Milkotronic Ltd

LACTOSCAN MCCW (ss box)

MILK ANALYZER

Directly controlled by embedded Windows tablet

Operation Manual

Switching Adapter

- **Input**: 100 - 240 V ~1.6 A max. 50-60 Hz
- **Output:** +12 V ⎓ 3 A min.
- **Output power:** 36 - 42 W

Measurement modes

- cow milk ☒
- sheep milk ☐
- UHT milk ☐
- goat milk ☐
- buffalo milk ☒
- cream 25% ☐
- cream 45% ☒
- whey ☐
- recovered milk ☐
- other /pasteurized milk/ ☐

CAUTION!
Keep the switching adapter dry!
Please, read and follow strictly all the instructions in the manual.

Due to continuous improvement in the device, information contained in this manual is subject to change without notice. Contact the company-producer for revisions and corrections

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SAFETY INSTRUCTIONS

1. **Read this manual carefully and make sure that you understand all the instructions.**

2. **For safety purposes the device is equipped with grounded power cable. If there is no grounded electrical outlet where the device will be used, please, install such before using the device.**

3. **Place the device on leveled and stable plate. In case it falls or is severely shocked it may be damaged.**

4. **Connect to the electrical network in such a way that the power cable to stay away from the side for accessing the device and not to be stepped on.**

5. **Do not disassemble the unit in order to avoid possible electrical shock. In case of malfunction contact your local dealer.**

6. **Handle the liquids the device works with carefully, following all the instructions for their preparation.**

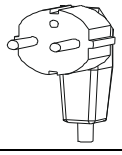
7. **Place the switching adaptor in such a way as to be protected from overflow and spillage of liquids.**

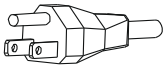
PARTS AND ACCESSORIES

In the table below the standard delivery configuration of the milk analyzer is listed:

№	Description	Item №	pcs
1.	Ultrasonic portable milk analyzer	WLSS001	1
1 sample measurement time		60 sec	☒
		30 sec	☐
2.	Operation manual	WLSS002	1
3.	Plastic sample holder	LSS003	2
4.	Spare Pipes	LSS004	2
5.	Alkaline cleaning solution Lactodaily	100 g	1
6.	Acidic cleaning solution Lactoweekly	100 g	1

In the table below the milk analyzer spares and accessories, which are delivered on customers request are listed:

№	Description a) included in the set: ☒ b) not included in the set (may be additionally bought): ☐	Item №	pcs	☒ / ☐
7.	RS232 Interface Cable - Analyser-IBM PC	LSS006		☐
8.	pH measuring system	LSS009	1	☒
9.	pH probe with cable and holder	LSS010	1	☒
10.	Buffer solution Ph 60 ml (pH7.00±0.01/20˚C)	LSS011	1	☐
11.	Buffer solution pH 60 ml (pH4.00±0.01/20˚C)	LSS012	1	☐
12.	Milk conductivity measuring system	LSS013	1	☒
13.	Buffer solution conductivity 50 ml (5.02 (±5%) mS/cm (18±0.1˚C)	LSS014	1	☐
15.	RS232 Interface Cable - Milk Analyser – Serial Printer/IBM PC	LSS018	1	☐
16.	High-fat measurement function	LSS020	1	☒
17.	Plug type		1	☒

			1	☐
18.	Spare O-ring for the pH probe		1	☒

1. FUNCTION

The function of the milk analyzer is:

- **to make quick analysis of milk on fat (FAT), non-fat solids (SNF), proteins, lactose and water content percentages, temperature (^{o}C), freezing point, salts, total solids, as well as density of one and the same sample directly after milking, at collecting and during processing.**
- **Total integration of the milk sample's measured parameters with the processes for storing, processing and sending the results towards the corresponding receiver.**

2. TECHNICAL PARAMETERS

2.1. Working modes characteristics:

The program of the milk analyzer has four working modes.

2.1.1. Measurement mode milk / dairy product – first type

2.1.2. Measurement mode milk / dairy product – second type

2.1.3. Measurement mode milk / dairy product – third type

These modes have been calibrated on customers' request for 3 milk types from the following: cow, sheep, UHT, buffalo, goat, camel milk, cream, ice cream mixtures, whey, recovered milk, etc. before leaving the production facilities and the text on the display will be for the corresponding types.

2.1.4. Cleaning

2.2. Measuring range:

Fat …….....	……...from 0.01% to 45%
SNF ……	..……...from 3% to 40%
Density ** …….	……..…….from 1015 to 1160 kg/m^3
Proteins ……..	…….from 2% to 15%
Lactose ……...	…….from 0.01 % to 20 %
Water content ……	……..……..from 0 % to 70 %
Temperature of milk ……	……..from 1^{o}C to 40^{o}C
Freezing point***……	……from – 0,4 to – 0,7^{o}C
Salts …….	……..……from 0,4 to 4%
PH*..……...	……..……from 0 to 14
Conductivity *..……	……..…from 2 to 14 [mS/cm]
Total Solids* ……	……...from 0 to 50 %

* Option, on customers' request

** Density data are shown in an abbreviated form. For example 27.3 have to be understood as 1027.3 kg/m^3. To determine the milk density, write down the result from the display and add 1000.
Example: result 21,20; density = 1000 + 21,20 = 1021,2 kg/m^3

The abbreviated form of the density is used also when entering data for samples in working mode **Recalibrate**, for example:
If the measured sample density is 1034.5 kg/m3, then in the menu for entering the samples parameters used for calibration, across the parameter Den = , you have to enter 34.5.

**** Please, carefully read Appendix Freezing Point.

2.3. Accuracy:

Fat …..……..	…..……...± 0.06%
SNF ……..	……..……...± 0.15%
Density ……	……..± 0.3 kg/m^3
Proteins ……...	……..……...± 0.15%
Lactose ……	……...± 0.20%
Water content …….	…….± 3.0%
Temperature of milk ……..	……± 1^{o}C
Freezing point……..	..……..……± 0.001^{o}C
Salts ……...	…..……..……...± 0.05%
PH …….	……±0.05%
Conductivity …….	……...±0.05

Total solids ……. …….± 0.17%

The difference between two consequent measurements of one and the same milk could not exceed the maximum permissible absolute error.

2.4 Correct ambient conditions:

Maximum permissible absolute error is guaranteed in case of normal ambient conditions:

Air temperature…… ….……from 10°C to 40°C
Relative humidity …… ……...from 30% to 80%
Power supply …… ……...220V (110V)
Extent of contamination at normal environmental conditions……..2

Maximum permissible absolute error values in point 2.3 are in dependence on the correctness of the corresponding chemical method, used for component content determination. In point 2.3. are used the following reference methods: Gerber – for fat, gravimetric – for SNF, Kjeldahl – for protein. The boundary for maximum variation of repeatability when the power supply voltage is from +10 to – 15% from the nominal voltage values (220 V) have to be no more than 0.8 accuracy according point 2.3. The analyzer is used in conditions free of outer electrical and magnetic fields (except the magnetic field of the Earth) and vibrations.

2.5. Dimensions:

…… 250/220/150 mm, mass 3,0 kg

2.6. Continuous working time:

……..……..……...……....non-stop

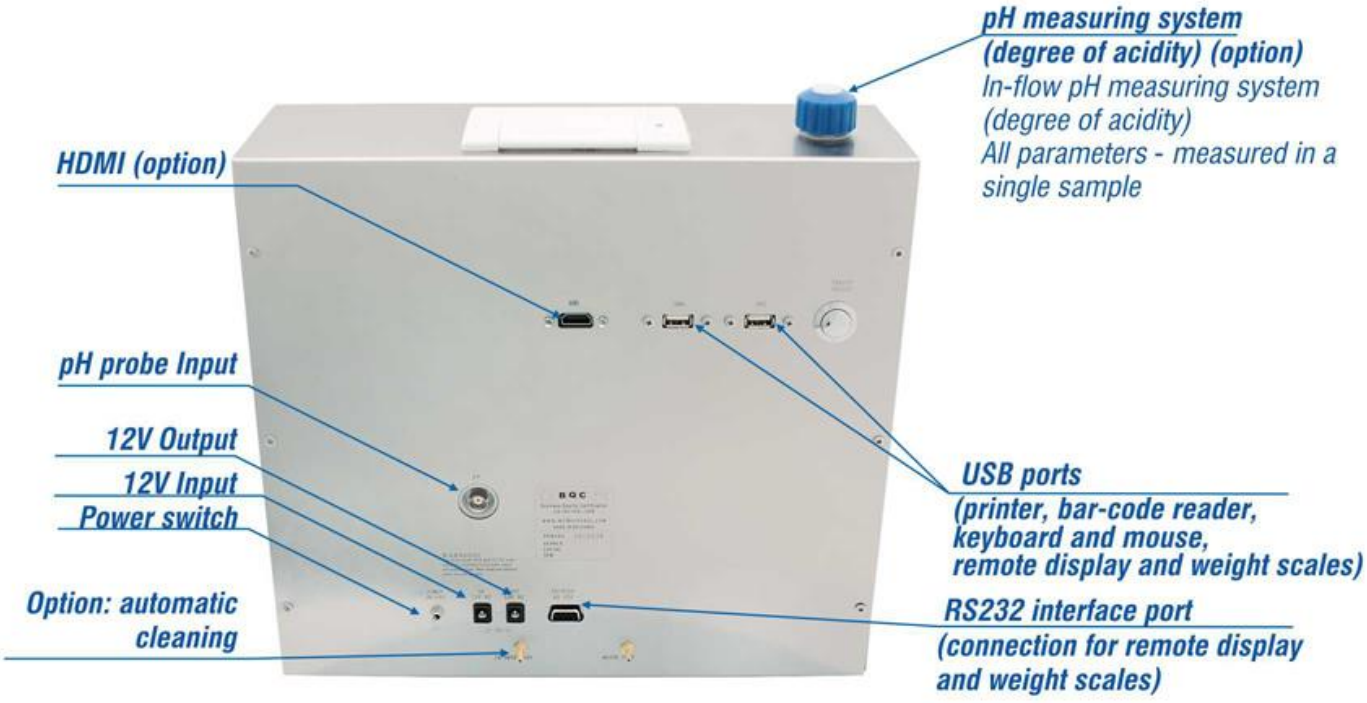
2.7 Milk sample volume per one measurement:

……..……..25 ml

Total view
Fig.1

Back Panel

Fig.2



3. Qualification of raw milk, thermally treated milk, other dairy products and derivatives

3.1. Taking samples and preparation for analysis

In order to receive reliable results in qualification of milk, dairy products and derivatives are needed: precise samples taking; correct samples storing (in need to be preserved); correct preparation before making measurement. The rules and requirements for this are described in details in *Appendix Preparing Samples.*

3.2. Making the measurement.

3.2.1. Preparing the analyzer for working mode

3.2.1.1. Put the analyzer on the working place, providing good ventilation and not in the vicinity of heat providing devices or sources. The temperature in the premises has to be in the boundaries 10-30^{o}C.

3.2.1.2. Switching on the analyser is done with a switch at the rear panel of the analyser. The tablet, controlling the analyser is powered by its power switch. Wait for Windows to be loaded. The operator has an access to all the resources of the system, where can be set, if necessary - printer (for example standard A4 printer), WiFi or connection to other peripheral devices (for example mouse and keypad, flash memory etc.). There's an USB Hub, which ports are mounted on the back panel of the analyser. These are standard USB ports, connected to the tablet (controlling computer).

There are 2 ways of control of the tablet/software:

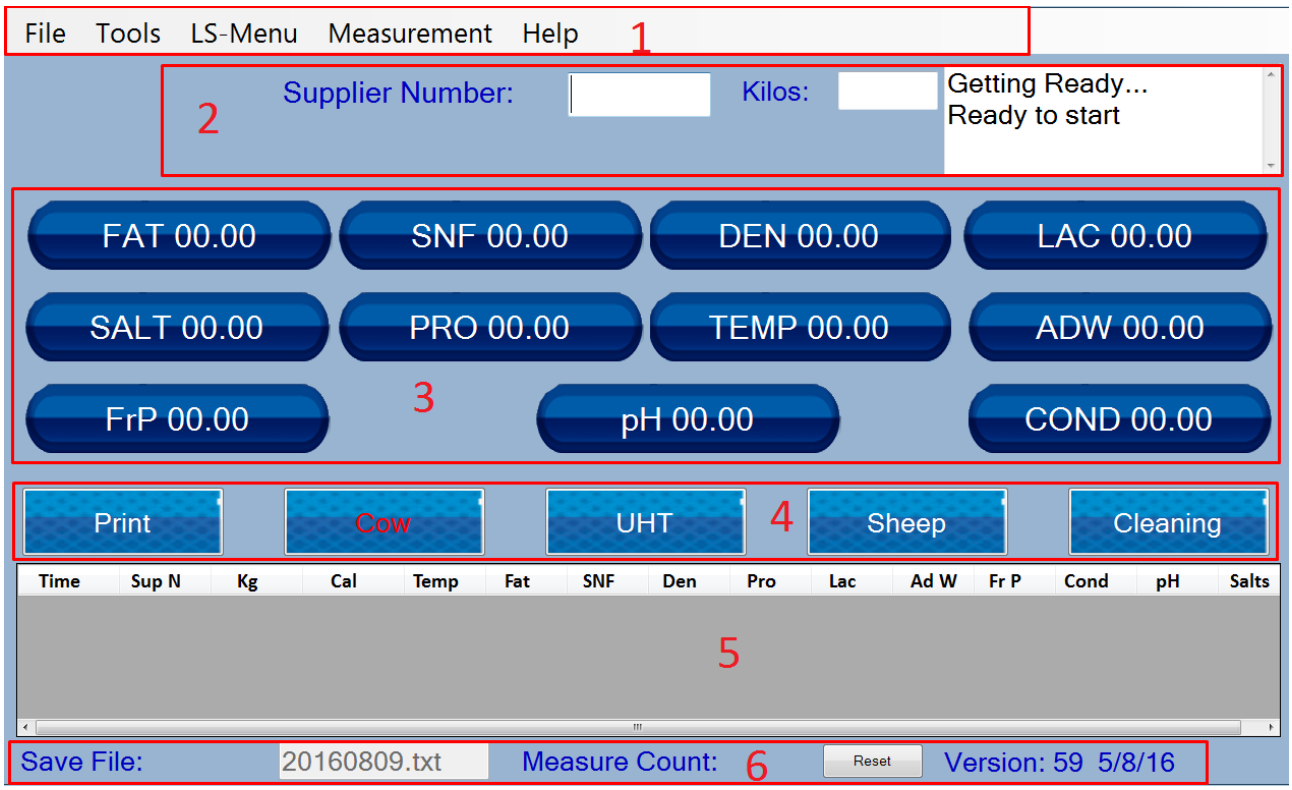
A. By direct touch on the buttons on the display (using the possibility of the touch screen of the tablet) and buttons on the front panel (if the version is with such buttons);

or

B. With the mouse and/or the keyboard, working like a standard computer.

Version A is suitable for daily work for measuring and cleaning the analyser, while version B is recommended for setting and servicing.

The software can be started directly after Windows has been loaded or by pressing an icon, in dependence of the custom's requirement. After the software is loaded, the main menu appears on the display:



Description of the main screen:

Position 1. System menu – the upper one on the display. It is described with the file Supplier Tools LS-Menu Help. Serves for direct control of the settings/test/service mode of the analyser.

Position 2. System Status – includes groups Supplier, Liters and information tab, imitating the display of the standard (analyser without a tablet) Lactoscan (upper right corner). Serves for entering the ID of the deliverer, liters/ kgs which were delivered and shows the current information, describing the exacution of the specific commands sent from the tablet towards the PCB of the analyser.

Position 3. Tab for measurement results – Fat=00.00, SNF=… Information tab and could not be changed by the operator. It serves for displaying the measurement results. The last measurement results stay active till the next measurement is started.

Position 4. Control buttons. The buttons at both ends are with fixed names – Print and Clean – for starting the corresponding commands. The rest 3 are with changeable names, because they show the name of the corresponding calibration (type of milk). By pressing them, a measurement on the chosen calibration is started. If the analyser is with outer keyboard, mounted in the box of the device (a number of buttons with the corresponding designations), by

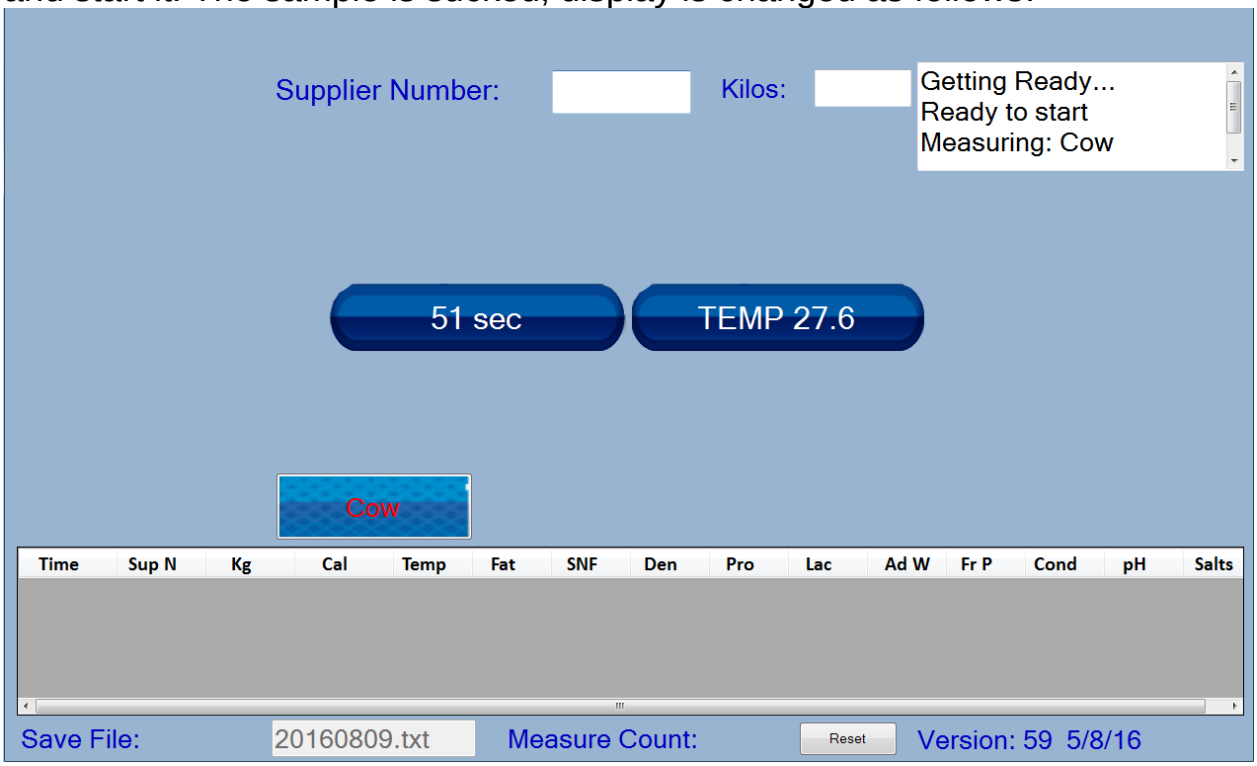
pressing the buttons left/right is moving the choice of the calibration. Using this keyboard, the chosen calibartion is started by pressing the button Enter.

Position 5. Archive tab, type List Box at the lower part of the display. It shows the last 10 measurement results. The meaning of the results is described in the list over them.

Position 6.Information line. It is at the bottom of the display. The group Save File shows the name of the file, where the results will be saved. It is generated automatically, based on the current date. If needed, it ca be changed. The group Meas Count – shows the number of the measurements already done. At the right of this line is displayed the version of the PCB (Main PCB – on which the measurement system is based) and software in it.

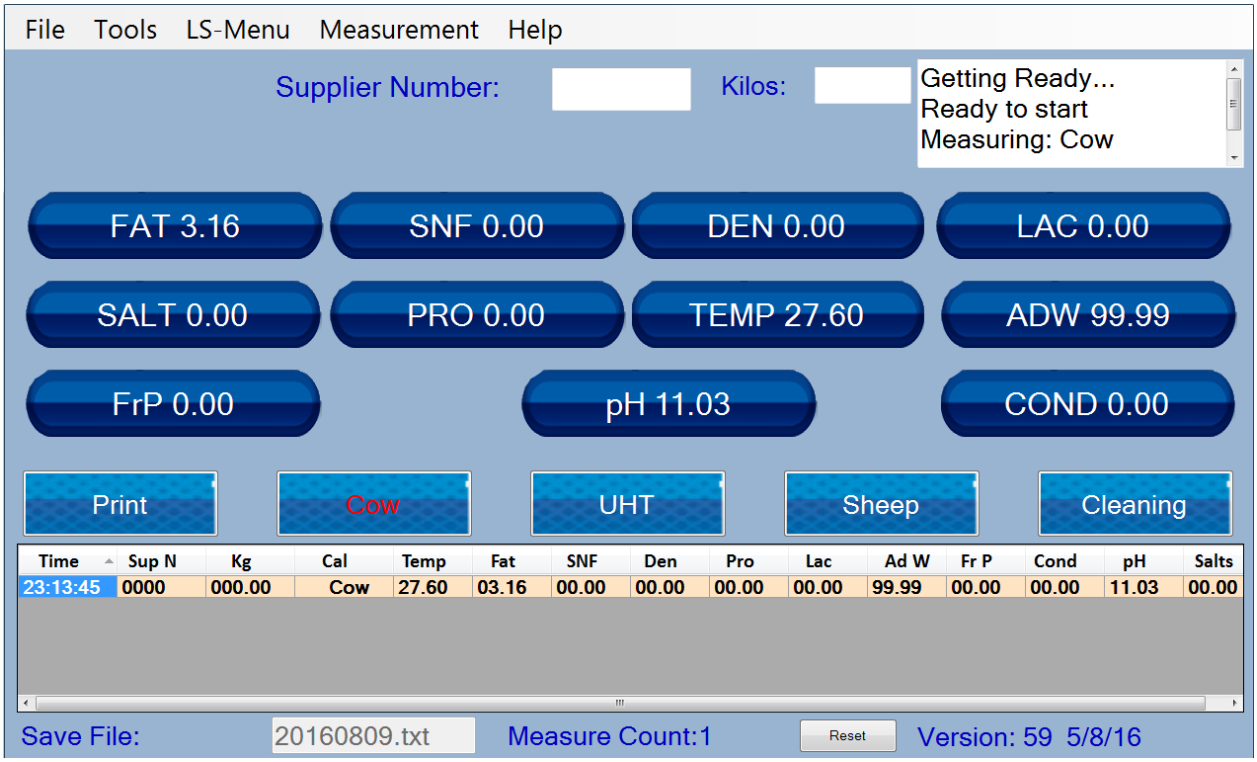
3.2.2. Working with the analyser in measurement mode.

This is the main working mode. It is needed a milk to be poured in the glass, to place it in the recess of the analyser, to choose the needed calibration and start it. The sample is sucked, display is changed as follows:



The calibration used at the moment remains on the display. The previous results are hidden. First appears the temperature of the sample. A clock/timer appears in the middle of the display, showing in seconds the remaining time till the appearance of the measurement results. After measurement completion, the results appear in the tab for the measurement results as well as in the archive tab i.e. the initial start display with valid results appears. The results are archived to a text file and can be used for later result analysis. If there is a internet

connection(e.g. WiFi, 3G modem, etc.) the results can be send to a cloud, where they can be stored or further analysed



If there's serial printer connected (loaded with paper, with closed cover), the results are printed out. The analyser is ready for the next command (it is in Idle mode) i.e. ready for the next measurement. Button Print is active – by pressing it a copy of the results can be printed out (it is advisable one printout to remain in the milk collecting center, while the second one to be given to the deliverer).

