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Standard Guide for Reporting Properties for Plastics and Thermoplastic Elastomers[1]

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1. Scope

1.1 This guide provides recommendations for reporting the results of commonly used plastics and thermoplastic elastomer tests but is not intended to replace any part of any individual test method.

1.2 This guide is intended to promote uniformity in the manner in which published test data are reported to minimize confusion when comparisons are made in published literature, data sheets, presentations, comparative analyses, etc.

NOTE 1—There is no equivalent or similar ISO standard.

2. Referenced Documents

2.1 Due to the large number of ASTM test methods referenced in this guide, they will not be identified individually in this section.

2.2 *ASTM Standards* (other than test methods):

D 883 Terminology Relating to Plastics[2]

D 1600 Terminology for Abbreviated Terms Relating to Plastics[2]

IEEE/ ASTM SI-10 Standard for Use of the International System of Units (SI): The Modern Metric System[3]

2.3 *NFPA Standard:*

NFPA 99 Standard for Health Care Facilities[4]

3. Terminology

3.1 *Definitions*—The terminology used in this guide is in accordance with Terminologies D 883, D 1600, and IEEE/ ASTM SI-10.

4. Significance and Use

4.1 This guide is intended to provide ready access to the recommended property name, test method reference, maximum number of significant digits,[5] and appropriate units for commonly used plastics and thermoplastic elastomer tests.

4.2 It is particularly useful for those involved in the writing and proofreading of documents containing data for a large number of tests since the need to go to each individual test method should be greatly minimized.

4.3 SI units are to be regarded as the standard. U.S. Customary units and conversion factors are provided to accommodate those situations where it is necessary to report both. U.S. Customary refers to units commonly used in the United States and is not always the same as inch-pound units.

5. Procedure

5.1 Refer to Table 1 for the recommended nomenclature and units for physical properties and the recommended number of significant digits for test data associated with each property.

5.2 Abbreviations not shown in Table 1 that may be necessary to further clarify the conditions of testing, such as MHz and kHz for electrical tests, can be found in IEEE/ASTM SI–10.

6. Keywords

6.1 conversion factors; decimal places; properties reporting; reporting guide; significant figures

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[1] This guide is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.94 on Government/Industry Standards.

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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] Available from National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269–9101.

[5] The recommended maximum number of significant digits is based on experience of experts in the plastics industry.

TABLE 1 Reference Guide for Properties Reported

Property Reported	Units, SI (U.S. Customary)	ASTM Test Method	Maximum Number of Significant Digits	Conversion Factor (CV) (SI × CV = U.S. Customary)
Arc Resistance	s (s)	D 495	2	1
Bulk Density	kg/m^3(lb/ft^3)	D 1895	3	0.06242797
Coefficient of Friction	—	D 1894	2	—
Coefficient of Linear Thermal Expansion	mm/mm × °C (in./in. × °F)	D 696	2 (expressed in scientific notation)	0.5555556
Color, CIE, L*, a*, b*	—	E 308	3	—
Crystalline Peak Melting Point (T_m) 2nd Heating Cycle	°C (°F)	D 3418	3	(°C × 1.8) + 32
Dart Impact	g (g)	D 1709	2 (1 if value is <100)	1
Deflection Temperature @ 1.82 MPa (264 psi) @ 0.455 MPa (66 psi)	°C (°F)	D 648	3	(°C × 1.8) + 32
Density	kg/m^3(g/cm^3) g/cm^3(g/cm^3) g/cm^3(g/cm^3)	D 792 D 1505 D 4883	3 3 3	0.001 1 1
Dielectric Strength (Specify Method Used)	V/mm (V/mil)	D 149	3	0.0254
Dissipation Factor (Specify Test Frequency)	—	D 150	2	—
Durometer Hardness Shore A Shore D	—	D 2240	2	—
Elmendorf Tear Resistance	N (gf)	D 1922	3	101.9716
Elongation @ Break	% (%)	D 638 D 882 D 412	2 2 2	1 1 1
Elongation @ Yield	% (%)	D 638 D 882 D 412	2 2 2	1 1 1
Flammability	cm/min (in./min)	D 635	2	0.394
Flexural Modulus	MPa (10^5 psi)	D 790	3	0.001450377
Flexural Modulus, ___% Secant	MPa (10^5 psi)	D 790	3	0.001450377
Flexural Strength	MPa (psi)	D 790	3	145.0377
Flexural Yield Strength	MPa (psi)	D 790	3	145.0377
Flow Rate, Condition ___°C/___kg	g/10 min (g/10 min)	D 1238	2	1
Gardner Impact Strength @ F_{50}	J (in. × lbf)	D 5420	2	8.8507452
Gas Permeability, CO_2	cm^3× mm/m^2 × 24 h × atm (cm^3× mil/100 in.^{2}× 24 h × atm)	D 1434	2	2.54
Gas Permeability, O_2	cm^3× mm/m^2 × 24 h × atm (cm^3× mil/100 in.^{2}× 24 h × atm)	D 3985	2	2.54
Gas Transmission Rate, CO_2	cm^3/m^2× 24 h × atm (cm^3/100 in.^{2}× 24 h × atm)	D 1434	2	0.064516128
Gas Transmission Rate, O_2	cm^3/m^2× 24 h × atm (cm^3/100 in.^{2}× 24 h × atm)	D 3985	2	0.064516128

