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Operating Manual
Electronic Moisture meter

KERN MLB_N

Version 2.1
04/2010
GB

MLB_N-BA-e-1021

GB

KERN MLB_N

Version 2.1 04/2010

Operating Manual

Electronic Moisture meter

English

Table of Contents

English

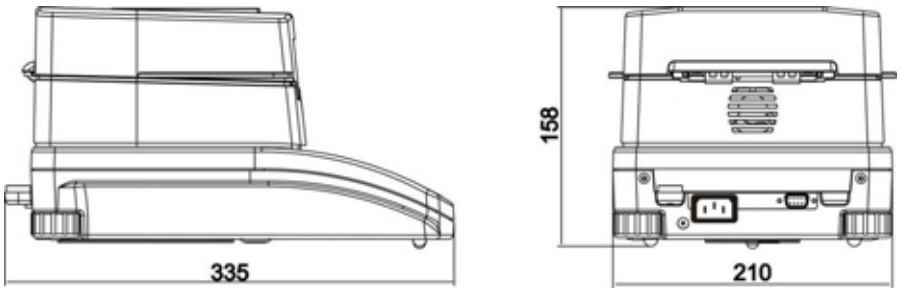
1 Technical Data

Data	MLB 50-3N
Radiator	Halogen (1 x 400 W)
Temperature range	max. 160°C
Maximum load (Max)	50 g
Readability (d)	1 mg
Readout accuracy Originally weighted in quantity < 1.5 g	0,01 %
Readout accuracy Originally weighted in quantity > 1.5 g	0,001 %
Recommended adjustment weight, not added (class)	50g (F1)
Sample size	max. 50 g
Warm-up time	4 h
Heating profiles	• Standard • Fast • Step-by-step • Soft
Repeatability for originally weighted in quantity 2 g	0,5 %
Repeatability for originally weighted in quantity 10 g	0,02 %
Repeatability in weighing mode (= standard deviation)	0,001g
Ambient conditions	• +15°C….+40°C ambient temperature • max 80% air humidity non-condensing

Shutoff criterion	• Automatic 1 (shutoff during change of weighing value < 1mg within 10 s) • Automatic 2 (shutoff during change of weighing value < 1mg within 25 s) • Automatic 3 (shutoff during change of weighing value < 1mg within 60 s) • Automatic 4 (shutoff during change of weighing value < 1mg within 90 s) • Automatic 5 (shutoff during change of weighing value < 1mg within 120 s) • Manual • Time-controlled (1 min – 9h 59 min)	
Sample dishes included	10 (Ø 92 mm)	
Display after drying Display may be switched over at any time	Moisture [%] = Weight loss from initial weight (SG)	0 – 100 %
	Dry matter [%] = Remaining weight (RG) from initial weight (SG)	100 – 0 %
	ATRO[%] [(SG – RG) : RG] x 100%	0 – 999 %
	Remaining weight	[g]
Dimensions	Case 210 x 335 x 158 mm	
	Available drying chamber 120 x 120 x 20 mm	
Net weight	6 kg	
Electric Supply	230V 50 Hz AC	

English

1.1 Dimensions



2 Declaration of conformity

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Konformitätserklärung

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

D	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 with 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 conformitá	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 Moisture Balance: KERN MLB_N

Mark applied	EU Directive	Standards
CE	2004/108/EC EMC	EN 55022 : 2000 EN 61326-1 : 2006
	2006/95/EC Low Voltage	EN 61010-1 : 2004

Date: 30.06.2008

Signature:

Gottl. KERN & Sohn GmbH
Management

3 Basic Information (General)

3.1 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.

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

3.3 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.
- 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).
- Do not use the moisture meter for analysing explosion prone, easily flammable samples.
- Do not operate the moisture meter in explosion prone environments.
- 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.
- 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.

3.4 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

3.5 Monitoring of Test Resources

In the framework of quality assurance the measuring-related properties of the balance 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.

4 Basic Safety Precautions

4.1 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.

4.2 Personnel training

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

5 Transportation & Storage

5.1 Testing upon acceptance

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

5.2 Packaging

Keep all parts of the original packaging in case you need to return the appliance.
Only use original packaging for returning.
Before sending, disconnect all connected cables and loose/movable parts.
Attach possibly existing transport safeguards. Secure all parts, e.g. weighing plate, power unit etc., to prevent slipping and damage.

6 Unpacking, Setup and Commissioning

6.1 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 your balance
-

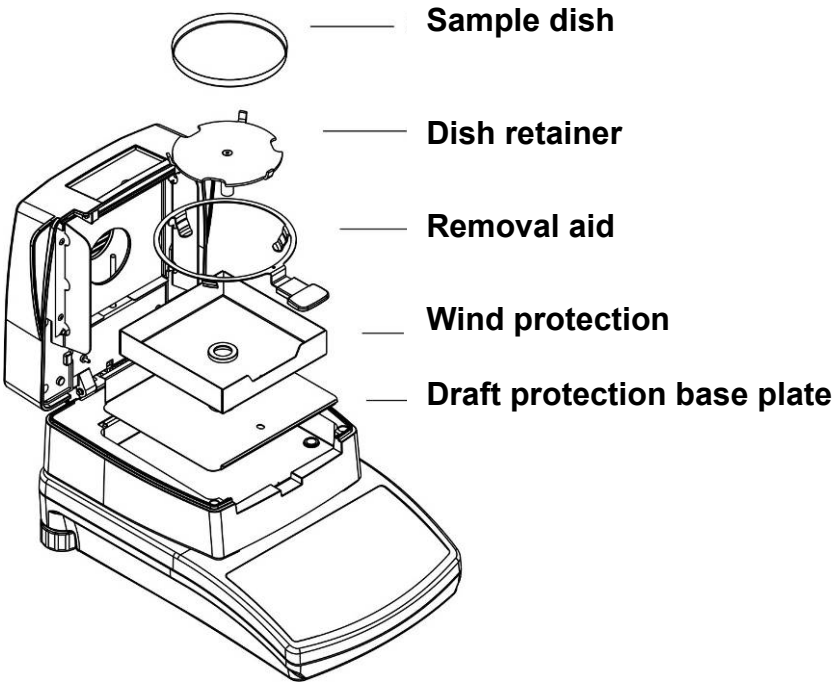
Therefore, observe the following for the installation site:

- Place the device on a firm, level surface;
- Avoid extreme heat as well as temperature fluctuation caused by installing next to a radiator or in the direct sunlight;
- Protect the device against direct draughts due to open windows and doors;
- 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.
- Avoid static charging of the material to be weighed, weighing container and windshield.

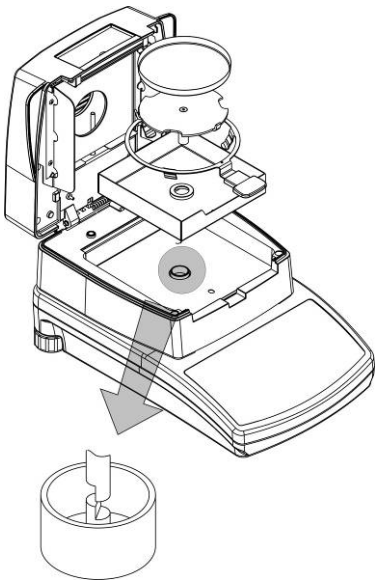
If electro-magnetic fields or static charge occur, or if the power supply is unstable major deviations on the display (incorrect weighing results) are possible. In that case, the location must be changed.

6.2 Unpacking and erection

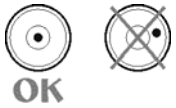
Take the moisture meter carefully out of its packaging, remove the plastic jacket and install it at the designated work space.
The moisture meter is supplied part-assembled. Control whether the delivery is complete immediately after unpacking the individual parts and assemble the separate component parts according to the enclosed diagram.



Put on the dish retainer carefully, ensuring correct positioning:



Level balance with foot screws until the air bubble of the water balance is in the prescribed circle



6.2.1 Scope of delivery

Serial accessories:

- For weighing balance with moisture determination attachment, see fig. chpt. 6.2
- 10 sample dishes
- Power cable
- Operating Manual

6.3 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 scales to the power grid unless the information on the scales (sticker) matches the local mains voltage.

Important:
Does the labelling (220 V 50Hz) 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.

6.4 Turning device on/off

Press the **ON/OFF** key. The unit will carry out a self-test. The device is ready for measuring as soon as 0.000 g appears on the weighing display. If the display deviates from zero, operate the **TARE** key.
For short pauses between measuring, turn off the device by pressing the **ON/OFF**-key. Do not disconnect it from the mains.

Stability display

The appearance of the stability symbol **[▂▃]** on the display indicates that the weighing plate is in a stable state. If the status is instable the [▂▃] display disappears.

Balance zero display

Should the balance not display exactly zero despite empty balance pan, wait for stability display and press the **TARE** button. The balance start with resetting to zero and the symbol **→0←** will appear.

6.5 Connection of peripheral devices

Before connecting or disconnecting of additional devices (printer, PC) to the data interface, always disconnect the balance from the power supply.
With your balance, only use accessories and peripheral devices by KERN, as they are ideally tuned to your balance.

6.6 Initial Commissioning

In order to obtain exact results with the electronic balances, your balance must have reached the operating temperature (see warming up time chap. 1).
During this warming up time the balance must be connected to the power supply (mains, accumulator or battery).
The accuracy of the balance depends on the local acceleration of gravity.
Strictly observe hints in chapter Adjustment.

6.7 Keyboard overview

Key	Function
ON OFF	• Switch machine on/off
M	• Change display during drying process
START STOP	• Start/Stop drying
ESC	• Cancel an entry • Leave menu
↑ ← → ↓	• Arrow keys for navigation in menu
PRINT	• Data export to external device • Confirm/save settings
TARE	• Taring • Balance zeroing
MENU	• Call operator menu (setting for drying parameters)
F	• Invoke user menu

English

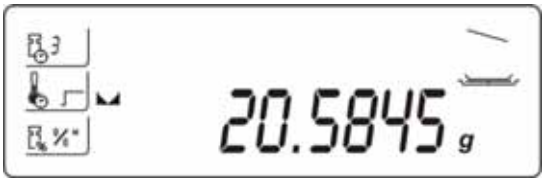
7 Weighing/taring

⇨ Weighing

Turn on by pressing the **ON/OFF**-key.

Prior to weighing, load and unload the weighing plate several times.

Place the load and wait until the stability message [▬] appears, read the weighing result.



⇨ Taring
If using a weighing container, tare with **TARE**-key. The tare weight is saved until it is deleted.
Information:
The tare procedure can be repeated as many times as necessary, for example with initial weighing of several components for a mix (add-on weighing). The limit is reached when the total weighing range capacity is full. After removing the taring container the total weight is displayed as negative display.

⇨ Delete tare
Unload weighing balance and press the **TARE**-key until zero is indicated.