4. CLEANING THE ANALYZER

This procedure prevents gathering milk fat residues and milk stone on the sensor. The milk stone consists of milk solids, calcium, iron, sulphates, magnesium, etc. All these substances form layer on the pipe and sensor's walls, which leads to deviations in the measurement results and blocking up the piping.

The company-producer recommends usage of the chemicals, supplied with the analyser – alkaline and acidic (Lactodaily and Lactoweekly). You may order them separately or together with the analyser. Try to use only these chemicals for cleaning the analyser.

In case you missed to order these chemicals, the alternative is to use alkaline and acidic cleaning solutions for dairy equipment by one the companies, producing such chemicals, as for example:
http://www.diversey.com
http://www.ecolab.com
http://www.calvatis.com

Do not use chemicals not intended for usage in the milking systems or vessels in the dairy sector. Pay special attention to the concentration of the acidic chemical. **Increased concentration may damage the measuring sensor.**

4.1. Periodically cleaning (rinsing) the analyzer

It is done in the process of routine work of the analyzer. Its aim is to prevent drying up and adhesion of different milk components in the milk analyzer's measuring system.

4.1.1. Periodical cleaning frequency.

It is easy to understand what is the period on which the rinsing could be done as the analyzer reminds you when it is necessary. This is done by a sound signal in 1-second cycle after the set time intervals elapse:

- 55 min. after switching on the power supply of the analyser, but idle work;

- 15 min. after the last measurement of real milk sample.

*Idle Mode is that part of the standard working mode, when the analyser is not making measurements. There's embedded in the analyser system for measurement of the idle time. The idle time is measured starting from the last action of the operator. In dependence of it (what the operator last did), are taken decisions regarding the cleaning.

There are 2 options:

Option A: If the analyser:

1. Was only switched on but was not started in measurement mode,
2. Or the last action was cleaning,
3. Or the last action was measuring sample with very low Fat (similar to water)

Then the signal for cleaning is started after 55 min.

Option B: If the last thing done with the analyser was measurement of normal milk sample, the signal for cleaning is started after 15 min.

After cleaning completion, new measurement takes place in above described time intervals.

4.1.2. Making the rinsing

After above message is received put in the recess of the analyzer a sample holder with alkaline cleaning solution or water.
Press Clean to start the rinsing mode.
In this mode the analyzer makes 8 cycles and stops.
Already used solution is poured out of the analyser. Now the device is ready for the next measurement. In case of doubt that the analyzer is still not well cleaned, the procedure Cleaning may be executed repeatedly.

4.2. Complete cleaning

4.2.1. Complete cleaning frequency

This cleaning is done after finishing the work with the analyzer at the end of the working day or if it is obvious that the measuring system of the analyzer is contaminated in case of intensive work with it. It is done with alkaline cleaning solution.
Preparation of 3 % alkaline solution of Lactodaily for circulation cleaning in the milk analyzer:
1. Take the package 100 g concentrated chemical Lactodaily
2. In appropriate vessel (for example bucket) pour 1 l water.
3. Add the powder and then again water up to 3 l.

For a single cleaning cycle you need only 25 ml cleaning solution. We recommend you to prepare working solutions of cleaning chemicals, enough for normal work for 1 week, because, during their stay unused, the working solutions loose their strength and also is difficult to store them.

Then follow the instruction for milk analyzer cleaning.

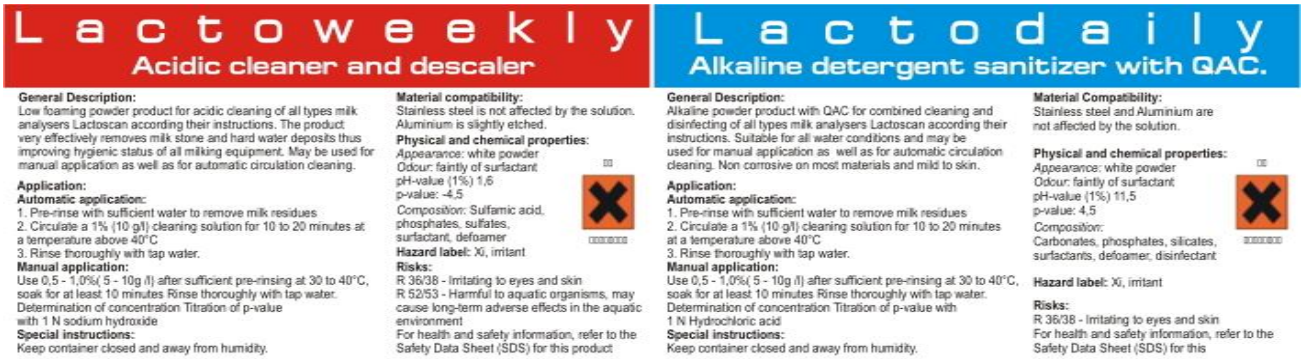
4.2.2. Cleaning

4.2.2.1.Rinsing milk residues
Fill in the glass with water. Put it in the recess of the analyser and start command Cleaning from the main menu. After finishing it pour out the contaminated water.
4.2.2.2.Cleaning with alkaline cleaning solution
Fill in the glass with warm (50-60 C) alkaline cleaning solution. Put it in the recess of the analyser and start the command Clean. After finishing it, pour out the contaminated liquid.
4.2.2.3.Rinsing with water
Fill in the glass with water. Put it in the recess of the analyser and start command Clean. After finishing it pour out the contaminated water. Now the device is ready for work.

4.2.2.4. Cleaning with acidic solution
It is recommended to be done every day.

Preparation of 3 % acidic solution of Lactoweekly for circulation cleaning in the milk analyzer:
1. Take the package 100 g concentrated chemical Lactodaily
2. In appropriate vessel (for example bucket) pour 1 l water.
3. Add the chemical and then again water up to 3 l.

Fig. 3 Labels for the cleaning chemicals



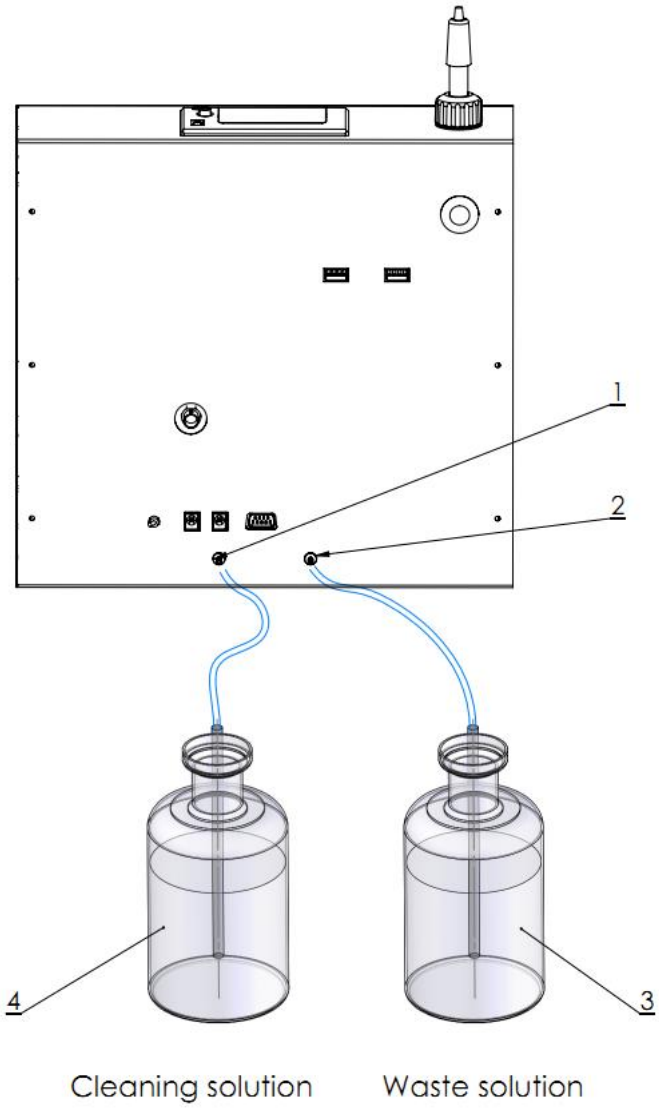
The following procedure is executed:
1. Rinsing the milk residues:
Fill in the glass with water. Put it in the recess of the analyser and start command Clean. After finishing it pour out the contaminated water.
2. Cleaning with acidic solution
Fill in the glass with warm (50-60 C) acidic cleaning solution. Put it in the recess of the analyser and start the command Clean. After finishing it, pour out the contaminated liquid.
3. Rinsing with water
Fill in the glass with water. Put it in the recess of the analyser and start command Clean. After finishing it pour out the contaminated water. Now the device is ready for work.

Please, pay attention that, when the analysers gives a signal for need of cleaning 15 min after the last measurement of real milk samples or 55 min. after being powered and not used, cleaning is made ONLY with alkaline solution in concentration 1-3%.
During the basic/final cleaning consequence is: alkaline solution – water – acidic solution - water

IMPORTANT
THE MAIN REASON FOR MALFUNCTIONING OF THE DEVICE IS THE BAD CLEANING OF THE SYSTEM AFTER MAKING ANALYSIS.
In case of malfunction due to the bad cleaning of the analyser your guarantee is not valid anymore and any repair has to be paid.

4.2.3. Automatic cleaning of the analyzer (Option)

Fig. 4 Connecting the container with the detergent



Contamination of the analyzer is a result of irregular washing and is the main cause for inaccuracies in the measurement. To avoid this, analyzers with transfer pump have an automatic washing.

To the analyzer should be included a container with detergent and exiting the pipe to the tank for collecting waste samples and used cleaning agent, as shown in Figure 4.

Note the tube in two tanks. The tube in the tank with the the detergent must be deeply immersed in it, as in the tank for waste samples and used cleaning agent MUST NOT be in the liquid.
Make sure and fill the detergent is lowered below the 2/3!

FIG. 5 Preparing of the analyzer for rinsing

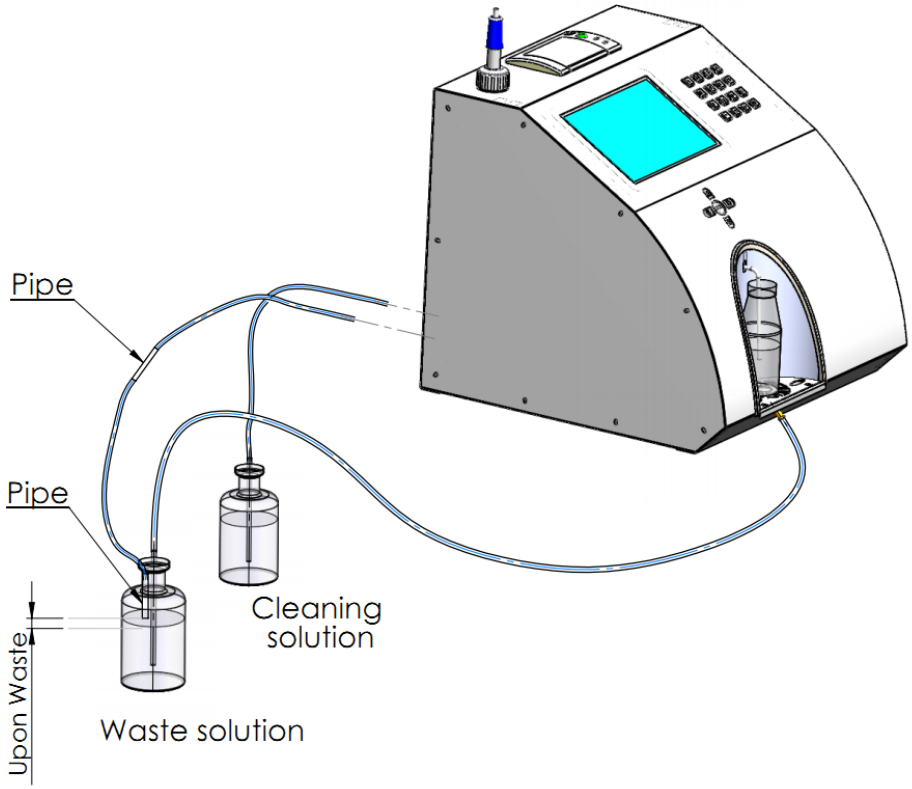
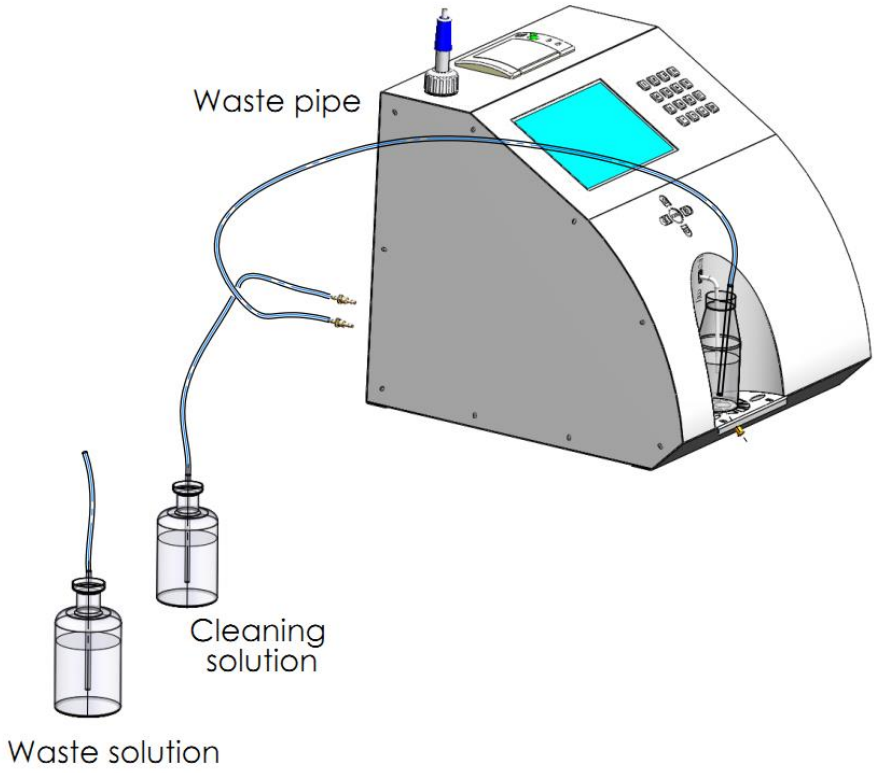
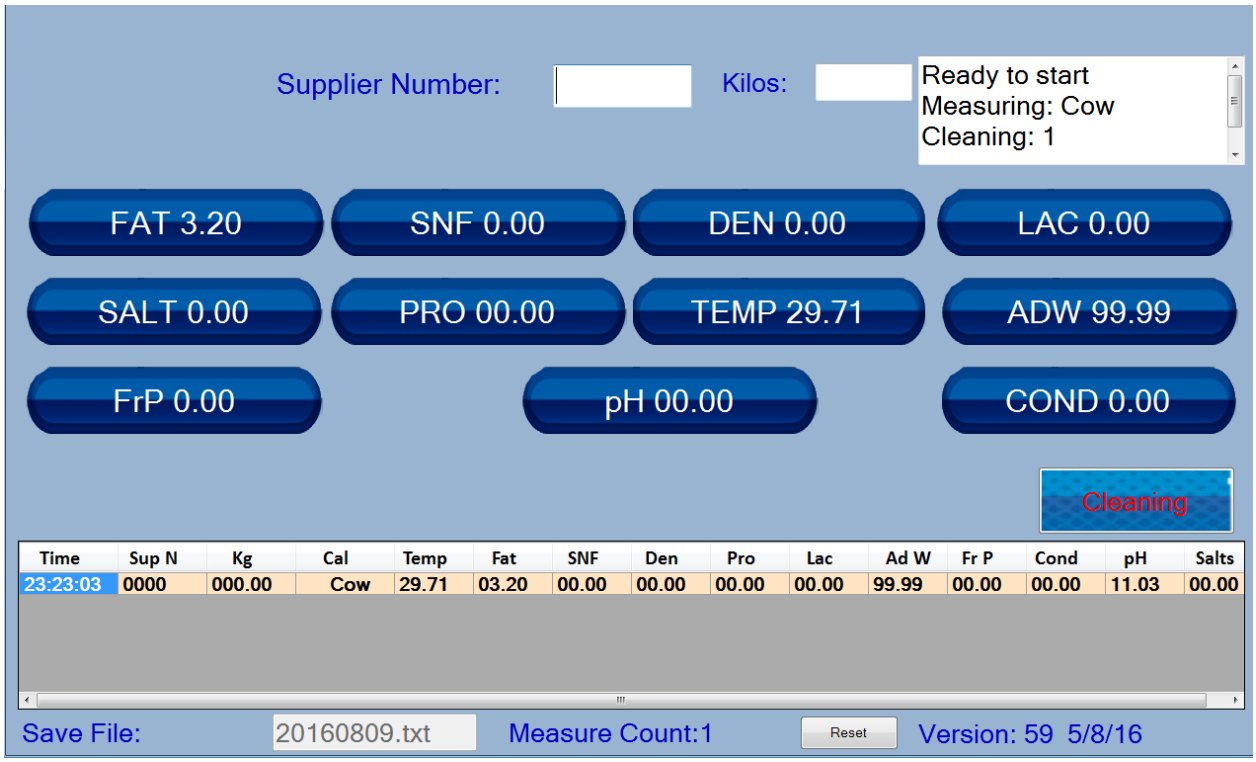


Fig. 6 Preparing of the analyzer for cleaning

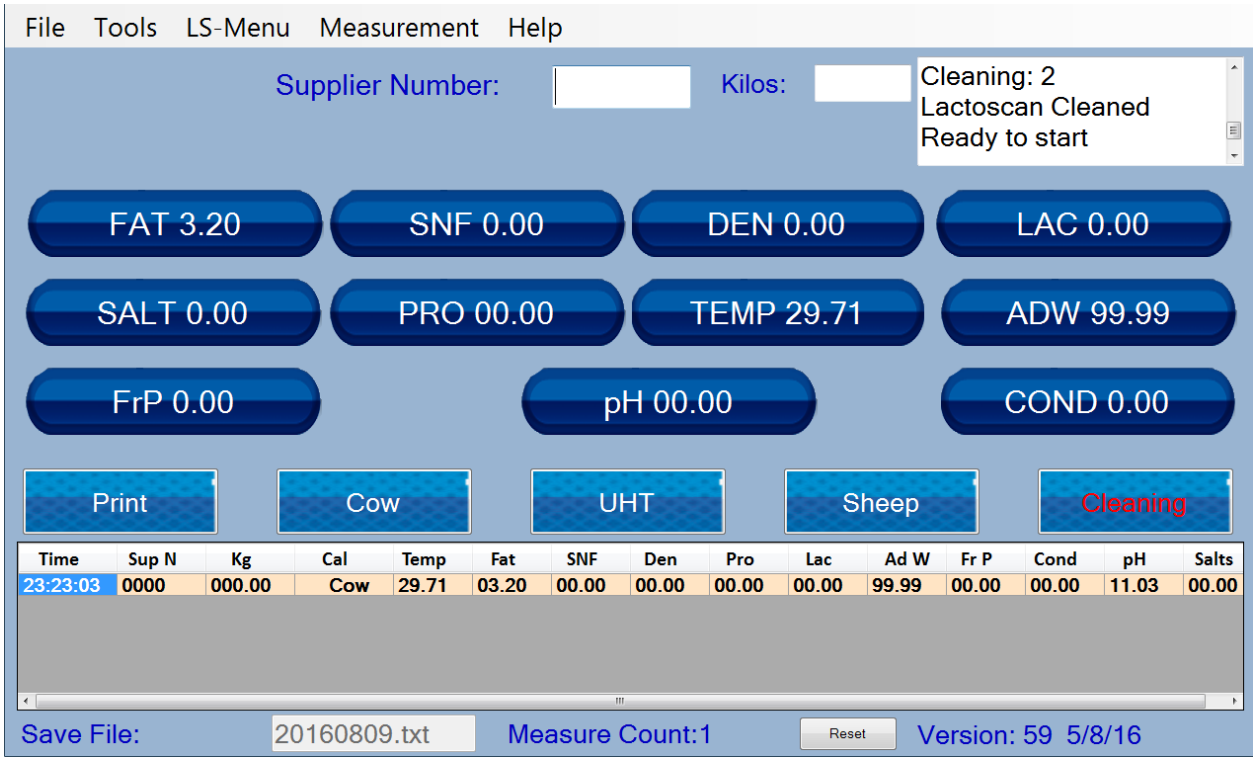


For maximum washing effect, it is recommended to heat the pre-cleaning solution to 70 ˚ C.

By pressing the button Clean, a cleaning procedure is started.



After the cleaning cycles are finished, the analyser returns “Lactoscan Cleaned” message and “Ready to start”



5. Menus' description.

These functions are NOT for everyday use. They are used in case some parameters of the analyser to be changed, after careful acquaintance with these commands and how to use them

Service mode menus are selected from the main menu system at the top of the screen. For easier work with the service menu we recommend using a mouse and a keyboard. Structure of the menu system:

File

System Setup

Purpose: To select the communication ports. Used in production conditions, or if necessary in the service conditions

Reset System

Purpose: To reset the hardware of the device - the specialized board. It is equal to switching the power Off / On.

Exit

Purpose: Exit from the software, controlling the analyser and returning to windows desktop. It is used in cases when the tablet needs settings to be made- for example connecting to a WiFi network, connecting an external printer, etc.

ShutDown

Purpose: Exitfrom the software and shutting down the tablet. It is used to turn off the system. After pressing shutdown, turn off the pcb using the switch on the back panel.

Supplier

Add Supplier

Purpose: To enter the details of a new supplier of milk. It is used in case of building or using a report system.

Edit Supplier

Purpose: To edit / change data for already introduced suppliers of milk.

