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Manual

Moisture Balance PCE-MA Series



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Thank you for purchasing a moisture balance from PCE Instruments.

1 Safety notes

Please read this manual carefully and completely before you use the device for the first time. The device may only be used by qualified personnel and repaired by PCE Instruments personnel. Damage or injuries caused by non-observance of the manual are excluded from our liability and not covered by our warranty.

- The device must only be used as describes in this instruction manual. If used otherwise, this can cause dangerous situations for the user and damage to the meter.
- The instrument may only be used if the environmental conditions (temperature, relative humidity, ...) are within the ranges stated in the technical specifications. Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture.
- The case should only be opened by qualified PCE Instruments personnel.
- Never use the instrument when your hands are wet.
- You must not make any technical changes to the device.
- The appliance should only be cleaned with a damp cloth. Use only pH-neutral cleaner, no abrasives or solvents.
- The device must only be used with accessories from PCE Instruments or equivalent.
- Before each use, inspect the case for visible damage. If any damage is visible, do not use the device.
- Do not use the instrument in explosive atmospheres.
- The limit values for the measuring variables as stated in the specifications must under no circumstances be exceeded.
- If possible, the device should be transported horizontally, bottom down and well-cushioned. Remove the loose attachment parts from the measuring chamber to avoid damage. We recommend to use the original packaging for transport.
- Only use IEC power connectors with a PE (ground) contact.
- Do not touch the halogen lamps or the cover during the measurement as this can cause severe burns.
- After the measurement, let the sample cool down before touching it.
- Never operate the device when the cover is open.



This instruction manual is published by PCE Instruments without any guarantee.

We expressly point to our general guarantee terms which can be found in our general terms of business.

If you have any questions please contact PCE Instruments.

Safety symbols

Safety-related instructions the non-observance of which can cause damage to the device or personal injury carry a safety symbol.

Symbol	Designation / description
	General safety symbol Non-observance can cause personal injury and/or damage to the device.
	Warning of hot surface Non-observance can cause burns.

2 Specifications

2.1 Technical specifications

Model	PCE-MA 100	PCE-MA 110	PCE-MA 200	PCE-MA 202
Weighing range	110 g	110 g	200 g	200 g
Readability	1 mg / 0.001 g	10 mg / 0.01 g	1 mg / 0.001 g	10 mg / 0.01 g
Heating element	Halogen lamp / round / approx. Ø 90 mm			
Drying temperature adjustable	+40...+199 °C			
Drying time (time mode)	1...99 min adjustable			
Measurement range moisture	0...100 %			
Readability moisture	0.01 %	0.1 %	0.01 %	0.1 %
Memory	16 drying programmes (parameters)			
Interface	RS-232			
Display	LCD, 17 mm digit height			
Power supply	220 V / 50 Hz or 110 V / 60 Hz			
Dimensions	200 x 180 x 380 mm			
Weight	Approx. 4.4 kg			
Parcel details	500 x 350 x 360 mm / approx. 7 kg			

2.2 Delivery content

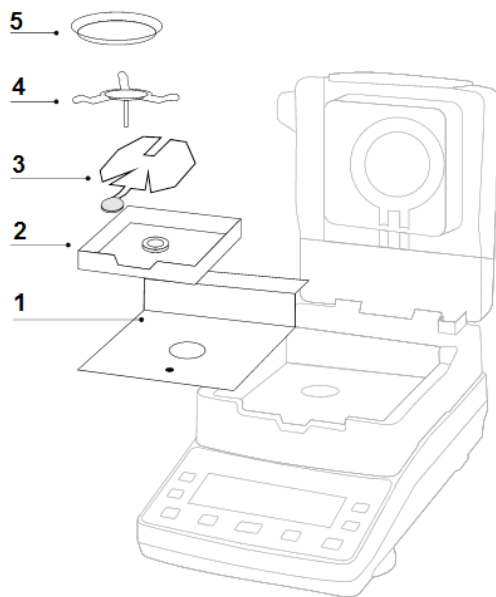
- 1 x moisture balance PCE-MA series
- 1 x wind shield
- 10 x sample pan
- 1 x mains cable
- 1 x sample pan holder / handle
- 1 x 100 g weight in plastic box
- 1 x instruction manual

