

## Are the 1D barcodes printed on the side of Matrix tubes robust, reliable, and chemically resistant?

Yes. In a study to test for performance of the side-printed 1D barcodes, the barcodes on Thermo Scientific™ Matrix™ 2D Barcoded Storage Tubes passed abrasion testing for robustness, freeze/thaw testing for reliability, and chemical-resistance testing.

### Introduction

Matrix 2D Barcoded Storage Tubes can be purchased with linear and human-readable 1D barcodes printed on the sides that match the unique 2D barcodes on the bottoms of the tubes (Figure 1). This allows 1D scanning or visual identification of samples. To address specific customer applications, the 1D barcodes printed on the tubes were subjected to multiple tests to check for quality post-manufacturing.



Figure 1. Image of a 1D side-printed barcode that matches the 2D barcode on the bottom of the tube.

### How were the 1D barcodes on the tubes tested?

Multiple analyses were used to assess the 1D barcodes printed on the sides of the tubes. First, to test the robustness of the barcodes, abrasion testing was employed. This was a scratch test where a metal probe, similar to a ballpoint pen, with a specific calibrated weight was applied to and run across the barcode to check if the barcode stayed intact. Next, the tubes were subjected to five (5) freeze/thaw cycles by freezing them at  $-176^{\circ}\text{C}$  and thawing them at  $+80^{\circ}\text{C}$  over an 8-hour period. In between each freeze/thaw cycle, the readability of the 1D barcode was analyzed using a barcode-grading verifier (Microscan™ LVS-9580 Verifier). After each tube was thawed, the 1D barcodes printed on a set of tubes were tested for chemical resistance by applying 70% ethanol, 70% isopropanol, 7.5%  $\text{H}_2\text{O}_2$ , and 5% bleach individually. After the first freeze/thaw cycle, the 1D barcodes were also checked for chemical resistance in the presence of 10% DMSO. The chemical-resistance testing was done to verify the readability of the barcodes in the presence of readily used chemicals in the laboratory. All testing reported was performed on 30 tubes (n=30).

## What do the results show?

The 1D side-printed barcodes passed abrasion testing, and there were no identifiable scratches from the metal probe during the analysis. The readability of the 1D barcodes after subjecting the tubes to extreme temperature conditions during five freeze/thaw tests was 100%. All of the 1D barcodes resisted the chemicals applied and maintained 100% readability throughout the chemical-resistance study and five freeze/thaw cycles. Taken together, the 1D barcodes printed on the sides of Matrix tubes are robust, reliable, and chemically resistant (Table 1).

**Table 1. Analyses, results, and number of tubes tested for the Matrix 1D side-printed barcodes.**

Analysis	Result	No. tubes tested
Abrasion test	PASS	30
5x freeze/thaw	100% readable	30
70% ethanol resistance	100% readable	30
7.5% H <sub>2</sub> O <sub>2</sub> resistance	100% readable	30
5% bleach resistance	100% readable	30
10% DMSO resistance	100% readable	30

## Summary

- The abrasion testing on the Matrix 1D barcodes printed on the side of each tube showed no identifiable scratches from the metal probe; therefore, the 1D barcode label is robust and can stand up to potential wear and tear during handling.
- The Matrix 1D barcodes are reliable, because they are able to maintain 100% readability after being subjected to extreme temperature conditions during five freeze/thaw cycles.
- The Matrix 1D barcodes are resistant to chemicals typically used in the lab because they were able to maintain 100% readability after chemicals were applied to the tubes during multiple freeze/thaw cycles.



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