Tools

LSCal

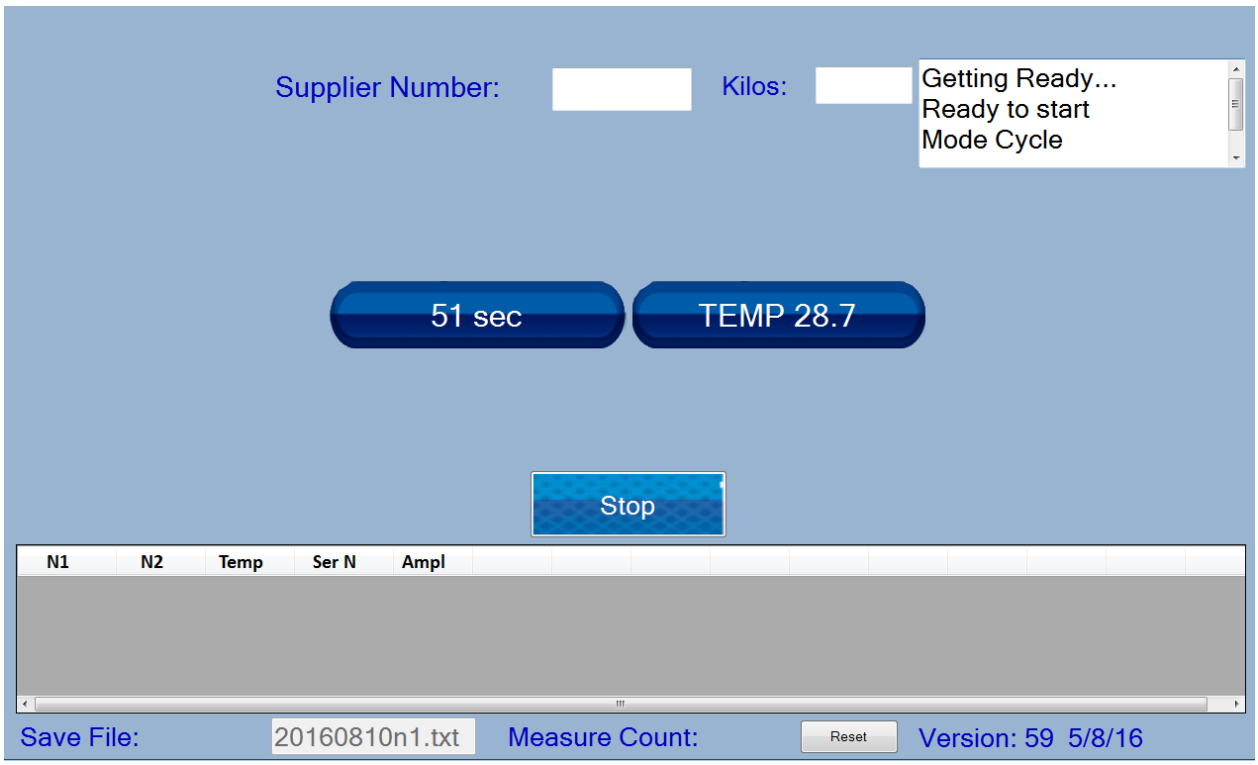
Purpose: To start an external software tool, used for the calibration of the device. The way of work with the tool LSCal.exe is described separately in the service documentation. After completion of the calibration, to resume work with the program press the button "Finish".

LS-Menu

Special Modes

Cycle

Purpose: Starts the unit in cyclic measurement of the ultrasound. The results appear in the results field, in place of Fat, SNF ... The results are remembered in a file. The mode is used for industrial purposes or for service work by qualified professionals. This type of measurement is not used in everyday laboratory work.



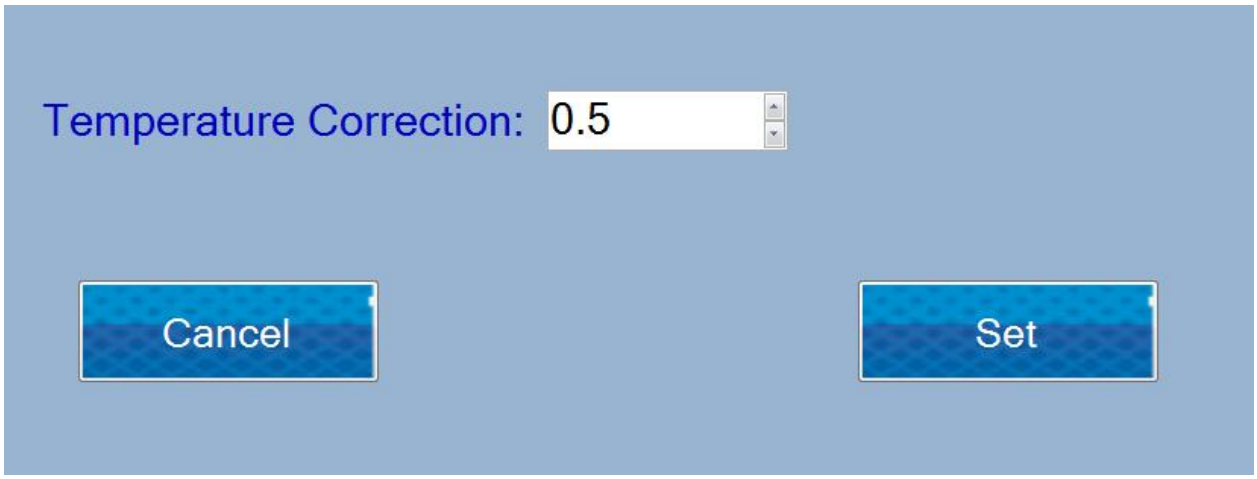
Calibration

Purpose: Starts the calibration procedure

Correction

Temperature Correction

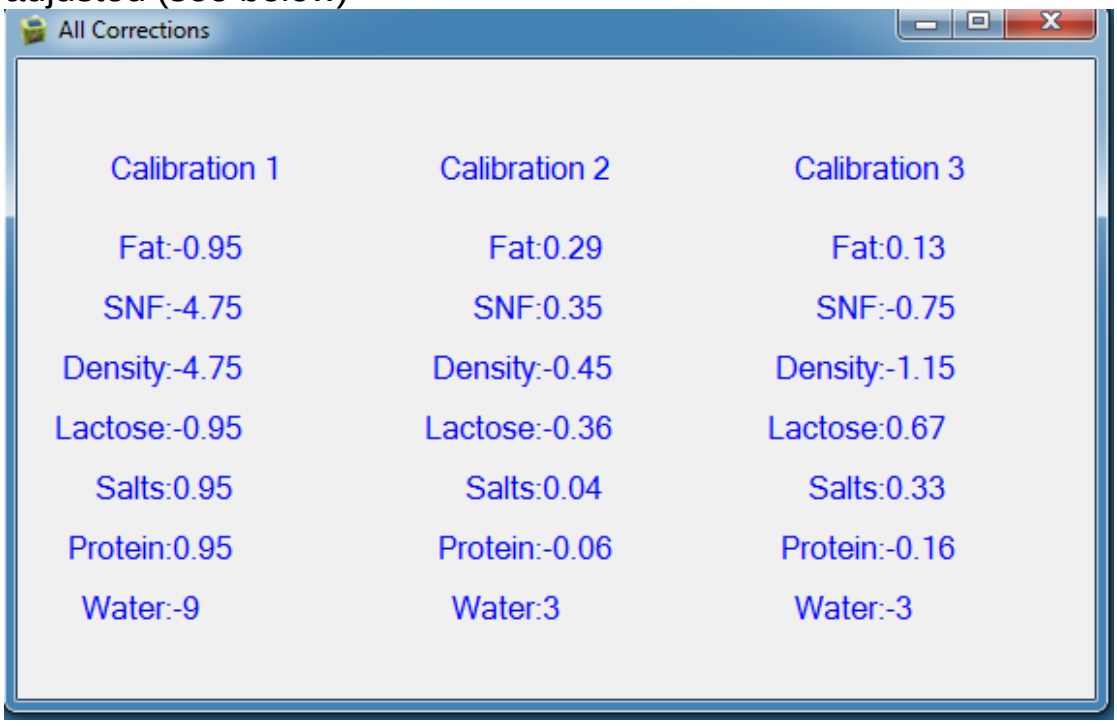
Purpose: To correct the measured sample temperature. Used by trained service specialists. The measured temperature can be varied within + - 9.9 degrees.



Correction

All Corrections

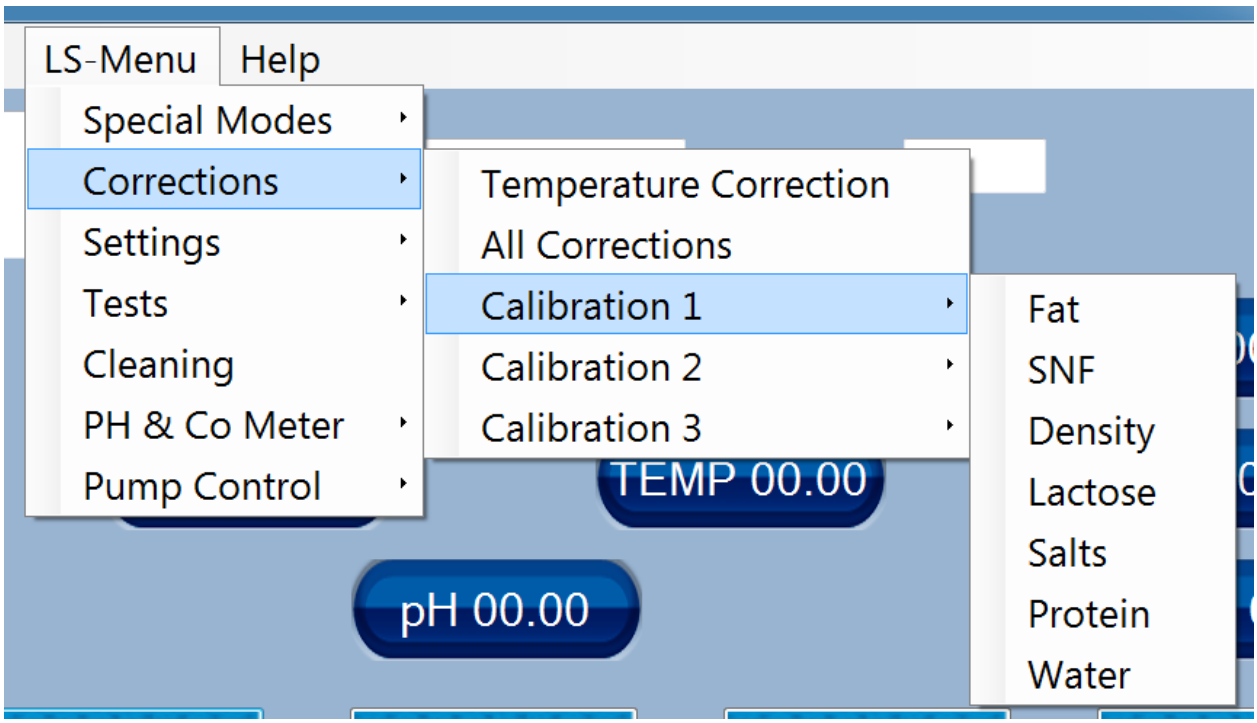
Purpose: Provides information about all existing corrections of the system parameters. The window is informative, for editing adjustments proceed to the selection of calibration and selection of parameters to be adjusted (see below)



Corrections
Calibration

Parameter:

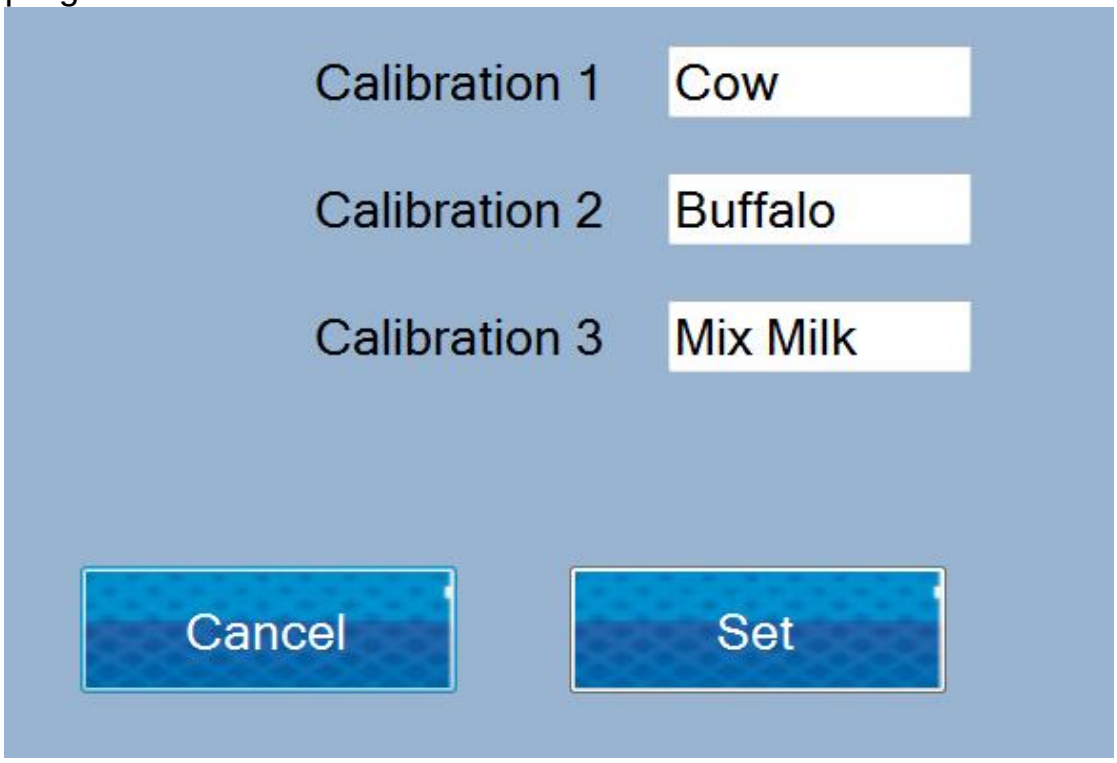
Purpose: The menus are used for selecting which parameter of which calibration will be corrected.



Settings

Set Calibration Names

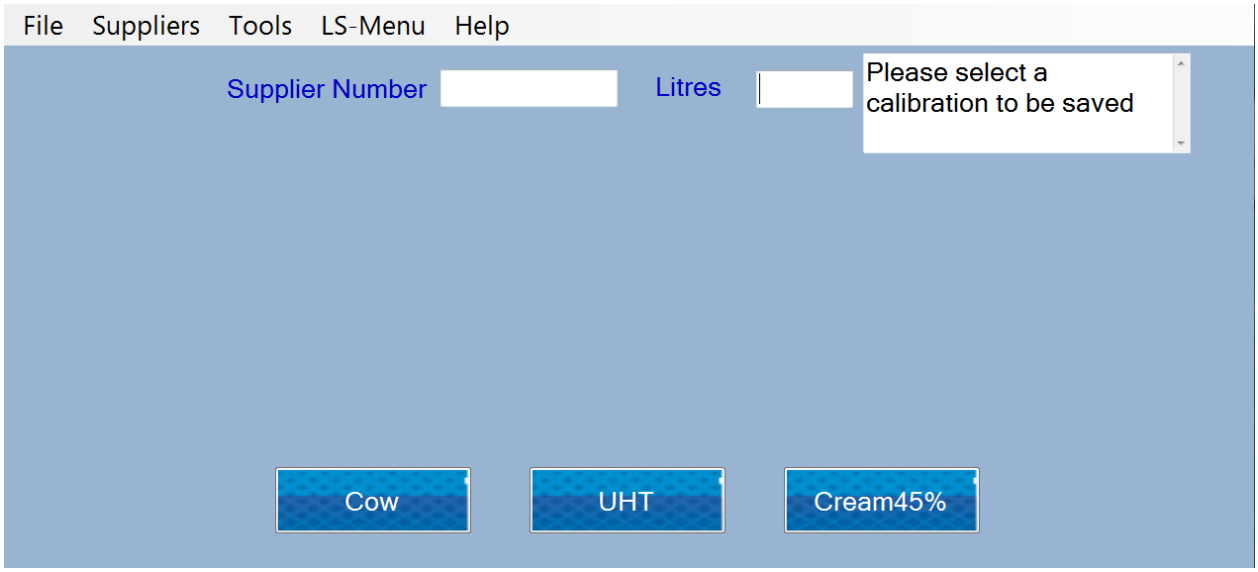
Purpose: To edit the names of the calibrations. The operator can introduce a free string of 8 alphanumeric characters. After starting, the screen displays the following, the operator must follow the instructions of the program:



Using the keyboard, the operator inputs the names of calibrations. Memorize them by pressing the Set button or refuse corrections by pressing button Cancel.

Save Calibration

Purpose: To save the calibration to a file in the computer. Select the calibration to be saved



Restore Calibration

Purpose: Restore an already saved to the tablet calibration

*Note: Each calibration is specific to the analyser. You can save a calibration and restore it only to the same machine

Autoprint Enable/Disable

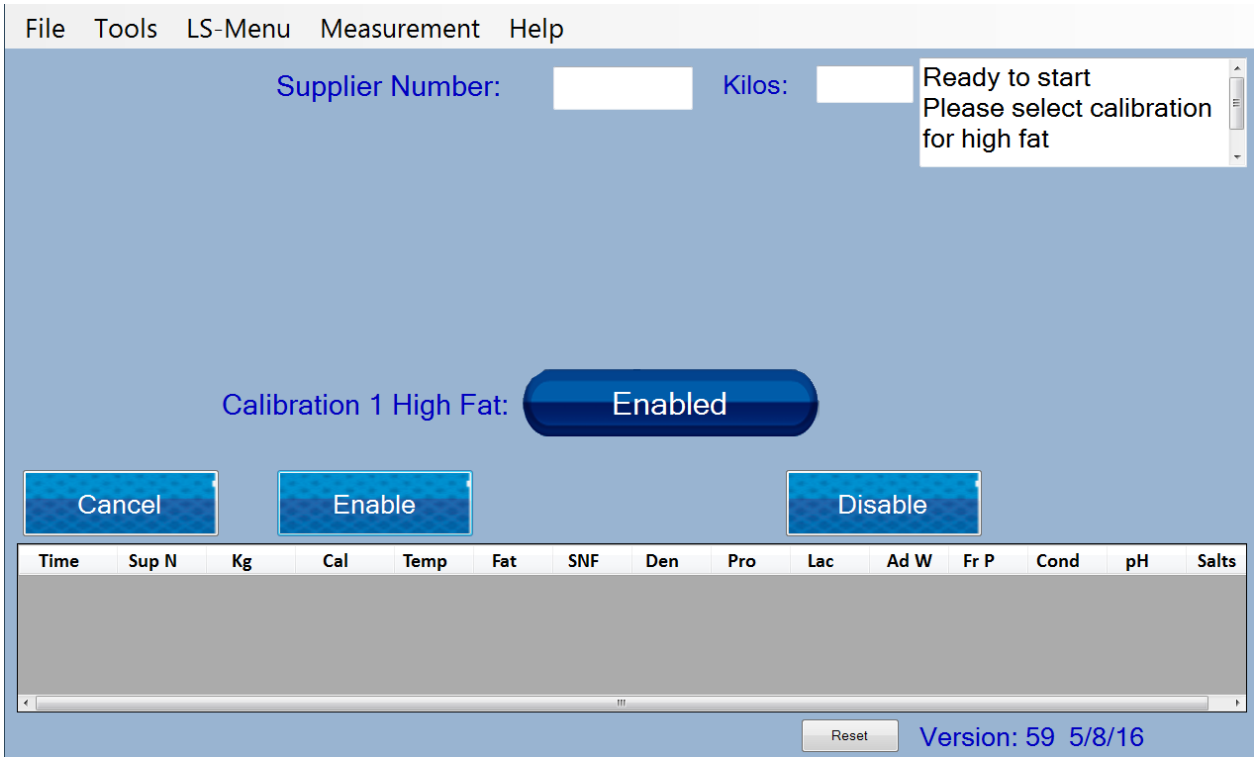
Purpose: To select whether the device will automatically print the results after finishing the measurement

Format Results:

Purpose: To select the format of the results – main or large. The device comes with factory settings for Large results. The machine should be set for operating with Large Results

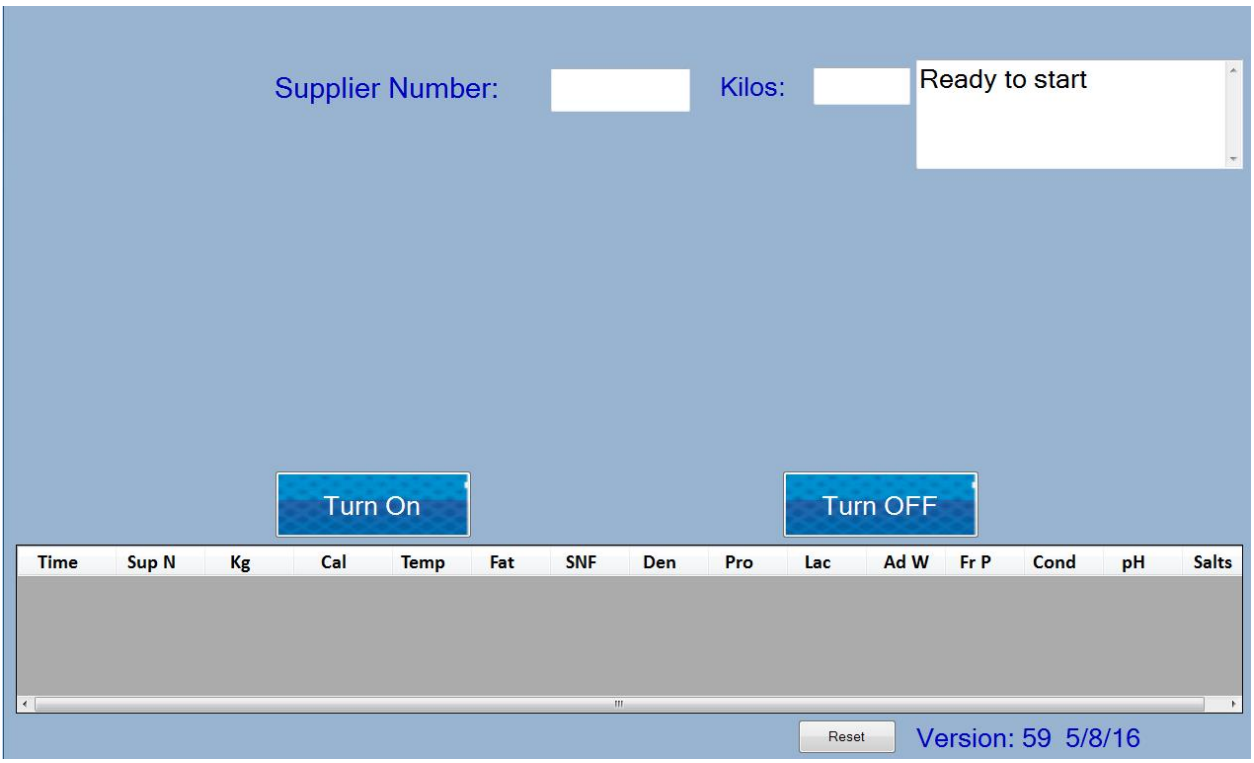
High Fat Control 45%

Purpose: To enable/ disable high fat measurement for a specific calibration for machines with High Fat Option. When selected from the menu, choose a calibration:



High Fat Speed For Calibration

Purpose: For machines **with** High Fat Option. Turn on High Fat speed for calibration, before attempting a calibration with high fat samples



Tests

Test Pump

Purpose: To test of the pump unit. Used in service conditions by qualified specialists. To end the test press the button "Finish".

