FRANZ LUDWIG
GESELLSCHAFT FÜR MESS- UND REGELTECHNIK MBH

TEST SAMPLE EXTRACTOR FL-MIKRO-LAB WITH MEASURED VALUE EVALUATION LAPTOP / PC

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TECHNICAL DATA

TEST SAMPLE EXTRACTOR FL-MIKRO-LAB:

Dimensions	H: 660 mm; ∅ of the sample container: 90 mm
Cover	High solid anodised aluminium
Weight	11,5 kg
Temperature Range of the material to measure	0-80°C
Volume	680 cm^3
Connection Cable	5x0,25 mm^2 shielded; Length: 2 meters

SYSTEM REQUIREMENTS OF EVALUATION PC:

Operation System	WIN 2000 / NT / XP
Serial Interface	1x RS 232 (COM-PORT)

FL-DIGI-SMART:

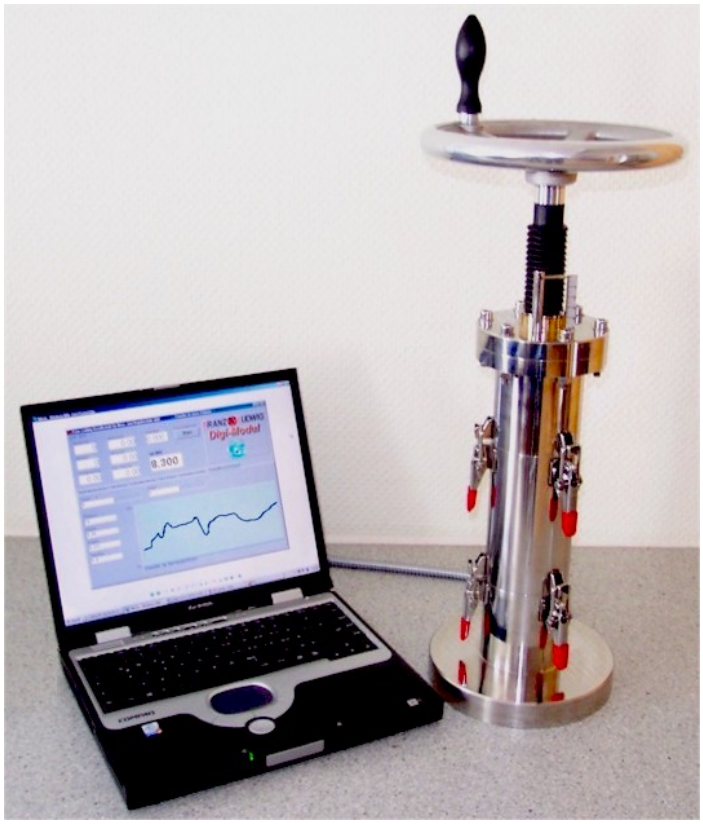
Dimensions	H: 75 mm, W: 122 mm, D: 120 mm
Power Supply	110 - 230 VAC (+ 10%), 50/60 Hz
Measure Range	0-XX.X % (depending to the measured medium)
No. of Calibration Graphs	unlimited
Accuracy	depending to measure range and material (approx. +/- 0,3%)
Temperature Range	0-50° C

MICROWAVE MOISTURE PROBE:

Dimensions of the Probe	∅ 75 mm; Length: 90 mm
Weight	0,85 kg
Power Supply	+24 V DC (+/- 25 %)
Power Absorption	3 VA
Temperature Range	0-80°C
Frequency	433,92 MHz
Outputs analog	2 analog outputs 0-20 mA
Cover	Solid Aluminium

