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USER MANUAL

Moisture Analyser
PCE-HGP

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Attention:

The device can be turned on and off by pressing and holding both SELECT and WOOD TEMP. Buttons simultaneously.

Moisture Meter HYGROPEN is an electronic device and should be operated carefully and reasonably.

1. Application

Moisture Meter HYGROPEN is a universal, state-of-the-art, electronic device for measuring moisture contents in wood, building materials and also air humidity and temperature. It is particularly useful for:

- wood moisture contents measurements.
- measurements of moisture contents in plywood (parquet) and concrete floors.
- evaluation of moisture contents in buildings.
- evaluation of atmospheric conditions (air humidity and temp.).

Despite its small size the device provides results of very high accuracy. This is achieved by the usage of a special microprocessor and high quality humidity and temperature sensors. The device is very user friendly. The measurement of wood moisture contents includes wood type and temperature compensation.

2. Technical data

Measuring range

air humidity	0 – 100 % RH
air temperature	-5°C to 50°C
dew point temp.	-9°C to 50°C
wood moisture contents	6 – 60%
building materials moisture contents	indicator

Out of range indication

below range	yes
over range	LO HI

Number of wood types

3 groups
(12 types + 270 exotic types)

Wood temp. range

0°C - 50°C
(32°F - 122°F)

Display

LCD, dedicated

Accuracy

air humidity (in 20°C)	± 2% within range 20 – 85% ± 3% within ranges 0 - 20% and 85 - 100%
air temperature	± 1°C (±2°F)
wood moisture contents	± 1% within range 6 – 15% ± 2% within range 16 – 28% over 28% - approx. Measurement.

Resolution

air humidity	0.5 % RH
air temperature	0.5°C (0.5°F)
wood moisture cont.	0.1%

Sensor types

air humidity	capacitance (HUMIREL)
air temperature	resistance (HUMIREL)

Power

12V (bat. 23A)

Battery life

2000 measurements

Auto power off

yes, after 5 min.

Low power indications

yes

Size

160 x 27 x 15 mm

Guarantee

12 months

3. Measurements of wood moisture contents

3.1 Preparing the instrument for measurements

To prepare the device for measurements of wood moisture contents proceed with the following steps:

turn the device on by pressing both SELECT and WOOD TEMP. simultaneously.

remove the cap protecting the needles.

use SELECT to choose the appropriate group of wood types (WOOD 1 or WOOD 2 or WOOD 3); a table containing most popular wood types is on the back of the device.

use WOOD TEMP. to select the measured or estimated wood temperature (the step is 5°C). The selected temperature will be displayed in the upper left corner of the LCD.

3.2 Moisture contents measurement

Slowly insert the needles into the wood. Do not use excessive force. A line connecting the needles should be perpendicular to the fibers of the wood (fig. 3.1). For moisture contents below 20% the way of measuring (perpendicular or parallel to the fibers) has no noticeable influence on the result.

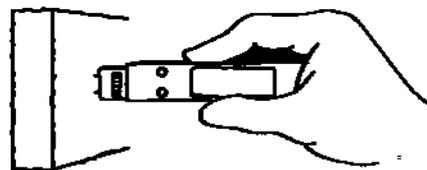


Fig. 3.1

If the wood is very hard and there is a danger of damaging (breaking) the device or the needles, use extra nails. Hammer two nails (1,5 mm thick) in the wood 15 mm apart and then touch the heads of the nails with the needles of the device (fig. 3.2). Read the result (for exotic wood types see chapter 6.5).

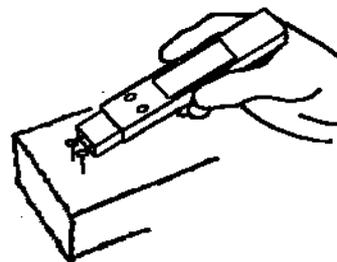


Fig. 3.2

4. Measurements of building materials moisture contents

The most commonly used method of measuring moisture contents in building materials (e.g. concrete, plaster, brick, gypsum) is based on the measurement of the resistance. Moisture Meter HYGROOPEN is also based on that method.

To measure (estimate) the moisture contents follow these steps:

- ⌚ turn the device on by pressing both SELECT and WOOD TEMP. simultaneously.
- ⌚ remove the cap protecting the needles.
- ⌚ use SELECT to choose BUILD. MAT.
- ⌚ hammer two nails (2-3 mm thick) in the floor 15 mm apart.
- ⌚ touch the heads of the nails with the needles of the device and read the result.

