Instron® TechNotes

Getting the most up-to-date information on materials testing

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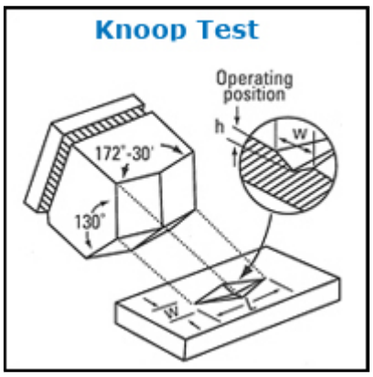
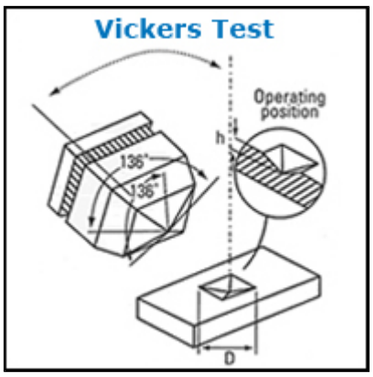
Tech Tip

The Difference Between a Knoop and a Vickers Test

Knoop and Vickers tests are used in micro and macro hardness testing to determine material hardness. It is based on measuring the impression from an application of a force.



The **Knoop test** uses a diamond indenter ground to pyramidal form that produces a diamond shaped indentation with an approximate ratio between long and short diagonals of 7:1. The depth of indentation is about 1/30 of its length. When measuring the Knoop hardness, only the longest diagonal of the indentation is measured. Originally the Knoop Hardness Number (KHN) was calculated by using this length and load in a formula. Then, look-up tables became a popular source to find the KHN. Currently, most KHN results are generated by digital measurement that automatically calculates the hardness number.

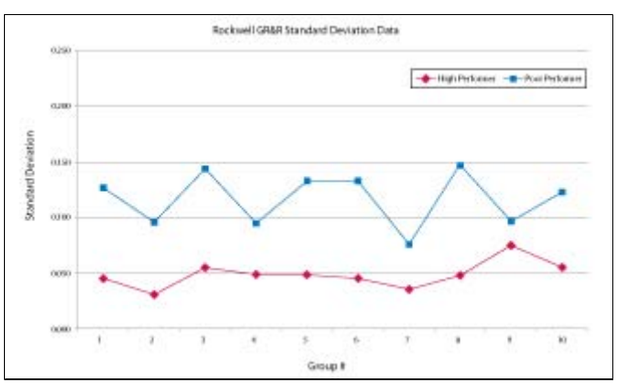


The **Vickers test** uses a ground squared pyramid. The depth of the indentation is about 1/7 of the diagonal length. Unlike the Knoop test, when calculating the Vickers Diamond Pyramid hardness number, both diagonals of the indentation are measured. The mean of these values used in a formula with the load determines the Hardness Vickers value (HV). Similar to the Knoop test, tables of these values are available, and the most current techniques utilize electronic or imaging measurements.

When choosing a test type you need to review the material, surface finish, geometry, thickness, uniformity and other characteristics. To learn more, visit our Knoop & Vickers web page.

Tech Tip

How GR&R Helps Your Rockwell Testing Process



A GR&R study determines how much of the tolerance in your testing process comes from the variation in the equipment and the operators. When operator error or equipment error becomes a significant portion of the tolerance, it's hard to determine if the results are accurately measured.

Performing GR&R reveals a lot about how well your system is reading Rockwell hardness; provides insight to potential problems; and determines if you need additional testing, such as direct verification.

A study conducted on 30 testers used daily showed that 90% failed a direct verification even though they passed an indirect verification using test blocks. These testers consume most of the allowable tolerances. Adjustments using test block verification do not accurately characterize an instrument's performance.

A full GR&R study involves multiple operators performing 90 tests using Rockwell test blocks. The calculated results reveal the inaccuracy of the tester. Acceptable GR&R values vary depending on the tester type (analog, digital, closed loop), as well as the quality, condition, and calibration status of the tester.

Contact us for more information on GR&R.

You Asked - We Answered

Q: What is a jominy test?

A: A jominy test is a method for determining the hardenability of steel. A test piece that typically measures 25 mm x 100 mm is heated to a pre-determined temperature and quenched by a jet of water sprayed onto one end. When the specimen is cold, hardness measurements using the Rockwell HRC scale (10 kg minor and 150 Kg major forces) are made at specific intervals along the test piece from the quenched end. Test results are then plotted on a standard chart. Hardness values are the highest at the quenched end of the specimen. You should find that the values decrease proportionally as you move to the other end.

We have found that using holding fixtures improves the accuracy of our results. We recommend using automatic software and stages to increase throughput. This setup accommodates from one to several bars at once, and performs the tests at pre-programmed intervals, while automatically plotting the data.

What do you think? Tell us!

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