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## **TECHNICAL BULLETIN 227**

### **Type 2000 Magnetic Stripe Card**

The Type 2000 Magnetic Stripe Card (MSC) is a tool for instantly evaluating the performance of the fluorescent wet method bath. The magnetic stripe of the Type 2000 MSC contains two encoded tracks. The upper track is labeled from 0 to 10 (X) when read from left to right. The lower track is a mirror image of the upper track and is labeled from 10 (X) to 0 when read from left to right.

Each track is magnetically encoded with a series of gradients that decrease in intensity in the direction of 0 to X. A more sensitive fluorescent material will display a greater number of observable gradients or indications than a less sensitive material. The Type 2000 MSC can be used to quantitatively evaluate the performance of the bath by displaying the number of indications that can be observed after the material has been applied to the stripe. Magnetic Stripe Cards are recognized as a tool for evaluation of fluorescent wet method baths in ASTM E-709 "Standard Guide for Magnetic Particle Examination", Appendix X4; as well as in ASTM E-1444 "Standard Practice for Magnetic Particle Testing", Appendix X2.

#### **Directions for Use**

The card can be exposed to fluid suspensions by pouring or spraying the bath over the card, or, by dipping the card in the bath, and allowing excess fluid to flow off. Observations can be made immediately. The fluid may be allowed to evaporate off, allowing permanent recording, as described below.

Using the scales printed next to the stripe; observe the number of visible indications. A reading may be recorded as the number of observable indications on either or both of the magnetic tracks. Both tracks should display close to the same number of indications, as long as the material is evenly applied.

Permanent documentation is easy. Firmly press the transparent tape over the dried indications and transfer the tape to Form 93-MSC-1. Records can be used to document bath conditions, make on-site bath standards and other purposes.

#### **Precautions**

When not in use, the Type 2000 MSC should be kept away from excessive heat and cold and strong magnetic fields. For optimum performance, the Type 2000 MSC should be used at room temperature. The stripe material has a coercivity of 2,750 Oersteds. In the unlikely event that the stripe is de-encoded the pattern of indications will not be visible. If the indications are not visible, the material shall be verified with another card or test before use.

### Measuring Particle Sensitivity on the Ketos Ring and the Type 2000 Card

Particle indications on the Type 2000 ("T2K") card can be compared to those seen on the Ketos ring (refer to AS 5282 "Tool Steel Ring for Magnetic Particle Inspection"). Both devices can evaluate the sensitivity of magnetic particle inspection materials. Sensitivity of either device can be rated in terms of the magnetic gradient that forms particle indications (units of MA/m<sup>2</sup>).

**Ketos Ring:** Table 1 shows the required "hole" indications (upper number) established in AS5282. The lower number in each box is the magnetic gradient associated with AS 5282 particle sensitivity requirements.

Type of Suspension	1000 Amps	1500 Amps	2500 Amps	3500 Amps
Fluorescent Oxide (Wet)	5 Holes 8 MA/m <sup>2</sup>	6 Holes 7 MA/m <sup>2</sup>	7 Holes 10 MA/m <sup>2</sup>	9 Holes 7 MA/m <sup>2</sup>
Black Oxide (Wet)	4 Holes 10 MA/m <sup>2</sup>	5 Holes 12 MA/m <sup>2</sup>	6 Holes 11 MA/m <sup>2</sup>	8 Holes 9 MA/m <sup>2</sup>

Table 1: Amperage is Full and Half Wave DC. The lower numbers are the equivalent magnetic gradient based on Finite Element Method (FEM) analysis.

**Type 2000 Card:** Unique magnetic encoding on the T2K card forms discrete magnetic gradients that can also form particle indications. The value of the gradients can be determined and are shown in Figure 1. The gradients decrease from about 8.6 MA/m<sup>2</sup> to less than 1.5 MA/m<sup>2</sup> between the 7<sup>th</sup> and 8<sup>th</sup> increments along the T2K stripes.

Magnetic Gradients, Increments "5" to "X"

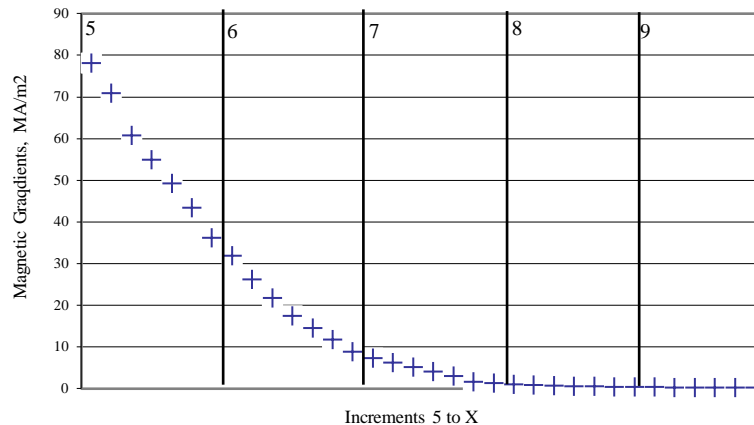


Figure 1: Each "+" represents the magnitude of magnetic gradients appearing on the T2K card

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