

## BRADY B-345 HIGH TEMPERATURE PERMASLEEVE(TM) MARKER

TDS No. B-345

Effective Date: 03/12/2010

### Description:

#### GENERAL

**Print Technology:** Thermal Transfer

**Material Type:** Irradiated polyvinylidene fluoride heat shrink tubing (2:1 shrink ratio)

#### APPLICATIONS:

B-345 PermaSleeve® Markers are designed for wire identification and insulation purposes. These sleeves are suitable for many high temperature and/or low outgassing applications. The sleeves can also be used in applications that require greater resistance to harsh chemicals such as fuels, lubricants and high power cleaning solvents.

#### RECOMMENDED RIBBONS

Brady R6000 Series and Brady R6600 Series black ribbons

Brady Series R4400W and Brady Series R6800 white for printing on dark colored markers

#### SPECIAL FEATURES

B-345 PermaSleeve® Markers meet the performance requirements of SAE-AMS-DTL-23053/18 (Class 2) for Insulation Sleeving, SAE-AS-81531 Marking of Electrical Insulating Materials and MIL-STD-202G, Method 215K Resistance to Solvents when printed with the recommended ribbons.

The operating temperature range is -55°C (-67°F) to +225°C (437°F).

B-345 PermaSleeve® meets the requirements of NASA Vacuum Outgassing specification SP-R-0022A.

B-345 PermaSleeve® markers are supplied in roll form in a flattened format on a carrier designed for use with thermal transfer printers.

B-345 PermaSleeve® is available in white, black, yellow, blue and pink.

### Details:

| MARKER SIZE |          | RANGE OF WIRE DIAMETERS (in) | RANGE OF WIRE DIAMETERS (mm) | WEIGHT (g/sleeve) |
|-------------|----------|------------------------------|------------------------------|-------------------|
| 3/32"       | 2HT-094  | 0.031-0.080                  | 0.6-2.0                      | 0.1550            |
| 1/8"        | 2HT-125  | 0.063-0.110                  | 1.2-2.8                      | 0.1997            |
| 3/16"       | 2HT-187  | 0.094-0.150                  | 1.6-3.8                      | 0.2384            |
| 1/4"        | 2HT-250  | 0.125-0.215                  | 2.4-5.5                      | 0.3732            |
| 3/8"        | 2HT-375  | 0.187-0.320                  | 3.2-8.1                      | 0.5485            |
| 1/2"        | 2HT-500  | 0.250-0.450                  | 4.8-11.4                     | 0.7243            |
| 3/4"        | 2HT-750  | 0.375-0.700                  | 6.6-17.8                     | 1.0640            |
| 1"          | 2HT-1000 | 0.450-0.950                  | 11.4-24.1                    | 1.4128            |
| 1 1/2"      | 2HT-1500 | 0.500-1.450                  | 12.7-36.8                    | 3.0818            |

| PHYSICAL PROPERTIES                                  | TEST METHODS                                                                                                                                                                                 | AVERAGE RESULTS                                                                                                                                                                               |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vacuum Outgassing<br>Tested at an outside laboratory | NASA SP-R-0022A<br>Specification Limits<br>%Total Mass Loss (TML) – 1.0% maximum<br>%Collected Volatile Condensable Material (CVCM) – 0.10 maximum<br>% Water Vapor Recovered (WVR) - Report | Black:<br>%TML - 0.25<br>%CVCM - 0.02<br>%WVR - 0.03<br>White:<br>%TML - 0.13<br>%CVCM - 0.00<br>%WVR - 0.05<br>Yellow:<br>%TML - 0.14<br>%CVCM - 0.02<br>%WVR - 0.04<br>Pink:<br>%TML - 0.14 |

|                                                                                                                                          |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                          |                                                                                                                                     | %CVCM - 0.02<br>%WVR - 0.05<br>Blue:<br>%TML - 0.14<br>%CVCM - 0.1<br>%WVR - 0.04<br>All colors meet the requirements of<br>NASA SP-R-022A                                                                                                                                                                                                                                            |
| Surface Flammability of Materials Using a Radiant Heat Energy Source<br>Tested at an outside laboratory<br>White and black tubing tested | ASTM E162<br>Common Maximum – 35                                                                                                    | Flame Spread Index (Is) (rounded average result of 4 tests)<br>White – 0<br>Black – 0                                                                                                                                                                                                                                                                                                 |
| Specific Optical Density of Smoke (Ds)<br>Tested at an outside laboratory<br>White and black tubing tested                               | ASTM E662<br>Common Maximum<br>Flaming and Nonflaming Mode at 1.5 minutes – 100<br>Flaming and Nonflaming Mode at 4.0 minutes – 200 | Specific Optical Density (Ds) (average of 3 tests)<br><i>White:</i><br>Flaming mode at 1.5 minutes – 2<br>Flaming Mode at 4 minutes – 6<br>Nonflaming mode at 1.5 minutes – 1<br>Nonflaming mode at 4.0 minutes - 5<br><i>Black:</i><br>Flaming mode at 1.5 minutes – 6<br>Flaming Mode at 4 minutes – 18<br>Nonflaming mode at 1.5 minutes – 3<br>Nonflaming mode at 4.0 minutes - 8 |

