



MATERIALS TESTING FOR MANUFACTURERS AND RETAILERS





UL helps you bring safe, high performance materials to the market while protecting your brand

When end-product manufacturers are searching for materials to use in their products, it is critical they select materials that are certain to meet their stringent specifications. Materials they can trust, and have been tested and validated, using the best methods, by unmatched experts in materials science.

With over 60 years of experience in materials testing, UL can work with you to configure a materials testing solution that can characterize your materials with certainty. UL has specific expertise working with plastics, rubber, paper and other component materials. We use recognized methods including AMS, ASTM, ISO, MIL, TAPPI and UL to test your products for compliance to international, federal, and regional standards.

UL's technical experts may help ensure that products meet performance requirements for their intended use and life. UL helps in meeting material requirements ensuring a safe and reliable product. They also can work with you to help identify and correct product vulnerabilities throughout its life cycle.

UL offers a full scope of material testing service capabilities, including:

- Standard testing and analysis
- Test method development
- Material recommendation and selection
- In-house sample preparation
- Packaging evaluation
- Testing to client protocol

UL helps clients in the advancement of quality assurance programs for their products, and leads the field in developing test methods for a wide variety of industries such as:

- Adhesives and coatings
- Plastics
- Rubber and elastomers
- Industrial, automotive & aerospace
- Commercial and government
- Packaging

UL is one of the world's leading materials testing and evaluation centers. Utilizing state of the art test methods, we can help you with selecting and verifying materials, investigating product failures, helping identify your production problems, and meeting your customer or industry requirements for material certification.

UL's clients rely on our knowledge to certify their materials and efficiently test polymer formulations. Within this document, you will find a detailed list of the most popular tests we provide our customers on a daily basis.

- Mechanical and physical properties
 - Tensile, flexural, compressive
 - Impact
 - Hardness
 - Abrasion
- Thermal properties
- Electrical properties
- Flammability
- Material analysis
- Extractions
- Spectroscopy
 - ICP+OES
 - ICP-MS
 - FT-IR
 - UV/VIS
 - 1. Light transmittance
 - 2. Light absorbance
- Gas chromatography
- Thermal analysis
 - Differential scanning calorimetry (DSC)
 - Thermogravimetric analysis (TGA)
- Thermal/humidity aging studies
 - UL 746B Polymeric Materials - Long Term Property Evaluations
 - UL 1446 Systems of Insulating Materials
- Weathering studies
- Customized programs
- Plastics processing
 - Two roll milling
 - Compression and injection molding of test specimens and plaques – Specimen fabrication

Have tests or unique test specimens not included in this document? Call us, we test and make specimens to many standards not included in this document.



MATERIALS TESTING

Material testing offered by UL include the most popular standard tests for all major plastics, rubbers, and film applications.

The range of analytical, chemical resistance, electrical, flammability, mechanical, optical, physical, rheological, and thermal tests meet the needs of many customers and industries. Other less common standard or customized requirements can often be performed upon request.

Analytical Testing

Detailed Service	Test Methods
Ash Content	ISO 3451-1 (Method A)
Ash Content (of Carbon Black)	ASTM D 1506 (Method A)
Ash Content (of Thermoplastics)	ASTM D 5630 (Procedure A)
Extractions	–
Gas chromatography (GC)	–
Gel Content	ASTM D 2765 (Method A)
Heats of Fusion and Crystallization, DSC	ASTM D 3417
Identification, FTIR	–
Ignition Loss (of Thermosets)	ASTM D 2584
Inductively coupled plasma mass spectrometry (ICP-MS)	–
Inductively coupled plasma optical emission spectrometry (ICP-OES)	–
Melting Point, Fisher-Johns	ASTM D 2133, Section 6.1.4
Melting Point, Fisher-Johns (of Nylons)	ASTM D 789, Section 10
Oxidative Induction Time, DSC (of Polyolefins)	ASTM D 3895
Thermogravimetric analysis (TGA)	ASTM D 3850
Transition Temperatures, DSC	ASTM D 3418, per transition
Ultraviolet-visible spectrophotometry	–
Volatile Loss, Activated Carbon	ASTM D 1203 (Method A)
Volatile Loss, Activated Carbon	ASTM D 1203 (Method B)
Weight Loss, of Volatiles	ASTM D 2288

