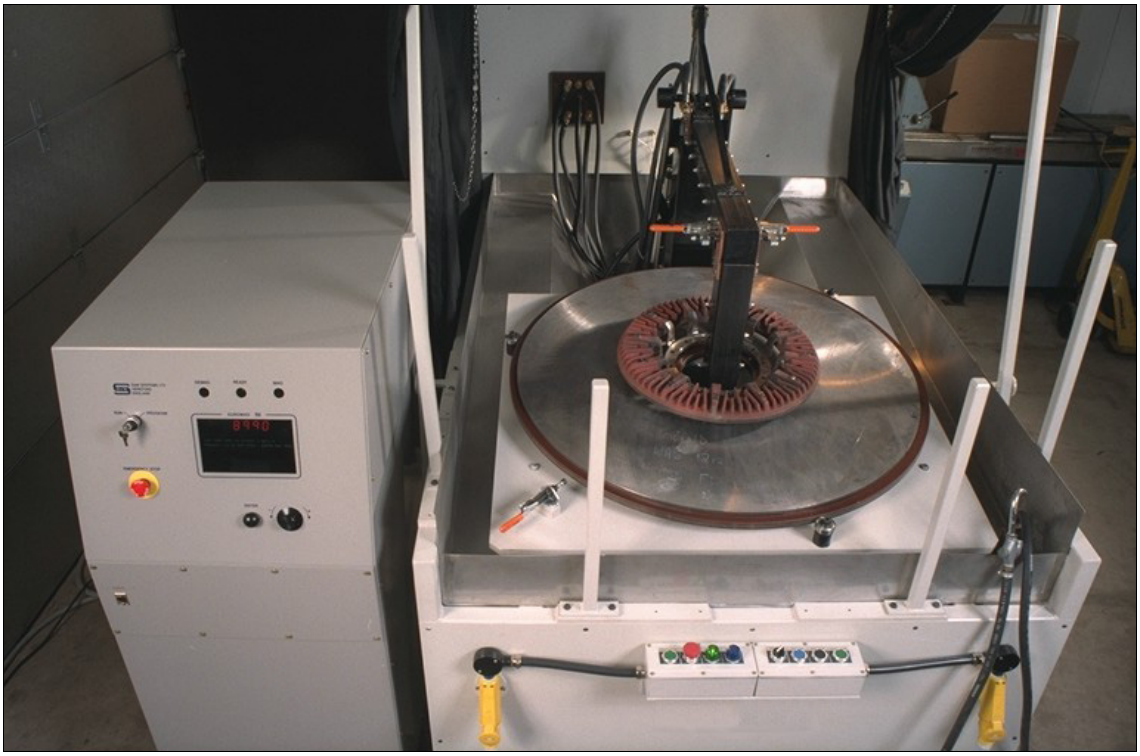
NON CONTACT MAGNETIC PARTICLE INSPECTION OF DISCS



This equipment is for the magnetic particle inspection of disc shaped components in a single non-contact magnetizing shot. This is achieved using a threader bar which is a composite of iron laminations and a copper conductor. Therefore it is necessary that the disc have a central hole large enough for the threader bar to pass through. See the reverse of this brochure.

Non contact magnetising techniques.

Maximum diameter of disc 1100mm.

Circular, radial and longitudinal magnetising.

Multi-Directional magnetising using a central conductor and induced current magnetising.

Rotary turntable for easy of inspection.

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For disc shaped parts encircling coil magnetisation will not reveal circumferential flaws on the edges or sections of the part not longitudinal. The common method of magnetising such an area is by direct contact magnetising by current flow across the diameter of the part with generally a number of shots at different positions. However, a more efficient method is the induced current method in which current is induced to run round the circular part by a laminated yoke threader bar system energised by an AC coil around one limb of the yoke.

This technique is also referred to as the transformer technique since the component being magnetised forms a single shorted secondary turn of a transformer with the energising coil being the primary and conduction of the flux by means of the laminated iron yoke. Obviously this operates more efficiently with AC applied to the primary - the laminations preventing significant losses by eddy currents - though half wave rectified DC may function adequately.

The current flowing around the component induces a magnetic flux perpendicular to the current which is toroidal. Thus any discontinuities on the edge of the material, sections near parallel to the ends and along the longitudinal surface will be indicated.

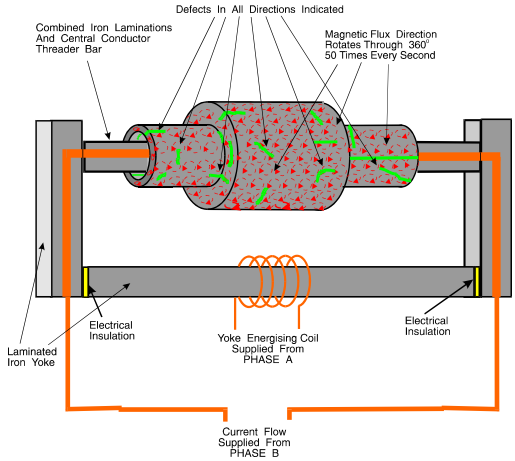
Whilst the induced current method of MPI is not in common usage the magnetisation in the circular direction, using a central conductor in the search for longitudinal and radial defects is of course a standard non contact technique.

In this method a conductor (or conductors) carrying high amperage current is passed through the central hole which induces a circular magnetic field in the component to reveal radial and longitudinal defects.

It is possible to combine the above two methods- induced current and central conductor - into a single magnetising process without contact and which requires only one shot to detect all defects regardless of their direction on the surface.
Multi-directional magnetising using the rotating field system is ideal for subjects with central holes. In the rotating field system two perpendicular magnetic fields are imposed on the piece in such a manner that the resultant single direction vector changes angle with time. If the two primary fields are derived from different phases of a 3 phase mains supply the field will be perpendicular to any defect 120 times per second, sufficient to attract particles to the discontinuity edges.

In practical terms a magnetising arrangement is shown. The threader bar is a composite of iron lamination and copper conductor as shown. Since the laminations are conductors it is important that there is insulation between the copper conductor and the lamination. Further to prevent recirculation currents there is insulation between the limbs.

This technique is admirably suited to aero-engine discs. The upper limb of the yoke is hinged to allow loading of the disc on to the supporting platen. After loading the upper limb is lowered and locked to ensure good contact between the split turns of the two turns control conductor. The whole system is tilted to permit drainage of the fluid off the disc.



The photograph on the front of this brochure is of a typical machine for testing railway brake discs. These applications are manual but there is no reason why the system should not be applied to automatic systems.

Mechanical Handling Systems

A range of mechanical systems are available for different product diameter ranges and central hole sizes.

The following features are available:

- Component vertically or horizontally held during the magnetizing cycle.
- Automatic inking of the component prior to and during part of the magnetizing cycle.
- A fully automatic system complete with conveyor for the component to be tested.

In addition to this standard system we offer a custom design solution to meet our customer's exact requirement.