering the password (see chapter 1.6.1, page 8 and chapter 1.6.2, page 9). From then on **Active** will again be shown automatically in larger type. Exit from this menu by pressing the *menu key* **▲**.



Functions that can be protected with a password



Functions with activated password protection



Changing the password-protected functions

5.6 Display contrast

The setting of the **XION 500** display can be changed with this function.

Starting in the main menu, press the **Options** and **Contrast** selection keys.

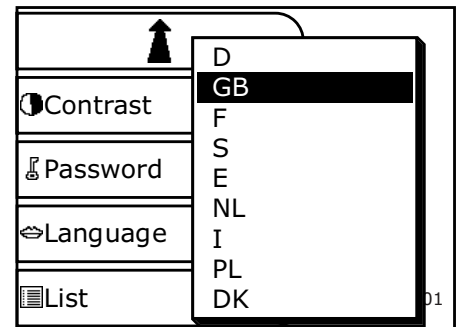
Press the **Lighter** or **Darker** selection key repeatedly until the contrast between text and background is satisfactory. Press the **menu key** to exit from this menu option.



Contrast menu

5.7 Language

This function can be used to set the language of the **XION 500**. A total of 9 languages are available. Starting in the main menu, press the **Options** and **Language** selection keys. Use the **cursor keys** to select the required language and confirm by pressing the **enter key**. Press the **menu key** to exit from the menu option.



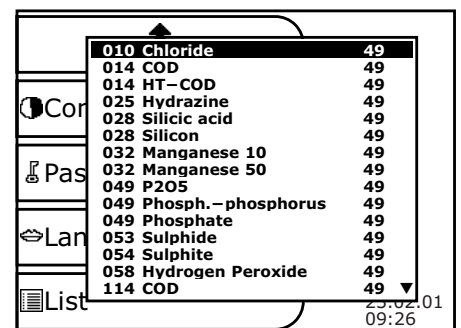
Language menu

5.8 List function

This function can be used to print the test data of all user tests and all Dr. Lange Tests from a selection list.

Starting in the main menu, press the **Options** and **List** selection keys.

Use the **cursor keys** to select the test to be printed from the selection list and press the **enter key** to confirm. Press the **menu key** to exit from the menu option.



Selection list



6.1 Error messages and display message

Error message	Cause	Response
*****	Result cannot be represented; take note of other error messages	
Absorbance > 3.5!	The measured absorbance exceeds 3.5	Dilute the sample and repeat the measurement
After blank value corr.	A blank value correction was carried out with LCW919	
Barcode label was not read!	The barcode label could not be read	Select the test manually from the selection list
Blank value corr. not possible!	No blank value correction is possible for the selected test	
Clean cuvette!	The cuvette is soiled or there are undissolved particles in the cuvette	Clean the cuvette; allow the particles to settle
Concentration too high!	Calculated concentration is higher than 999999	Dilute the sample and repeat the measurement
Copying data.	Data are being copied to the diskette	
Curve is not steady.	The standard concentrations were not entered in ascending order or standard concentrations were entered twice	Check all entries
Data present on diskette. Overwrite?	Saved data are already present on the diskette	Insert new diskette or overwrite the data
Delete data?	The menu option Delete was selected in order to delete marked or all measurement results	Respond with Yes or No
Delete test?	The menu option Delete was selected to delete user tests	Respond with Yes or No
Insert sample cuvette!	Zero cuvette was inserted instead of sample cuvette	Remove zero cuvette and insert sample cuvette
Insufficient space available on the diskette!	Diskette already holds data, or the volume of data exceeds the storage capacity of the diskette	Insert empty diskette
Invalid password	A blank character was entered instead of a password	Enter a character combination
Loading data!	Test data are being transferred from the data handset to the XION 500	
Loading test data.	Test data are being loaded into the XION 500	