2.3 Optional Accessories

- PCE-BP 1 thermal printer

3 System description

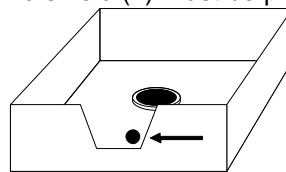
3.1 Device



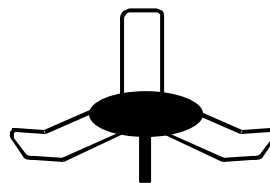
- | | | | |
|----|-----------------------|----|--------------|
| 1. | Heat protection plate | 4. | Pan retainer |
| 2. | Wind shield | 5. | sample pan |
| 3. | Insertion aid | | |

Assemble the parts as illustrated above.

1. Start with the heat protection plate (1).
2. The notch in the side wall of the wind shield (2) must be placed in a way that it faces the user.

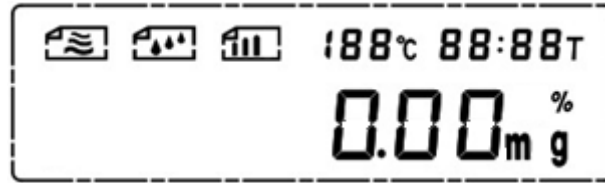


3. The handle of the insertion aid (3) is placed to rest in this notch.
4. Place the sample pan retainer (4) in the middle of the measuring chamber. Make sure that the cone of the sample pan retainer rests in the guide properly



5. The sample pan (5) is the last part you need to install.

3.2 Display



- Heat-up mode (Standard / Quick / Slow)



- Measuring / stop mode (constant reading / user / time lapse)

188°C

- Drying temperature (40°C bis zu 199°C)