8 Menu

The menu is arranged in a user and operator menu. The user menu is used to adapt the weighing balance to user requirements, the operator menu to set the drying parameters. To enable the user menu, press the **F**-key; to enable the operator menu, press the **MENU**-key.

User menu:

P1 CAL [adjustment]

P1-01	ECAL	|		[external adjustment]
P1-02	tCAL	|		[adjustment test]
P1-03	tE_CAL	|		[Temperature calibration]
P1-04	CALr	|		[printout adjustment log]

P2 GLP [good lab practice]

P2-01	USr	|	_	[user]
P2-02	PrJ	|	_	[project]
P2-03	Ptin	|	YES/no	[printout time]
P2-04	PdAt	|	YES/no	[printout date]
P2-05	PUSr	|	YES/no	[printout user]
P2-06	PPrJ	|	YES/no	[printout project]
P2-07	PId	|	YES/no	[printout serial number weighing balance]
P2-08	PFr	|	YES/no	[frame printout]

P3 tinne [Date/time]

P3-01	StinnE	|	[Setting time]
P3-02	SdAtE	|	[Setting date]

P4 rEAd [Basic settings]

P4-01	AuE	Stand/Slouu/FASt	[filter settings]
P4-03	Auto	|On/OFF	[Auto zero]

P5 Print [parameter for serial interface RS 232]

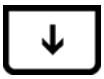
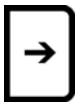
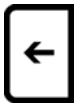
P5-01	bAud	|2400/4800/9600/19200	[Baud rate]
P5-02	PStb	YES/no	[output stable/instable weighing values]
P5-03	LinE_t	|1/2/3/5/10/20/30/60/120/180	[Output interval]

P6 othEr [additional useful functions]

P6-01	Libr	|	YES/no	[Program library]
P6-02	bL	|	On/Aut/OFF	Display background illumination
P6-03	bEEP	|	On/OFF	[touch tone]
P6-04	PrnS	|		[printout “weighing parameters”]

English

8.1 Navigation in the menu:

Key	Function in Menu
	• Access to Main menu
	• Scroll to next page • Decrease in the numerical value of a figure by "1"
	• Scroll back • Change parameter value • Increase in the numerical value of a figure by "1"
	• Submenu/Parameter call-up • Shift and select number to be changed to the right
	• Sub-menu/exit parameter, back to menu • Shift and select number to be changed to the left
	• Confirm/save settings
	• Quit function without changing the settings • Back to menu

English

Storing / jumping back to weighing mode

Any changes made in the balance memory will only be saved when the storing process is complete.

To achieve this, press the  key several times until **"SAVE"?** appears.

Any changes carried out are stored by pressing the  key.
To cancel changes, press the  key.
Afterwards the balance automatically jumps back to weighing mode.

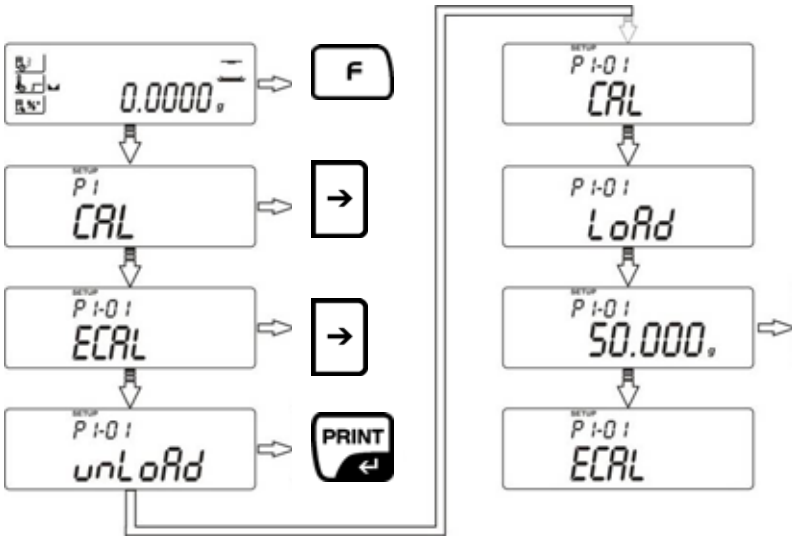
9 P1 Calibration (adjustment)

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 for the first commissioning, after each change of location as well as in case of fluctuating environment temperature. To receive accurate measuring values it is also recommended to adjust the balance periodically in weighing operation.

9.1 P1-01 External adjustment

Carry out adjustment with the help of the recommended adjustment weight (see chapter 1 “Technical Specifications”).
Observe stable environmental conditions. A warming up time (see chapter 1) is required for stabilization.

Sample dishes must be in place. During the adjustment process no objects should be on the sample plate.



Wait until the weight value for the required adjustment weight is overlaid. Place the adjusting weight in the centre of the sample dish.

If the adjustment was successful, this will be followed by automatic reset to the menu.

The **ESC** key may be used to cancel the adjustment.
Errors during adjustment or the use of an incorrect adjusting weight will result in an error message. Repeat adjustment.
If objects are left in the sample dish during adjustment, error message **Er1 Hi** will appear.

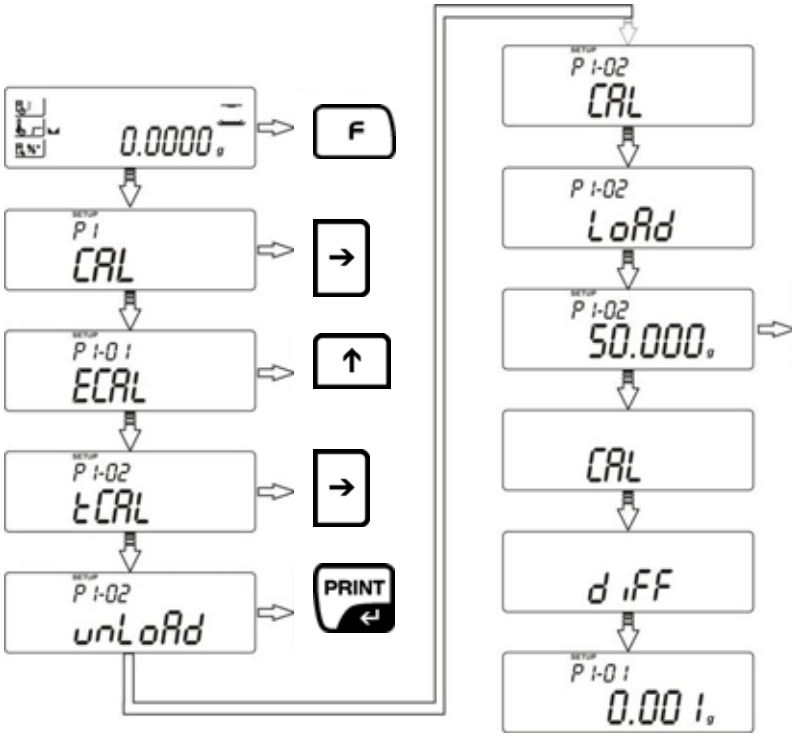
Return to weighing mode:

Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

9.2 P1-02 Adjustment test

Here, deviation from the last adjustment is determined. This is only a check, i.e. no values are changed.



Wait until the weight value for the required adjustment weight is overlaid. Place the adjusting weight in the centre of the sample dish.

The result of the adjustment test is shown.

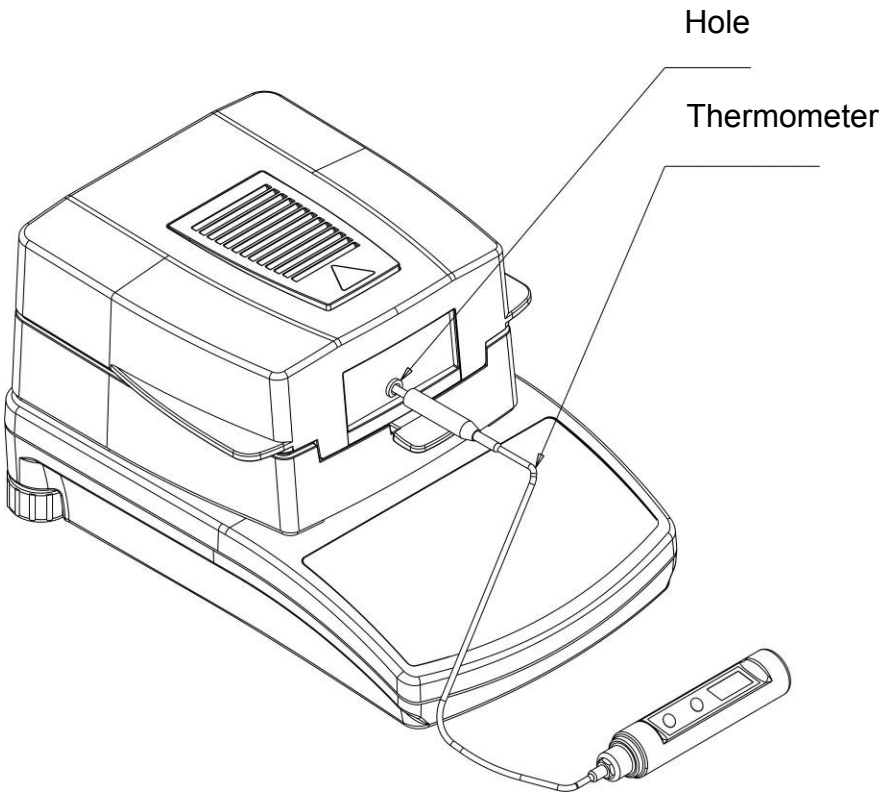
Return to weighing mode:

Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

9.3 P1-03 Temperature calibration / adjustment

We recommend that you test the temperature value of the device occasionally with the help of temperature calibration set **MLB-A11**.
Before you do this, allow the device to cool down for at least 3 hours after the last heating phase. Insert the measuring probe in the designated hole in the disc. Push the measuring probe as closely to the thermal sensor of the MLBD as possible. The temperature is measured at two points and it is possible to correct it at both temperature points.



Press repeatedly until **tE_CAL** appears.

temperature calibration starts.
Current temperature is shown.

The temperature calibration of point 1 takes 14.59 min after which you will hear an acoustic signal.

If required, operate the arrow keys to adjust the temperature value (e. g. 20/26).

Confirm your entry after which temperature calibration of point 2 will start.

The temperature calibration of point 2 takes 14.59 min after which you will hear an acoustic signal.

If required, you can now use the arrow keys to correct the temperature (e. g. 120/98).