If the result is below 17.0 and there is a DRY sign displayed over it, it indicates that the floor is dry.

If the result is between 17.0 and 20.0 and the signs DRY and WET are displayed alternately, it indicates that the floor is almost dry.

If the result is over 20.0 and there is a WET sign displayed over it, it indicates that the floor is wet and requires additional drying.

A very rough estimate of moisture contents in concrete can be calculated as $\frac{1}{8}$ of the displayed result. Example: the result of 24.0 indicates that the moisture contents in concrete is approximately $24 : 8 = 3.0\%$.

5. Measurements of air humidity and temperature

Moisture Meter HYGROOPEN can be used to measure relative humidity and temperature of the air. The sensors are located below the slits in the forward part of the device. To enable the air flow to the sensors move the cap half way or remove it completely.

To measure relative humidity use SELECT to choose AIR RH.

To measure temperature use SELECT to choose AIR TEMP. The LCD will present two numbers:

- ⌚ in the middle – air temp. (°C),
- ⌚ in the upper left corner – dew point temperature (°C)
(see chapter 6.4 Dew point temperature measurement)

Waiting for the results

The general rule is to wait until the result stabilizes i.e. it practically stops changing. Waiting time is proportional to the difference between the temperature of the instrument and the temperature of the surrounding air. Correct results can be obtained no sooner than the temperature of the instrument's case is equal to the temperature of the surrounding air.

If the temperature of the case (and the temperature of the air inside the device around the sensors) is 1°C higher than the "real" temperature of the air in the room, the measured humidity will be 3% lower than the "real" one. Similarly if the temperature of the case is 1°C lower than the "real" one, the indicated humidity will be 3% higher than the "real" one.

As you can see the influence of temperature on the accuracy is very significant. Accelerating the process of air exchange between the measuring chamber and the surroundings shortens the waiting time. This can be achieved by e.g. swinging the device in the air.

It is recommended to check the temperature every 10 - 15 minutes.

If two consecutive readings are the same it can be assumed that the temperature inside the case and the temperature of the surroundings are the same and the results of humidity and temperature displayed by the instrument are correct.

Warning:

Avoid placing very cold HYGROPEN in rooms of high humidity. This may cause condensation on the case and sensors. Consequently an out of range sign (HI) will be displayed on the LCD. The sensors will not be damaged and after some time (when they dry off) the moisture meter will operate normally.

6. Examples of application

6.1 Measurement of moisture contents in concrete floor

The method of measuring moisture contents in building materials described in chapter 4 is not the only one. Another way is to measure humidity of air that is in equilibrium with the building material.

Use transparent plastic foil (approx.40 cm x 40 cm) to tightly cover the concrete floor at least 24h before the measurement. There should be a considerable amount of air trapped under the foil (the foil can not cling to the floor). Seal the edges with tape.

If it is possible leave HYGROPEN under the foil for the whole time (fig.6.1).

Correct results can also be obtained without leaving the HYGROPEN under the foil for the whole 24h. It can be placed there later. However three conditions must be met:

while placing the HYGROPEN under the foil do it in a way that will minimize the exchange of air between the volume trapped under the foil and the surroundings.

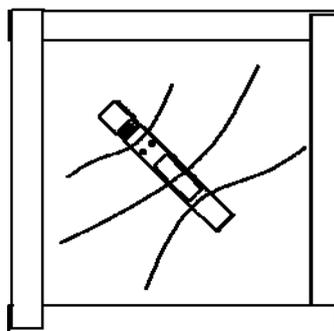


Fig. 6.1a

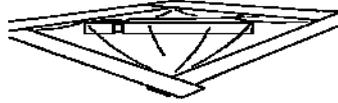


Fig 6.1b

After placing the HYGROPEN under the foil seal it with tape or Plasticine (fig. 6.1), leave HYGROPEN under the foil for at least 2 hours.

Interpreting the results

After 24 hours (or after 24 hours + 2 hours) turn the instrument on and use SELECT to choose AIR RH. Read the result (all this without removing the instrument from under the foil).

If the result is lower than 75% RH, the floor is dry. Results between 75% and 85% can be considered acceptable. Results over 85% indicate that the floor is still wet.

6.2 Measurement of moisture contents in plaster

Measurements of moisture contents in plaster are most commonly done in order to check if the wall is dry enough to be painted.

Use plastic foil (approx. 40 cm x 40 cm) to tightly cover the wall at least 24h before the measurement. Seal the edges with tape or Plasticine (clean the surface, fig. 6.2). This will allow for the moisture contents to equalize throughout the cross-section of the plaster. Use SELECT to choose BUILD. MAT.