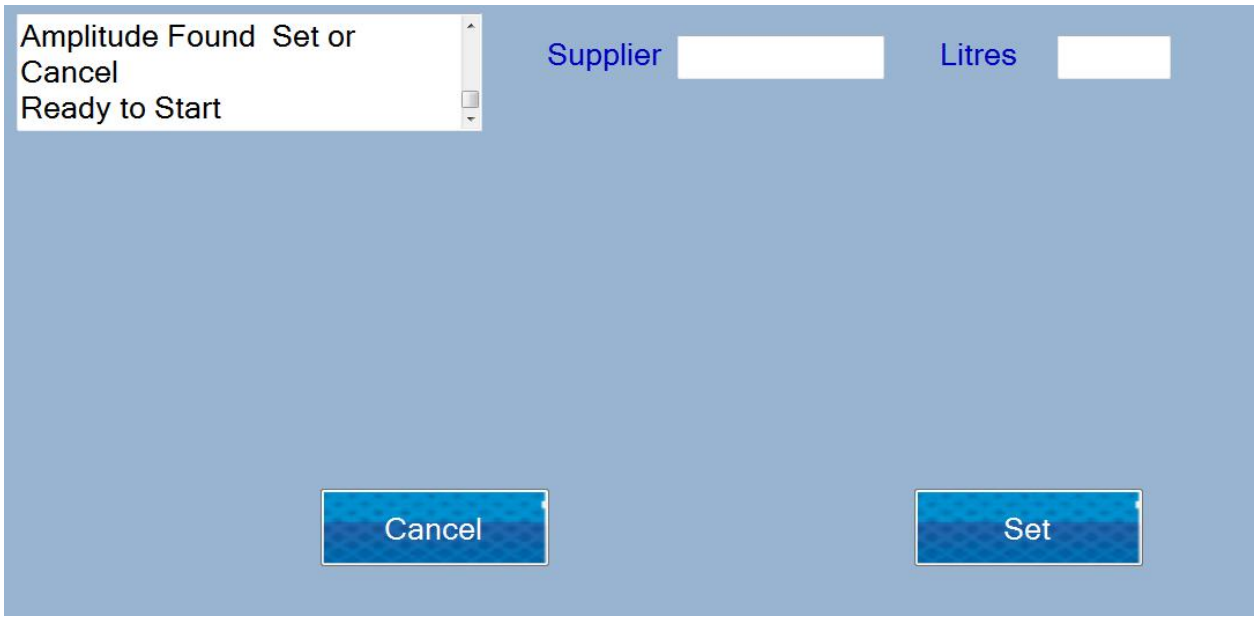
Ultrasound

Purpose: To set the measuring system of the device. Used in service conditions by qualified specialists. The procedure is similar to that used in standard devices without integrated tablet. Current messages are displayed in the field System Status (top left corner of the display)

To finish the procedure, press the button “Finish”.

Set Amplitude

Purpose: To set the metering system of the device. Used in service conditions by qualified specialists. The procedure is similar to that used in standard devices without integrated tablet. Current messages are displayed in the field System Status (top left corner of the display). When the procedure is finished apparatus brings a message that the amplitude is found and asks the user to set this amplitude or cancel the procedure



Cleaning

Starts cleaning of the analyser. It is equal to pressing the button Clean from the main menu.

pH & Co Meter

pH Meter En/Dis

Purpose: To turn on / off pH measurement in the process of measuring other parameters. It is available for devices with manufactured hardware option pH.

pH Test

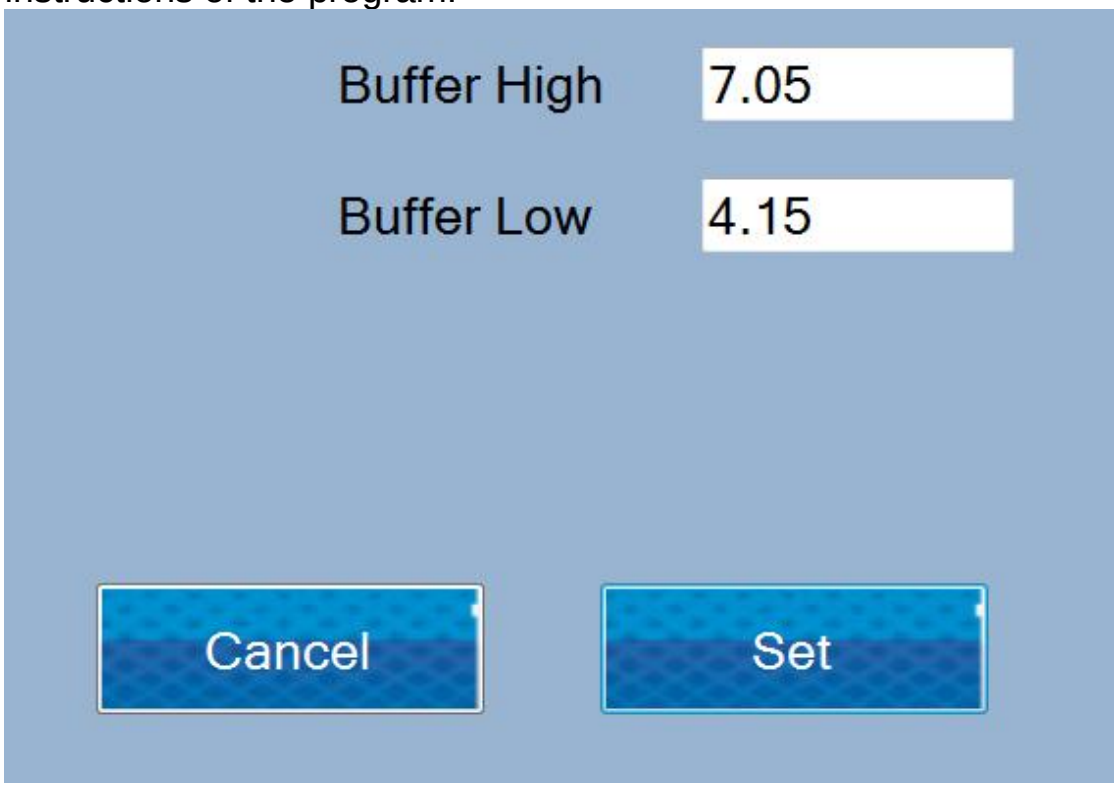
Purpose: To set a pH measurement system of the device (if the device is manufactured with an optional pH). Used in service conditions by qualified specialists.

pH Measure

Purpose: For off-line measurement of pH. In this case the analyser works only as pH meter, without measuring other parameters of the sample.

pH Meter Calibration

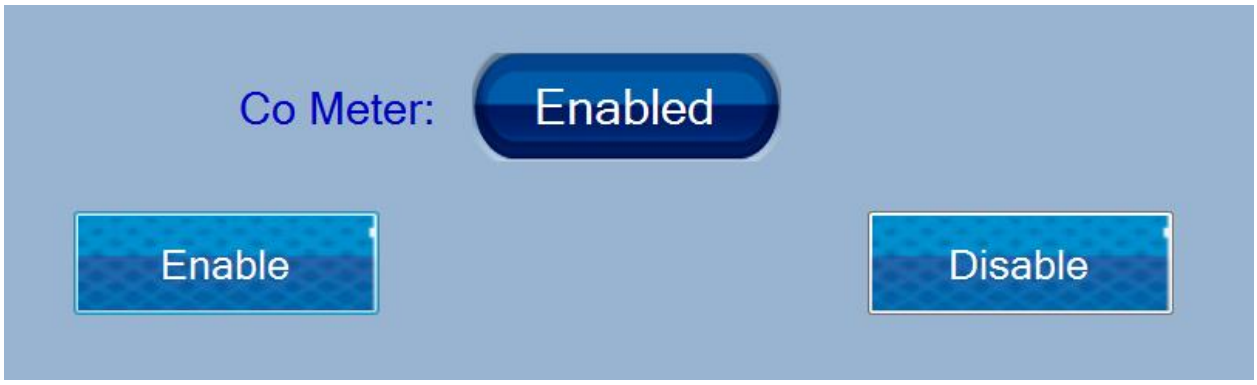
Purpose: To calibrate the system for measuring the pH. After starting, the screen displays the following, the operator must follow the instructions of the program:



The operator inputs the values of the buffers used for calibration. Selection of buffers and principles of work with the pH meter are described in the document WLS-TechManual. By pressing the Set button to go to the actual calibration. Reports of this process is displayed in the System Status, in the upper right corner of the screen. By pressing the Cancel button procedure is terminated and transferred to the main screen.

Co Meter En/Dis

Purpose: To turn on / off the conductivity measurement in the process of measuring other parameters. It is available for devices with manufactured hardware option conductivity.

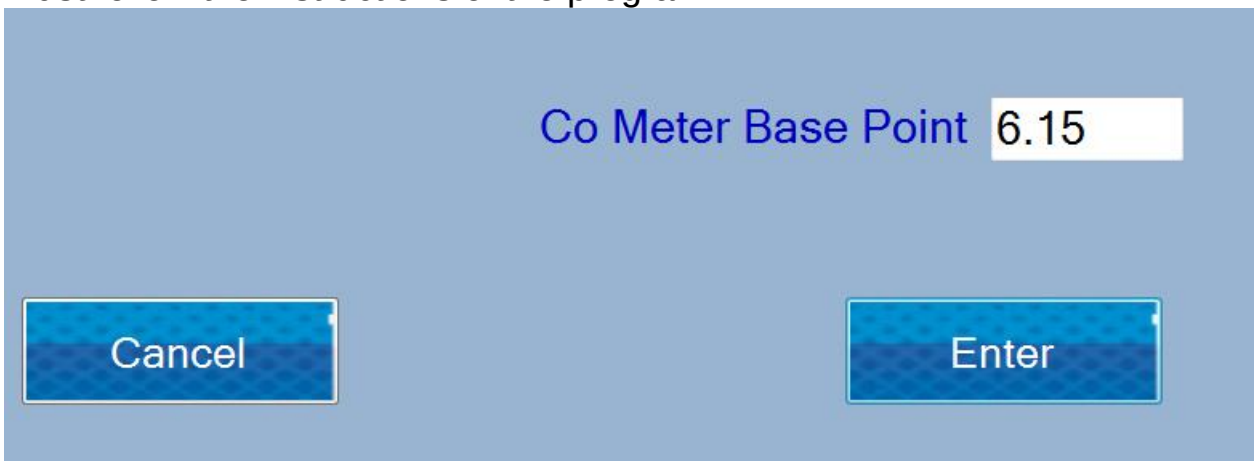


Co Meter Test

Purpose: To set up the measuring system to the conductivity of the device (if the device is manufactured with an option conductivity). Used in service conditions by qualified specialists.

Co Meter Calibration

Purpose: To calibrate the system for measuring conductivity. After starting, the screen displays the following, the operator must follow the instructions of the program:



The operator enters the values of the buffer that will be used for calibration. Selection of buffer and principles of working with the system for

measuring conductivity are described in the document WLS-TechManual. Pressing the Enter key passes to the actual calibration of the measurement system. Reports of this process is displayed in the System Status, in the upper right corner of the screen. By pressing the Cancel button procedure is terminated and transferred to the main screen.

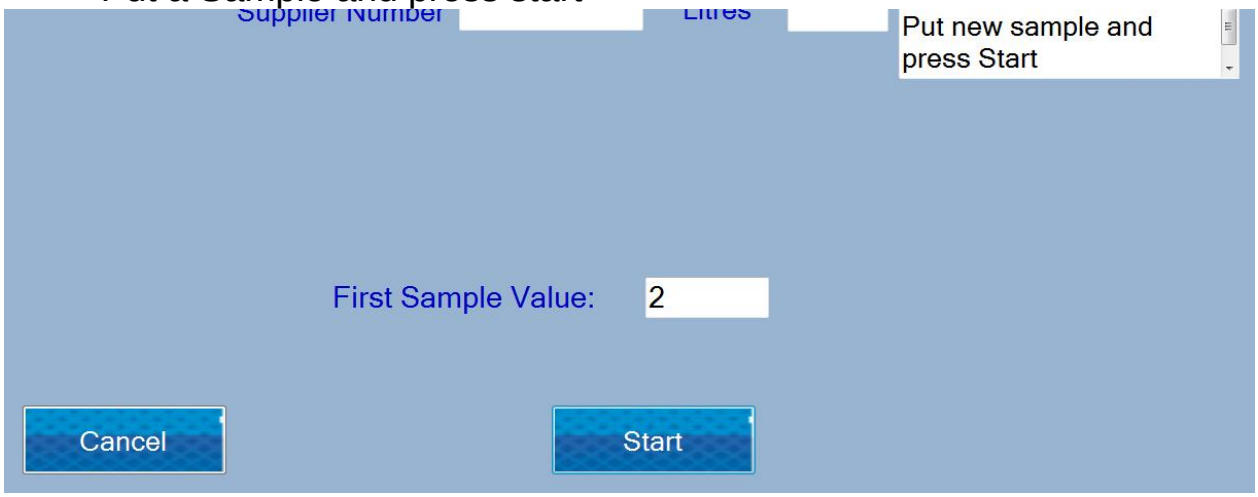
5 **Sample calibration**

Purpose: To make a precise calibration of the Conductivity Meter. For the calibration are used 5 conductivity buffers

The procedure is as follows:

- Enter first sample value

- Put a Sample and press start



- Repeat the same steps for the rest of the buffers.

For each sample five measurements are made.

Pump Control

Purpose: The following menus are used for test of the pump unit. Used in service conditions by qualified specialists.

Pump In
Pump Out
Stop

Measurement

Discard Last measurement

Purpose: Discard the last measurement from the daily report

Help

Device Identity

Purpose: Displays information about the hardware of the device - serial number version of the program board.

Operation manual

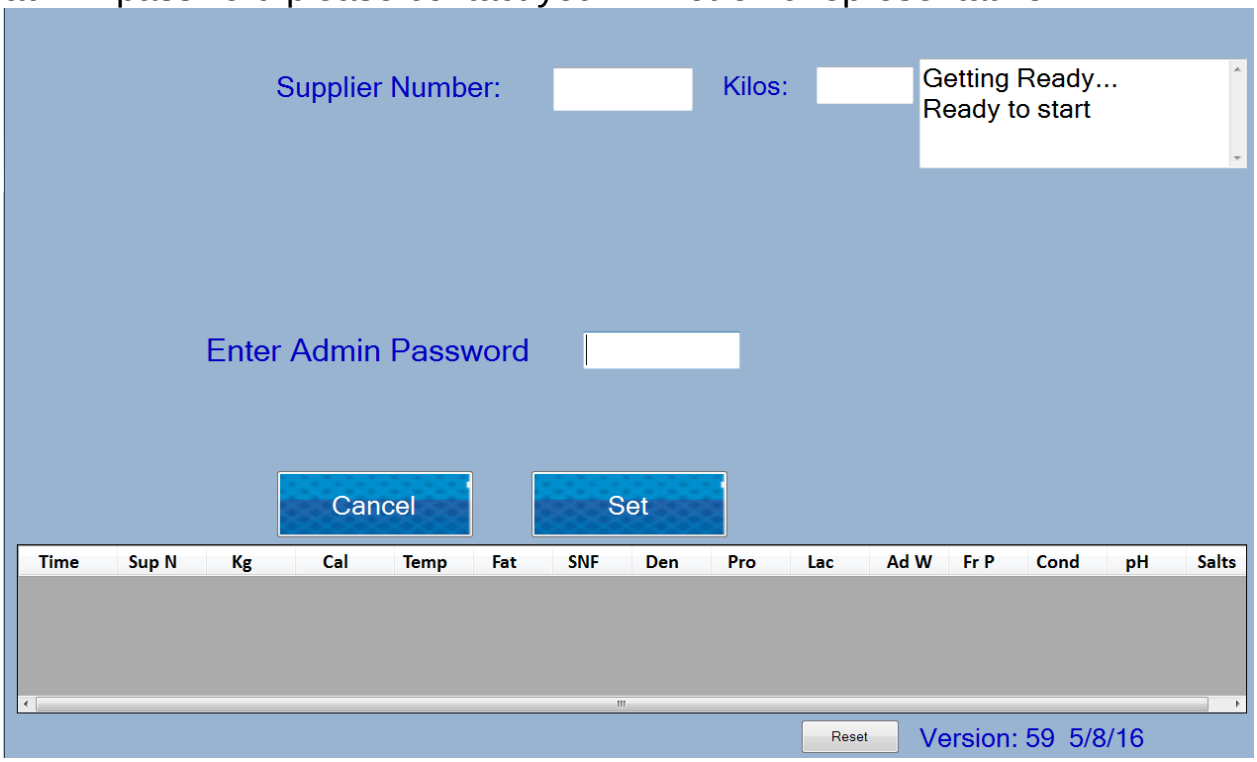
Purpose: Opens the operation manual of the device

About

Purpose: Displays information about the program in the tablet control hardware appliance.

Admin Mode

Purpose: Enter admin password for enabling admin menu. For receiving your admin password please contact your Milkotronic representative



Cleaning history

Purpose: Display document, containing the cleaning history of the device

Admin Mode

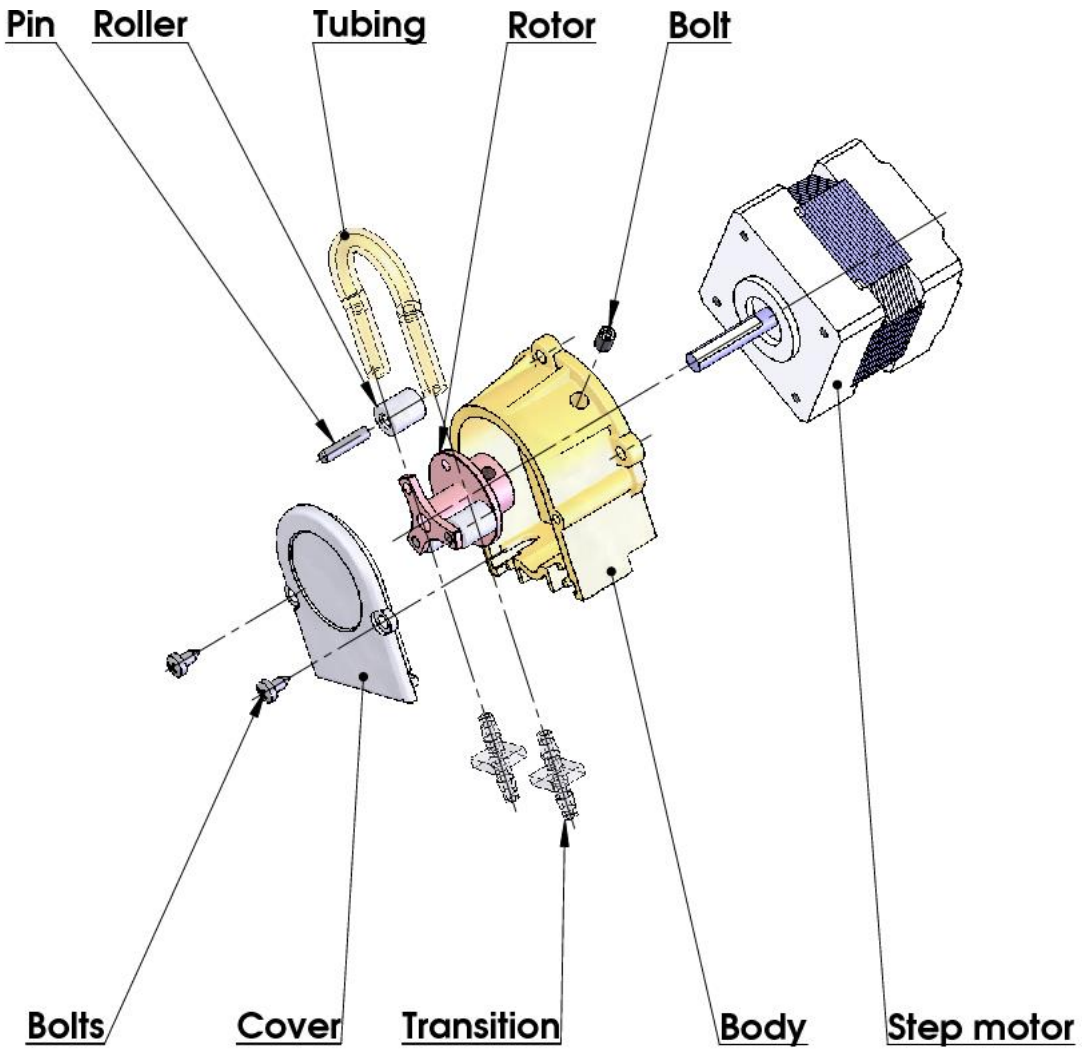
Restore Factory Settings

Purpose: Return the machine in the state of which it was produced.

NOTE! This procedure will erase all user data such as calibration corrections, new calibrations and will restore the machine to the state in which it was received from Milkotronic.

6. Peristaltic pump service

Fig.7 Peristaltic pump



7. POSSIBLE MALFUNCTIONS AND ERROR MESSAGES, TROUBLESHOOTING

In the table below are described the possible malfunctions during the milk analyzer's exploitation and ways for their repair/remedy. If the problem persists after all recommended measures are taken, please, connect the nearest service center for help. Do not forget to tell the analyser's identity.

To receive the analyzer's identity, refer to point 3.2.1.3.

Error message	Possible problem /cause	Repair/remedy
2 MA overheated Accompanied by a continuous sound signal	Overheated milk analyzer	Immediately switch off the analyzer. Pay attention the analyzer to be situated away from direct sunlight or heating devices. Wait 5-10 minutes the device to cool down or to be normalized the ambient temperature and switch it on again.
3 Empty Camera	Insufficient quantity of the milk sample sucked in the system or air in the sample	The analyzer is ready to measure the next sample. In order to avoid the future appearance of the same error message, please, check the following: - The sample is prepared according the instructions and there aren't air bubbles in it. - There is a real suction of the sample after starting measurement, i.e. it is obvious that the level of the milk sample in the sample holder decreases. In other case – there is damage in the suction system. - Avoid the end of the suction pipe to be above the surface of the liquid (not dipped enough). - Avoid curdling of the milk sample. Clean immediately if there is a sample curdled in the system. - In mode Measurement, after starting the measurement, remove the sample holder and see if there is no milk poured

		back in the sample holder.
4 Sample Overheat	Sucked overheated sample	The analyzer is ready to measure the next sample. In order to avoid the future appearance of the same error message, please, check the following: -The sample is prepared according the instructions and its temperature does not exceed the maximum permissible sample's temperature. -Complete the procedure for checking the analyzer in case of error message **Empty Camera.**

8. MAKING CORRECTIONS AND RECALLIBRATION OF THE DEVICE

In the process of work with the analyser there is a possibility the results to start differing between the data for some of the measuring parameters when measured with the milk analyzer and the corresponding reference method of analysis (Gerber for fat, Kjeldhal for proteins etc). In order to establish the possible discrepancy and to correct the readings of the milk analyser do the following:

8.1. Taking samples and preparation of samples for checking the accurracy of the milk analyser, making corrections and recalibration

This is a basic moment for the correct checking the accuracy of the analyser and for making correct and precise correction and calibration. It is accomplished according Appendix Sampling and preparation of samples for verification the accuracy of the milk analyzer, making corrections and recalibration.

8.2. Determination the type of the discrepancy:

8.2.1. Making measurements

Make measurements with different samples (not less than 3) with known values of a separate parameter (for example fat content), determined by the known reference methods of analysis (for example Gerber's method for determination of fat content). For more accuracy it is recommended among these samples to be also such with values, close to the lowest and highest bounds for the measured parameters.
Make 5-time measurement for each of the samples. Calculate the average value for each sample parameter, without taking into consideration the first measurement for each sample.

8.2.2. Analysing the measurement results

Make comparison between the values of the parameter from the reference sample and measured with the analyser. Make analysis of the difference received.

8.2.2.1. If the received differences are relatively constant value for samples with different content of the analysed parameter, it is necessary to make correction.

For example

M% of the reference samples:	2,20	3,00	3,80	4,60	5,20
M%average when measuring with the analyser:	2,38	3,17	4,01	4,79	5,42
Difference:	0,18	0,17	0,21	0,19	0,22

Conclusion: the difference is relatively constant value and correction is possible to be done with – 0,2 % (see Corrections, p6.3.3)

8.2.2.2. If the differences are not a constant value it is necessary recalibration to be done.

For example.

