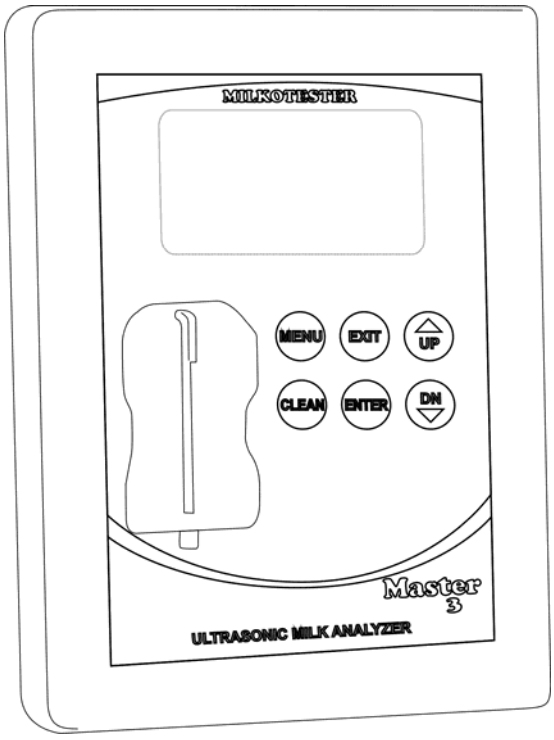
FMCG Industry Solutions Pty Ltd

MILKOTESTER

Milk analyzing device
Model: **Master Eco**
Fat, Solids-Non-Fat (SNF), Protein, Lactose, Water content, Temperature (°C), Freezing point, Salts, Density, pH

OPERATING INSTRUCTIONS



THE INFORMATION CONTAINED IN THIS MANUAL IS A SUBJECT TO CHANGE WITHOUT NOTICE. FOR UPDATES, PLEASE CONTACT THE MANUFACTURER OR USE THE FOLLOWING WEB ADDRESS :

CAUTION!

This device operates on 100-250V. In order to avoid electrical shock or to prevent the unit from damage DO NOT REMOVE the cover!
Please follow the instructions in this manual!

Safety recommendations :

- **Read carefully and make sure you understand all the instructions.**
- **After initially turning on the device do recommend 3-4 cycles of "Clean"**
- **Place the device on a leveled and stable surface. If it falls or is severely shocked its functional systems may be damaged.**
- **When plugging the device into the electrical outlet, put away the power cord so it does not stay in the way when accessing the device and cannot be stepped on.**
- **Do not disassemble the device in order to avoid possible electrical shock. In case of malfunction contact your local dealer.**
- **Handle the liquids the device works with carefully, following all the instructions for their preparation.**

Table of contents

CHAPTER ONE

1 General description

MILKOTESTER MASTER is designed for percentage analysis of Fat, Solids-Non-Fat (SNF), Protein, and Lactose, Water content, Temperature (°C), Freezing point, Salts, Density and pH. This components can all be measured at the same time. The device measures cow milk, sheep milk, buffalo milk, camel milk, lama milk, restored milk, UHT, cream, whey and buttermilk.

The factory preset is for cow milk, sheep milk and UHT. Upon user's request the device can be calibrated for any of the above mentioned types of milk.

The device has a compact design with a robust structure and a user-friendly interface. Most importantly, the one-button operation is extremely simple – you press only once to start measuring, you press only once for cleaning. MILKOTESTER MASTER can analyze three types of milk defined by user. The measurement speed is 50 samples per hour with cleaning included. The samples are precisely dosed and small quantities are required – the sample volume is 25 cm³. No thermal or mechanical treatment of the samples before analysis is necessary. No use of chemical reagents is required. The working conditions are as follows – temperatures from 5° to 35 °C, HR from 30% to 80%.
With regard to the "moisture problem" which remains of much significance the front panel of the device is designed to operate when with wet hands. In addition to this MILKOTESTER MASTER provides a one year's full warranty.

