

Structured Magnetics

An introduction to the technology
Machine-readable security

Structured Magnetics from TSSI can automatically authenticate that an item is genuine. Plastic, paper based documents can all be made machine-readable by the incorporation of Structured Magnetics technology.

The technology is available in several forms; Watermark Magnetics® for application to plastic cards, DeedMark™ for hot foil or hot roll application to paper and OpVantia™ thread for embedded application into paper.

The structured magnetic technology applied to a document is then complemented by a proven, reliable and secure reading process which ensures the authenticity of a document and can transmit a number derived from the Structured Magnetic feature to a database system.

THE TECHNOLOGY



Figure 1

The manufacturing process for structured magnetic products is similar to that used for standard magnetic tape. A controlled thickness of magnetic oxide slurry is coated onto a suitable non-magnetic substrate. While still wet, the slurry is passed over a permanent magnet to align all the particles.

For structured magnetic tape, the wet slurry then passes over an electro-magnetic encoding head (see *figure 1*) which is positioned at 90° to the permanent magnet. When the encoding head is switched on, the magnetic particles are rotated through 90°; when switched off, they remain in their original orientation. Proprietary electronics control the switching of the electro-magnet to create a pattern which represents a binary code.

DECODING PROCESS

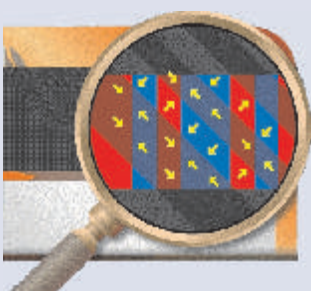


Figure 2

The decoding of the pattern into a number relies on the detection of transitions between the different orientations. If transitions are present only at the boundaries of the "bit", it represents a "0"; if an additional transition occurs at the centre of the "bit" it is a "1". By changing the switching of the electromagnet, a pattern is built into the magnetic particles of the tape and the pattern can be changed for every unit of tape (see *figure 2*).

After Structured Magnetic encoding is performed, the tape passes through an oven which cures the resins and drives off any solvents. This permanently fixes the orientation of the particles and gives each unit a secure identity which is protected against copying, alteration or erasure.

READING

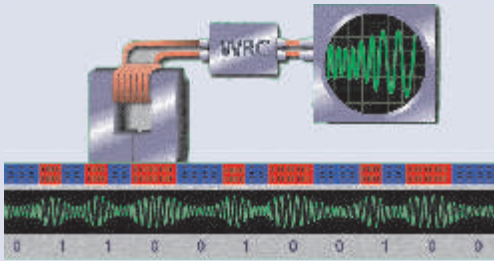


Figure 3

It is important that the reading technology should be able to discriminate between genuine Structured Magnetic tape and fraudulent attempts at duplication. To provide this security, a unique active reading technology has been developed. Instead of the reader passively detecting the magnetic field due to the polarisation of the tape, the read head is actively driven by the reading circuitry.

An alternating magnetic field is produced across the head gap which penetrates the tape. As regions of different orientation pass the head, they interact with the alternating field. This interaction is detected by the reading circuitry, which confirms that the tape is genuine and identifies the transitions in the pattern (see figure 3). As the transitions are detected, the data bits are read from the tape. The active read technology erases any standard polarity encoding in its path, thereby removing the threat posed by fraudulent attempts to mimic Structured Magnetics.

DeedMark™



DeedMark is a hot foil and hot roll version of Structured Magnetic technology designed for application by standard hot foiling (or hot roll) equipment onto paper based substrates. The Structured Magnetic material is released from the polyester carrier layer which is removed during the foiling (or hot roll) process, to leave a very thin magnetic layer containing the permanent encoding. The codes can be either batch or uniquely numbered and once applied gives each document a secure machine-readable feature. Authentication of the document can be automated by use of the active reading technology.

Watermark®



Figure 4

Watermark Magnetics is the world's most effective technology for safeguarding the security of magnetic data cards. Watermark offers machine-readable data which is secure. In addition, standard soft magnetic data can be encoded over the Watermark pattern to ISO standards, offering compatibility with existing magnetic stripe readers and cards. As the Watermark uses an active reading technology which would erase standard data, the Watermark data is read in a separate location to standard encoding. For ISO standard cards this is the "track 0" position - which lies between the ISO track 1 position and the edge of the card (see figure 4).

OpVantia™



OpVantia threads are designed for embedding into paper substrates when the paper is being manufactured. The thread becomes an intimate part of the paper and provides it with a secure, machine-readable identification. The threads are available for both fully embedded and windowed forms with the latter available in different colours including colour-shifting.