M% of the reference samples:	2,20	3,00	3,80	4,60	5,20
M% when measured with the analyser:	2,02	2,93	3,76	4,75	5,44
Difference:	-0,18	-0,07	-0,04	0,15	0,24

Conclusion: It is obvious that the difference is variable value and recalibration have to be done.

8.3. Making corrections

8.3.1. Possible corrections, limits and changing steps

Every parameter from each calibration may be separately corrected. Below is the table with possible corrections, limits and changing steps:

Parameter	Increasing	Decreasing	Step
FAT	0.95%	0.95%	0.01%
SNF	4.75%	4.75%	0.05%
Density	4.75%	4.75%	0.05%
Lactose	0.95%	0.95%	0.01%
Salts	0.95%	0.95%	0.01%
Proteins	0.95%	0.95%	0.01%
Added water	9.00%	9.00%	1.00%
Sample’s temperature	9.90^{o}C	9.90^{o}C	0.1^{o}C

Corrections are described in a dedicated software tool.

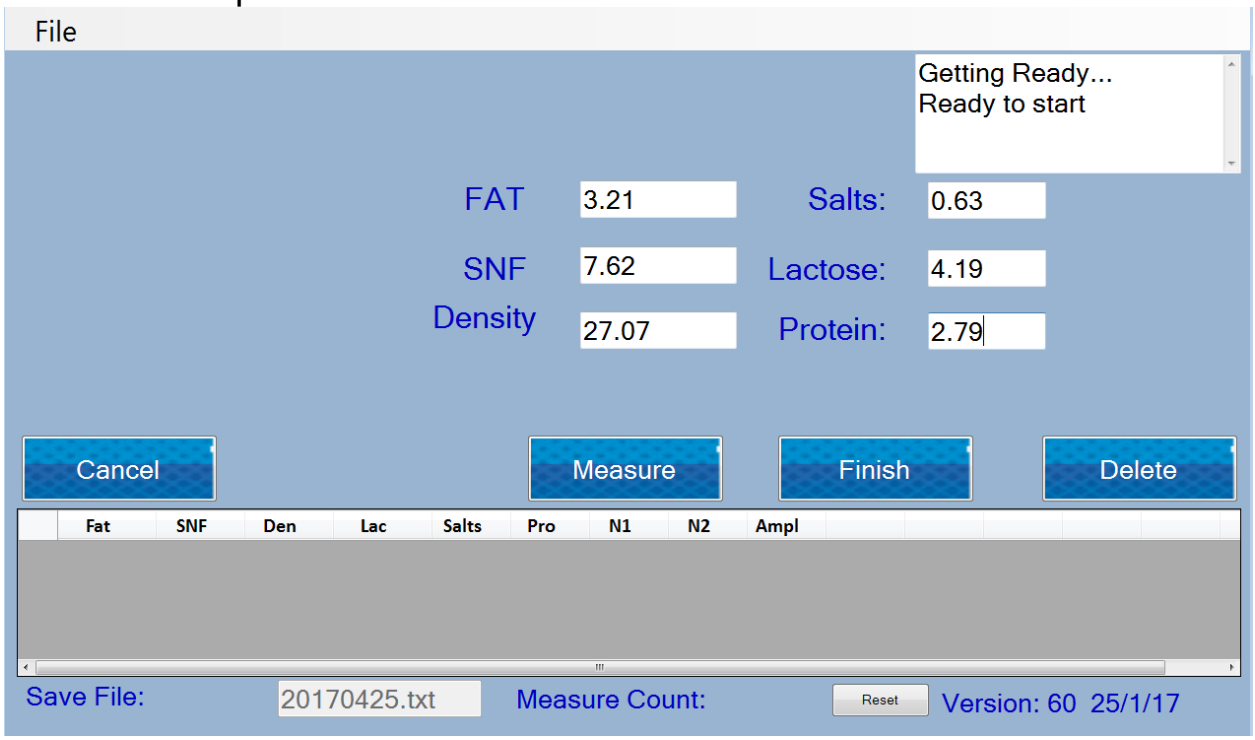
8.3.2. Making verification

After the corrections are made put the milk analyser in working mode and make several times measurement of reference samples with known values of the corrected parameter. If the difference between the values of the parameter from the reference methods and milkanalyser are in the limits for the parameter it may be considered that the correction is successfully made.
If the discrepancy between the measurements from the milk analyser and classical methods is bigger than is necessary to make second correction according above described way.
If after the second correction the results are unsatisfactory we recommend making a calibration of the analyser.

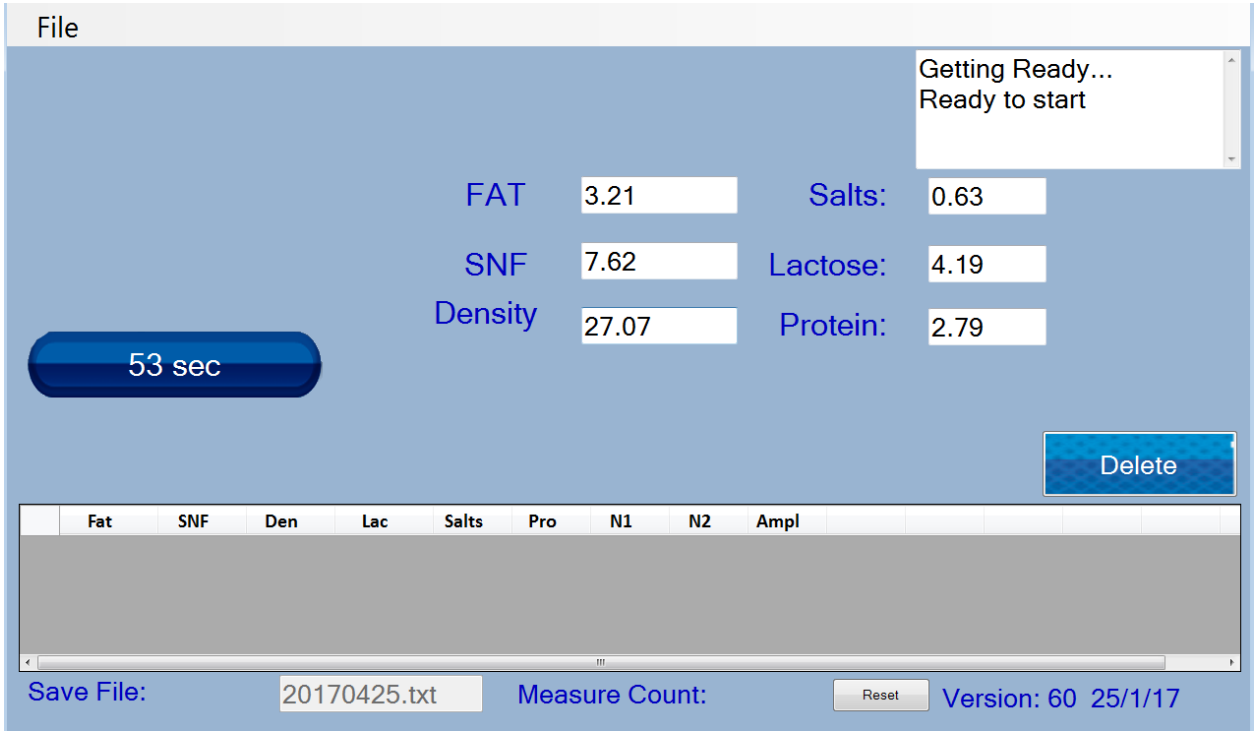
When making corrections or calibrations be 100% sure in the accuracy of the reference methods result.

8.3.3 Recalibration of the device

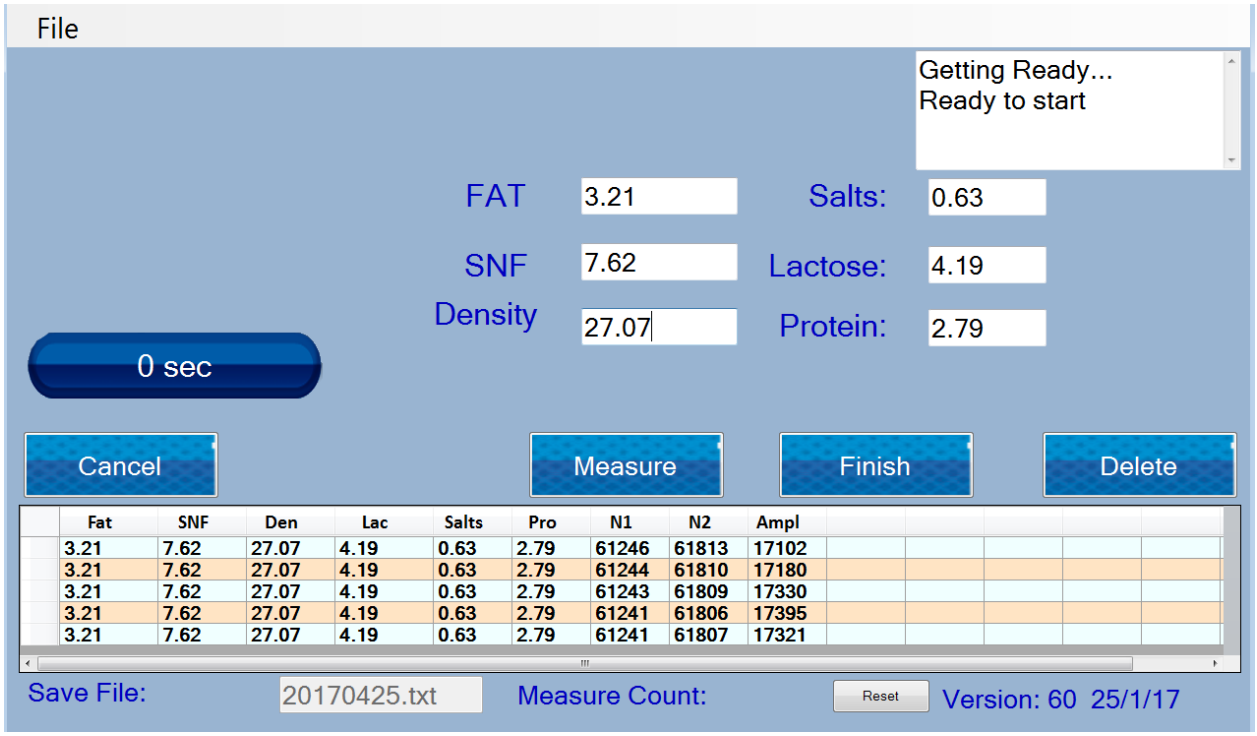
*Note: Before starting calibration please read appendix 1 of this manual.
To start the procedure go to Menu -> Special Modes -> Calibration
The window opens:



Input the parameter values for the high sample. By pressing the “Measure” button start a measurement



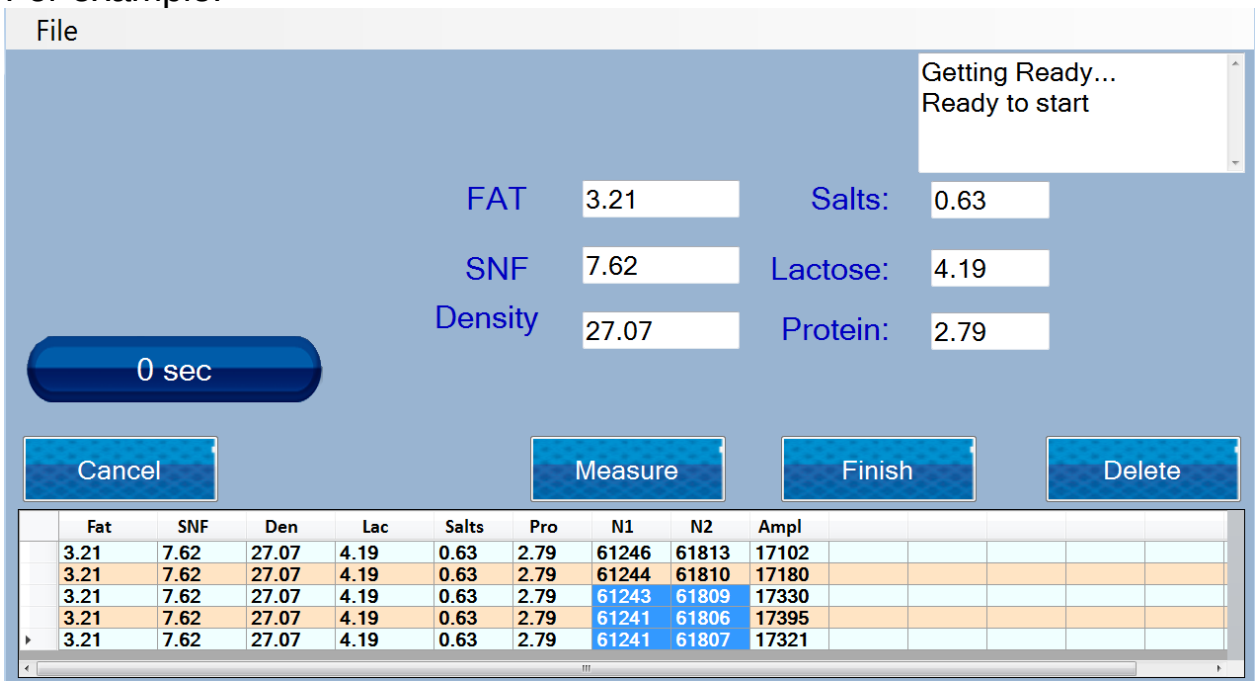
Finished measurements are added to the table



Stir well the sample with high fat value. Temperature of the milk sample has to be between 18-22°C.

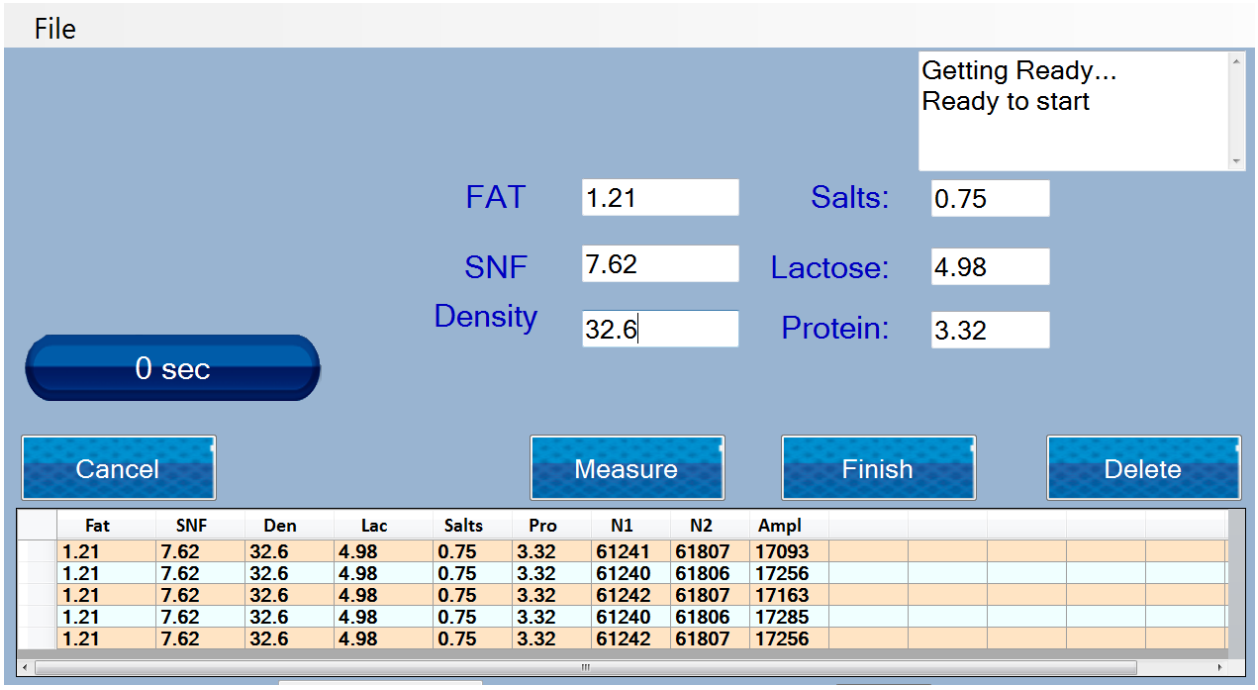
You have to measure high fat sample 5 times. Results are shown on the computer's display.

Delete the first two measurements – mark the value you want to delete and press Cut. Check if the results in the columns N1 and N2 are stable and in the limits 60000-65000. For stable results are taken those with difference 2x-3x one from another.
For example:



Fat	SNF	Den	Lac	Salts	Pro	N1	N2	Ampl
3.21	7.62	27.07	4.19	0.63	2.79	61246	61813	17102
3.21	7.62	27.07	4.19	0.63	2.79	61244	61810	17180
3.21	7.62	27.07	4.19	0.63	2.79	61243	61809	17330
3.21	7.62	27.07	4.19	0.63	2.79	61241	61806	17395
3.21	7.62	27.07	4.19	0.63	2.79	61241	61807	17321

If results for N1 and N2 are with bigger difference than 3x, check milk's acidity (it has to be normal one); stir the sample and measure once again 5 times; in case you receive again not stable results, address our service.
If the results are normal, write in fields **Calibration sample – parameter values** the new values of low fat sample.
Stir well the sample with low fat value. Temperature of the milk sample has to be between 18-22°C. You have to measure low fat sample 5 times. Results are shown on the computer's display. After the fifth measurement of the low fat sample



Delete first 2 measurements. Check the stability of the results in columns №1 and №2

In the field **Calibration sample – parameter values** enter 0, because the next sample will be water.
Pour water. Measure water 5 times without changing it. The water has to be opaque. This is normal for calibration with water.
Check stability of the results in columns №1 and №2
Delete the first 2 measurements with water.
After finishing water measurement check carefully the results and if they are stable, click **Finish**
Confirm by pressing **the calibration channel** and the program will download the new calibration coefficients in the analyser.
When the analyzer is connected the next time it will be ready for work with those milk types you've just calibrated it for.

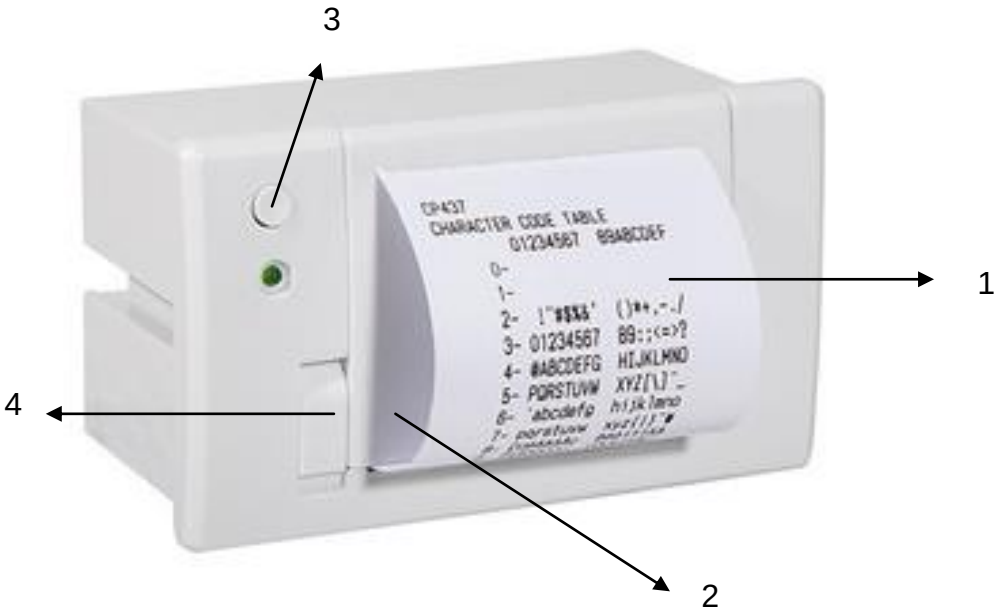
Checking the calibration
Switch on the calibrated device.
Make sure it shows the same serial number as this already calibrated. For checking use the third sample with medium FAT content. Measure the milk 5 times in the mode you've calibrated it.
In case that the device is not connected towards printer write down the results. Ignore the first two results.
The rest three could not differ one from another more than 0,05% FAT, 0,07% SNF, 0,7% Density.

9.Basic printer characteristics

9.1. Basic printer characteristics

printing method	Thermo
Type of paper	Termorulony sensitive to the heat of the party outside
Recommended types of paper	From 55 g / m2 to 70 g / m2
Width	57,5 mm ± 0,5 mm

Fig. 8 Printer control panel



1. *Printout*
2. *Paper roll compartment*
3. *Printout button*
4. *Cover opening button*

Changing the roll

To change the paper rolls proceed as follows:

1. Press the button as it is shown on the figure.

2. Position the paper roll making sure it unrolls in the proper direction.

3. Tear off the paper and close the cover

Sequence of actions when printing

The embedded printer is automatically switched on with switching on the device. After finishing the measuring procedure the results are automatically printed out. If there is a need of repeated printing of the same results the operator has to press the button Print on Main Display (each pressing the button Print - the results will be printed out). If you do not need to print out the results after the measurement is completed, just open the lid of the printer.

10.WORKING WITH THE KEYPAD

Fig. 9 Keypad

0-9 - numbers.
** - "ESC"*
 # - "Enter"

Letters A,B,C,D:
A – Tab
B – backspace
C – Delete
D – Decimal point.

11. ADDITIONAL POSSIBILITIES OF THE ANALYSER

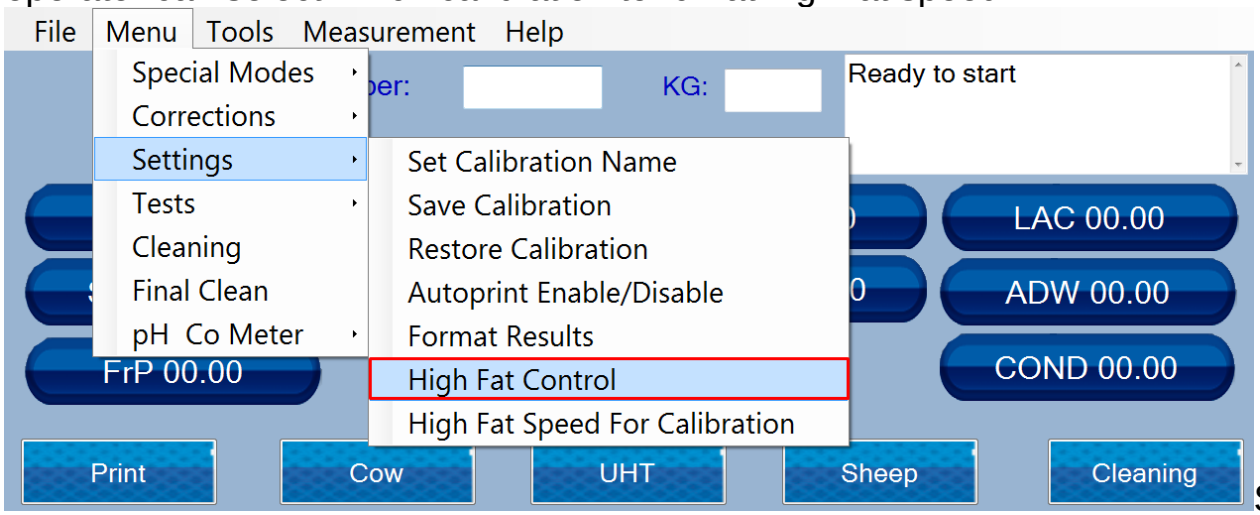
11.1. Connecting to 12 V DC power supply.

