MICRONIC
INNOVATION IN SAMPLE STORAGE

TECHNOTE

"Micronic laser-etched 2D Data-Matrix codes can be read after extreme abrasion and submerging into several chemicals. The excellent results of the Micronic 2D Data-Matrix codes confirm the capability of mechanical and chemical resistance guaranteeing reliable sample identification after short or long-term storage."

CODE RESISTANCE PERFORMANCE

Of laser-etched versus ink 2D based codes

CODE RESISTANCE PERFORMANCE

ONE OF THE BIGGEST CONCERNS REGARDING SAMPLE TRACEABILITY IS THE LOSS OF A TUBE CODE OR ITS INVALIDATION THROUGHOUT THE STORAGE PROCESS. FOR THIS REASON, MICRONIC 2D DATA-MATRIX CODES ARE MECHANICAL AND CHEMICAL RESISTANT GUARANTEEING RELIABLE SAMPLE IDENTIFICATION AFTER SHORT OR LONG-TERM STORAGE.

A 2D Data-Matrix code is a two-dimensional square or rectangle of black and white "cells" that encodes information in text or numeric data. A well-placed and high-quality 2D Data-Matrix code is essential for reliable sample identification and is critical to the success of an automated system. For this reason, Micronic ensures that its 2D Data-Matrix codes are permanently applied on the tubes.

- First, the tubes are manufactured using a unique 2K injection molding technique so that the highly transparent tube and the black codable surface are molded in to one component and cannot be separated;
- Second, the 2D Data-Matrix codes are laser-etched on the bottom of the tubes.

In order to prove Micronic's excellent 2D Data-Matrix code performance, research on the mechanical* and chemical** resistance was conducted. This report describes a benchmark test with Micronic and other manufacturers of coded sample storage tubes.

Mechanical Resistance

The mechanical resistance of Micronic's 2D Data-Matrix tube codes and the 2D Data-Matrix tube codes of competitors is tested by exposing the codes to extreme abrasion. Laser-etched codes (Micronic) and ink based codes (competitors) are compared in order to determine which code type has the best mechanical resistance. The criteria of this test is to identify how many cycles on an abrasion machine makes the code classification deteriorate using the AIM-DPM Quality Guideline.

Protocol

1. First, place tubes in a rack starting from position A1.
2. Then, register the tube codes in a table for cycle interval 0.
3. Determine the code classifications of the tubes.

The code classifications are determined by the least high result for each parameter (e.g. cell size, modulation or finding pattern) which means that the code is always as good as its lowest scoring parameter. The classifications range from A to F, with A being the best and F the worst grade. Experiences show that code grades from D to F are more difficult or impossible to read by the most common code readers in the market.

4. During the process, scratch tubes according to the given cycle interval (10-30-50-70-90-110).
5. Wipe off the dust and determine the code classifications.
6. Fill in the code classification and cycle intervals into the table.
7. Repeat steps 3 and 4 for all cycle intervals each time moving the sandpaper to a fresh area.

Results

The Micronic laser-etched 2D Data-Matrix codes perform the best during the abrasion test (see Table 1). During the abrasion test of the laser-etched codes, an A or B code classification was maintained. Laser-etched codes are solid and have a direct bond with the base material. The ink based 2D Data-Matrix codes performed considerably worse, after 250 abrasion cycles the codes showed an F code classification.

		Number of abrasion cycles					
Manufacturer	Code	0	10	40	90	160	250
Micronic	Laser-etched	A	B	B	A	A	B
Competitor MX4	Ink	A	C	D	F	F	F
Competitor CW7	Ink	B	E	F	F	F	F

Table 1: Code classifications per manufacturer after accumulating number of abrasion cycles

Chemical Resistance

The chemical resistance of Micronic's 2D Data-Matrix tube codes and the 2D Data-Matrix tube codes of competitors is tested by exposing the codes to several chemicals. Laser-etched codes (Micronic and competitors) and ink based codes (competitors) are compared in order to determine which code has the best chemical resistance. The criteria of this test is to maintain the code after 24 hours exposure to chemicals (Isopropanol, Acetone and Methanol).

* Test Report TR022201 can be requested for more information.

** Test Report TR022501 can be requested for more information.

Protocol

1. First, register the tube codes.
2. Then, register the start classification of the codes.
3. Submerge the tube code in the chemical for 24 hours.
4. After the submersion, register the code classification subsequently to the chemical exposure.
5. Scratch the code with 10 cycles, 140 grams, 20 mm stroke and 25 cycles/min on the abraser.
6. At the end, measure the code classifications.

Results

The Micronic laser-etched code performs the best result during the chemical resistance test (see Table 2). The code classification before and after the submerging into the chemicals, and after the scratch test remained A or B (highest grades) for almost all chemicals. The laser-etched 2D Data-Matrix codes of competitors perform a lot worse. After the submersion into the chemicals and the scratch test, the codes showed a D, E or F grade for almost all chemicals. The ink based 2D Data-Matrix codes performed somewhat better after submerging into chemicals (A grade). However, after the scratch test the codes showed a D, E or F grade for almost all chemicals.

Conclusion

Micronic laser-etched 2D Data-Matrix codes can still be read after extreme abrasion (250 cycles) and submerging into several chemicals. Competitors did not perform well with the ink-based codes after abrasion, and ink/laser-etched codes after submerging into chemicals. It is proven that Micronic uses high-quality materials and manufacturing processes for its sample storage products. The excellent results of the Micronic 2D Data-Matrix codes confirm the capability of mechanical and chemical resistance guaranteeing reliable sample identification after short or long-term storage.

		Chemical								
		Isopropanol			Acetone			Methanol		
Manufacturer	Code	Before	After	Scratch	Before	After	Scratch	Before	After	Scratch
Micronic	Laser-etched	A	A	B	A	A	C	A	A	B
Competitor MX4	Ink	A	A	C	A	A	D	A	A	D
Competitor ZB8	Laser-etched	D	D	-	C	F	-	D	D	-
Competitor VT6	Laser-etched	B	E	E	B	B	C	B	D	D
Competitor CW7	Ink	A	A	F	C	C	D	D	D	E

Table 2: Code grades per manufacturer after exposure to chemicals and abrasion

Micronic Europe
(Asia, Africa, Europe, Oceania)
Tel: +31 (0)320 277070

Micronic America
(North, Central and South America)
Tel: +1 484 480 3372

E-mail: sales@micronic.com
www.micronic.com

MICRONIC
INNOVATION IN SAMPLE STORAGE