Appendix 15: Quick Guide LC-S

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1 Switching on

Before the device is switched on, the following points should be respected:

- Unit has no damage on
- The unit is fully assembled and closed
- There are no foreign objects in the fluid housing
- An battery approved by the WMB AG is installed

If all the points above are met, then the device can be turned on with the "ON OFF" button.

The LC-S performs the following steps, until it has reached the main menu:

- The start screen with the words "LactoCorder LC-S" is shown on the display
- If no species is set, it can be entered here
- If the time is not set, then you will be prompted to enter it
- It is checked whether the wire is inserted
- It is checked whether the tilt sensor has been calibrated
- The loaded software version, package version and serial number are displayed
- The elimination is initialized
- The diaphragm disk initialized
- The date and time are displayed on the display
- Operation name, company number and the sampling mode are displayed
- When set to the Commander the measurement is started directly, then this is going to start or otherwise the main menu appears.

2 Measurement

With the LC-S can be measured in two different ways. Firstly, without loading herd data and secondly, measurement by means of the Commander. The two types of measurement are explained in detail in the following two chapters.

2.1 Installing LC-S in the parlor

Before a measurement with the LC-S can be made, the device has to be installed in the parlor. When installing, make sure that the hoses, before and after the LC-S, are as short as possible (avoiding vacuum losses). Likewise, the device should be hanging as straight as possible.

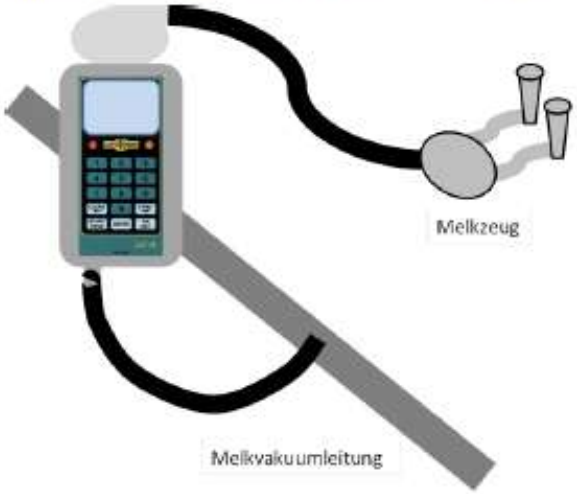

Figure 1: LC-S in the parlor

2.2 Measuring without herd data

2.2.1 Preparing the LCS

To perform a measurement without herd data ("BD"), one can proceed as follows:

1. Start the LCS (main menu is displayed)
2. Change to the next menu window by the "ENTER" key
3. Press the "6" (measure without BD)
4. The species to be measured is displayed for a short time on the display
5. Key in the herd number (min. One digit) and confirm with "ENTER" button
6. Key in the milking place number (min. One digit) and confirm with "ENTER" button
7. Select the sampling mode with the respective numeral:
   - 1 Number one for a measurement without sampling (continued in point 10)
   - 2 Number two for a measurement of a half sampling (further in point 8)
   - 3 Number three for a measurement with a whole sampling (further in point 8)
   - 4 Number four for a measurement of a manual sampling (the "ENTER" key is pressed during the measurement) (continued in point 8)
8. If the measurement with a sampling has been selected, then you can selected: Button "1" for no sample-ID (further in point 10), or for reading the sample-ID with the sample bottles reader (bottom right in the keyboard), by pressing the button "2" (continue in point 9)
9. The transponder of the sampling can be kept on the bottles reader (bottom right in the keyboard)
10. Key in the animal number (min. One digit) and confirm with "ENTER"
11. When measurement with a sampling, then the expected **daily quantity** (quantity of milk of the animal in a day) appears on the display. This can be confirmed with the "ENTER" button (further in point 13) or with the "CLEAR" button to change it (continued in point 12)
12. The expected **daily quantity** (quantity of milk of the animal in a day) can now be changed and confirmed with the "START STOP" button.

2.2.2 Start Measurement

Now all the preparations are made for milking and a measurement can be started.

