# *User Manual*
# *Moisture Analyser*

PCE-MB series

*Measuring method description*

*Contents:*

## 1. General description

PCE-MB series moisture analyser is destined for fast and precise moisture determination. The moisture analyser is based on two cooperating devices: the balance, used to measure current sample weight, and the dryer, which dries the sample using halogen heaters. Drying parameters may be set according to user preferences.

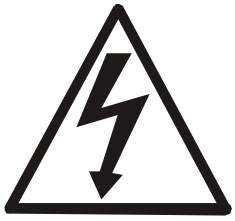
Moisture analysers are mainly destined for use in quality control in food industry, building materials industry, biotechnology, pharmacy, environment protection and others.

Moisture analysers may be also used as laboratory balances for routine weighing (without drying).

## 2. Completeness

Standard package consists of:
1. Moisture analyser,
2. Pan shield, pan support, pan handle,
3. Single-use pans – 10 pcs,
4. Power supply cord,
5. User manual,
6. Guarantee card.

## 3. Security rules



To avoid electrical shock or damage of the balance or connected peripheral devices, it is necessary to follow the security rules below.

- To feed the analyser use only mains socket with ground contact.
- Dryer chamber cover heats up to 40°C, but perforated cover at the top may heat up over 60°C. Do not touch the cover top during drying as it may cause severe burns!
- During heating, the halogen heaters warm up to very high temperature. Avoid touching the heaters as it may cause severe burns!
- All repairs and necessary regulations can be made by authorised personnel only.
- Do not use the analyser when its cover is opened.
- Do not use the analyser in explosive conditions.
- Do not use the analyser in high humidity.
- If the device seems not to operate properly, plug it out of the mains and do not use it until checked by authorised service.

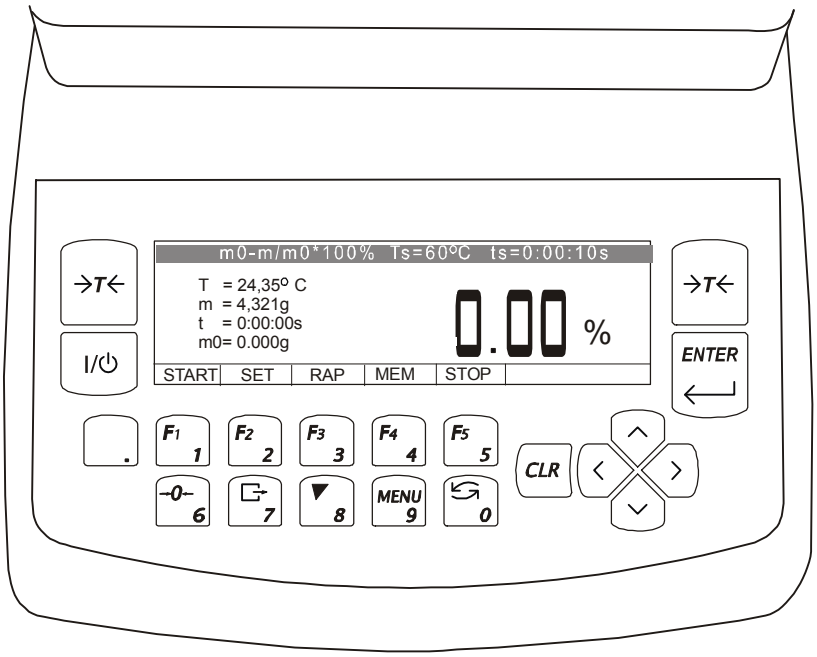
## 4. Environment protection

| | |
|---|---|
|  | According to legal regulations it if forbidden to dispose wasted electronic equipment in waste containers. |
| • Please return wasted device to the point of purchase or other company specialised in recycling of wasted electronic components. | |

## 5. Technical data

| Type | | | |
|---|---|---|---|
| Maximum sample weight | 50g | 100g | 200g |
| Minimum sample weight | 0,02g | 0,02g | 0,02g |
| Reading unit (d) | 1mg | 1mg | 1mg |
| Verification unit (e) | 0,01g | 0,01g | 0,01g |
| Tare range | -50g | -100g | -200g |
| Accuracy class | II | | |
| Working temperature | +18 ÷ 33°C | | |
| Analyser resolution | 0,01% | | |
| Moisture measurement accuracy | for sample weight 0,1g÷5g ..... ±0,3%<br>for sample weight 5g÷15g ..... ±0,06%<br>for sample weight >15g ..... <±0,04% | | |
| Max drying temperature | 160°C | | |
| Sampling time | 1 ÷ 180s | | |
| Maximum drying time | < 10h | | |
| Oven dryer nominal power (halogen l=118mm) | 200W | | |
| Warm-up time (100°C) | ~1min. | | |
| Pan size | ϕ90mm | | |
| Drying chamber dimensions | ϕ108x20mm | | |
| Weight | 7kg | | |
| Device dimensions (with legs) | 215(235)x345x200mm | | |
| Power | ~230V 50Hz 110VA | | |
| Calibration weight (OIML) | F2 50g | F2 100g | F2 200g |

## 6. Keys and indicators

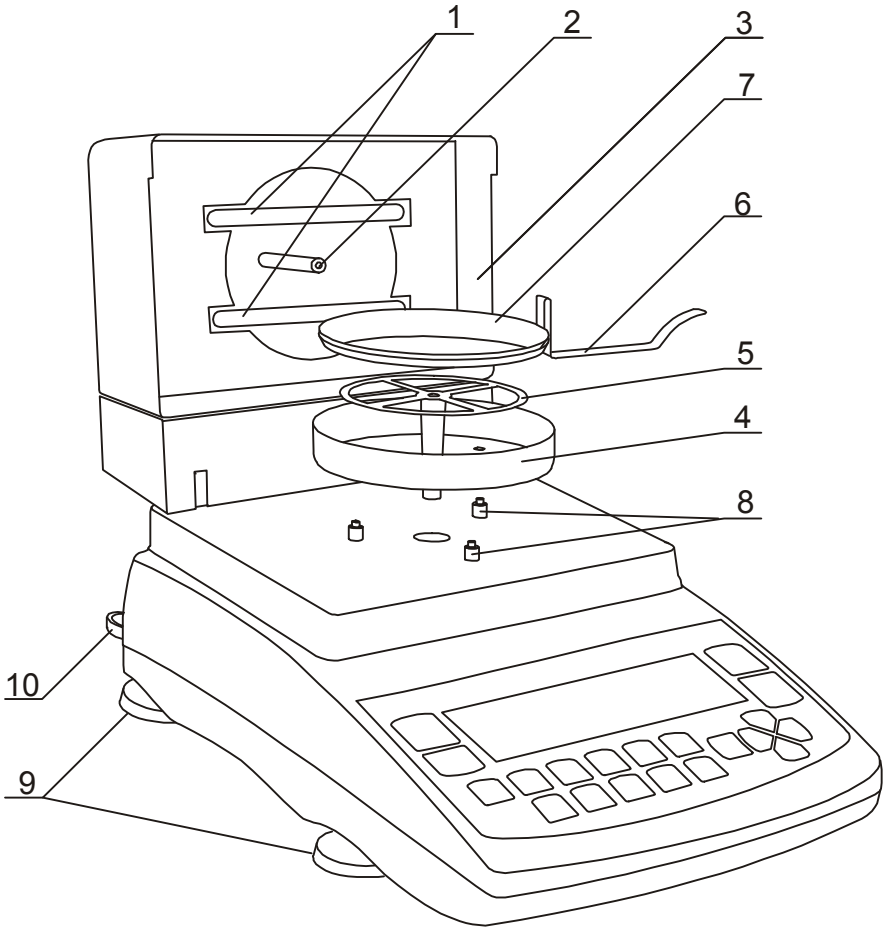



| | |
|---|---|
| *→T←* | - tare (subtract package weight from weighed mass) |
| *I/⏻* | - switch- on / switch-off (standby), |
| *ENTER* | - confirmation / select the option |
| . | - decimal point, |
| *1/F1* | - digit key 1 / START – start measurement (drying), |
| *2/F2* | - digit key 2 / SETTINGS – moisture measurement parameters setting, |
| *3/F3* | - digit key 3 / STAT – drying chart, measurement report, |
| *4/F4* | - digit key 4 / MEM – settings memory, |
| *5/F5* | - digit key 5 / STOP – instant drying termination, |
| *6/→0←* | - digit key 6 / zeroing (optional) |
| *7/* | - digit key 7 / printout (data transmission), |
| *8/* | - digit key 8 / autocalibration (unused function), |
| *9/MENU* | - digit key 9 / enter the function menu |
| *0/* | - digit key 0 / mode switching (analyser – balance) |
| > | - enter the option, |
| < | - leave the option, |
| ∧ | - navigation / move the cursor up, |
| ∨ | - navigation / move the cursor down, |
| indicator | - result stabilisation, |
| bar indicator | - total load indicator (0-100%), |
| indicator OFF | - stand-by mode (when switched-off with I/ ⏻, key), |
| Max, Min, d, e | - metrologic parameters. |

## *7. Preparing moisture analyser to work*

During heating, the halogen heaters *1* warm up to very high temperature. When drying chamber is opened avoid touching the heaters as it may cause severe burns or damage the heaters!

Dryer chamber cover *3* heats up to 40°C, but perforated cover may heat up over 60°C. Do not touch the top cover during drying as it may cause severe burns!




1. Take all contents out of a package: the moisture analyser and packed separately: the tin pan shield, single use pans, the pan handle and the pan support.
2. Place the balance on a stable ground not affected by mechanical vibrations and airflows.
3. Level the balance with rotating legs *9* so that the air bubble in water-level *10* at the back of the balance is in the middle and the moisture analyser rests on all four legs.
4. Open the dryer chamber with the handle at the front. Put the pan shield *4* on three distance sleeves *8*. Gently insert the pan support *5* into the mechanism hole.

