



MEASUREMENT SYSTEMS

ADVANCED ANALYTICAL SOLUTIONS FOR THE DAIRY INDUSTRY

MEASUREMENT SYSTEMS LTD

18, Pop Manol Street, Plovdiv 4003, Bulgaria, email: office@msyst.eu,
www.msyst.eu, tel./fax: +359 32 961 424

DAIRYSCAN

Milk analyzing device

Model – JET 2

Fat, Solids-Non-Fat (SNF), Density, Protein, Lactose, Salts, Water content, Freezing point, Temperature, Conductivity, pH and Titratable Acidity

OPERATING INSTRUCTIONS





MEASUREMENT
SYSTEMS

ADVANCED ANALYTICAL SOLUTIONS FOR THE DAIRY INDUSTRY

*Thank you for purchasing this product!
For optimum safety, proper use and maintenance of
the device,
Please read these instructions carefully!*

MEASUREMENT SYSTEMS LTD

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!

**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:**

www.msyst.eu



Safety recommendations:

- **Read carefully and make sure you understand all the instructions.**
- **For safety purposes this device is equipped with grounded power cable. If you do not have grounded electrical outlet please have one installed before using the device.**
- **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.**
- **Unplug the device from the electrical outlet every time before cleaning. The device must remain unplugged from the outlet for the entire time during cleaning.**
- **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.**



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General description

2. General description

DAIRYSCAN JET 2 is designed for percentage analysis of Fat, Solids-Non-Fat (SNF), Density, Protein, Lactose, Salts, Water content, Freezing point, Temperature (°C), pH, Conductivity and Titratable acidity. Those components can all be measured at the same time.

The device can measure three types of milk. Factory preset is for cow milk. Upon user's request the device can be calibrated for other 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. DAIRYSCAN JET 2 can analyse three types of milk defined by user. The measuring cycle is 60/90 samples per hour. The samples are precisely dosed and small quantities are required – the sample volume is 15cm³. 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 10° to 40°C (option 43°C), Relative Humidity from 30% to 80%.

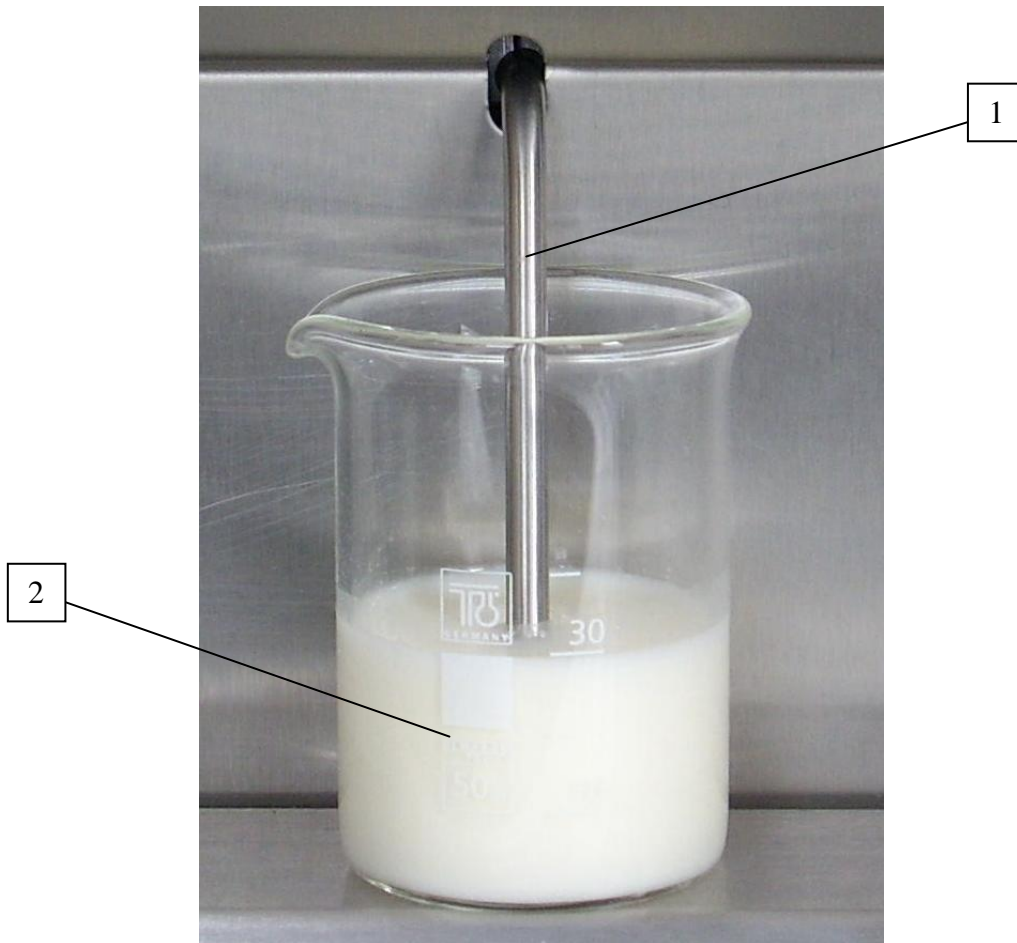
With regard to the “moisture problem” which remains of much significance the front panel of the device is designed to operate when with wet hands. In addition to this DAIRYSCAN provides a one-year full warranty.