6.1 Error messages and display message

Error message	Cause	Response
Lower wavelength must be lower than upper wavelength!	Lower wavelength is greater than upper wavelength	Enter another wavelength
Memory error	The instrument terminated the calibration	Contact your local Dr. Lange agency
Move test back to Dr. Lange?	A moved Dr. Lange Test was selected for deleting under the menu option User	Respond with Yes or No
Negative result!	The calculated result is negative	Check the concentration of the sample
No barcode!	The cuvette has no barcode	Insert cuvette with barcode
No evaluation!	Error in the Dr. Lange Test database	Contact your local Dr. Lange agency
No paper	Printer has no paper	Load paper
Over calibration range!	During a polygonal interpolation, the measured absorbance exceeds the calibration range of the test	Dilute the sample and repeat the measurement
Over measuring range!	The measured absorbance is above the calibration range of the test	Dilute the sample and repeat the measurement
Please check lamp	The lamp output is too low	Check the lamp and replace it if necessary
Please contact Call Centre!	Dr. Lange has changed a test and the control number of the test in the XION does not agree with that of the working procedure, or the EPROM version of the Dr. Lange Cuvette Test in the XION does not agree with that of the inserted barcode cuvette	Dial the Call Centre and carry out an update
Please insert data handset!	Displayed during data transfer by telephone, or request after the decision to call a test	Comply with the request
Please insert diskette.	There is no diskette in the drive	Insert diskette
Please insert program diskette	The diskette in the drive is not a program diskette	Insert program diskette
Please insert test data diskette	The diskette in the drive is not a test data diskette	Insert test data diskette
Please remove cuvette!	A cuvette is in the cuvette compartment	Remove the cuvette

6.1 Error messages and display message


Error message	Cause	Response
Renew the copy?	A test that is to be copied is already present under the menu option User	Respond with Yes or No
Sending data.	Test data are being transferred to a PC with DATAtrans software	
Terminate programming?	The menu key  was pressed during or after programming	Respond with Yes or No
Terminate vary?	The menu key  was pressed during or after vary	Respond with Yes or No
Test already exists!	A Dr. Lange Test is already present as a copy under the menu option User and was also moved	
Test data exist! Call anyway?	An existing test has been requested again from the Dr. Lange Call Centre	Respond with Yes or No
Test needs zero solution. Insert zero solution cuvette!	A sample cuvette has been inserted instead of a zero solution cuvette	Remove sample cuvette and insert zero solution cuvette
Test no. already assigned!	An already assigned number has been entered during programming	Select another test number
Test not found!	No moved, programmed or copied tests are present in the selection list under the User menu option The selection list under the menu options Edit and Permanent contains no tests whose permanent setting can be reversed	
Test not ok!	Error in the test database	Contact your local Dr. Lange agency
The entries are incomplete.	One or more programming entries are missing	Check that all entries are present
Too many dilutions!	No space left in user dilutions memory	Delete a redundant dilution under menu options Edit , Dilution and Delete
Too many samples!	No space left in user sample names memory	Delete a redundant sample name under menu options Edit , Sample and Delete
Too many tests!	Too many user tests have been programmed	Delete a redundant test under menu options Edit , and Delete
Too many users!	No space left in user name memory	Delete a redundant user name under menu options Edit , User and Delete

6.1 Error messages and display message

Error message	Cause	Response
Under calibration range!	During a polygonal interpolation, the measured absorbance is below the calibration range of the test	Change the calibration range
Under measuring range!	The measured absorbance is below the calibration range of the test	If possible, select a test with a lower measurement range or use a cuvette with a longer path length
Vers 2 Meas 1	The sample cuvette and the blank value cuvette have different EPROM versions	Insert cuvettes from the same cuvette test package
Wrong password	Unknown password was entered	Enter the correct password



NB:

All error messages must be acknowledged by pressing the **menu key** .

6.2 Inspection and service

Malfunctions that are not attributable to defects or wear can only be eliminated by servicing.

Please contact one of our service centres and describe the malfunctioning of your **XION 500**. Our service department will provide prompt assistance.

We advise users to sign a contract with our Service department immediately after purchase for an annual inspection of their **XION 500** (either in-house or at a Dr. Lange inspection centre). As well as ensuring the operational readiness of the instrument, this has the advantage that the guarantee is extended to 3 or 5 years. The only maintenance that the user is expected to perform is changing the lamp.

6.2.1 Cleaning the instrument

The **XION 500** can be cleaned with a dry cloth or a mild household cleanser. Under no circumstances should solvents such as petroleum spirit, acetone or similar be used.

The optical parts should only be cleaned by the Dr. Lange service department.

