Feuchtigkeitsmessgeräte
Moisture Meter
Humidimètre

PELAN Manual

Pelletsanalyser PELAN

Measuring system für bulk goods for determination of

- materieal moisture with 3 different measuring amplifiers
- specific gravity
- temperature

Controlling with standard PC over wireless bluetooth interface.

Moisture Measuring System Type PELAN

Duly use::

The measuring system PELAN is for qualitativ evaluation of bulk goods. With two capacitive moisture measuring sensors, a balance, a temperature sensor and a temparatur compensated conductance measureng amplifier we get crucial parameters for quality evaluation of the bulk goods.

Measuring Ranage:

capacitive moistuire	0 bis	100 % H_2O
conductance measuring:	5 bis	35 % H_2O
balance:	0 bis	2000 g
temperature measurement:	0 bis	100 °C

The measurement will be done with a special volume, therefore with the measured weight we can calculate the specivic gravity too.

With a vibrator and a weight plate, put on the top, the bulk material is always compressed in the same way.

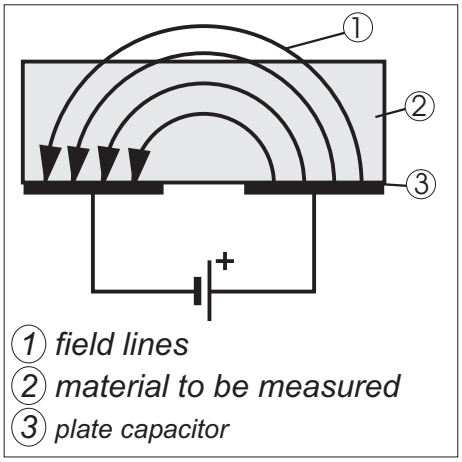
Moisture Measurement:

In the measuring bukket there are two electrodes where

1. with high frequency electrical filelds capacitive moisture values and
2. between the electrodes the electrical resistance of the measured material

can be measured (conductance measuring principle).

A microprocessor receives the measured signals and determines from the measured values the percentage water content taking the material setting in account.



1 *field lines*
2 *material to be measured*
3 *plate capacitor*

Capacitive Measuring Principle:

The meter works in accordance with the principle of an opened plate capacitor. The capacity of the capacitor depends on the dielectric-constant ε_r of the material in between the plates. Compared with air (ε_r= 1) , for example water has a very high dielectric-constant (ε_r = 80). The water content of a wet material can therefore be determined by determining the dielectric-constant of this material.

Conductance Measuring Principle:

With the two electrodes the electrical resistance will be measured. A microcontroller determins the moisture value taking in account the material setting and the measured material temperature.

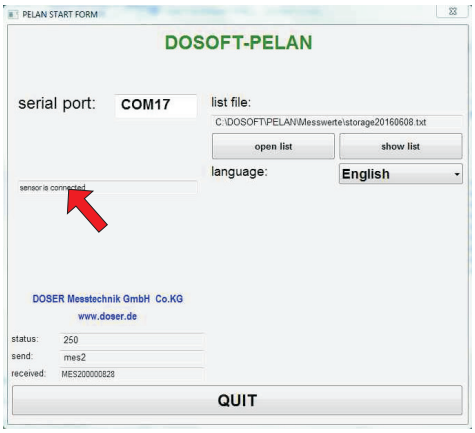
Moisture Measuring System Type PELAN

First Using:

The **PELAN** needs to be connected to a standard PC via Bluetooth. For this a special software needs to be installed. This can be downloaded:

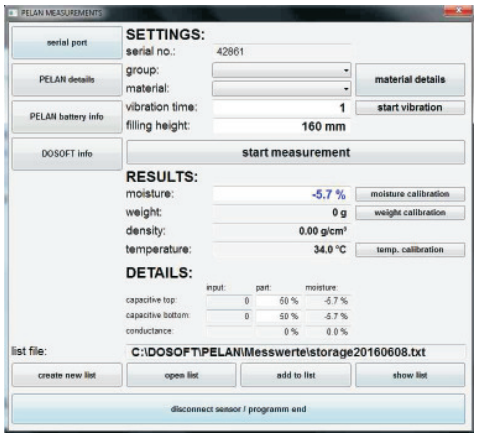
http://www.doser.de/media/software/DOSOFT-PELAN.ZIP

For the PC we added special programmed Bluetooth dongle. You need to put this dongle into an USB connector at the PC. You need to install the driver “usbserial.inf” which is enclosed into the download file. In the device manager you now can see a new COM device. This COM device must be adjusted after starting the DOSOFT-PELAN software at the first time.

