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Operating Manual Electronic Moisture Analyser

KERN MLS_A

Version 3.1
09/2010
GB



MLS_A-BA-e-1031



KERN MLS_A

Version 3.1 09/2010

Operating Manual

Electronic Moisture Analyser

Table of Contents

1	Technical Data	4
2	Declaration of conformity	8
3	Appliance overview	9
3.1.1	Overview of displays	10
3.1.2	Keyboard overview	11
3.1.2.1	Numeric entry	12
4	Basic Information (General)	13
4.1	Proper use	13
4.2	Improper Use	13
4.3	Danger Information	13
4.4	Warranty	14
4.5	Monitoring of Test Resources	14
5	Basic Safety Precautions	15
5.1	Pay attention to the instructions in the Operation Manual	15
5.2	Personnel training	15
6	Transportation & Storage	15
6.1	Testing upon acceptance	15
6.2	Packaging / return transport	15
7	Unpacking, Setup and Commissioning	15
7.1	Installation Site, Location of Use	15
7.2	Unpacking and erection	17
7.2.1	Scope of delivery	18
7.3	Mains connection	18
7.4	Connection of peripheral devices	18
7.5	Commissioning	19
8	Appliance configuration	19
8.1	Navigation in configuration menu	19
8.2	Configuration menu overview	20
8.3	Description of individual menu items	21
8.3.1	Password – menu block „PASSCODES“	21
8.3.2	Adjustment – menu block „CALIBRATION“	23
	Call-up adjustment function	23
	Adjust balance	24
	Adjust temperature	26
	Adjustment log	28

8.3.3	Settings of balance – menu block „SETUP“	30
	Setting time	31
	Date format	31
	Setting date	31
	User identification	32
	Signal tone pressing button	32
	Signal tone after end of drying	32
	Display background illumination	33
	Filter	33
	Language Operator guide	33
9	Drying parameters	34
9.1	Adjustment	34
9.1.1	Description of the drying parameters	34
9.1.2	Menu overview	39
9.1.3	Navigation in the menu	40
9.1.4	Menu settings	40
9.2	Save	49
9.3	Calling up	51
9.3.1	Call-up factory setting „PST 00“	51
9.4	Delete	52
9.5	View / change drying program	53
10	How to implement drying	53
11	Print, store and call-up measurement results	56
11.1	Print / store	56
11.2	Calling up	59
11.3	Delete	59
12	General information concerning moisture analysis	61
12.1	Application	61
12.2	Basics	61
12.3	Adjustment to existing measuring method	61
12.4	Preparing a sample	62
12.5	Sample material	63
12.6	Sample size / originally weighted in quantity	63
12.7	Drying temperature	64
12.8	Recommendations / Guidelines	65
13	Data output /RS 232C interface	66
13.1	Interface parameters	66
	Baud rate	67
	Parity	67
	Output condition „CONTINUOUS“	67
13.2	Technical Data	68
13.3	Remote control instructions	68
14	Service, maintenance, disposal	69
14.1	Cleaning	69
14.2	Service, maintenance	69
14.3	Disposal	69
15	Instant help	70

1 Technical Data

Data	MLS 65-3A	MLS 65-3A110V
Radiator	Halogen (1 x 400 W)	
Temperature range	50°C - 160°C Choice of steps at 1°C	
Maximum load (Max)	65 g	
Warm-up time	2 h	
Minimum for drying	2 g	
Readability (d) „Weighing mode / Moisture analysis mode“	0.001g /0.01 %	
Reproducibility „Weighing mode“	0.002g /0.05 %	
Reproducibility „Weighing mode“	Weighed in quantity 3 g: 0,15 %	Weighed in quantity 10g: 0,05 %
Heating methods	Standard drying / preheating stage can be added Gentle drying / preheating stage can be added Stage drying	
Linearity	± 0.003 g	
Stabilization time (typical)	4 sec.	
Recommended adjustment weight, not added (class)	50g (F1)	
Ambient conditions	<ul style="list-style-type: none"> • 0°C....+40°C ambient temperature • max 80% air humidity non-condensing 	

Shutoff criterion	<ul style="list-style-type: none"> • Manual (STOP button) • TIME Drying is finished after the set time, adjustable 3 – 99 minutes. • STABLE Drying is finished, when the set weight value per time unit is lower than the nominal value, both values being freely adjustable. • TIME / STABLE This shut-off criterion is a combination of „TIME“ and „STABLE“. Drying time and weight loss per time unit freely adjustable. The value reached first finishes drying.
Sample dishes included	Ø 90 mm
Weighing Units	[g] Residual weight [% M] Percent moisture [% S] Percent dry mass [ATRO % M] ATRO moisture [ATRO % S] ATRO dry mass
Internal memory	49 memory locations for drying programs
	99 memory locations for measurement results
Interface	RS232
Dimensions	Housing 250 x 360 x 185 mm
Available drying room	Ø 90 mm, 25 mm high
Net weight	6 kg
Electric Supply	230V AC 50-60 Hz 110 V AC 50-60 Hz
Language/ User guidance	German, English

Data	MLS 150-2A
Radiator	Halogen (1 x 400 W)
Temperature range	50°C - 160°C Choice of steps at 1°C
Maximum load (Max)	200 g
Warm-up time	30 min
Minimum for drying	2 g
Readability (d) „Weighing mode / Moisture analysis mode“	0.01g /0.01 %
Reproducibility „Weighing mode“	0.02g /0.05 %
Reproducibility „Weighing mode“	Weighed in quantity 10 g: 0,2 %
Heating methods	Standard drying / preheating stage can be added Gentle drying / preheating stage can be added Stage drying
Linearity	± 0.03 g
Stabilization time (typical)	3 sec.
Recommended adjustment weight, not added (class)	50 g (F1)
Ambient conditions	<ul style="list-style-type: none"> • 0°C....+40°C ambient temperature • max 80% air humidity non-condensing

Shutoff criterion	<ul style="list-style-type: none"> • Manual (STOP button) • TIME Drying is finished after the set time, adjustable 3 – 99 minutes. • STABLE Drying is finished, when the set weight value per time unit is lower than the nominal value, both values being freely adjustable. • TIME / STABLE This shut-off criterion is a combination of „TIME“ and „STABLE“. Drying time and weight loss per time unit freely adjustable. The value reached first finishes drying.
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Language/ User guidance	German, English

2 Declaration of conformity



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Declaration of conformity

EC-Konformitätserklärung
 EC- Déclaration de conformité
 EC-Dichiarazione di conformità
 EC- Declaração de conformidade
 EC-Deklaracja zgodności

EC-Declaration of -Conformity
 EC-Declaración de Conformidad
 EC-Conformiteitverklaring
 EC- Prohlášení o shode
 EC-Заявление о соответствии

EN	Konformitäts- erklärung	Wir erklären hiermit, dass das Produkt, auf das sich diese Erklärung bezieht, mit den nachstehenden Normen übereinstimmt.
GB	Declaration of conformity	We hereby declare that the product to which this declaration refers conforms to the following standards.
CZ	Prohlášení o shode	Tímto prohlašujeme, že výrobek, kterého se toto prohlášení týká, je v souladu s níže uvedenými normami.
E	Declaración de conformidad	Manifestamos en la presente que el producto al que se refiere esta declaración está de acuerdo con las normas siguientes
F	Déclaration de conformité	Nous déclarons avec cela responsabilité que le produit, auquel se rapporte la présente déclaration, est conforme aux normes citées ci-après.
I	Dichiarazione di conformità	Dichiariamo con ciò che il prodotto al quale la presente dichiarazione si riferisce è conforme alle norme di seguito citate.
NL	Conformiteit- verklaring	Wij verklaren hiermede dat het product, waarop deze verklaring betrekking heeft, met de hierna vermelde normen overeenstemt.
P	Declaração de conformidade	Declaramos por meio da presente que o produto no qual se refere esta declaração, corresponde às normas seguintes.
PL	Deklaracja zgodności	Niniejszym oświadczamy, że produkt, którego niniejsze oświadczenie dotyczy, jest zgodny z poniższymi normami.
RUS	Заявление о соответствии	Мы заявляем, что продукт, к которому относится данная декларация, соответствует перечисленным ниже нормам.

Electronic Balance: KERN MLS_A

Mark applied	EU Directive	Standards
CE	2004/108/EC	EN 61326-1:2005
	2006/95/EC	EN 61010-1:2001

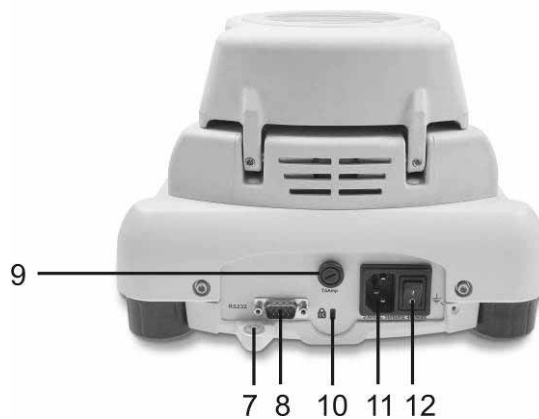
Date: 13.09.2010

Signature: _____

KERN & Sohn GmbH
Management

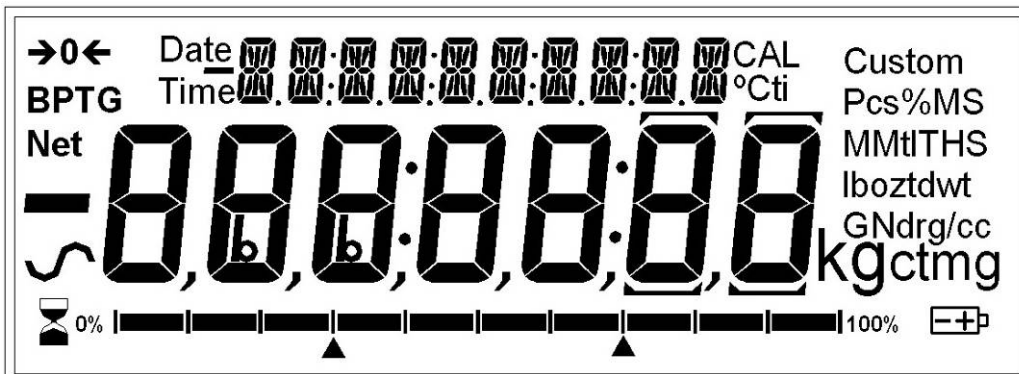
KERN & Sohn GmbH, Ziegelei 1, D-72336 Balingen, Tel. +49-[0]7433/9933-0
 Fax +49-[0]7433/9933-149, E-Mail: info@kern-sohn.com, Internet: www.kern-sohn.com

