LAURA® Smart

BLUE POINT OF QUALITY

USER MANUAL

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1. Introduction

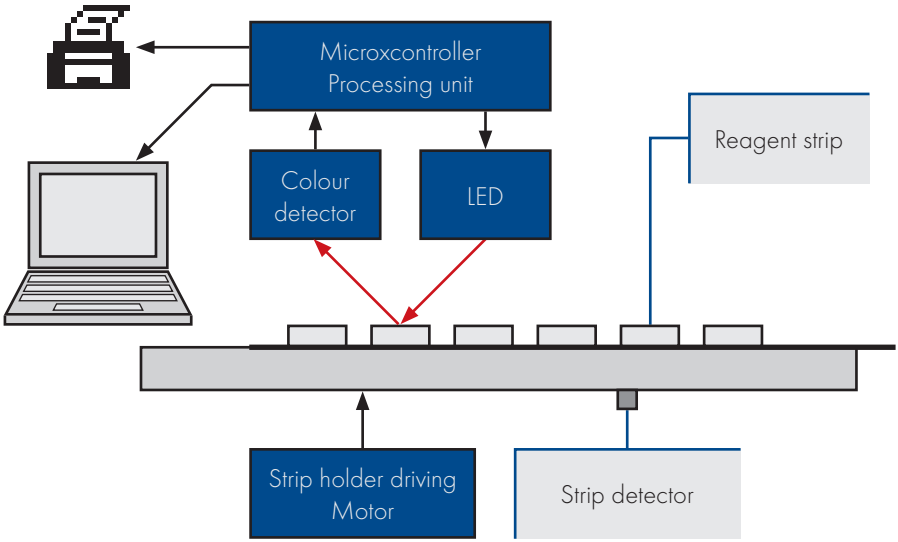
This manual contains the operation and maintenance instructions for the LAURA® Smart photometer.

1.1 Intended use

The LAURA® Smart reader is a reflection photometer for semi-quantitative urine analysis using test strips PHAN® LAURA. The LAURA® Smart reader is designed for use in medical laboratories and doctors offices.

1.2 Measurement principle

The following drawing shows the theoretical working function of the LAURA® Smart reader.
The strip is inserted into the urine sample then it has to be placed onto the strip holder tray. The built-in strip detector recognizes the strip and starts the timing of incubation. The instrument moves the strip under the measuring head and measures the reflectance. White LED makes the illumination and a colour detector detects the reflected light.
The processing unit converts the reflected light intensity to the analytical value.
The result is presented on the display and printed by the built-in thermal printer.
The instrument moves out the strip holder tray and the user dispose the strip.



1.3 User Interfaces

1.3.1 Overview of instrument

Figure 1

1.3.2 Connectors

Figure 2

1. Introduction

1.4 Icons and abbreviation

ID - Patient identification code (a figure or a text, max. 15 characters)

Seq.No - Sequence number of the measurement

Sample - Urine specimen to be measured

REM - Remission value

BCR - Barcode reader

Host - Computer (Laboratory Information System)

Smart Timing® - Incubation timing method

2. Installation

2.1 Unpacking

After unpacking the instrument, please check carefully that your package contains all the parts listed below, and all of them are in a good condition.

Figure 3

- LAURA® Smart instrument
- DC Adapter with 230 V (AC) cable
- Serial interface cable
- 1 roll of the thermal printer paper
- Tube with control grey strips
- User manual

2.2 Set up the instrument

Please follow the steps below:

- Select the working place
- Choose a place for the reader, which is flat and clear

Do not place the device close to the window, centrifuge or heating surface. Protect it from the direct sun light, vibration and extreme temperature.

2. Installation

- Connect the power and interfaces

Check if the master switch on the rear side is turned off!

Refer to Fig 2.

- o Insert the serial cable and the keyboard or BCR to the reader for the BCR use the PS2 input.
- o Insert the adapter output plug to reader.
- o Insert the adapter main cable into the net.

- Inserting the printer paper
  - o Open the printer cover by pressing the release button!
  - o Place the paper roll into its holder and pull out approx. 10 cm of it in front direction.
  - o Check if the paper lies between the 2 metal ears of the printer.
  - o Close the cover while holding the paper tight with one hand.
  - o Push the cover in the middle or both sides until it clicks into its place.

Never push the cover asymmetrically!

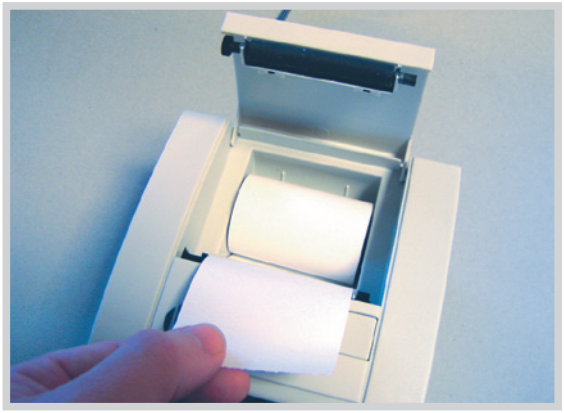


Figure 4

Now the instrument is ready to turn on; switch on the master switch!

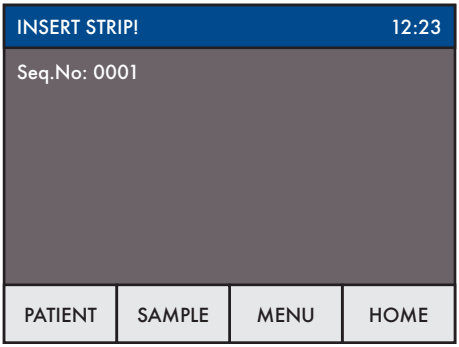
After power on the display lights up and the reader carries out a Self Test.
During this test the optic and the built in calibration PAD is tested.
Completing the test successful, the reader prints out the OK message and goes into the Standby mode.
The reader is now ready for measurement.

3. Routine operation overview

3.1 Ready to measure status

This is the status where the instrument after performing the Self Test waits for user command. The instrument has a touch sensitive display. The user can control the instrument by pressing the displayed buttons.

In the ***Ready to Measure*** status the following possibilities are available for the user:



- Start a new measurement process, by placing a strip on the strip holder
- Enter patient information:
  - o Seq.No
  - o ID
- Enter sample information:
  - o Select a sample colour from the predefined list
  - o Select a sample clarity from the predefined list
  - o Insert comment
- Enter the menu, by pressing the MENU icon.
- Send the instrument to *Stand by* mode by pressing of button HOME or automatically after the defined time.

