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Issue 35

In This Issue

Increasing Efficiency in Knoop and Vickers Testing

Two of the most common hardness tests are Knoop and Vickers that are used in micro and macro testing. These tests determine the material hardness based on measuring the size of a diamond-shaped impression from an application of a force. The nature of the test process typically dictates a relatively light force application, resulting in extremely small impressions that must be manually measured. Traditional techniques involve the use of microscopes with objective lenses to manually measure through an eyepiece. This is a time-consuming, subjective, and potentially error-filled process. It's not uncommon for a technician to manually produce and measure hundreds of indentations during a day – which means that operator fatigue could compromise the measurements.

During the past several years, automated processes have become a more popular technique. What used to take 25 minutes to test manually now takes 5 minutes to test with an automatic tester. Newer technology eliminates much of the hardware that created operational challenges and cluttered workspaces. It typically consists of:

- Automatic rotating turret
- Actuation in the Z axis for applying the indentation and for automatic focusing of the specimen
- Automatic XY traversing motorized stage and USB video camera integrated to the test frame
- Stage movement through a virtual joystick or stage controllers

Together, these produce a fully-automated hardness testing system. When loaded with samples and a stored program, it can be left alone to automatically make, measure, and report on an almost a limitless amount of indentation traverses.

"Using an automated tester is very useful. The biggest benefit to our lab is the amount of time it saves us. What used to take us 1.5 weeks to test now takes us 2.5 days. Automated testing allows for less human error and frees up time for the operator to do other jobs. Plus, it saves us money."

– Dipak Patel, Prudential Steel

Best Practices: Which Rockwell Scale to Use

Rockwell hardness values are a combination of a hardness number and a scale symbol representing the indenter and the minor and major loads. The symbol HR and the scale designation represent the hardness number. The combination of indenter and test force make up the Rockwell scale. These various combinations make up 30 different scales and are expressed as the actual hardness number followed by the letters HR and then the respective scale. A recorded hardness number of HRC 63 signifies a hardness of 63 on the Rockwell C Scale. Higher values and Rockwell scales indicate harder materials, such as hardened steel or tungsten carbide.

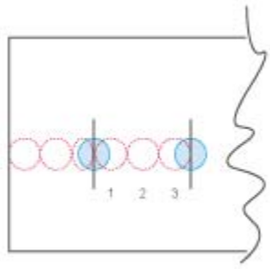
The majority of applications are covered by the Rockwell B and C Scales for testing steel, brass, and other metals. However, the increasing use of other materials requires a basic knowledge of the factors that must be considered in choosing the correct scale. The choice is between the regular and superficial hardness tests (a lighter, 3 kg minor load test), and the diamond and various carbide ball indenters

The operator relies on the engineering specifications that are established at the material design. If no specification exists or there is doubt about the suitability of a predetermined scale, refer to our Best Practices article published in **Industrial Heating Magazine**.

Request a Hardness Wall Chart

Q: How far apart should I space each Rockwell hardness test

A: Indent spacing is a common concern during specimen testing or coupon block verification. The purpose for these distances is to ensure that any new indentation is not influenced by work hardening of the materials' edge or material around a previous indentation. The accepted criteria are that the distance from the center of any indentation should be at least three times the diameter of the indentation. The distance from material edge to the center of any indentation should be at least two and one-half times the diameter of the indentation. Also, the edge distance requirement ensures that the indentation's area of contact permits proper support.



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