Pierce the foil and pin the needles of the instrument into the plaster. Read the result.

For oil based paints the results should not exceed 17.0 (also indicated by the DRY sign).

For emulsive paints results up to 20.0 are acceptable (also indicated by DRY or interchanging DRY and WET signs).

All results above 20.0 (also marked by the WET sign) indicate that the wall is wet and requires additional time to dry.

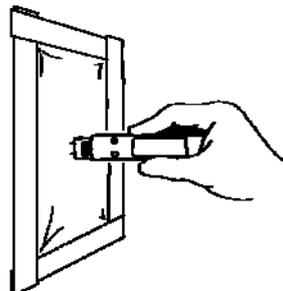


Fig. 6.2

6.3 Surface temperature measurement

Usually the measurement of surface temperature is done using thermometers with special probes. Moisture Meter HYGROOPEN allows for an approximate measurement of the surface temperature.

Use SELECT to choose AIR.TEMP., and remove the cap protecting the needles half way. Place the instrument on the surface LCD down. After some time (e.g. every 10 minutes) turn the instrument right side up, read the result and turn it back LCD facing the surface again. Repeat these steps until the result stabilizes.

If two consecutive readings are the same the result is the temperature of the surface. Truthfully it is the temperature of the air approx. 1 cm over the surface.

The surface temperature measurement helps estimate the “distance” to the dew point temperature. It can be useful to evaluate the danger of water condensation on the surface. (See chapter 6.4 Dew point temperature measurement).

6.4 Dew point temperature measurement

To measure dew point temperature use SELECT to choose AIR TEMP. The LCD will present two numbers:

- ⌚ in the middle – air temp. (°C),
- ⌚ in the upper left corner – dew point temperature (°C)

The instrument calculates the dew point temperature (°C) based on current relative humidity (%RH) and temperature (°C).

The dew point temperature is the temperature which causes the water contained in the air to condensate in form of dew, fog or white frost. The more water in the air (higher humidity) the higher the dew point temperature.

In certain tasks the knowledge of the current dew point temp. is crucial. An example of such task is painting steel structures with anticorrosion coating. Condensation may cause the paint to loose tack with the structure and flow down with gravity. For paint jobs a safe margin is 3°C, i.e. the temperature of the surface should be at least 3°C higher than the dew point temp. for the current conditions.

The knowledge of the dew point temp. is also useful for determining the source of moisture in walls (i.e. condensation or other external source).

6.5 Measurement of moisture contents in exotic wood types

The measurement of moisture contents in wood of exotic type should always be conducted with the following settings:

wood type – WOOD 2 (group 2),
wood temp. – measured or estimated wood temperature.

Depending on the type of wood the result displayed by the device should be multiplied by the appropriate coefficient **G** given in Table 6.2.

Example: wood type Teak (group 2),
displayed result: 12.2 %,
real moisture contents: $12.2\% \times 0.88 = 10.7\%$

Table 6.2 EXOTIC WOOD TYPES,
G COEFFICIENT VALUES

Group 1 (G = 0.88)

Chipboard (phenolic resin bonded)	Gonzales Alves Parana Pine Zebrano
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Group 2 (G = 0.88)

Assegai	Indian-Rosewood
Avodiré	Iroko
Box-tree	Jarrah
Brazilian- rosewood	Karri
Chipboard (urea bonded)	Kempas
Cedar, white + red Cocuswood	Kokrodua
Columbian pine	Mahagony, Khaya
Cypress, southern	Mahagony, Sapelli
Dahoma	Massaranduba
Dogwood Doug- lasie	Mecrusse
Ebony, afr. + asiat.	Moabi Mora
Ebony, macassar	Mucarati
Europen aspen	Muhimbi
Freijo	Muhuhu
Goncalo	Mukulungu Mukusi
Groupie	Niove
Greenheart	Nyankom
Guaycan	Obeche
Hardboard	Okoume
Idigbo	Olive tree
Pyinkado	Ozouga
Quebracho Blanco	Pear
Quebracho colorado	Persimmon
Ramin	Pillarwood
Redcedar, western	Pink Ivory wood
Sandalwood	Pockholz
Sapele	Satinwood
Sasswood	Snake wood
	Sucupira
	Tali
	Teak
	Tulipwood
	Wacapou
	Wattle, black
	Wenge
	Zapatero

Group 3 (G = 0.98)