3. Routine operation overview

3.2 Measurement

The instrument LAURA® Smart begins the measurement automatically when a strip is placed on the strip holder tray.

To carry out a measurement do the following steps:

- Enter a new SeqNo or ID if necessary
- If you want to define the appearance of sample, select a colour or clarity from the offer
- Deep the reagent strip into the urine sample
- Remove the excess urine from the strip (Push the edge of the strip to an absorbent paper, follow the Instruction of the strips PHAN® LAURA)
- Insert the strip into the strip holder tray

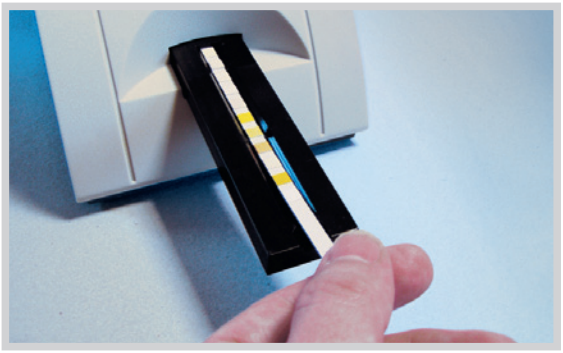
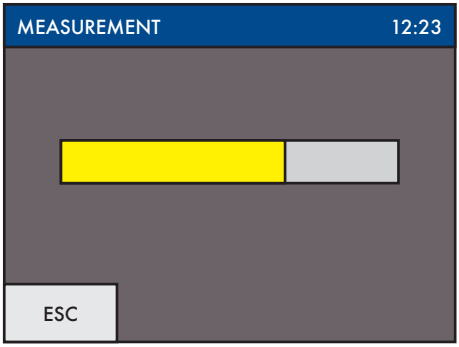


Figure 5

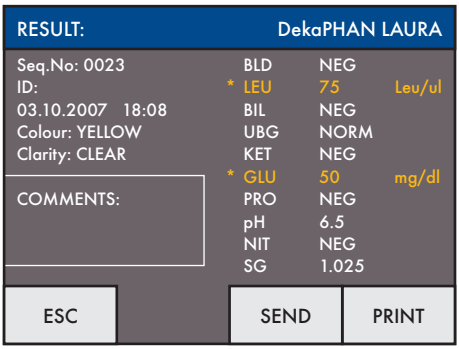
LAURA® Smart has a build in strip detector at the end of the insert area, under the tray. If the strip is placed correctly this detector will recognize it and the incubation time countdown starts.

A progress bar displays the status:



- After 55 sec the reader moves the tray in, measures the strip, displays and prints out the result.

3. Routine operation overview



The result is displayed on the LCD. The positive parameters are marked with* and are displayed in yellow colour. Pressing the *PRINT* or *SEND* button the result can be send or print any time again. It is possible to add comment to the result by touching the screen inside the comment rectangle.

If a comment to this measurement already exists, the new comment will overwrite the old one!

The comment and all the other result parts are stored in the memory.
Placing a new strip into the holder will start the next measurement procedure.
After pushing the ESC button the, program jumps back to the *Ready to Measure* status.

- After the strip was measured the reader moves the strip holder out, and the strip has to be removed and disposed manually by the user.

The instrument recognizes automatically the type of the test strip, which is possible to measured:
DekaPHAN® LAURA
HeptaPHAN® LAURA
PentaPHAN® LAURA
DiaPHAN® LAURA
MicroalbuPHAN® LAURA

The instrument increases the Seq.No after every measurement.

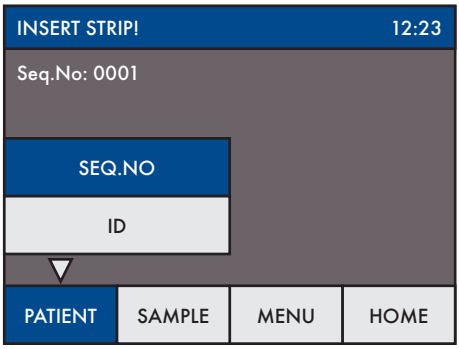
3. Routine operation overview

3.3 Patient identification

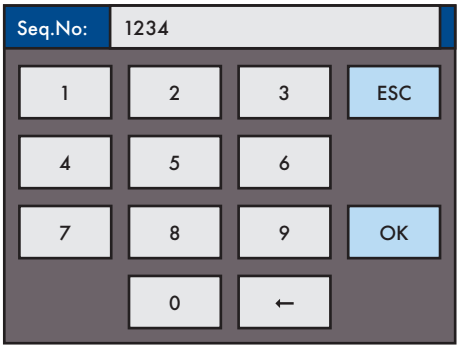
LAURA® Smart supports 2 different sample identifications:

- Seq.No - working with Sequence Number
- Patient ID - working with Identification number

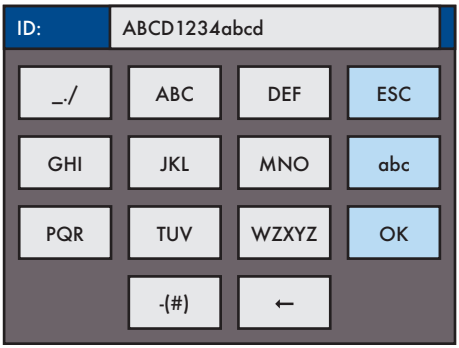
In order to enter a new Seq No the user has to touch the *PATIENT* button then select the *SEQ.NO* button.



The following numeric PAD will appear and the user can type a number between 1-9999.



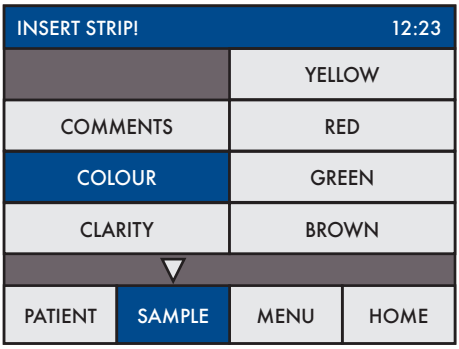
Selecting the ID button a similar edit field appears, where the user can enter a max 15 characters long ID string. This ID could also be entered with help of external keyboard or the barcode reader in the *Ready to Measure* status as well.