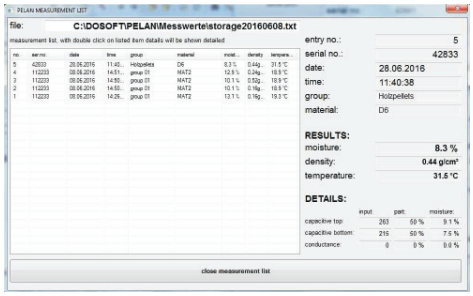


Programstart / PELAN connecting

With the connected Bluetooth dongle the Software DOSOFE-PELAN can be started. You will get a window at the screen similar to the picture nearby. If “COM is open” will be displayed the PELAN can be switched on, it will be connected to the PC, the new window “PELAN-MEASUREMENTS”will be displayed and the first measurements will be started automatically with the last settings. After this measurements are finished, the button “start measurements” will be displayed to be able to make more measurements.



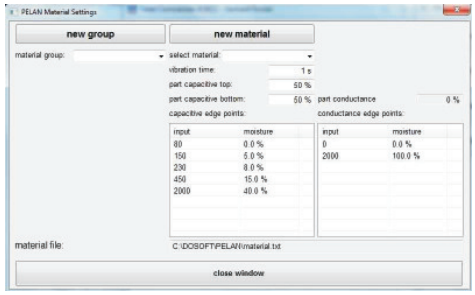
PELAN info:	serial no., type, firmware and the actual battery voltage will be displayed.
PELAN battery-infos:	information about the last battery loading will be displayed. Additional the actual battery voltage will be shown. If this voltage is below 6V the batteries needs to be reloaded.
DOSOFT info:	Informationen about the software and the license will be displayed. You have to admit the shown conditions, otherwise it is not allowed to use the software.
group:	one of the implemented group can be selected
material:	one of the implemented material can be selected
material details:	details about the selected material will be shown, Details can be changed and new groups and materials can be programmed.
moisture:	the moistre result from the last measurement
moisture calibration:	with the optional calibration module, basic calibrations at the moisture measuring amplifiers can be done
weight:	weight value of the bulk goods from the last measurement
weight calibration:	the balance can be calibrated with a known weight module
temperature:	temperature value of the bulk goods from the last measurement
temperatur calibration:	calibration of the temperature measurement
details:	internal results of the moisture amplifiers and the part of them for the moisture calculation
start vibration:	the vibration for compressing will start and will take as long as the shown value for vibration time. For thsi procedure the heavy cover can be put on to the material



filling height:	filling height for calculating the specivic gravity
start measurements:	Pelan makes new measurensts and will send the results
list file:	opend file for storing measured data
create new list:	a new list file will be created
open list:	an existing list will be opend for displaying or for adding new measurement data.
add to list:	the actual data will be added to the open list.
show list:	the stored measurement will be shown as a list; alternatively the stored data can be read with Excel too.:
disconnect sensor:	The connection to the PELAN will be canceled, the PELAN will switch off automatically and the software ends.

Measurement Process:

- the measurement bukket has to be filled completely with the bulk goods, then the PELAN has to be connected to the PC, the first measurements will start automatically and the results will be displayed after a few seconds
- for temperature measurements the bulk goods have to stay in the bukket for at least 1 minute, then start a new measurement
- for weight measurements the weight plate has to be removed befor starting the measurement and for calculating the specific gravity the filling height can be corrected if the bukket is not filled completely
- after the measurement, do not remove the bukket for emptying it, tip it over together with the PELAN instrument.
- for cleaning the bukket and for calibration measurements the bukket can be removed from the pellan (bayonet catch)



PELAN Materialsetting (Materialdetails):