88:88T

- Drying time / Duration of drying process

m%

- Percentage moisture

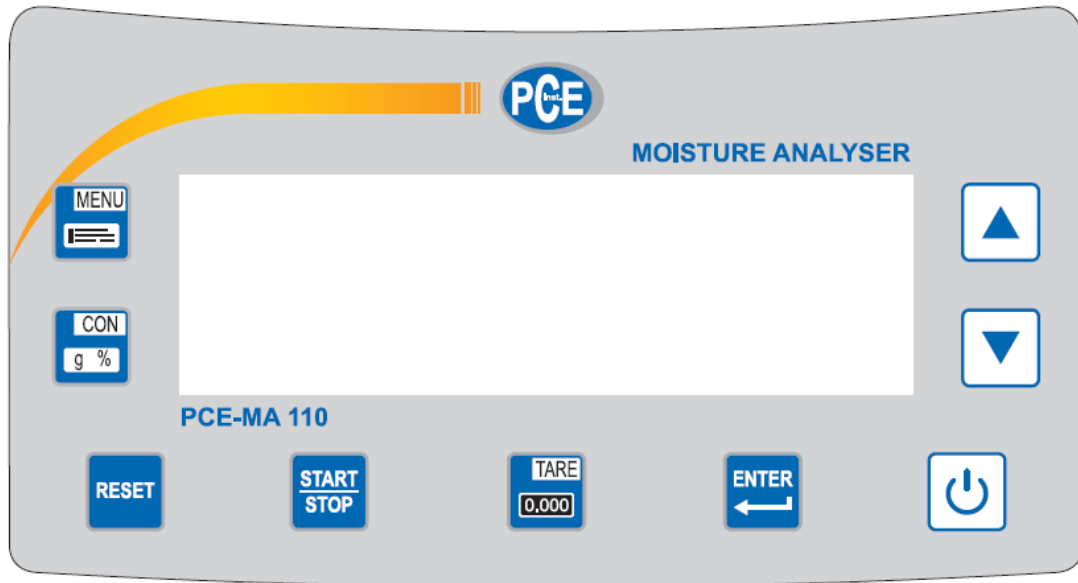
%









- Percentage **dry weight** / dry matter %

g

- Grammes

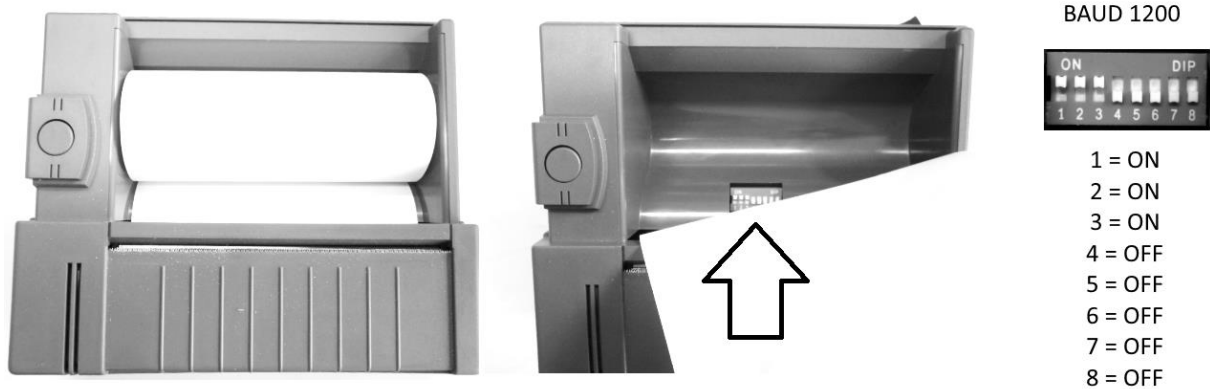
3.3 Function keys



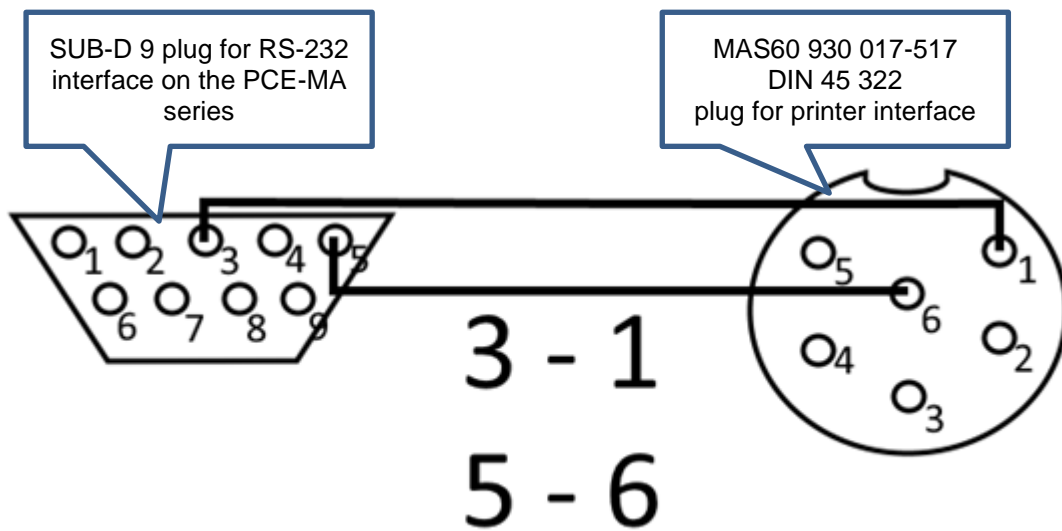
Key	Function
	Power on / off
	Start / stop measurement
	Tare / Leave settings
	Open settings
	Switch between absolute and relative measuring result
	Confirm current settings / go to next setting
	Return to weighing mode (short keystroke) / Calibration (long keystroke)
	Change settings

3.4 RS-232 interface / printer

The RS-232 interface is used for connecting the optional PCE-BP 1 printer to the scales. To do so, you have to set the following on the printer:



The printer comes with an RS-232 cable which is used for connecting both devices:



4 Preparation

4.1 Preparation of sample

You should always prepare only one sample for measurement to avoid that it loses moisture to the environment or absorbs air humidity. In case several samples have to be taken at the same time, they should be put into airtight containers to make sure their characteristics do not change when stored.

