

Summary

In the doctoral dissertation, a project was carried out and a prototype of a pendulum measuring device was built, which is used in research on determining the hardness of paint coatings by the pendulum damping method according to ISO 1522:2006 (2008) standard. The design and construction of the pendulum device expanded the research described in the standard to include the possibility of simulating variable atmospheric conditions surrounding the sample, with particular emphasis on temperature changes. Analyzing the standard, one can find information regarding the technique of conducting research, which assumes that they will be carried out at an ambient temperature of 23 °C (± 2 °C) and relative humidity at the level of 50% ($\pm 5\%$). Based on this information, it can be concluded that paints and varnishes subjected to testing in accordance with the ISO 1522:2006 standard are tested only under constant (laboratory) environmental conditions. Such conditions do not reflect the real adverse effects of the environment on paint coatings. In the case of using digital measuring devices, it can be assumed that the obtained results and the preparation of the device for measurement will be carried out with greater accuracy and certainly the algorithm implemented in the microprocessor memory will perform measurements with greater repeatability, ensuring the reliability and quality of the measurements carried out. With the proposed modification of the device, it will be possible to obtain a significant improvement in the repeatability of the measurement when electronically setting the angle and measuring it. The regulation of changes in ambient temperature will be based on the latest technologies available on the market based on the use of Peltier cells allowing for positive and negative temperatures. Conducting research at temperatures lower than ambient temperature will require controlling the dew point and thus stabilizing the humidity level in the measurement chamber. Expanding the research to include the impact of temperature can be applied to paints/lacquers used by manufacturers of vehicles (land, water, and air) as well as all kinds of products subject to varying weather conditions. Thanks to the aforementioned measuring chamber, it is possible to simulate different environmental conditions.