3 Appliance overview



Item	Description	Item	Description
1	Foldable hood with heating element	7	Spirit level
2	Temperature sensor	8	RS 232 interface
3	Sample dish	9	Fuse:
4	Adjustable foot	10	Not documented
5	Display	11	Mains cable connection
6	Keyboard	12	Master switch

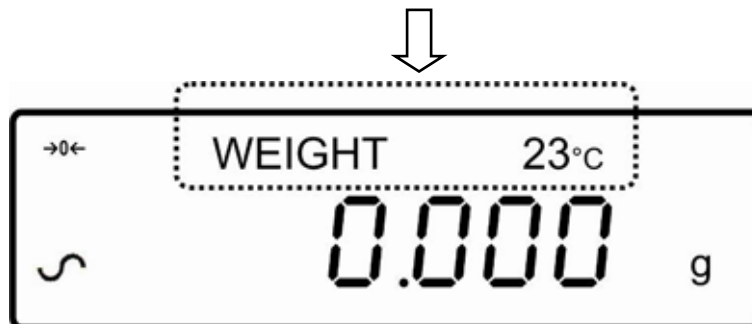
3.1.1 Overview of displays



Display	Description
→0←	Zeroing display
⌚	Stability display
Net	Net weight
⌚	Busy

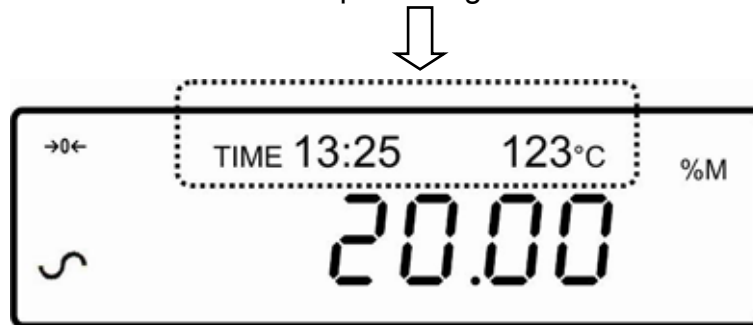
Display in weighing mode:


Status display in German and English (see chap.8.3.3) / current temperature.



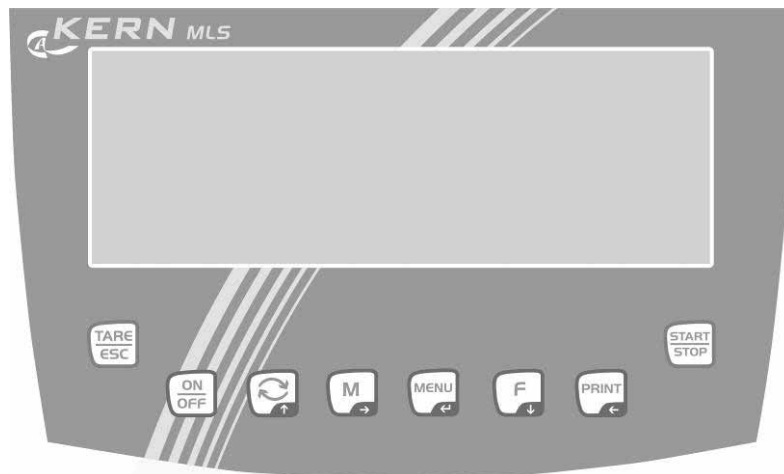
Display in moisture analysis mode:






Second digital display for indication of the time sequence, the current temperature and the moisture percentage in %.








To switch the display to the various units of the measured result, press the  key.






3.1.2 Keyboard overview



Button	Description	Function in Weighing mode
	ON/OFF key	<ul style="list-style-type: none"> • Turn on/off
	TARE button	<ul style="list-style-type: none"> • Taring • Zeroing • Cancel process/input • Return to weighing mode
	 button	<ul style="list-style-type: none"> • Switch-over display
	Arrow key 	<ul style="list-style-type: none"> • Increase flashing digit • Scroll forward in menu • Call up drying processes

	M-button	<ul style="list-style-type: none"> • Store / call-up drying parameters
	Arrow key →	<ul style="list-style-type: none"> • At numeric input digit selection to the right • In the menu block „SETUP“ one menu step back
	MENU-key	<ul style="list-style-type: none"> • Call-up configuration menu
	Arrow key ←	<ul style="list-style-type: none"> • Confirm / store settings
	F-key	<ul style="list-style-type: none"> • Invoke user menu (drying parameter setting)
	Arrow key ↓	<ul style="list-style-type: none"> • Scroll backwards in menu • Decrease flashing digit
	PRINT button	<input type="checkbox"/> Calculate weighing data via interface
	Arrow key ←	<ul style="list-style-type: none"> • At numeric input digit selection to the left
	Start/Stop button	<ul style="list-style-type: none"> • Start/Stop drying

3.1.2.1 Numeric entry

Button	Description	Function
	Arrow key ↑	Increase flashing digit
	Arrow key ↓	Decrease flashing digit
	Arrow key ←	Digit selection to the left
	Arrow key →	Digit selection to the right
	Arrow key ←	Confirm entry

4 Basic Information (General)

4.1 Proper use

The device purchased by you is designed for a fast and reliable determination of material moisture in liquid, porous and solid materials by applying the method of thermogravimetrics.

4.2 Improper Use

Impacts and overloading exceeding the stated maximum load (max) of the device, minus a possibly existing tare load, must be strictly avoided.

Balance may be damaged by this.

Never operate device in explosive environment. The serial version is not explosion protected.

The structure of the balance may not be modified. This may lead to incorrect weighing results, safety-related faults and destruction of the moisture analyser.

The moisture analyser may only be used according to the described conditions. Other areas of use must be released by KERN in writing.

4.3 Danger Information

Individual parts of the case (e. g. the ventilation grids) may heat up considerably during operation. For this reason, please touch the device only at the designated handles.

Sample materials developing aggressive vapours (e. g. acids) may cause corrosion problems on some parts of the device. The moisture meters should mainly be used for drying aqueous substances. Explosion prone, flammable samples must not be analysed using the moisture meter.



- Do not open or touch drying chambers during the drying process as the device develops very high temperatures. Even after finishing the measurement the appliance remains hot.



- Careful when removing the sample. The sample itself, the sample dish and the heating unit may be very hot.



- Do not use the moisture meter for analysing explosion prone, easily flammable samples.
- Do not operate the humidity analyser in areas with hazard of explosion



- Sample materials emitting toxic substances must be dried with a special extraction system in place. Create an environment that prevents the inhalation of vapours hazardous to health.



- Do not place combustible materials on, under or next to the device.
- Ensure that there is sufficient empty space around the device in order to prevent heat accumulation (distance to device 20 cm, above it 1m).
- Make sure that liquids do not get in contact with the interior of the device or the connections at the rear of the device. If you spill liquid on the device, disconnect it immediately. Afterwards do not operate the moisture meter and have it checked by a competent KERN stockist before any further use.

4.4 Warranty

Loss of warranty due to

- Our conditions in the operation manual are ignored
- The appliance is used outside the described uses
- The appliance is modified or opened
- mechanical damage and damage caused by media, liquids
- Natural wear and tear
- The appliance is improperly set up or incorrectly electrically connected
- The measuring system is overloaded

4.5 Monitoring of Test Resources

In the framework of quality assurance the measuring-related properties of the moisture analyser and, if applicable, the testing weight, must be checked regularly. The responsible user must define a suitable interval as well as type and scope of this test. Information is available on KERN's home page (www.kern-sohn.com) with regard to the monitoring of balance test substances and the test weights required for this. In KERN's accredited DKD calibration laboratory test weights and balances may be calibrated (return to the national standard) fast and at moderate cost.

5 Basic Safety Precautions

5.1 Pay attention to the instructions in the Operation Manual



Carefully read this operation manual before setup and commissioning, even if you are already familiar with KERN balances.

5.2 Personnel training

The appliance may only be operated and maintained by trained personnel.

6 Transportation & Storage

6.1 Testing upon acceptance

When receiving the appliance, please check packaging immediately, and the appliance itself when unpacking for possible visible damage.

6.2 Packaging / return transport



- ⇒ Keep all parts of the original packaging for a possibly required return.
- ⇒ Only use original packaging for returning.
- ⇒ Prior to dispatch disconnect all cables and remove loose/mobile parts.
- ⇒ Reattach possibly supplied transport securing devices.
- ⇒ Secure all parts such as the glass wind screen, the weighing platform, power unit etc. against shifting and damage.

7 Unpacking, Setup and Commissioning

7.1 Installation Site, Location of Use

The unit is designed to achieve reliable weighing results under normal conditions of use.

You will work accurately and fast, if you select the right location for the appliance.

On the installation site observe the following:



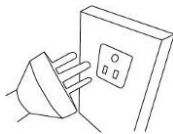
- Avoid extreme heat as well as temperature fluctuation caused by installing next to a radiator or in the direct sunlight;



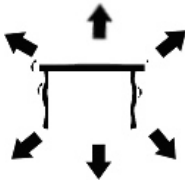
- Remove explosion prone, easily flammable material in the immediate vicinity. Emerging vapours, sample dish and all parts of the sample chamber are hot!



- Place the device on a firm, level surface.
- Major display deviations (incorrect weighing results) may be experienced should electromagnetic fields (e.g. due to mobile phones or radio equipment), static electricity accumulations or instable power supply occur. Change location or remove source of interference.