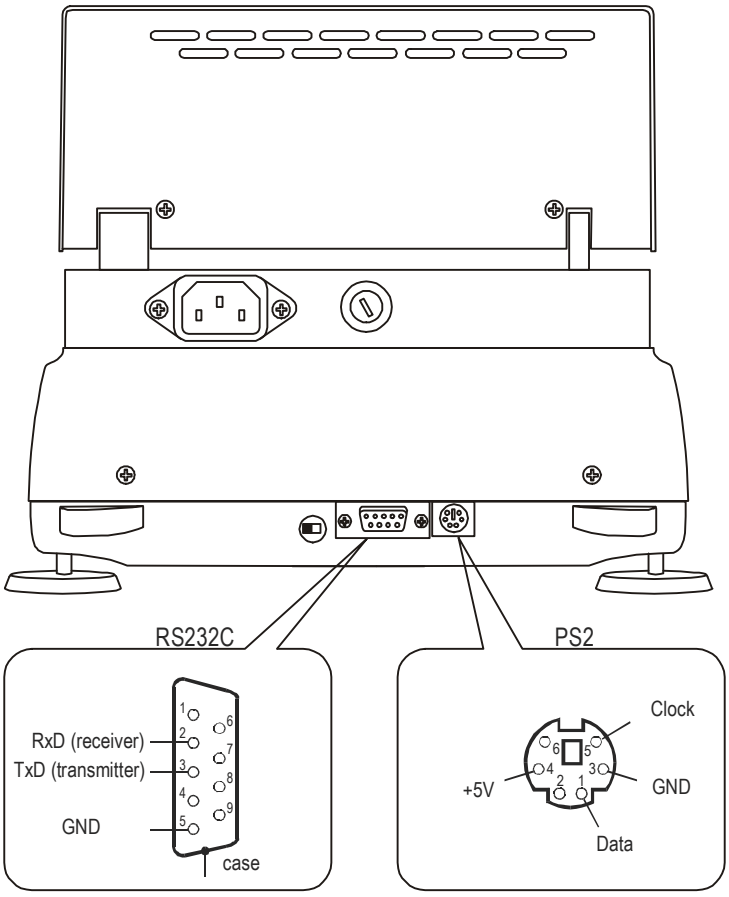
5. Place a single use pan *7* on the pan handle *6* and put the pan on the pan support (the handle should rest on the pan shield so that it does not touch the pan or the pan support).
6. Close the drying chamber cover *3* and plug the device to the mains (230V).
7. After self-tests and result stabilisation zero indication is displayed. The dryer starts initial heating (signalised with an appropriate communicate). After initial heating the moisture analyser is ready to work.

When temperature during initial heating exceeds 105°C or heating time is longer than 1 minute, terminate initial heating with CLR key and check if the temperature sensor *2* works properly and if both halogen heaters light *1* (see chapter 15).
In case any defect occurs contact an authorised service point.

8. The balance should not be used to weigh ferromagnetic materials due to accuracy decrease.

## 8. Interfaces

The moisture analyser is equipped with RS23C interface to connect a printer or a computer and with PS2 port to connect an external computer keyboard.




## 9. General working rules

***During transportation remove the pan, the pan support and the pan shield and place it in a separate package.***

1. Distribute a sample all over the pan. A sample surface should not touch temperature sensor placed above the pan.
2. The balance is equipped with the tare equal to its range. To tare the balance press →*T*← key. Writing the tare does not extend measuring range, but only subtracts the tare value from a load placed on the pan. To make weight control easier and to avoid range overdrawing, the balance is equipped with weight indicator (graduated in percentages).
3. Do not overload the balance more then 20% of maximum load (*Max*).
4. The mechanism of the balance is a precise device sensitive to mechanical strokes and shocks. Do not press the pan with a hand.

## 10. Description of thermogravimetric analysis

This section gives some practical details about moisture analysis using infrared radiation for reliable results and easier use of moisture analyser. The description is based on a pre-production experience and customers' suggestions.

Moisture in substances is an essential quality factor of technical and economical importance.

Methods of determining moisture may be grouped in two main categories: absolute and deductive.

Absolute methods are based on simple relations, e.g. weight decline during drying.

Thermogravimetric analysis used in PCE-Inst. moisture analyser is an example of this method.

Deductive (indirect) methods measure physical quantity related with moisture, e.g. electromagnetic waves absorption, electrical conductance, acoustic wave speed. Some of these methods, unlike thermogravimetric analysis, enable to determine water content.

**Thermogravimetry -** *lat.* thermo – heat, gravi – weight, metry – method

**Thermogravimetric analysis** – a process of determination of a substance mass decline as a result of heat-up. The sample is weighed before and after heating-up, the difference is calculated in relation to initial weight or final weight (dry mass).

**Moisture in substances**

Thermogravimetric analysis includes all ingredients evaporating from substances during heating-up, which results in weight decrease.

In result of the above, determining of moisture content in substances is not equal water content. Beside water, moisture consists of all other volatile matter: fats, alcohol, aromas, organic dissolvent and other substances resultant as en effect of thermal decomposition.

Thermogravimetric analysis does not distinguish water from other volatile matters.

Infrared radiation drying is more effective than traditional methods (e.g. in an oven) as the radiation deeply penetrates the substance, which shortens drying time.

### 10.1 Infrared radiation source

ADS series moisture analyser uses 2 halogen heaters (rated power 200W, l=118mm) in serial connection as a radiation source. The heaters emit also visible radiation, which does not affect drying process.

### 10.2 Infrared radiation drying description

Sample drying is a result of absorption of infrared radiation, which results in sample temperature increase and evaporation of volatile matters.

Infrared radiation penetrates surface layers, the depth depends on penetrability of a sample (different in various substances). Part of radiation is reflected by the sample

surface. Penetrated layers absorb the radiation and convert its energy into heat. Emitted heat propagates inside the sample. Effectiveness of the propagation depends on thermal conductivity of the sample. The better the conductivity, the faster drying process and volatile matter evaporation. During drying process sample parameters change, its thermal conductivity decreases so there is a risk of burning the sample. Some parameters may be estimated "by sight", e.g. smooth and light surfaces reflect radiation better. This must be taken into account when setting drying parameters.

### *10.3 Drawing and preparation of a sample*

As sample of given substance must be representative, drawing and preparing a sample is very important process as it affects repeatability of measurements. The most common method of homogenizing a sample is mixing. The other method is to draw few samples from different but specific points in a substance and calculate an average value. Another – to draw few samples from different points in a substance, mix them and draw a sample from the mixed samples.

Sampling method depends on the object of a research. For quality purpose many representative samples are analysed. In production control it is enough to assure sampling repeatability, which enables to study a tendency.

While preparing and drawing, it is important that the sample does not absorb moisture from the environment – it is advised that operation time is as short as possible.

If it is necessary to analyse more than one sample at the same time, the samples should be closed in plastic bags or other isolated containers. Give attention that samples must not lose moisture inside the container (the container should not consist of to much air, the moisture condensed on the sides of the container should be mixed with the sample again).

### *10.4 Tools requirements*

Tools and instruments used in preparation process may affect measurement accuracy, so it is advised not to use tools that transmit heat, as it makes the sample lose moisture before analysis.

Use only special mills and pestles.

In case of liquids with consisting of solid materials use a glass mixer, a spoon or a magnetic mixer.

### *10.5 Single-use pans*

To analyse the moisture, put a sample on a single-use pan and place it in the dryer chamber.

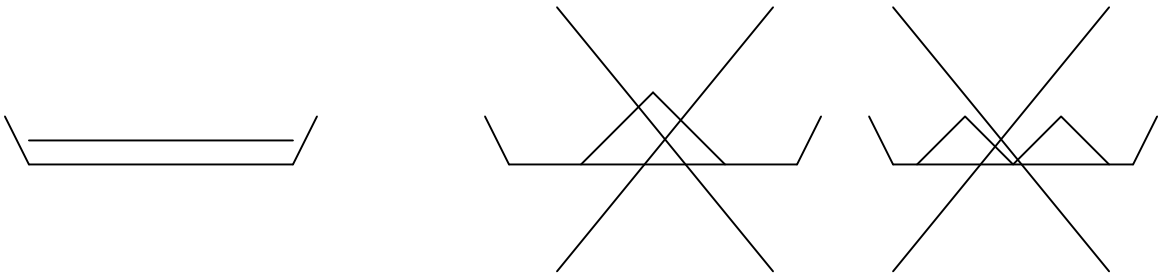
Using non-reusable pan helps to avoid false results by remains of previous samples.

10 single use pans are provided with the moisture analyser. Any quantity may be delivered on demand.

### *10.6 Placing a sample*

A sample should be placed uniformly all over the pan, so that heat propagates equally all over the sample and dries whole sample effectively and quickly without leaving “wet” places.

**Correct** **Incorrect**



**Attention:**

Due to temperature sensor localisation, max sample height is 10mm.

When substance ply is too thick, surface layers will be heated too much and internal – not enough. This may result in burning the sample or surface incrustation, which will make drying process difficult and measuring result false.

A sample should be placed in uniformed layers 2÷5mm thick, weighing 5÷15g, depending on a substance.

### *10.7 Glass fibre filter*

When drying liquids, pastes or substances that may melt or loose liquid during drying, it is advised to use glass fibre filters.

Filters ensure equal liquid distribution or, in case solid materials, avoiding burning a sample.

### *10.8 Practical notes*

Put a sample on the pan as quickly as possible to avoid losing moisture.