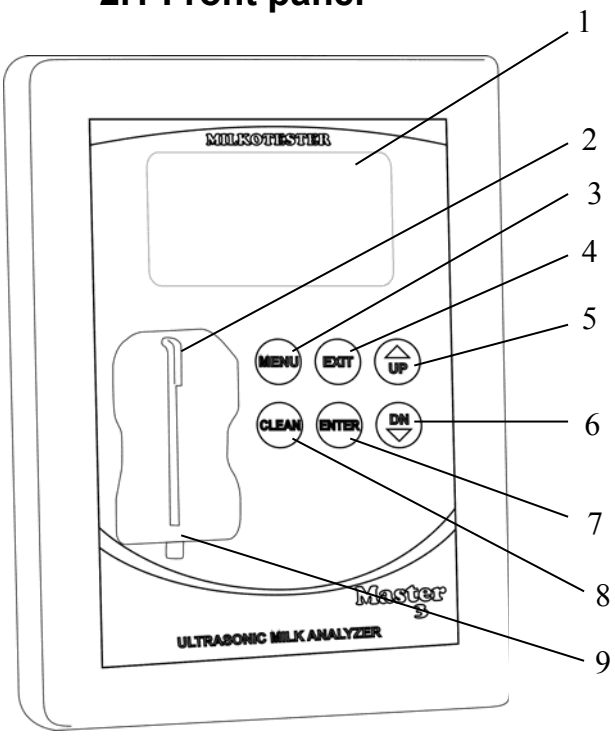
CHAPTER TWO

2 Close-up view

IN THIS CHAPTER

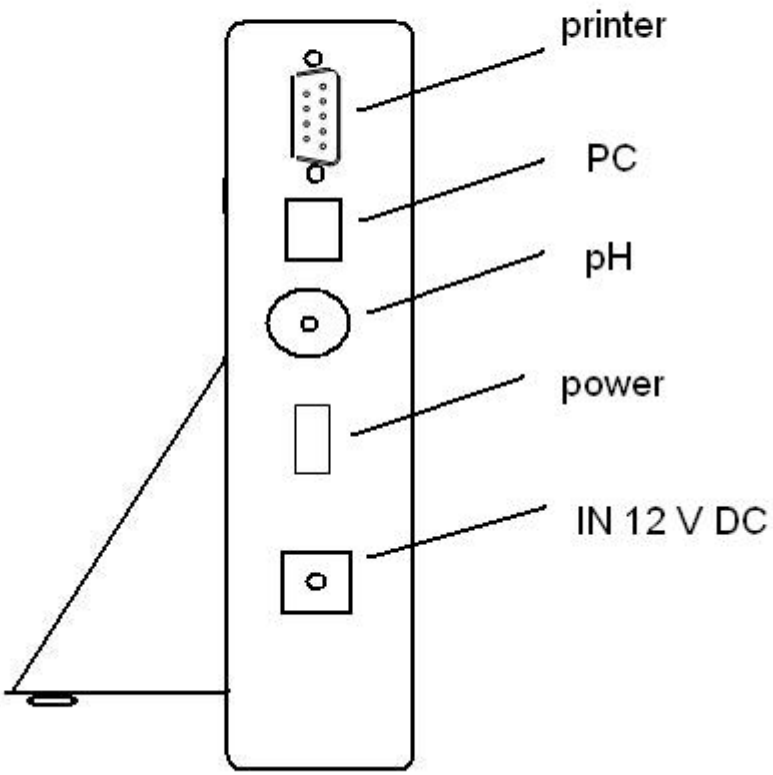
- Front panel
- Side panel

2.1 Front panel



1. Display
2. Input / output pipe
3. “MENU” button
4. “EXIT” button
5. “Arrow UP” button
6. “Arrow DOWN” button
7. “ENTER” button
8. “CLEAN” button
9. Sample holder

2.2 Side panel



CHAPTER THREE

3 Samples preparation

In order that most accurate results are obtained it is important that the milk be kept for 2 hours after milking and stirred well before being used for sample material. A good way to stir up the milk is to pour it several times out of one vessel into another and back. Before analysis the samples have to be filtered in order to be free from foreign fragments. Milk samples should be 5-35 °C. Full cream samples containing fat over 10% should be heated up to 42-43 °C and then cooled to 25-30 °C. If the sample temperature is over 36 °C the message “Sample overheated” will appear on the display. Use milk samples only once and do not return it to the vessel. Samples can be kept for a maximum of 2 days if they are stored at a temperature not exceeding 5 °C.

Milk stirring

It is a very important condition for receiving exact results. Before taking samples from big vessels the milk (fresh or thermally treated, whole-milk or whipped) has to be well stirred for no less than 5 min., by vertical and circular slow movements. Mixing spoon with long handle is used, allowing the lowest layers of the liquid to be reached. The milk in the milk-cans is stirred 5 to 8 times from the surface to the bottom and reverse with slow circular movements.

Sample preservation

The vessels where the samples will be put have to be clean, dry, glass, metal or from other suitable material, to be tightly closed with rubber or other stopples. The stopples not to absorb water and fat and not to influence the analyses sample content.

In summer the sample fills up to the top the vessel, but in winter – at least 3/4 from the vessel's volume. Each sample for analyses has to be labeled and described in a way not allowing to be mixed up.

The samples are stored in conditions, assuring temperature, corresponding to the requirements for storing such kind of product (advisable – 1 °C).

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. The samples have to be stored in a cold and dark place after the preservation. Have in mind that during the analyses the results for SNF% will be increased with 0,1 %. After adding the preservative the sample has to be well stirred.

Preparing the samples for analyses

Milk – raw and thermally treated

When examining samples taken immediately before analyses and shortly stored, the milk is poured several times from vessel to vessel in order to distribute the fat content uniformly. To avoid foam formation or separation of milk fat, the samples have to be carefully poured using the walls of the vessels, as they are tilted slightly. For a better mixing the sample it has to be poured at least 3 times. When needed the same is tempered to the temperature within the measuring range.