Abura	Balsamo
Afcelia	Banga Wanga
Agathis	Basswood
Agba	Berlinia
Alder	Birch, yellow
Alstonia	Birch, meanness
Amazokoue	Blackwood, afr.
Amendoim	Blackwood, austr.
American –	Blue Gum
Mahagony	Bomax
Andiroba	Borneo Camphor- wood
Andoung	Brushbox
Angelin	Bruyere
Angelique	Boire
Antiaris	Cabbage-bark, black
Ash, americ.	Campeche
Ash, jap.	Campherwood, real, afr.
Ash, meanness	Canarium, afr.
Aspe	Cativo
Assacu	Chengal
Azobé	Cherry
Baboen	Chickrassy
Bahia	Cocobolo
Baitoa	Madrono, Pacific
Balau	Magnolia
Balsa	Mahagony, Kosipo
Coigue	Mahagony, Tiama
Cypresse	Makore
Daniellia	Manbarklak
Danta	Manio
Diambi	Maple, Mountain
Douka	Maple, soft
Elm	Maple, sugar
Esia	Menkulang
Eucalyptus	Meranti, yellow
Europen-plane	Meranti, white
Evino	Merawan
Eyong	Merbau
Fraké	Mersawa
Gerongang	Moringui
Gedu	Muninga
Nohor	Musizi
Guarea	Mutenye
Guatambu	Myrtle
Gum-tree	Nyatch Oak, jap.
Haldu	Oak, red
Hemlock	Oak, stone
Hickory	Oak, white
Hornbeam	Oak, grape
Horse-cestnut	Oak, haft
Ilomba	Okan
Izombe	Okwen
Jacareuba	Olivillo
Jelutong	Opepe
Juniper	Ovankol
Kauri	Ozigo
Keruing	Padouk, afr.
Koto	Padouk, burma
Landa	Padouk, Manila
Larch, europ.	Paldao
Larch, jap.	Partidge
Larch, sibir.	Pencil-wood, afr. + virg.
Laurel, Chile	Seraya, red +yell.
Laurel, Indian	
Limbali	
Lime	
Louro, vermecho	

Pencil-wood, calif.	Sikon
Pernambuc	Spruce Western
Pine, black + red	White
Pine,	Shore-pine
weymouth +	Sucamore
stone	Sugi
Pine,	Sweet-chestnut
pitch + insignis	Sweetgum
Plum-tree	Tchitola
Podo	Thuya-Maser
Ponderosa Pine	Tangile
Port-orfordcedar	Toosca
Purpleheart	Tupelo
Quaruba	Umbrella-tree
Rauli	Walnut, americ.
Red peroba	West-indian-locust
Redwood, calif.	Whitewood
Rengas	White-afara
Robinie	White-peroba
Roble	Willow
Safukala	Wood-fiber
Saligna Gum	insulating panels
Sapo	Yang
Sen	Yemane
Sepetir	Yew
Seraya, white	

Group 4 (G = 1.10)

African walnut	Lauran, white +
Akatio	red
Aniegré	Mahagony, Sipo
Aningori	Mahagony
Bubinga	Mansonia
Brasilian walnut	Meranti, dark red
	Meranti, light red

6.6 Measurement of moisture contents in very dry wood

Measurement of moisture contents in very dry wood (below 10 %) requires extra care as it is very susceptible to interference. During the measurement the result may appear to “float” or “jump”. The source of this interference are electromagnetic charges and electromagnetic fields. Often such measurements are conducted with very low humidity of surrounding atmosphere (below 30 % RH). Such conditions intensify the difficulties.

During the measurement of moisture contents in very dry wood please observe the following rules:

- conduct the measurement away from sources of electromagnetic interference (e.g. away from engines, high voltage wires, walls with stray currents etc.).

- do not move the device.

- do not walk by the device during the measurement.

- use thin needles (nails) as this will assure best possible contact between them and the wood.

- in extremely unfavourable conditions conduct the measurements on a grounded metal board or gauze and use a grounded armband.

7. Storage and batteries

The instrument is equipped with a power level control unit. When the power drops below acceptable level a sign "BAT" appears on the LCD. This indicates that the battery has expired and should be replaced with a new one. To replace the battery unscrew only one screw at the backside of the device furthest from the needles. Replace the battery. Pay attention to the correct polarity.

Store the device in a dry place. Should the device not be used for a period longer than 2 weeks it is recommended to remove the battery before storage.

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NOTE: "This instrument doesn't have ATEX protection, so it should not be used in potentially explosive atmospheres (powder, flammable gases)."