Temperature inside the chamber is much higher than outside, so the sample may evaporate partly before measurement begins, which will result in a false result.

When analysing the same substance quantity in successive measurements, use the same tools to put a sample to be sure that samples are each time of the same size.

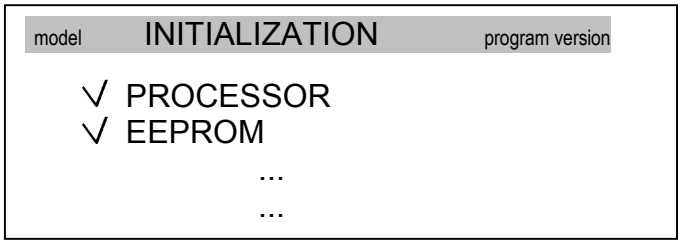
Before putting a sample, tare a single-use pan and take it out of the chamber. Right after putting a sample on the pan, place it inside the analyser chamber, close the chamber and press START.

Be sure that no dirt sticks under the pan, as it may increase sample weight and result in false values.

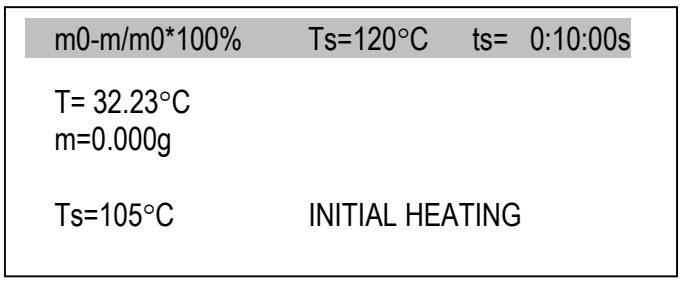
# 11. Moisture analyser functioning description

## 11.1 Switching on

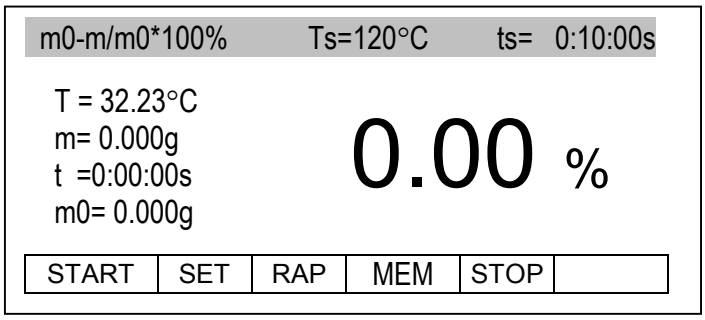
After switching-on the moisture analyser proceeds with self-tests.



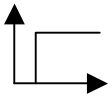

After completing self-tests, the analyser is tared and the dryer begins initial heating necessary to create thermal conditions suitable for measurements.




Initial heating should warm the drying chamber up to 105°C within 1 minute.
When temperature during initial heating exceeds 105°C or heating time is longer than 1 minute, terminate initial heating with CLR key and check if the analyser is not damaged (see chapter 15).
After initial heating is completed (or terminated), the device displays the following information:

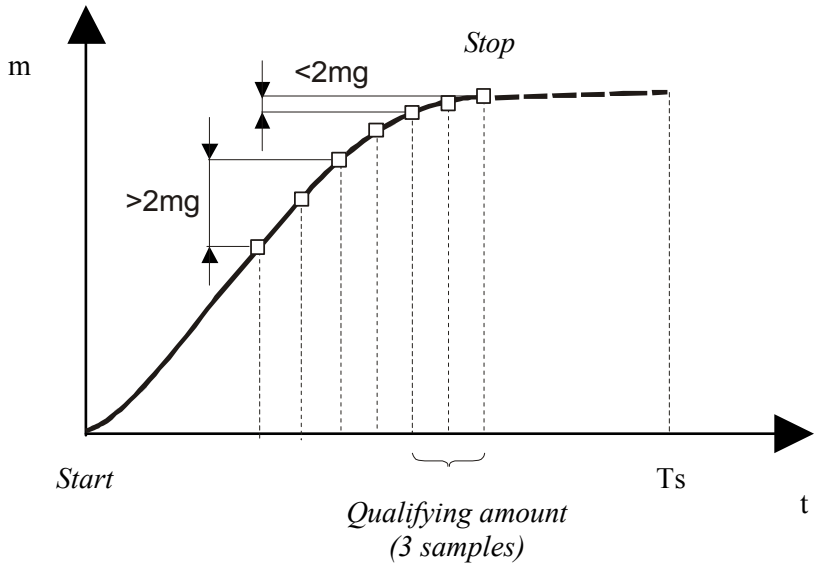



Legend:
m0-m/m0*100% - formula used to calculate the moisture
Ts – defined drying temperature
ts – defined drying time
T – current temperature in the drying chamber
m – current weight,
t – current drying time
m0 – initial weight

 - indicator of drying profile

### *11.2 Drier operation modes*

During the balance – drier operation sampling of the mass on the pan takes place. Sampling time is set by the user, according to drying process speed. As a result of sampling the current humidity value is calculated and displayed. Measurement is finished depending on selected Drying mode:
1. In *Time mode* total humidity measurement time (Drying time) is defined by the user,
2. In *Short mode* humidity measurement is finished, when drying is stopped and differences of a few successive mass samples are smaller than threshold value (2 mg). Amount of successive samples taken into consideration is defined as *Samples quantity*. Measurement is finished when Drying time is exceeded at the latest.




Drying chart in *Short mode* for *Samples quantity = 3*.

### *11.3 Calculation methods*

Humidity may be calculated upon the basis of various mathematic formulas, defined in balance – drier as *Calculation method*:

1. Relative humidity, defined in relation to initial mass

$$w\ [\%] = m_0\text{-}m/m_0*100\%\ ,$$

where $m_0$ – initial mass, m- current mass

2. Relative humidity, defined in relation to current mass

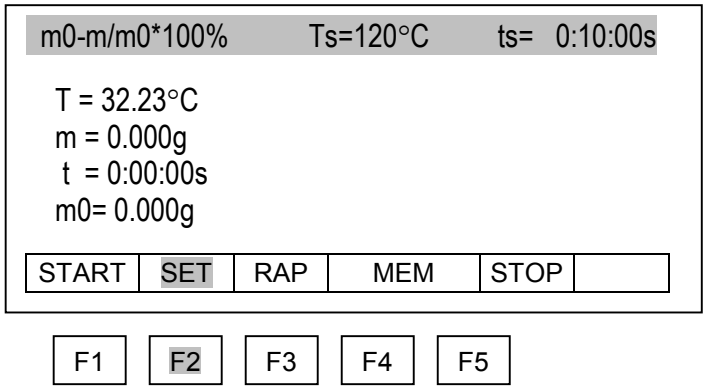
$$w\ [\%] = m_0\text{-}m/m*100\%\ ,$$

3. Percent current mass content in sample

$$w\ [\%] = m/\ m_0*100\%\ .$$

*Drying temperature* is maximum temperature, measured by sensor, located in the dried material vicinity. Note that the dried material temperature may be higher than its surrounding temperature.

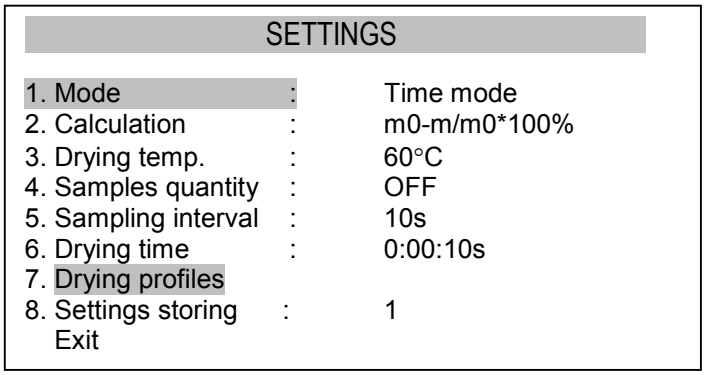
### *11.4 Drier operation parameters setting*




F1 | F2 | F3 | F4 | F5

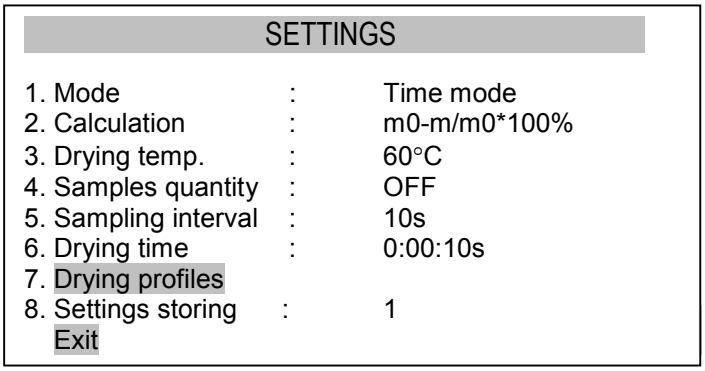
Select *Settings* option by pressing *F2* key.

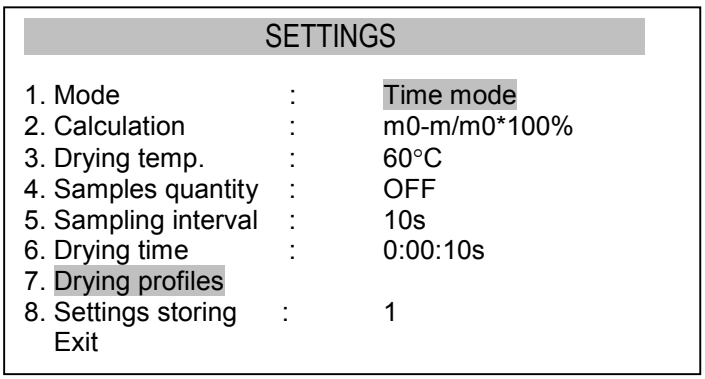
With the navigation keys ∧ and ∨ successive menu positions are selected, e.g. *Mode*.