3.4 Colour and clarity

Before placing the strip to the way user can set the colour and clarity informations of the sample. The colours and clarities are preddefined and can be modified by the user in the customisation menu (see 4.6). There are four different colours and four different clarities available.

The colour and clarity information will be listed after pressing the following buttons *SAMPLE* and *COLOUR* or *CLARITY*:



Pressing the desired button will select the corresponding information.
It will appear on the display and will be added to the next measured sample. For deleting the previously selected information, the user can go into the selection menu again but instead of selecting a value from the list the COLOUR or CLARITY button has to be pressed again. In this case the program clears the previously set value.

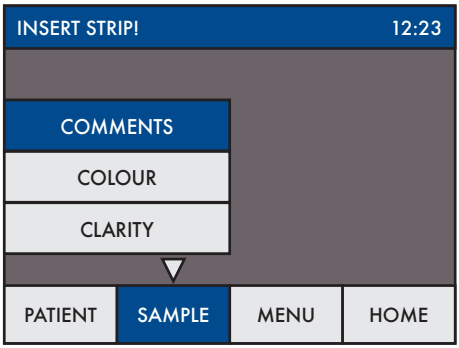
3. Routine operation overview

3.5 Comments

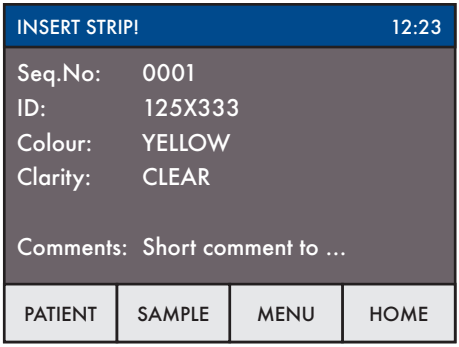
There is possibility to add comments (39 characters long) to the measurements at the three different points:

- Before the measurement
- After the measurement when the result is displayed on the LCD
- When the result is selected from the memory

Giving the comments before measurement could be achieved with the following buttons:



This picture shows an example screen when all measurement related parameters are set:



3.6 Cleaning

To keep the instrument clean and in the order to avoid cross-contamination, the strip holder tray must be cleaned. The strip holder has to be clean periodically every day after the finishing the work. The excess of urine has to be removed from the strip before inserting it into the instrument.
For cleaning wipe off the tray use a soft textile or paper.
For cleaning with disinfections, use an alcohol disinfectant (max 85 %) such as ethanol, isopropanol, if necessary!

Never use acetone, petrol or other aggressive solvents for the cleaning!

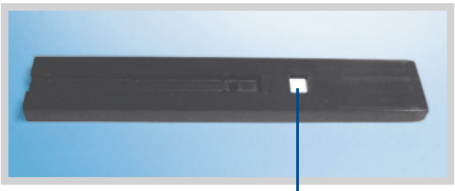
If necessary, the tray could be removed from the reader by pulling it out manually. So it could be cleaned or washed easier.

In this case pay attention not to damage or scratch or rub the white REF plastic PAD!

This PAD could also be washed and wiped with soft materials.

The strip holder is possible to remove only it the instrument is switched off.

The instrument case and the touch screen could also be wiped off with the above mentioned solvents.



The REF pad

WASTE DISPOSAL:
Used strip should be treated as potentially infectious and should be disposed in accordance with local and national regulations relating to safe handling of such materials. Waste is to be recycled or to be put to municipal waste.

4. Menu structure

LAURA® Smart has a clear, well organized menu structure. The user is guided trough the menu by the LCD. The menu functions are represented by buttons or list controls.

Pressing the touch screen can activate the desired function.

The pressed buttons are highlighted by blue colour.

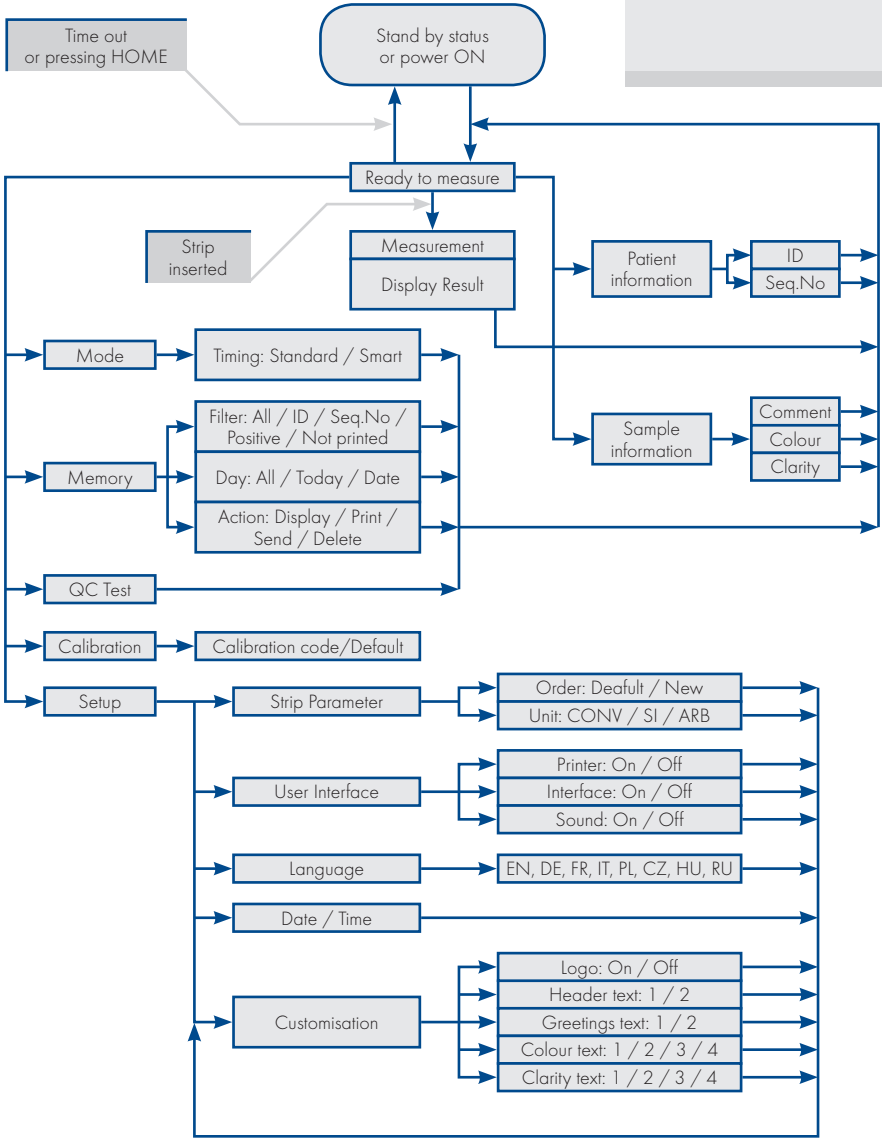
If no button is pressed TBD minute long the program jumps back to *Stand by* status.