1. TEST SAMPLE EXTRACTOR FL-MIKRO-LAB

1.1 CONSTRUCTION

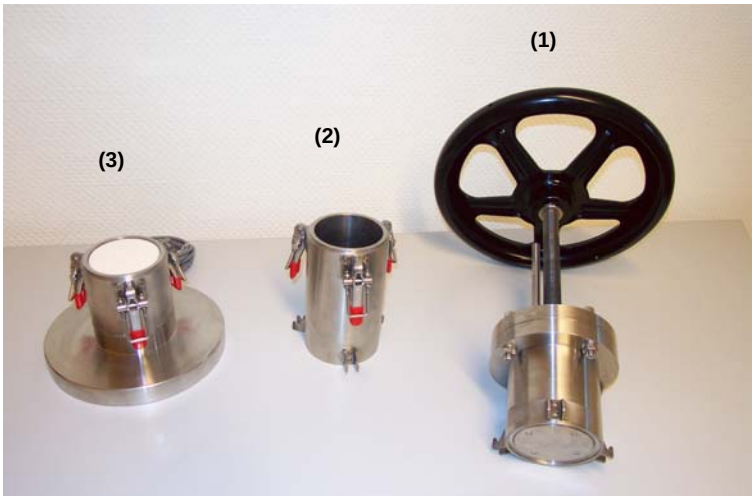


Test Sample Extractor FL-Mikro-Lab / Evaluation via LAPTOP / PC

The Test Sample Extractor FL-MIKRO-LAB is 3-part constructed.

Upper Part

The spring arrangement in the top **(1)** of the test sample extractor can be moved through the hand wheel.
A scaled measuring stick and a needle are situated underneath the hand wheel. The hand wheel and the scaling are guaranteeing the same pressure conditions in the test sample extractor when using.



Middle Part

The middle part **(2)** contains the test sample material.

Lower Part

The Microwave Moisture Probe is installed in the lower part **(3)** and is connected to the evaluation unit with the probe's measure cable.

The three parts of the test sample extractor are equipped with bow clasps for an easy filling and cleaning.

!!! Please make sure the spring is relieved of pressure before opening the clasps. !!!

1.2 MEASURE OPERATION

Generals

Before real moisture values can be displayed on the evaluation unit FL-AE, a calibration (see 2.4 - Calibration) has to be proceeded or a pre-calibrated calibration graph has to be operated. When measuring material with different ingredients and grain structure, you have to take several calibration graphs. You have to make sure the correct calibration graph is chosen in the evaluation PC when starting the measurement. Unlimited calibration graphs can be stored.

Measurement Sequence

- Make sure the requested calibration graph is pre-chosen in the evaluation PC (see 2.2 - Operation Panel/Protocolling).
- Turn the hand wheel of the test sample extractor FL-MIKRO-LAB completely to top.
- Open the upper bow clasps and remove the upper part.
- Make sure the material to measure is homogenized perfectly.
- Fill the test sample extractor until the upper edge (e.g. with a funnel).
- Now the upper part is put on and the bow clasps are closed. Pay attention not to leave any test material between the contact pads of the upper and the middle part.
- Turn the hand wheel down. First of all, the scaling and the needle will move down simoultanious. As soon as only the needle is moving on, the test material is compressed through the spring arrangement.
- Stop turning the hand wheel when reaching the scale point, which is evaluated during the calibration (see 2.4 - Calibration).
- Pay attention to start the measurement immediately when reaching the limit scale point at the evaluation PC. Longer delay times occur to measured value distortions.
- Start now the measurement at the evaluation PC. Pay attention that the corresponding calibration graph is chosen with different materials (see 2.4 – Calibration). The measurement takes approx. 5 seconds and is processed automatically after pressing the start key. If the measurement is finished, the % moisture value can be taken.
- After the measurement the pressure spring is relieved when turning back the hand wheel. Open now the test sample extractor for emptying. Make sure no material remains are soiling the test sample extractor nor the probe's measure surface.

1.3 CLEANING

Make sure no material remains are soiling the test sample extractor nor the probe's measure surface after emptying the FL-MIKRO-LAB. Material remains can be removed with a brush or air pressure. Material stockings on the probe's surface can be removed with common household cleaners (e.g. scouring agents). Heavy soiling can be removed with a high pressure cleaner.