- Avoid static charging of the material to be weighed, weighing container and windshield.



- Avoid jarring during weighing



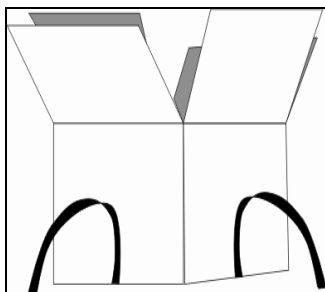
- Protect the appliance against high humidity, vapours and dust.
- Do not expose the device to extreme dampness for longer periods of time. Non-permitted condensation (condensation of air humidity on the appliance) may occur if a cold appliance is taken to a considerably warmer environment. In this case, acclimatize the disconnected appliance for ca. 2 hours at room temperature.



- Protect the device against direct draughts due to open windows and doors.

7.2 Unpacking and erection

Take the moisture meter carefully out of its packaging, remove the plastic jacket and install it at the designated work space.



The moisture meter is supplied part-assembled. Control whether the delivery is complete immediately after unpacking the individual parts and assemble the separate component parts according to the enclosed diagram.

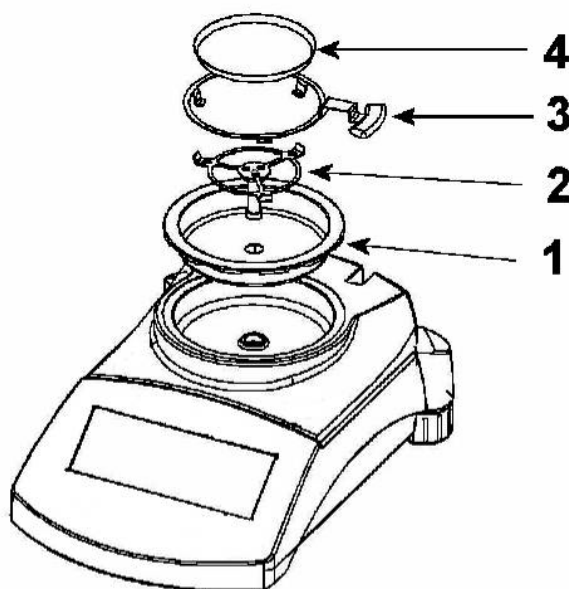
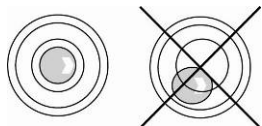


Fig. 1: Structure

1. Put cover into the weighing chamber.
2. Put on the dish retainer carefully, ensuring correct positioning
3. Position removal aid in a way that the handle fits under the groove of the cover.
4. Put sample dish on the dish holder.



Level balance with foot screws until the air bubble of the spirit level is in the prescribed circle.

7.2.1 Scope of delivery

Serial accessories:

- Moisture analyser, see chpt. 7.2, fig. 1
- 10 sample dishes
- Power cable
- Spare fuse
- Operating Manual

7.3 Mains connection

Power supply is provided via the supplied mains cable.

Check, whether the voltage acceptance on the scales is set correctly. Do not connect the appliance to the power grid unless the information on the appliance (sticker) matches the local mains voltage.

Important:

Does the labelling (115 VAC \pm 10% or 230 VAC \pm 10%) match the local mains voltage?

- Do not connect if mains voltages are different!
- If matching, connect the scales.

The moisture meter must be connected to a standard socket with earth terminal. Do not eliminate the protective effect by using an extension lead without earth terminal. For power supplies from power grids without earth terminals call a specialist to establish equivalent protection according to the relevant installation regulations.

7.4 Connection of peripheral devices

Before connecting or disconnecting of additional devices (printer, PC) to the data interface, always disconnect the moisture analyser from the power supply.

Use with the moisture analyser only accessories and peripheral devices of KERN; as they are ideally tuned to the appliance.

7.5 Commissioning

After actuating the main switch on the rear side, in the display the serial number appears, the software number followed by the balance capacity. If the serial number is not set, scores will be displayed. Afterwards the balance will carry out a self-test. As soon as the weight display appears, the moisture analyser is ready for weighing. If a „user password“ is deposited, password will be inquired.



Enter the password using arrow keys **↓** **↑** (numerical input see chapter 3.1.2.1) and confirm with **MENU** button. Deactivate password / emergency password see chap. 8.3.1.

In order to obtain exact results, the appliance must have reached its operating temperature (see warm-up time chap. 1).

For this warm-up time the appliance must be connected to the power supply.

The accuracy of the appliance depends on the local acceleration of gravity.

Strictly observe hints in chapter Adjustment.

8 Appliance configuration

Via the configuration menu the appliance can be individually adapted to your weighing needs. The menu is structured in the following menu blocks

- SERIAL
- PASSCODES
- CALIBRATE
- SETUP


8.1 Navigation in configuration menu

Call-up menu and enter password

In weighing mode press **MENU** button.

With activated password after query „PASSCODE“ use the arrow keys **↓** **↑** to enter the supervisor password (see chap. 8.3.1) and confirm by pressing **MENU** button.

Scrolling on one level

⇒ Scroll forward using  button (**↑**)

⇒ Scroll backward using **F** button (**↓**)

Activate menu item/ store setting

Press **MENU** button.

Exit menu / back to weighing mode

Press the **TARE** key.

8.2 Configuration menu overview

Menu item	Display	Choice	Description	
Settings „Serial interface“ (see chap. 13.1)	SERIAL	BAUD RATE	2400/4800/9600/19200/38400	
		PARITY	off	
			even	
			odd	
		CONTINUOUS	off	
			on ↓ INTERVAL (01 – 99 seconds)	
Password (see chap. 8.3.1)	PASSCODES	OPERATOR	Operator	
		SUPERVISOR	Supervisor	
Settings „Adjustment“ (see chap. 8.3.2)	CALIBRATE	CAL MASS	Balance adjustment	
		CAL TEMP	Temperature adjustment	
		CALIBRATE REPORT	Printout adjustment log yes/no	
Settings „Balance“ (see chap. 8.3.3)	SETUP	TIME	Hour (0 -23)	
			Minute (0 -59)	
			Second (0 -59)	
		DATE FORM	European (dd/mm/yy)	
			USA (mm/ dd /yy)	
			ASIA (yy/mm/dd)	
		DATE	Year (00 - 99)	
			Month (00 - 12)	
			Day (00 - 31)	
		USER-ID	User identification n. (10 characters)	
		KEY BEEPER	Signal tone when pressing button on/off	
		TEST BEEP	Signal tone (3 x) after end of drying on/off	
		BACKLIGHT	Back lighting of the display on/off/auto	
		FILTER	Slow	slow / less sensitive
			Normal	↑
			Fast	fast/sensitive
LANGUAGE	English			
	German			

8.3 Description of individual menu items

8.3.1 Password – menu block „PASSCODES“

Call up menu item

- ⇒ In weighing mode press the **MENU**-button, the first menu item „**SERIAL**“ is displayed.
- ⇒ Press arrow keys **↓** **↑** repeatedly until „**PASSCODES**“ is displayed.



- ⇒ Confirm by pressing the **MENU** button.
- ⇒ Press the arrow keys **↓** **↑** to select desired setting.



Password entry by operator
after actuating the main switch, see chap. 7.5.



Password entry for supervisor menu access see chap. 8.1.

- ⇒ Confirm by pressing the **MENU** button.



Enable/disable password

- ⇒ Use the arrow keys **↓** **↑** to enter the currently set password (numeric input see chapter 3.1.2.1). At first input acknowledge „zero“.

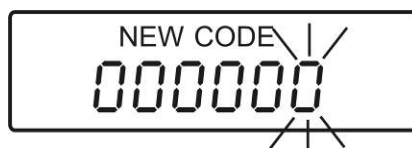


If the password has been forgotten, enter as „15“ as **emergency password**.

- ⇒ Confirm by pressing the **MENU** key.



- ⇒ Use the arrow keys **↓** **↑** to enter the new password (numeric input see chapter 3.1.2.1). When entering „0“ the function is disabled and allows an unlimited access.



- ⇒ Confirm by pressing the **MENU** key.
- ⇒ Press the **F** button, the balance will return to the menu. Either make more settings in the menu, if necessary, or go back to weighing mode using **TARE**-button.

Back to menu/weighing mode



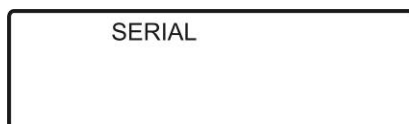
Query password

see chpt 7.5

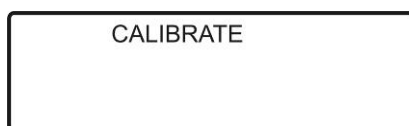
8.3.2 Adjustment – menu block „CALIBRATION“

Call-up adjustment function

- ⇒ In weighing mode press the **MENU** button, the first menu item „SERIAL“ is displayed.

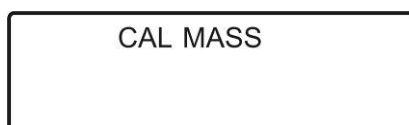


- ⇒ Press arrow keys **↓** **↑** repeatedly until „CALIBRATE“ is displayed.



- ⇒ Confirm by pressing the **MENU** button.

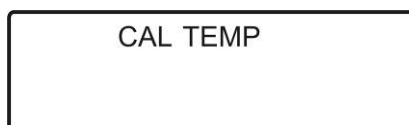
- ⇒ Use the arrow keys **↓** **↑** to select the desired setting and confirm using **MENU**-button.



Adjust balance



Printout adjustment log yes/no



Adjust temperature

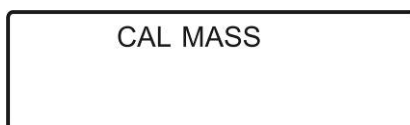
- ⇒ Confirm setting by pressing the **MENU** button

Adjust balance

As the acceleration value due to gravity is not the same at every location on earth, each balance must be coordinated - in compliance with the underlying physical weighing principle - to the existing acceleration due to gravity at its place of location (only if the balance has not already been adjusted to the location in the factory). This adjustment process must be carried out during the initial start-up, after change in location and variation of surrounding temperature. To receive accurate measuring values it is also recommended to adjust the balance periodically in weighing operation.