B-345 Permasleeve® white, yellow, blue and pink samples were printed on the Brady PR Plus (300 dpi) and IP™ (300 dpi) printers with the R6000 and R6600 Series black ribbon. B-345 black samples were printed with the R4400W and R6800 Series white thermal transfer ribbons on the same printers. The results were the same with all ribbons unless otherwise stated.

| PERFORMANCE PROPERTY                            | TEST METHODS                                                       | AVERAGE RESULTS                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High Service Temperature                        | 5 minutes at 500°F (260°C)                                         | Yellow: no visible effect to tubing or printing<br>Pink and blue: very slight discoloration of tubing, no visible effect to printing<br>White: slight discoloration of tubing, no visible effect to printing<br>Black: No visible effect to tubing, slight yellowing of printing (both R4400W and R6800) |
|                                                 | 24 hours at 350°F (180°C)                                          | Yellow: no visible effect to tubing or printing<br>Pink, Blue, White: very slight discoloration of tubing, no visible effect to printing<br>Black: no visible effect to tubing, slight yellowing of printing                                                                                             |
|                                                 | 1000 hours at 267°F (130°C)                                        | Black: No visible effect to tubing or printing<br>White, Blue, Pink: very slight discoloration of tubing, no visible effect to printing.<br>Yellow: no visible effect to tubing or printing                                                                                                              |
| Low Service Temperature                         | 1000 hours at -94°F (-70°C)                                        | All colors: No visible effect to tubing or printing                                                                                                                                                                                                                                                      |
| Weatherability                                  | ASTM G155 Cycle 1<br>1000 hours in Xenon Arc Weatherometer         | Yellow, Pink, Black and White: No visible effect to tubing or printing<br>Blue: Slight tube darkening, no visible effect to printing                                                                                                                                                                     |
| UV Light Resistance                             | ASTM G155 Cycle 1 dry<br>1000 hours                                | All colors: No visible effect to tubing or printing                                                                                                                                                                                                                                                      |
| Humidity Resistance                             | 1000 hours at 100°F/95% RH                                         | All colors: No visible effect to tubing or printing                                                                                                                                                                                                                                                      |
| Salt Fog                                        | 1000 hours at 5% Salt Spray                                        | All colors: No visible effect to tubing or printing                                                                                                                                                                                                                                                      |
| Dielectric Strength                             | ASTM D2671 (after unrestricted shrinkage)                          | 80 KV/mm                                                                                                                                                                                                                                                                                                 |
| Flammability                                    | ASTM D2671, Procedure A and C                                      | Pass                                                                                                                                                                                                                                                                                                     |
| Print Adherence per SAE-AS81531 (Section 3.4.2) | Samples tested after unrestricted shrinkage at 200°C for 3 minutes | Pass                                                                                                                                                                                                                                                                                                     |

|                                                                                             |                                                                                                                                                                                                            |      |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|                                                                                             | 20 eraser rubs with hard hand pressure                                                                                                                                                                     |      |
| Solvent Resistance per SAE-AS81531<br>(Sec 3.4.3)<br>Solution A<br>Solution C<br>Solution D | Samples tested after unrestricted shrinkage at 200°C for 3 minutes<br><br>MIL-STD-202G, Method 215K<br>3 cycles of 3 minute immersions in specified fluids followed by toothbrush rub after each immersion | Pass |

Solution A: 1 part isopropyl alcohol, 3 parts mineral spirits

Solution B: deleted from MIL-STD-202G, Method 215K

Solution C: BIOACT® EC-7R™ terpene defluxer

Solution D: 42 parts water, 1 part propylene glycol monomethylether, 1 part monoethanolamine at 70°C

| PERFORMANCE PROPERTY | CHEMICAL RESISTANCE |
|----------------------|---------------------|
|----------------------|---------------------|

B-345 white yellow and other colors were thermal transfer printed using the R6000 Series and R6600 Series thermal transfer ribbons and shrunk on appropriate sized wires. Test was conducted at room temperature after 24 hour dwell. Testing consisted of 5 cycles of 10 minute immersions in the specified chemical reagent followed by 30 minute recovery periods. Samples rubbed with a cotton swab saturated with the chemical reagent after final immersion. The rating scale below shows the effect to the quality of the print for each sample.