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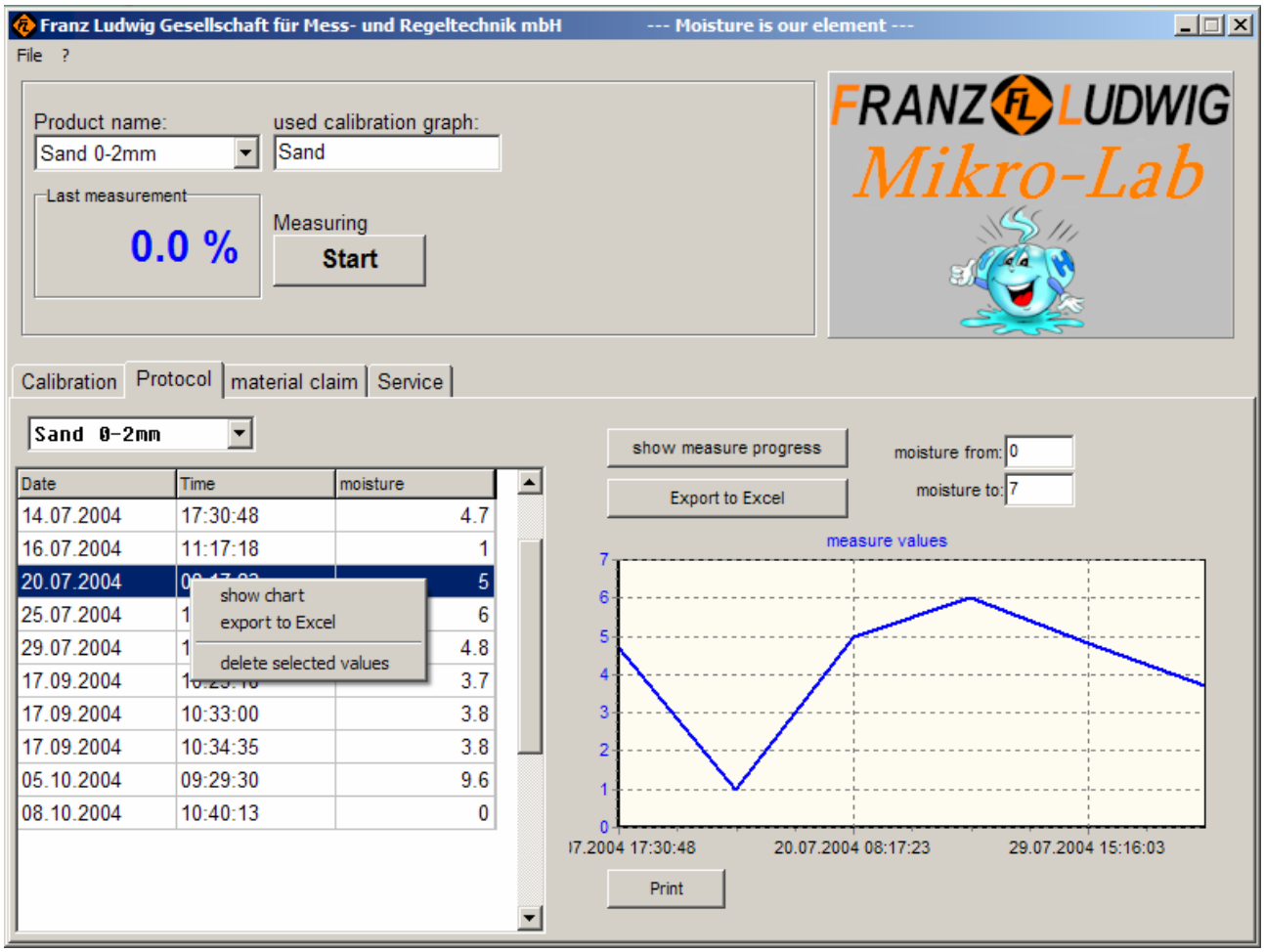
2. MEASURED VALUE EVALUATION VIA LAPTOP/PC

2.1 SOFTWARE INSTALLATION

Exceed SETUP.EXE and follow the directions. An Icon is automatically generated on the desktop.
After starting the program go to the „SERVICE"-page and enter the password „55124", than confirm with „OK".
Set now your language and the used Com-Port of your laptop/pc.

2.2 OPERATION PANEL / PROTOCOLLING

At the upper edge the currently chosen product („product name") and the corresponding calibration graph chosen are displayed. After touching the „START"-button a measurement is done with this calibration graph and the current moisture value is displayed in the field „measured value" after 5 sec. The measured value is simultaneously stored in the protocolling menu.