In this status the reader pulls in the strip holder tray, the buttons disappear from the screen and the actual time is displayed.

To leave this status and enter back to *Ready to measure* status the screen has to be touched anywhere.

4. Menu structure

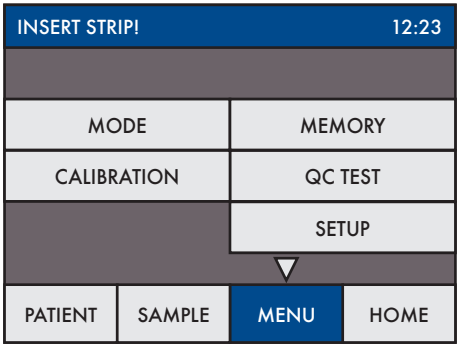
4.1 Menu overview



4. Menu structure

4.2 Main menu

After pressing the MENU in ***Ready to measure*** status the following main functions are available:



- Mode
  The instrument can work in the two timing modes:
  - Standard mode
  - Smart Timing®

  In standard mode the strip is inserted to the holder tray and the incubation timing is started. After 60 sec the reader measures the colour of placed strip and reports the result.

  In case of the Smart Timing® the incubation runs outside of the reader, max 4 strips could be incubated at once.

- Calibration
  Allows to calibrate instruments for the current used batch of test strips MicroalbuPHAN® LAURA.

- Memory
  LAURA® Smart has a memory for the last 360 measurements.
  The stored measurement results with all of their related information (date, time, comment, colour..), can be selected from the memory, displayed, printed or send to the computer anytime.

- QC Test
  In this function the instrument measuring capability could be tested, by using the grey control strip. The instrument measures the grey control strip and compares the result with the predefined should values. The test result is displayed and also printed for QA purpose.

- Set up
  In this menu point the working parameters of the reader could be set.

4.2.1 Timing modes

LAURA® Smart has two different timing modes:
Standard mode and Smart Timing®

Standard mode
It is a linear workflow as is described in the routine measurement chapter.
Working in this mode only 1 strip/minute measuring speed could be achieved.

Smart Timing®
It is used to speed up the measurement with the LAURA® Smart.

In this working mode the throughput is increased due to incubating of the strips are outside of the reader. The user places the measured strips outside of the reader and when the incubation time elapses, the strip will be inserted into the reader only for the time of the measurement.
To support this process is offered an incubation plate with the four slots and the reader gives four corresponding software timers.

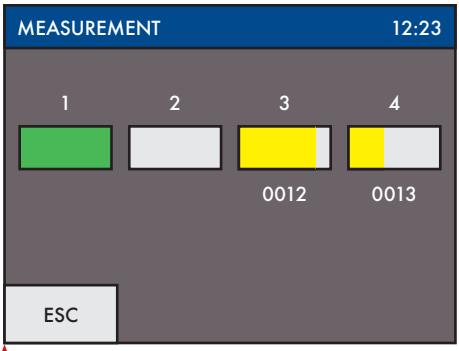
The general workflow for using of the Smart Timing® mode is follows:

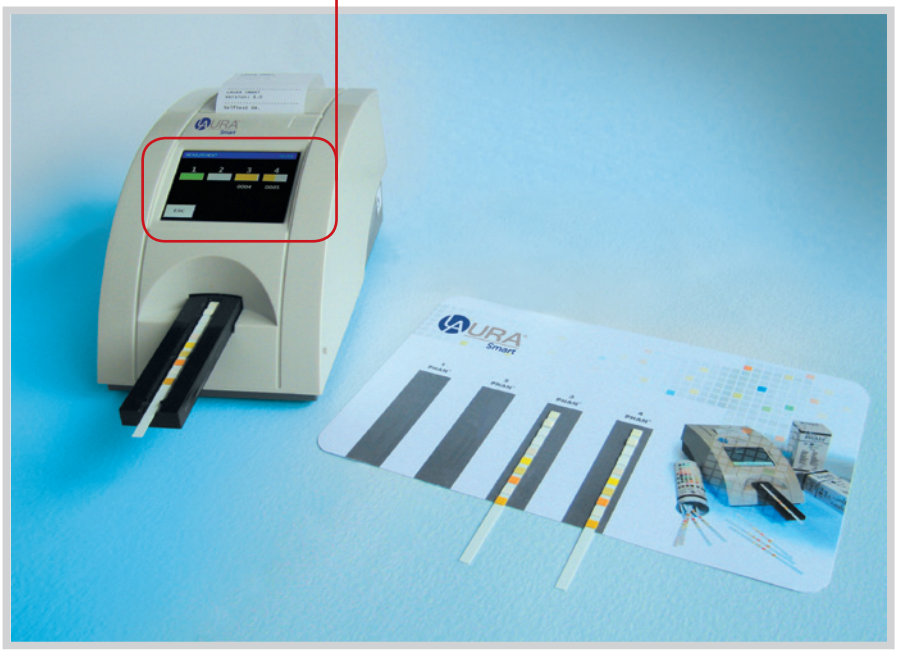
- Whenever a timer is available (green) insert a strip to the urine sample.
- Place the strip on the incubation plate, to the corresponding slot, and start the timer/the corresponding progress bar by pushing it. The green progress bar changes the colour to the yellow.
- Whenever a timer runs down, it beeps and the colour turns from yellow to red.
- Pick up the corresponding strip from the incubation plate and place it to the instruments strip holder tray.

The following pictures help to understand the procedure.

4. Menu structure

The position 1 is available for the new strip. The incubation has finished on the position 2 and the strip is inserted on the strip holder. The incubations run on the positions 3 and 4 with the strips/samples with Seq.num. 12 and 13.





Keep the incubation plate clean, you prevent the possibility of cross-contamination among the individual samples.

