# Scotch® BRAND MAGNETIC TAPE FOR INSTRUMENTATION

## 480-481 SANDWICH

## TECHNICAL DATA

| Physical Properties | Units | Test Notes | 480 | 481 |
|---|---|---|---|---|
| Color | — | — | Black/Brown | Black/Brown |
| Backing Material | — | — | Polyester | Polyester |
| Thickness — Backing | Mils | 1 | 1.42 | 0.92 |
| Coating | Mils | 1 | 0.39 | 0.39 |
| Protective Overlay | Mils | 1 | 0.04 | 0.04 |
| Total | Mils | 1 | 1.85 | 1.35 |
| Width Tolerance | Inches | 2 | +0.000/−0.004 | +0.000/−0.004 |
| Static Tensile | | 3 | | |
| Yield Strength | lbs./¼" width | 4 | 5.5 | 4.0 |
| Breaking Strength | lbs./¼" width | 5 | 9.0 | 6.8 |
| Elongation at Break | Percent | 5 | 100 | 95 |
| Residual Elongation | Percent | 6 | 0.1 | 0.2 |
| Shock Tensile Strength | ft.-lbs. | 7 | >0.59 | >0.59 |
| Coating Wearability | Ratio | 8 | 30 | 30 |
| Layer-to-Layer Adhesion 130°F. at 85% R.H. | — | 9 | Surpasses Requirements | Surpasses Requirements |
| **Intrinsic Magnetic Properties** | | | | |
| Coercivity ($H_{ci}$) | Oersteds | 10 | 260 | 260 |
| Retentivity ($B_{rs}$) | Gauss | 10 | 1030 | 1030 |
| Remanence ($\Phi_r$) | Lines/¼" width | 10 | 0.64 | 0.64 |
| Erasing Field Required | Oersteds | 11 | 1000 | 1000 |
| **Electro-Magnetic Performance** | | | | |
| Maximum Undistorted Output 10 mil wavelength | Decibel | 12 | 0.0 | 0.0 |
| Sensitivity | | | | |
| 10 mil wavelength | Decibel | 13 | 0.0 | 0.0 |
| 1 mil wavelength | Decibel | 13 | −2.0 | −2.0 |
| Uniformity at 10 mil wavelength | | | | |
| Within a Roll | Percent | 14 | ±3% | ±3% |
| Roll to Roll | Percent | 14 | ±10% | ±10% |
| Dropouts per roll* | | 15 | 1 or less | 1 or less |

*Measured by recording 200 non-return-to-zero (NRZ) pulses per inch on a 0.035" track. A reduction to less than 50% normal signal amplitude constitutes a signal error. Zero errors are measured by saturating the tape unidirectionally. Each spurious signal greater than 10% of normal signal amplitude constitutes a zero error. Errors per roll based on recording 7 tracks on rolls ½" x 2500'.





M-IL 102(1261)R2

## TEST NOTES

1. Total thickness measurements are averages for ten layers of tape taken over a length of approximately two feet. ASTM D374-57T, Method A, is used to measure to 0.0001 inch. The average thickness per layer is calculated. Coating thickness figures are the difference between average per layer thicknesses measured before and after the coating in question is removed.

2. Width is measured on an optical device that has a magnification of at least 5.

3. Static tensile tests are performed at a constant rate of jaw separation of 12 ipm from an initial separation of four inches, as specified in Federal Specification W-T-0070, "Yield Strength."

4. Yield strength is defined as that force which produces 5% elongation of the sample (otherwise termed the "F5 point"). It is measured during static tensile testing. (See NOTE 3.)

5. Breaking strength is equivalent to ultimate strength for the magnetic tape backing described and is self-explanatory. Both the force to cause rupture and the sample's elongation at rupture are measured during static tensile testing. (See NOTE 3.)

6. Residual elongation is that elongation, expressed as a percentage of the original length, which remains after a stressed sample is permitted to recover at zero stress. Test method is that of Federal Specification W-T-0070 for "Elongation Under Stress" in which initial sample length is 20 inches, stressing and recovery times are 3 hours each, and applied load is 2½ lbs. for ¼ inch wide tapes.

7. Shock tensile strength is a measure of the kinetic energy absorbed by ¼ inch wide tape before rupture occurs. Test method is that of Federal Specification W-T-0070.

8. Coating wearability is a relative measure of a tape's ability to resist the typical degrading effects of actual use. It is measured in terms of the number of passes before failure occurs (as manifested by excessive dropouts or reduced output) and is expressed as a ratio with respect to the life of another tape type tested under the same conditions.

9. Temperatures and humidities listed represent conditions under which there will be no coating transfer when using the test method of W-T-0070 (Layer-to-Layer Adhesion).

10. Intrinsic coercivity is that field intensity required to reduce induction from saturation to zero. Retentivity is that induction per unit cross section area retained by the tape when the field intensity is reduced from 1000 oersteds to zero. Remanence per unit width is the total flux that remains in a coating when the magnetizing field is reduced from 1000 oersteds to zero. These properties are measured using a 60 cps dynamic B-H vs. H hysteresis loop tracer calibrated in terms of volt-ampere standards traceable to those maintained by the National Bureau of Standards.

11. The erasing field requirement is that peak value of a 60 cps alternating field which will cause at least a 60 db reduction in level of a 1 mil wavelength saturated signal pre-recorded on the tape.

12. Maximum undistorted output is a measure of the output level capability of a tape relative to that of "SCOTCH" Brand No. 498 using the same output distortion criteria (1% T.H.D.) for both. Tapes are tested under identical conditions, except that the recorder bias is individually optimized for each. The input signal, at a frequency chosen to produce 10 mil wavelength signals on the tape, is varied in level until 1% T.H.D. appears in the output, the level of which is then reported relative to that of No. 498 tested in the same manner.

13. Sensitivity data provides a means of comparing the output of one tape with that of another when recordings are made at the same low input (i.e., an input at which an insignificant amount of system distortion is contributed by the tape). The recorder is equalized for zero db output at all frequencies using "SCOTCH" Brand No. 498 tape at its optimum bias and a constant voltage input chosen well below that producing saturation. Tapes to be evaluated are tested at their own optimum bias with the same input level as used for No. 498. Outputs thus produced are compared with those of No. 498, with the latter taken as zero db.

14. Uniformity of output signal is a measure of the tape's ability to deliver a steady and consistent signal when being recorded with a constant amplitude input. The record level is that which produces 1% 3rd harmonic distortion in the output with optimum bias. The playback signal variation, in percent, from an average is the uniformity.

15. Dropouts are instantaneous nonuniformities of a recorded signal caused by imperfections in the tape.

**The data has been compiled from our own laboratories. The data is typical, determined by experience and can be used for comparative purposes.**

Magnetic Products Division 3M COMPANY