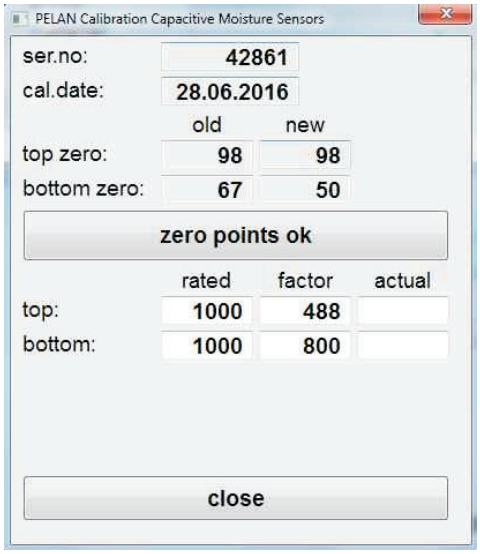
new group:	a new material group will be created, the name will be copied in all languages, this names can then be changed afterwards in to different languages
new material:	a new material will be created, the name will be copied in all languages, this names can then be changed afterwards in to different languages
material group:	the wished material group can be selected from a list, the name can be changed
material:	the wished material group can be selected from a list, the name can be changed
vibration time:	for the selected material the vibration time in seconds can be nominated
part capacitive top:	part of the bottom capacitive sensor for moisture calculation
part capacitive bottom:	part of the top capacitive sensor for moisture calculation
part conductance:	part of the conductance measurement for moisture calculation, will be calculated automatically: 100% - (capacitive top + capacitive bottom)

capacitive edge points: table with the calibration curve for the capacitive moisture measurement, measurement values will be correlated to moisture values

conductance edge points: table with the calibration curve for the conductive moisture measurement, measurement values will be correlated to moisture values

material file: file where the material data are stored

close: window “Material Setting” will be closed



Calibration of the capacitive moisture meaurement

For the calibration, the sensor has to be clean and dry, the bukket has to be removed!

top zero: zero point of the top capacitive sensor

bottom zero: zero point of the bottoim capacitive sensor

zero points ok: with click on it, the new zero points will be accepted, the window will change
“zero points ok” will be hidden, other buttons will be shown

rated value: rated value of the top and bottom capacitive sensor

factor: calibration faktors for the top and bottom capacitive sensor

actual value: actual values of the capacitive sensors

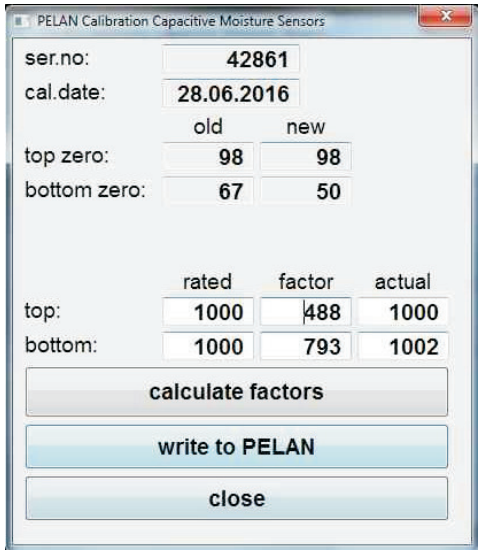
top: values for the top capacitive sensor

bottom: values for the bottom capacitive sensor

calculate factors: with rated and actual values the new calibration factors will be calculated, these factors can be changed manually too.

write to PELAN: new zero point values and factors will be sent to the PELAN

close: the calibration window will be closed



Calibration of Conductnace Moisture Measurement

The calibration of the conductance measurement is only possible through the manufacturer. For testing the calibration, an optional LM-Testbox is available.

Balance Calibration

For the calibration of the balance the bukket has to be mounted, additional the sensor and the bukket has to be clean and dry.

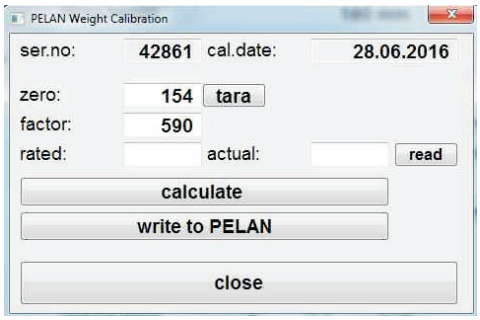
zero: with the button “tara” the weight is measured and stored as as zero value

rated: the known weight of the test weight has to be put in here

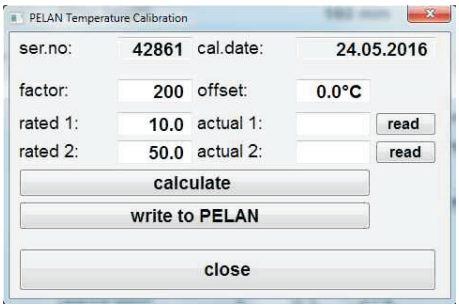
read: the actual value is measured and stored

calculate: the calibration factor will be calculated

write to PELAN: the new calibration values will be sent to the PELAN.