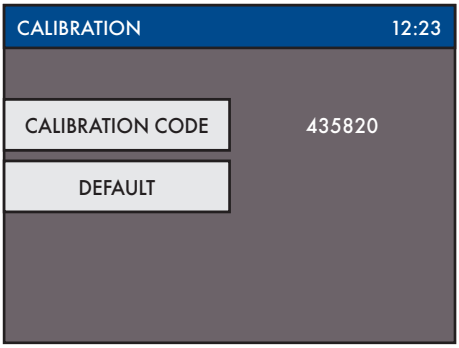
4.2.2 Calibration

Calibration mode allows to perform calibration on the currently used batches of test strips MicroalbuPHAN® LAURA. Calibration is performed for both diagnostic pads for the determination of microalbumin and for determination of creatinine in urine.

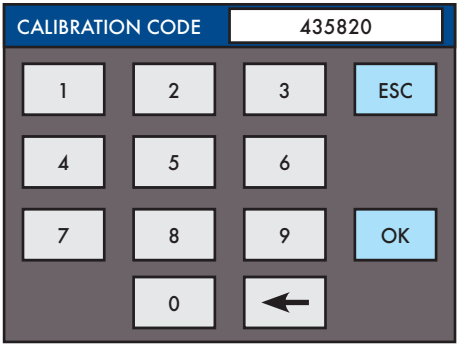
Six-digit calibration code is an integral part of the label and on the label is always under the batch number.

The first three digits are associated with a pad for determination of creatinine, the other 3 digit with pad for the determination of microalbumin in urine.

After pressing the CALIBRATION in MENU the following functions are available:



After pressing the CALIBRATION CODE the numeric keypad appears for entering of calibration code. The update setting becomes valid after pressing the OK button.



After pressing the DEFAULT is set value 435820 (original value).

Calibration is intended for strips MicroalbuPHAN® LAURA only!

4. Menu structure

4.2.3 Memory

The reader has a non-volatile memory, which automatically stores the last 360 measurements.

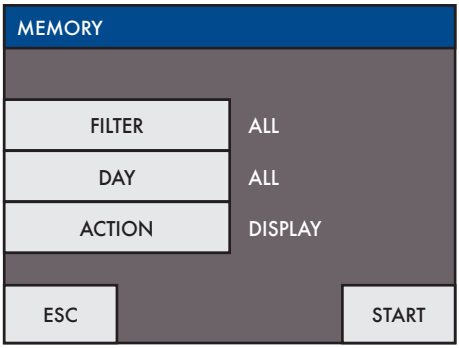
The oldest result will be overwritten by the new measurement without any warning.

When the actual measurement is ready the reader stores the result along with the following parameters:

- Result of the strip
- Type of the strip
- Seq.No
- ID
- Date and time
- Colour
- Clarity
- Comment

The user can reach the memory from the Menu by selecting the Memory button.

For administration the Memory the following display appears:



FILTER and *DAY* button serve to set the selection parameters, after then the *START* button activates the selected action.

4. Menu structure

The desired measurement can be selected in the following way:

- Select the FILTER criterion:
  - o All - all stored result
  - o ID - enter the desired ID
  - o Seq.No - enter the desired Seq.No
  - o Positive - where at least 1 value was positive
  - o Not printed - results that where not printed yet

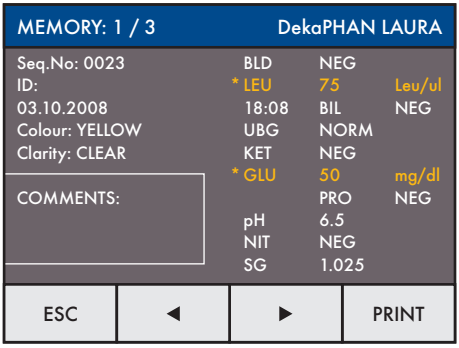
- Select the DAY of the measurement:
  - o All - regardless of date
  - o Today - searching only among the today measured result
  - o Specific date - select the desired day

  (The program offers only those days where there are results in memory.)

- Choose an ACTION, what should happen with the selected results:
  - o Display - the selected measurements will be displayed
  - o Print - the selected measurements will be printed
  - o Send - results will be sent to HOST, RS232 and USB
  - o Delete - the measurements correspond with the selection criterion are deleted

When all three above mentioned parameters (*Filter, Day and Action*) have been defined, the process can be activated by pressing the *START* button.

In case of ***DISPLAY*** was selected the found results are displayed in following form:



The latest measurement in the list will be displayed at first.
With help of the ◄► buttons the user can step forward or backward in the list.
The actually displayed result could be printed and the new comment could be attached.

4. Menu structure

4.2.4 QC Test

The purpose of this test measurement is to verify that the optical measuring capability of the instrument works properly. Perform this test once a week, or if you receive suspicious result in normal use. For testing the instrument the grey control strips are provided in the LAURA® Smart package.

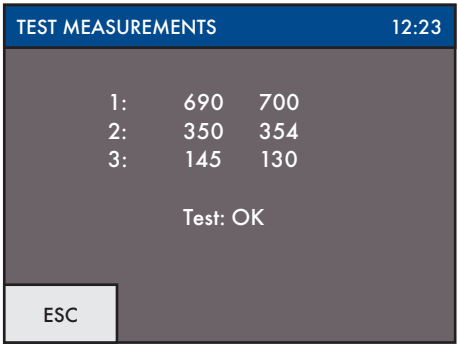
Clean carefully the strip holder before using of QC Test. You prevent the degradation of the grey control strip with the rest of urine.

Take out one from the tube and follow the steps below:

- Select the QC Test button
- Place a grey strip on the strip holder tray
- The reader starts the measurement
- Wait for the measurement is complete.

After measurement the reader compares the obtained remission values to the predefined ranges, stored in the instrument, in every greyscale and wavelength. Then displays and prints out the result. When the measured values are in harmony with the predefined values the result of QC *Test is OK*.