Confirm

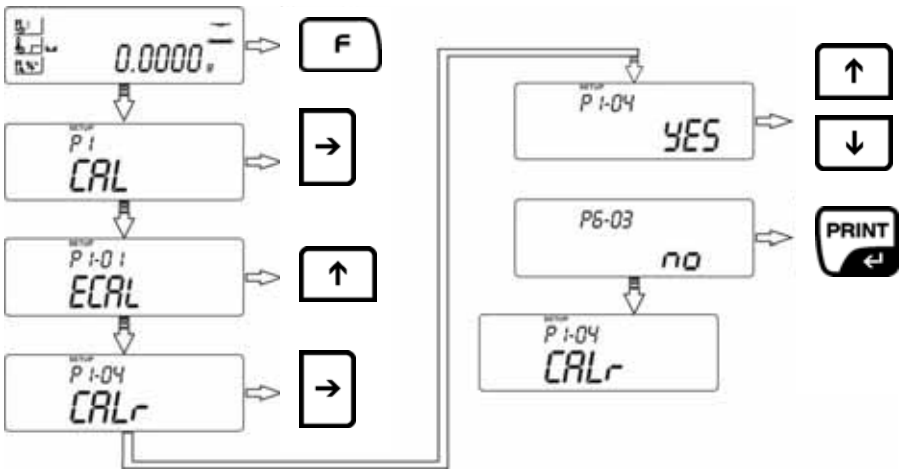
Return to weighing mode:

Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

9.4 P1-04 Printout adjustment protocol

When this function is enabled, each adjustment will automatically be followed by a printout of the adjusting data.



YES Function activated
NO Function deactivated

Return to weighing mode:
Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears. Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

The content of this printout depends on the data defined in **P2 GLP** (see chpt. 10.1)

Example of adjustment protocol:

*** External calibration report ***

Date	: 2007/08/08
Time	: 12:21:57
User Id	: WILK
Project Id	: TEST
Balance Id	: 100000
Calibr.	: External
Difference	: - 0.004 g

Name . . . . . .

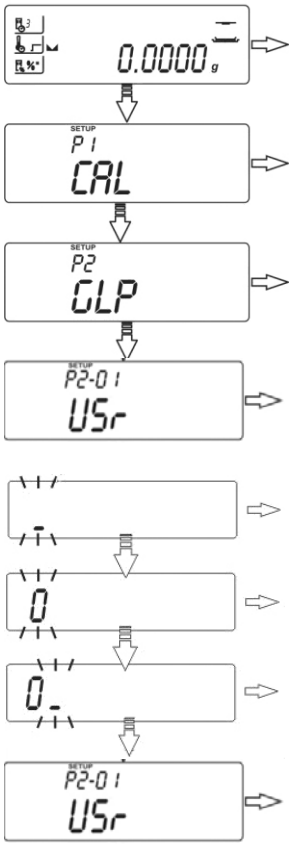
English

10 P2 GLP (Good laboratory practice)

Quality assurance systems require printouts of weighing results as well as of correct adjustment of the balance stating date and time and balance identification. The easiest way is to have a printer connected.

- **P2-01 USr/P2-02 PrJ**

Entry of user/project (max. 6 characters)



The first digit is flashing

Use the ↓ ↑-keys to change the value of the digit/number.

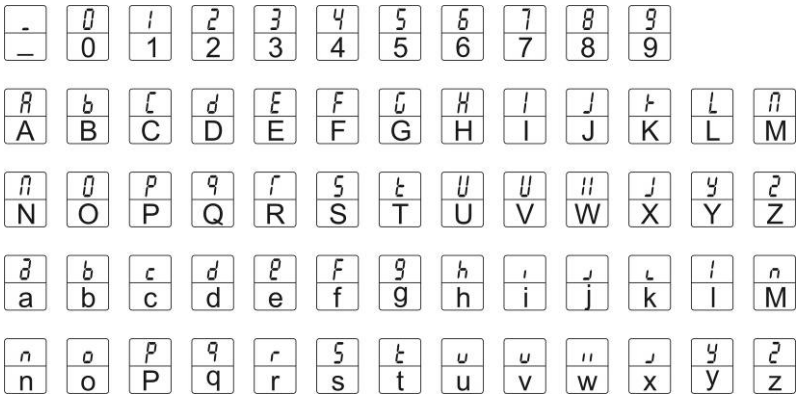
Press the ← → keys, to select the digit on the left/right (the relevant current digit flashes).

Confirm PRINT.

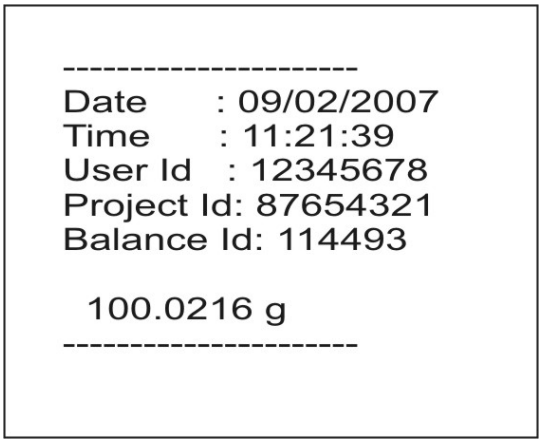
This will be followed by a return to the menu.

↑ The next menu item "**P2-02 PrJ",** used to enter the name of the project, appears. To enter, use the same procedure as for "user".

Overview data input / data output:



The content for the data output is defined in menu items **P2-03** to **P2-08** (For setting see **P2-01 USr/P2-02 PrJ)**. All parameters set to "**YES**" will be issued.



P2-03 Ptin	**YES**	Printout time
P2-04 PdAt	**YES**	Printout date
P2-05 PUSr	**YES**	Printout User (Entry in P2-01 USr)
P2-06 PPrJ	**YES**	Printout Project (Entry in P2-02 PrJ)
P2-07 PId	**YES**	Printout Serial No. Balance
P2-08 PFr	**YES**	Frame printout (See example below)

P2.8 PFrn: YES	

Date	:20.03.07
Time	:11.31.07
UserID	:Sample
Balance ID	:180151
4.090 g	

P2.8 PFrn: no	
Date	:20.03.07
Time	:11.31.07
UserID	:Sample
Balance ID	:180151
4.090 g	

Return to weighing mode:

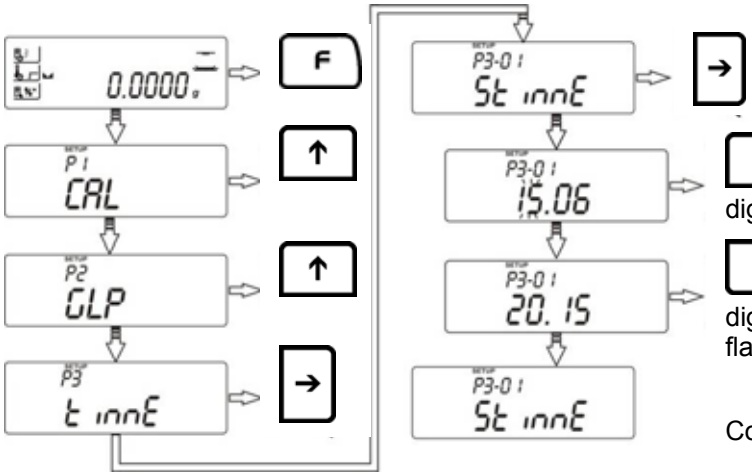
Press the **ESC**-key repeatedly until the query "**SAVE**?" appears.

Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

English

11 P3 Set date/time

- **P3-01 StinnE for setting of time**

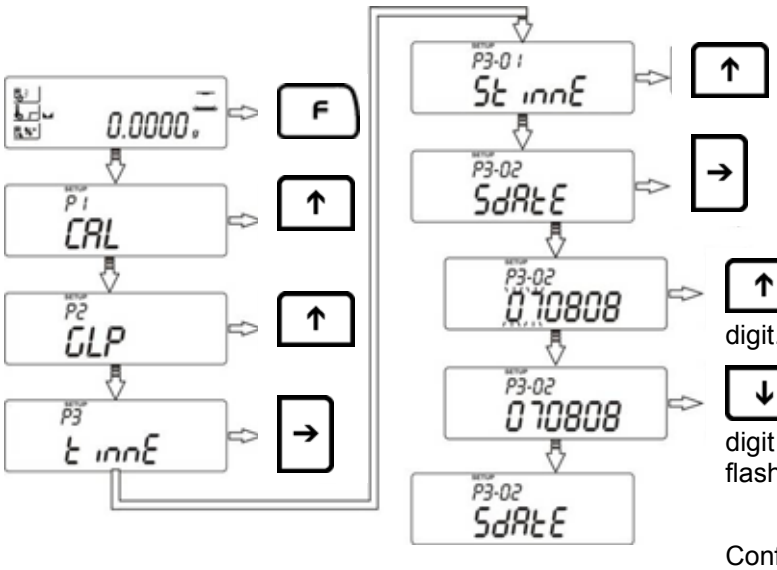


Press the ↓ ↑ keys to change the digit.

Press the ← → keys, to select the digit on the left/right (the relevant current digit flashes).

Confirm PRINT

- **P3-02-SdAtE – Set date**



Press the ↓ ↑ keys to change the digit.

Press the ← → keys, to select the digit on the left/right (the relevant current digit flashes).

Confirm PRINT.

Return to weighing mode:

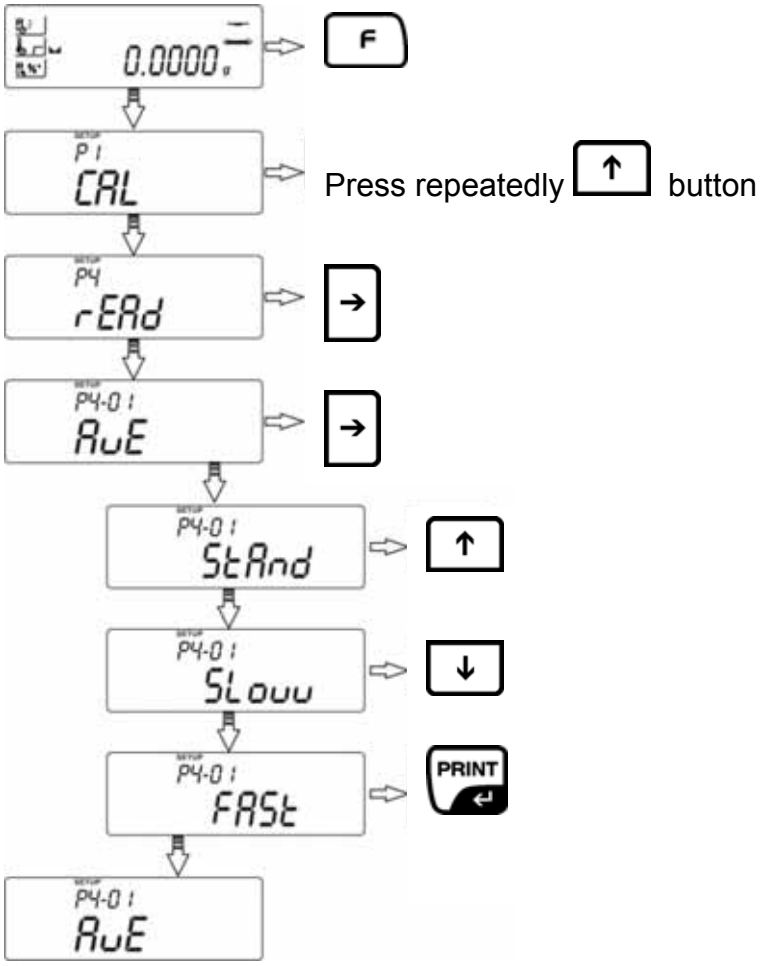
Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