< > ENTER

● ● ●



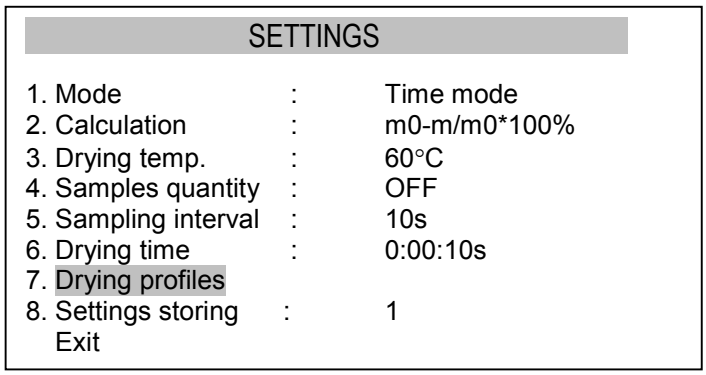



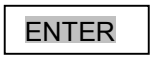

To go to options selection press *ENTER*.
Appropriate option, e.g. *Time mode*, is selected with the navigation keys < and >. Selected option is accepted after pressing *ENTER*.
Set the following positions:
- *Operation Mode – Time mode* or *short mode*,
- *Calculation method* – humidity calculation formula,
- *Drying temperature* (max 160°C) –temperature in drying chamber),..
- *Samples quantity* (2, 3, 4 or 5) – amount deciding of drying end (in case of *Short mode* only)
- *Sampling interval* – interval between successive mass measurements (1÷180s.),
- *Drying time* (1s ÷10h) (in *Short mode* it will be the maximum allowable time for drying process)
- *Drying profile* – (standard, slow, step or quick type)
- *Settings storing*– number of memory location (1÷10), where the settings will be stored.

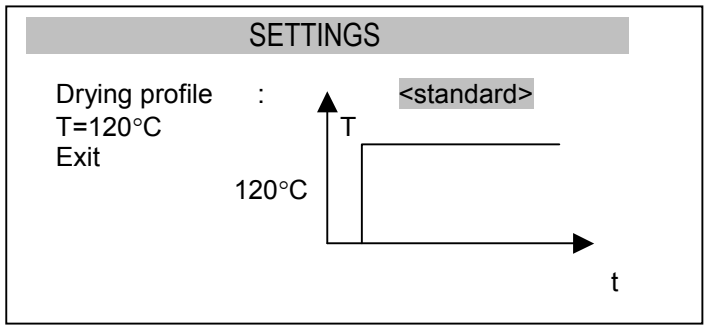
To finish settings, select *Exit* and press *ENTER*.

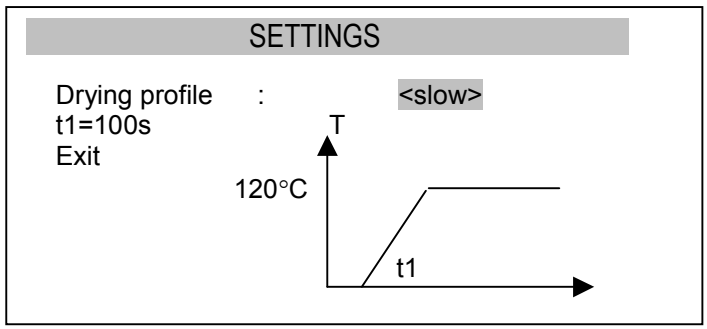
***Note:*** All defined parameters are stored in the memory until the next changed (also after unplugging the device from the mains).

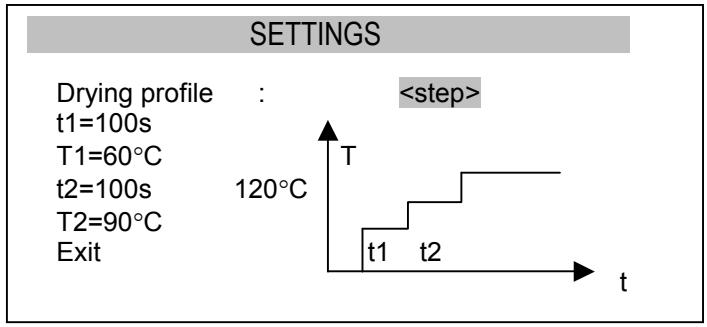
### *11.4.1 Drying profiles*

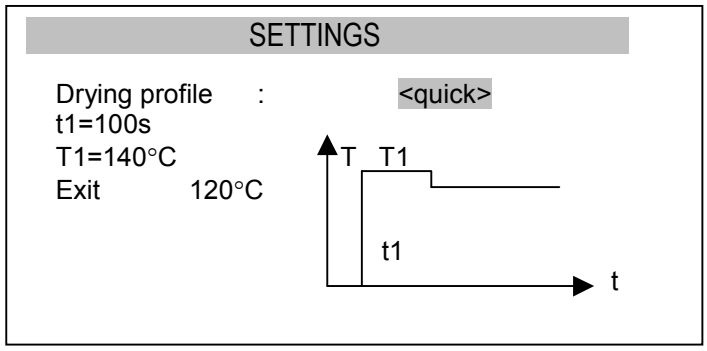



*Drying profile* will be used to optimization of drying process by accommodation a process to physical properties of sample material.
*Step* or *slow* profile can be used to oxidizing or surfaces thicken materials. *Quick* profile can be used to immune materials.
Profile chooses and his parameters should be the result of experience with the test material.
Selected a drying profile by ENTER key, choose a adequate profile (*standard, slow, step* or *quick*) and set a temperature (T) and time (t) value.

***Caution:***

The ending temperature can be setting on *Standard profile* or *Setting* (*Main menu*) only

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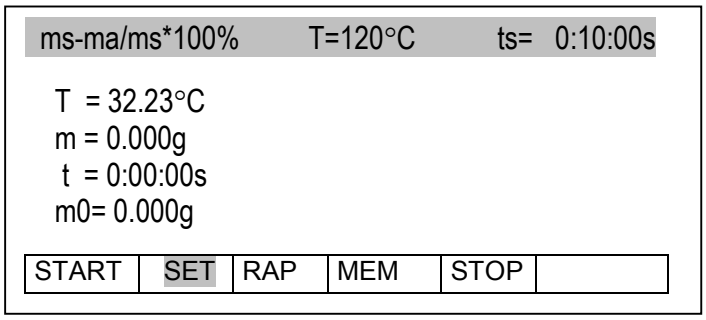
### *11.5 Moisture analyser settings storing*

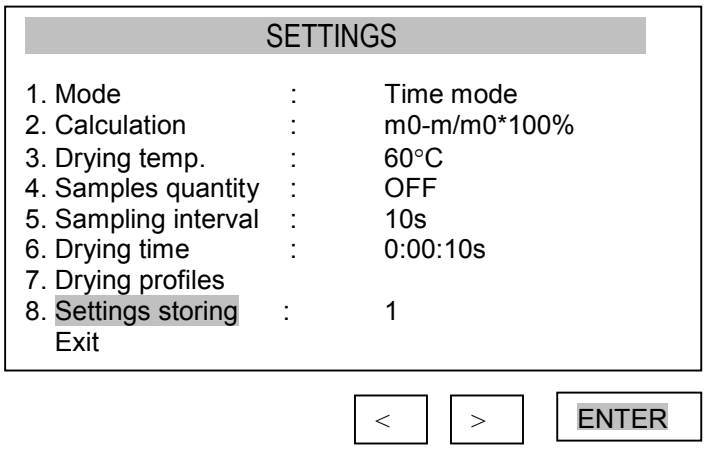
The moisture analyser enables to save 10 different drying settings. Saved settings are kept in the memory even after unplugging balance from the mains.

#### *11.5.1 Saving settings*

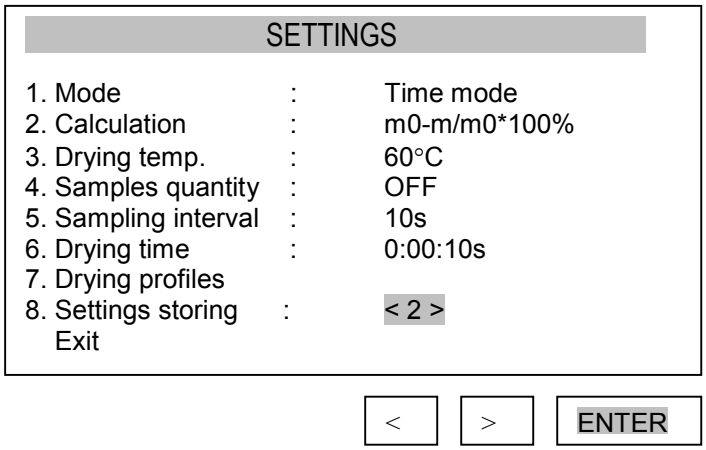
To save drying settings follow the instructions below:



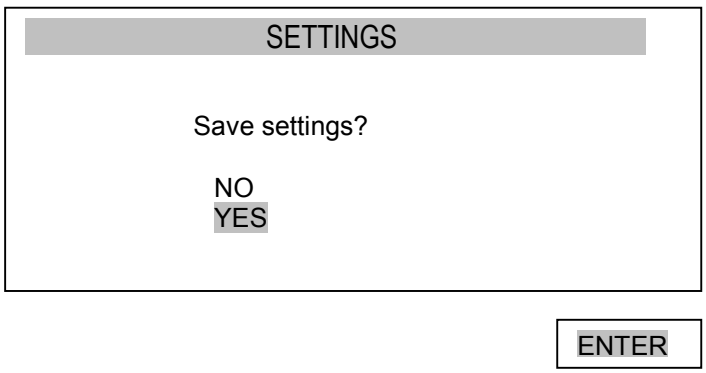

Press *F2* key to choose *SET* option.