- Observe stable environmental conditions. A warming up time (see chapter 1) is required for stabilization.
- Sample dishes must be in place.
- Use the **TARE**-button to cancel the adjustment process at any time.
- Carry out adjustment with the help of the recommended adjustment weight (see chapter 1 "Technical Specifications"). Info about adjustment weights can be found on the Internet at: <http://www.kern-sohn.com>.

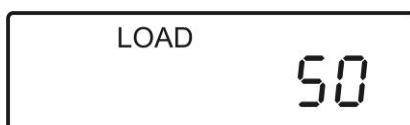
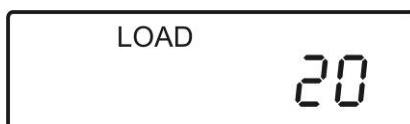


⇒ Call-up adjustment function **CAL MASS** and confirm using **MENU** button.



⇒ Ensure that there are no objects on the sample dish. Press **MENU** button.

⇒ Wait until the weighed value for the required adjustment weight appears. Using the arrow keys **↓** **↑** can be selected between 20 g or 50 g (MLS 65-3A) and accordingly 50 g or 150 g (MLS 150-2A). Confirm setting by pressing the **MENU** button.



- ⇒ Carefully place adjusting weight in the centre of the sample dish. Wait for stability display and press **MENU** button.
- ⇒ After successful adjustment the appliance automatically returns to weighing mode.



When an optional printer is connected, an adjustment protocol will be edited automatically, prerequisite menu setting [CAL REPORT „ON“]

Printout example see following chapter „Adjustment log“.

i Errors during adjustment or the use of an incorrect adjusting weight will result in an error message. Use the **TARE**-button to return into weighing mode and repeat adjustment process.

When error low is displayed the balance returns to normal weighing

When error high is displayed the balance whistles and displays dashes

When error stab is displayed the balance returns to LOAD zero

Adjust temperature

We recommend sometimes to check the temperature value of the device using the optional temperature calibrating set MLS-A04. Before you do this, allow the device to cool down for at least 3 hours after the last heating phase. Push the probe as closely as possible to the thermal sensor of the MLS. The temperature is measured at two points and it is possible to correct it at both temperature points.

Preparation:

- ⇒ Push fixing clip under the cover of the weighing chamber according to illustration.
- ⇒ Insert the probe into the clip. Push the probe as closely as possible to the thermal sensor of the MLS. Fix the position using the side screw.

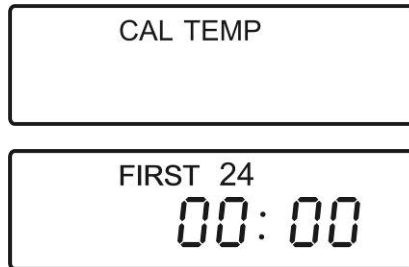


- ⇒ Close cover, as shown on illustration.



- Sample dishes must be in place.
- Use the **TARE**-button to cancel the adjustment process at any time.

- ⇒ Call-up adjustment function **CAL TEMP** and confirm using **MENU** button. Adjustment starts. Every minute sounds the acoustic signal in order to display the permanent adjustment.



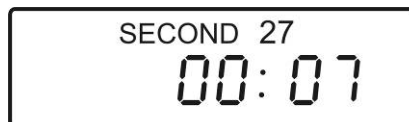
- ⇒ Temperature calibration of first point will take 10 min after which you will hear an acoustic signal. The display for entering the first temperature point will appear.



- ⇒ Read temperature on the MLSA-04. Enter the temperature value using arrow keys (↓ ↑) (numerical input see chapter 3.1.2.1), the active position flashes.



- ⇒ Confirm by pressing the **MENU** button. Adjustment of the second point will start. Heating up to approx. 150°C.



- ⇒ Temperature calibration of the second point will finish approx 20 min, then you will hear an acoustic signal. Press the **MENU** button, the display for entering the second temperature point will appear.



- ⇒ Read temperature on the MLS-A04. Enter the temperature value using arrow keys ↓ ↑ (numerical input see chapter 3.1.2.1) and confirm with **MENU** button. The appliance returns to weighing mode.



i

- The 10-minutes heating-up phase of the first temperature point can be reduced using the **MENU** button, if the temperature constancy is reached before. Then enter the temperature value as described before.
- With the error message „TEMP CAL FAIL“ or inadmissible temperature inputs the appliance returns to weighing mode. Adjustment will be interrupted, repeat adjustment procedure.
- If the temperature value for the second point is not entered within 30 minutes, the adjustment will be interrupted.
- When connecting an optional printer, an adjustment log will be edited automatically.
Prerequisite menu setting [cal report „on“]
Example of printout see following chapter „Adjustment log“.

Adjustment log

- ⇒ Call up adjustment function **CALIBRATE REPORT** and confirm using **MENU** button.



- ⇒ Use the arrow keys **↓** **↑** to select the desired setting and confirm using **MENU** button.



- ⇒ Confirm by pressing the **MENU** button.

„ON“ Edition adjustment log „yes“

„OFF“ Edition adjustment log „no“

Printout examples:

1. Weight adjustment

MASS CALIBRATION	Adjustment balance
DATE: 15/05/2009	Date
TIME: 09:38:07	Time
SER NO: AE12345678	Serial no.
USER NO: 1234567	User identification number, see chapter 8.3.3
WT REF: _____	Free field for hand-written notes
MASS: 1.76 oz	Used adjustment weight
CALIBRATION BY _____	Signature
	Space line

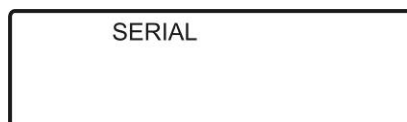
2. Temperature adjustment

TEMPERATURE CALIB.	Adjustment temperature
DATE: 15/05/2009	Date
TIME: 09:38:07	Time
SER NO: AE12345678	Serial no.
USER NO: 1234567	User identification number, see chapter 8.3.3
TEMP REF: _____	Free field for hand-written notes
TESTED 23°C/142°C	Revised temperature values
CALIBRATION BY _____	Signature
	Space line

8.3.3 Settings of balance – menu block „SETUP“

Select balance settings

- ⇒ In weighing mode press the **MENU** button, the first menu item „SERIAL“ is displayed.



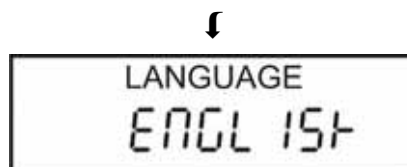
- ⇒ Press arrow keys **↓** **↑** repeatedly until „SETUP“ is displayed.



- ⇒ Acknowledge by using **MENU**-button, the first balance setting „TIME“ with the current setting appears.



- ⇒ Using the **MENU**-button other balance settings with the current setting can be selected subsequently.



Setting time



- ⇒ Use the arrow buttons **↓** **↑** to set the hour and confirm using **MENU**-button. Set in analogue way minutes and seconds.



- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Date format



- ⇒ Use the arrow keys **↓** **↑** to select the desired setting and confirm using **MENU**-button.

„EUROPEAN“ (dd/mm/yy)
„USA“ (mm/ dd /yy)
„ASIA“ (yy/mm/dd)

- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Setting date



- ⇒ Use the arrow keys **↓** **↑** to set the year and confirm using **MENU**-button. Set in analogue way month and day.



- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

User identification

The number set here will be edited in the measurement log.

USER ID

- ⇒ Use the arrow keys **↓** **↑** to select the user identification number (10 characters) and confirm using **MENU**-button.

9876543210

- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Signal tone pressing button

KEY BEEPER
OFF

- ⇒ Use the arrow keys **↓** **↑** to select the desired setting and confirm using **MENU**-button.

„ON“ Signal tone switched on
„OFF“ Signal tone switched off

- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Signal tone after end of drying

TEST BEEP
OFF

- ⇒ Use the arrow keys **↓** **↑** to select the desired setting and confirm using **MENU**-button.

„ON“ Signal tone switched on
„OFF“ Signal tone switched off

- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Display background illumination



- ⇒ Use the arrow keys \downarrow \uparrow to select the desired setting and confirm using **MENU**-button.
 - „ON“ Background illumination on
 - „OFF“ Background illumination off
 - „AUTO“ Backlighting automatically switched off 10 seconds after achieving stable weighing value.
- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Filter



- ⇒ Use the arrow keys \downarrow \uparrow to select the desired setting and confirm using **MENU**-button.
 - „SLOW“ Busy environment. Balance works slower, but is insensitive to outside influences
 - „NORMAL“ Normal conditions. Weighing balance working at medium speed
 - „FAST“ Very quiet and stable environment. Balance works faster but is sensitive to outside influences
- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

Language Operator guide



- ⇒ Use the arrow keys \downarrow \uparrow to select the desired setting and confirm using **MENU**-button.
 - „DEUTSCH“
 - „ENGLISH“
- ⇒ The next balance setting appears. Either set new parameters or return to weighing mode using the **TARE**-button.

9 Drying parameters

Via the drying parameters the appliance is individually adapted to the sample which has to be analysed.

There are 49 memory locations available for these defined drying programs which can be simply called-up and started when needed.

9.1 Adjustment

9.1.1 Description of the drying parameters

1. Display of result

Here is defined the unit of the measurement result.

Description / Calculation of the units

Explanation of symbols

SG: Start weight (weight value at beginning of the measurement)

RG: Residual weight (weight value at the end of measurement)

Unit:	Calculation
[%] moisture:	$0 - 100\% = \frac{SG-R}{S} \cdot 100\%$
[%] dry mass:	$100 - 0\% = \frac{R}{S} \cdot 100\%$
ATRO* dry mass:	$ATRO\ 100 - 999\% = \frac{S}{R} \cdot 100\%$
ATRO* moisture:	$ATRO\ 0 - 999\% = \frac{S - R}{R} \cdot 100\%$

i *ATRO is a unit which is exclusively used in the timber industry. The timber humidity (ATRO) means the percentage of water contained in the timber, indicated in percent of the mass of the water-free timber. It is calculated from the difference between fresh weight (SG) and dry weight (RG).

