MISTRAS
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Products & Systems Division

Application Brief

M100A Metal Inspector: Cracks & Defects

The Model 100A Metal Inspector uses resistivity, a basic principle of electronics - to help detect, characterize, or describe cracks and other defects in metal. Once detected, most flaws can be quickly and easily .sized up. by the Model 100 The Model 100 can evaluate both surface and subsurface flaws, making it a practical adjunct to other testing methods or a fast, reliable alternative.

Defects Product Different Readings

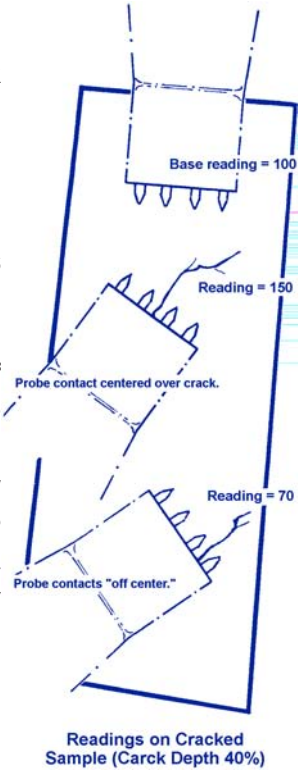
The Metal Inspector pulses a rapidly reversing direct current into metal through a 4-point probe and measures its resistivity. This is called the base reading. Because voids, cracks, slag inclusions and other defects are electrically nonconductive, they cause a change in resistivity. If the inner probe contacts are centered over the crack/defect, a higher resistivity reading will result. If the probe contacts are .off-center . (meaning the outermost contacts are bridging the defect), a lower resistivity will result. In either case, the new resistivity readings will be significantly different than the base reading.

Sizing a Crack

Here's one way to evaluate a crack using resistivity:

(1) Place the Metal Inspector probe in an area of the part away from the crack, and take a reading. This is your base reading.

(2) Locate the fault visually if possible. Place the inner probe contacts across the fault line and take a reading. A higher resistivity will be measured. If you bridge the crack with the outermost contact, it will produce a reading lower than your base reading.



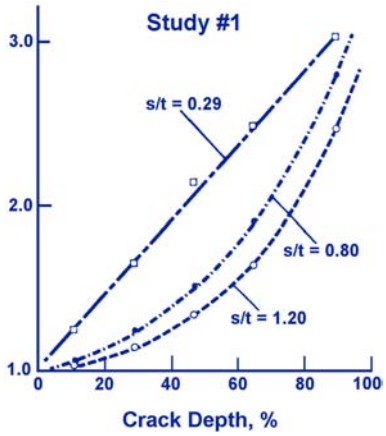
Readings on Cracked Sample (Carck Depth 40%)

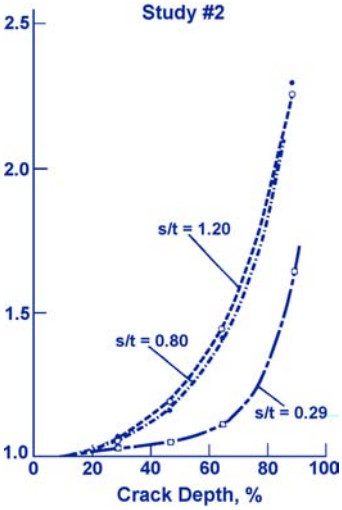
(3) Move the probe along the fault line in both directions and take more readings. Test until the highest reading occurs. This is the area where the crack is deepest. (Note: If you bridge the crack with the outermost contacts, your lowest reading will occur here.

4) Note when you finally take a reading that is approximately equal to your base reading (within 3%). This means you are no longer over the flaw: the probe is back on sound metal.

How Resistivity Rises as Cracks Deepen

The graphs on this page show how the resistivity measured over a visible crack in a metal sample (Rc) increased over the resistivity of the base metal (Rm) as the crack deepened. Study #1 was performed with the Model 100 inner probes over an exposed crack. Study #2 was made on the opposite side of the sample, simulating a hidden crack.





These curves are independent of material type. They depend on probe spacing (s) and material thickness (t). The s/t ratio determines the sensitivity of the Metal Inspector measurements.

If your results are erratic, perform another correlation study using a different probe cartridge, or call for assistance at 609-716-4000, fax: (609) 716-0706, or e-mail us at sales.systems@mistrasgroup.com.

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