Understanding Direct Park Marking

Frequently Asked Questions

What is direct part marking or DPM?
Direct Part Marking (DPM) is a technology used to produce two different surface conditions on an item.

How are direct part markings created?
The primary methods used to produce machine-readable symbols for DPM include dot peening, laser marking, electro-chemical etching, and ink-jet printing.

What is Dot Peening?
Dot peening is achieved by pneumatically or electromechanically striking a carbide- or diamond-tipped stylus against the surface of the material being marked. Reading solutions utilize lighting techniques to create contrast between the indentations forming the modules of the symbol and the surface of the part. Therefore, the quality of the indented dots is very important to the readability of the code.

What is Laser Marking?
Laser marking applies heat to the surface of a part that causes the surface of the part to melt, vaporize or change in some way in order to produce a mark. The resulting quality of the mark depends upon the interaction of the laser with the material it is marking. A laser can produce both round and square modules; typically, the laser is used to produce a square module and continuous finder pattern for higher density (large data capacity) codes. The laser marking process offers high speed, consistency, and high precision. Laser marking is widely used in the semiconductor, electronics, and medical device industries.

What is Electro-chemical Etching?
Electro-chemical etching (ECE) is a process whereby a mark is produced from oxidation of metal from the surface being marked through a stencil impression. This is achieved by sandwiching a stencil between the surface being marked and an electrolyte soaked pad, and passing a low voltage current between the two. ECE is recommended for round surfaces and for stress-sensitive parts. ECE is used for marking certain components of jet engines, automobiles, and medical devices.

What is the process for Ink-jet Printing to direct mark parts?
Ink-jet printers precisely propel ink drops to the part surface, after which the fluid that makes up the ink dot evaporates, leaving a colored die on the surface of the part creating the pattern of modules that make up the mark. The application of ink-jet marking may require preparation of the part surface, as it is the chemical interaction of the ink to the surface of the part that determines the level of mark permanence and contrast. Ink-jet marking provides fast marking of moving parts, and offers very good contrast.

What factors influence the marking process?
Important factors influencing the marking process decision include part life expectancy, material composition, environmental wear and tear, and production volume. Other considerations include surface texture, the amount of data to be encoded on each part, as well as the available space for,

and location of, the mark on the part. The choice of marking process is typically incorporated into the component design; deviations from this design may require engineering change approval.

How does placement of the mark affect the readability of the code?
The location of the code on a part can directly impact the readability of the code. The location should be clearly visible throughout the manufacturing process and, when possible, on a region on the part. Also, choose a location where the mark is in a prominent position on the part that is easily viewed by the reader. Avoid locations where there may be a surrounding surface relief that could potentially affect the illumination of the code by the reader's illumination source.

Why would a company use direct part marking?
To address full life cycle traceability of parts, manufacturers are marking these parts with two-dimensional (2D) codes that are marked directly on the part, and that automatically identify the part throughout the manufacturing and supply chain operations.

Who is using DPM?
Assembly and parts suppliers to the Department of Defense are increasingly implementing DPM, as are a growing number of automotive, aerospace, medical device and electronics manufacturers. Many manufacturers are using traceability data to create a history of the part through the manufacturing process for use later in supply chain management and repair depots.

What considerations of use are unique to DPM?
Traditional print quality measures are based on the assumption that there will be a measurable difference between dark and light elements of a symbol. Because DPM symbols frequently do not have sufficient contrast between elements intended to be dark and light, it is often necessary to provide specialized lighting in order to produce highlights or shadows in order to distinguish the various elements of the symbol.

What are some of the challenges in using DPM?
Some marking technologies are not capable of producing symbols with smooth, continuous lines when viewed by an imager. For example, dot peened symbols often produce unconnected dots.