Spread the sample on the sample pan **evenly** and in a **thin layer** to get reproducible results.

Uneven application of the sample causes inhomogeneous heat distribution in the sample to be dried. This means that the sample is dried incompletely or that the drying time is increased. Due to piling material, the upper layers will heat up more strongly, which will cause combustion or incrustation. An excessively high thickness of the layer or possible incrustations prevents the moisture from leaving the sample. The residual moisture makes the measurement results non-verifiable and non-reproducible.

4.2 Tools for sample preparation

The tools and instruments used for sample preparation have a huge effect on the accuracy and reliability of the measurement. You should avoid tools with heat-conducting properties, i. e. which are able to transfer heat to the sample. Improper handling and preparation of the sample will falsify the end result of the measurement.

4.3 Disposable aluminium sample pan

To be able to measure the moisture content of the sample, the sample should be spread on the sample pan evenly and then be placed in the drying chamber of the moisture balance. Re-using a sample pan can falsify the end result of the measurement because of the adhering residues.

4.4 Spreading of the sample



ATTENTION:

The samples should not exceed a thickness of 8 mm and a diameter of 90 mm.

If the max. height of the sample is exceeded, this can lead to combustion or incrustation of the sample.

The sample should be spread on the sample pan evenly, ideally in layers of 2 ... 5 mm.

Make sure that the temperature probe, which is located in the cover of the moisture balance, does not touch the sample as this will falsify the result.



Solids:

- Spread powdery and grained samples evenly on the sample pan.
- Crush coarse-grained samples using a mortar or similar device. Avoid any heat supply when crushing the sample as this will cause moisture loss.



Liquids:

For liquids, pastes or melting samples, it is recommended to use the glass fibre filter.

4.5 Glass fibre filter circle

Glass fibre filter circles ensure that liquid samples are evenly spread on the sample pan and prevent the combustion of solids.

The glass fibre filter circle has the following advantages:

- even spreading due to capillary action
- no formation of drops
- quick evaporation due to larger surface

4.6 Practical advice

Before starting the measurement, place the sample pan and, if appropriate, the glass fibre filter on the pan retainer and tare it to make sure that only the weight of your sample is assessed.

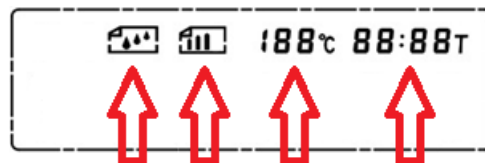
If you carry out several consecutive measurements, keep in mind that the temperature from the previous measurement still obtains in the measuring chamber and that evaporation already takes place when the cover is closed. This might affect the measuring results.


Therefore, you must either allow some time for the drying chamber to cool down or accept the deviations and start the next measurement as soon as possible.



5 Operation


5.1 Measurement

The moisture balance saves the drying parameters last used after switching off and back on. These are shown in the display.



Prepare the sample and place it in the drying chamber. You can now start the measurement by pressing the  key.

After the measurement, the measured values will be available until they are deleted. You can use the  key to switch between the **weight indication / dry matter indication in %** and the **indication of the moisture content in %** during and after the measurement. After the measurement, the measurement values last determined must be deleted from the memory. To do so, press the  key.

ATTENTION: Before placing the next sample on the sample pan, make sure that the display shows 0.0 g respectively 0.00 g. If this is not the case, press the  key.

If, however, different drying parameters are necessary due to the different samples, you can use up to 16 memory locations. You can save the selected heat-up mode / termination criterion / drying temperature, as well as the drying time if necessary, to each of the memory locations.




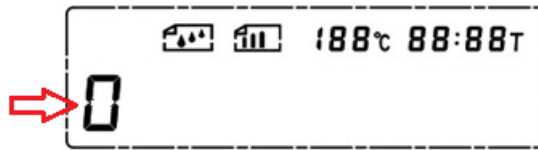
ATTENTION:



Do not touch the halogen lamps or the cover during the measurement as this can cause severe burns.