If there is a need the analyser to work on place without electrical supply available, then it could be powered by car battery or other 12 V DC external power supply. Use the 12 V power supply cable (art. number 30030).

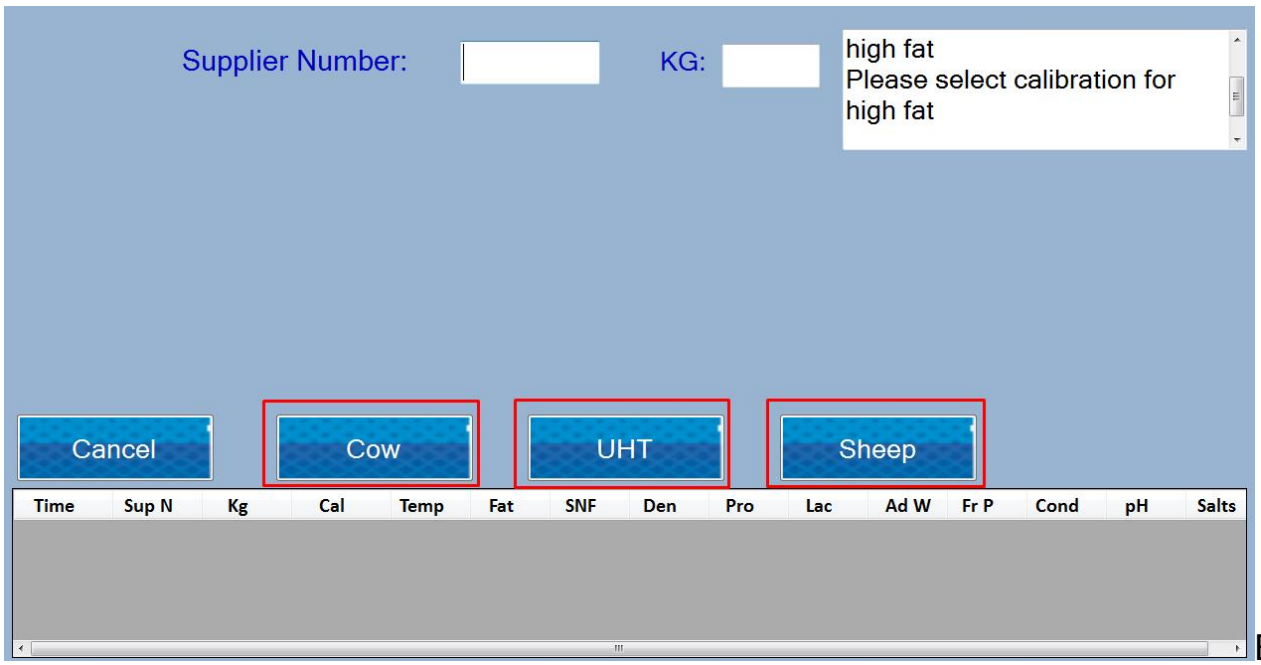
11.2. Measuring high fat samples (option).

The standard device measures samples up to 25% fat.
On customer's request, the device could be produced with possibility to measure samples up to 45% fat. The customer can choose which calibration to have this possibility and which not, as well as during the process of exploitation to change the measuring mode i.e. to pass from measuring normal fat percentage towards high and vice versa.
What the operator sees during these passes is the difference in the speed of sucking the sample. For that purpose, the high-fat sample has to be preliminary heated up to 30C +- 3C.

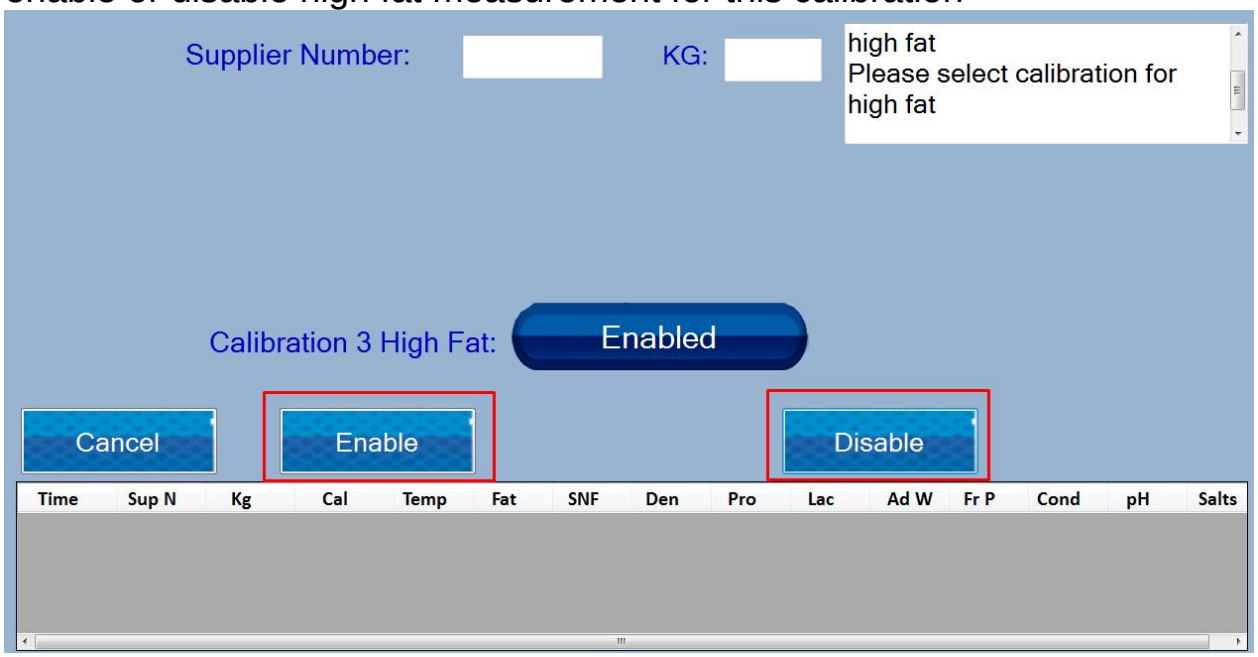
If the device is with High Fat option, the operator can select which calibration to run at a high fat speed. By going to Menu->Settings->High Fat control the operator can select which calibration to run at high fat speed.



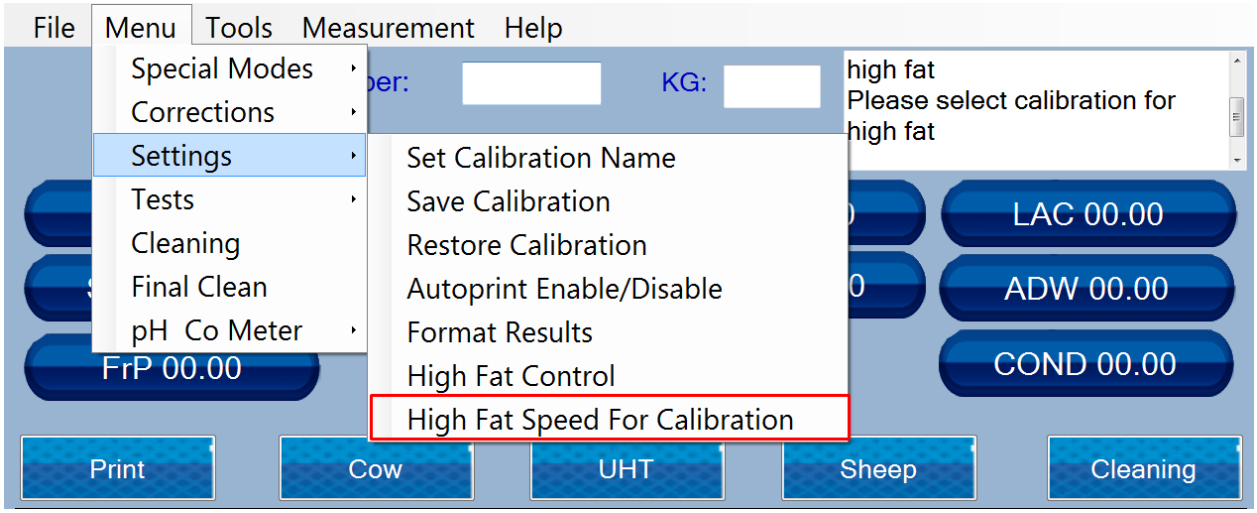
Select the calibration you need so you can edit the status



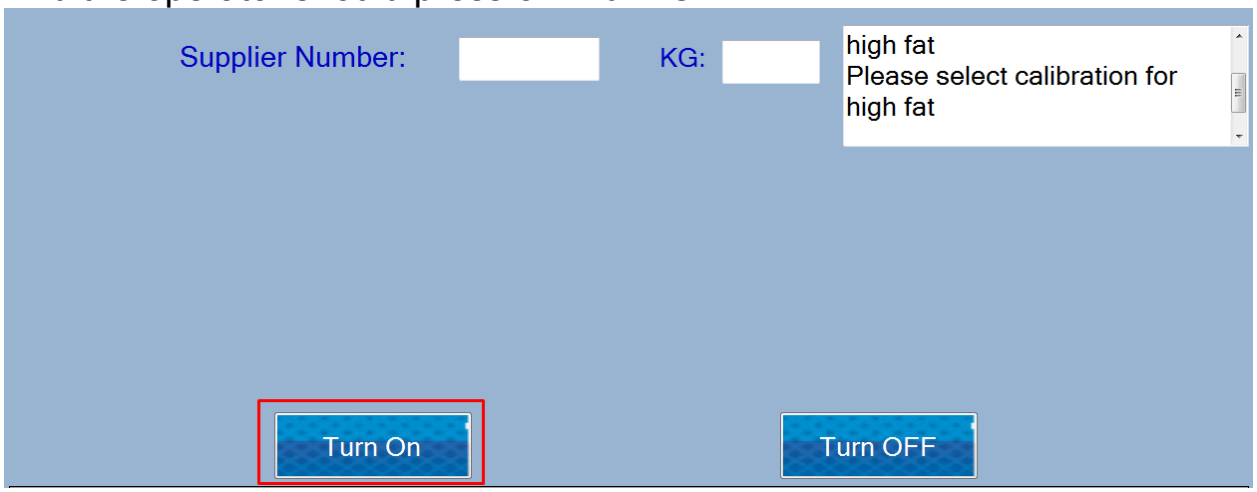
By clicking on the calibration the details windows appears and the operator can enable or disable high fat measurement for this calibration



By pressing the appropriate button, the operator can select the type of measurement and exit the menu. If you change the type of measurement of the calibration to do calibration for the corresponding speed. When calibrating for measuring samples with high fat content, before proceeding with the calibration procedure, the operator must select the menu ->Settings ->High Fat speed for calibration



And the operator should press on “Turn On”



With this the device is ready for calibration with high fat samples. The user should start calibration procedure by going to Menu->Special Modes->Calibration

11.3 Saving and Archive of measurement data

After each measurement is finished, the results are stored in file with nameyyyyMMdd.txt, in C:/LSdata/import, where yyyy is the year, MM is the month and dd is the day, in which the measurements were made. This means there is such file for each day in which measurements were made. The structure of the file is as following:
Date ‘tab’ time ‘tab’ supplier ‘tab’ litres ‘tab’ serialNumber ‘tab’ calibration number ‘tab’ temperature of the sample ‘tab’ fat ‘tab’ snf ‘tab’ density ‘tab’ protein ‘tab’ lactose ‘tab’ Added water ‘tab’ salts ‘tab’ conductivity ‘tab’ ph ‘tab’ freezing Point,where ‘tab’ is separator between values

At the same time the results can be sent to a cloud server via Internet. So if the client provides protocol for communicating with their cloud server, the program will automatically send the results, when the measurement is

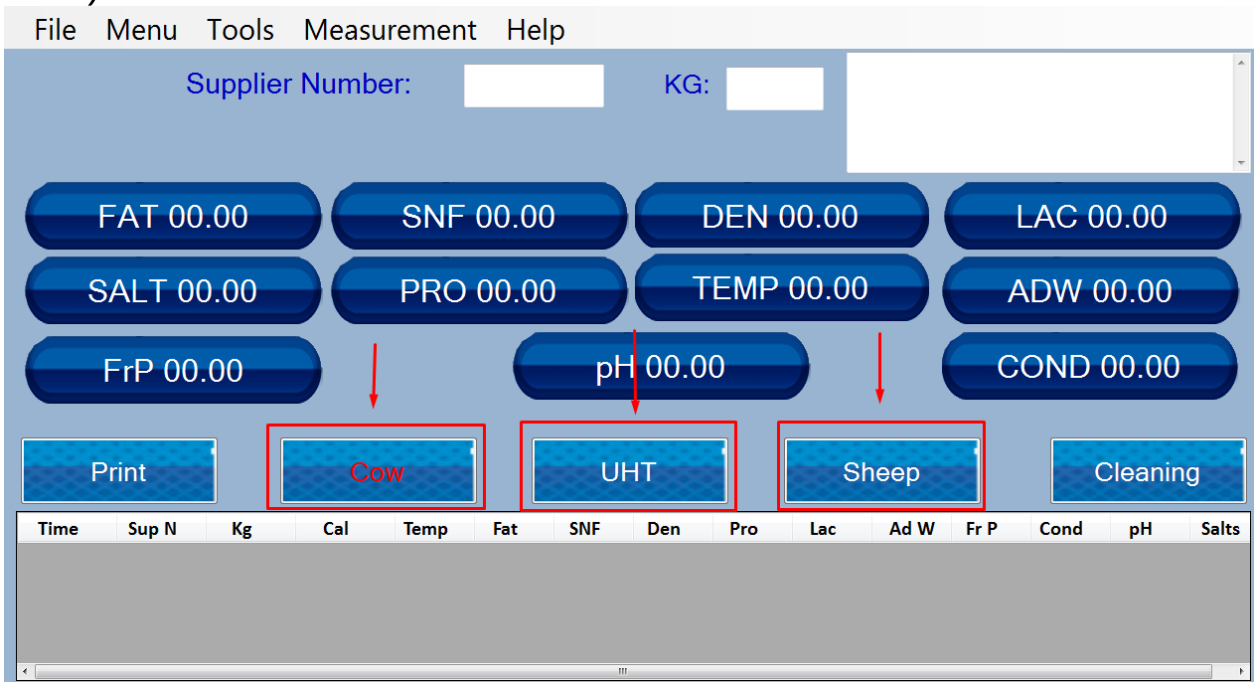
made. At the moment the machine sends the results to a test cloud server using HTTP REST API, so if given a proper REST API address, the results can be easily redirected to this address.

After finishing the measurements for a shift or group of measurements of operators choosing, the inbuilt data collection program can be started, which comes installed on every tablet – LSAN-DB (username:1, password: 1), which manual LSANDB_UserGuide.pdf can be found in c:/LSdata

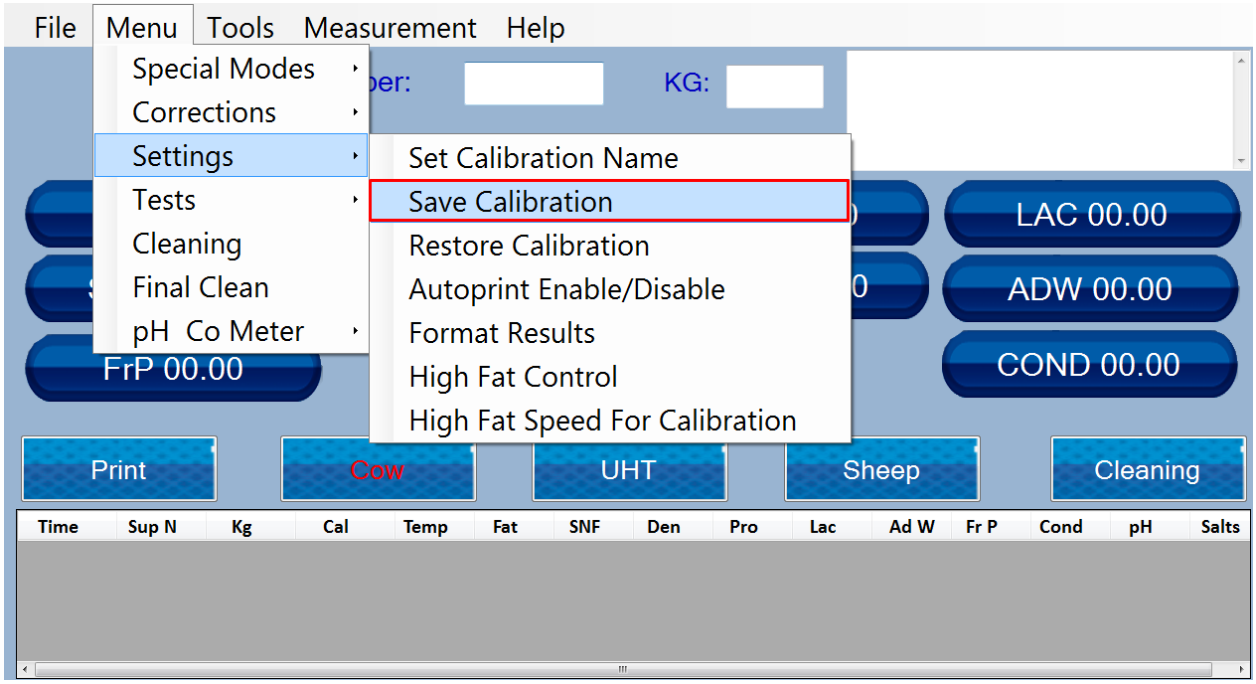
11.4 Possibility of more than 3 calibrations

Lactoscan MCCW allows the user to have more than the 3 calibrations that are inbuilt in the device.

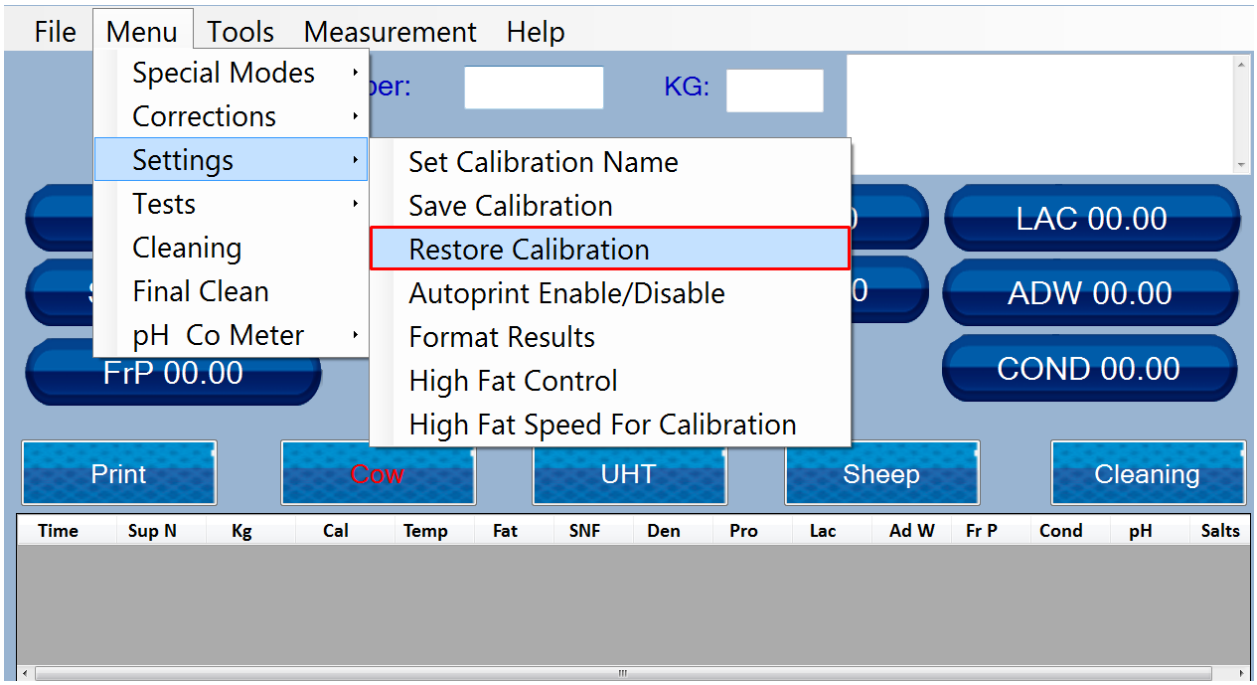
At any moment the analyser has 3 active calibration, which names are written on the middle 3 buttons of the Control Buttons (Operation manual section 3.2.1)



Each Calibration made in this device can be saved to the tablet, which is operating the analyser(operation manual, section 5 – Settings – Save Calibration)



At any moment the user can Restore a calibration on one of the 3 calibration channels (operation manual, section 5 – Settings – Restore Calibration)



This way the user can have any number of calibrations saved to the tablet and when needed Restore(replace) one calibration with another

Appendices

APPENDIX 1: PREPARATION OF SAMPLES FOR MILKANALYSERS' CALIBRATION

For calibration are needed samples of cow milk with the following parameters:

		Low Fat	High Fat	Middle
1	Cow	2,2%	5,2%	3,6%

For the calibration are needed:
1. Distilled water
2. Min. 3 milk samples with known values for fat, SNF, protein, density, lactose, salts.

Calibration samples have to be with low, middle and high values of the analyzed components. Samples have to be representative for given milk type. Volume of the sample has to be enough for making min 5 measurements for each sample – not less than 1,00 l. Changes in the analyzed parameters in the samples have, if possible, to cover the whole measuring range – i.e. used samples to be with low, middle and high content of the analyzed components.

Methods of milk samples preparation for calibration.
For milk sample with middle value of the analysed components we recommend to use milk taken from not less than 10 animals from most common in the region breed.
Sample with low and high value are prepared on the following way:

1. Pour the fresh milk with FAT at about 3.7% in a separating funnel.
2. Leave the funnel with the milk in refrigerator for 12 hours at temperature +5-+8 ° C.
3. Draw the substratum of the separated milk in a vessel, mix it well, pour it and heat it in water-bath up to 20°C.
4. Pour the upper layer in another vessel.
5. Determine the concentration of the measured components (FAT, protein, SNF, density, lactose, solids) by using certified methods.

The analyser's accuracy depends only on the correctness of the chemical analysis of the components in the samples and the normal acidity during calibration!

It is recommended the first cow milk sample with low fat content to be with the following parameters:
2-2,3% FAT; 8.7-9% SNF; 3,3-3,5 % Protein; 4,8-4,9% Lactose; 0,75 Salts; 1030-1033 kg/m3 Density.

The second cow milk sample with high fat content to be with the following parameters:
5-5,3% FAT; 8.4-8,79% SNF; 3,1-3,2% Protein; 4,6-4,7% Lactose; 0,7 Salts; 1028-1029 kg/m3 Density.
If, after milk's separation you do not obtain samples in the requested range, then, by adding milk with high fat value into the low fat milk sample you can obtain necessary value-2,3%
Analogous to this, by adding low fat milk sample into a milk sample with high fat value you may receive 5,3%
Samples with medium values are received by mixing low fat and high fat samples in necessary proportion.
If there is a need of longer sample storing they have to be preserved; the most commonly used preservative is potassium dichromate (K2Cr2O7) - 1 g for 1 000 ml.
When using samples, stored shortly, preliminary pour the sample from one vessel to another in order to distribute the milk components evenly paying attention not to form foam in the sample.
When the samples are stored for a longer period it is recommended to warm it up to 35-45 °C, and the vessel to be shaken carefully. In case that there is a cream stuck on the vessel's surfaces – remove it. The sample is poured from vessel to vessel several times and is cooled down (advisable to 20 °C /.