1. The measurement can be started with the "ENTER" key => the red LED starts flashing
2. The milking vacuum must be turned on (the LCS goes to the measurement mode => it shows the milk flow in kg/min (big display) and the amount of milk in kg (small display)
3. Now, the animal can be connected to the milking machine
4. As soon as the milk flow is above 0.2 kg/min, the flashing of the LED stops
5. When the milking of the animal has been finished, the measurement can be terminated with the "START STOP" button

2.3 Measuring with Commander

The Commander is a handheld device by which there can be identified: which animal (RFID), which milking place (RFID). Furthermore it can read the sample number (RFID). By means of the Commander the total milk measuring process can follow a very high milking cadence and human errors at allocation of the measured milking results and the sample taken to the right animal can be excluded also under critical working conditions.
In the following there is explained step by step how the Commander and the LC-S has to be prepared and subsequently how a milk metering can be performed.

Figure 2: Commander

2.3.1 Preparation of the Commander

1. With the evaluation software "LactoPro", the herd data ("BD") for the Commander can be set. For this the herd-data-editor must be opened in LactoPro and the settings in the herd data have to be adjusted as desired. It is important that the "Bottle ID" is set correctly, if it is carried out with the LC-S. That means, if a barcode reader is fitted in the LC-S, the setting cannot be set to "LactoCorder transponder reader". The same applies if a transponder-reader is installed, the setting must not be set to "LactoCorder barcode reader".

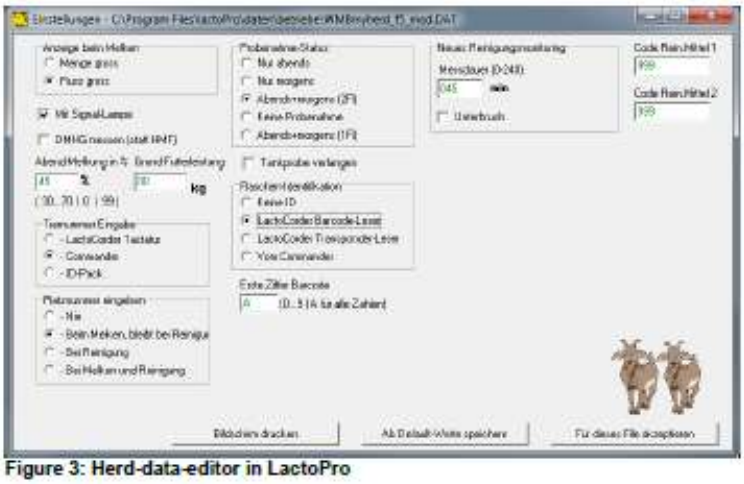

Figure 3: Herd-data-editor in LactoPro

2. It is also important that the first 10 animals are virtual animals in the animal data. These animals are required for a situation, where at the beginning of the measurement an animal number is not yet present, then a sampling can be carried out all the same – with the expected milk yield of these virtual animals. Once the LC-S receives the correct animal number from the Commander, the sampling is continued at the expected milk yield of this animal.

