



Designation: D7932 – 14

Standard Specification for Printed, Pressure-Sensitive Adhesive Labels for Use in Extreme Distribution Environments¹

This standard is issued under the fixed designation D7932; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification provides a standard means to test and measure performance characteristics of printed, pressure-sensitive adhesive labels for containers, particularly containers to be used in extreme distribution environments (for example, hazardous materials labels, aerospace, military containers). For the purposes of this specification, an extreme distribution environment is one in which it can be reasonably expected to experience direct exposure to deteriorating chemicals, weather, elevated/cold temperatures, and other environmental and physical elements for an extended period of time.

1.2 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

- A666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- D374 Test Methods for Thickness of Solid Electrical Insulation (Withdrawn 2013)³
- D975 Specification for Diesel Fuel Oils
- D996 Terminology of Packaging and Distribution Environments

¹ This specification is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.14 on Tape and Labels.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

D1000 Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

D3611 Practice for Accelerated Aging of Pressure-Sensitive Tapes

D3951 Practice for Commercial Packaging

D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing

D4814 Specification for Automotive Spark-Ignition Engine Fuel

D6210 Specification for Fully-Formulated Glycol Base Engine Coolant for Heavy-Duty Engines

D6252/D6252M Test Method for Peel Adhesion of Pressure-Sensitive Label Stocks at a 90° Angle

G195 Guide for Conducting Wear Tests Using a Rotary Platform Abraser

2.2 Department of Defense Standards:⁴

MIL-STD-810 Environmental Engineering Considerations and Laboratory Tests

MIL-STD-2073 Standard Practice for Military Packaging

MIL-DTL-83133 Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37)

2.3 Society of Automotive Engineers Standards:⁵

SAE J183 Engine Oil Performance and Engine Service Classification

SAE J300 Engine Oil Classification

2.4 Other:

ISO/IEC 15415 Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Print Quality Test Specification – Two Dimensional Symbols⁶

ISO/IEC 15416 Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Print Quality Test Specification – Linear Symbols⁶

⁴ Copies of these documents are available online at <http://quicksearch.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4/D, Philadelphia, PA 19111-5094.

⁵ Copies of these documents are available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

⁶ Copies of these documents are available at www.iso.org or www.ansi.org or from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036.

ISO/IEC 15426-1 Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Verifier Conformance Specification – Part 1: Linear Symbols⁶

ISO/IEC 15426-2 Information Technology – Automatic Identification and Data Capture Techniques – Bar Code Verifier Conformance Specification – Part 2: Two-Dimensional Symbols⁶

ANSI MH10.8.1 Linear Bar Code & 2-Dimensional Symbols⁷

ANSI/ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes⁸

3. Terminology

3.1 General definitions for packing and distribution environments are found in Terminology D996.

3.2 Definitions:

3.2.1 *porous*—possessing or full of pores or openings that permit solids, liquids, or gases to permeate or penetrate an outer surface or membrane.

3.2.2 *non-porous*—possessing a non-permeable outer surface or membrane that does not permit solids, liquids, or gases to penetrate an outer surface or membrane.

3.2.3 *printed, pressure-sensitive adhesive label*—the combination of a release liner, pressure-sensitive adhesive, and facestock (face material) which has been printed with an image.

3.2.4 *label sample*—used to describe a facestock and its pressure-sensitive adhesive while still adhered to its release liner only.

3.2.5 *test surface panel*—used to describe the solid material surface onto which the label samples are adhered for the purpose of testing (see 4.2).

3.2.6 *label test specimen*—used to describe a test surface panel with a label sample applied by way of its pressure-sensitive adhesive.

4. Significance and Use

4.1 Degradation of pressure-sensitive adhesive labels due to environmental and physical factors is a common occurrence during transportation and storage. This specification provides minimum performance requirements for printed, pressure-sensitive labels for use in extreme distribution environments. In addition, standard laboratory test methods are provided to simulate exposure to various conditions and measure associated degradation of required performance characteristics. The data from these methods can be used as acceptance criteria between a supplier and customer.