If there is fat stuck on the walls of the vessel and the stopple (when the samples were stored for a long time), the milk has to be slowly heated up to 35-40 °C. At the same time it has to be slowly shaken. The cream, stuck to the walls of the vessel is removed. The sample is poured several times and is cooled down (advisable up 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 expected.

 Do not make analyses if the acidity of the milk is more than 17°T.

CHAPTER FOUR

4 Working description

IN THIS CHAPTER

- Preparing the device
- Measuring samples
- Corrections
- Calibration

4.1 PREPARING THE DEVICE

1. Place the device on a horizontal and stable surface.
   Caution: Any sources of hot or cold air can influence the accuracy of the measurements.

2. Connect the power cord 12V DC to the power socket on the rear panel of the unit and plug it into the electrical outlet (the outlet has to be grounded, see *"**Important Safety Instructions**")*.

3. Turn on the **POWER** switch and MILKOTESTER MASTER will be ready for use. Before proceeding with using the unit, please read and follow the rest of the instructions in this chapter!

Powering by an external 12V DC power source

Milk analyzer MASTER can be used in places where no regular electrical supply is available, MILKOTESTER MASTER can be powered by your car battery or other 12V DC external power sources. Milk analyzer MASTER has provided a cable suitable for this purpose. To use this option, follow the procedure described below:

1. Unplug the 12V DC power cable from the socket on the rear panel of the unit and then from the electrical outlet.

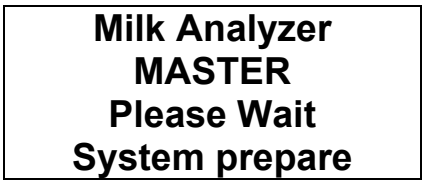
2. Connect the supplied power cord 12V DC to the **Power-in socket 12V DC** socket on the rear panel of the unit and plug the other end of the cable into the electrical lighter socket inside your vehicle.

3. The device will be turned on immediately. After starting the unit goes into system check mode and will be ready for analyses in about 5 minutes.

NOTE:
If the unit does not start up after it is connected to the power source, check the fuse inside the connector plugged into the electrical lighter socket.

4.2 MEASURING SAMPLES

After MILKOTESTER MASTER is turned on from the **POWER** switch, the display reads first:



Followed by:

You can choose among three types of milk at a time, (**upon user's request the device can be calibrated for any of the other types of milk**).
Place the cup with the milk sample
Place a second milk sample under the pH probe (the automatic mode for pH measurement must be turned on).
When you choose the desired type you use the ↑↓ (UP and DOWN) arrow buttons, and then press ENTER to activate analyzing.

The following text will appear:

MEASURING… **Please Wait**

In about 60sec. the results of analyzing will appear on the display as follows:

F=xx.xx P=xx.xx **S=xx.xx L=xx.xx** **D=xx.xx Sl=xx.xx** **Fp- x.xxx W=xx.xx**

Where:
F is for Fat
S is for Solids-Non-Fat (SNF)
D is for Density
Fp is for Freezing point
P is for Protein
L is for Lactose
Sl is for Salts
W is for Added water.
In 10 seconds you can check the result of the pH sample by pressing the ↓ button. (active only on request)

Page1

F=xx.xx P=xx.xx **S=xx.xx L=xx.xx** **D=xx.xx Sl=xx.xx** **Fp=x.xxx W=xx.xx**

The results will be printed immediately after they are ready.
By choosing the ENTER button you can start measuring anew.

Page2

Temp. xx.xx **pH = xx.xx** **Co = xx.xx**

By choosing the EXIT button you can start from the very beginning and choose to analyze another type of milk.

When finished analyzing the instrument issues a beep sound, returns the analyzed sample material back into the cup, and the values of all measured components appear on the

display. If the unit is connected to the printer all results will be automatically printed out.

At this point the sample cup can be removed from under the pipette. The instrument will continue to show the measured values until a new analysis is initiated.

WARNING!
Make sure that the instrument is at rest during analysis. Any shaking of the device will cause inaccurate results.

NOTE:
Due to the possible presence of water inside the flow system left from the last flushing procedure, we recommend that you do not take into account the first analysis after flushing if they appear inaccurate. To prevent or reduce this inaccuracy due to water in the system, please refer to chapter “Cleaning and Maintenance”, section “Thorough Cleaning”.

To access the menu, press the MENU button. The range of functions is grouped into submenus. Scroll through the menu to select the one that you need and then select the settings you need to make. Press ENTER to activate them. Press EXIT to keep the previous settings.