Chemical Resistance Testing

Detailed Service	Test Methods
Chemical Resistance	ASTM D 543 (Practice A), per chemical
Environmental Stress-Crack Resistance	ASTM D 1693 (Condition A)
Environmental Stress-Crack Resistance	ASTM D 1693 (Condition B)
Environmental Stress-Crack Resistance	ASTM D 1693 (Condition C)
Fusion Quality, Acetone Immersion (of Rigid PVC)	ASTM D 2152
Residual Stress, Acetic Acid Immersion (of ABS)	ASTM D 1939

Electrical Testing

Detailed Service	Test Methods
Dielectric Breakdown Voltage and Dielectric Strength	ASTM D 149 (Method A)
Dielectric Breakdown Voltage and Dielectric Strength	ASTM D 149 (Method B)
Dielectric Breakdown Voltage and Dielectric Strength	ASTM D 149 (Method C)
Dielectric Constant (Permittivity) and Dissipation Factor (Loss)	ASTM D 150, Contact (1 MHz)
Dielectric Constant (Permittivity) and Dissipation Factor (Loss)	ASTM D 150, Two Fluid (1 MHz)
Insulation Resistance or Conductance	ASTM D 257
Surface Resistance (or Resistivity) or Conductance	ASTM D 257
Volume Resistance (or Resistivity) or Conductance	ASTM D 257



Flammability Testing

Detailed Service	Test Methods
Burning Rate	ASTM D 229, Sections 61-66 (Method I/Vertical)
Burning Rate	ASTM D 635 (Horizontal)
Burning Rate	FAA 25.853b5 (Horizontal)
Burning Rate	FMVSS 302 (49CFR571) (Horizontal)
Burning Rate	ISO 3795 (Horizontal)
Burning Rate	UL 94 HB (Horizontal)
Burning Rate	UL 94 HBF (Horizontal)
Burning Rate	UL 94 5V (Vertical)
Burning Rate	UL 94 V (Vertical)
Burning Rate	UL 94 VTM (Vertical)
Flame Propagation (of Elastomers)	ASTM C 1166
Flammability, Enclosure	UL 746C, Sect. 17-19 & 52-54
Flammability, Small Component	UL 1694
Oxygen Index	ASTM D 2863 (Procedure A/Test Method A)

Mechanical Testing

Detailed Service	Test Methods
Apparent Bending Modulus (Stiffness), Cantilever Beam	ASTM D 747
Apparent Shear Strength, Single-Lap-Joint (of Adhesives)	ASTM D 1002
Bond or Cohesive Strength	ASTM D 952
Coefficient of Friction	ASTM D 1894, per condition
Compression Deflection (of Flexible Closed-Cell Vinyl Foams)	ASTM D 1667, Sections 16-20
Compression Deflection (of Flexible Urethane Foams)	ASTM D 3574, Sections 30-36 (Test C)
Compression Deflection (of Rubbers)	ASTM D 575 (Method A)
Compression Deflection (of Rubbers)	ASTM D 575 (Method B)
Compressive Properties	ASTM D 695
Compressive Properties (of Rigid Cellular Plastics)	ASTM D 1621
Deformation Under Load	ASTM D 621 (Method A)