4.2 The test methods described in this specification are performed on standard stainless steel test surface panels (see

10.3). Substitution of panels representative of the proposed substrates for the standard stainless steel panel is acceptable for this procedure.

NOTE 1—Test surface panels other than specified stainless steel panels may not meet the minimum requirements of Tables 2 and 3.

4.3 Type I labels are intended for use on container outer surfaces where direct contact with physical and environmental factors is unavoidable. Material strength and resistance to abrasion, sunlight, rain, extreme temperatures, chemicals, and other deteriorating environmental elements are required. Type I labels may be used on porous surfaces (Class 1) or non-porous surfaces (Class 2).

4.4 Type II labels are intended for use on inner containers where there will be a physical barrier to outside elements, such as an overpack. Since not all barriers are hermetically sealed, material strength and resistance to abrasion, extreme temperatures, and other deteriorating environmental elements are required. Type II labels may be used on porous surfaces (Class 1) or non-porous surfaces (Class 2).

4.5 Type III labels are intended for applications not covered by Type I or II labels. The performance requirements and testing shall be tailored by the customer. Type III labels may be used on porous surfaces (Class 1) or non-porous surfaces (Class 2).

5. Classifications

5.1 Type:

5.1.1 *Type I*—Heavy Duty.

5.1.2 *Type II*—Medium Duty.

5.1.3 *Type III*—Custom requirements.

5.2 Classes:

5.2.1 *Class 1*—For use on porous surfaces.

5.2.2 *Class 2*—For use on non-porous surfaces.

6. Ordering Information

6.1 *The inquiry or order shall include the following:*

6.1.1 ASTM designation and date of issue.

6.1.2 Type and Class required (see Section 5).

6.1.3 *For Type III Labels*—Required tests from Table 1 and minimum performance criteria for each.

6.1.4 Label form (for example, in sheets, rolls, etc.).

6.1.5 Individual label size.

TABLE 1 Minimum Number of Test Samples

Test Method	Minimum Number of Test Samples		Reference Paragraph
	Type I	Type II	
Print Quality	5	5	11.2
Peel Adhesion	5	5	11.3
Thickness	5	5	11.4
Abrasion	15	15	11.5
High Temperature	5	5	11.6
Low Temperature	5	5	11.7
Rain	5	Not Required	11.8
Salt Fog	5	Not Required	11.9
Blowing Dust	5	Not Required	11.10
Humidity	5	5	11.11
Freeze and Thaw	5	5	11.12
Accelerated Aging	5	5	11.13
Contamination by Fluids	40	Not Required	11.14

⁷ A copy of this document is available at www.mhi.org or from the Material Handling Industry, 8720 Red Oak Boulevard, Suite 201, Charlotte, NC 28217-3992.

⁸ A copy of this document is available from American Society for Quality (ASQ), 600 North Plankinton Ave., Milwaukee, WI 53203.

6.1.6 Printing requirements, as necessary.

6.1.7 When testing and inspection certification is required (see Section 13).

6.1.8 Report requirements, as necessary (see Section 12).

6.1.9 Packing and marking requirements (see Section 15).

7. Physuical Properties

7.1 All labels shall comply with the requirements listed in Table 2 and Table 3 when tested in accordance with Section 11.

8. Workmanship, Finish, and Appearance

8.1 All labels shall be uniformly constructed and free from defects that impair the usefulness of the label for the purpose intended (see Section 4). The label adhesive coating shall be uniform, covering entirely the adhesive side of the label and shall be mounted on a release liner. The adhesive shall be pressure-sensitive, water insoluble, and shall require no moisture, heat, or other preparation prior to, or after, application to clean, dry surfaces. The labels shall be furnished in the form of individual labels, sheets, rolls, or as specified by the customer. The label edges shall be clean, straight, unbroken,