| CHEMICAL REAGENT                       | SUBJECTIVE OBSERVATION OF VISUAL CHANGE |                        |       |
|----------------------------------------|-----------------------------------------|------------------------|-------|
|                                        | TUBING AND PRINTING<br>WITHOUT SWAB RUB | PRINTING WITH SWAB RUB |       |
|                                        |                                         | R6000                  | R6600 |
| Isopropyl alcohol                      | No visible effect                       | 1                      | 1     |
| Toluene                                | No visible effect                       | 3                      | 3     |
| 20 Wt Oil @ 70°C                       | No visible effect                       | 1                      | 1     |
| MIL 5606 oil                           | No visible effect                       | 1                      | 1     |
| MIL 7808 oil                           | No visible effect                       | 1                      | 1     |
| Rust Veto® 377                         | No visible effect                       | 1                      | 1     |
| Brake Fluid DOT 3                      | No visible effect                       | 1                      | 1     |
| Northwoods™ Buzz Saw<br>Citrus Cleaner | No visible effect                       | 1                      | 1     |
| JP-8 Jet Fuel                          | No visible effect                       | 1                      | 1     |
| Gasoline                               | No visible effect                       | 1                      | 1     |
| Diesel Fuel                            | No visible effect                       | 1                      | 1     |
| Skydrol® 500B-4                        | No visible effect                       | 3                      | 3     |
| Super Agitene®                         | No visible effect                       | 1                      | 1     |
| Propylene Glycol                       | No visible effect                       | 1                      | 1     |
| ULS200D                                | No visible effect                       | 1                      | 1     |
| Mineral Spirits                        | No visible effect                       | 1                      | 1     |
| Deionized Water                        | No visible effect                       | 1                      | 1     |

Rating scale:

1=no visible effect

2=slight print fade or removal

3=moderate print fade or removal (print still legible)

4=severe print fade or removal (print illegible or just barely legible)

5=complete print fade or removal

NP=print removed prior to rub

B-black samples were thermal transfer printed using the R4400W Series and R6800 Series white thermal transfer ribbons and shrunk on appropriate sized wires. Test was conducted at room temperature after 24 hour dwell. Testing consisted of 5 cycles of 10 minute immersions in the specified chemical reagent followed by 30 minute recovery periods. Samples rubbed with a cotton swab saturated with the chemical reagent after final immersion. The rating scale below shows the effect to the quality of the print for each sample.

| CHEMICAL REAGENT                       | SUBJECTIVE OBSERVATION OF VISUAL CHANGE |                        |       |
|----------------------------------------|-----------------------------------------|------------------------|-------|
|                                        | TUBING AND PRINTING<br>WITHOUT SWAB RUB | PRINTING WITH SWAB RUB |       |
|                                        |                                         | R4400W                 | R6800 |
| Isopropyl alcohol                      | No visible effect                       | 1                      | 1     |
| Toluene                                | No visible effect                       | 4                      | 3     |
| 20 Wt Oil @ 70°C                       | No visible effect                       | 1                      | 1     |
| MIL 5606 oil                           | No visible effect                       | 1                      | 1     |
| MIL 7808 oil                           | No visible effect                       | 1                      | 1     |
| Rust Veto® 377                         | No visible effect                       | 1                      | 1     |
| Brake Fluid DOT 3                      | No visible effect                       | 3                      | 3     |
| Northwoods™ Buzz Saw<br>Citrus Cleaner | No visible effect                       | 2                      | 2     |

|                  |                   |   |   |
|------------------|-------------------|---|---|
| JP-8 Jet Fuel    | No visible effect | 1 | 1 |
| Gasoline         | No visible effect | 2 | 2 |
| Diesel Fuel      | No visible effect | 1 | 1 |
| Skydrol® 500B-4  | No visible effect | 3 | 3 |
| Super Agitene®   | No visible effect | 1 | 1 |
| Propylene Glycol | No visible effect | 1 | 1 |
| ULS200D          | No visible effect | 3 | 2 |
| Mineral Spirits  | No visible effect | 1 | 1 |
| Deionized Water  | No visible effect | 1 | 1 |

Rating scale:

1=no visible effect

2=slight print fade or removal

3=moderate print fade or removal (print still legible)

4=severe print fade or removal (print illegible or just barely legible)

5=complete print fade or removal

NP=print removed prior to rub

Product testing, customer feedback and history of similar products support a customer performance expectation of at least five years from the date of receipt for this product as long as this product is stored in its original packaging in an environment at 65 to 95 degrees F (18 to 35 degrees C) per SAE-AMS-DTL 23053/18. We are confident that our products will perform well beyond this time frame. However it remains the responsibility of the user to assess the risk of using such product. We encourage customers to develop functional testing protocols that will qualify a product's fitness for use in their actual applications.

#### Trademarks:

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**Note:** All values shown are averages and should not be used for specification purposes.

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