If there is separated liquefied fat or white particles with irregular form on the vessel's walls reliable results could not be received.

Because it is very difficult both lactose and salts to be measured but they are substantial and influence in great extend when determine added water. That's why it is better both lactose and salts to be calculated by using SNF results. The milk must be for sure without added water.

If you are unable to make the analysis of milk in certified methods in a pinch you can use the following formulas:

DETERMINATION OF THE BASIC PARAMETERS IN THE MILK SAMPLE BY USING FORMULAS IS NOT AS PRECISE AS USING THE ARBITRARY METHODS, BUT IS SUITABLE FOR USAGE IN FIELD WORK.

1. Determination some of the parameters by formulas

There is dependence between the different parameters in milk and its density, which may be expressed with mathematical equation. On this base different formula, tested and confirmed by the classical laboratory methods for analysis, are developed. We recommend the following:

2. SNF determination.

For determination of SNF the correlation dependence exists between the milk's density, fat and SNF in the milk. When the density and the fat are known, the SNF can be calculated.
There are several formulas with different applicability.

A/ When the Total Solids and fat are known
SNF is calculated by subtracting the fat percentage from the Total solids.

SNF = Total Solids – F (%)

Where
Total Solids in (%),
F – fat content in (%),
This formula is used for determination of SNF in whey, buttermilk, and cream.

B/ Known quantity of fat and density (most commonly used method when maximum accuracy is needed).
We recommend the following formula:

$$SNF = \frac{0{,}075 * F\% + 100 - 100 / density}{0{,}378}$$

This is a universal formula and actual for milk of almost all kind of cows and sheep all over the world.

3. Determination of lactose content

We recommend the following formulas:

A/ for cow milk

Lact. = SNF * 0,55 (%)

Where
SNF – content of SNF in percentages (%),
0,55 – constant coefficient.

B/ for sheep milk

Lact. = SNF* 0,45 (%)

Where

SNF –solids-non-fat content in percentages (%),

0,45 – constant coefficient.

This is an actual coefficient for sheep breeds on the territory of the Balkan Peninsula.

4. Determination of salts content

We recommend using the following formulas:

A/ for cow milk

Salts = SNF* 0,083 (%)

Where

SNF – solids-non-fat content in percentages (%),

0,083 – constant coefficient.

B/ for sheep milk

Salts = SNF * 0,075 (%)

Where

SNF – solids-non-fat content n percentages (%),

0,075 – constant coefficient.

This is an actual coefficient for sheep breeds on the territory of the Balkan Peninsula.

5. Determination of total proteins content

We recommend using the following formulas:

A/ for cow milk

Protein = SNF * 0,367 (%)

Where

SNF - solids-non-fat content in percentages (%),

0,367 – constant coefficient.

B/ for sheep milk

Protein = SNF * 0,475 (%)

Where

SNF – solids-non-fat content in percentages (%),

0,475 - constant coefficient.

This is an actual coefficient for sheep breeds on the territory of the Balkan Peninsula.

APPENDIX 2 FREEZING POINT DETERMINATION

1. Methods for determination.

The milk analyzer determines the freezing point of each sample and the quantity of added water. The milk analyser does not measure the freezing point, but calculates it from the components it depends on. The basic components in the milk are water, solids, lactose, FAT, proteins, minerals (salts) and acids. The freezing point depends only on the diluted in the milk components and quantity of the solvent (in the milk it is water). The ultrasonic technology allows direct measurement of FAT, proteins, lactose + salts (the soluble components, only influencing the freezing point), and the quantity of the solvent in % is determined by 100 % – total solids %, total solids = lactose % + FAT % + proteins % + salts % + acids %.
Without understanding the meaning of the freezing point – determined or shown from the milk analyzer added water result easily may lead to a mistake for the value of this parameter.

2. The basic freezing point.

Milk freezes at lower temperature than water. The average freezing point of the raw milk in the most regions is at about -0,540°C. The average reading for your region is called “basic” freezing point.
The freezing point of milk is a “physiological constant”. This does not mean that it will not vary. In fact feed, breed, season, time of lactation, climate, whether the sample is taken at the beginning, middle or end of lactation – all these factors will have an effect on the freezing point of the individual sample. This means that there is an average value of all these numbers. The more samples used in obtaining this average, the more reliable it is as a base. Or the basic freezing point is an average of freezing points of milk, taken from many cows. When a laboratory checks a producer, it is only comparing the average of the producer’s cows against a larger area average.
The Health authorities establish the basic freezing point or agriculture departments in some regions, sometimes by universities, separate dairy producers, or their associations. Frequently, tolerances have been established on top of a basic freezing point to allow some variations in the milk as well as device or operator variations.
Without mentioning the basic freezing point, the Association of Official Analytical Chemists now recommends an upper limit freezing point at -0,525°C (2,326 standard deviations above the most recently determined North American average of –0,5404°C), below which there will be at 95%

confidence that will show 99% of all freezing point determinations on unwatered milk:
“if the freezing point is –0,525°C or below, milk may be presumed to be free of water or may be confirmed as water free by tests, specified below. If the freezing point is above –0,525°C, milk will be designated as “presumptive added water” and will be confirmed as added water or added water free by tests specified below. Evaluate extreme daily fluctuations in the freezing point of herd, pooled herd, or processed milk for presence of added water”.
“Presumed added water”, as described above, must be “confirmed” by means of tests on authentic milk samples obtained as specified in the AOAC METHODS.
After determination the freezing point of your sample via the milk analyzer, the added water is calculated using the following formula:

$$AddedWater = \frac{FrPo\,\mathrm{int}_{Base} - FrPo\,\mathrm{int}_{Calc}}{FrPo\,\mathrm{int}_{Base}} * 100[\%]$$

Where:
FrPointBase is the basic freezing point
FrPointCalc is measured freezing point

Note:
If the freezing point is not correctly determined, the result for the added water is not valid. In this case results for FrPoint and AddWater are not shown on the display and on the printout from the printer. If the density of the measured sample is 0, the result for AddWater is not valid and is also not shown on the display and the printouts.

Sample:
First variant
If you’ve entered for milk analyzer basic freezing point -0.520°C (according article 5.9 of the EU Milk Hygiene Directive 92/46/EEC), measured freezing point –0.540°C, using the above pointed formula you’ll receive –3,8%. Because it is not possible the added water to be negative value, the milk analyzer indicates 0% added water. The reason for this is the tolerance in the basic freezing point, reasons for which are described below.
If in the same milk we add 3,8% water, and the basic freezing point is the same, the milk analyzer will measure freezing point –0.520°C, and will indicate again 0% added water.

Second variant
If you've entered for the device basic freezing point –0.540°C, measured freezing point –0.540°C, the milk analyzer will indicate 0%. When you add 3,8% water, the device will indicate 3,8%-added water.
From the above mentioned follows that it is very important to enter correct basic freezing point in the device.

The device's results for added water may give information about doubt of added water in the milk and the exact value of this added water may be determined after a "cowshed sample" is taken and the result for the freezing point, measured by the milk analyzer of the "cowshed sample" is entered as basic freezing point in the formula for calculation of added water.
Then the result from this formula will give us the absolute value of the added water for the corresponding milk supplier.

In this case, the result obtained by this formula will give the absolute value of a particular provider of added water

APPENDIX 3 PH MEASURING

1. General information

PH probe is a unit, measuring the solution acidity or alkalinity degree. It is measured on scale of 0 to 14. The term pH is derived from "p", the mathematical symbol for the negative logarithm, and "H", the chemical symbol of Hydrogen. The formal definition of pH is the negative logarithm of the Hydrogen ion activity.

2. pH Electrode

For pH measurement the milk analyzer needs a combination electrode, compatible with most pH electrodes that have BNC connectors and zero potential (the pH where the mill volt output of the electrode equals 0) near 7 pH.

2.1. Electrode part

The electrode is the most important part of the pH measurement. The electrode glass membrane is fragile and must be handled with care. To protect the glass membrane and to maintain activation, a protective rubber cap containing a suitable storage solution covers the glass membrane.

2.2. Electrode care & Electrode maintenance

pH Electrodes are susceptible to dirt and contamination and need to be clean regularly depending on the extent and condition of use. At no time should one touch or rub the glass bulb as this causes the build-up of electrostatic charge.

2.3. Storage

For best results, always keep the pH bulb wet. An optimal storage solution for combination electrode is pH 4 buffer with 225 grams of KCl per liter. Table salt, NaCl, can be used if KCl is not really available. Other pH buffers or tap water are also acceptable storage media, but avoid storage in de-ionized water. The protective rubber cap filled with the buffer solution provides ideal storage for long periods.

2.4. After Use

After measurement is completed, follow the sequence below for storage.
- Wash the electrode and reference junction in de-ionized water.
- Close the refilling hole by returning its rubber sleeve or stopper cap. (Necessary for only refillable electrode).
- Store the electrode as mentioned above (see section Storage).

2.5. Electrolyte Replacement (for refillable electrode only).

The reference electrolyte needs to be refilled when the electrode has been used for a long period, or when the internal electrolyte has dried up. To accomplish this, follow the procedure described below.

- Remove the protective rubber cap or sleeve;
- Remove the protective rubber sleeve to expose the filling port of the electrode;
- Remove the old reference electrolyte with a syringe;
- Fill the new reference electrolyte.

2.6. New electrolyte preparation:

- Open the KCl container;
- Add in de-ionized water until it reaches the level of 20 ml;
- Close the container and shake it to dissolve the KCl;
- Add in fresh electrolyte until it reaches the level of the refilling port. The reference electrolyte used should be 3M(Mol) KCl;
- Replace the rubber sleeve.

2.7. Re-use the electrode.

- Rinse the liquid junction with de-ionized water.

If these steps fail to restore normal electrode response, you may attempt to rejuvenate it (See: Electrode Rejuvenation).

2.8. Electrode cleaning

Electrodes which are mechanically intact can often be restored to normal performance by one or combination of the following procedures.

- Salt deposits:

Dissolve the deposit by immersing the electrode in tap water for ten to fifteen minutes. Then thoroughly rinse with de-ionized water. Wash the electrode pH bulb in a little detergent and water. Rinse electrode tip in with de-ionized water.

- Oil/Grease films:

Wash electrode pH bulb in a little detergent and water. Rinse electrode tip with de-ionized water.

- Clogged Reference Junction:

pH electrodes have junction, which allows the internal fill solution of the measuring electrode to leak out into the solution being measured. The

junction can become clogged by contamination in the solution. If a clogged junction is suspected it is best to clear the junction.
Heat up the diluted KCl solution to 60-80°C. Place the sensing part of the pH electrode into the heated KCl solution for approximately 10 minutes. Allow the electrode to cool while immersed in some unheated KCl solution.

- Protein Deposits
Prepare 1% pepsin solution in 0.1 M HCI. Allow the electrode to stand in this solution for five to ten minutes. Rinse the electrode with de-ionized water.

2.9. Electrode activation

Generally, if the procedure of storage and maintenance had been closely followed, the electrode can
be used immediately. However, should the electrode response become sluggish, it may be possible that the bulb has dehydrated.
The bulb can be dehydrated by immersing the electrode in an ideal storage solution (e.g. buffer pH 4 solution) for 1-2 hours. If this fails, the electrode may require re-activation. If the above procedure does not reactivate the electrode to acceptable status, try rejuvenation the electrode by following the procedure outlined below.

2.10. Rejuvenation Procedure

Dip and stir the electrode in freon or alcohol for 5 minutes.
Leave the electrode in tap water for 15 minutes.
Dip and stir the electrode in concentrated acid (HCI, H_2S_4) for 5 minutes.
Leave the electrode in tap water for 15 minutes.
Dip and stir in strong base (NaOH) for 5 minutes.
Leave the electrode in tap water for 15 minutes.
Test with standard calibration solution.
Finally, test with standard calibration buffer solution to see if the electrode yields acceptable results. You may repeat again for better response (maximum 3 times). If the response does not improve, then the electrode has completed its useful life. Replace with a new electrode.

2.11. Electrode Lifespan

pH electrodes have a finite lifespan due to their inherent properties. How long a pH electrode will last will depend on how it is cared and the solution it is used to measure. Even if an electrode is not used it still ages. Electrode demise can usually be characterized by a sluggish response, erratic readings or a reading, which will not change. When this occurs an electrode can no longer be calibrated. pH electrodes are fragile and have a limited lifespan. How long an electrode will last is determined by how well is maintained and the pH application. The harsher the system, the shorter the lifespan. For this

reason it is always a good idea to have a back-up electrode on hand to avoid any system down time.

3. Buffer Solutions

Buffers are solutions that have constant pH values and the ability to resist changes in that pH level. They are used to calibrate pH measurement system.

PH buffer solution description (Pharmacopoeia standard)

Use only this types standard buffers for calibration!

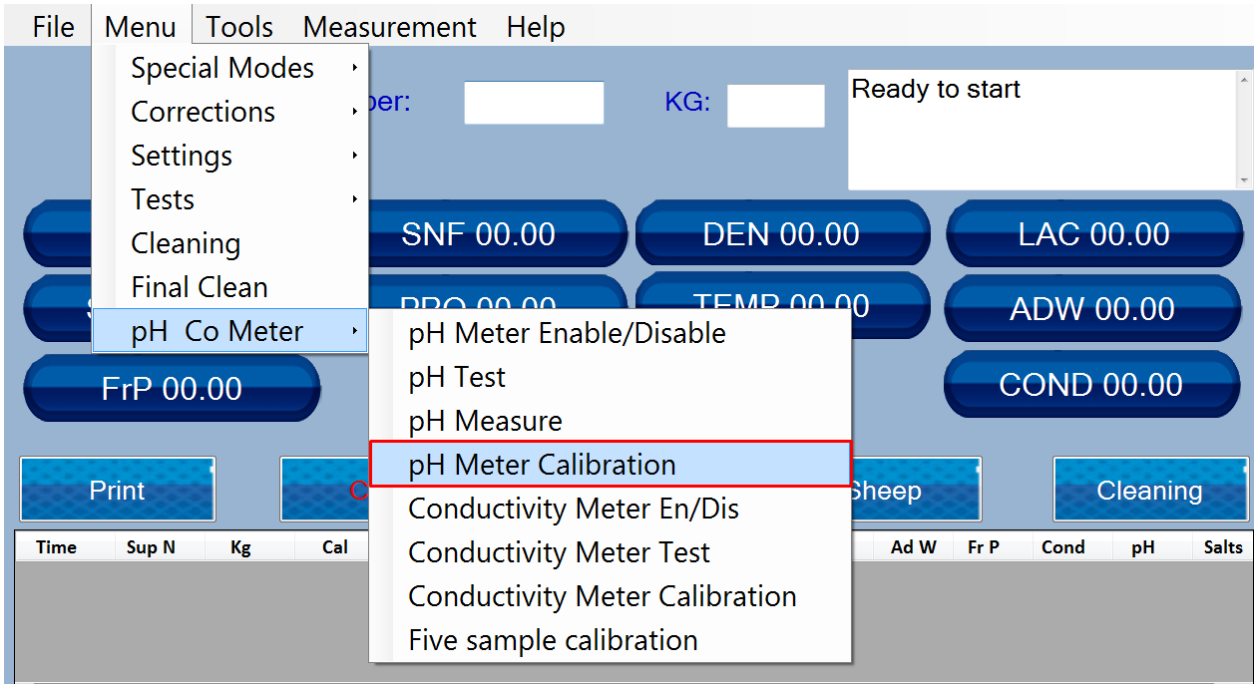
Description	pH 7.00±0,01/20ºC	pH 4.00±0,01/20ºC
Composition	Potassium dihydrogen phosphate, Di-sodium hydrogen phosphate	Borax, Sodium hydroxide solution
Temperature parameters	10ºC - 7.06 25ºC - 6.99 20ºC - 7.00 30ºC - 6.98 40ºC - 6.95 50ºC - 6.91	10ºC - 4.00 25ºC - 4.00 20ºC - 4.00 30ºC - 4.00 40ºC - 4.00 50ºC - 4.05

4. pH Electrode Calibration

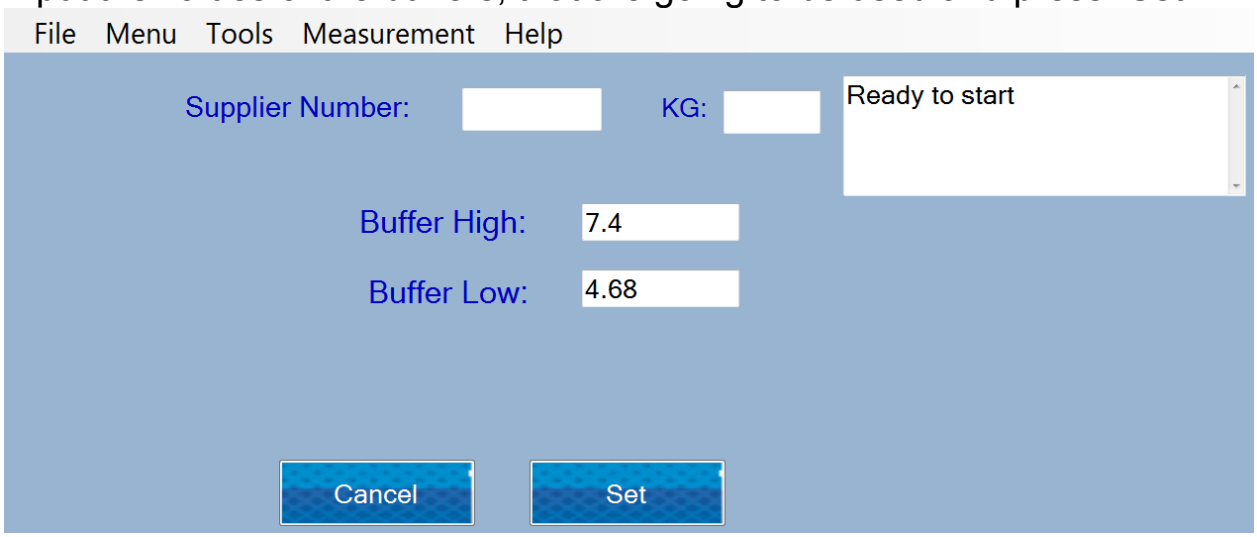
pH Electrodes are like batteries; they run down with time and use. As an electrode ages, its glass changes resistance. For this reason, electrodes need to be calibrated on a regular basis. Calibration in pH buffer solution corrects for this change.
Calibration is an important part of electrode maintenance. This assures not only that the electrode is behaving properly but that the system is operating correctly.
Usually pH meters require calibration at 3 specific pH values. One calibration is usually performed at pH 7, second and third are typically performed at pH 4 and pH 10.

It is best to select a buffer as close as possible to the actual pH value of the sample to be measured. Use standard calibration buffers that the temperature and the sample solution are the same.
Use the operation manual for the corresponding pH meter.

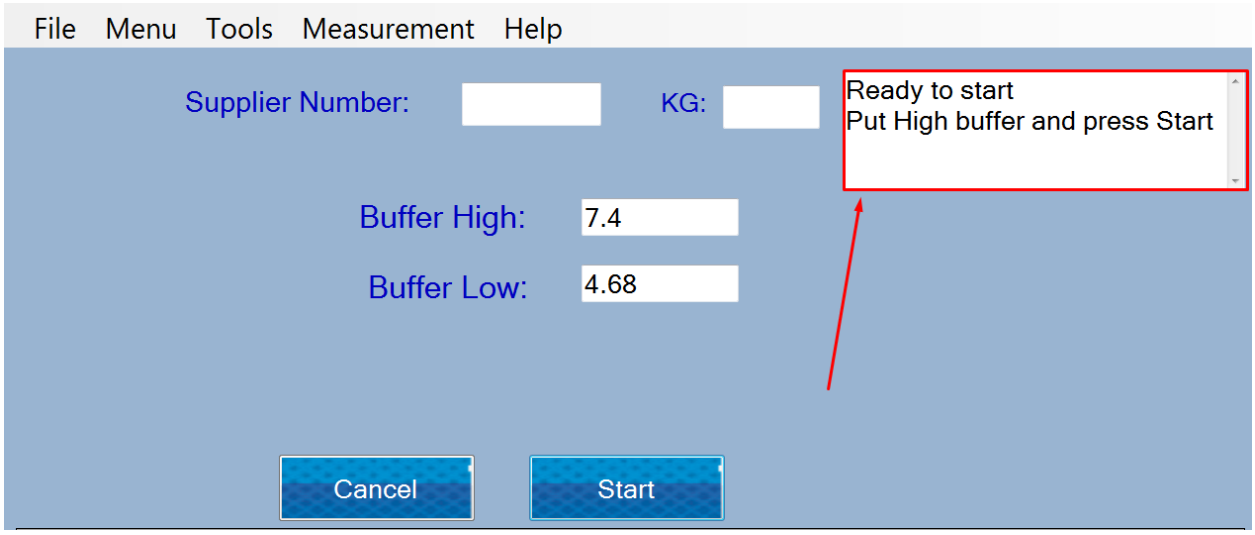
To start the calibration procedure select Menu -> pH & Co Meter ->pH Meter Calibration



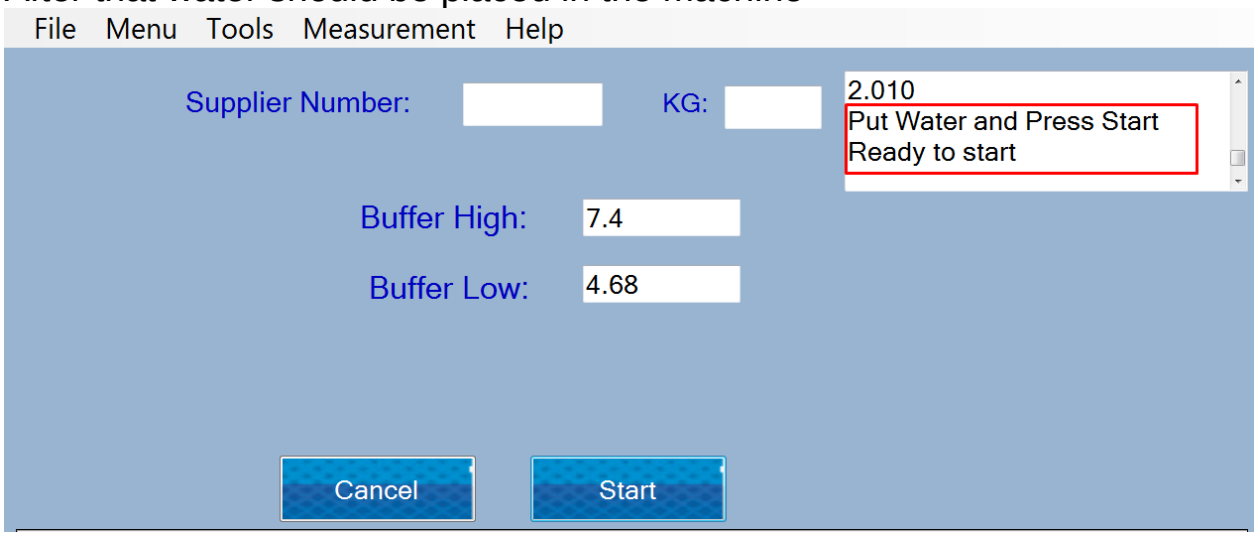
Input the values of the buffers, that are going to be used and press “Set”