After the measurement, let the sample cool down before touching it.


5.2 Drying modes

Press the  key to get to the drying mode selection screen. Here you can select different drying modes and set up new ones.



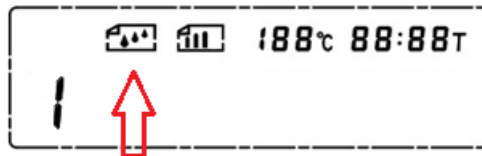
A number which indicates the memory location flashes on the left-hand side of the display. The user can retrieve up to 16 different memory locations, using the arrow keys  and . The saved drying parameters are displayed along with the selected memory location.

If you wish to use the drying parameters of a certain memory location, press the  key. The moisture balance will then take over the drying parameters and you can start the measurement.

If you want to save some new drying parameters to a memory location, select the memory location and confirm with the  key.

5.2.1 Specify heat-up mode

After the selection of the memory location, the drop icon will flash in the upper side of the display.



The user can select one out of three heat-up speeds.

Standard heat-up mode

This is the default mode which is suitable for most sample types.
In this heat-up mode, 120 °C are reached **after approx. 4 minutes**.

Quick heat-up mode

This mode is suitable for samples with a high moisture content.
In this heat-up mode, 120 °C are reached **after approx. 1 minute**.

ATTENTION: When using this heat-up mode, there might be increased temperatures in the drying chamber for a short period as the sensor and the control need some time to regulate the temperature.

Slow heat-up mode

This mode is suitable for samples with a low moisture content.
In this heat-up mode, 120 °C are reached **after approx. 8 minutes**.

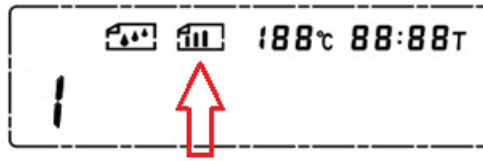
ATTENTION: When using this heat-up mode, it is particularly important that the drying time of the sample is adapted to the drying mode as otherwise the drying process could be terminated (time expired) although there is still some residual moisture in the sample.

You can select the desired heat-up mode using the arrow keys  and .

To confirm the selected heat-up mode, press the  key.

5.2.2 Specify measurement / stop mode

After the selection of the heat-up mode, the bar icon will flash in the upper side of the display.



The user can select between three measurement / stop modes.

Constant measurement value


In this measurement / stop mode, the measurement is stopped automatically when the measurement value is constant over a certain period of time.

The following table shows the stop conditions:

	Stop conditions <period of time (weight change)>		
	Fast heat-up mode	Standard heat-up mode	Slow Heat-up mode
PCE-MA 110	36 s (<20 mg)	45 s (<20 mg)	60 s (<20 mg)
PCE-MA 202	36 s (<20 mg)	45 s (<20 mg)	60 s (<20 mg)
PCE-MA 100	36 s (<3 mg)	45 s (<2 mg)	60 s (<2 mg)
PCE-MA 200	36 s (<3 mg)	45 s (<2 mg)	60 s (<2 mg)

ATTENTION: In this mode, it is not possible to set a measuring time.

Manual / user stop mode



In this measurement / stop mode, the measurement can be ended by the user. To do so, press the  key.


ATTENTION: Depending on the temperature, combustion of the sample can easily occur in this measurement / stop mode. This mode should only be used if constant monitoring can be guaranteed. The advantage of this mode is that the sample can be dried for a long time to allow moisture to escape which is located very deep in the sample.

Time stop mode

In this measurement / stop mode, the measurement is stopped automatically when the set measuring / drying time has passed. **88:88T**

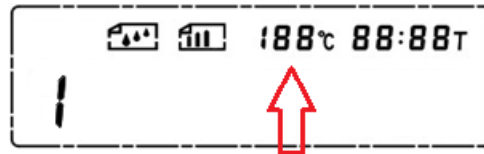
ATTENTION: The maximum measuring / drying time you can set is 99 minutes.