At the lower edge the chosen „protocolling menu" is shown. All product's measure results are displayed depending to date and time. The requested product is chosen in the product name field (here: and 0-2 mm). It is necessary to choose the recording period before the measure value course can be displayed graphically:

Left mouse key	- marks the beginning of the range
Left mouse key + pressed shift key	- marks the end of the range

Afterwards the measured value graph can be displayed graphically when touching the „Show Measure Progress" field. When touching „Export to Excel"-field the marked range is changed in an excel-compatible data format and automatically opened in Excel so all data can even be shown on other systems. The moisture range to be displayed in the diagram can be set when using the fields „Moisture from", „Moisture to". To delete a marked table part, press the right mouse key and „Delete selected Values". The displayed measured value diagram or the depending measured values or both can be printed on a connected printer with „Print".

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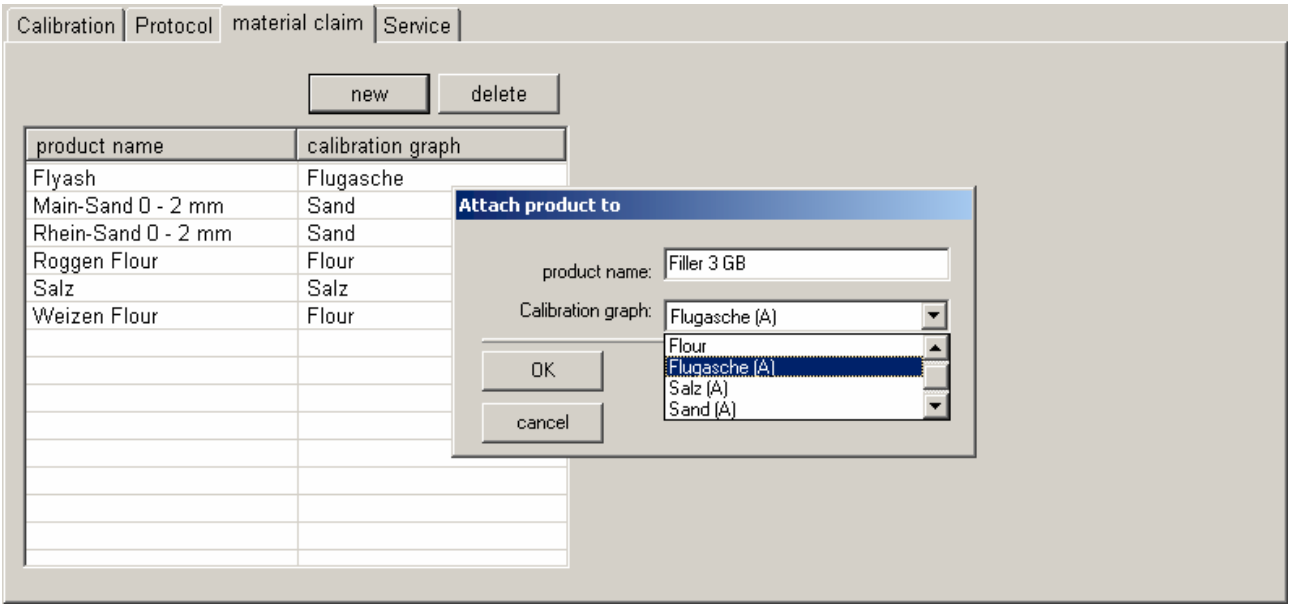
2.3 MATERIAL ASSIGNMENT

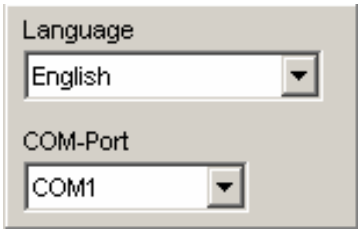


In the menu „Material Claim“ the pre-set calibration graphs are assigned to certain products. You can assign one calibration graph to as many products as you would like. To make a new assignment, press „NEW“. The „Attach Product To“ window opens. Enter first the name of the product to be measured in „Product Name“. Than choose an existing calibration graph in the field „CALIBRATION GRAPH“. (Pre-calibrated calibration graphs are named with „A“). The assignment is stored with “OK”.
With new material, no calibration graph has been taken before, a calibration has to be proceeded first (see 2.4. - CALIBRATION). If an assignment in the table has been marked with the right mouse key, it can be deleted when touching the DELETE-button.
ATTENTION: All already protocolled measured values of this assignment are deleted, too!