6.3 Technical data

Type	Scanning grating spectrophotometer with reference beam path, open measurement in round and rectangular cuvette compartments, integrated processor for data management and data processing via diskette drive, measured value output to backlit graphic display
Operating modes	Absorbance spectra: Absorbance: -3 A to +3 A, transmittance: 0 to 100% Concentration calculation with the help of factor, linear and nonlinear calibration curves, time-controlled measurements, Dr. Lange Cuvette Test evaluation
Wavelength range	340 to 900 nm with fully automatic wavelength calibration and storage of zero value and base line.
Wavelength resolution	≥ 1 nm
Light sources	Halogen lamp: 340 – 900 nm
Monochromator	Concave grating with 1200 lines/mm
Operating system	C 167 computer (16-bit processor) 2 MB program memory, 2 MB data memory
Cuvette compartments	Rectangular cuvette compartment for 10 to 50 mm rectangular cuvettes and flow-through cuvettes; closable round cuvette compartment for automatic evaluation of Dr. Lange round cuvettes via barcode reader, 10-point measurement of the cuvettes, average value calculation after elimination of outliers with a specific program
Wavelength accuracy	+/- 2 nm (holmium oxide filter at 361 nm)
Wavelength reproducibility	< 0,3 nm
Scanning rate	5 nm/sec.
Photometric accuracy	0,5 % at A = 1,0 (filter VAA 360, set 0277, PTB-certified on 29.11.00)
Photometric reproducibility	+/- 0,001 A at A = 1,0
Stability of the zero point	+/- 0,0034 A / 12 hours
Stray light	< 0,16 % (at 340 nm, with Schott glass GG 435/3) < 0,1 % (at 500 nm, with Schott glass OG 570/3)
Spectral band width	8 nm

Interfaces	Flowcell, autosampler, scanner ProID, PC/LD500, parallel printer
Mains connection	100 to 240 volt, 50 to 60 Hz
Power consumption	90 VA
Dimensions	Width 41,5 cm, height 16,5 cm / depth 37 cm
Weight	9 kg
Guarantee	2 years (up to 5 years with service contract - please contact Dr. Lange Agency for details)
Environmental requirements	Ambient temperature +15°C to + 35°C, Storage temperature -20°C to +60°C Maximum relative humidity 85% non-condensing

6.4 Glossary

Term	Meaning
λ -scan	Starting in the main menu, press the Analysis, λ-scan selection keys to plot absorbance and transmittance spectra (see chapter 2.6).
-----	Appears in display or selection list when no further information about measurement result is required (see chapter 2.3).
ABS/TRANS	Starting in the main menu, press the Analysis, Abs/Trans selection keys to carry out absorbance and transmittance measurements (see chapter 2.5).
Absorbance	Parameter that increases in proportion to the concentration of a sample in accordance with the Beer-Lambert law.
Absorbance spectrum	Plot of absorbance against wavelength. Usually an analysis procedure is calibrated at the absorbance maximum (see chapter 3.2.2).
Addista	Predefined sample name when addista standard solutions are used.
ANALYSIS	Option in main menu (see chapter 2).
Barcode label	Label on the Dr. Lange cuvettes, which is read by the barcode reader.
Barcode reader	Device that automatically reads round cuvettes with barcode label (Dr. Lange Cuvette Tests).
Beer-Lambert law	Law that describes the proportional relationship between absorbance and concentration (see chapter 2.5.1).
Blank value cuvette	Cuvette containing reagents, distilled water, etc..
Calibration	Automatic self-test by the XION 500 with wavelength adjustment.
Calibration curve	Plot of absorbance (or transmittance) against concentration.
Centronics interface	Standard protocol for parallel data transmission.
CONTRAST	Starting in the main menu, press the Options, Contrast selection keys to set the contrast between background and text (see chapter 5.6).
Control bar	Bar showing the relationship of the measured value to the measurement range.
COPY	Starting in the main menu, press the Edit, Copy selection keys to copy Dr. Lange Tests to User (see chapter 3.5).
Cuvette	Measurement vessel that is inserted in the photometer.
Cuvette compartment	Compartment into which the cuvette is inserted.
DATA	Starting in the main menu, press the Edit and Data selection keys , or after each measurement press the Data selection key , in order to edit, delete and print measurement results (see chapter 3.1).