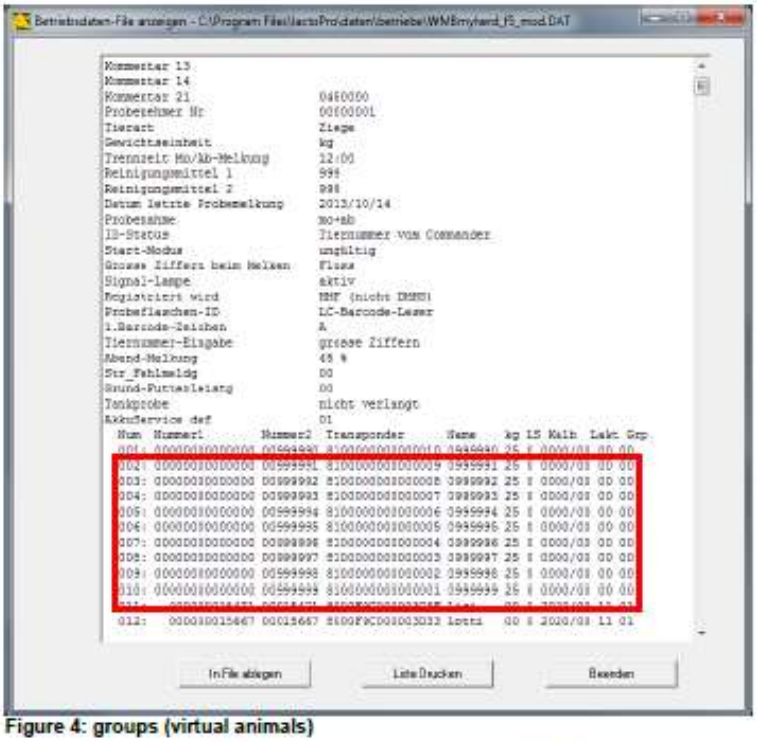

Figure 4: groups (virtual animals)

3. After the herd data have been set correctly, they may be uploaded the Commander. For this, the Commander must be connected to your computer using the PC interface. Open the LactoPro and select the menu "Commander" -> "herd data PC -> CMD".

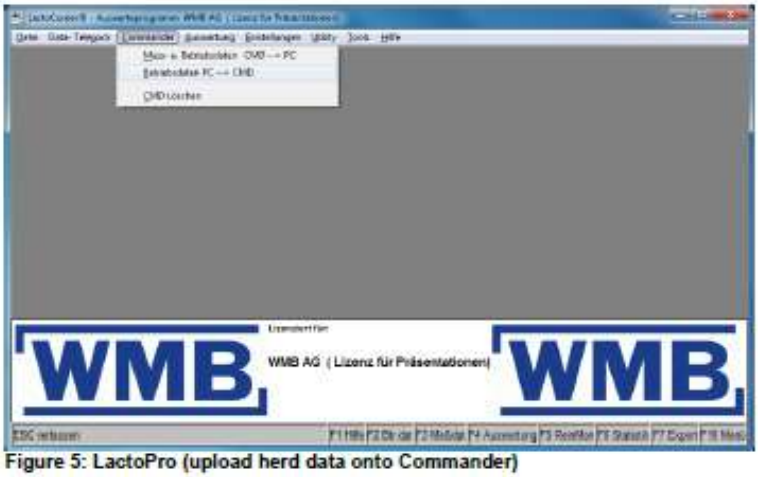

Figure 5: LactoPro (upload herd data onto Commander)

4. A window opens in which the proper herd data can be selected.

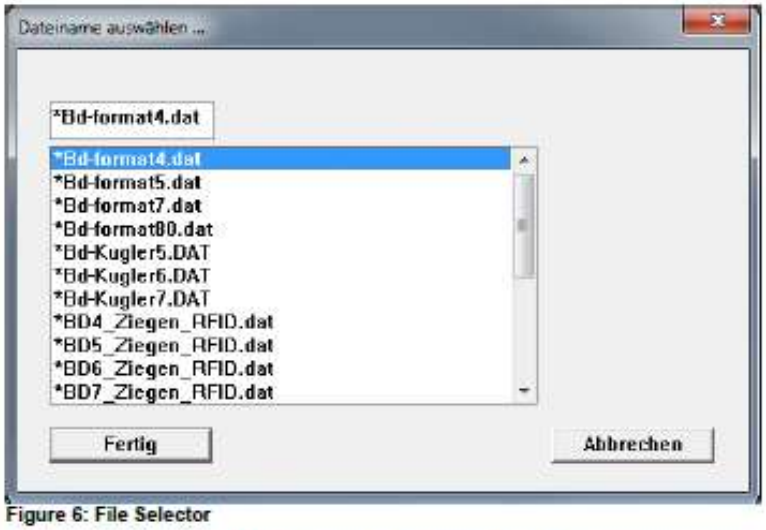

Figure 6: File Selector

5. The herd data then are being uploaded to the Commander.
   The Commander is now prepared for the preparations in the milking operation. Using the same herd data multiple Commanders can be loaded.

2.3.2 Preparations in the milking parlor

Before starting with the measurements, some settings have to be made in the milking operation.