4.3 MAKING CORRECTIONS AND CALIBRATION

In the process of work with the analyzer 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 analyses (Gerber for fat, Kjeldahl for proteins etc). In order to establish the possible discrepancy and to correct the readings of the milk analyzer do the following:

Taking samples and preparation of samples for checking the accuracy of the milk analyzer, making corrections and recalibration

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

Determination the type of the discrepancy:

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 analyses (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.

Analyzing the measurement results

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

If the received differences are relatively constant value for samples with different content of the analyzed 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 analyzer:	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 %

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 analyzer:	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.

MENU

To select Mode*, Options* or *Settings* use the ↑↓ (up and down) arrows and press ENTER.

Mode **Options** **Settings**

MENU > Mode

Enter password **00000**

Default password is 00000.

Correction **Calibration** **Back up** **Restore** **----------** **Security** **Res d point**

4.3.1 Correction

Example:

MENU > Mode > Correction > Cow milk > Fat.

In Submenu *Mode* Use the ↑↓ (up and down) arrows and press ENTER to select Correction, *Calibration, Back up* or *Restore*.

If you choose correction and press *ENTER*, then use the ↑↓ (up and down) arrows and press ENTER to select the type of milk.

Cow Milk **Sheep Milk** **UHT Milk** **Temperature**

After choosing the type of milk use the ↑↓ (up and down) arrows and press *ENTER* to choose a component for correction (mind that there are 2 (two) pages of components thus scroll up and down).

Fat
SNF
Density

Protein
Lactose
Salts
Water

Press the ↑↓ (up and down) arrows to correct the value with 0.01.

Correction
Of Fat
0.01

Press ENTER to validate the correction or EXIT to keep the previous value.

MENU > Mode > Calibration.

4.3.2 Calibration:

In order to perform calibration of the device for a certain type of milk /for example – cow milk/. You need two samples of milk with known values of their parameters – one with comparatively high percentage of *Fat* and one with comparatively low percentage of *Fat*.
After pressing ENTER on the display appears:

Calibration
Cow milk
Sheep milk
UHT milk

Use the ↑↓ (up and down) arrows and press ENTER to select the type of milk.
The following text will appear on the display:

Set High sample **FAT=x.xx** **SNF=x.xx** **DEN=x.xx**

Set High sample **PRO=x.xx** **LAC=x.xx** **SAL=x.xx**

Use the ↑↓ (up and down) arrows and press ENTER to select a parameter. Then the cursor will mark the place to enter a known value. Use the ↑↓ (up and down) arrows to set the desired figure and press

ENTER to confirm. Then the cursor goes to the figure to the right. Use the same procedure to enter the second and third figure. After confirmation of the last figure the cursor goes to the next parameter for entering new values (mind that there are 2 (two) pages of components thus scroll up and down).
By confirming the last figure of the last parameter the following text appears on the display:

Set Low sample **FAT=x.xx** **SNF=x.xx** **DEN=x.xx**

And then

Set Low sample **PRO=x.xx** **LAC=x.xx** **SAL=x.xx**

By performing the procedure described above enter the known values of the parameters of the milk with low percentage of *Fat*.
After confirming the last figure of the last parameter by pressing ENTER the following text appears on the display:

Put sample
High Milk
1/5 times
and Press ENTER

The sample of milk with high *Fat* must be measured 5 consecutive times. Put the first cup with the sample and press ENTER. After measurement the following text appears on the display:

Put Sample
High Milk
2/5 times
and Press ENTER

Follow the procedure until the 5th measurement. After performing the last measurement the following text appears on the display:

Put Sample
Low Milk
1/5 times
and Press ENTER

The sample of milk with low *Fat* must be measured 5 consecutive times. Put the first cup with the sample and press ENTER. After measurement the following text appears on the display:

Follow the

Put Sample
Low Milk
2/5 times
and Press ENTER

procedure until the 5th measurement. After performing the last measurement the following text appears on the display:

Put Sample
Water
1/5 times
and Press ENTER

Follow the described above procedure. After the end of the 5th measurement the calibration procedure is complete.

Please note:
Before each sample measurement stir the milk by pouring it from one vessel to another.
The temperature of the samples should be in the range of 15 to 25 degrees.
Before starting calibration it is recommendable to back up the parameters of the existing calibration:

MENU > Mode > Back up

Cow – calibr. 1
Sheep – calibr.2
UHT – Calibr. 3

Choose the type of milk calibration for back up and press *ENTER*

In case of unsuccessful calibration / electricity cut, temperature range, etc / choose *Restore* from the *MENU* to validate the last backed up calibration and press *Enter*.

MENU > Mode > Restore

MENU > Mode > Security

Type of results
Limited measur.
Edit password
Sensor RESET

MENU > Mode > Security>Limited measur.

200 measurements
400 measurements
600 measurements
OFF counter

Limits the number of measurements (suitable for samples)

MENU > Mode > Security>Edit password

ON password
OFF password
Change password

MENU > Mode > Security>Sensor reset

 **Use only if the sensor is changed**

If you use this option, you will need a sample with water
**Read the manual for change of the sensor*

MENU > Mode >Res d point

xx.x
xx.xx

4.4 Settings and options

MENU > Options

System Info
Language
Time and Date
PC connection

Memory to print
Clear memory
Printer En/Dis
Fast Start

Choose *Options* and press ENTER.