English

12 P4 Default settings

- **P4-01-AuE –Filter settings**

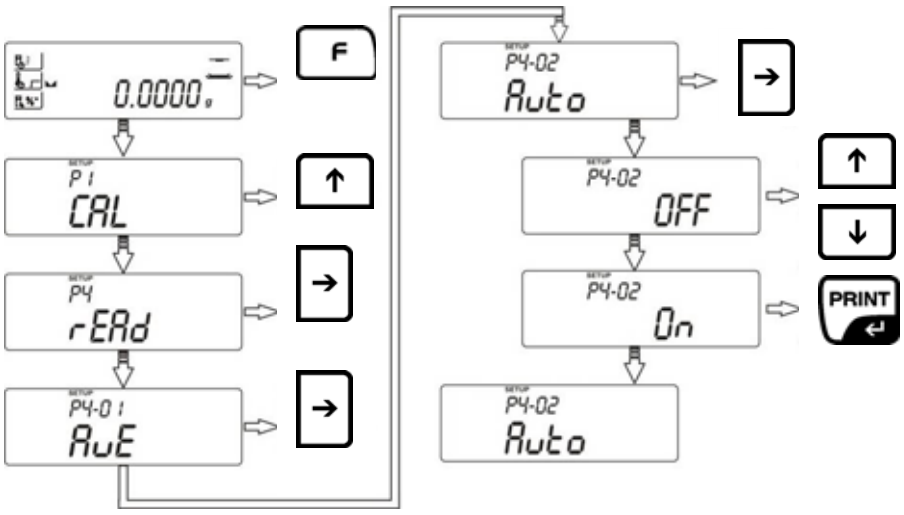


AuE = StAnd Standard, normal environmental conditions
AuE = Slouu - Impervious but slow, unsteady site of operation (such as vibration)
AuE = Fast - Sensitive but fast, very steady site of operation

English

- **P4-01-AuE –Autozero**

This function is used to tare small variations in weight automatically.
In the event that small quantities are removed or added to the material to be weighed, incorrect weighing results can be displayed due to the “stability compensation“ in the balance. (e.g. slow flow of liquids from a container placed on the balance, evaporating processes).
When apportioning involves small variations of weight, it is advisable to switch off this function.



Auto = On - Function activated
Auto = OFF - Function deactivated

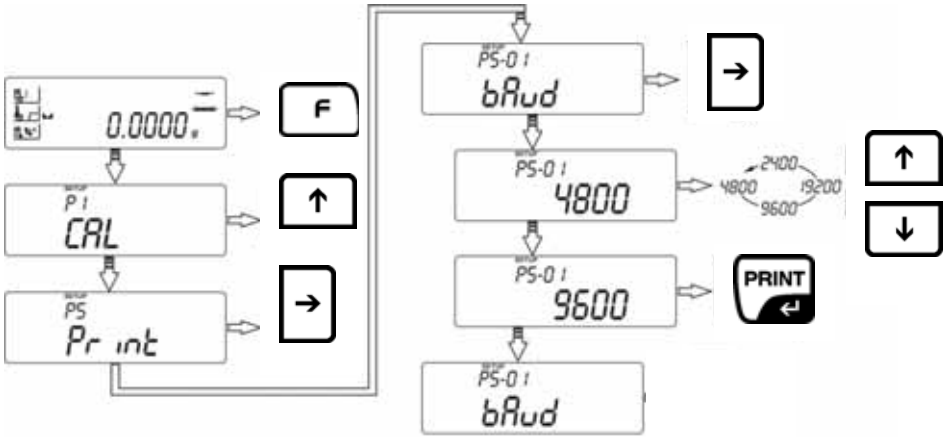
Return to weighing mode:

Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

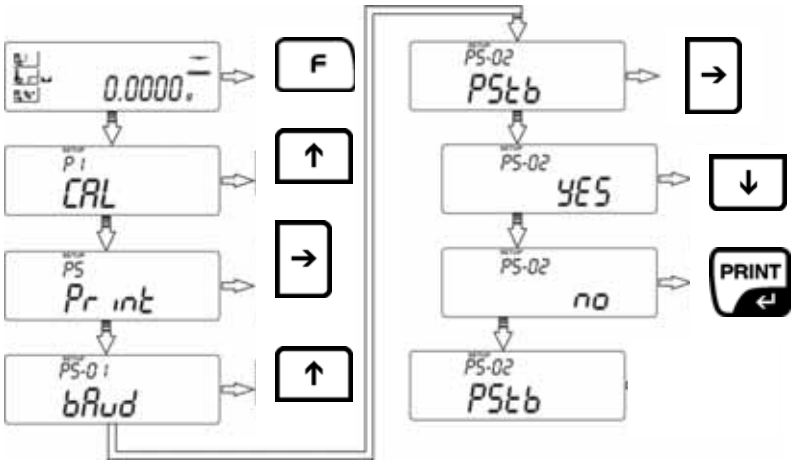
Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

13 P5 Interface RS 232

- **P5-01-bAud – Set Baudrate**



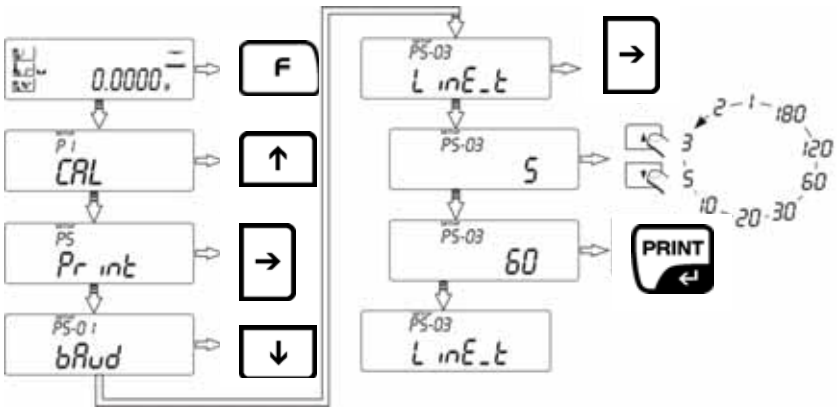
- **P5-02-PStb – Output stable/instable weighing value**



YES Output for stable weighing value only
NO Output even for unstable weighing value

English

- **P5-03-LinE_t – Set output interval**



English

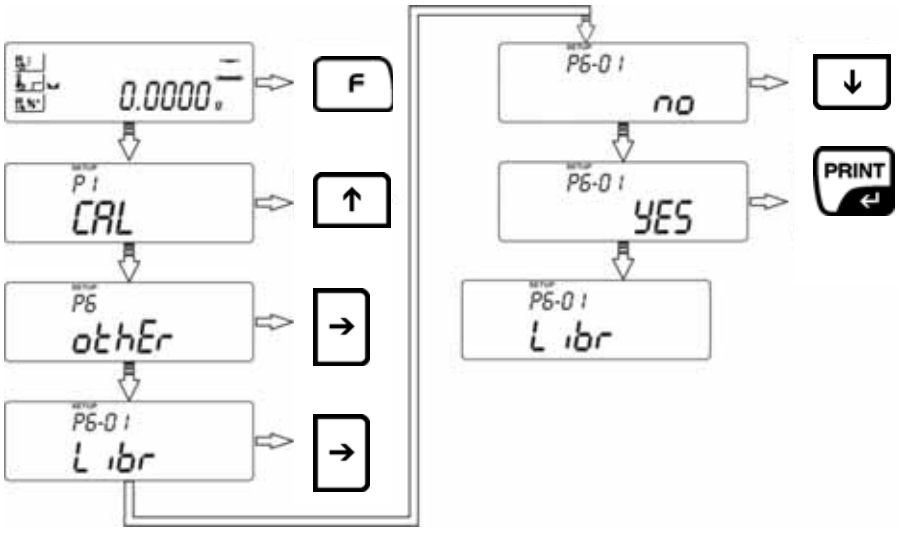
Return to weighing mode:

Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

Confirm query by pressing the **PRINT**-key or reject it by pressing the **ESC**-key.

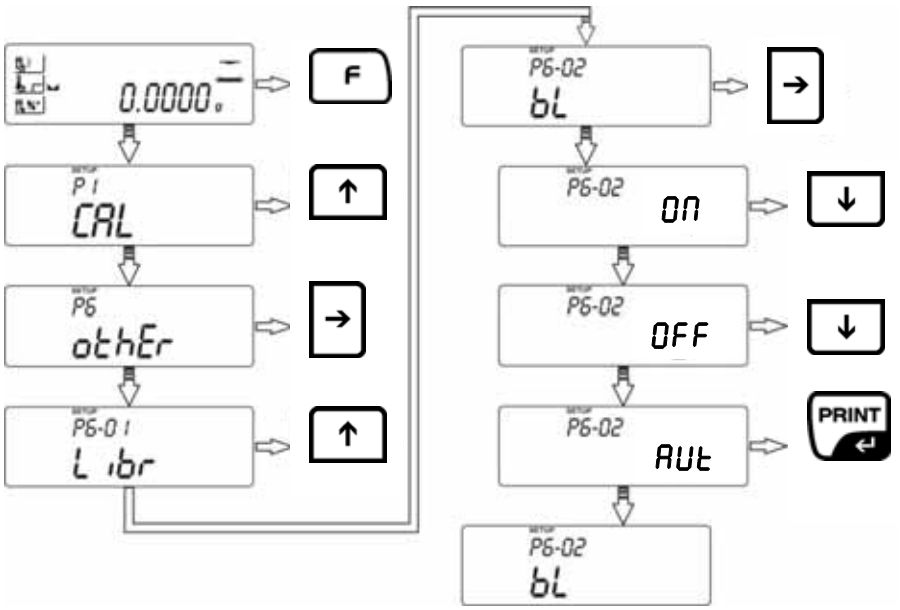
14 P6 Additional useful functions

- **P6-01-Libr – Program library for drying programs enable/disable**



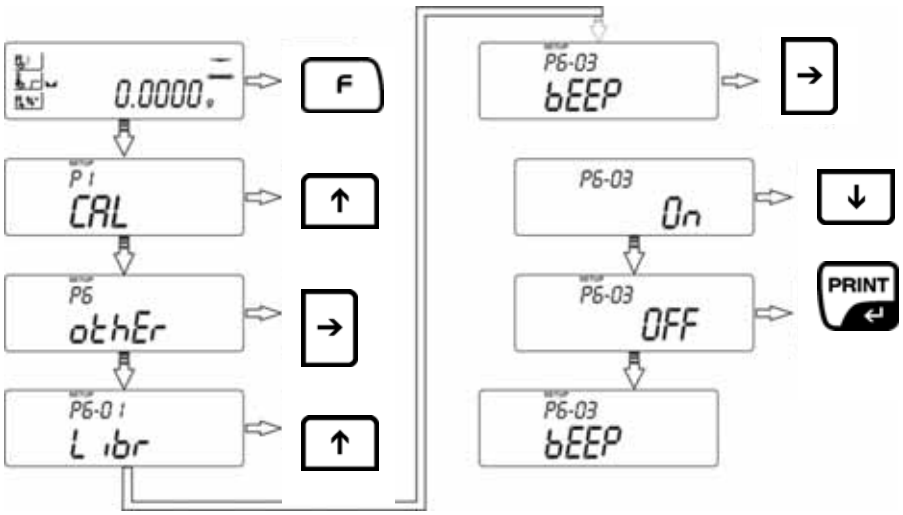
YES Function activated
NO Function deactivated

- **P6-02-bl – Backlight for display unit**



bl = ON Background illumination on
bl = OFF Background illumination on
bl = Aut Backlight switches off automatically after 10 s, after reaching a stable weighing value.