1. Install the LC-S at the different milking places.
2. At each milking place a RFID transponder must be mounted (for example by VELCRO-band on cluster) so that the Commander knows which LC-S is connected to which milking place and so that the Commander later can contact the respective right LC-S.
3. Now the LC-S can be switched on (see Chapter 1 Switching on)
   When in the menu "<5> Service" -> "<2> Settings" -> "<E> Continue" -> "Autostart CMD" the automatic start of the Commander-measurement is activated, then he LC-S waits after its start for configuration data. Otherwise, the Commander-measurement has to be started from the main menu "<E> Continue" -> "<7> Measurement with CMD".
4. The LC-S is now waiting for configuration data
5. In order that each LC-S receives the configuration data, each milking place must be configured. For this action start the Commander with the "Start" button on and then keep the "Func" key pressed for a longer time in order to access the main menu.
6. In the main menu, press the "Func" key to enter the menu for technicians.
7. Enter the password (10-complement of date)
8. Call now the menu "Configure Parlor" -> "Prepare Parlor"
9. Press "Start" button and read the transponder of the milking place
10. Press again "Start" and read the transponder in the LC-S (this is located under the button "Start Stop")
11. Now the configuration data (BD no., time synchronization, way of milking and milking place) are sent by the Commander to the LC-S
12. The points "9" to "11" must be performed with each LC-S.
13. The LC-S is now waiting either for the sample-ID (sample ID reading by the Commander), for the animal data (no sampling) or for the reading of the sample ID (sample ID reading by the LC-S).
14. If a configuration has been done wrong, then modification can be done in the Commander menu "Configure Parlor" -> "Modify Parlor". For this, the LC-S must also be taken to the menu again, where it waits for the configuration data

15. Before proceeding with the milking, there should be tested whether the configurations have been successful. For this action go to the main menu of the Commander and then to menu "Test". Read the transponder of the milking place and afterwards the transponder of the LC-S. Now it has been tested that communication between Commander and LC-S is working. Likewise it is tested that the Commander can read the transponders and that the milking place to the respective LC-S.

2.3.3 Start milking

Now all the devices are ready for milking. The milking can be started.
Go to the Commander main menu and from there in the menu "start milking". Now you have to select the first group to be milked. After to the group selection the measurement can begin.
It is necessary to distinguish whether the milking process is performed without sample-ID or the sample-ID is read by the Commander or by the LC-S.
Important: The sample-ID must always be read before the milking place and animal. It does not matter whether the sample-ID is read by LC-S or by the Commander. When measuring without sample-ID the Commander sends off a dummy sample-ID.

2.3.3.1 Sample ID from the LC-S

When the sample-ID comes from the LC-S (transponder / barcode reader), then the measurement is started as soon as the sample-ID has been read from the LC-S (LC-S switches to status 2). The LC-S starts the measurement with the expected milk yield of the group which is being milked at present. After that the Commander must the transponder of the milking place and the animal (LC-S switches to status 3). To start a new measurement the old measurement of the LC-S must be stopped (LC-S switches to status 1).

2.3.3.2 Sample ID from the Commander

When the sample-ID comes from the Commander, then the measurement is started as soon as the transponder of the sample-ID, of the milking place and of the animal have been read. When the measurement is completed, then you can simply return to reading the sample-ID, the milking place and the animal for starting a new measurement.

2.3.3.3 Without sample

When there is milking without taking a sample then can be read the milking place and the animal with the Commander , so that measurement of the LC-S is started. When the measurement is completed, re-reading the milking place and the new animal starts a mew measurement of the LC-S.

2.3.4 Quit milking

The milking can be stopped in the LC-S, by pressing the "START STOP" button during the measurement.
With the Commander the milking can be ended when going from the main menu to the menu "Finish milking". Thereafter, the transponder of the milking place and the animal must be read.

3 Cleaning

After it has been milked, the device must be cleaned. A good cleaning is very important so that the functions of the device are guaranteed. The cleaning can be started from two different menus: Either the main menu, or after finishing the Commander measurement.