TABLE 1 *Continued*

Property Reported	Units, SI (U.S. Customary)	ASTM Test Method	Maximum Number of Significant Digits	Conversion Factor (CV) (SI × CV = U.S. Customary)
Glass Transition Temperature (T_g)	°C (°F)	D 3418	3	(°C × 1.8) + 32
Gloss @ ___°	—	D 2457	3	—
Haze	% (%)	D 1003	2	1
Heat of Fusion	kJ/kg (cal/g)			
1st Heating Cycle		E 793	2	0.2388459
2nd Heating Cycle		D 3417	2	0.2388459
Impact Resistance (Puncture), Energy @ Maximum Load	J (ft × lbf)	D 3763	2	0.7375621
Impact Resistance of Plastic Film, Energy to Rupture	J (ft × lbf)	D 4272	2	0.7375621
Impact Strength, Unnotched	J/m (ft × lbf/in.)	D 4812	3	0.01873408
Izod Impact Strength, Notched	J/m (ft × lbf/in.)	D 256	3	0.01873408
Light Transmission	% (%)	E 308	2	1
Melt Density @ ___°C	kg/m^3(g/cm^3)	D 3835 D 1238 (Note A, Table 2)	3	0.001
Mold Shrinkage	mm/mm (in./in.)	D 955	3	1
Oxygen Index	% (%)	D 2863	2	1
Permittivity (Dielectric Constant) (Specify Test Frequency)	—	D 150	2	—
PPT Tear Resistance	N (lbf)	D 2582	2	0.2248089
Refractive Index, n_D	—	D 542	4	—
Rockwell Hardness (Specify Scale)	—	D 785	3	—
Soluble Matter Loss	% (%)	D 570	2	1
Specific Gravity	—	D 792	3	—
Specific Heat @ ___°C (°F)	kJ/kg × K (cal/g × °C or Btu/lb × °F)	E 1269	3	(cal/g × °C) 0.2388459 (Btu/lb × °F) 0.2388459
Static Decay Rate	s (s)	D 4470 NFPA 99	3	1
Surface Resistivity	ohms/square (ohms/square)	D 257	2 (expressed in scientific notation)	1
Tear Propagation Resistance, Split-Tear Method	N (lbf) N/mm (lbf/in.)	D 1938	2 2	0.2248089 5.710147
Tear Propagation Resistance (Specify Specimen Type)	N/mm (lbf/in.)	D 624	3	5.710147
Tensile Modulus	MPa (10^5 psi) MPa (10^5 psi) MPa (10^5 psi)	D 638 D 882 D 412	3 3 3	0.001450377 0.001450377 0.001450377
Tensile Modulus, __% Secant	MPa (10^5 psi) MPa (10^5 psi) MPa (10^5 psi)	D 638 D 882 D 412	3 3 3	0.001450377 0.001450377 0.001450377
Tensile Stress @ Break	MPa (psi) MPa (psi) MPa (psi)	D 638 D 882 D 412	3 3 3	145.0377 145.0377 145.0377

TABLE 1 *Continued*

Property Reported	Units, SI (U.S. Customary)	ASTM Test Method	Maximum Number of Significant Digits	Conversion Factor (CV) (SI × CV = U.S. Customary)
Tensile Stress @ Yield	MPa (psi) MPa (psi) MPa (psi)	D 638 D 882 D 412	3 3 3	145.0377 145.0377 145.0377
Thickness of Film Tested	microns (mils)	D 5947 ≤250 microns (≤10 mils)	2	0.03937008
Thickness of Sheet Tested	mm (mils)	D 5947 >0.25 mm (>10 mils)	2	39.37008
Transmittance (Specify Regular Transmittance and/or Total Transmittance)	% (%)	D 1003	2	1
Transparency (Clarity)	% (%)	D 1746	2	1
Vicat Softening Temperature	°C (°F)	D 1525	3	(°C × 1.8) + 32
Volume Resistivity	ohms × cm (ohms × cm)	D 257	2 (expressed in scientific notation)	1
Water Absorption	% (%)	D 570	2	1
Water Vapor Transmission Rate	g/m^2× 24 h ($g/100\ in.^2$× 24 h)	F 372 (film/sheet)	2	0.06451628
Yellowness Index	—	E 313	2	—