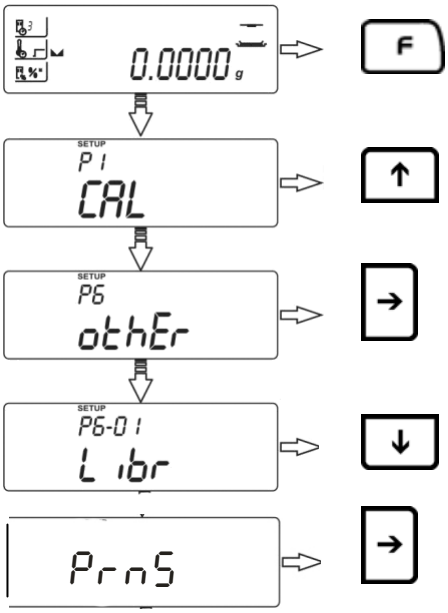
- **P6-03-bEEP – Turn on/off key sound**



YES Key sound ON
NO Key sound OFF

English

- **P6-04-PrnS – Output of set weighing parameter via RS 232 interface**



English

15 Operator menu – moisture analysis

The device has space for up to 20 different drying programs for carry-out operator-defined drying processes. Simply invoke from library and start the finished programs (See chpt. 15.2).
How to set drying parameters without using the program library is describes in the chapter below.

15.1 Moisture analysis without using the program library

Disabling the program library:

For random entry of drying parameters disable the program library function **P6-01 Libr** in the user menu, see chpt. 14.

Setting drying parameters

You can enter parameters for each drying process in the menu, as follows:

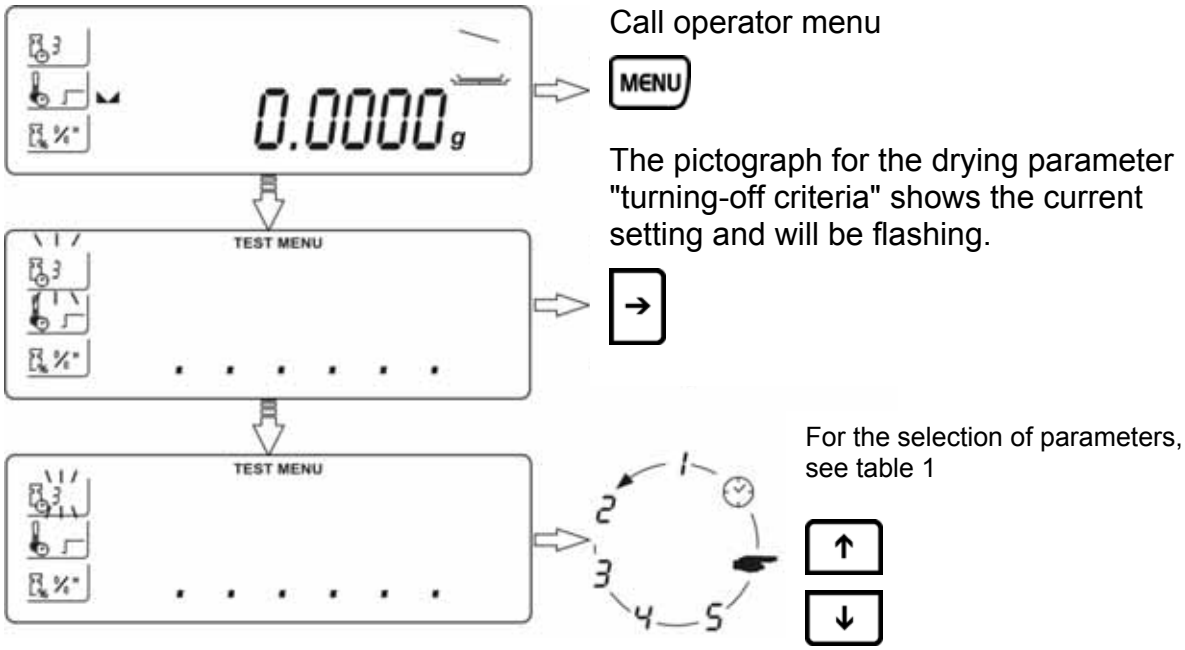
Shutoff criterion

Heating profile (temperature, time)

Display after drying

- **Shutoff criterion**

This is where you select the criteria according to which drying is finished



Call operator menu

MENU

The pictograph for the drying parameter "turning-off criteria" shows the current setting and will be flashing.

→

For the selection of parameters, see table 1

↑

↓

Tab. 1: Parameter selection “turning-off criteria“

1-5 **Automatic/mg per time**
Drying is shut off automatically when the weight loss for the set time is smaller than the number of set digits (1 digit = 1mg)

1 Automatic shutoff for change of weighing value ≤ 1mg within 10 s.
2 Automatic shutoff for change to weighing value ≤ 1mg within 25 s.
3 Automatic shutoff for change to weighing value ≤ 1mg within 60 s.
4 Automatic shutoff for change to weighing value ≤ 1mg within 90 s.
5 Automatic shutoff for change to weighing value ≤ 1mg within 120 s.

Manual

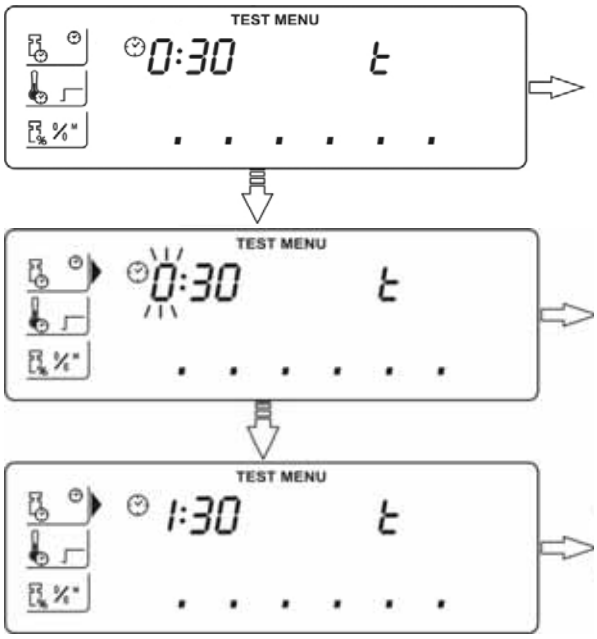
To turn off drying manually, press START/STOP.

Temporal
Drying is shut off when set time has passed, adjustable from 1min – 9h 59 min

To store the parameter, press twice PRINT.

English

When selecting “**turning-off criteria by time“** press time setting :



Press the ↓ ↑ keys to change the digit.

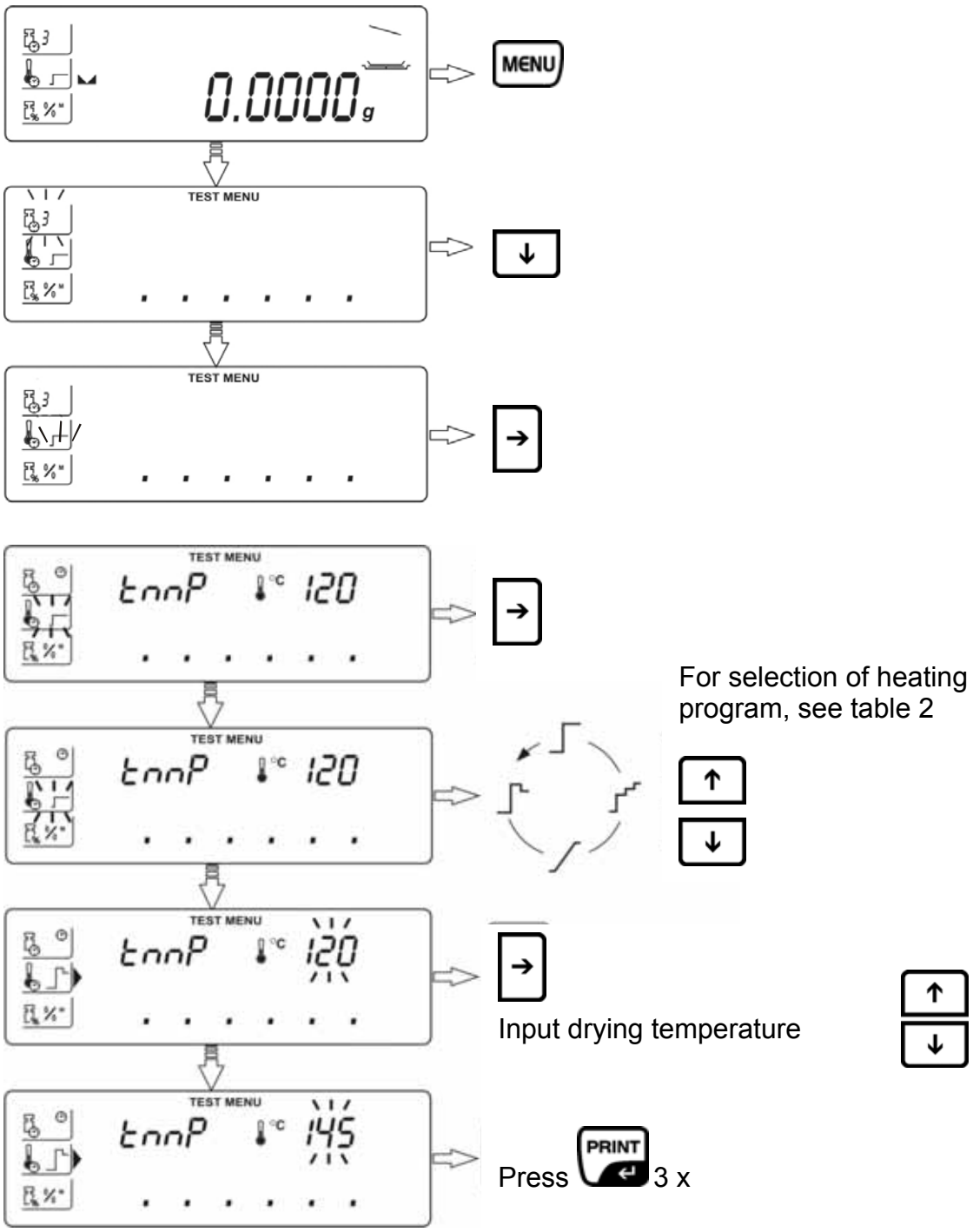
Press the ← → keys, to select the digit on the left/right (the relevant current digit flashes).