PROBE CHECK: Point 3.2 CHECKING OF MEASURING PROBE

LANGUAGE: The requested language can be set

COM-PORT: Assign a COM-PORT



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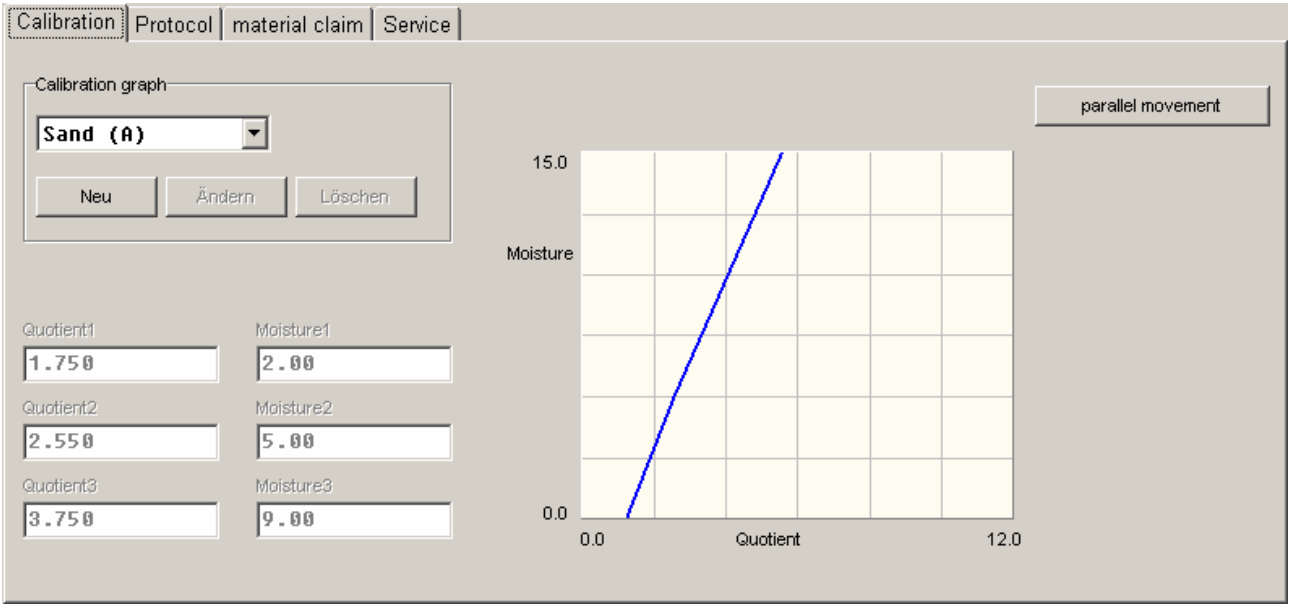
2.4 CALIBRATION

For evaluating of realistic %-moisture-values, the FL-MIKRO-LAB has to be calibrated first. If materials with very different compound and grain structure should be measured, it is recommended to take several calibration graphs. You can take as many calibration graphs as you like.



Taking of a new calibration graph

Prepare two material samples with different moistures. The moisture values have to be known and should serve the upper and lower part of the moisture range to measure (The material sample with the lower moisture should be higher than '0'.)