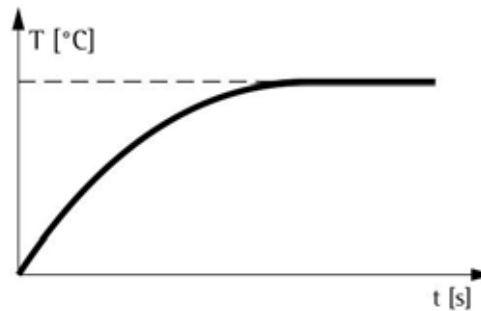
2. Heating profile

This is used to select suitable heating programs considering the drying temperature and drying time.

Standard drying

Standard drying is the most frequently used drying process. This type of heating method is suitable for the majority of substances.

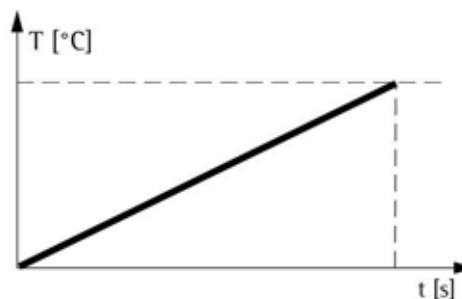
Here the end temperature is defined by the user.



Gentle drying

The soft heating method is suitable for substances that are unable to tolerate a sudden rise in temperature applied by radiators. There are also those substances that form a film when warmed up quickly. This film will afterwards affect the evaporation of the enclosed moisture. For such substances, the soft mode of warming is equally suitable.

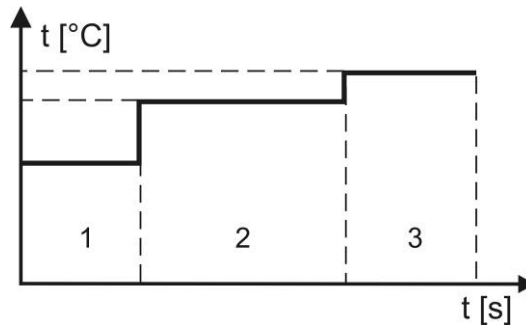
Here the end temperature and the time until reaching the end temperature is defined by the user.



Step-by-step drying

Step-by-step drying is suitable for substances that display special behaviour during warming. Samples should have a moisture content of at least 15%.

The individual steps are freely selectable regards duration and temperature rising step.

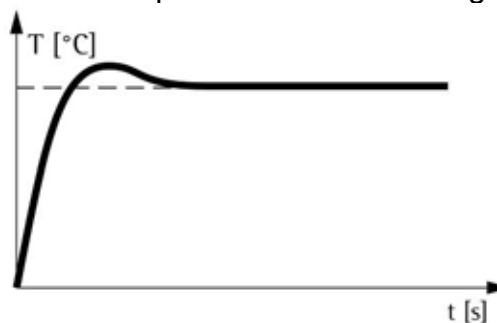


3. Edition interval

Setting a time interval after which the intermediate results will be printed, 1-99 sec can be set.

4. Preheating stage

The preheating stage is suitable for samples with a moisture content of 5% to 15%. The temperature is increased very quickly and, for a short while, will exceed the set drying temperature. After that the temperature will be adjusted down to the set value. The sample must contain enough moisture.



The preheating stage can be added to standard and to stage drying.

Example:

⇒ **Preheating stage enabled** (menu setting **RAPID „ON“**)

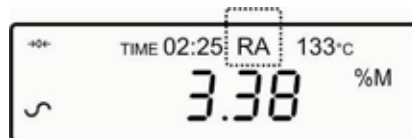
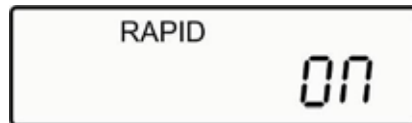
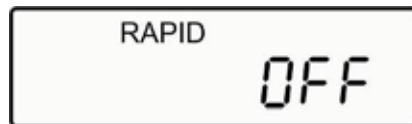
For the heating profile „standard drying“, a drying temperature of 100 °C is set. If the preheating stage is added, the device will heat up to 140 °C within 3 minutes, after that the temperature will be reduced to 100 °C.

If the preheating stage is activated, „RA“ in the display will appear.



⇒ **Enable preheating stage manually** (menu setting RAPID „MANUELL“)

Before the drying process starts, press the **Start/Stop** button and a query appears if the preheating stage shall be enabled.



5. Shutoff criterion

This is used to select the criteria used for finishing the drying process.

Manual

Drying is finished by the operator pressing the **Start/Stop**-button.

Automatic

⇒ TIME

Drying is finished after the set time, adjustable 3 – 99 minutes.

⇒ STABLE

Drying is finished, when the set weight value per time unit is lower than the nominal value, both values being freely adjustable.

⇒ TIME / STABLE

This shut-off criterion is a combination of „TIME“ and „STABLE“. Drying time and weight loss per time unit freely adjustable. The value reached first finishes drying.



Default setting

Drying is finished if there occurs a weight loss of 0.002 g within 15 sec.

6. Start criterion

This is used to select the criteria used for starting the drying process.

Manual

Drying is started by the operator pressing the **Start/Stop** button.

Automatic

Drying is started 5 sec after closing the sample chamber.

7. Data output

“OFF”: Data output disabled

“ON”: Data output activated, at the same time the result will be stored, see chap. 11.1

8. Data format

“Complete”: Complete data output see chap. 11.1

“Summary”: Shortened data output see chap. 11.1

9.1.2 Menu overview

	Menu item	Parameter	Adjustment
Result display			
	RESULT	% moisture ([%] humidity)	
		% Solid ([%] dry mass)	
		% ATRO Moisture (ATRO humidity)	
		% ATRO Solid (ATRO dry mass)	
Heating profile			
	HEAT	Single (standard drying)	Temperature
		Step (stage drying)	Temperature 1
			Time 1
			Temperature 2
		Time 2	
		Temperature 3	
		Time 3	
	Ramp (gentle drying)	Temperature	
		Time	
Output interval			
	INTERVAL	1 – 99 sec can be selected	
Preheating stage			
	RAPID	on	Preheating stage enabled
		off	Default setting
		manual	Preheating stage may be enabled manually
Shutoff criterion			
	STOP	Time	Time
		Stable	Weight loss
			Time
		Time/Stable	Time
			Weight loss"
		Heating duration	
Start criterion			
	START	Manual	
		Auto	
Data output			
	PRINT TEST	on	
		off	
Data format			
	FORMAT	complete	
		summary	

9.1.3 Navigation in the menu



- Call up menu
- Scroll in menu



- Confirm setting



- Cancel process/input
- Return to weighing mode



- Print out list of current settings

9.1.4 Menu settings

- ⇒ To enable the user menu, press the **F**-key. The first menu item „**result display**“ showing the current setting will be displayed.



- ⇒ Press the arrow keys (↓ ↑) to select desired unit.
[%] dry mass:



ATRO moisture



ATRO dry mass



[%] moisture



- ⇒ Confirm setting by pressing the **MENU** button.
The next menu item to set the **heating profile** is displayed.



- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

Gentle drying











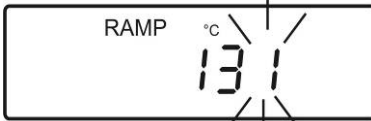





Step-by-step drying



Standard drying



- ⇒ Confirm setting by pressing the **MENU** button.
The display of parameter input appears, independent of the set heating profile.
The active digit is flashing.
- ⇒ Enter drying temperature / drying time using the arrow keys (numeric input see chap.3.1.2.1).

Selection Standard drying	Selection Stage drying	Selection Gentle drying
 	  Stage 1	 
		
<p>50°C – 160°C can be set</p>	<p>50°C – 160°C can be set</p>	<p>50°C – 160°C can be set</p>
		
	<p>0 – 59 min. can be set</p>	
		
	<p>Temperature and time for stage 2 and 3 in an analogue manner. For a two-stage drying set the time for step 3 to 00:00</p>	

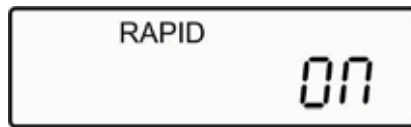
- ⇒ Confirm by pressing the **MENU** button.
The next menu item to set the **output interval** is displayed.



1-99 sec can be set

- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

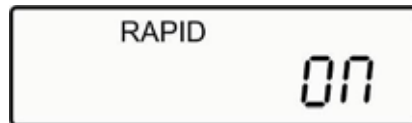
- ⇒ Confirm by pressing the **MENU** button.
The next menu item to set the preheating stage is displayed.



- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

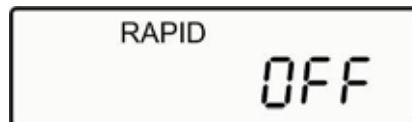
RAPID ON

Preheating stage enabled.



RAPID OFF

Preheating stage disabled.



RAPID MANUAL

Preheating stage may be enabled manually.



- ⇒ Confirm setting by pressing the **MENU** button.
The next menu item to set the **shut-off criterion** is displayed.



- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

STABLE

Drying is finished, when the set weight value per time unit is lower than the nominal value, both values being freely adjustable.



TIME

Drying is finished after the set time, adjustable 3 – 99 minutes.









TIME / STABLE

Drying time and weight loss per time unit freely adjustable. The value reached first finishes drying



- ⇒ Confirm setting by pressing the **MENU** button.
The display of parameter input appears, independent of the set shut-off criterion.
The active digit is flashing.
- ⇒ Enter time / nominal value “weight loss” using the arrow keys (numeric input see chap.3.1.2.1).

