Surtest magnetic flux indicator strips are widely used to indicate the presence of induced magnetic fields during the magnetic particle inspection method for inspection of ferromagnetic materials. Flux Indicators give evidence of an external field in the air above the magnetised surface and in some circumstances can be used to obtain a semi-qualitative estimate of the tangential field strength $H$.

Type 1 indicators are typically used for general engineering applications and Type 11 are used for aerospace applications. Both types consist of three laminations measuring 50x12 mm which are fixed together to form a sandwich structure which is nominally 0.15 mm thick. The outer lamination has 3 interruptions which are parallel to the long side. The width of these interruptions and the material of the outer laminations means that Type 1 indicators respond to a weaker field than Type 11 strips. Both types are protected by a polymeric layer and can be differentiated by the Roman numeral next to the Ely logo.

Flux Indicators have the advantage of being flexible enough so that they can be bent to fit the contours of a workpiece, but robust enough to enable them to be used many times. They may also be cut into smaller pieces to allow them to be fixed in recesses and otherwise inaccessible locations on the workpiece.

**METHOD OF USE**

Attach one flux indicator to a vertical surface of the workpiece under test so that it’s length is at right angles to the direction of the applied current and attach a second at right angles to the first. Magnetise the workpiece by the use of the same electric current wave form as will be used for the inspection and by the same technique.

The magnetisation time will vary according to the self inductance of the workpiece, but should not be less than 3 seconds.

While the workpiece is being magnetised apply magnetic particles. It is essential that the application of magnetic particles stops before the end of magnetisation.
**PRINCIPLE**

All simple flux indicators rely on the fact that when an induced magnetic field $B$ in a ferromagnetic material is interrupted by a non-ferromagnetic material there is a flux leakage. When magnetic particles are applied to such a device during magnetisation then visible indications will be formed provided that the directions of the interruptions are not parallel to that of the induced magnetic field. In order to make practical use of this simulation of the magnetic particle inspection process, the material containing the interruptions is covered by an entire piece of material.

Ely flux strips are ideal for confirming that an induced field exists across the surface of the workpiece as well as indicating the direction of that field. Estimates of the field strength $H$ can only be made when the workpiece is magnetised by electrical contact. When any method of magnetisation which uses a magnetic field induced in the air around the workpiece is used, no estimate of field strength can be made since the flux indicator will respond to airborne flux whether a ferromagnetic body is present or not. This excludes the possibility of estimating field strength when any of the following methods of magnetisation are used:

- Encircling coil, magnetic flow, yoke magnetisation, induced current, central conductor, adjacent cable, permanent magnet.

The design of the Surtest Flux Indicators allows estimates of the field strength to be made when workpieces are magnetised by use of alternating current (AC) at 50 or 60 Hz.

**INTERPRETATION**

The direction of the induced magnetic field is seen readily from the response of the flux indicators. If one indicator shows indications and the other none, the induced magnetic field is in the direction parallel to the indicator showing no indications. If both flux strips show indications this shows that the direction of the induced magnetic field is at an angle of between 30 and 60 degrees to them. The exact direction can be checked by re-orientating the indicators with respect to the direction of the field. If neither flux indicator shows any indications there is insufficient field for the test to take place.

Interpretation of the strength of the magnetic field can only be made when alternating current of 50 or 60 Hz. frequency is used by direct contact to magnetise the workpiece.

The indicators must also be mounted in a vertical plane. In these conditions the induced magnetic field strength is as follows:

- Greater than 2400 Amp/metre when all three indications can be seen on the Type 1 indicator.
- Greater than 6400 Amp/metre when all three indications are seen on the Type 11 indicator.

**ASSOCIATED PRODUCTS**

- **SUPRAMOR™** Black Magnetic Ink
- **LUMOR™** Fluorescent Ink
- **FERROMOR™** Visual and Fluorescent Dry Powders.