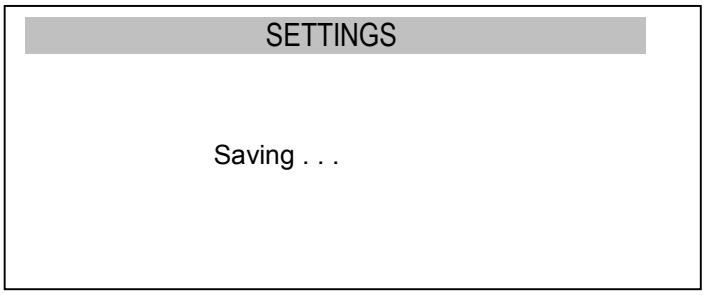

Set necessary drying settings (see chapter 11.3).
Select *Settings storing* option using ∧ and ∨ and press *ENTER* to accept.




Choose a reference number for specific setting using < and > keys and press *ENTER* to accept. Than chose *Exit* and press *ENTER*.

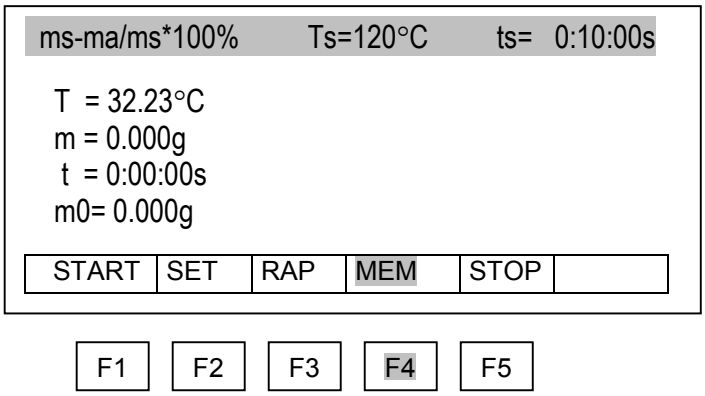



To save settings choose *YES* and press *ENTER* to accept.

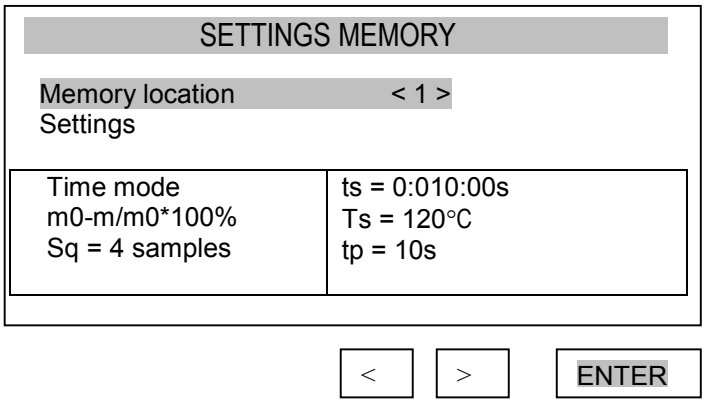



The analyser displays a short communicate *Saving....* After the parameters are saved the analyser is ready to work with new drying parameters.

### *11.5.2 Loading saved settings*




To load saved settings, stored in the memory, choose *MEM* option using *F4* key.



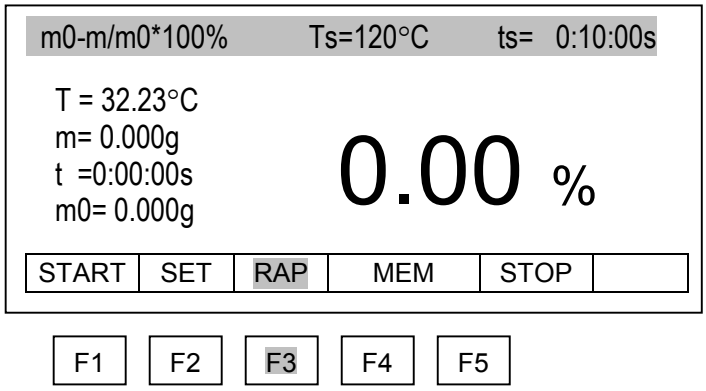

Select a number of desired settings using navigation keys < and >. Press *ENTER* to accept.

### *11.6 Initial moisture analysis*

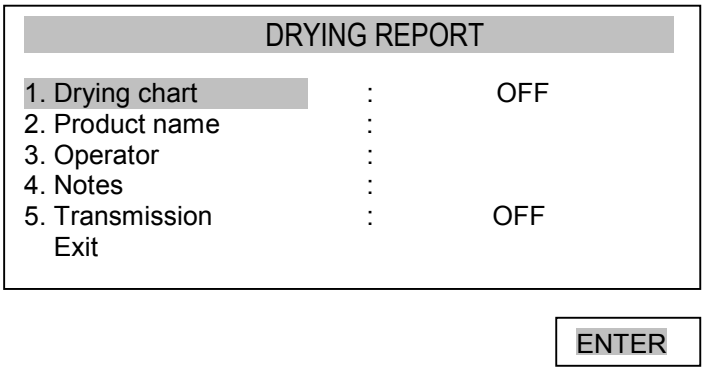
To determine optimal drying parameters for unknown sample, it is recommended to perform initial measurement with activated drying chart displaying. To do this, set the following drying parameters (see Drying parameters setting):

- Operation Mode: Time mode
- Calculation method: m0-m/m0*100%
- Drying temperature:
  organic substances: 80 - 120 $^0$C
  inorganic substances: 140 - 160 $^0$C
- Samples quantity: do not set
- Sampling interval: 1 second
- Drying time: set time, after which the sample will be definitely dried

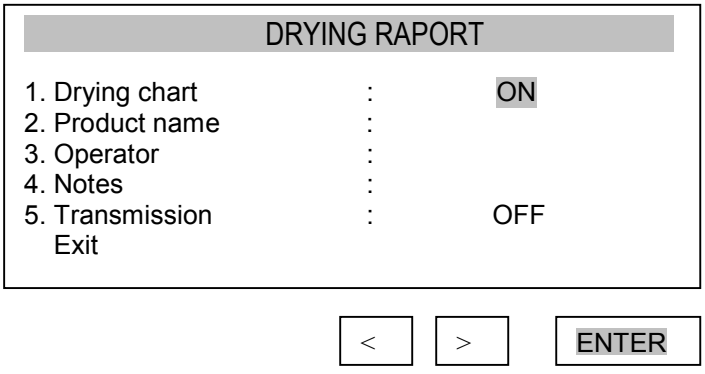
To activate displaying of drying chart, which will be visible on the display instead of humidity indication, perform the following actions:




Choose *RAP* option with *F3* key, select *Drying chart* and press *ENTER*.



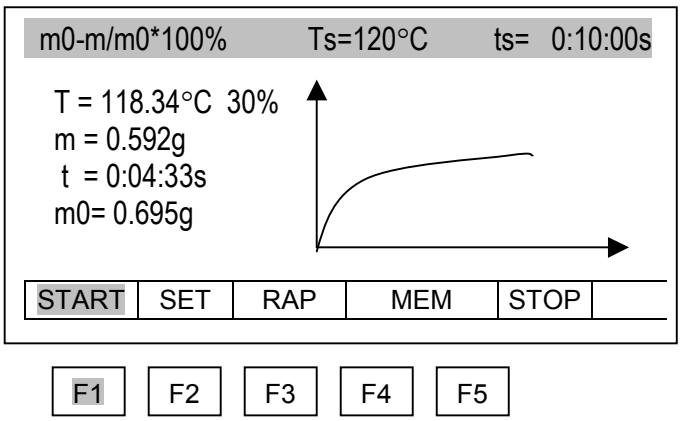

Choose *Drying chart* using ∧ and ∨ keys and press *ENTER*.




Using < and > keys choose *ON* and press *ENTER*.

Set the following positions:
- *Product name,*
- *Operator,*
- *Notes*.

Use number keys or external key-board with PS-2 socket (option).




When drying chart is visible, place a sample on the pan and choose *START* option (*F1* key). Drying parameters and drying process chart are presented on the display.

Observing drying process chart it is possible to evaluate its course and define time required for complete drying. The chart shows 160 time samples on the X axis (for longer times chart is scaled to 360 samples, 720, etc.) and humidity value according to selected formula on the Y axis (chart is automatically scaled to 10%, 30%, 50%, etc.). Selecting 1 s of sampling time allows for more precise chart.

Achieved chart allows for initial settings selection for main measurement. *Drying temperature* should be selected according to dries material type, so the drying is performed quickly and sample does not change colour. Material drying moment is visible on the chart as drying characteristic bending. As *Drying time* for main humidity measurement select time from the beginning to chart "flattening". As the time axis is not described on the chart, use "evaluation with high margin". Too short drying time does not allow to achieve precise humidity measurement results.