MENU > Options > System info.

Choose *System info, Language* or *Time and Date*, and press ENTER.

MILKOTESTER
Model: MASTER LM2
Ver: x.xx
SN: XXXXXX

MENU > Options > Language.

Language:

English
Spanish

MENU > Options > Time and Date

Time and date:

Set time
Set date

MENU > Options >PC connection
It is used for factory settings

MENU > Options >Memory to print

Last analysis
Last 5 analysis
Last 10 analysis

Sends the recorded results to printer or PC

MENU > Options >Clear memory
Delete all recorded results

MENU > Options >Printer En/Dis

Printer On
Printer Off

It is used to turn the printer on and off

The printer will automatically show result after each measurement if it's ON.

MENU > Options >Fast start

Enable
Disable

It starts the measurement irrespective of the ambient temperature (used in hot weather)
IT IS RECOMMENDED TO USE THIS OPTION WHEN THE DEVICE WORKS AT MORE THAN 35 C IN THE ROOM.

MENU > Settings
Choose *Settings* and press ENTER.

Set Fr. Point
Set pH
Set thermometer
Conductivity

MENU > Settings > Set Fr. Point.

Set f. Point Cal.1
Set f. Point Cal.2
Set f. Point Cal.3

Choose *Set Fr. point* and press ENTER.

Use ↑↓ (Up and *Down*) arrows to choose a type of milk and press ENTER. The following text appears on the display:

Set Fr. Point
- 0,540
Press ENTER
To Set

Use ↑↓ (Up and *Down*) arrows to enter the new value and Press *Enter* to confirm. After dialing the last symbol press ENTER to confirm the new value.

4.5 Measurement of pH

MENU > Settings > Set pH
(active only on request)
Set pH:

pH calibration
pH mode

Table of errors of pH measurement according to ambient temperature:

ºC	ºF	2	3	4	5	6	pH7	8	9	10	11	12
5	41	0,30	0,24	0,18	0,12	0,06	0	0,06	0,12	0,18	0,24	0,30
15	59	0,15	0,12	0,09	0,06	0,03	0	0,03	0,06	0,09	0,12	0,15
25	77	0	0	0	0	0	0	0	0	0	0	0
35	95	0,15	0,12	0,09	0,06	0,03	0	0,03	0,06	0,09	0,12	0,15
45	113	0,30	0,24	0,18	0,12	0,06	0	0,06	0,12	0,18	0,24	0,30
55	131	0,45	0,36	0,27	0,18	0,09	0	0,09	0,18	0,27	0,36	0,45
65	149	0,60	0,48	0,36	0,24	0,12	0	0,12	0,24	0,36	0,48	0,60
75	167	0,75	0,60	0,45	0,30	0,15	0	0,15	0,30	0,45	0,60	0,75
85	185	0,90	0,72	0,54	0,36	0,18	0	0,18	0,36	0,54	0,72	0,90

Temperature effects on the value of pH buffers

T (ºC)	pH		
0	4.01	7.12	9.52
10	4.00	7.06	9.38
20	4.00	7.02	9.26
25	**4.01**	**7.00**	**9.21**
30	4.01	6.99	9.16
40	4.03	6.97	9.06
50	4.06	6.97	8.99
60	4.10	6.98	8.93
70	4.16	7.00	8.88
80	4.22	7.04	8.83
90	4.30	7.09	8.79

MENU > Settings > Set pH > pH Calibration

In order to calibrate the device you will need two buffer solutions with known values, for example – one with value of pH 3 /low value/ and the other – pH 7 /high value/.

After choosing Set *pH the* following text will appear on the display:

Set **pH low buffer:** **x.xx**

Remove the protective cup of the electrode.
Dip the electrode into the low value buffer solution and make sure that the junction zone of the electrode is at least at 30 mm below the surface of the buffer solution and leave it at rest. Now you have to enter the known value of the “low” buffer solution. Use ↑↓ (Up and *Down*) arrows to enter the new value and Press *Enter* to confirm. After dialing the last symbol press ENTER to confirm the new value.
The following text will appear on the display:

Setting **Ref. Value: xxxxx**

Wait until the electrode and the buffer stabilize /the reference value should change the least possible/. Press *Enter* to set the value.