Close-up view

3. Close-up view

3.1 Front panel

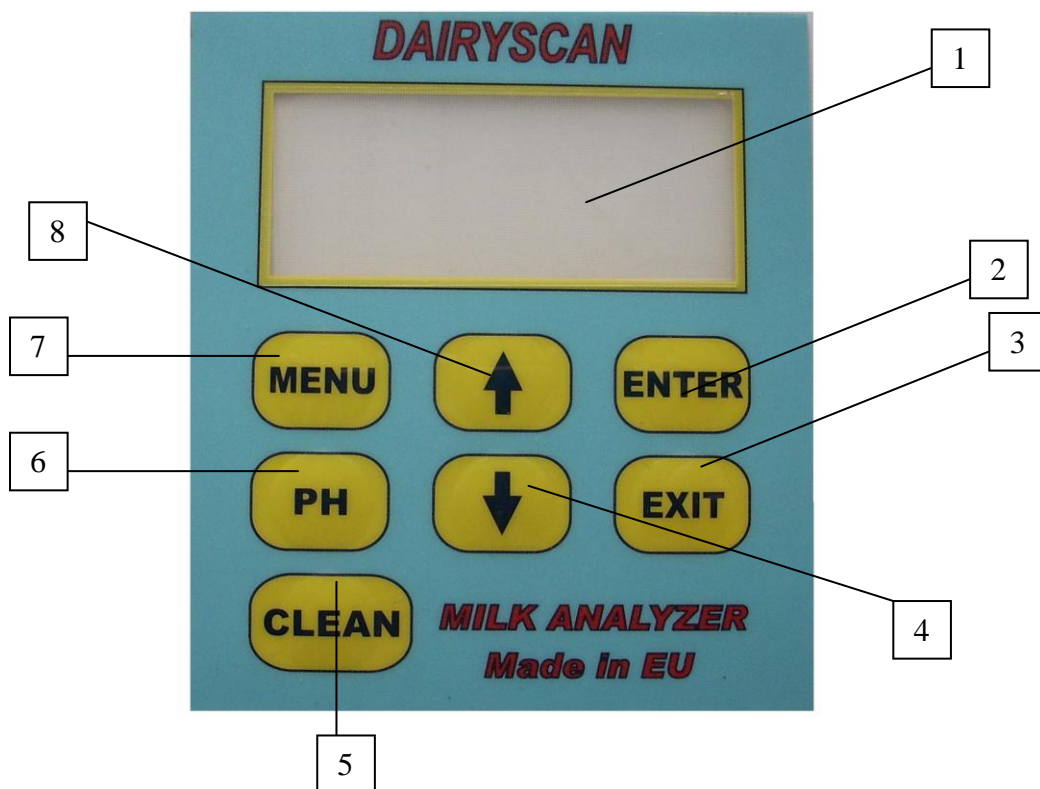


- 1 – Intake pipette
- 2 – Sample cup



Close-up view

- Display

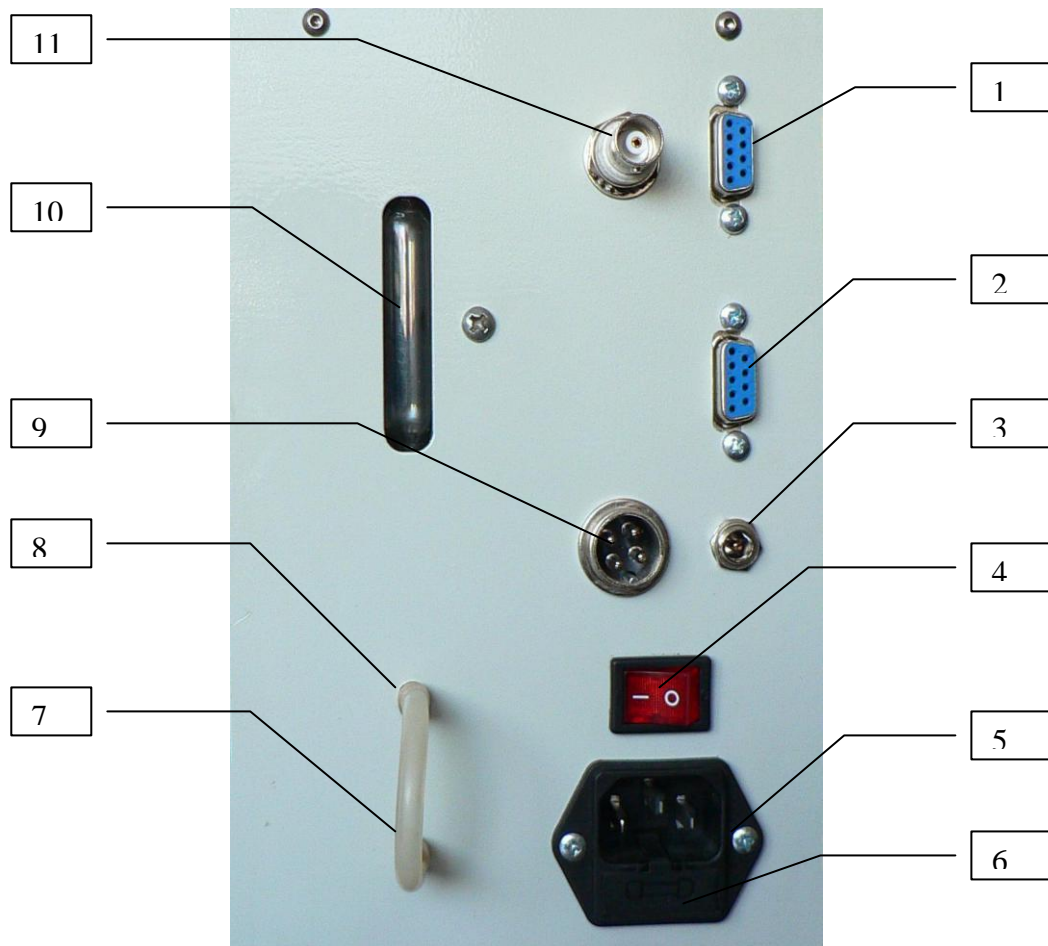


- 1 – LCD
- 2 – ENTER button
- 3 – EXIT button
- 4 – Arrow DOWN button
- 5 – CLEAN button
- 6 – pH button
- 7 – MENU button
- 8 – Arrow UP button



Close-up view

3.2 Back panel



- 1 – Serial port to printer
- 2 – Serial port RS 232
- 3 – Power out 12V (for printer)
- 4 – Power switch 220V AC
- 5 – Power socket 220V AC
- 6 - Replaceable fuse 1,6A
- 7 – Hose
- 8 – Connection to flushing syringe
- 9 – Power-in socket 12V DC
- 10 – Tube indicating the quality of flushing (milk level indicator)
- 11 – pH connector



Samples preparation

4. 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 1-40°C (option 43°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 40°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.



Working description

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 220V AC 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 DAIRYSCAN JET 2 will be ready for use. Before proceeding, please read and follow the rest of the instructions in this chapter!

Powering by an external 12V DC power source

DAIRYSCAN JET 2 can be used in places where no regular electrical supply is available, DAIRYSCAN JET 2 can be powered by your car battery or other 12V DC external power sources. DAIRYSCAN JET 2 has provided a cable suitable for this purpose. To use this option, follow the procedure described below:

1. Unplug the 220V AC 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 1 minute.



Working description

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.