Selection TIME	Selection STABLE	Selection TIME / STABLE
<div style="border: 1px solid black; padding: 5px; text-align: center;"> TIME STOP </div> <div style="text-align: center;">  </div> <p>Entering time after which drying has to be finished.</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> STAB STOP </div> <div style="text-align: center;">  </div> <p>Input nominal value „weight loss“</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> TIME/STAB STOP </div> <div style="text-align: center;">  </div> <p>Input of max. drying time</p>
<div style="border: 1px solid black; padding: 5px; text-align: center;"> STOP TIME 07:in 20 </div> <p>3 – 99 minutes can be set</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> STAB RANGE 0.008 </div> <div style="text-align: center;">  </div> <p>Input time unit</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> STOP TIME 07:in 20 </div> <div style="text-align: center;">  </div> <p>Input nominal value „weight loss“</p>
	<div style="border: 1px solid black; padding: 5px; text-align: center;"> STAB TIME SEC 15 </div> <p>1 - 99 sec can be set</p>	<div style="border: 1px solid black; padding: 5px; text-align: center;"> STAB RANGE 0.008 </div> <div style="text-align: center;">  </div> <p>Input of time unit after which the nominal value shall be trespassed below.</p>
		<div style="border: 1px solid black; padding: 5px; text-align: center;"> STAB TIME SEC 15 </div>

-
- ⇒ Confirm by pressing the **MENU** button.
The next menu item to set the **start criterion** is displayed.



- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

Manual

Drying is started by the operator pressing the **Start/Stop** button.



Automatic

Drying is started 5 sec after closing the sample chamber.



- ⇒ Confirm by pressing the **MENU** button.
The next menu item to set the **data output** is displayed.

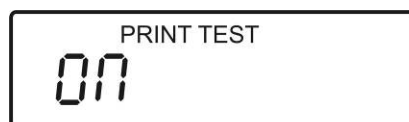


- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

“**OFF**”: Data output disabled



“**ON**”: Data output activated and measurement result stored at the same time
see chapter 11.1



- ⇒ Confirm by pressing the **MENU** button.
The next menu item to set the **data format** is displayed.



- ⇒ Press the arrow keys (↓ ↑), to select desired setting.

“Complete”: Complete data output see chap. 11.1



“Summary”: Shortened data output see chap. 11.1



- ⇒ Confirm by pressing the **MENU** button.
The device returns to the menu.



- ⇒ During the parameter input, a list of the current set drying parameters can be printed out at any time using the **PRINT**-button.

Printout example:

CURRENT TEST SETTINGS		
DATE:	08/01/2009	Date
TIME:	14:44:49	Time
SER NO:	AE00001234	Series no.
USER NO:	1234567	User ID
Preset:	PST 01 ABCD-01234	Drying program n. Name of the drying program, see chap. 9.2
Result	%MOISTURE	Result display
Heating:	Ramp 112 C 27:00	Heating profile
Interval:	05 Sec	Output interval
Rapid:	off	Preheating stage
Stop:	TIME / STABLE 60 Min 0.002 g 15 Sec	Shutoff criterion
Start:	MANUAL	Start criterion

- ⇒ After all drying parameters have been set, press the **TARE** button. The appliance returns to weighing mode. Drying with the set parameters can be started (see chap. 10) or stored (see chap. 9.2).



9.2 Save

The appliance has more than 49 memory locations for often used drying programs. A drying program comprises the current set drying parameters, (see chap. 9.1.4).

i Memory location PST 00 is reserved for factory settings, see chap. 9.3.1. These factory setting may neither be modified nor overwritten.

⇒ After all drying parameters have been set, press the **M** button.

⇒ Press the arrow keys (↓ ↑), to select “PST STORE“



⇒ Confirm by pressing the **MENU** button. The next free number of the memory location is displayed.



Either

⇒ Acknowledge indicated number of the memory location using **MENU** button.

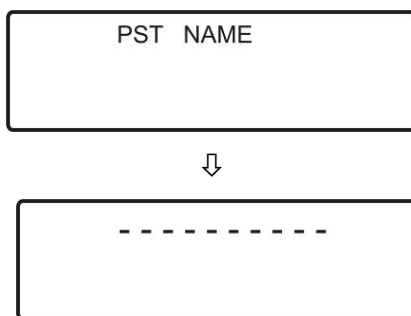
or

⇒ Overwrite using arrow keys (numerical input see chapter 3.1.2.1) and acknowledge using **MENU** button. If under the selected memory location already a drying process was stored, in the display appears „OVERWRITE?“. To store the new drying process, press **MENU** button. The old drying process will be overwritten.

or

to cancel the storing process press **TARE** button. The former contents of the memory remain valid.

- ⇒ The display to enter the memory location name or additional text „PST NAME“ appears, followed by the name used as last. Display shows “-----“ if no name has been allocated yet.



- ⇒ Use the arrow keys to enter the memory location name with 10 characters max. (numeric input see chap. 3.1.2.1). Available characters:

— . / 0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

- ⇒ Confirm by pressing the **MENU** key. If the drying process has been stored successfully, „STORE OK“ is shortly displayed before the appliance changes into weighing mode.



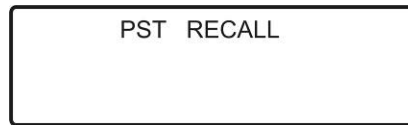
It is not compulsory to enter a memory location name. In the printout in the „Preset“ field only blanks (_ _ _) are edited now. Also during calling-up (see chap. 9.3) as name only blanks are displayed.

CURRENT TEST SETTINGS	
DATE:	08/01/2009
TIME:	14:44:49
SER NO:	AE00001234
USER NO:	1234567
Preset:	PST 01

Result	%MOISTURE
Heating:	Ramp
	112 C
	27:00
Interval:	05 Sec
Stop:	TIME / STABLE
	60 Min
	0.002 g
	15 Sec
Run:	MANUAL

9.3 Calling up

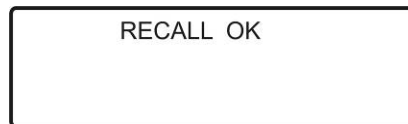
- ⇒ Press the **M**-button and select „PST RECALL“ using the arrow keys (↓ ↑) .



- ⇒ Confirm by pressing the **MENU** button.

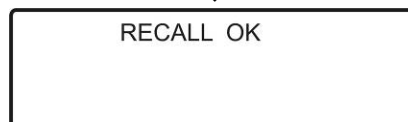


- ⇒ Select the desired number of the memory location using arrow keys and acknowledge by pressing the **MENU** button.
If the selected drying process has been successfully loaded from the memory, „RECALL OK“ is shortly displayed before the appliance changes into weighing mode.



9.3.1 Call-up factory setting „PST 00“

- ⇒ Press the **M**-button and select „PST RECALL“ using the arrow keys (↓ ↑) .
- ⇒ Confirm by pressing the **MENU** button.
- ⇒ If necessary, enter memory location „00“ using the arrow keys (numeric input see chap. 3.1.2.1) and acknowledge by pressing the **MENU** button.



The following factory settings are loaded:

Result display	% moisture
Heating profile	Standard drying (Single) Drying temperature = 110 °C
Output interval	5 s
Rapid	off
Shutoff criterion	TIME / STABLE Loss of weight / time = 0.002 g / 15 s Heating duration = 60 min
Start criterion	Manual (Start/Stop button)
Data output	Print Test = on
Data format	Print Format = complete (complete data output)

9.4 Delete

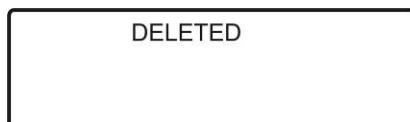
- ⇒ Press the **M**-button and select „PST DELETE“ using the arrow keys (↓ ↑) .



- ⇒ Confirm by pressing the **MENU** button. The number occupied as last of the memory location is displayed.



- ⇒ Select the desired number of the memory location using arrow keys and acknowledge by pressing the **MENU** button. The selected drying process is deleted. Either delete more drying processes or return to weighing mode using the **TARE** button.



9.5 View / change drying program

- ⇒ Press the **F** button, the first menu item „**results display**“ with the current setting is displayed
- ⇒ Using the **MENU**-button the menu items with the current setting can be selected subsequently.
- ⇒ Carry out temporary changes as described in chap. 9.1.4.
- ⇒ In order to store the drying program must be overwritten or saved under a new memory location number, see chap. 9.2

10 How to implement drying

Set the drying parameters as described in chap. 9.1.4 or load from store a suitable drying program for the sample, see chap. 9.3.

You may of course also carry out drying with the help of the factory set drying parameters, see chapter 9.3.1.

- ⇒ Place removal aid with empty sample dish on the sample dish retainer. Make sure that the sample dish is resting flat on the sample dish retainer. Use the sample retainer at all times as it allows safe working and prevents burns.
- ⇒ Set to zero using **TARE** button



- ⇒ Put prepared sample (see chap. 12.4) in the sample dish.



- ⇒ Close lid; the device is ready for measuring
Dependent on the setting, drying is started **automatically** or **manually**.

Automatic

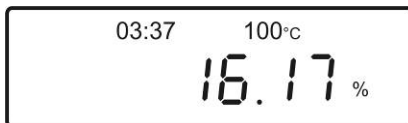
Drying is started 5 sec after closing the sample chamber.

Manual


Drying is started by pressing the **Start/Stop** button.

- ⇒ When data output is **activated** (see chap. 9.1.4 „PRINT TEST ON“) the printout is started.

- ⇒ Drying also will be started. The current drying parameters are displayed and printed if necessary.

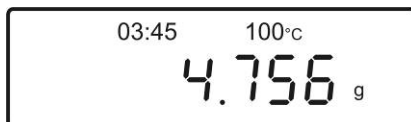


The second display above shows the elapsed time and the current temperature, the main display shows the current intermediate result in the set unit (%M = [%] moisture, %S = [%] dry mass): The intermediate result will be updated after every interval step (see chap. 9.1.4 „Output interval“).

- ⇒ During drying the display can be switched over by repeated pressing of the  button. The display appears for 5 seconds.