The desired measurement / stop mode can be selected by means of the arrow keys  and .

To confirm the selected measurement / stop mode, press the  key.

5.2.3 Setting the drying temperature **188°C**

After selecting the measurement / stop mode, the temperature indication will flash in the upper side of the display.

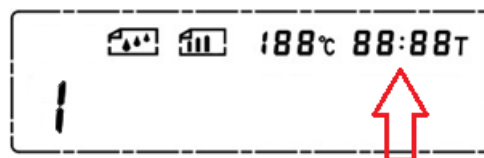




You can set the drying temperature using the arrow keys  and . The first setting can be made in steps of 10 %. After confirming with the  key, the setting can be carried on in increments of 1 °C.


ATTENTION: During temperature regulation, temperature fluctuations of approx.. 4 °C can occur. Mind this when selecting the temperature to make sure the sample does not scorch. Otherwise, the moisture reading will be falsified.

5.2.4 Setting the drying / measuring time **88:88T** (only in time stop mode)

Depending on the previously set measurement / stop mode, the time indication flashes in the upper side of the display.



The drying / measuring time can be set using the arrow keys  and .

To confirm the set drying / measuring time, press the  key.


ATTENTION: The **maximum** drying / measuring time you can set is **99 minutes**.

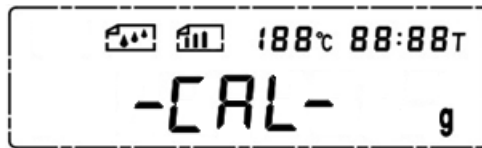
5.3 Adjustment / calibration

The moisture analyser consists of a weighing unit and a drying chamber. The moisture measurement is carried out on the basis of the weight loss. This can be easily reproduced by a rule of three.

ATTENTION: The moisture analysers of the PCE-MA series have a higher weighing resolution than the one indicated. The moisture balance uses the higher resolution which is invisible to the user for calculation. This can result in deviations after the decimal point when trying to reproduce the result.

The weighing unit can be adjusted by means of a 100 g external test weight (min. M1). Special care must be taken when positioning the scales (as little vibration as possible and balanced by means of the level). The adjustment of the weighing unit should only be carried out after a heat-up time of approx. 30 minutes.

To do so, press and hold the  key for approx.. 6 seconds. "-CAL-" will be displayed.



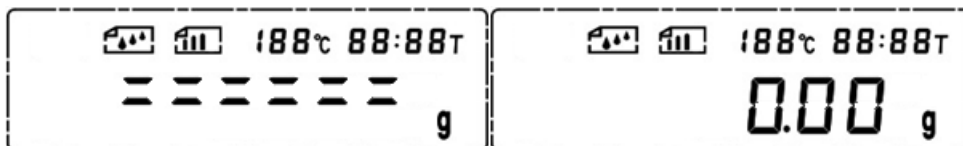
After the "-CAL-" indication, "100.00 g" will flash.



Now place the 100 g calibration weight in the middle of the weighing platform. The indication will change from "100.00 g" to "====".










When the indication changes from "====" back to "100.00 g", remove the weight from the weighing platform. After this, the display will show "====" again and change to "0.00 g" automatically.



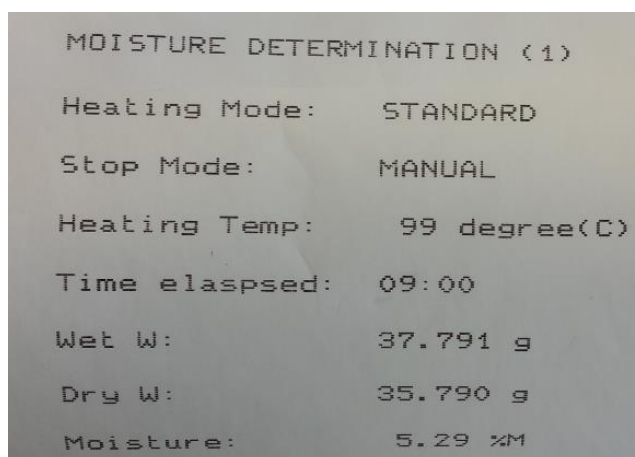
The adjustment of the balance is now finished.