SELECTING A WORKING MODE

After DAIRYSCAN JET 2 is turned on from the **POWER** switch, the display reads first:

**Milk Analyzer
DAIRYSCAN
Please Wait
System Check**

Followed by:

**Cow Milk
Sheep Milk
UHT Milk**

You can choose among three types of milk at a time, (upon user's request the device can be calibrated for any type of milk). When you choose the desired type you use the ↑↓ (UP and DOWN) arrow buttons, then press ENTER to activate analyzing.



Working description

In the meantime you should have dipped the intake pipette into the sample milk in the cup and should have put them in a vertical position. The following text will appear:

MEASURING...
Please Wait

In about 40/60 sec. 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 SI=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

SI is for Salts

W is for Added water.

By choosing the ENTER button you can start measuring anew.

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

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.



Working description

Example:

MENU > Mode > Correction > Cow milk > Fat

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

Mode Options Settings
--

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

Correction Calibration Back up Restore

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

Correction Cow Milk Sheep Milk UHT Milk
--



Working description

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
Solids
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.



Working description

MENU > Mode > Calibration

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 LAC=x.xx SOL=x.xx PRO=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



Working description

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

LAC=x.xx

SOL=x.xx

PRO=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



Working description

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:

**Put Sample
Low 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
Water
1/5 times
and Press ENTER**

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



Working description

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

<p>Cow – calibr.1 Sheep – calibr.2 UHT – Calibr.3</p>
--

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



Working description

MENU > Options > System info

Choose *Options* and press ENTER.

System Info
Language
Time and Date

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

DAIRYSCAN
Model: Jet 2
Ver: x.xx
SN: XXXXXX

MENU > Options > Language

Language:

**Not available
for this model**

Example:

MENU > Options > Time and Date

Time and date:

**Not available
for this model**



Working description

MENU > Settings > Set Fr. Point.

Choose *Settings* and press ENTER.

Set Fr. Point
Set pH
Set thermometer

Choose *Set Fr.point* **or** *Set pH* and press ENTER.

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

Use $\uparrow\downarrow$ (*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 $\uparrow\downarrow$ (*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.



Working description

MENU > Settings > Set pH

Set pH:

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 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 $\uparrow\downarrow$ (*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 stabilizes/the reference value should change the least possible/. Press *Enter* to set the value



Working description

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 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 $\uparrow\downarrow$ (*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 stabilizes/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 deionized 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.



Working description

CONNECTING TO PRINTER

DAIRYSCAN JET 2 can be connected to an optional serial printer for printing out the results. DAIRYSCAN JET 2 is set to work only with printers supplied by Measurement systems Ltd. We warn you that the unit is not set to work with other types of printers.

To connect DAIRYSCAN JET 2 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 DAIRYSCAN JET 2.
- 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 DAIRYSCAN JET 2.
- 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.

MEASURING SAMPLES

After selecting the type of milk to be measured, tilt the lower end of the pipette, place a cup with sample material on the sample shelf, and then return the pipette back in vertical position.

Press ENTER to start measurement.

When finished analysing the instrument issues a beep sound, returns the analysed 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.



Working description

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”.

MEASUREMENT OF pH

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



Working description

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.

Table of errors of pH measurement according to ambient temperature:

t°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	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

error /.30=0.3 of 1pH/



Cleaning and maintenance

6. Cleaning and maintenance

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

6. 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 **Time to Clean** appears on the display. Please carry out the following procedure:

1. Fill up a sample cup with clean warm water (45 – 60°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 8 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 and the following text will appear:

Cow Milk Sheep Milk UHT Milk



Cleaning and maintenance

6.2. Complete flushing

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

- 1.** Unplug the power cable from the electrical outlet.
- 2.** On the rear panel of the device pull out the silicone hose from the upper nozzle marked **PULL** and connect that end of the hose to the flushing syringe (the other end of the hose must remain connected to the nozzle marked **FLUSHING**).

By doing this you disconnect the internal electrical pump from the flow system and connect the syringe on its place which practically makes it work as an external manual pump.