3.1 Start cleaning from the Main Menu

In the following the sequence of a cleaning from the main menu is described. After the milking the LC-S can remain normally connected to the milking installation with an empty sample bottle plugged to the LC-S.

1. From the main menu
2. Press the "2" (Clean)
3. Cleaning starts and the display shows what action the LCS currently is performing for the cleaning
4. Now the cleaning process of the milking installation can be started
5. At the end the cleaning of the LC-S can be terminated with the "CLEAR" button
6. It will automatically switch to the main menu

3.2 Starting the cleaning from the Commander measurement

In the following the sequence of a cleaning after a Commander measurement is described. End the Commander measurement (see 2.3.4 end milking). The LC-S after Commander measurement the LC-S can remain normally connected to the milking installation with an empty sample bottle plugged to the LC-S.

1. On the display it appears that the measurement is finished. Cleaning can be started with the "ENTER" key
2. Cleaning starts and the display shows what action the LCS is performing for the cleaning
3. Now the cleaning of the milking installation can be started
4. At the end the cleaning of the LC-S can be terminated with the "CLEAR" button
5. It will automatically switch to the main menu

4 Data Transfer

The measurement data that have been recorded with the LC-S can be read to an USB-stick (USB flash drive). The procedure of how this can be done is explained below.

1. From the main menu
2. Press the "3" (data transfer)
3. Press the "2" (write data)
4. The LC-S asks for a USB flash drive
5. Fit the USB-stick to the USB connector
6. The data are written to the USB flash drive into folder "LCS measurement data". If this does not yet exist, then it will be created in the top level of the USB stick.
   The file name has the structure "MD_X_Y.DAT"
   MD: indicator for measuring data
   X: herd number
   Y: date when the herd data have been loaded to the LC-S (yymmdd)
7. After the successful writing of the data, the level of memory is displayed on the LC-S.
8. Press the "ENTER" key.
9. Remove the USB flash drive and press "ENTER".
10. Then you will be asked whether the data in the memory of the LC-S should be deleted. With the key "ENTER" (Yes), the data can be deleted or with the "CLEAR" button, the data may be left on the memory of the LC-S.
11. Thereafter, the LC-S goes directly back to the main menu.

5 Load measurement data into Lactopro

The measurement data created by the LC-S can be viewed on the computer with the program LactoPro. In the following there are the instructions.

1. The file which was stored onto the USB flash drive in the chapter "Data transfer 4", can be copied to the following folder in the installation directory of LactoPro "Data \ data pack \ LCS_Messdaten \". The structure of the file name must be "MD _ *. DAT". Otherwise the LactoPro does not read the file
2. Start the LactoPro
3. The measurement data can now be imported by one of the two menus "Data- Telepack" -> "Measuring and Herd Data DP -> PC" or by "Commander" -> "Measuring and Herd Data CMD -> PC". The measurement data can also be read with the "F3" key
4. The LactoPro now reads the data. The measured data, which peviously have been copied into the folder "Data \ data pack \ LCS_Messdaten \" are being renamed from LactoPro to "MDA _ *. DAT".
5. Now the measurement data can be selected in the menu "Evaluation" -> "Results".
6. The LactoPro now displays the data in tabular form.
7. When you highlight a line and then press the "F4", the measurement data can be viewed in a graph (curves of milk flow, temperature, conductivity and absolute pressure)
8. Use the "Page Up" and "Page Down" to switch between the various measurements.

6 Performing a LC-S Firmware Update

For loading a new firmware to the LC-S the following steps can be carried out:

1. Store the new firmware on a USB flash drive in the folder "LCS update". If the folder does not exist, it must be created in the top level of the USB stick. The file path must have exactly this name (small/big form letters, interspaces, etc.)
2. Switching on the LC-S (see 1 Switching on)
3. In the main menu, press the "5" key. -> There appears the Service-menu
4. Connect the USB-stick with the new firmware by means of the USB-connector to the LC-S
5. Press the "4" key. -> You are asked whether there really should be carried out an update of the LC-S.
6. Both the firmware that is loaded on the LC-S at present as well as the firmware on the USB stick are displayed.
7. If the new firmware (firmware on the USB stick) should be replaced with the old firmware (firmware on the LC-S), then this may be confirmed with the "ENTER" key.
8. The LC-S now performs the update. If no error has occurred, the LC-S is turned off, or an error message on the screen will be displayed (the update will be required again when switching on the LC-S)
9. If the update was successful, then the next time, the new firmware will get started.