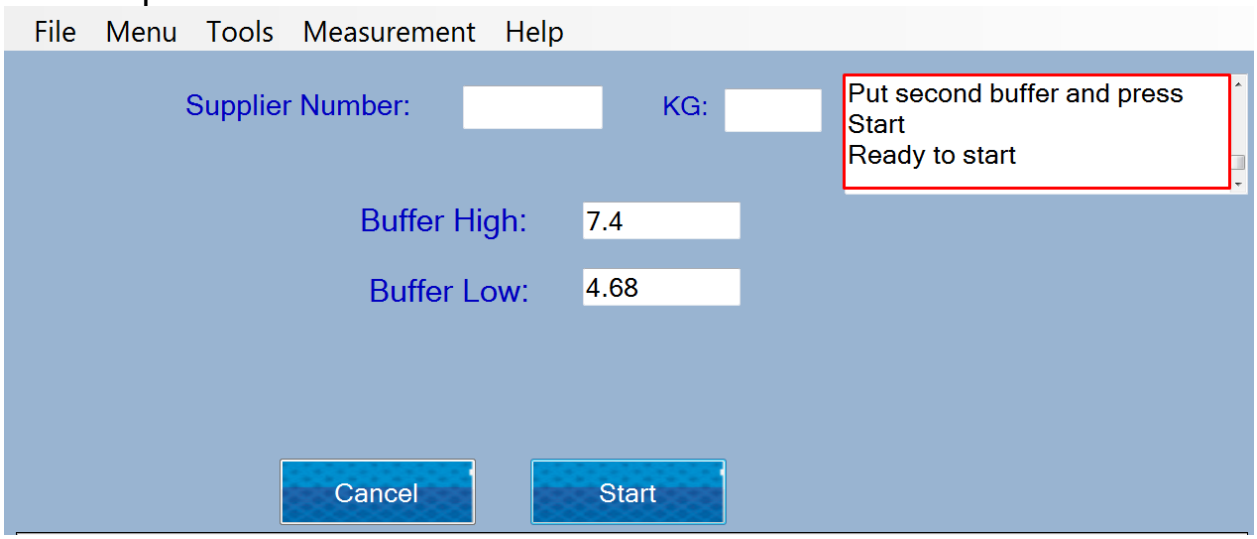
Follow the instructions, received in the field



Wait for couple of measurements and press “Stop”. The buffer should be returned in the glass.
After that water should be placed in the machine

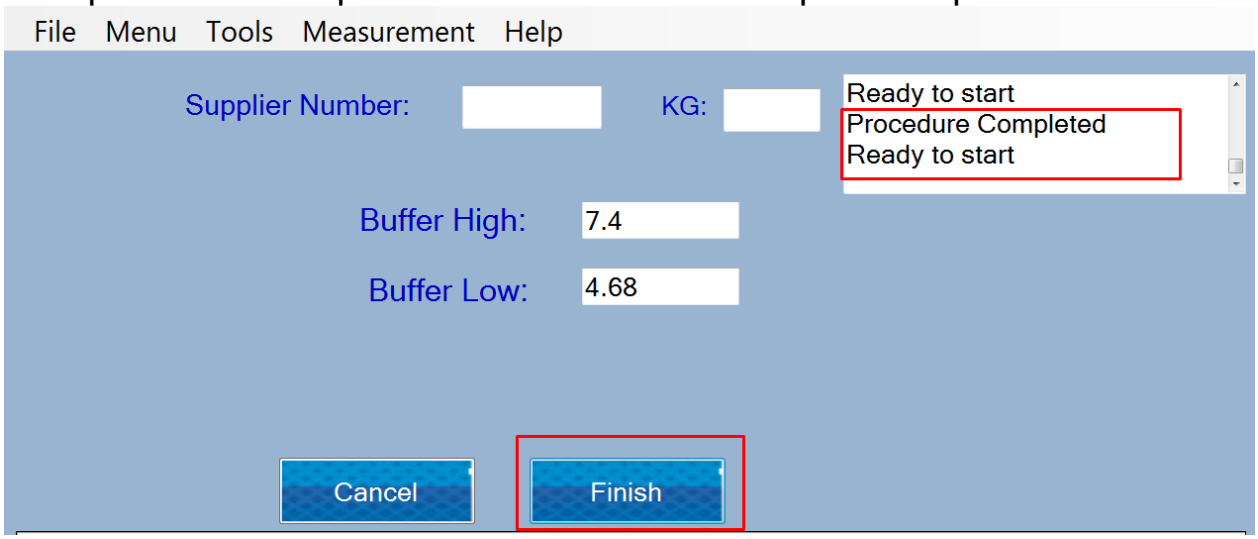


Next step is the second buffer:



Wait for couple of measurements and press “Stop”. The buffer should be returned in the glass.

Again place water in the machine
After the rinsing the machine returns “Procedure completed message” and the operator should press “Finish” button to complete the procedure



For Sensorex pH electrodes, originally supplied with the milk analyser read the following information:

Temperature compensations
The output of pH electrodes varies with temperature in manner, predicted by theory. When needed, Sensorex can supply electrode holders with build-in automatic temperature compensators. The need of automatic compensation depends on the temperature variation, the pH value being measured. At pH of about 7 there is no error due to temperature and, of course, at a constant temperature there is no error. As shown in the following table, the pH error due to temperature is a function of both the temperature and the pH value being measured. At a pH of about 7 there is no error due to temperature and, of course, at a constant temperature there is no error. The more the temperature changes from the ambient calibration temperature and the more the pH departs from 7 the greater is the pH error.

pH temperature error table

°C	pH										
	2	3	4	5	6	7	8	9	10	11	12
5	.30	.24	.18	.12	.06	0	.06	.12	.18	.24	.30
15	.15	.12	.09	.06	.03	0	.03	.06	.09	.12	.15
25	0	0	0	0	0	0	0	0	0		0
35	.15	.12	.09	.06	.03	0	.03	.06	.09	.12	.15
45	.30	.24	.18	.12	.06	0	.06	.12	.18	.24	.30
55	.45	.36	.27	.18	.09	0	.09	.18	.27	.36	.45
65	.60	.48	.36	.24	.12	0	.12	.24	.36	.48	.60
75	.75	.60	.45	.30	.15	0	.15	.30	.45	.60	.75
85	.90	.72	.54	.36	.18	0	.18	.36	.54	.72	.90

0 pH Error Range Less than .1 pH Error Range

5. PH helpful hints

For greatest accuracy in pH measurement, follow these guidelines:
Use the same technique to measure samples, which was used for calibration.
Be consistent with stirring rates, times and conditions.
Calibrate with buffers, which are close in temperature to that of the sample.
Calibrate the pH electrode regularly, e.g. once an hour for accuracy to within 0.01 pH, or once a day for accuracy to within 0.1 pH.
Use fresh buffers for calibrations. Avoid contamination of the stock buffer solution and do not use it beyond the expiry date.
Keep all connections dry.
Immerse the electrode far enough into the solution to insure the reference junction is below the surface.
Allow adequate time for the electrode to stabilize in standards and samples before taking a reading.
Clean the electrode periodically. Allow more time for aged electrodes.
Do not use the pH electrode in solutions of fluoride ion at low pH. This will etch the glass membrane.
Sulphide vapors can permeate the electrode wick and contaminate the reference element. Minimize contact in such environments and change the reference electrolyte frequently.

Lactic acidity and pH

This table shows the relationship between the values of pH and °T

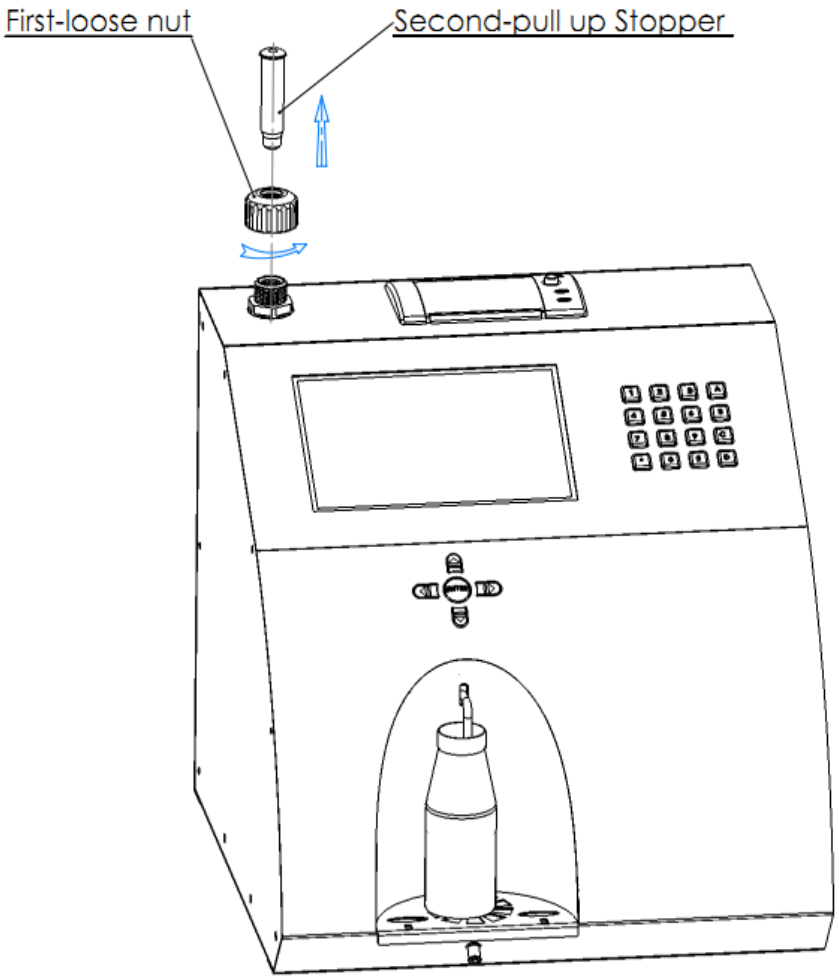
°T	Deviations	pH average value	°T	Deviations	pH average value
Raw milk			Pasteurized milk		
16	6,74-6,70	6,72	16	6,68-6,64	6,66
17	6,69-6,65	6,68	17	6,63-6,58	6,61
18	6,64-6,58	6,62	18	6,57-6,52	6,55
19	6,57-6,52	6,55	19	6,51-6,46	6,49
20	6,51-6,46	6,49	20	6,45-6,40	6,43
21	6,45-6,40	6,43	21	6,39-6,35	6,37
22	6,39-6,35	6,37	22	6,34-6,30	6,32
23	6,34-6,30	6,32	23	6,29-6,24	6,26
24	6,29-6,24	6,25	24	6,23-6,19	6,21

Preparation for pH measurement

When the analyzer is with pH measuring option, it is received from the customer with pH probe packed separately and there's a stopper on its place. If you need to measure pH follow the procedure below:

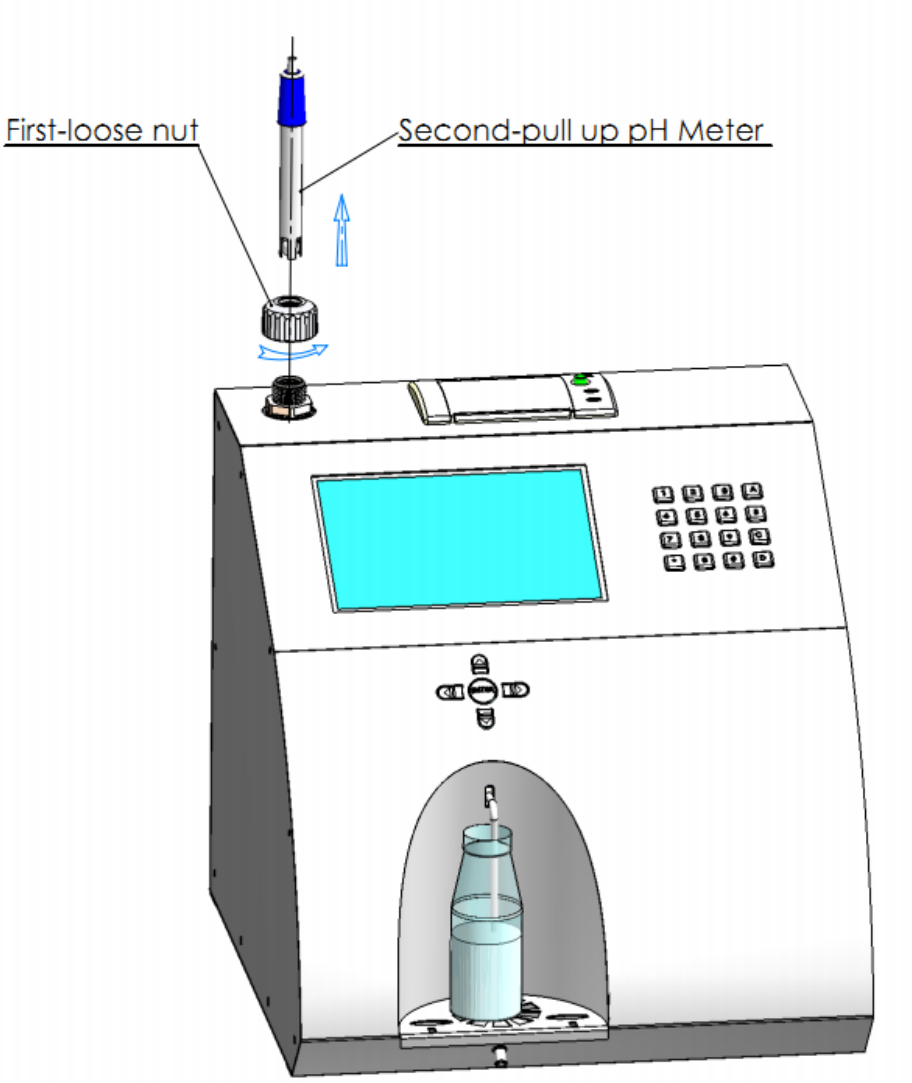
1. Loosen the nut anti-clockwise (1).
2. Pull up the stopper (2)
3. Carefully place the pH probe paying attention not to remove the sealing O-ring (3)
4. Place the probe with the nut in the hole (C & D) and tighten it.

Fig. 10 Preparation for work with the pH probe



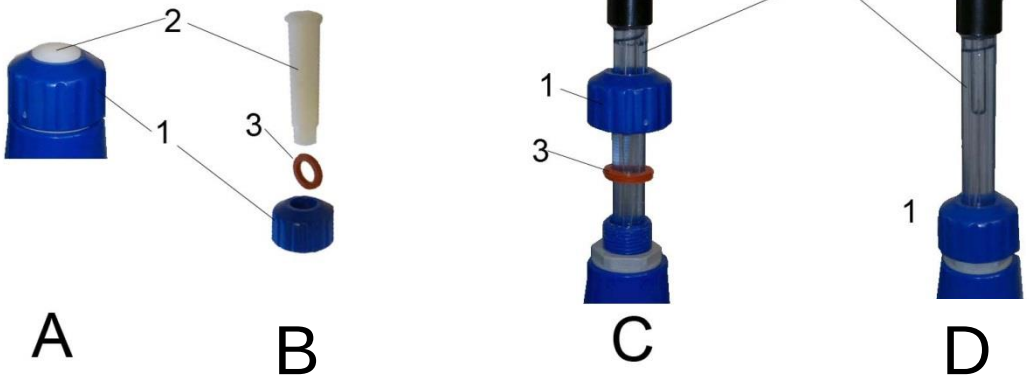
It is very important to close the nut tightly, paying attention not to allow air to enter the system.

Fig. 11 Placement of the probe



If you are working with the analyser regularly (each day) do not remove the probe after work.

If you ‘ll not use the analyser more than 2 days, you must take out the probe and to place the stopper back.
The pH probe must be stored separately as per the instructions of point 2.3 Appendix 3.


2
1
3
4
1
3
1
A
B
C
D

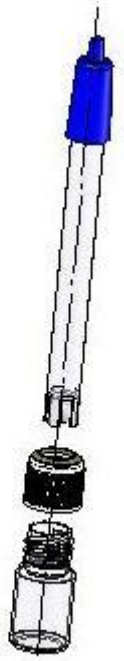
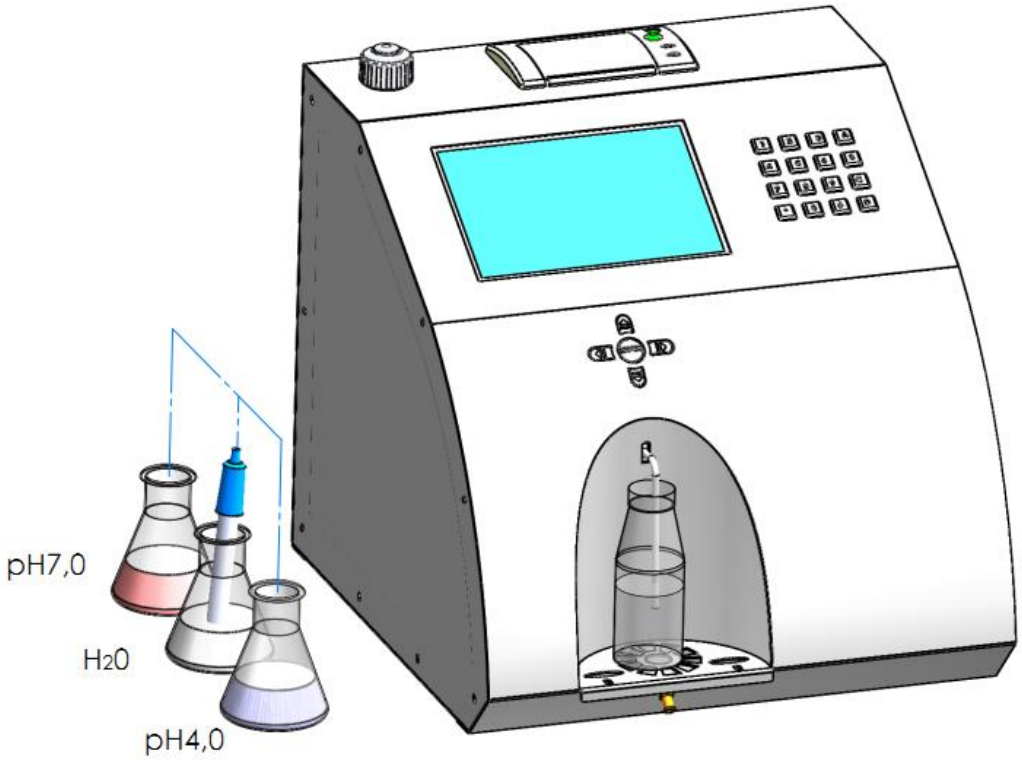


Fig. 12 Buffers for calibration



Designed for calibrating pH meter. For this purpose, use 2 reference buffer output to the screen as a Low buffer (eg 5.00 pH) and High buffer (eg 7.00 pH).

Use this procedure only if you have a sufficient number of buffers for calibration, since they can not be reused.
If you do not have enough buffers, place the probe in the containers near the unit as shown in Fig. 12.

7. PH measuring.

Measuring pH is an additional feature of the analyser and is optional.
Remove the protective rubber cap of the pH electrode. Take care to handle it appropriate in order not to be damaged. Use de-ionized or distilled water to rinse the electrode before usage. Fill in the sample holder with milk, put it in the recess of the analyser and dip the pH electrode into the milk sample, ensuring complete dip of the electrode in the sample. Stir gently for homogenization of the sample.
Measuring can be done in two modes:

Off line by starting the menu **pH & Co Meter | Measuring**, when the analyser works only as a pH meter.

On line automatic pH measuring, when measuring the rest of the sample's parameters.

When starting work with pH meter first connect the probe/sensor, and then the power supply of the device.

Having in mind the characteristics of the process of pH measuring it is necessary to dip the pH probe in the sample and then start measurement.

APPENDIX 4 CONDUCTIVITY MEASURING

1. Method of determination.

Conductivity (or Electrolytic Conductivity) is defined as the ability of a substance to conduct electrical current. It is the reciprocal of the resistance.

In a healthy animal*, the mean value of electric conductivity is:

Milk type	**Conductivity values**
Cow milk	between 4 to 6 mS/cm (18°C);
Sheep milk	between 3 to 5 mS/cm (18°C);
Buffalo	between 2,5 to 5 mS/cm (18°C);

*These values depend on the geographical region, the breed and on other factors.

Milk conductivity changes on the concentration of ions in the milk:

Added water, sugar, proteins, insoluble solids	Decrease the ion's concentration. Milk conductivity decreases.
Added salts	Increase the ion's concentration. Milk conductivity increases. Increase the ion's concentration. Milk conductivity increases. Often the milk is falsified by adding salt: towards milk with good characteristics: fat 4%, SNF 8,8, conductivity 4,5 are added salt and water. Then the results are changed to 3,2 and 8,8, conductivity 10. In other words adding water regulates the increased value of SNF and density till normal (within the boundaries/parameters) and even the fat is normal. By the values of these parameters may be determined if the sample is falsified, but the only characteristic, proving this is conductivity, which is out of boundaries nevertheless added water. But be careful, as the falsification is not the only possible reason for conductivity increasing. The other possibility is mastitis that’s why we recommend using another (chemical) method for checking it.
Significantly extreme	Should indicate the development of mastitis.

value (6,5 - 13,00 mS/cm (18°C)	Infections damage the tissue of the udder. This allows sodium and chlorine ions from the blood to be released into the milk. The concentration of ions in the milk is thereby raised, and it can more easily conduct an electrical current - the conductivity of the milk increases.

Milk conductivity can be used as tests for degree of water evaporation in condense milk production.
Milk conductivity change notifies of powder (dry) milk solution rate.

2. Conductivity measurement
Conductivity measurement is additional possibility of the analyser and is delivered on customers request/

5. Corrections in conductivity measurement.
Please, follow the instructions on the display of the tablet.

7. Conductivity calibration buffer preparation

In order a standard buffer for conductivity measuring to be prepared follow the instruction below:

1. Take the packet with the powder buffer.
2. Carefully shake the packet in order to gather the powder at the bottom.
3. Cut one end of the packet.
4. Empty its content in a measuring mug with 1 l volume, paying attention all its content to be emptied.

   For standard buffer: 5,02 ms – 3,056 г

5. Add 600-700 ml distilled water, which was preliminarily deaerated in vacuum dryer or boiled and then cooled down to 20 ˚C.
6. Shake the mug till the powder is fully dissolved.
7. Add distilled water to the mark.

Basic concepts

User – any individual who is a user of the device and / or the software

Disclaim

Important legal information

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Contents:

GUARANTEE CARD

LACTOSCAN MCCW ss

Guarantee period is 1 (one) year after purchasing date.
Improper handling, transport and storage will invalidate the guarantee.
Guarantee is void if warranty labels are removed.

Serial №

Date of purchase:

Password:

Distributor:

Signature:

Stamp:

GUARANTEE CARD

Purchaser:

Service report:

Service entry date	Damage	Delivery date	Signature

Covers:
Lactoscan MCCW ss

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