5.4 Print out results (optional)

You can print out the measurement results by using the optional PCE-BP 1 printer. To do so, follow these steps:

1. Make sure that the printer is set up properly and both devices are connected to each other.
2. During operation, press and hold the  key until "PrInT" appears in the display.
3. After this, the options "L-C" (Chinese print-out) and "L-E" (English print-out) will appear in the display. Use the arrow keys  and  to select the desired option and press the  key to confirm.
4. After this, numbers from 1 to 5 will appear in the display which represent the last 5 measurements (which are stored in the device). Select a measurement by using the arrow keys  and  and press the  key to confirm.
5. The data is now sent to the printer via the RS-232 interface.

Print-out:



6 Troubleshooting

Error message	Error cause	Possible solution
-Err 1-	Sample weight below 1 g	Put more than 1 g of the sample on the scales and start the measurement.
-Err 2-	Temperature setting below +40 °C	Restart the scales.
-Err 3-	Measuring time setting below 30 seconds.	Restart the scales.
-Err 4-	Halogen lamp problem	Please contact our technical support.
-Err 5-	Time setting for slow heat-up mode below 3 minutes	Restart the scales.
-Err 6-	Temperature sensor broken	Please contact our technical support.

7 Contact

If you have any questions, suggestions or technical problems, please do not hesitate to contact us. You will find the relevant contact information at the end of this user manual.

8 Disposal

For the disposal of batteries, the 2006/66/EC directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose.

In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law.

If you have any questions, please contact PCE Instruments.



9 Contact

If you have any questions about our range of products or measuring instruments please contact PCE Instruments.

9.1 PCE Instruments UK

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EC-Konformitätserklärung	EC- Declaración de conformidad
EC- Dichiarazione di conformità	EC- Declaration of conformity
EC- Déclaration de conformité	EC- Uygunluk Beyanı
EC- Conformiteit-verklaring	EC- Заявление о соответствии
EC- Declaração de conformidade	EC- Deklaracja zgodności
EC- Prohlášení o shode	

D	Konformitätserklärung	Wir erklären hiermit, dass das Produkt, auf das sich diese Erklärung bezieht, mit den nachstehenden Normen übereinstimmt.
E	Declaración de conformidad	Manifestamos en la presente que el producto al que se refiere esta declaración está de acuerdo con las normas siguientes.
I	Dichiarazione di conformità	Dichiariamo con ciò che il prodotto al quale la presente dichiarazione si riferisce è conforme alle norme di seguito citate.
GB	Declaration of conformity	We hereby declare that the product to which this declaration refers conforms with the following standards.
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.
TR	Uygunluk Beyanı	Bu bildirimle bağlı ürünün aşağıdaki standartlara uygun olduğunu beyan ederiz.
NL	Conformiteit-verklaring	Wij verklaren hiermede dat het product, waarop deze verklaring betrekking heeft, met de hierna vermelde normen overeenstemt.
RUS	Заявление о соответствии	Мы заявляем, что продукт, к которому относится данная декларация, соответствует перечисленным ниже нормам.
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.
CZ	Prohlášení o shode	Tímto prohlašujeme, že výrobek, kterého se toto prohlášení týká, je v souladu s níže uvedenými normami.

Moisture Analyzer: PCE-MA 110, PCE-MA 50, PCE-MA 105, PCE-MA 102, PCE-MA 100, PCE-MA 202, PCE-MA 50T, PCE-MA 100T, PCE-MA 200T, PCE-MA 202T

Mark applied	Standards
	2004/108/EC EN61000-6-3:2007+ A1:2011 EN61000-3-2:2006+ A1:2009+A2:2009 EN61000-3-3:2013 EN61000-6-1:2007

Meschede, 04.07.2014
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