The following text will appear on the display:

Set **pH high buffer:** **x.xx**

Dip the electrode into the high value buffer solution and make sure that the junction zone of the electrode is at least at 30 mm below the surface of the buffer solution and leave it at rest. Now you have to enter the known value of the “high” buffer solution. Use ↑↓ (Up and *Down*) arrows to enter the new value and Press *Enter* to confirm. After dialing the last symbol press ENTER to confirm the new value.
The following text will appear on the display:

Setting **Ref. Value: xxxxx**

Wait until the electrode and the buffer stabilize /the reference value should change the least possible/. Press *Enter* to set the value
Please note:

The pH electrode must be calibrated on a regular base in order to obtain high accuracy results of the measurement.
For calibration use buffer solutions with values as close as possible to the pH values of the milk samples.
After each measurement of pH rinse the tip of the electrode with de-ionized water.
After each measurement or calibration put on the protective cup of the electrode.
The pH electrode is fragile and must be handled with care.

MENU > Settings > Set pH > pH Mode

pH calibration **pH mode**

The milk analyzer has two modes of work – manual and automatic. They are selected from *MENU > Settings > set pH > pH mode*
Choose *pH mode* and press ENTER.

Auto pH meas. **Manual pH meas.**

Under the manual mode, the milk sample is put under the pH probe, then you press the pH button and the measurement will last without interruption (until the pH button is pressed again). In order to measure pH the device must be in a working condition.
Measurement of pH is not possible when the device is in the following mode:

MEASURING…
Please Wait

In this mode the device is measuring all the other components.

To start measurement of pH press pH button. The milk analyzer now is operating as a pH meter. The following text will appear on the display:

pH result:
X.XX

Press the EXIT button to stop measurement of pH and enter the mode:

Cow Milk
Sheep Milk
UHT Milk

Now you can start measuring the other components of milk.

MENU > Settings > Set Thermometer

Press *Enter* and the following text will appear on the display:

Put probe 15°C
and press ENTER

Put a sampe of water with temperature 15° and press ENTER
The following text will appear on the display:

Put probe 25°C and press ENTER

Repeat the procedure with a sample of 25°C

4.6 Measurement of Conductivity

MENU > Settings > Conductivity
(active only on request)

Calibr.Co Meter **ON/OFF Co Meter**

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 6,5 mS/cm (25°C);
Sheep milk	between 3 to 5,5 mS/cm (25°C);
Buffalo	between 2,5 to 5,5 mS/cm (25°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:

Conductivity calibration

Menu > Settings > Conductivity > Calibration Co meter

Following message is displayed:

Put sample 5.0mS/cm **1/5 times** **And press Enter**

Serves for conductivity measuring system

calibration. Clean the analyzer before starting conductivity measurement. You need a standard buffer with conductivity 5.0[mS/cm], with temperature 25°C.

Menu > Settings > Conductivity > ON/OFF Co Meter

ON Co Meter
OFF Co Meter

CHAPTER FIVE

5 Cleaning and maintenance

IN THIS CHAPTER
❑ Routine cleaning ❑ Complete flushing ❑ Weekly cleaning

For high accuracy and reliability of the device, the following cleaning procedures should be performed on due times.

5.1. Routine cleaning

When the interval between 2 consecutive measurement analyses is more than 30 minutes or a considerable number of measurements have been performed the device begins to issue continuing beep sounds. At the same time the message **Cleaning needed** appears on the display. Please carry out the following procedure:

1. Fill up a sample cup with clean warm water (45 – 50°C) and place it on the sample shelf under the pipette.

2. Press “clean” to initiate the flushing procedure. The device automatically takes in the necessary amount of water and then returns it back into the cup. This is repeated 5 consecutive times and after that the cup has to be removed from the sample shelf.

After the end of the procedure the device is ready for measurement.

5.2. Complete flushing

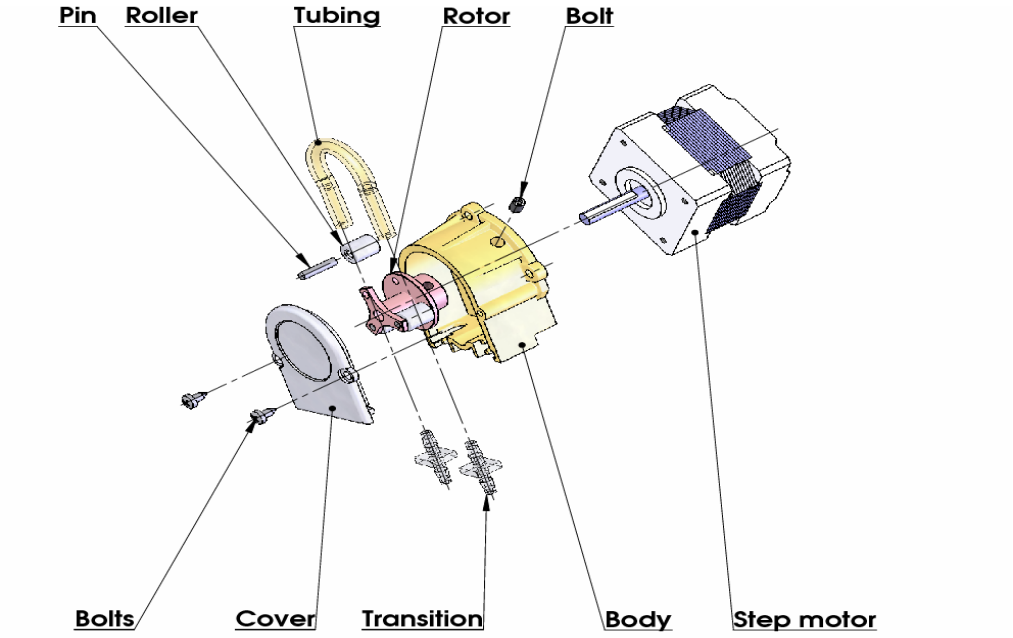
At the end of the working day the following procedure should be performed:

The daily cleaning of the milk analyzer is done with water, heated to 50° C or with cleaning powder “Master Daily”, by pressing the button “Clean”. The liquid in the cup must be changed each time until all of the contamination is removed. At the end the system must be washed out with water.

5.3 Weekly cleaning

We recommend that you carry out the following procedure at the end of every week.
The weekly cleaning of the milk analyzer is done with water, heated to 50° C or with cleaning powder “Master Weekly”, by pressing the button “Clean”. The liquid in the cup must be changed each time until all of the contamination is removed. At the end the system must be washed out with water.

5.4 Peristaltic pump service



CHAPTER SIX

6 Troubleshooting

Error message	Possible problem /cause	Repair/remedy
Error 10 Empty Sensor	Insufficient quantity of the milk sample sucked in the system or air in the sample	- Check that there are no air bubbles in the sample. - Check if after starting measurement, milk sample in the sample holder decreases. In other case – there is damage in the suction system.
The sample temperature is high.	Sucked overheated sample	- The sample temperature exceeds the maximum permissible sample's temperature.
The temperature of box is high	Analyzer temperature has exceeded acceptable at work.	- ENABLE OPTION 'FAST START' (see menu settings – fast start)
Error 11	Fault in sensor	- Needs replacement of the sensor. Contact Milkotester Ltd for advice and assistance.

CHAPTER SEVEN

7 Technical specification

1. Measured components:

- Fat
- Solids-Non-Fat (SNF)
- Protein
- Lactose
- Water content
- Temperature (°C)
- Freezing point
- Salts
- Density

2. Ranges of measurement:

Fat	0.00% ÷ 25%
SNF	3% ÷ 15%
Density *	1015 ÷ 10 40 kg/m^3
Proteins	2% to 7%
Lactose	0.01 % ÷ 6 %
Added water	0 % ÷ 70 %
Sample temperature	1 °C ÷ 40 °C
Freezing point	– 0,3 ÷ – 0,7 °C
Salts	0,4 ÷ 1,5%
active only on request:	
Conductivity	2 ÷ 10 [mS/cm]
pH	0 ÷ 14

* To determine the milk density, add 1000 to the result from the display.
Example: Result = 22; density = 22+1000 =1022.

3. Accuracy:

Fat	± 0.10%
SNF	± 0.1%
Density	± 0.3 kg/m^3
Proteins	± 0.15%
Lactose	± 0.1%
Added Water	± 3.0%
Sample Temperature	± 1^{o}C
Freezing point	± 0.005^{o}C
Salts	± 0.05%
Air temperature	from 10˚C to 40˚C
Relative humidity	from 30% to 80%
Electrical parameters:	
AC Power supply	95÷250V
DC Power supply	12V

(active only on request)

pH	± 0.05
Conductivity	± 0.1

3. **Dimensions:**
140x190x120 mm

5. **Weight** – 2 kg

1. **Milk sample volume per 1 measurement:** 25 cm^3 (=25 ml)

Appendix 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 analyzer does not measure the freezing point, but calculates it from the components it depends on. The basic components in the milk are water, salts, 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 dewatered 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

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.

CONNECTING TO EXTERNAL PRINTER

MILKOTESTER MASTER can be connected to an optional serial printer for printing out the results. MILKOTESTER MASTER is set to work only with printers supplied by Milkotester Ltd. We warn you that the unit is not set to work with other types of printers.

To connect MILKOTESTER MASTER to the serial printer, follow the steps below:

1. Connect the provided power-out 12V DC cable to the POWER OUT 12 V (for printer) socket on the rear panel of MILKOTESTER MASTER.

2. Plug the jack on the other end of the cable into the matching socket on the back of the printer.

3. Connect the provided serial cable to printer to the Serial port to printer on the rear panel of MILKOTESTER MASTER.

4. Connect the other end of the cable to the serial connector RS 232 on the back of the printer.

5. Turn on the POWER switch on the right panel of the printer. The printer is now ready for printing. From this moment on all measured results will be automatically printed out.