Calibration of the temperature measurement:



The temperature calibration is done with two points. 2 rated values can be put in, the actual values can be measured or can be edited.

read:	the temperature is measuren and stored to the die corresponding actual value
calculate:	the new calibration factor and offset will be determmined
write to PELAN:	the new calibration date will be sent to PELAN

Customer Specific Calobration for Moisture Measurement :

For the optimised determination of moisture, we suggest using customer specific calibration curves, they have to be determined for each material with test measurements as accurate as possible.
If there are no calibration date for the actual material available, as an option, probes can be send to us for determining the optimised calibration curve in our lab.

The results of our moisture senors can be influences through different density, tempertaure, dimmension of the pellets, different mixtures and also through different surface conditions.

Oven Drying Method:

The oven drying method is the most accurate way to measure the material moisture in materials.

We recommend this for testing and calibrating of all electronic moisture measuring systems.

Short description:

1. For measuring the weights we recommend a balance with a measuring range of 200g and an accuracy of 0,01g
2. For drying you need an oven with adjustable temperatures of 40, 102, 104 and 105°C
3. The probe should be at least 50g
4. It is very important to take the weight of the first probe immediately, as air humidity may change the moisture content. Name of the first weight: wet weight (WW)
5. The probe must be dryed in the oven until the weight is constant.
   The drying temperatures:

wood moisture:	104 °C	(ISO 3130-1975)
paper, cardboard:	105 °C	(DIN EN 20287)
building materials	40 - 105 °C	(DIN EN ISO 12570)
feed, pellets	103 - 105 °C	(Weender Analysis)
leather	102 °C	(DIN 53340)

6. the weight of the dry probe is DW

wood (DIN 52183)

$$\text{moisture} = \frac{(WW - DW)}{DW} * 100\ \%$$

paper and cardboard
building materials
feed, pellets, wooden chips:

$$\text{moisture} = \frac{(WW - DW)}{WW} * 100\ \%$$

Moisture Measuring System Type PELAN

Technical Data:

dimmension:	160 x 190 x 220 mm (with bukket)
weight:	1,7 kg (without bukket) 3,9 kg (with bukket)
moisture measuring range:	0 - 100%
weight measuring range:	0 - 2 kg
temp. measuring range:	0 - 70 °C
bukket volume:	2,78 l
storage temperature:	-20 - 70 °C
working temperature:	5 - 70 °C

Batteries:

The PELAN is working with 4 batteries type AA (Mignon)
The loading electronic is optimised for recharable NiZn batteries.
The loading current is 200 mA.
After 10 hours the loading is stopped, also if the loading voltage has not reached the battery loading maximum voltage.
The PELAN only should be used with minimum battery voltage of 5V!
Alternatively the PELAN also works with alkaline batteries.

Attention!

In accordance with battery legislation, all used batteries must be disposed off in special battery collecting bins.

The disposal of old or used batteries as part of normal waste is not allowed!

Optional Extras:

- manufacturer certificates
- test modul PELAN-TM for calibrating the capacitive moisture sensors
- LM-Testbox for testing the conductance amplifier
- customer specific calibrations
- extra recharchable batteries Ni-Zn, 1,6V, 2500 mWh
- extra charger for 4 NiZn Batteries

safety tips:

- follow the operating instructions
- only use the instrument as directed (see page 1)
- keep the instrument away from live and current electrical parts
- avoid impacts
- protect the instrument from heat
- protect the instrument from condensing water, the dew point must not be touched, condensing water is influencing the measurement and the electronic can be damaged!
- keep the instrument dry and try to prevent dirt from entering the case
- protect the instrument from electrostatic discharge
- the instrument must only be repaired and serviced by qualified specialists

Damages caused by failure to follow the above safety tips are not covered by the warranty !