TABLE 3 Contamination by Fluids Requirements

Test Chemical	Specification	Number of Test Samples	Minimum Adhesion to Stainless Steel
		Type I	
Water, distilled		5	55 N/100 mm (50 oz/in.)
Engine oil: SAE 15W-40, API CI-4, CI-4 Plus, or CJ-4	SAE J300 SAE J183	5	55 N/100 mm (50 oz/in.)
Gasoline (Petrol), unleaded, Anti-knock Index 87, min	ASTM D4814	5	38 N/100 mm (35 oz/in.)
Turbine Fuel JP-8	MIL-DTL-83133	5	38 N/100 mm (35 oz/in.)
Diesel fuel, Grade No. 1-D S15 or 2-D S15	ASTM D975	5	38 N/100 mm (35 oz/in.)
Automatic Transmission Fluid	Dexron VI	5	38 N/100 mm (35 oz/in.)
Coolant Type III-FF or IV-FF	ASTM D6210	5	38 N/100 mm (35 oz/in.)
Brake fluid, DOT 3, 4, or 5	FMVSS 116 49 CFR 571.116	5	38 N/100 mm (35 oz/in.)

TABLE 2 Physical Property Requirements

Property	Units	Type I		Type II	
		Class 1	Class 2	Class 1	Class 2
Thickness, max	(mm)	0.22	0.22	0.22	0.22
	(mils)	8.5	8.5	8.5	8.5
Initial Adhesion, min	(N/100 mm)	66	66	55	55
	(oz/in.)	60	60	50	50
Abrasion resistance, minimum cycles to failure:	At low temperature (-67° F)	500	500	100	100
	At ambient temperature (73.4° F)	500	500	100	100
	At high temperature (140° F)	500	500	100	100
	Post-eposure adhesion, min:				
High temperature	(N/100 mm)	66	66	55	55
	(oz/in.)	60	60	50	50
Low temperature	(N/100 mm)	66	66	55	55
	(oz/in.)	60	60	50	50
Rain	(N/100 mm)	66	66	N/A	N/A
	(oz/in.)	60	60	N/A	N/A
Salt fog	(N/100 mm)	66	66	N/A	N/A
	(oz/in.)	60	60	N/A	N/A
Blowing dust	(N/100 mm)	66	66	N/A	N/A
	(oz/in.)	60	60	N/A	N/A
Humidity	(N/100 mm)	66	66	55	55
	(oz/in.)	60	60	50	50
Freeze and thaw	(N/100 mm)	66	66	55	55
	(oz/in.)	60	60	50	50
Accelerated aging	(N/100 mm)	66	66	55	55
	(oz/in.)	60	60	50	50
Contamination by Fluids	(N/100 mm)	See Table 3		N/A	N/A
	(oz/in.)	See Table 3		N/A	N/A

and shall display no excessive bleeding of adhesive. The finished product shall conform to the levels of quality established herein.

9. Acceptance Criteria

9.1 *First Article of Manufacture*—When a product is first manufactured in a plant, it shall be tested and inspected to determine compliance with all examinations and tests of this specification by an independent laboratory. First article of manufacture examinations need only be repeated when there is a change in materials or processes.

9.2 Unless otherwise specified, the number of label test samples shall be as specified in Table 1, with an acceptable quality limit (AQL) of 4.0 % in accordance with ANSI/ASQC Z1.4.

10. Procedures

10.1 Unless otherwise specified, prior to label application, each label sample and test surface panel shall be conditioned in the standard conditioning atmosphere described in Practice D4332 for a minimum of 24 h.

10.2 Each requirement shall be tested in accordance with the test methods listed in Section 11. The total test quantities shall follow sequential testing as described in Figs. 1 and 2 for Type I and Type II labels, respectively. Unless otherwise noted in the applicable test method, tests shall be conducted in the standard conditioning atmosphere described in Practice D4332.

10.3 *Test Surface*—Except for abrasion resistance, each test sequence, unless otherwise specified by the customer, shall be conducted on panels of stainless steel 302 or 304 in accordance