Term	Meaning
Data exchange	Data exchange through the Dr. LangeNet (see <i>chapter 4.1</i>) or by diskette (see <i>chapter 4.2</i>).
Data handset	Instrument for transferring data by telephone.
Data request	Display message indicating that the data for updating or installing Dr. Lange Cuvette Tests, Pipette Tests, Trace Analyses and "beta" tests must be requested (see <i>chapter 4.1.1</i>).
Database	The XION 500 has 4 results databases, to which the measurement data are automatically saved. The saved data can be recalled for viewing or editing (see <i>chapter 1.9 and chapter 3.1</i>).
DILUTION	Starting in the main menu, press the Edit and Dilution selection keys to extend the selection list by entering user-defined dilution factors (see <i>chapter 2.3.3</i>).
Dilution factor	Value with which the measurement result is multiplied. A dilution factor of 10 is necessary if 1 part of the sample is diluted with 9 parts of distilled water.
Diskette	3.5" disk on which data can be stored, e.g. measurement data or updates. The storage capacity is 1.44 MB.
DISKETTE	Starting in the main menu, press the Edit, Data, Tests or Abs/Trans, Output and Diskette selection keys to save measurement data (see <i>chapter 3.1.1.4</i>) or, starting in the main menu, press the Update and Diskette selection keys to update the program and/or test data (see <i>chapter 4.2</i>).
Diskette drive	Diskette drive, opening at the front of the XION 500 , which can accommodate a 3.5" diskette.
Display	Backlit graphic display on which results and menus are shown.
Display zone	Display of the actual values, data, graphics, submenus and input zones of the individual menu items.
DR. LANGE	Starting in the main menu, press the Analysis and Dr. Lange selection keys to measure Dr. Lange Tests (Pipette Tests, Trace Analyses and "beta" tests) (see <i>chapter 2.1</i>).
Dr. Lange Call Centre	Central data transmission station for updating or installing Dr. Lange Cuvette Tests, Pipette Tests, Trace Analyses and "beta" tests (see <i>chapter 4</i>).
Dr. Lange cuvette tests	Dr. Lange round cuvettes with a barcode label, containing precise quantities of reagents.
Dr. Lange ProID system	System for mix-up-free identification of sample and cuvette. It consists of a Dr. Lange hand-held barcode scanner, a holder and differently coloured ProID clips.

Term	Meaning
EDIT	Option in main menu (<i>see chapter 3</i>).
Error messages	Messages displayed automatically by the XION 500 to indicate operating errors or instrument malfunctions (<i>see chapter 6.1</i>).
Evaluation form	Also evaluation options. Some cuvette tests allow a choice between different evaluation forms, e.g. NO ₃ or NO ₃ -N (<i>see chapter 2.2.2</i>).
Factor	Mathematical element of an evaluation formula. Usually the reciprocal value of the gradient of the calibration curve.
Flow-through cuvettes	Used to enable large numbers of samples to be measured in flow-through mode without changing cuvettes.
GLP	Good laboratory practice. International standard that defines the output of measurement results (<i>see chapter 5.3</i>).
Guarantee	Dr. Lange guarantees a newly purchased XION 500 for 2 years. This can be extended to up to 5 years with a service contract (<i>see chapter 6.2</i>).
INFO	Used to call up and assign information about the measurement result (<i>see chapter 2.4</i>).
Input zone	The input zone is represented on the display screen by a window with an input prompt and input markings (<i>see chapter 1.6.1 and chapter 1.6.2</i>).
INTERFACES	Starting in the main menu, press the Options and Interfaces selection keys to configure the serial interfaces.
Interval	Separation of two successive measurement points on plots of absorbance and transmittance spectra.
Lamp compartment	Contains the lamp (<i>see chapter 1.7</i>).
Lamp cover	Cover on the top of the housing of the XION 500 for the purpose of ventilating the lamp compartment.
LangeNET	Data exchange with data handset and Dr. Lange Call Centre.
LANGUAGE	Starting in the main menu, press the Options and Language selection keys to set the XION 500 to one of the 9 available languages (<i>see chapter 5.7</i>).
LD 500	Dr. Lange laboratory printer with continuous thermal paper.
Lower limit	Detail of programming and variation of tests. Defines the lower measurement range limit (<i>see chapter 3.2.3.1</i>).
Lower wavelength	Lowest wavelength of an absorbance/transmittance spectrum (<i>see chapter 2.6</i>).

Term	Meaning
Main menu	Start menu with menu options: Analysis, Edit, Update, Options
Measurement key (green)	A red LED indicates when the key should be pressed to measure a sample cuvette.
Measurement wavelength	Wavelength at which the procedure was calibrated, usually the absorbance maximum.
Measuring range	Concentration range with exactly defined upper and lower limits. If a sample concentration exceeds the upper limit the sample can be diluted with distilled water. If a sample concentration is below the lower limit, a longer path length or a concentration method must be used.
Menu options	Main menu and submenu items. The individual menu options can be selected by pressing the appropriate selection key .
MOVE	Starting in the main menu, press the Edit and Move selection keys to move Dr. Lange Tests (Pipette Tests, Trace Analyses and "beta" tests) to User (see chapter 3.6).
No.	Control number which depends on the definition of the variables. Calculated automatically by the XION 500 .
None	Option in the selection list of units – indicates no unit is required (see chapter 2.3.4).
OPTIONS	Main menu item (see chapter 5).
Parallel interface	Interface that enables a commercial DOS-compatible printer with a parallel (Centronics) input to be connected.
PASSWORD	Starting in the main menu, press the Options and Password selection keys to provide certain XION 500 functions with password protection (see chapter 5.5).
Path length	Length of the path taken by the light in a cuvette. The longer the path length of a cuvette, the higher the measured absorbance.
PROGRAM	Starting in the main menu, press the Edit and Program selection keys to program user tests (see chapter 3.2).
ProID clips	Eight differently coloured clips, which represent up to eight different sample identifiers, e.g. different sampling locations, and are attached to the tops of the cuvettes.
Rectangular cuvettes	High-precision glass, quartz or plastic cuvette as evaluation vessel for inserting in the cuvette compartment. 10 mm wide with specific length (up to 50 mm).
Result window	Window in which the determined result, etc. is shown.