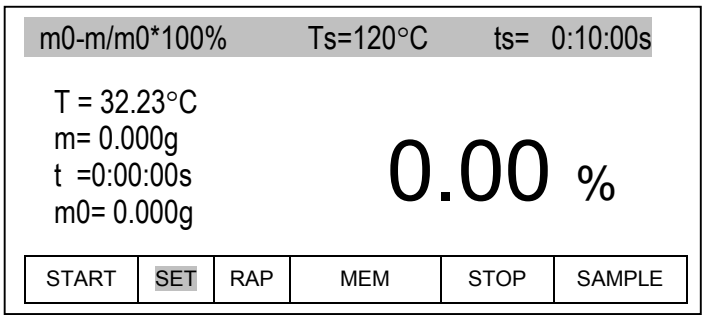
In case of *Short mode*, in main measurement select *Sampling time*, which allows to include approx. 10 samples in time of characteristic bending. If drying is finished too quickly, increase *Samples quantity* or *Sampling time*.

***Notes:***

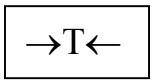
1. Before main measurement remember about deactivating of chart displaying.
2. To improve operation it is possible to use *Promas* software (available on demand), which generates precise drying chart.

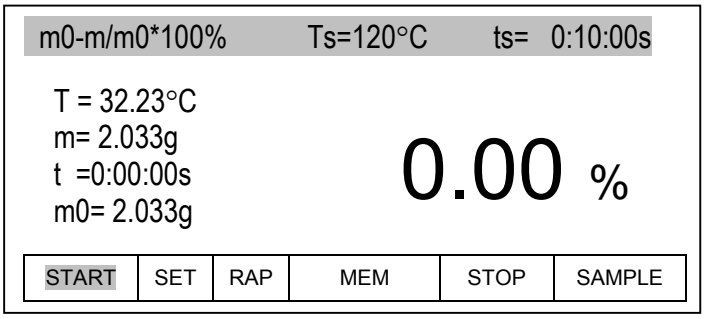
### *11.7 Proper moisture analysis*

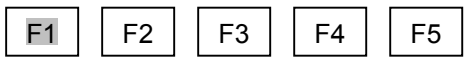
Before measurement carefully prepare the sample (as described in chapter Description of Thermogravimetric Analysis) and set correct drying parameters (see chapter Working Parameters Setting).



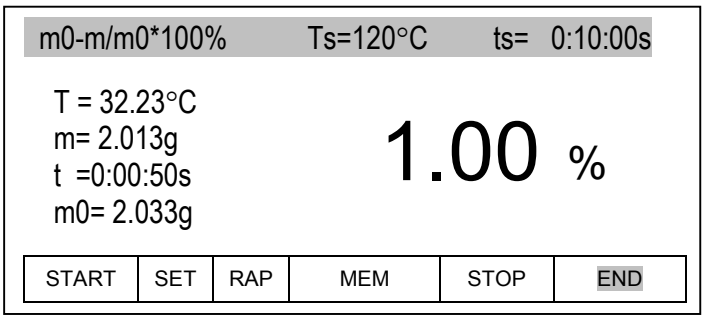

Place an empty single-use pan and tare the balance with →*T*← key.
Open the drying chamber and using the pan handle place the single-use pan with the sample on the pan support. Close the chamber.




Start the measurement choosing *START* option (*F1* key).
Drying in progress is signalised with alternating *SAMPLE / DRYING* communicate.



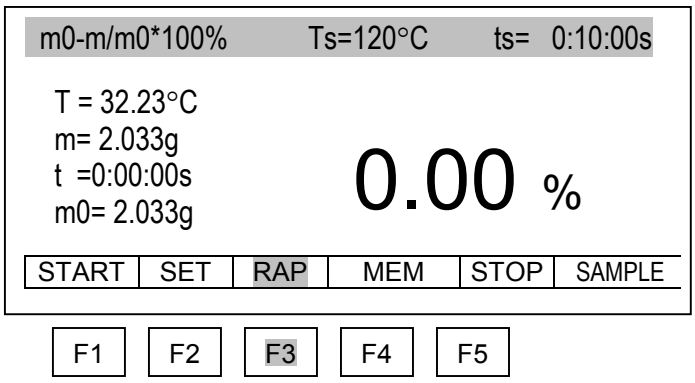

Wait until *END* communicate appears. Now read the result.

During the measurement the following information is displayed:
m0-m/m0*100% - mathematic formula used for calculations
T s – defined drying temperature
ts - defined drying time
T – current drying temperature
m – current weight
t – current drying time
m0 – initial weight

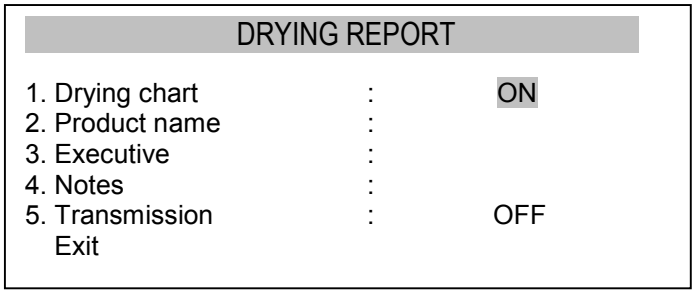
## 12. Connecting to a computer or a printer

When drying process is finished measurement result can be printer or a computer via RS232C interface.

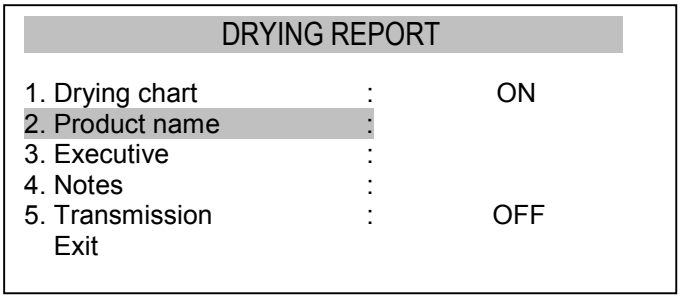
Measuring data can be also completed with text information. To enter text descriptions it is necessary to connect a computer keyboard to PS2 port at the back of the moisture analyser.




Choose *RAP* option (*F3* key).




Using navigation keys and *ENTER* key choose *Drying chart* and disable or enable printing and displaying the chart.




Set necessary options:
- *Product name,*
- *Executive,*
- *Notes*.

and with the connected computer keyboard enter text information for printed report. Use PS-2 socket.

Activation of *Transmision* option will activate sending of all sampling results through the RS232C port. The may be printed by the printer or stored in the computer, e.g. by the *Promas* software.

A set of characters available using the keyboard while you use *Product name, Executive or Notes*:

1 . , ’ ? ! ” - ( ) @ / : _ ; + & % * = < > $ [ ] { }\ ~ ^ ‘ # |
2 A B C a b c
3 D E F d e f
4 G H I g h i
5 J K L j k l
6 M N O m n o
7 P G R S p g r s
8 T U V t u v
9 W X Y Z w x y z
0 space

Erasing the mark and move the cursor to the left: the navigation key <.

To print the drying report press ⮆ key.

Drying started:
- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Date: 2004-06-10
Time.: 12:34:33
Serial number: 123456789

Drying parameters
- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Product
Drying temperature : 130C
Mode : Short mode
Calculation : m0-m/m0*100%
Finished : time over

Initial weight : 0.000 g
Final weight : 0.000 g
Drying time : 0:00:00s.
Sampling interval: : 10s
Moisture : 0.00%

NOTE:

The analysis proceeded by:

Signature .....

It is possible to set necessary serial port parameter values (8bit, 1stop, no parity, 4800bps). To use *RS232C Settings* option press ↻ key (weighing mode) and pres *MENU* key.

## 13. Testing and calibration of the balance

To check the weighing function of balance – drier, switch it to the simple weighing (↻ key) and check it by putting precisely weighed object, e.g. calibration weight F2 (OIML), equal to device measurement range. In case of any inaccuracies perform the balance calibration. It is performed by activating the calibration function, available in special functions menu, and putting the calibration weight on the pan according to indications on the display (see *Sensitivity calibration function*).

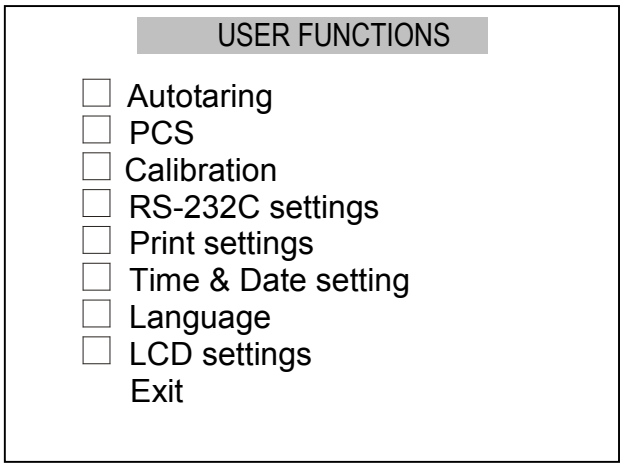
Control of humidity measurement precision requires use of standard substance – disodium tartrate (di-Sodium tartrate dihydrate $C_4H_4Na_2O_6*H_2O$). For the control use 5 g sample, setting: step mode, calculations method: m/ $m_0$*100% , temperature 150$^oC$, sampling time 10 s, samples amount 4 and drying time 00:15:00s.

The result should be contained in range 15.61 – 15.71%.

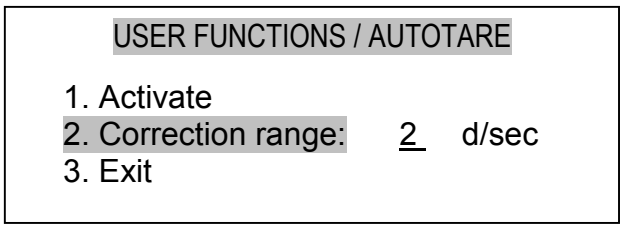
## 14. Moisture analyser as a balance

The moisture analyser may be also used as a normal balance. To switch between analyser / weighing mode press ↻ key.
In weighing mode *MENU* key opens a set of special functions. Standard functions are described below. Other special functions may be delivered on demand.