Example:

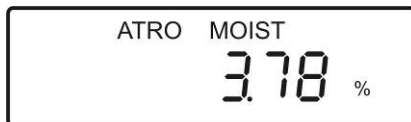
Current weight



[%] dry mass:



ATRO moisture



Remaining time of set time period



In which display can be switched over depends on the respective settings in the menu (see chap. 9.1.4). Further alternatives are:

[g] weight

[%] dry mass:

[%] moisture

ATRO moisture

ATRO dry mass



Using the **Start/Stop** button drying can be finished at any moment if required.

- ⇒ When drying is finished, you will hear an acoustic signal (setting see chap. 8.3.3) and the heating will be shut off.

The main display shows the measured value in the set unit, the secondary display the heating time as well as the kind of switch-off (**ASTOP** = automatic switch-off after reaching the nominal value, **TSTOP** = automatic switch-off after a set time, **MSTOP** = manual switch-off „**Start/Stop** button“).

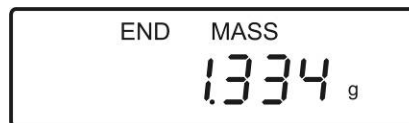


- ⇒ The  button may be used to switch-over the display.

Start weight



Residual weight



Memory location „Measurement result“ („Data output on“ see chap. 9.1.4)



- ⇒ If data output is **activated** the foot line of the measurement log will be printed out (see chap. 11.1).



The measured value remains in the display until it is deleted by the **TARE** button.

Whilst the measured value is displayed, the foot line can be printed-out by pressing the **PRINT** button.

- ⇒ Use the **TARE** button to return the appliance to weighing mode.
- ⇒ Open lid and remove the sample with the help of the removal aid. Caution! Sample dish and all parts of the sample chamber are hot!

11 Print, store and call-up measurement results

11.1 Print / store

With activated data output function „PRINT TEST ON“ (see chap. 9.1.4) the drying process is documented via a measurement log. In addition to the measurement result, for the finished drying process all drying parameters are automatically stored with the printout (99 positions). The denomination of the memory location is automatically assigned with a continuous number RESxxxxx. If the memory is fully occupied, „MEM FULL“ is displayed. In order to create new memory locations, delete drying results no longer needed, see chap. 11.3.

Use a suitable cable to connect the moisture analyser to the interface of the printer. Faultless operation requires an adequate KERN interface cable.

For the data exchange between moisture analyser and printer, the communication parameters (baud rate, bits and parity) of moisture analyser and printer must match. Detailed description of the communication parameters see chap. 13.1.


The contents of the data output is defined by the function FORMAT „COMPLETE“ or „SUMMARY“ (see chap. 9.1.4).

COMPLETE Complete data output (edition of all intermediate results after every interval step, defined by the function „output interval“, see chapter 9.1.4.)

SUMMARY Shortened data output (without intermediate results)


Printout example „COMPLETE“

MOISTURE TEST				Header	
FILE NAME:	RES00032			Name of drying process, see chap. 11.1	
DATE:	15/05/2009			Date	
TIME:	09:38:07			Time	
SER NO:	AE12345678			Serial no. Moisture analyser	
TEST NO:	_____			Free field for hand-written notes	
USER NO:	9876543210			User identification number, see chapter 8.3.3	
Preset:	PST 05			Drying program n. see chap. 9.2	
	Bread - 4			Drying program name, see chap. 9.2	
Result	% Moisture			} Current drying parameters, see chap. 9.1.4	
Heating	Step				
Temp:	Step 1	120 C			
	Time 1	90 Sec			
	Step 2	110 C			
	Time 2	90 Min			
Interval	30 Sec				
Rapid	off				
Stop	Time/Stable				
	60 Min				
	0.002 g				
Start:	30 Sec				
	Manual				
INIT MASS:	12.341 g			Start weight	


MODE	TEMP	TIME	RESULT	Intermediate results	
ST1	65C	00:30	1.26 %M		
ST1	118C	01:00	2.11 %M		
ST1	120C	01:30	3.15 %M		
ST2	111C	02:00	3.79 %M		
ST2	109C	02:30	4.11 %M		
ST2	110C	03:00	4.19 %M		
ST2	111C	03:30	4.22 %M		
ST2	109C	04:00	4.24 %M		
ST2	111C	04:30	4.26 %M		
ST2	112C	05:00	4.27 %M		
ST2	111C	05:30	4.27 %M		
*****AUTO STOP*****				Foot line (measured value)	
					
LAST TEMP:	111C			Final temperature	
TEST TIME:	05:30	Min		Drying time	
FINAL MASS	11.820	g		Residual weight	
MASS LOSS:	0.521	g		Weight loss	
RESULT:	4.27	M		Measured value	
				Empty lines	

Printout example „SUMMARY“

English

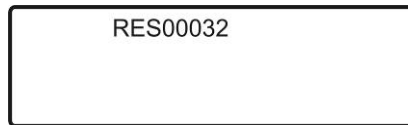
MOISTURE TEST		Header	
FILE NAME:	RES00032	Name of drying process, see chap. 11.1	
DATE:	15/05/2009	Date	
TIME:	09:38:07	Time	
SER NO:	AE12345678	Serial no.	
TEST NO:	_____	Free field for hand-written notes	
USER NO:	9876543210	User identification number, see chapter 8.3.3	
Preset:	PST 05 Bread - 4	Drying program n. see chap. 9.2 Drying program name, see chap. 9.2	
Result	% Moisture	} Current drying parameters, see chap. 9.1.4	
Heating	Step		
Temp:	Step 1 120 C		
	Time 1 90 Sec		
	Step 2 110 C		
	Time 2 90 Min		
Interval	30 Sec		
Rapid	off		
Stop	Time/Stable		
	60 Min		
	0.000 oz		
	30 Sec		
Start:	Manual		
INIT MASS:	12.341 g	Start weight	
*****AUTO STOP*****		Foot line (measured value)	
			
LAST TEMP:	111C	Final temperature	
TEST TIME:	05:30 Min	Drying time	
FINAL MASS	11.820 g	Residual weight	
MASS LOSS:	0.521 g	Weight loss	
RESULT:	4.27 M	Measured value	
		empty lines	

11.2 Calling up

- ⇒ In weighing mode press  button and select „**PRINT**“ using the arrow keys (↓ ↑).




- ⇒ Confirm by pressing the **MENU** button. The drying process stored as first will be displayed.
- ⇒ Use the arrow keys (↓ ↑) to select the desired drying process and confirm using **MENU**-button.



- ⇒ The data of the selected drying process are loaded from the memory and edited to the printer.
- ⇒ Use the **TARE** button to return the appliance to weighing mode.

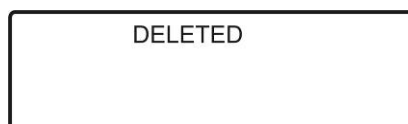
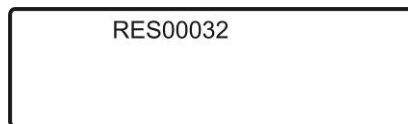
11.3 Delete

Delete the individual drying process

- ⇒ In weighing mode press  button and select „**DELETE**“ using the arrow keys (↓ ↑).




- ⇒ Confirm by pressing the **MENU** button. The drying process stored as first will be displayed.
- ⇒ Use the arrow keys (↓ ↑) to select the desired drying process and confirm using **MENU**-button.



- ⇒ The selected drying process is deleted. Either select new drying processes or return to weighing mode using the **TARE** button.

Delete all drying processes

- ⇒ In weighing mode press  button and select „**DELETE ALL**“ using the arrow keys (↓ ↑).



- ⇒ Confirm by pressing the **MENU** button. Confirm query „SURE“ by pressing the **MENU** button



- ⇒ The appliance counts down from 99 – 0, then all the stored drying processes are deleted.



- ⇒ Use the **TARE** button to return the appliance to weighing mode.

12 General information concerning moisture analysis

12.1 Application

In all cases where moisture is added to or removed from products, a fast determination of the moisture content is of enormous importance. For countless products the moisture content is not only a quality feature but also an important cost factor. Very often fixed limits for moisture content apply to the trade in industrial or agricultural goods as well as chemical or food products which are defined by terms of delivery and general standards.

12.2 Basics

Moisture does not only mean water but includes all substances that evaporate when heated up. In addition to water this includes,

- Fats
- Oils
- Alcohol
- Solvents
- etc...

There are various methods to analyse moisture in a product.

KERN MLB uses a method called thermogravimetrics. In accord with this method, the sample is weighed before and after heating, determining the material moisture by looking at the difference.

The conventional drying chamber method follows the same principle, with the exception that this method requires a considerably longer measuring period. In accord with the drying chamber method, the sample is heated from the outside to the inside by a hot air current, so as to remove the moisture. The radiation applied in the KERN MLS penetrates mainly the sample in order to be transformed inside it into heat energy that is, warming from the inside to the outside. A minor amount of radiation is reflected by the sample, a reflection that is less in dark samples than in light-coloured ones. The depth of penetration of the radiation depends on the permeability of the sample. In samples of low permeability the radiation only penetrates the outer layers of the sample, possibly resulting in imperfect drying, incrustation or burning. For that reason the preparation of a sample is of great importance.

12.3 Adjustment to existing measuring method

Quite frequently the KERN MLB replaces a different drying method (such as a drying chamber) as the KERN MLB achieves shorter measuring times during a simplified operation. For that reason the conventional measuring method must be matched to the KERN MLB in order to achieve comparable results.

- Carry out parallel measurement
 - Lower temperature setting for KERN MLB than drying chamber method
- Result of KERN MLB does not match reference
 - Repeat measurement with changed temperature setting
 - Vary shutoff criterion

12.4 Preparing a sample

Prepare one sample at a time for measuring. This prevents the sample from exchanging moisture with its surroundings. If several samples have to be taken at the same time, they should be packed in airtight boxes so that they do not undergo changes during storage.

To receive reproducible results, spread the sample thinly and evenly on a sample dish.

Patchy spreads will produce inhomogeneous heat distribution in the sample to be dried resulting in incomplete drying and increased measuring time. Sample clusters generate increased heating of the upper layers resulting in combustion or incrustation. The high layer thickness or possibly arising incrustation makes it impossible for the moisture to escape from the sample. Due to this residual moisture, measured results calculated in this way will not be comprehensible or reproducible.