Press PRINT 3 x

English

- **Heating profiles**

This is where you select a suitable heating program and where you enter the drying temperature and heating up time.

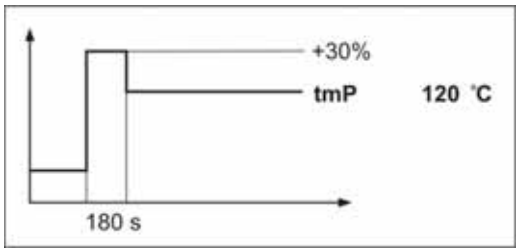


English

Tab. 2: Parameter Selection “heating profile"

Standard
Standard Drying is the most frequently use heating profile. This type of heating method is suitable for the majority of substances.
Drying temperature **tmP** adjustable from 40°C-160°C.

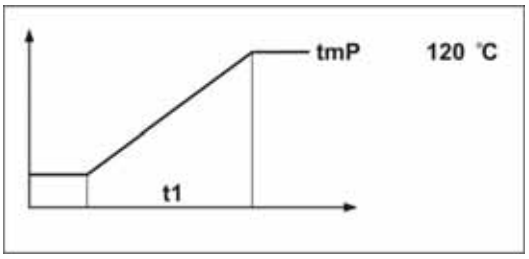
Fast
The fast heating profile is suitable for samples with a moisture content of about 5% - 15%. The temperature will rise within 180 s to 30% above the set drying temperature. After that the temperature will be adjusted down to the set value.

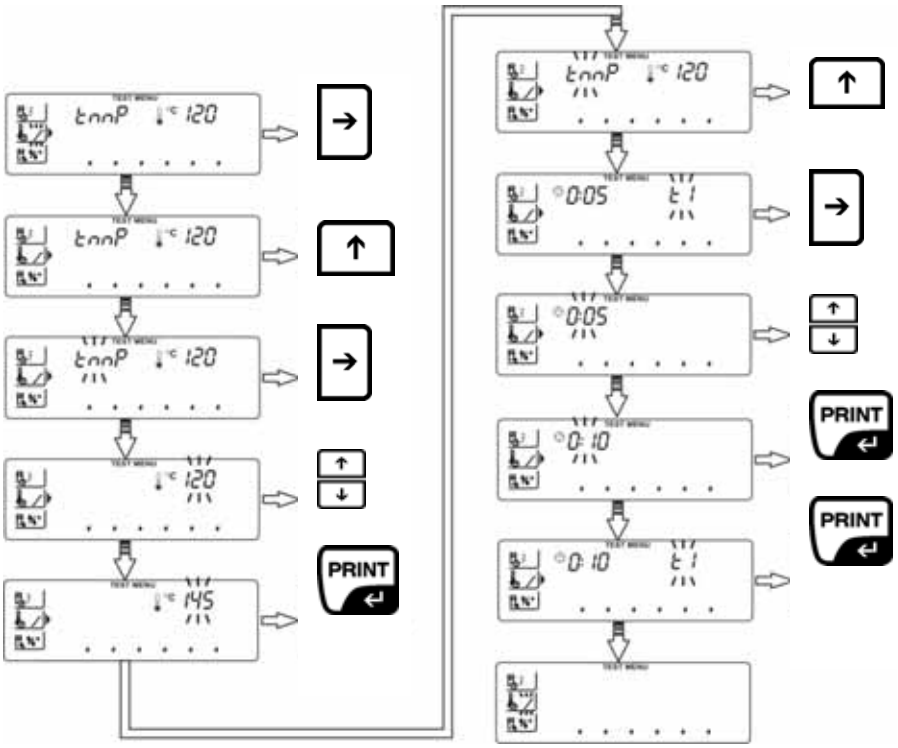


Drying temperature **tmP** adjustable from 40°C-160°C.

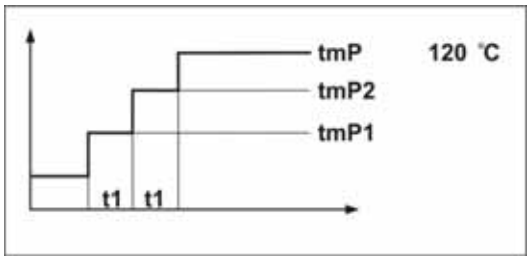
Mild
The mild heating profile is suitable for substances that are unable to tolerate fast warming by radiator. There are also substances that will form a skin when heated up too fast. This skin afterwards will have an effect on the evaporation of the enclosed moisture. For such substances, the soft mode of warming is equally suitable.

Adjustable parameters include the heating-up time **t1** in which the drying temperature **tmP** is reached.



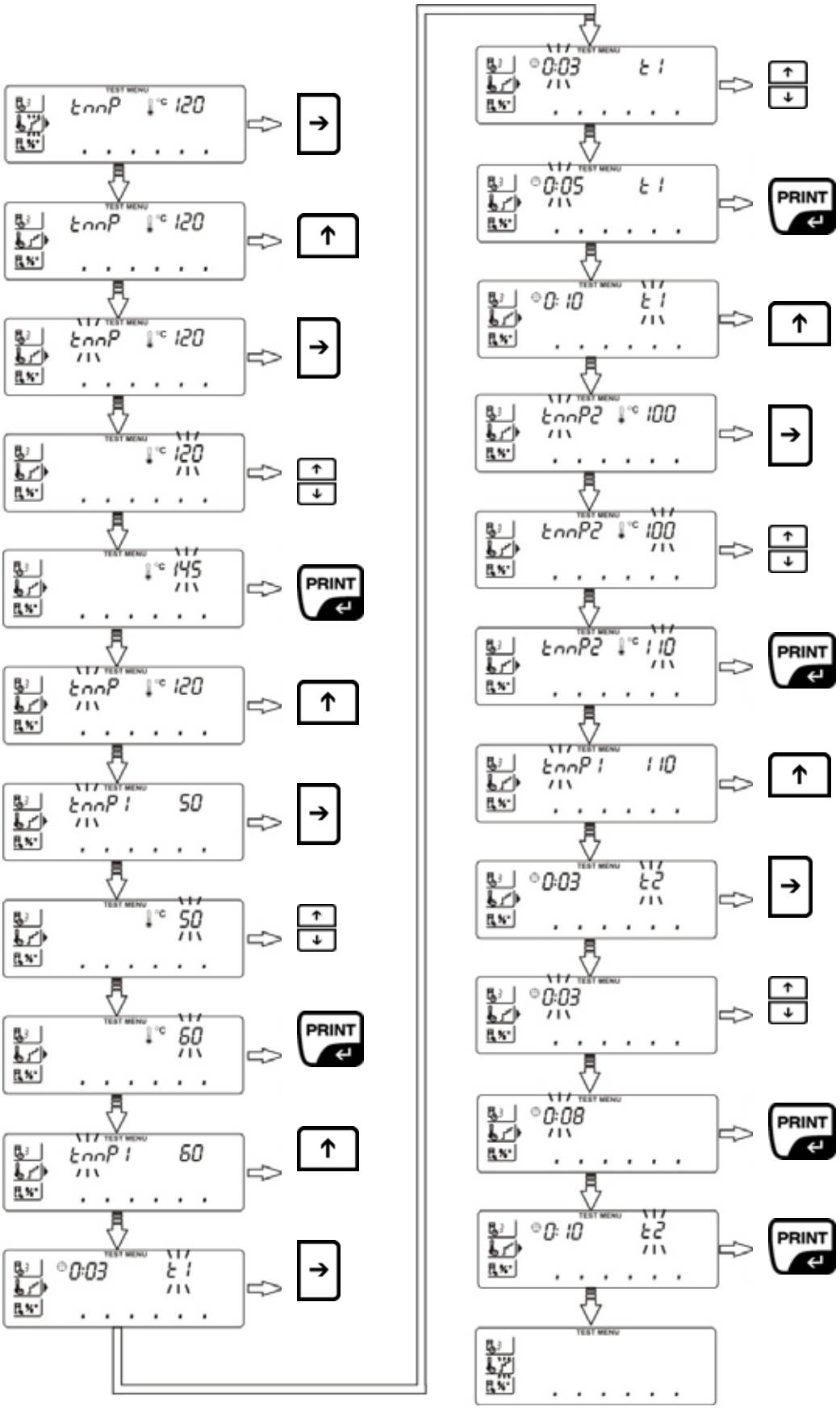


Step-by-step
Step-by-step drying is suitable for substances that display special behaviour during warming. The individual steps are freely selectable regards duration and temperature rising step.



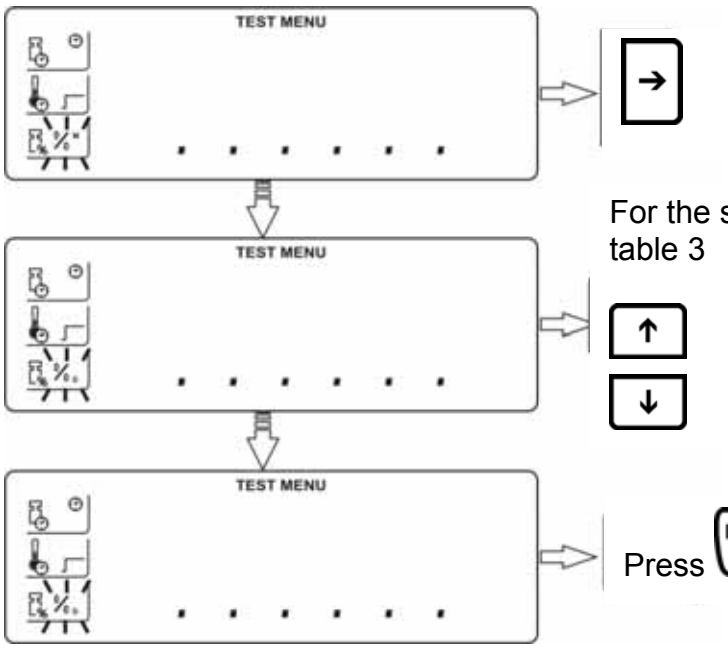
Adjustable parameters include the drying temperature **tmP**, warming-up steps **tmP1** and **tmP2** as well as the heating-up time **t1** and **t2** between the single steps.