The picture of the display after QC Test is following:



Print out the result of measurement:

```
LAURA TEST MEASUREMENT
2009.10.01        11:39
************************
PAD:        %Rg   %Ro

  1         696   671
  2         361   347
  3         141   132

TEST: OK
------------------------
```

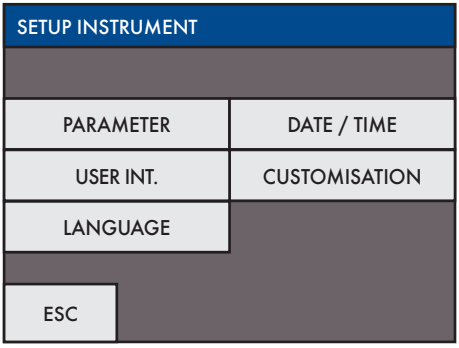
Keep the print out for QC reference.
If the test fails, Test Error will be reported and the wrong result is displayed in red. In this case repeat the test with another check strip. If it gives error again call the service.

Keep the grey strips always in its tube, do not touch the surfaces by hand, and handle them with care. The strips are intended for repeated using. Refer to the label of the grey strip tube!

4.2.5 Settings

Under this menu point the instrument working parameters could be set.

The available settings are displayed in the following format:



The several working parameters are organized in the following way:

- Parameter – strip and measurement related parameters could be set here, as:
  ORDER of parameter at printing
  UNIT of parameters

- User interface – turning ON/OFF the following user interfaces:
  PRINTER
  INTERFACE (HOST)
  SOUND

- Language – selecting the language from the 8 defined languages:
  EN – English
  DE – German
  FR – French
  IT – Italian
  CZ – Czech
  PL – Polish
  HU – Hungarian
  RU – Russian

- Date / Time – set the date and time and the format of date

- Customisation – customizing the header text and logo, defining the colour and clarity texts

4. Menu structure

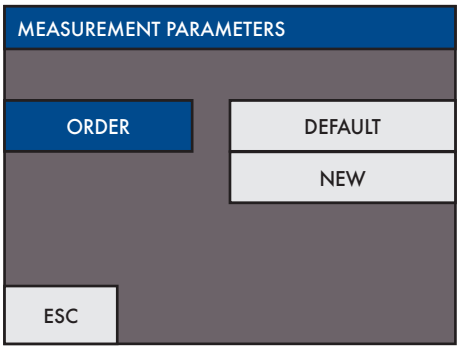
4.3 Parameter Settings

This menu point is divided into two submenus:

- Printing order
- Unit settings

4.3.1 Printing order

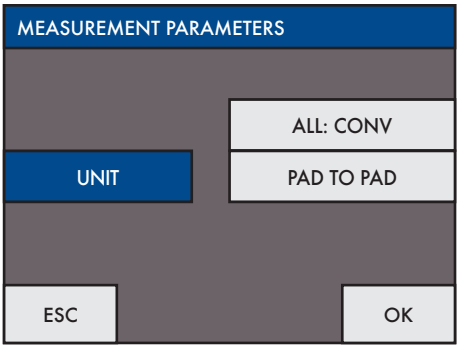
The parameter printing order can be set in the following menu point:



Pressing the *DEFAULT* button the printing order will correspond to the Parameter order of the strip DekaPHAN® LAURA.
The instrument allows changing this order as the user like. In this case the *NEW* menu point should be used. The program offers all the parameters and they should be touched after each other in the desired order.

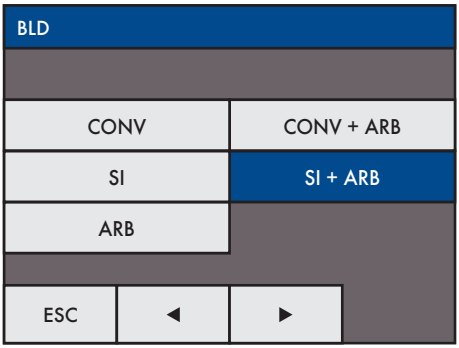
4.3.2 Unit settings

Unit can be selected with help of the following menu point:



CONV, SI, and ARB

The *ALL*: button set the selected unit for all the 10 parameters.
If the user would like to set the unit individually for the parameters then the *PAD TO PAD* button can be used. In this case the parameters are displayed in the header of the LCD and the desired unit can be set individually.



The following table summarizes the possible reported values in the entire of three units:

4.3.3 Parameter table

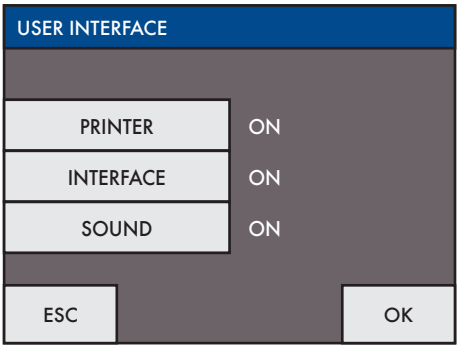
Parameter	CONV		SI		ARB
	values	unit	values	unit	values
BLD	NEG	Ery/µl	NEG	Ery/µl	NEG
	10		10		1+
	50		50		2+
	250		250		3+
LEU	NEG	Leu/µl	NEG	Leu/µl	NEG
	25		25		1+
	75		75		2+
	500		500		3+
BIL	NEG	mg/dl	NEG	µmol/l	NEG
	1		17		1+
	3		51		2+
	6		103		3+
UBG	NORM	mg/dl	NORM	µmol/l	NORM
	1		17		1+
	3		51		2+
	6		102		3+
	12		203		4+
KET	NEG	mg/dl	NEG	mmol/l	NEG
	5,2		0,5		±
	16		1,5		1+
	52		5		2+
	156		15		3+
GLU	NORM	mg/dl	NORM	mmol/l	NORM
	50		2,8		1+
	100		5,5		2+
	300		17		3+
	1000		55		4+
PRO	NEG	mg/dl	NEG	g/l	NEG
	30		0,3		1+
	100		1		2+
	500		5		3+
pH	5				
	6				
	6,5				
	7				
	8				
	9				
NIT	NEG				
	POS				
SG	1,000				
	1,005				
	1,010				
	1,015				
	1,020				
	1,025				
	1,030				
CRE	0,1	g/l	0,9	mmol/l	
	0,25		2,2		
	1		8,8		
	2		17,7		
	> 3		> 26,5		
MA	10	mg/l	0,01	g/l	
	30		0,03		
	80		0,08		
	150		0,15		
	300		0,3		
	1000		1		
	5000		5		

4.4 User Interface

In this menu point the built in interfaces could be switched ON or OFF. These interfaces are:

- Printer
- Serial interface
- Sound

The factory setting for LAURA® Smart is all interfaces: ON.