- 3.** Place a cup with clean warm water (45 – 60°C) on the sample shelf.
- 4.** Take water in and out of the flow system by pumping in and out with the syringe. Do this 5 or 6 times to ensure better flushing.
- 5.** Fill the large sample cup with flush solution half way, place it on the sample shelf and repeat the procedure from step **4** twice.

In order to prepare flush solution dissolve two sample cups of dishwashing detergent into 1 liter of water. Thus made the solution has to be well stirred up and can remain good for unlimited time.

- 6.** After flushing with the solution, flush the system with clean water twice by repeating steps **3** and **4**.

When finished, disconnect the hose from the syringe, pump air into the syringe, connect it back to the hose, and blow the air through the system. Repeat this 2 – 3 times.



Cleaning and maintenance

7. Disconnect the hose from the syringe again and since you have finished flushing the flow system, connect it back to the nozzle **PULL** where it was previously connected.

WARNING!

If during work the electrical supply is interrupted and sample material remains inside the flow system, immediately blow the sample out of the system using the syringe; after that flush the system as described in this section.

6.3 Weekly cleaning

We recommend that you carry out the following procedure at the end of every week.

1. Unplug the power cord from the electrical outlet.
2. Fill the sample cup with hot flush solution (about 45-60°C), the preparation of which is described in the “**Complete flushing**” section.
3. Place the cup on the sample shelf.

On the rear panel of the unit pull out the silicone hose from the upper nozzle marked **PULL** and connect it to the flushing syringe. (The other end of the hose must remain connected to the nozzle marked **FLUSHING**).

4. Using the syringe, take in about 25 cm³ of flush solution into the flow system and leave it to stay in the system for about 12 hours (minimum of 10 hours).
5. After that pump out the flush solution back into the cup and flush the system with clean water twice as described in section “**Complete flushing**”, steps 3 and 4.
6. Disconnect the syringe from the hose and fill it with air. Afterwards connect it back to the hose and blow the remained water out of the system. Repeat this 2 - 3 times (section “**Complete flushing**”).



Troubleshooting

7. Troubleshooting

Error message	Possible Problem /cause	Repair/remedy
Empty Sensor	Insufficient quantity of the milk sample sucked in the system or air in the sample	<ul style="list-style-type: none">- 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.- Check if the end of the suction pipe is not above the surface of the liquid (not dipped enough).- Check the state of the level indicator (Back panel, 10).- Check the hose connections (Back panel, 7).
Sample Overheated	Sucked overheated sample	<ul style="list-style-type: none">- The sample temperature exceeds the maximum permissible sample's temperature.



Technical specifications

8. Technical specifications:

1. Measured components:

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

2. Ranges of measurement:

Fat	0.01% to 20%
SNF	3% to 20%
Density *	1015 to 1100 kg/m ³
Proteins	2% to 7%
Lactose	0.01% to 10%
Salts	0,1% to 5%
Added water	0% to 70 %
Freezing point	– 0,3 to – 0,7°C
Sample temperature	1°C to 40°C (option 43°C)
Conductivity	3 to 14 mS/cm
pH	0 to 14 pH
Titratable Acidity (Dornic/Thorner)	15 to 25°D/13.5 to 22.5°Th

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



Technical specifications

3. Accuracy:

Fat	± 0.08%
SNF	± 0.15%
Density	± 0.3 kg/m ³
Proteins	± 0.15%
Lactose	± 0.2%
Salts	± 0.05%
Added Water	± 3%
Freezing point	± 0.001°C
Sample Temperature	± 1°C
Conductivity	± 0.05%
pH	± 0.05%
Titrateable Acidity (Dornic/Thorner)	-
Air temperature	10°C to 40°C (option 43°C)
Relative Humidity	30% to 80%
Electrical Parameters:	
AC Power supply voltage	220V (110V)
DC Power supply voltage	12V to 15V

4. Dimensions: W/D/H -125/260/205mm,

5. Weight – 3kg

7. Milk sample volume per 1 measurement: 15cm³(=15ml)



MEASUREMENT SYSTEMS

ADVANCED ANALYTICAL SOLUTIONS FOR THE DAIRY INDUSTRY

MEASUREMENT SYSTEMS LTD
18, POP MANOL Street
4003 PLOVDIV BULGARIA

GUARANTEE CARD

Dairyscan JET2

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 No:..... Date of purchase:.....

Distributor:.....

Signature:.....

Stamp:.....