



High Temperature ACFM® Inspections

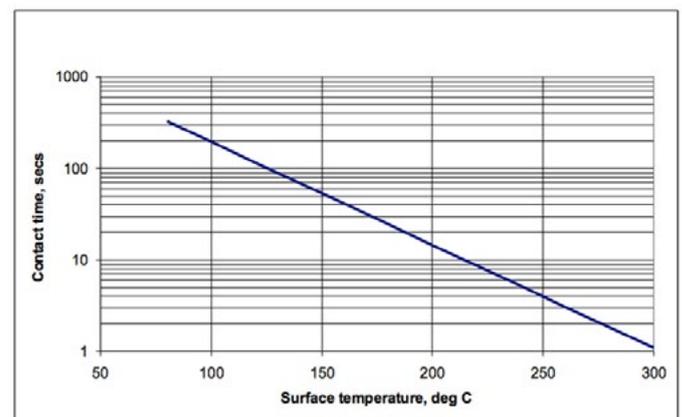
The ability to inspect at elevated temperatures can provide significant cost savings by avoiding plant shut down, additionally avoiding any problems of cracks closing up when structures are cooled down.

By using special temperature resistant components, ACFM® probes can be designed to inspect at temperatures of 500°C (930°F) or more for long periods. Even standard ACFM® probes can be used at high temperatures for short periods because of the ceramic noses used to house the sense coils.

Examples of the use of ACFM® for high temperature inspection include:

- Inspection of hot pipework in petrochemical plant.
- Monitoring of defect-prone sites under lagging by permanently installed high temperature array probes.
- Interpass inspection during welding without having to allow each bead to cool down and then be reheated.

Standard ACFM® AMIGO™ probes can be used to inspect high temperature components as long as the internal temperature of the probe does not exceed around 80°C (175°F). The ceramic noses on standard probes help insulate the sensor coils, giving protection for short periods. This protection is improved slightly by the ceramic paste used to surround the coils in TSC's elevated temperature probes. Using this feature, standard probes can be used to inspect surfaces at 200-300°C (400-570°F) as long as the contact time for each scan is kept to a few seconds, and the probe is allowed to cool down in between scans (see graph to right).



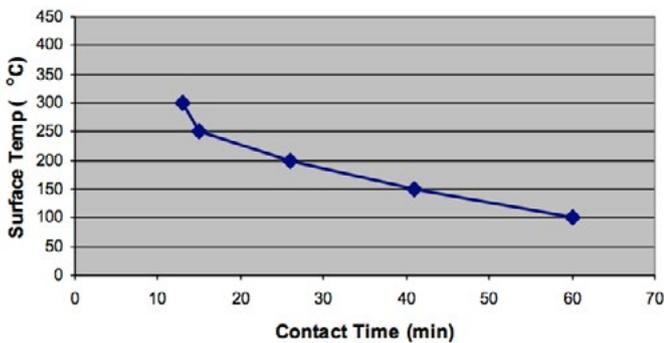
Contact times for standard Elevated Temperature ACFM probes

Probes designed for underwater use (where electronics are not housed in the probe body) can be used for continuous inspections at temperatures up to 120°C (250°F), as long as the probe cable is not in contact with the hot surface.

For very high temperature inspection, TSC can manufacture special-purpose ACFM® probes using sensors made from heat-resistant insulated nickel wire which can be used on surfaces up to about 500°C (930°F). Users should be aware, however, that the thicker wire used means that sensitivity to shallow or short defects is reduced. In ferrous steel, the minimum defect reliably detected is approximately 10mm long by 2mm deep, but defects down to 1mm deep can be detected when the inspection surface is smooth.

It should be noted that there is a small variation (of the order of 15%) in depth sizing results versus probe temperature. For consistency, all high temperature probes are set up at TSC to give accurate sizing at room temperature. Therefore, once a defect has been detected using a high temperature probe, the probe should be allowed to cool down before taking a quick scan of the defect for sizing purposes.

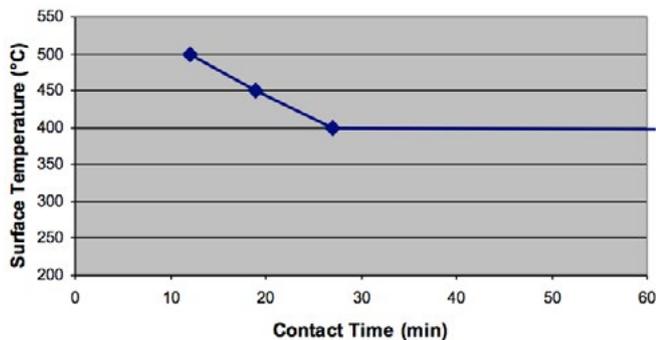
Two basic types of high temperature probe are available - with or without forced air cooling. For access into tight geometries, the small size of the probe head means that there is no room for a coolant path. In this design, the maximum continuous contact temperature is limited to the 80°C that the internal electronics can withstand. However, the probe nose can withstand high temperatures for several minutes (see graph below).



Contact times for high temperature probe with no coolant

Where access is not restricted, a weld-type probe can be used. This not only allows forced air-cooling to be incorporated, but also is much more stable to deploy.

With forced air-cooling, the maximum continuous contact temperature is much higher, but dependent on flow rates. At 10 litres/min with air at 20°C, this temperature is 400°C (see graph below).



Contact times for high temperature probe with 10litres/min 20°C forced air coolant

N.B. All figures given in this datasheet are for guidance only. Unless otherwise specified, ACFM® probes are not designed to be used at high temperatures and their tolerance may vary from the values given here.



Above: High temperature right angle pencil probe for tight access applications.



Above & Below: High temperature weld probe with forced air cooling for increased contact times.



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