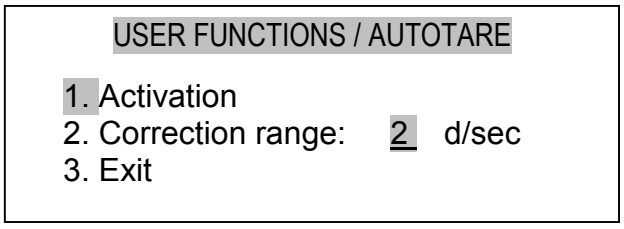
### 14.1 Autotaring



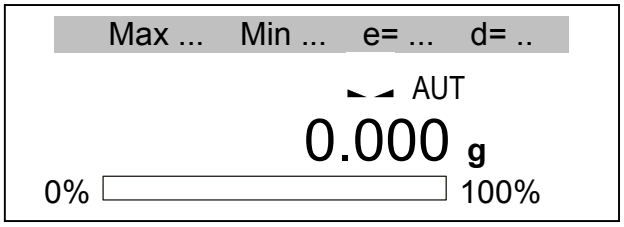

Press *MENU* key to enter the user function menu, chose *Autotaring* and press *ENTER* key.




Chose *Correction range* and press *ENTER* key.
Enter maximum zero flow value to be automatically corrected (chose between 0.5 ÷ 5 verification unit(s) per second).




Chose *Activate* option and press *ENTER*.



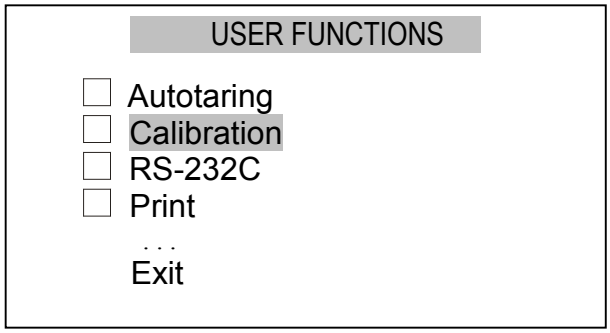

Any changes off the zero readout that are equal to a defined fraction of digits per second are automatically tared, independently of changing environment conditions (temperature, humidity, etc.).

To leave the function press *MENU* key, chose *Auto-tare* function and then chose *Deactivate* option.

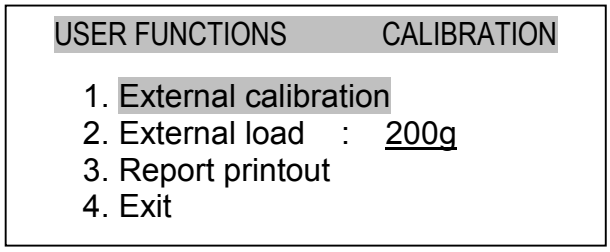
### *14.2 Balance calibration*

Calibration with external weight standard should be performed in case indications exceed permissible error. To calibrate the balance use calibration weight as stated in Technical Data table (or of better accuracy).

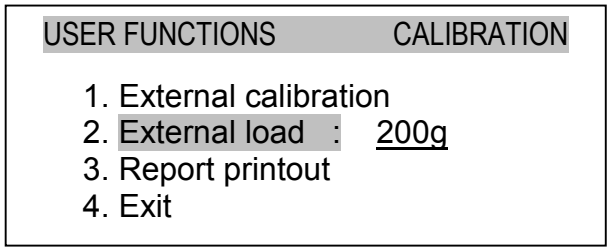
***Calibration options:***



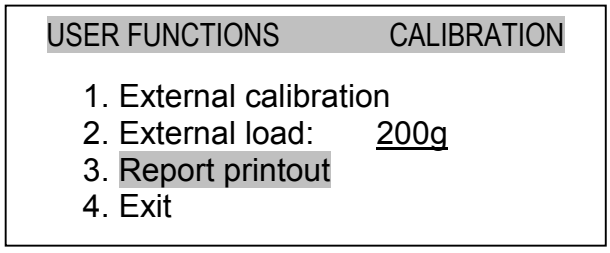

Press *MENU* key choose *Calibration* option and press *ENTER*.




To calibrate the balance use *External calibration* option (described in further part of the instruction).




Option *External weight* enables to enter the value of used calibration weight. Choose *External weight* option, press *ENTER* and use > and < keys to select desired value. It is advised to use as great weight value as possible.

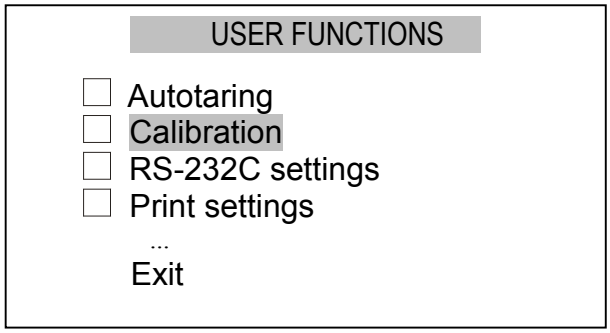



To print a calibration report, connect a printer and use *Report printout* option. Calibration report is a proof of correct calibration process and may be useful for balance diagnostics.

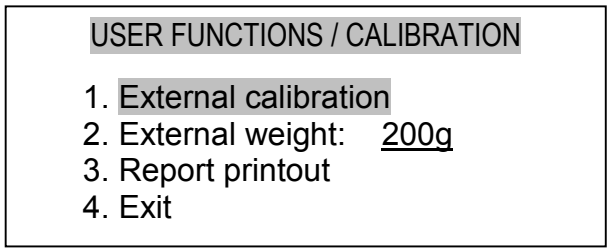
Report example:

| | | |
|---|---|---|
| Date : 2006-10-17 Time.: 13:07 | | |
| --- | | |
| Date of production | : 2006-10-17 | |
| Serial number | : 2 | |
| Program version | : PCE-MB 044 | |
| External weight | : 200.000g | - external weight value used for last calibration |
| Factory weight | : | - (unused parameter) |
| Internal weight | : | - (unused parameter) |
| Weight difference | : | - (unused parameter) |

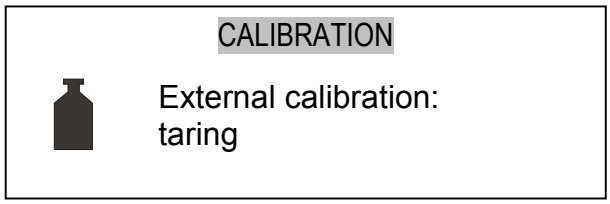
***Calibration operation sequence:***



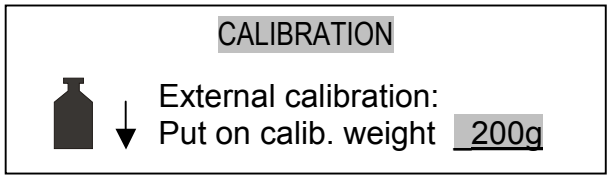

Press *MENU* key, choose *Calibration* and press *ENTER* key.



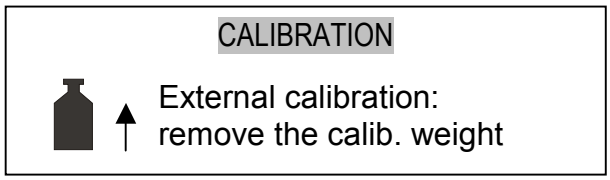

If necessary, enter the correct value of used calibration weight using *External weight* option.
Select *External calibration* option and press ENTER to start calibration.



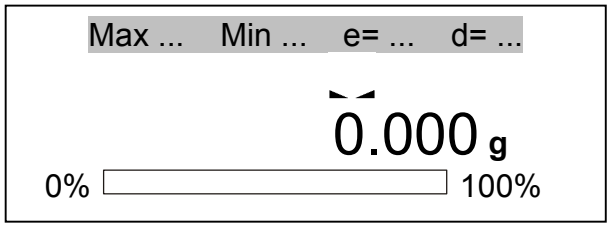

Wait until tare process is finished.




Place proper calibration weight on the pan.



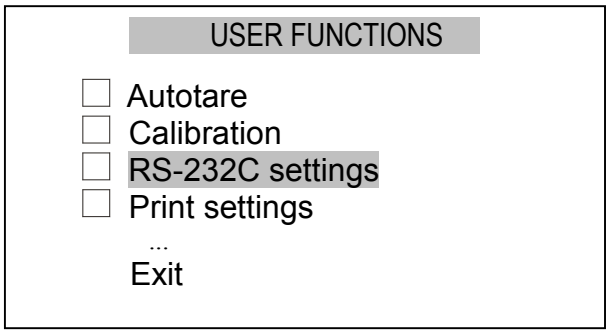

Remove the calibration weight from the pan.



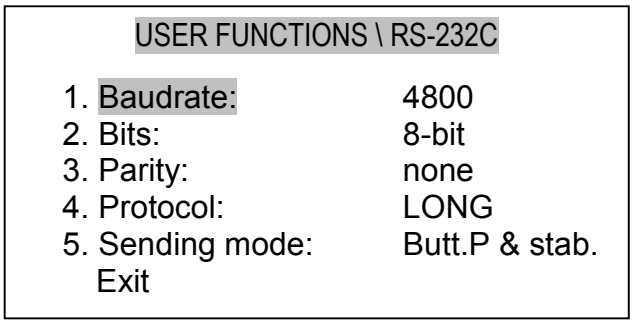

After completing calibration process the balance is the weighing mode.

