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Messtechnik



Moisture Meter for Plastics

AQUATRAC+

Brabender Messtechnik
GmbH & Co. KG

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The water content of High-Tech plastic material has a great influence on the quality of the finished product. The test could be made swiftly on an instrument having a simple test procedure.

The **AQUATRAC+** is a moisture meter for use with solid products in granular form and is designed to meet requirements of the plastic processing industry. It detects water content down to 0.0005%. It is robust and portable thus being suitable for shop floor use. As the principle of operation is an absolute chemical method, no calibration is required for each different substance tested.

The used sample weight is fairly high and is therefore representative of the batch being tested.

Ranges

With the **AQUATRAC+** different ranges are obtained by different sample weights. To always provide the same gas volume the sample weight depends on the density of the substance. Three sample containers A, B and C are provided. The density is the specific weight of the compact material, not the bulk density.

The possible ranges are shown in the tabulation.

| density g/cm ³ | sample container A | | sample container B | | sample container C | |
|------------------------------|--------------------|--|--------------------|--|--|--|
| | weight g ±1g | range % H ₂ O _{max} | weight g ±0,5g | range % H ₂ O _{max} | weight g | range % H ₂ O _{max} |
| 0,8 | 32 | 0,125 | 10 | 0,4 | independent of density e.g. 1 2 4 | 4 2 1 |
| 1,0 | 40 | 0,100 | | | | |
| 1,2 | 48 | 0,083 | | | | |
| 1,4 | 56 | 0,071 | 15 | 0,27 | | |
| 1,6 | 64 | 0,063 | | | | |
| 1,8 | 72 | 0,056 | | | | |
| 2,0 | 80 | 0,050 | 20 | 0,2 | | |
| 2,2 | 88 | 0,045 | | | | |
| 2,4 | 96 | 0,042 | | | | |

Ranges

Construction

The measuring volume consists mainly of the sample container, which contains the sample and the reagent. To cover as many ranges as possible, there are three sample containers A, B and C each with different volumes. They consist of hardened stainless steel. Weighing the sample there is no need to meet the exact value required in the tabulation, the actual weight is fed into the instrument. This simplifies the handling. The sample is placed into a sample container which is then evacuated by the built-in vacuum pump, which takes approximately 20 sec. The pressure obtained is displayed and is lower than 10mbar. The sample container is then heated up to the selected temperature (between 80°C to 200°C). The program flow runs processor-controlled.

The few steps for a measurement are given by a multilingual, menu-driven application program and are shown on the LCD display.

At the outlet of the container other volatiles than water are condensed in a cooling trap, hence not influencing the reading. The gas pressure is monitored by means of a piezoelectric transducer. The obtained electric signal is calculated with sample weight and temperature to obtain a result in % water content. An audible alarm indicates the end of a test.

Measuring Principle

Water and calcium hydride react according to the following equation, producing hydrogen:



This reaction takes place in a sealed reaction vessel. It is evacuated by using a built-in vacuum pump before the test. The container is then heated up to the measuring temperature. The evaporating water reacts with the reagent calcium hydride to generate a gas. The gas produced is hydrogen; the gas pressure is proportional to the water content in the sample and is monitored by means of a piezoelectric transducer.

Volatiles other than water do not react with the reagent and will condense, hence not influencing the reading.

The reagent is placed in a mesh based insert above the sample. The partial pressure in the gas system is zero; therefore the water content is selected completely. This, in combination with the heat applied and the vacuum, means results are obtained in a short time. Furthermore the test is not affected by the presence of oxygen and no carrier gas is needed.