Preparing a sample from solids:



- Spread powdery or grainy samples evenly on the sample dish.
- Grind coarse samples using a mortar or a shredder. When grinding the sample avoid any heat supply as this may cause loss of humidity.

Preparing a sample for liquids:



For liquids, pastes or melting samples we recommend to use a glass fiber filter. The glass fiber filter has the following advantages:

- Even distribution thanks to capillary attraction
- no formation of droplets
- fast evaporation due to a greater surface

12.5 Sample material

Easy to determine are usually samples with the following characteristics:

- Grainy to powdery, pourable solids
- Thermally stable materials, emitting the moisture to be determined easily without other substances evaporating at the same time
- Liquids that vaporize to leave a dry substance without developing a film

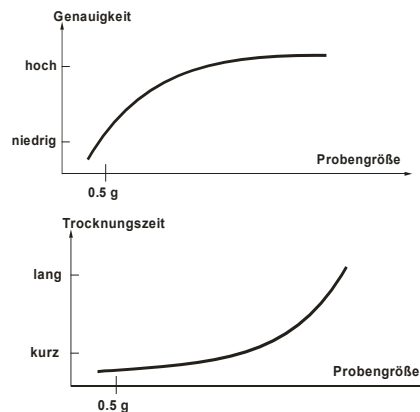
Difficult to determine may be samples that are:

- Glutinous or sticky
- Become incrustrated easily or tend to form a film
- Decompose easily under the influence of heat or emit various elements

12.6 Sample size / originally weighted in quantity

Drying times, as well as achievable accuracy, are significantly influenced by sample distribution. In the course of this arise two opposed requirements:

The lighter the originally weighted in quantity, the easier it is to achieve shorter drying times.



However, the heavier the originally weighted in quantity, the more accurate a result will be achieved. (example of a sample with ideal characteristics):

Poured quantity	Reproducibility approx.
0.5g	±0,6%
1g	±0,3%
2g	±0,15%
5g	±0,06%
10g	±0,03%

12.7 Drying temperature

Bear in mind the following factors when setting the drying temperature:

Surface of the sample:

Compared with powdery or grainy samples, liquid and spreadable samples have a smaller surface for the transmission of heat energy.

The use of a glass fiber filter improves the heat application.

Colour of sample:

Light-coloured samples reflect more heat radiation than dark ones and therefore require a higher drying temperature.

Availability of volatile substances:

The better and faster the water or other volatile substances can be disposed, the lower a drying temperature is required. If water is difficult to get to (e. g. in synthetics), it has to be calcined at high temperatures (the higher the temperature, the higher the water vapour pressure).

Results equivalent to other moisture analysing methods (e. g. drying chamber) can be achieved by experimentally optimising the setting parameters such as temperature, heating level and shutoff criteria.

12.8 Recommendations / Guidelines

MATERIAL	Weight Sample (g)	Drying temperature (° C)	Data query interval (s)	Average water content	Drying time (min)
Butter	2-5	138	15	16.3	4.5
Cement	8-12	138	15	0.8	4-5
Coal	8-10	120	10	3.8	8-10
Chocolate powder	2-4	100	5	1.9	4
Cocoa powder	2-3	106	20	0.1	2
Coffee cream	2-3	130	15	78.5	6-8
Cornflakes	2-4	120	15	9.7	5-7
Dried piece of apple	5-8	100	10	76.5	10-15
Dust	5-10	104	10	7.3	8-15
Flour	8-10	130	10	12.5	4-5
Ground coffee	2-3	106	5	2.8	4
Margarine	3-4	138	20	16	10
Mayonnaise	1-2	138	20	56.5	10
Milk	2-3	120	15	88	6-8
Milk chocolate	2-5	106	15	1.3	3.5
Milk powder	2-4	90	15	5	6
Mustard	2-3	130	20	76.4	10
Paper	2-4	106	20	6.4	10
Polyamide	2-5	138	20	2	75
Potato chips	3-4	106	15	6.9	7.5
Soup (instant product)	2-3	80	15	3	4.5-7
Red wine	3-5	100	15	97.4	15-20
Sludge	11-12	130	15	80	90
Sugar	4-5	138	15	11.9	10
Sunflower oil	10-14	138	20	0.1	2
Moist apple	5-8	100	10	7.5	5-10
Adhesive	2-5	136	15	54.3	6-8
Yoghurt	2-3	110	15	86.5	4.5-6.5

13 Data output /RS 232C interface

The moisture analyser is typically equipped with a RS 232C interface. The weighing data can be edited either automatically or by pressing the **PRINT**-button via the interface.

This data exchange is asynchronous using ASCII - Code.

The following conditions must be met to provide successful communication between the moisture analyser and the printer.

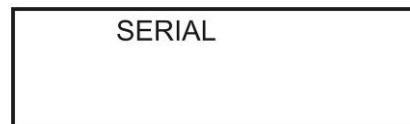
- Use a suitable cable to connect the moisture analyser to the interface of the printer. Faultless operation requires an adequate KERN interface cable.
- Communication parameters (baud rate, bits and parity) of moisture analyser and printer must match.

13.1 Interface parameters

In the menu (see also chapter 8.1) the settings for the serial interface can be adapted.

Call-up interface parameters

- ⇒ In weighing mode press the **MENU** button, the first menu item „**SERIAL**“ is displayed.



- ⇒ Acknowledge by using **MENU** button, the first parameter „**BAUDRATE**“ with the current setting appears.



- ⇒ Using the **MENU**-button other parameters with the current setting can be selected subsequently

Baud rate



BAUDRATE
4800

- ⇒ Use the arrow keys ↓ ↑ to select the desired setting **2400 / 4800 / 9600 / 19200 / 38400** and confirm using **MENU**-button.
- ⇒ The next parameter showing the current setting will be displayed. Either set new parameters or return to weighing mode using the **TARE**-button.

Parity



PARITY
EVEN

- ⇒ Use the arrow keys ↓ ↑ to select the desired setting **none / even / odd** and confirm using **MENU**-button.
- ⇒ The next parameter showing the current setting will be displayed. Either set new parameters or return to weighing mode using the **TARE**-button.

Output condition „CONTINUOUS“



CONTINUOUS
ON

- ⇒ Use the arrow keys ↓ ↑ to select the desired setting „ON“ or „OFF“ and confirm using **MENU** button.

„ON“ = continuous output on

„OFF“ = continuous output OFF

The edition contains only the weight value after the set interval having been elapsed. The drying process is not stored. Per line 9 characters xxxxxxxx<CR><LF> without leading zero (zero = blank, e.g. ___ 12.345) are edited.

⇒ The display for setting the output interval appears,



⇒ The next parameter showing the current setting will be displayed. Either set new parameters or return to weighing mode using the **TARE**-button.

⇒ Use the arrow keys ↓ ↑ to select the desired setting and confirm using **MENU**-button.

⇒ The next parameter showing the current setting will be displayed. Either set new parameters or return to weighing mode using the **TARE**-button.

13.2 Technical Data

Connector	9 pin d-subminiature bushing Pin 2 input to balance RXD Pin 3 output from balance TXD Pin 5 signal ground GND No confirmation operation
Baud rate	2400/4800/9600/19200/38400 bps
Parity	NONE (=8N1), EVEN (=8E1) or ODD (=8 O 1)
Handshake	No

All lines are finished with carriage return and line forward feed. (<CR><LF>).

In „CONTINUOUS“ mode the edition format is one-line, e.g. “12.567 g<CR><LF>”.

13.3 Remote control instructions

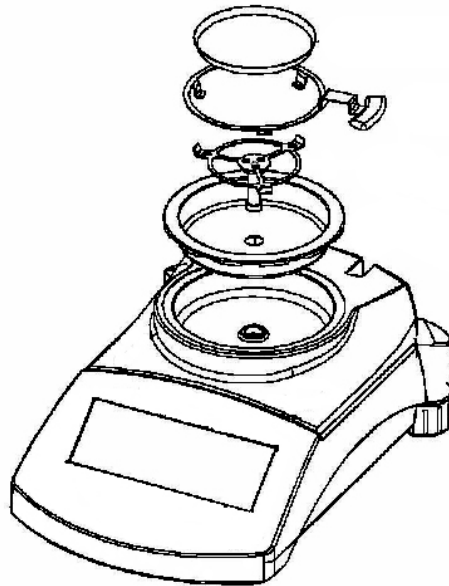
The orders can be sent in upper and lower case letters, e.g. „!KT“ or „!kt“. Finish all inputs on the PC using <CR> (Enter button).

!KT<CR>	Taring, accordingly with TARE button
IKS<CR>	Start or finish drying process, accordingly with START/STOP button

14 Service, maintenance, disposal

14.1 Cleaning

Before cleaning, disconnect the appliance from the operating voltage.



For cleaning purposes remove the accessory parts one after the other (see illustration).

Please do not use aggressive cleaning agents (solvents or similar agents), but a cloth dampened with mild soap suds. Take care that the device is not penetrated by fluids and polish it with a dry soft cloth.

Loose residue sample/powder can be removed carefully with a brush or manual vacuum cleaner.

Spilled weighing goods must be removed immediately.

14.2 Service, maintenance

The appliance may only be opened by trained service technicians who are authorized by KERN. Before opening, disconnect from power supply.

14.3 Disposal

Disposal of packaging and appliance must be carried out by operator according to valid national or regional law of the location where the appliance is used.

15 Instant help

Fault

Possible cause

Display is not lit up.

- The display unit is not switched on.
- The mains supply connection has been interrupted (mains cable not plugged in/faulty).
- Power supply interrupted.

Measurement is taking too long

- Incorrect setting shutoff criterion

Measurement is not reproducible

- Sample is not homogenous
- Drying time is too short
- Drying temperature too high (e.g. oxidation sample material, boiling point of sample exceeded)
- Temperature sensor soiled or defective

The displayed weight is permanently changing

- Draught/air movement
- Table/floor vibrations
- Electromagnetic fields / static charging (choose different location/switch off interfering device if possible)