LactoCorder-S (LC-S) for Cows Routine Water Test

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A.1 Annual Routine Testing of LactoCorder-S (LC-S) Milk Meter for Cows

A.1.1 General

ATTENTION The routine testing with testing fluid must be carried out with properly cleaned equipment.

ATTENTION After the test, the device must be rinsed with clear water.

A.1.2 Reference value

The reference value of a milk meter is determined, by dividing the value read on the display, by a correction factor. This correction factor for the LC-S meter takes into account the difference between the specific gravity, viscosity and foaming characteristics of milk and of the test fluid. According to our present settings this **correction factor is 1,031**. Deviations from the test equipment or test fluid recommended by the manufacturer can lead to a slight change in the correction factor. For use in the periodic tests results of previous tests can be made available.

A.1.3 Equipment needed

- Vacuum pump with a negative pressure of 40 to 50 kPa
- Hoses with 14-16mm internal diameter
- Flow reduction piece (flow rate about 5.5 kg/min, Art. 2506, supplier WMB AG)
- Intermediate piece with air inlet, Art. 2505 (supplier WMB AG)
- Calibrated electronic scales (resolution 10 g)
- Bucket with min. 15 l volume
- Milking pail for receiving the test liquid
- Thermometer

A.1.4 Test liquid

- Product: Neoagrar Top S Art.15566 (1 liter) supplier: WMB AG
- Water with a temperature of 20 ° C +/- 5 ° C
- Addition of 0.3% (volume %) of the Neoagrar Top S
- Mix test fluid well
- The fluid may be used for 50 measurements or one day only.