Printer ON /OFF means, that the results will be printed automatically after measurement, or not.
It is possible to switch off this feature, in this case the instrument will measure the strip and store it in the memory, but it won't print it.
The result can be printed at any time from the memory or when the result is displayed.

Interface ON /OFF means that the results will be send to Host automatically after measurement, or not.
It is possible to switch off this feature, in this case the instrument will measure the strip and store it in the memory, but it won't send it.
The result can be sent at any time from the memory.

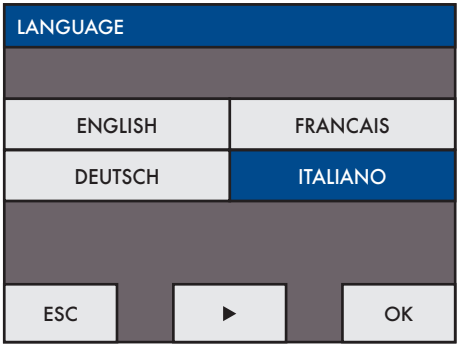
Sound ON/OFF turns the button feedback beep on or off.
Warning beeps are always ON, this setting has no influence to them.

4. Menu structure

Language Setting

Here the user can select the language of the instrument. Pressing the corresponding button can make the selection. The actual set language button is pressed. OK button must be pressed to make the selection valid.

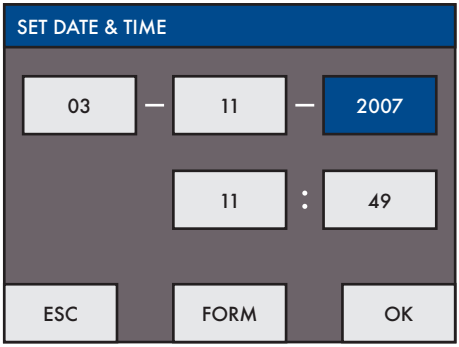
Pressing the ▶ button the next four available languages are displayed.



The following languages are available:
English
German
French
Italian
Czech
Polish
Hungarian
Russian

4.5 Date / Time setting

The Time and the Date format can be set in this menu point.



Select the Date / Time button in settings menu, the following display will appear:

To change the date or time values push the corresponding button! A numeric PAD will appear and the desired value can be entered.

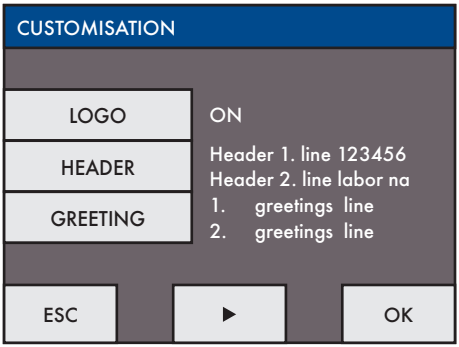
When date and time are correct the DATE format can be set, by pressing the *FORM* button.

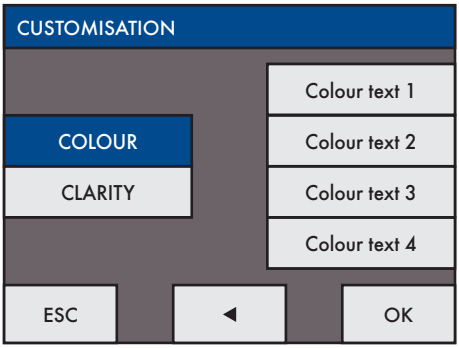
The following formats could be used:
Year – Month – Day YYYY-MM-DD
Day – Month – Year DD-MM-YYYY
Month – Day – Year MM-DD-YYYY

Pressing the OK button the actual settings became valid.
The real time clock in LAURA® Smart is running from a built in lithium battery. This battery is independent on the removable batteries.

4.6 Customisation menu

Customisation menu serves to enter user defined texts into the reader LAURA® Smart.
The text lines could be entered with help of alphanumeric PAD or with a connected external keyboard:
These texts are as follows:





Paging could be done by pressing the ◀ ▶ buttons.

These texts are as follows:

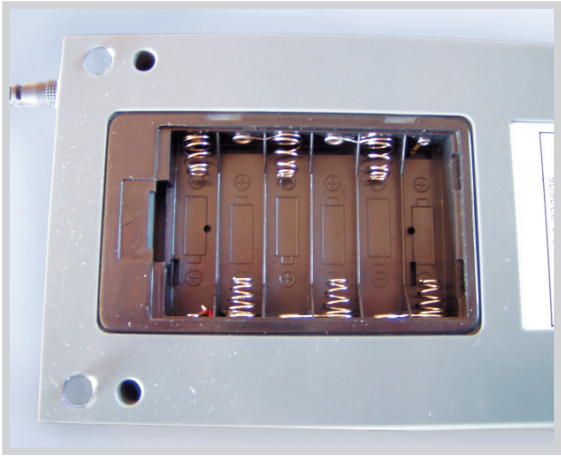
- 2 result header lines, appear with each result print out, max 24 characters
- 2 greeting lines, are printed after self test, max 24 characters
- 4 clarity text each, max 10 characters
- 4 colour text each, max 10 characters

Beyond these, the Logo ON/OFF switch could be reached from this menu point. In case of Logo ON is set, the LAURA Smart logo will be printed with every results.

4. Menu structure

4.7 Powering by batteries

LAURA® Smart could also be used with batteries power supply. The battery holder is locating at the bottom of the instrument. 6 pcs 1.5 V AA type batteries or accumulators could be used. While inserting the batteries, please pay attention to the polarity. It is indicated on the holder.



When using the batteries type LRG, 200 measurements with printing or 240 without printing could be carried out with one set. The instrument displays a BAT icon on the LCD that gives information about the battery status.

To increase the batteries lifetime generally consider the following:

- Turn off the automatic printing and print the result only if it is really necessary!
- If the measurement series has been done switch off the instrument.

The *Stand by* status needs also energy!

The instrument gives a beep warning in *Stand by* when battery is used.
If the adapter power plug is inserted the instrument will work from adapter and the batteries are disconnected.

5. Service information

LAURA® Smart is a high sensitive and accurate optical measuring instrument. All optical components, and REF PAD are adjusted with special tools during manufacturing.

5.1 Trouble-shooting

In case of any error, please refer the following table. It helps to identify the possible cause of the error and gives instruction how to solve it.