English


TEST MENU
tnnP 120
tnnP 120
tnnP 120
120
145
PRINT
tnnP 120
tnnP 1 50
50
60
PRINT
tnnP 1 60
0:03 t 1
0:05 t 1
PRINT
0:10 t 1
tnnP2 100
tnnP2 100
tnnP2 110
PRINT
tnnP 1 110
0:03 t2
0:03
0:08
PRINT
0:10 t2
PRINT

- **Display after drying**

This is where the unit of the measuring result is defined.



Tab. 3: Parameter selection “display after drying““

$\%_M$	Moisture [%] = weight loss from initial weight (SG)	0 – 100 %
$\%_D$	Dry matter [%] = remaining weight (RG) from initial weight (SG)	100 – 0 %
$\%_R$	ATRO[%] [(SG – RG) : RG] x 100%	0 – 999 %
g	Remaining weight	

How to implement drying

After setting the desired drying parameter for the sample to be tested, you can now start the drying process.

START STOP 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. Always work using the sample holder which allows safe handling and prevents burns.

TARE

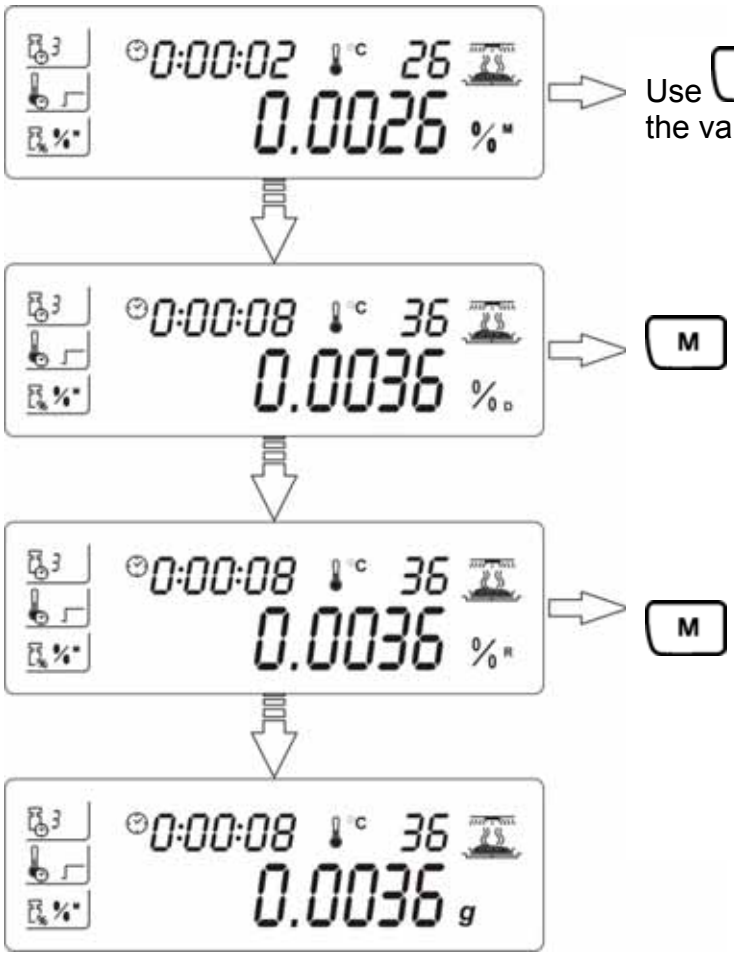
The device is ready for the originally weighted in quantity of the sample

Place sample in sample dish

Close lid; the device is ready for measuring

Drying will start automatically after scales have settled.

Drying parameters are shown on the display.



Use M to switch the display over to the various units of measuring results.

M

M

When drying is finished, you will hear an acoustic signal and the heating will be shut off.

The display shows the measured result in the set unit.

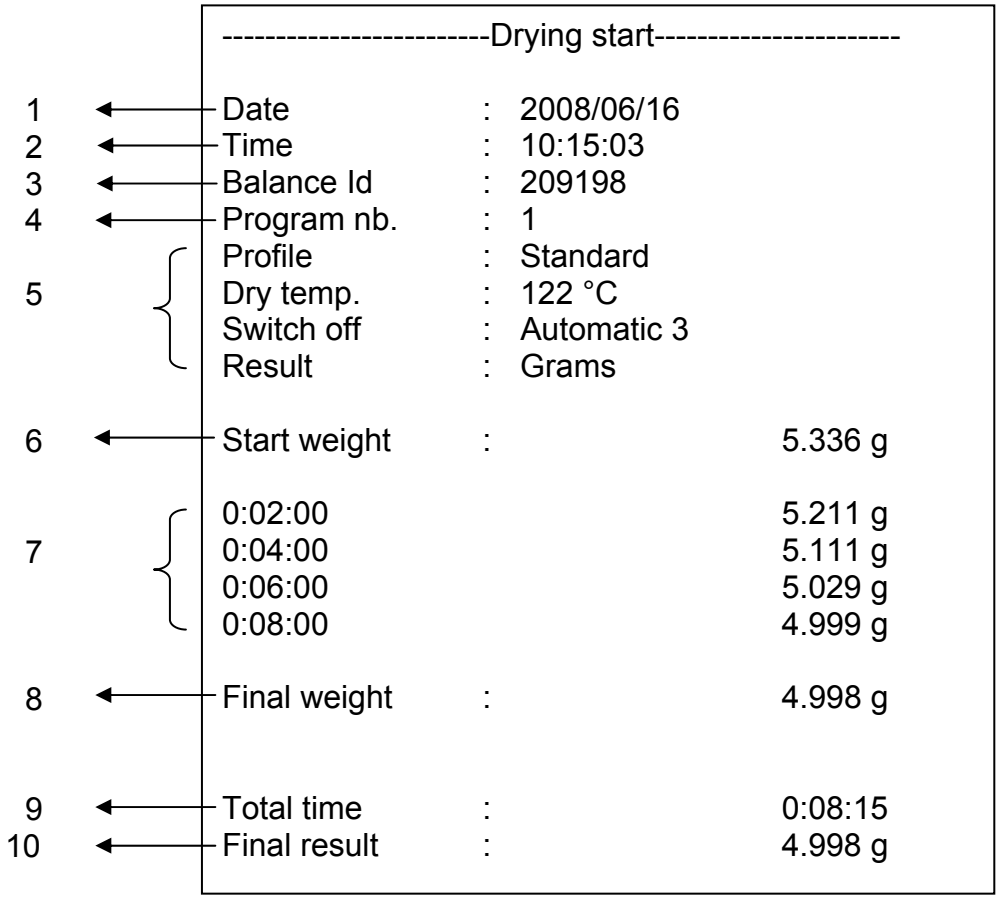
Open lid and remove the sample with the help of the removal aid.

Caution: Caution! Sample dish and all parts of the sample chamber are hot!

If an optional printer is connected, data output will take place automatically via the RS 232 interface.

English

Example of printout:

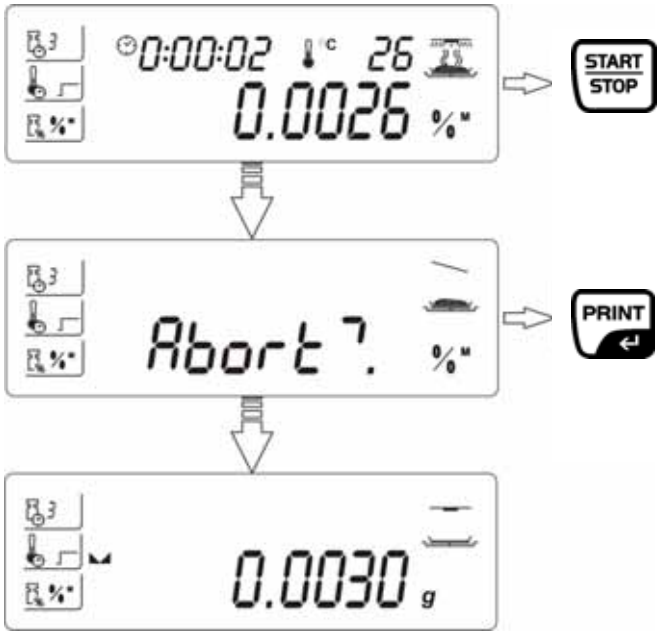


1. Current date
2. Current time
3. Serial no.
4. For set drying program, see chpt. 15.2
5. For set drying parameter, see chpt. 15.1
6. Initial weight
7. Output interval, for setting see chpt. 13 „P5-03-LinE_t“
8. Remaining weight
9. Drying time
10. Final result in set measuring unit, see chpt. 15.1

You can cancel the drying process by pressing **START/STOP** , followed by **PRINT**.

For setting turning-off criteria = manual

Stop drying process by pressing **START/STOP**.

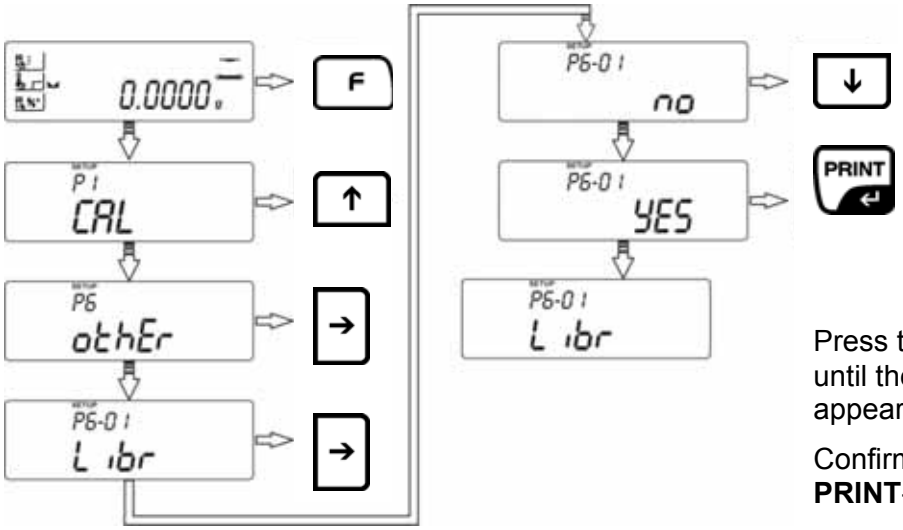


English

15.2 Moisture analysis using the program library

The device has a memory for drying programs! 20 drying programs can be allocated to this memory (library). Simply invoke and start the finished programs from the library.