Term	Meaning
Results database - ABS/TRANS	Measurement results of absorbance and transmittance measurements. Up to 500 records can be accommodated.
Results database - TESTS	Measurement results of Dr. Lange Cuvette Tests, Pipette Tests, Trace Analyses, "beta" tests and user tests. Up to 2500 records can be accommodated.
Results database - t-scan	Measurement results of time-dependent absorbance and transmittance measurements. Up to 3 scans can be accommodated.
Results database - λ-scan	Measurement results of absorbance measurements. Up to 3 scans can be accommodated.
Round cuvettes	High-precision glass cuvette of the Dr. Lange Cuvette Tests. Serves as reaction and evaluation vessel.
SAMPLE	Starting in the main menu, press the Edit and Sample selection keys to enter sample names as part of the process of creating a selection list (see chapter 2.3.1).
Sample cuvette	Cuvette in which the sample has already reacted with the test reagents, causing coloration of the contents.
Sample-specific blank value	Variable blank value with which the XION 500 is set to zero before each sample is measured.
Selection list	Display of all available tests, data, names, etc.
Serial interface	Interface for connecting the Dr. Lange LD 500 printer or a PC to which the measured values can be transferred with the DATAtans software (see chapter 5.4).
Service contract	Contract with the Dr. Lange Service department under which the XION 500 is regularly inspected, cleaned and calibrated. Causes the guarantee to be extended to 3 or 5 years (see chapter 6.2).
Standard cuvette	Solution of known concentration in a cuvette.
Submenu	Menu that opens when a main menu item is selected by pressing a selection key .
Test number	Specific number of a procedure (1 – 3 characters), which appears in the selection lists (see chapter 1.6.4 and chapter 3.2).
Time-dependent absorbance or transmittance measurement	Plot of absorbance or transmittance measurements at a given wavelength against time (see chapter 2.7).
Transmittance	Transmittance is the percentage of light of a certain wavelength that passes through a solution (see chapter 2.5.1).
Transmittance spectrum	Plot of transmittance against wavelength (see chapter 3.2.2).

Term	Meaning
t–scan	Starting in the main menu, press the Analysis and t–scan selection keys to carry out a time-dependent absorbance or transmittance measurement (see <i>chapter 2.7</i>).
Unit	Detail of the programming and variation of formulas for tests. Defines the unit of the interim result.
UNITS	Starting in the main menu, press the Edit and Units selection keys to enter the units as part of the process of creating a selection list (see <i>chapter 2.3.4</i>).
UPDATE	In the main menu, press the Update selection key to load new software versions, upgraded software packages, test data from a diskette or data for individual tests through the Dr. LangeNET (see <i>chapter 4.1 and 4.2</i>).
Upper limit	Detail of programming and variation of tests. Defines the upper measuring range limit (see <i>chapter 3.2.3.1 and chapter 3.3</i>).
Upper wavelength	Highest wavelength of an absorbance or transmittance spectrum (see <i>chapter 2.6</i>).
USER	Starting in the main menu, press the Analysis and User selection keys to display the list of user-programmed tests or user-modified Dr. Lange Tests (moved Pipette Tests, Trace Analyses and "beta" tests and copied Dr. Lange Cuvette Tests and Dr. Lange Tests) in order to carry out measurements (see <i>chapter 2.1</i>).
USER	Starting in the main menu, press the Edit and User selection keys to enter the user name as part of the process of creating a selection list (see <i>chapter 2.3.2</i>).
User test	Test developed by the user or taken from the literature, which can be evaluated by the XION 500 . The measurement wavelengths, factors, etc. must be determined by the user (see <i>chapter 3.2.2</i>).
VARY	Starting in the main menu, press the Edit and Vary selection keys to carry out specific changes to programmed tests (see <i>chapter 3.3</i>).
Working procedure	Procedure and evaluation of a test.
Zero solution cuvette	Cuvette with which the XION 500 is set to zero. Contains blank solution, reagents, distilled water, solvent, etc.
Zero key (blue)	A red LED indicates when the key should be pressed to measure a zero cuvette.