User guide for PC connection of the milk analyzers from Master Series

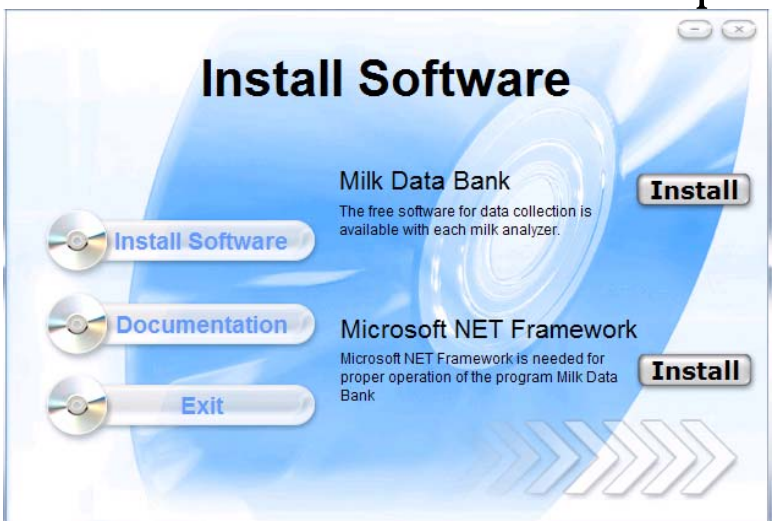
Milkotester milk analyzers usually operate with two type communication port – RS232 COM and USB 2.0 connecto

It is recommended always to connect the **RS** connector to the analyzer before to switching on the device.

Usually computers contain one **COM PORT**, so the connection with the analyzer is trough **COM1**.

Port is used to connect with the program **MASTER DATA BANK**, which is included in each CD supplied with the ordered set.

First step is to use the CD that comes with any device. When started, the CD appears in picture and you have to click 'INSTALL' on the Microsoft NET Framework, and after that 'INSTALL' on the Milk data bank program.



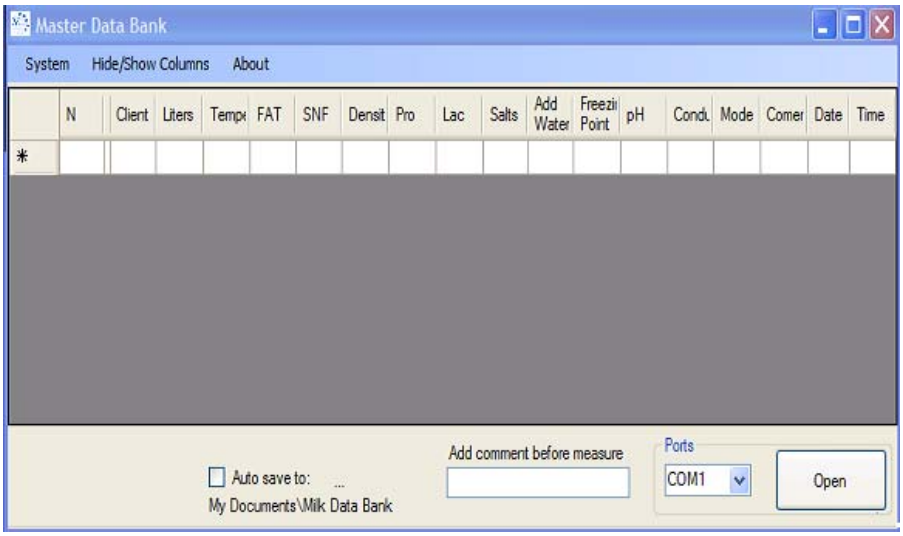
When installed correctly, the program will make it's own shortcut on the desktop:

MILK DATA BANK.

After successful installation, connect the milk analyzer with USB cable and turn it ON.

<u>The program works as below described way:</u>

Starting the software, the following window will appear:



In the down right corner of the window you can see the COM PORT that is connected milk analyzer. Choosing button OPEN, both devices connect each other and every measurement mad from the analyzer will be ordered in the table.
In checking (filling) the box AUTO SAVE, the program keeps the data automatically as Microsoft Excel file in new computer directory in “My documents”.
Hint: If the document in Excel is not in correct values you have to change the system separator from (,) to (.) (from comma to full stop sign). This you can change form Excel options menu: EXCEL OPTIONS > ADVANCED > SYSTEM SEPARATOR where the decimal separator must be full stop sign.

2.USB 2.0

After successful installation, connect the milk analyzer with USB cable and turn it ON. If it’s on USB the device will find new COM PORT on your computer. Open Milk data bank and open the com port in the bottom right corner.

USB usage is the most popular way for PC connection for now. MASTER PRO milk analyzers are with embedded USB port. It operates at the same way as RS connector, but the difference is that the USB has to be installed from the CD (supplied with each analyzer) and it forms own COM PORT. For example, if your computer has not got RS port, the USB will form COM 1. If there is RS on your computer, the USB will form COM 2, if your computer have 10 communication ports, then the USB connector will create COM 11 and etc..

GUARANTEE CARD