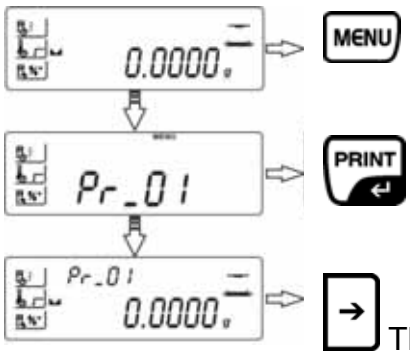
Enable program library “P6-01-Libr“



Press the **ESC**-key repeatedly until the query ”**SAVE**?“ appears.

Confirm query by pressing the **PRINT**-key

Setting drying parameters

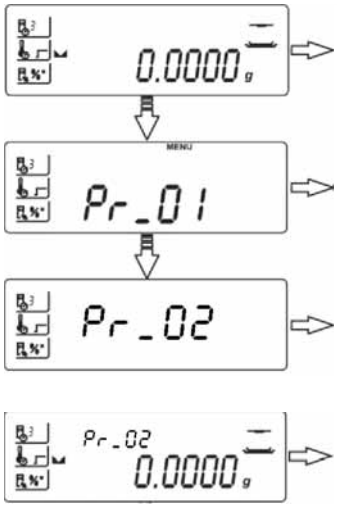


Current drying program no. appears.

The pictograph for the drying parameter "turning-off criteria" shows the current setting and will be flashing.
Set all parameters, that is “turning-off criteria”, heating profile” and “display after drying” for this drying program, see chpt. 15.1.

Call drying parameter and carry out drying.

With the program library enabled, invoke the desired drying program as follows.



MENU

PRINT Current drying program no. appears.

Select desired drying program no.

PRINT

After setting the desired drying program for the sample to be tested, you can now start the drying process. For procedure see chpt. 5.1

English

16 General information concerning moisture analysis

16.1 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.

16.2 Basics

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

- Fats
- Oils
- Alcolhol
- 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.

16.3 Adjustment to existing measuring method

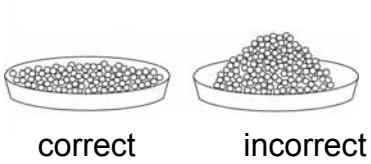
Quite frequently the KERN MLB replaces a different drying method (such as a drying chamber) as the KERN MLB achieves shorter measuring times during a simplified operation. For that reason the conventional measuring method must be matched to the KERN MLB in order to achieve comparable results.

- 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

16.4 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 bulk material:



correct incorrect

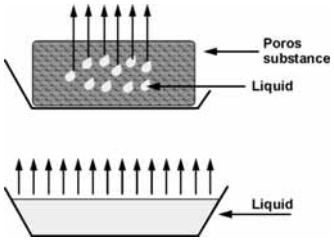
No special sample preparations are necessary for bulk materials.

Spread powdery or grainy samples evenly on the sample dish.

Coarse sample may need crushing (grind, crush using a mortar).

Preparing a sample from liquids:

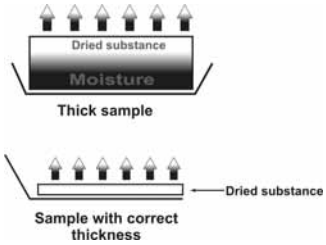
This, too, does not require any special sample preparation.



Spread glutinous or sticky samples thinly. It is advisable to use glass fibre filters.

Weight loss caused by splashes can be prevented by covering the sample with a glass fibre filter. If using glass fibre filters, their weight has to be deducted from the gross weight.

Preparing a sample from solids:



In this case special preparation of the sample is advisable, as drying, in particular the drying time, depends on the surface as well as the thickness of the sample.

English

16.5 Sample material

Easy to determine are usually samples with the following characteristics:

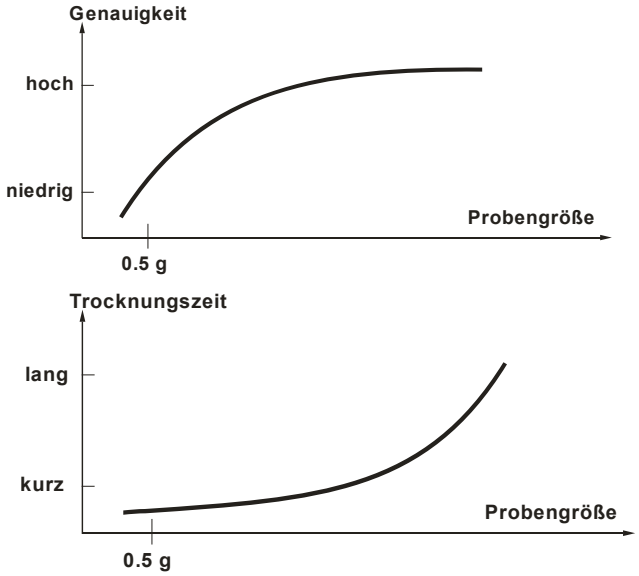
- Grainy to powdery, pourable solids
- Thermally stable materials, emitting the moisture to be determined easily without other substances evaporating at the same time
- Liquids that vaporize to leave a dry substance without developing a film

Difficult to determine may be samples that are:

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

16.6 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.



The heavier the originally weighted-in quantity, the more accurate the result (example of an ideal sample):

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

16.7 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 fibre 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.

16.8 Recommendations / Guidelines

Prepare standard sample:

- Crush sample, as required, and spread it evenly in the aluminium dish.

Prepare special samples:

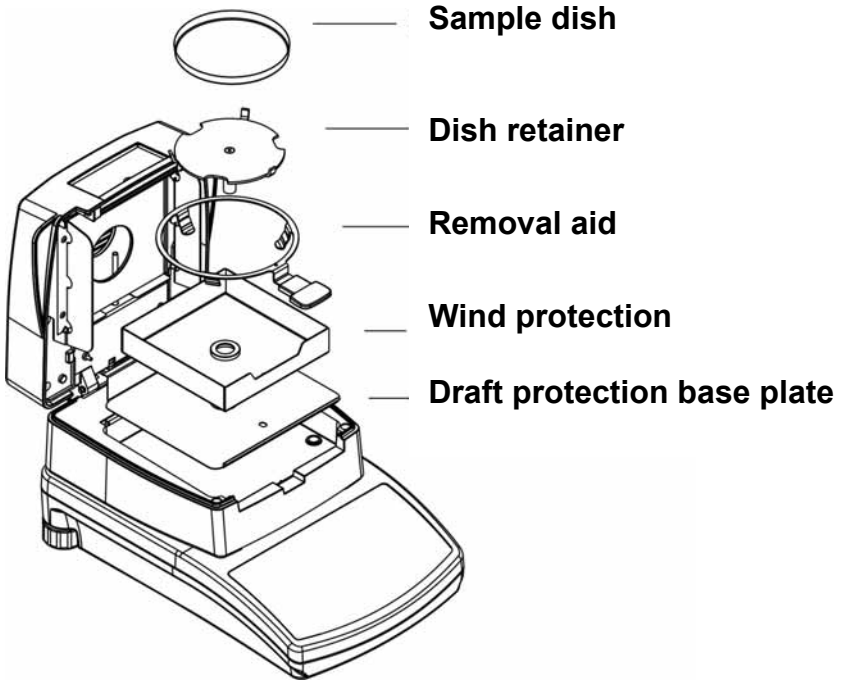
- For sensitive or hard to spread test materials (e. g. mercury) a glass fibre filter is available for use.
- Spread sample evenly on glass fibre filter and cover is with a second glass fibre filter.
- The glass fibre filter is also useful as a protection when splashing materials are dealt with (each splash falsifies the final result).

MATERIAL	Specimen weight (g)	Drying temperature (º C)	Data query interval (s)	% moisture % solid	Drying time (min)
Dried piece of apple	5-8	100	10	76.5	10-15
Moist apple	5-8	100	10	7.5	5-10
Butter	2-5	138	15	16.3	4.5
Mustard	2-3	130	20	76.4	10
Ground coffee	2-3	106	5	2.8	4
Cornflakes	2-4	120	15	9.7	5-7
Yoghurt	2-3	110	15	86.5	4.5-6.5
Cocoa powder	2-3	106	20	0.1	2
Margarine	3-4	138	20	16	10
Milk powder	2-4	90	15	5	6
Red wine	3-5	100	15	97.4	15-20
Sunflower oil	10-14	138	20	0.1	2
Sugar	4-5	138	15	11.9	10
Milk	2-3	120	15	88	6-8
Flour	8-10	130	10	12.5	4-5
Cement	8-12	138	15	0.8	4-5
Paper	2-4	106	20	6.4	10

17 Service, maintenance, disposal

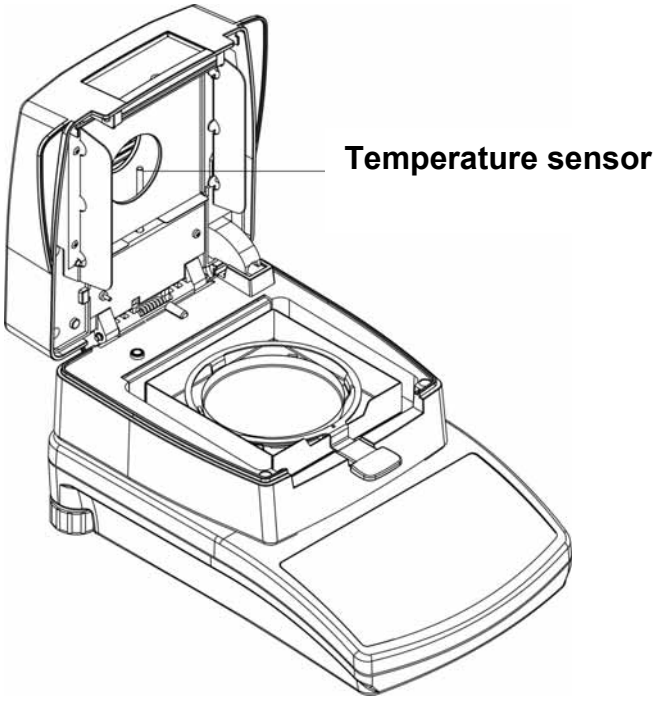
17.1 CLEANING

Before cleaning, please 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. Ensure that no liquid penetrates into the device and wipe 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.

Cleaning the temperature sensor:



Clean the same way, as described above. Take care that the radiator is not touched, or worse, damaged.

17.2 Service, maintenance

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

17.3 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.

18 Instant help

In case of an error in the program process, briefly turn off the balance and disconnect from power supply. The weighing process must then be restarted from the beginning.

Help:

Fault	Possible cause
The displayed weight does not glow.	• The balance 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 • Weighing plate has contact with other objects. • Electromagnetic fields / static charging (choose different location/switch off interfering device if possible)
Weighing result obviously wrong or not reproducible	• The display of the balance is not at zero • Adjustment is no longer correct. • Great fluctuations in temperature. • Electromagnetic fields / static charging (choose different location/switch off interfering device if possible)

English