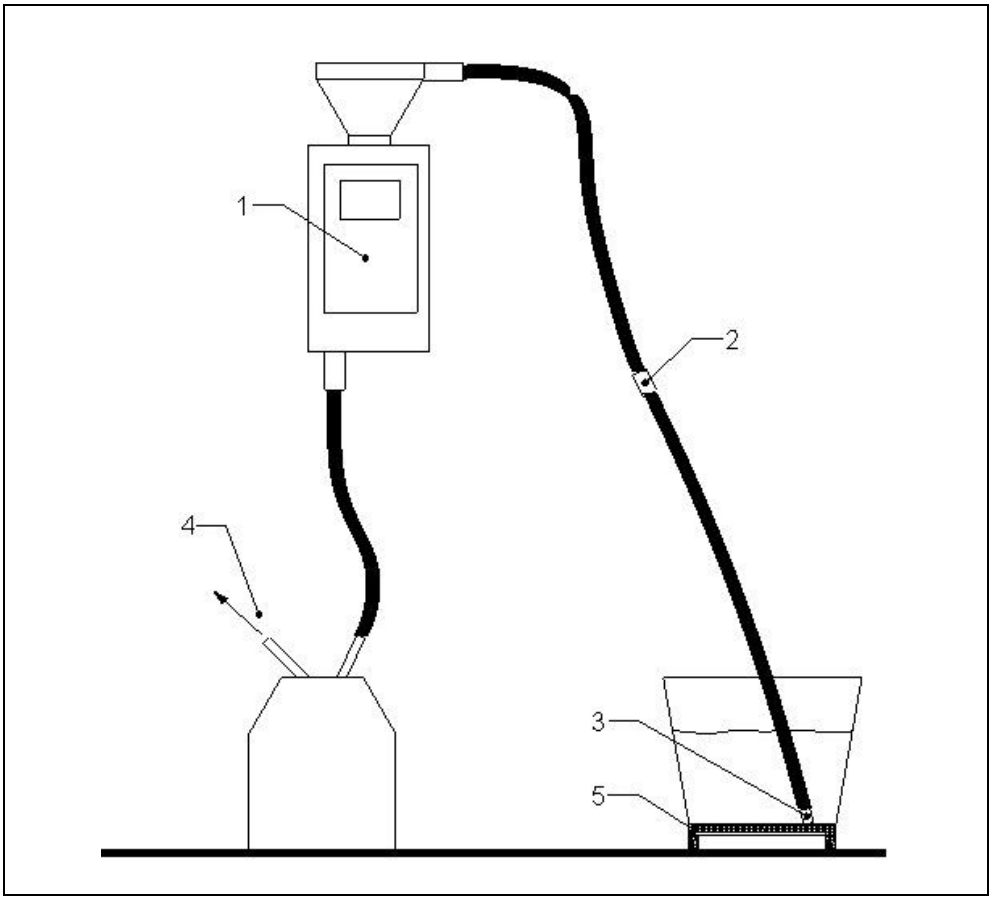

Fig A.1.4 Set-up for routine testing

1 LC-S secured free of tilting at an altitude of about 1.5 m
2 Intermediate piece with air inlet, Art. 2505
3 Flow restrictor, approximately 5.5 kg/min (Art. 2506)
4 Connection to Vacuum 40 to 50 kPa
5 Calibrated scale

A.1.5 Test procedure

1. Set bucket with about 15 l of test liquid on the scale and tare (set to zero)
2. Switch on the LC-S by pressing the button “ON/OFF”
3. Select Species: From the main menu, press the <7> (service), then key <2> (settings), then "ENTER" key, then press the <6> and then the <1> for test cows
4. Use the <C> (CLEAR) for going back to the main menu
5. In the main menu select “measurement without BD (=herd data)” by pressing <3>
6. Key in a herd number (for example 1) and confirm with <E> = “ENTER” key
7. Key in a milking place (for example 1) and confirm with the <E> = "ENTER" key
8. Select the measure without sampling
9. When you want to measure with sampling press the <1> button
10. Enter animal number: Change or Next
11. There has to be entered the expected **daily** amount of milk. As the measured

quantity in this water test should be 10 kg, the expected daily milk amount to be entered would be the double (=20 kg). Thus key in “20” and then confirm with the button “START/STOP”

12. Now hold the hose connected to the LC-S inlet head into the bucket
13. Start the measurement by pressing the "ENTER" key
14. Turn on the vacuum
15. After the fluid quantity to be measured (=10 kg) has been sucked out of the bucket, pull the hose and hold it up, so that the liquid still in the hose can flow into the LCS. It must be ensured that all liquid flowing back from the hose is collected in the bucket.
16. Then block the end of the suction hose with your finger until the flow rate displayed on the LCS screen drops below 0.1 kg/min
17. Then exit the measurement by pressing “START/STOP”
18. Turn off the vacuum
19. Divide the amount displayed on the LC-S by the previously mentioned correction factor (at present 1,031) for determining the reference value.
20. Measure the weight of the bucket with the remaining fluid and subtract it from the starting weight.
21. Determine the difference between the reference value and the amount of fluid effectively withdrawn from the bucket.
22. For a new measurement, press the "ENTER" key and then proceed as described in section 8 in this test procedure.

A.1.6 Evaluation of the measurement results (in acc. with D. Nosal)

- If the first measuring value deviates 0.1 kg or less from the reference value: meter = correct.
- If the first measuring value deviates more than 0.1 kg from the reference value, proceed to a second measurement.
- If duplicate measurements show an average deviation of 0.2 kg or less from the reference value: meter = correct.
- If two consecutive measuring values differ more than 0.2 kg from each other, proceed to a third measurement.
- If a meter does not come up to this standard during the periodic checking, proceed to a fourth or even fifth measurement.
- If there still is a difference of more than 0.2 kg to the reference value after 5 measurements, a correction should be applied to the meter.
- Applying a correction before 5 measurements are done is not recommended by WMB AG.

A.1.7 Analysis of sample volume

If the keyed-in expected **daily** milk amount (see point 11 in this document) is exactly the double of the fluid quantity that has been sucked out of the bucket (see point 15 in this document) the volume of fluid in the sample bottle should be between 33 and 38 ml.