### *14.3 RS-232C settings*

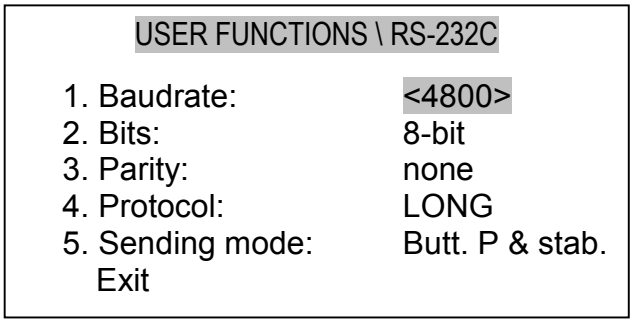
To establish a connection between the balance and a printer (or a computer), set identical transmission parameters for both devices. Default parameters for the moisture analyser are: 8bit, 1stop, no parity, 4800bps. To set different transmission parameters, switch the analyser to weighing mode using ↻ key, press *MENU* key and choose *RS-232C settings* function.
Choose between the following parameters:
- transmission speed (1 200 ÷ 115 200bps),
- number of bits in a sign (7 or 8 bits),
- parity control (none, even, odd),
- protocole mode (default value LONG),
- transmision mode (after pressing ⎆ key with stable indication, after pressing ⎆ key independently of indication stabilisation, automatically after stabilisation of each measurement, continuous in 0,1s periods).




Press *MENU* key, choose *RS-232C settings* and press *ENTER* key.




Select desired parameter with ∧ and ∨ keys and press *ENTER* key.




Using < and > keys choose desired value and press *ENTER* key.

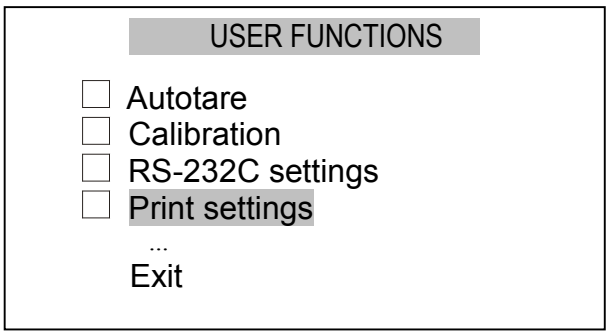
***Data transmission protocol description (Long protocol)***

Transmission parameters: 8bits, 1stop, no parity, 4800bps
Computer→Balance: initialising signal S I CR LF (53h 49h 0Dh 0Ah)
Balance→Computer: balance indication in the following format (16Bytes)

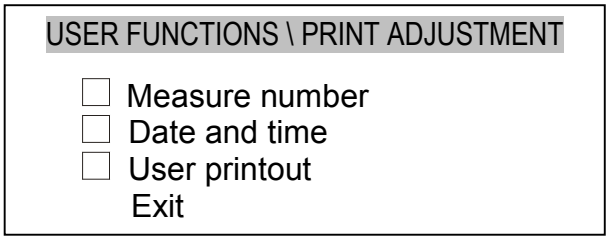
| | | |
|---|---|---|
| Byte | 1 | - sign or space |
| Byte | 2, 11 and 14 | - space |
| Byte | 3÷4 | - digit or space |
| Byte | 5÷9 | - digit, decimal point or space |
| Byte | 10 | - digit |
| Byte | 12 | - k, l, c, p or space |
| Byte | 13 | - g, b, t, c or % |
| Byte | 15 | - CR (0Dh) |
| Byte | 16 | - LF (0Ah) |

### *14.4 Printout parameters*

This function enables to select following information for printouts:
- successive measurement number,
- curremnt date and time for each measurement,
- user information (available on demad) – additional information entered with external keyboard.



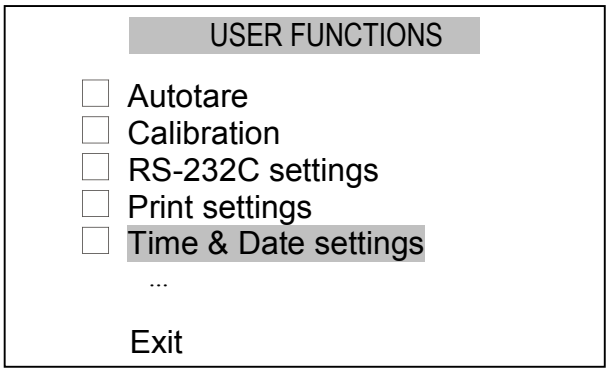

Press *MENU* key, choose *Print settings* and press *ENTER* key.



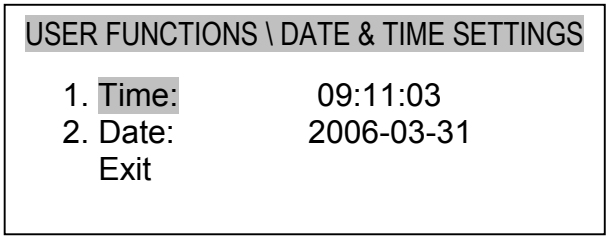

Using ∧ and ∨ keys choose desired option and press *ENTER* key.

### *14.5 Date and time settings*

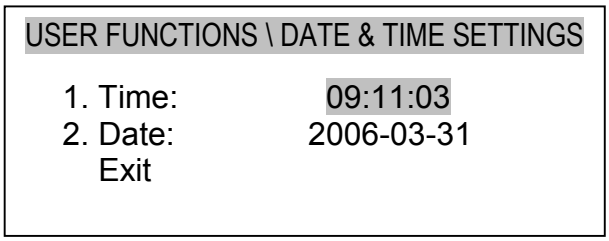
This function enables to set curent time and date (used in printouts):




Press *MENU* key, choose *Time&Date settings* and press *ENTER* key.



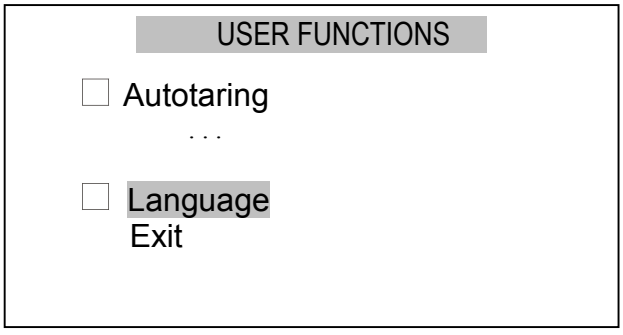

Using ∧ and ∨ keys choose desired value and press *ENTER* key.




Use digit keys to enter correct values and press *ENTER* key to accept.

### *14.6 User language*

This function enables to change user language (used for communicates and printouts):




Press *MENU* key, choose *Language* and press *ENTER* key.


Using ∧ and ∨ keys choose desired language and press *ENTER* key.

## 16. Maintenance and repairs of small defects

1. A moisture analyser should be kept clean.
2. Take care that no dirt gets between the casing and the pan. If found any, remove the pan (lift it up), remove dirt and then replace the pan.
3. In case of improper operation caused by a short-lasting power supply decay, unplug the balance from the mains and then plug it again after few seconds.
4. It is forbidden to make any repairs by unauthorised persons.
5. To repair the scale, please contact an authorised service centre.

***Measuring problems:***

| Problem | Solution |
|---|---|
| A sample burns down | Reduce temperature<br>Use glass fibre filter on the top of the sample<br>Reduce sample quantity and distribute it uniformly |
| Drying lasts too long | Increase temperature<br>Reduce sample mass |
| A sample loses weight before measurement | Take out the pan and put a sample outside the chamber |
| A sample is liquid or paste | Use glass fibre filter |
| A sample does not consist of enough volatile matters | Enlarge a sample |

***Troubleshooting:***

| Display indication | Possible cause | Remedy |
|---|---|---|
| Initial heating Ts temperature exceeds 105°C, the sensor does not react when touched with a finger | The temperature sensor is damaged. | Contact an authorised service point. |
| Initial heating Ts temperature does not reach 105°C, the halogen heater(s) do not light. | The heater is damaged. | Replace the heater. |
| "Test ..." | Auto-tests in progress / electronic unit damage | wait for 1 minute |
| " - - - - " | The balance is during zeroing / mechanical damage | wait for 1 minute<br>check if the balance is placed on stable ground, not affected by vibrations |
| „Tare range exceeded” | Tare key pressed during zero indication | Balance indications must be different than zero |
| „Zeroing range exceeded” | Permissible zeroing range was exceeded | Remove the load from the pan |
| „Weighing range exceeded” | Permissible weighing range (Max +9e) was exceeded | Reduce the load |
| „Measuring range exceeded (+)” | Upper limit of analog-digital transducer measuring range was exceeded | Remove the load from the pan |
| „Measuring range exceeded (-)” | Lower limit of analog-digital transducer measuring range was exceeded | Check if there are all necessary pan elements |

# Declaration of Conformity CE

We:

PCE Deutschland GmbH / Im Langel 4 / 59872 Meschede / Germany

confirm with all responsibility that moisture analysers:

PCE-MB 50, PCE-MB 100 and PCE-MB 200

marked with CE mark comply with the following:

1. EN 61010-1 standard *Safety requirements for electrical equipment for measurement, control and laboratory use. General requirements* harmonized with the directive 73/23/EEC (Low Voltage Directive).
2. EN 55022:2000 standard *Limits and methods of measurement of radio disturbance characteristics of information technology equipment* and IEC 61000-4-3 Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test, harmonised with the Council Directive 89/336/EEC.

Additional information
Conformity evaluation for the Council Directive 89/336/EEC was carried out by Research Laboratory of Electrotechnology Institute Division Gdańsk, accredited by Polish Centre for Accreditation.

## *Notes*