Example:

Moisture Range to measure	0 % - 10 %
Material sample 1	2 %
Material sample 2	6 %

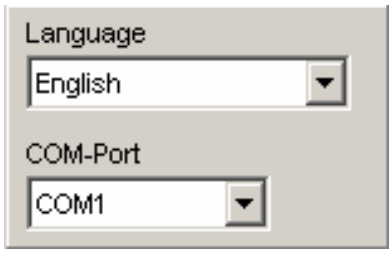
- After clicking the NEW field, a window opens and the name of the calibration graph can be entered.
- With the mouse or the TAB change into the field FIRST MOISTURE VALUE. Enter here the lower moisture value (2 from the example).
- Fill the FL-MIKRO-LAB with the first sample and pull the hand wheel down. The needle has to stop at a scale position which has to be pre-set in advance. We recommend scale position 1 until 2. Products with high condensity should be condensed to one of the lower scale positions.
- Start the measurement with START.
- After approx. 5 seconds you are asked to enter the 2nd moisture value (e.g. 6).
- Fill the sample extractor with the second probe, condense the material and start the 2nd measurement.
- After 5 seconds the calibration is done. Touch OK to return to the calibration mode.
- The calibration graph can now be assigned to a product at the point MATERIAL CLAIM.

Important:

All measurements with this product have to be processed with the same pressure (same scale position) during the further calibration as well as in the later measure operation.

2.6 MENU LANGUAGE

You have the possibility to set the language at tab "MATERIAL CLAIM":



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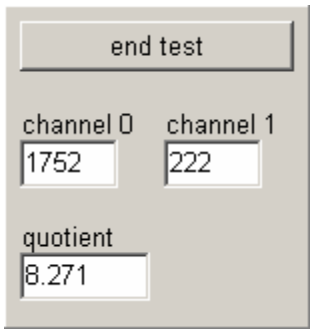
3. ERROR DETECTION

3.1 INEXACT MEASURE RESULTS

- Calibration been done?
- Several material specific calibration curves have been taken for the measurement of very different materials (compound, grain structure)?
- The correct calibration curve has been assigned or calibrated to the product designation?
- The evaluated pressure point (scale position) evaluated during the calibration has been kept every times ?
- The measurement has been started **(immediately)** after reaching the pressure point?
- Are soilings and/or build ups on the measure surface and in the interior of the test sample extractor excluded?
- Has the FL-MIKRO-LAB been filled every times completely before measurement?
- The material sample to be measured has been mixed homogeneously?
- The moisture values taken for calibration and comparisation measurement through a reference system (e.g. drying oven) are reliable? (Probably proceed control dryings).

3.2 CHECKING OF MEASURING PROBE

At tab MATERIAL CLAIM you have the possibility to get the probe's measure channels displayed when touching the button PROBE CHECK. The displaying of the probe's measure channels K0 and K1 allows the function checking of the microwave moisture probe. Take off the upper and the middle part
if the FL-MIKRO-LAB. Start a measure process with uncovered probe. The value of channel 0 has to lay around 2000 (+/- 500). The value of channel 1 has to lay around 3800 (+/- 500). The value of channel 1 should go down to approx. 400 (+/- 200). Should the values of your probe lay out of this range, please contact one of our technicians for further steps. The Q-value (quotient value) is a linking up with K0 and K1 and indicates the non-calibrated measured value.



3.3 INTERFERENCE OF ISM-FREQUENCIES

Radio frequency devices use particular ISM-Frequencies (Industrial Scientific and Medical), which are international prescribed.
Our Microwave Moisture Probe, which counts as this type of device, is operated inside the frequency range from 433,05 to 434,79 MHz.
Radio frequency ranges are utilized in many commonly known devices. An example of these devices are as follows.

-
- Radio Alarm Systems - Vehicle Opener
- Mobile Transmitters - Garage door Opener
- Remote Controls - Wireless Movement Detectors

On account to the huge number of ISM-Devices it can lead to mutual influences or interferences, if they are operated in direct environment. The radio signals might be received from others as the expected receiver. To avoid each kind of interferences, we recommend, that your other operating ISM-devices, which use the range from 433,05 – 434,79 MHz as well, not be used in immediate vicinity of our Microwave Moisture Probes resp. be laid out for other ISM-Frequencies. This goes especially for possible danger zones as for example cranes, roll-doors, buckle conveyor belts, e.g. In researches and tests, which had been done by us and outside institutes, have been found out, that the from us used frequency range from 433,05 to 434,79 MHz is the most advantageous to get reliable and accurate Moisture Measurement with our Microwave Moisture Probes.

Please feel free to contact us. We look forward to answer any questions you may have.

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