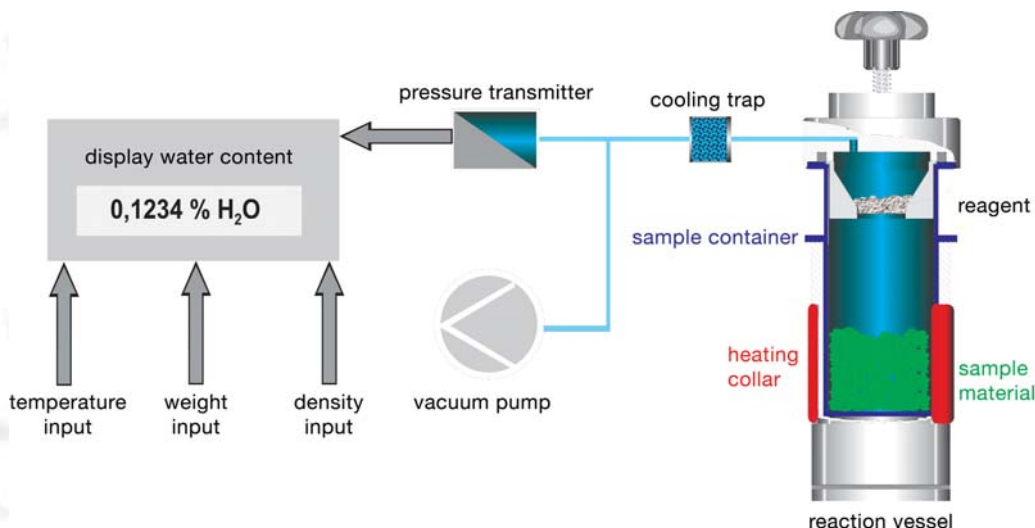
Reagent

The reagent is calcium hydride in a granular form and is specific to water. It is non-polluting and non-toxic, so no special disposal is required. By using the dosing spoon, the mesh based insert has to be filled with a certain amount of the reagent. The quantity of one filling is sufficient material for a couple of measurements and the amount of produced hydrogen by each measurement is rather low. The calcium hydride can be supplied in quantities of 250 g, which is sufficient for approx. 500 tests.

Outlets

The **AQUATRAC+** has a built-in printer for the documentation of the measurements. Different modes like prints in intervals or just end value could be selected. The printer could be switched off, too.

By the serial data port RS 232 the measurement results could be transmit to a connected PC, but a computer is not necessary to run the **AQUATRAC+**.



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Software

Data storage

To save the results of measurements or make an analysis later, the **AQUATRAC+** could be connected with a PC.

The software will give a curve (water content in % H₂O over the time) and additionally the different measurement points of each measurement are stored in a table. In combination with the data stored on the **AQUATRAC+** a database would be generated. This database allows an access on each measuring parameter anytime.

Applications

Some typical plastics

Acrylonitrile butadiene styrene ABS
 Acrylonitrile butadiene styrene /
 Polycarb. ABS/PC
 Ethylene Copolymer EVA
 Polyacryletherketone PAEK
 Polyamide 6.6 PA 6.6
 Polyamide 6 PA 6 GF 30
 Polyamide 12 PA 12
 Polycarbonate PC
 Polyester PET
 Polyester elastomer IPE
 Polyester imide PEI
 Polyethyleneterephtalat PETP
 Polymer blend PETP/PC
 Polymethylmethacrylate PMMA
 Polyphenylene ether PPE
 Polyphenylene sulphide PPS
 Polysulphone PSU
 Polyurethane TPU

Technical data

| | |
|----------------------|--|
| Measuring principle: | Chemical reaction with calcium hydride |
| Ranges: | 0 ... 0,1 % 0 ... 0,4 % 0 ... 1,0 % 0 ... 4,0 % |
| Accuracy: | Measurement accuracy ± 2% of reading ± 1% of range Reproducibility approx. ± 1% of range |
| Sample weight: | 1 ... 96 g according to range |
| Test temperature: | 80 °C – 200 °C in 1°C - steps |
| Test time: | 15 ... 30 min. depent on material |
| Display: | % H ₂ O |
| Measures: | b x h x t: 43 x 32,5 x 39 cm |
| Weight: | 13,6 kg |
| Power supply: | 100 V (50/60 Hz, 400 W) 200 V (50/60 Hz, 400 W) 230 V (50/60 Hz, 400 W) |

Brabender Messtechnik GmbH & Co. KG

Am Kiekenbusch 10
D- 47269 Duisburg

Tel.: +49 203 99819-0
Fax: +49 203 9981922

www.brabender-mt.de
sales@brabender-mt.de

brabender Messtechnik