Error description	Possible cause	Corrective action
The reader cannot be switched on. The display remains dark.	Power supply is not connected or wrong type.	Check the power supply and the connections.
Self test failed.	Strip holder tray is missing or the REF PAD dirty movement of the tray is obstructing.	Check the strip holder tray it must be clean and easy to move also by hand.
The reader doesn't print, or the printing is not visible.	Paper cover is not closed. Wrong paper is in (not thermal paper). Paper is inserted with wrong side up.	Check the printer visually, for any damage or jam. Insert the right type of paper correctly. Close the printer cover.
The reader won't recognize the inserted strip.	The strip holder tray is in wrong position.	Check if the round whole of the tray is exactly above the strip detector.
Host communication failed.	Serial cable is not attached or wrong. Interface mode is turned OFF, or parameter doesn't match with HOST settings.	Check the cable! Check that interface mode is ON and parameters are correct.
Reader displays *Measurement Error.*	Strip is placed wrong. Wrong strip is used. Dry or not fully inserted strip is used.	Repeat the measurement with correct strip.

5.2 Service information

In the case of error, first try to solve it according the trouble-shoot guide above.
If the failure remains, please contact your distributor for service.

Never open the reader's case.

5. Service information

5.3 Safety information

LAURA® Smart complies the with EMC directive 89/336/EEC and low voltage directive 73/23/EEC.
LAURA® Smart instrument in combination with PHAN® LAURA test strips complies with the requirements of IVD directive 98/79/EC.

5.4 Producer

Producer of the system LAURA® Smart and diagnostic strips PHAN® LAURA:
Erba Lachema s.r.o.
Karásek 1d, 621 33 Brno
Czech Republic

5.5 Ordering information

		cat. number:
LAURA® Smart reader	-	50003508
DekaPHAN® LAURA	-	10008297
HeptaPHAN® LAURA	-	10008298
PentaPHAN® LAURA	-	10010239
DiaPHAN® LAURA	-	10010238
MicroalbuPHAN® LAURA	-	10010262

Spare parts:

Strip holder tray for LAURA® Smart	-	50003510
Power supply for LAURA® Smart	-	50003511
Interface cable for LAURA® Smart	-	50003512
The grey control strips for LAURA® Smart	-	50003513

5.6 Guarantee conditions

The producer Erba Lachema s.r.o. guarantees the reader LAURA® Smart for 12 months after installation. The free service isn't guarantea for spare parts from the list (see 5.5).

6. Technical parameters

General	Dimension	230×127×110 mm
	Weight	0.7 kg without batteries
	Power source	External adapter 7.5 V DC / 6 A 90–230 V/ 50–60 Hz
	Power consumption max / standby	20 W / 6 W
	Battery	6×1.5 V AA
	Battery life type LRG	200 measurements with printing or 240 without printing

Measurement	Method	Reflection photometry
	Throughput	max. 240 strips/hour
	Wavelength	470, 540, 650 nm
	AD resolution	10 bit

User Interface	Printer	58 mm graphical thermal printer, 24 char/line
	LCD	320×240 colour TFT

Memory	Capacity	360 complete measurement results
	RTC	Lithium battery kept real time clock

Interfaces	Host interface	RS232 Serial interface, 19 200 Bd 8N1 USB interface
	BCR / PC AT keyboard	Wedge type BCR with standard PS2 interface

Recommended operating environment	Temperature	15–35 °C Optimal range 20–25 °C
	Humidity	20–80%
	Place	Horizontal surface No shock or vibration Not direct Sun shine

Storing / transport	Temperature	-20–60 °C
	Humidity	20–90%

7. Serial interface protocol

The LAURA® Smart has an RS232 interface to HOST computer. If the communication is enabled (Interface: ON) the reader sends out the result immediately after measurement. Stored measurements can also be sent at any time from the memory.

The hardware parameters of the RS232 port are:

Baud rate:	19 200 Bd
Bit length	8
Parity:	No
Stop bit:	1

The interface has a DB9 mother type connector with the following PIN connection:

PIN number	Connected
2	TxD
3	RxD
5	GND
1, 4, 6, 7, 8, 9	- not connected

If USB host is connected, the reader sends the data trough the USB port as well.
The format of the data stream is identical to the serial (RS232) case.
The communication is unidirectional LAURA® Smart -> HOST, and is in ASCII text form.
The reader sends 1 result in 1 package. Every package has the same format, which is:

Name of field	**Characters sent out**											**# of bytes**
Frame start	STX			Strip name			9 space				CR, LF	26
Seq.No line	"Seq.No:" 7 char			SP	4 char long Seq number, right justified, filled with 0						CR, LF	26
ID line	"Pat.ID:" 7char			SP	14 char long ID				2×SP		CR, LF	26
COLOR	„COLOR:"			3×SP	Color text 10 char						CR.LF	21
CLARITY	„CLARITY:"			SP	Clarity text 10 char						CR LF	21
Date line	YYYY.MM.DD				6×SP		HH:MM			3×SP	CR, LF	26
1st. result line	'*' or SP	SP	3char par. name	SP	5char result Conv or SI	SP	6char unit	SP	5char ARB result		CR, LF	26

10th. result line	'*' or SP	SP	3char par. name	SP	5char result Conv or SI	SP	6char unit	SP	5char ARB result		CR, LF	26
Comment line	{	80 char long comment or space									}	82
Frame end	ETX											1

Where:

- STX = 0×02, ETX= 0×03, CR=0×0d, LF=0×0a, SP=0×20
- The parameter order is the default regardless of printing order.
- In case of shorter strip (HeptaPHAN® LAURA, PentaPHAN® LAURA, DiaPHAN® LAURA, MicroalbuPHAN® LAURA) only the measured parameter lines are sent
- The result and the unit is depending on the selected unit (SETTINGS/STRIP/PARAMETER)

8. Short Instructions

1. Check carefully if the instrument is complete and not damaged.
2. Connect the instrument to the plug with the relevant cable; check if there is a connection between the instrument and external plug.
3. Switch on the instrument with the main switch.
4. Wait till the instrument performs the self-test.
5. Set the mode of the results (direct printing after analysis, printing after measurement of all samples, sending to the external net etc.).
6. Start the measurement in the mode Seq.No or ID.
7. Complete the measurements of urine samples; follow all recommendations during the operation, which are included in the instruction of the diagnostic strips.
8. Perform the everyday cleaning after having finished your daily measurements.
9. Leave the instrument switched on in Standby mode or switch it off using the main switch.

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