Flexural Strength and Modulus	ASTM D 790 (Procedure A)
Flexural Strength and Modulus	ISO 178
Impact Resistance, Falling Weight	ASTM D 5420
Impact Resistance, Falling Weight (of Rigid PVC)	ASTM D 4226 (Procedure A)
Impact Resistance, Falling Weight (of Rigid PVC)	ASTM D 4226 (Procedure B)
Impact Resistance, Pendulum, Charpy	ASTM D 6110
Impact Resistance, Pendulum, Izod	ASTM D 256 (Test Method A)
Impact Resistance, Pendulum, Izod	ASTM D 256 (Test Method E)
Impact Resistance, Pendulum, Izod, Unnotched	ASTM D 4812
Impact Strength (of UHMWPE)	ASTM F 648, Annex A1
Peel (or Stripping) Strength (of Adhesives)	ASTM D 903
Peel Strength, T-Peel (of Adhesives)	ASTM D 1876
Penetration Resistance, Slow Rate (of Films)	ASTM F 1306
Shear Strength, In-Plane, Compressive	ASTM D 3846
Shear Strength, Punch	ASTM D 732
Shear Strength, Short-Beam	ISO 14130
Tear Resistance	ASTM D 1004
Tear Resistance	ASTM D 1004
Tear Resistance, Elmendorf	ASTM D 1922
Tear Resistance, Single-Tear	ASTM D 1938
Tear Strength (of Rubbers)	ASTM D 624
Tensile Impact Strength	ASTM D 1822
Tensile Strength and Elongation	ASTM D 638
Tensile Strength and Elongation (of Rubbers)	ASTM D 412 (Method A)
Tensile Strength and Elongation, Microtensile	ASTM D 1708
Tensile Strength, Elongation, and Modulus	ASTM D 638
Tensile Strength, Elongation, and Modulus (of Films)	ASTM D 882



Optical Testing

Detailed Service

Haze and Luminous Transmittance

Test Methods

ASTM D 1003 (Procedure B)

Residual Stress, by Polarized Light (of Transparent or Translucent Plastics)

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Physical Testing

Detailed Service

Abrasion Resistance, Surface, Taber (of Transparent Plastics)

Test Methods

ASTM D 1044

Abrasion Resistance, Taber (of Coated Fabrics)

ASTM D 3389 (Method A)

Abrasion Resistance, Taber (of Coated Fabrics)

ASTM D 3389 (Method B)

Abrasion Resistance, Taber (of Coatings)

ASTM D 4060

Apparent (Bulk) Density, Bulk Factor, and Pourability

ASTM D 1895 (Method A)

Apparent (Bulk) Density, Bulk Factor, and Pourability

ASTM D 1895 (Method B)

Apparent (Bulk) Density, Bulk Factor, and Pourability

ASTM D 1895 (Method C)

Apparent Density

ISO 61

Apparent Density (of Rigid Cellular Plastics)

ASTM D 1622

Bulk Density and Specific Gravity (of Plastic Lumber and Shapes)

ASTM D 6111

Density (of Flexible Urethane Foams)

ASTM D 3574, Sections 9-15 (Test A)

Dimensional Changes

ASTM D 1204

Extrusion Quality (Heat Reversion) (of PVC Pipe)

ASTM F 1057

Gel Count (of Films)

ASTM D 3351

Indentation Hardness, Barcol

ASTM D 2583

Indentation Hardness, Durometer, Shore (of Rubbers and Plastics)

ASTM D 2240

Indentation Hardness, Rockwell

ASTM D 785 (Procedure A)

Indentation Hardness, Rockwell

ISO 2039-2

Linear Thermal Shrinkage

ASTM D 2732





Physical Testing - continued

Mold Shrinkage	ASTM D 955
Resilience, Rebound (of Rubbers)	ASTM D 2632
Specific Gravity/Density	ASTM D 792 (Method A)
Thickness (of Film and Sheet)	ASTM D 374, Section 9.2 (Method A or B)
Thickness (of Film and Sheet)	ASTM D 374, Section 9.2 (Method C)
Thickness (of PVC Sheet)	ASTM D 1593, Sect. 7.2 & 10.1.3
Void Content (of Reinforced Plastics)	ASTM D 2734 (Method A)
Void Content (of Reinforced Plastics)	ASTM D 2734 (Method C)
Water Absorption	ASTM D 570
Water Absorption	ISO 62 (Method 1)
Water Absorption (of Flexible Closed-Cell Vinyl Foams)	ASTM D 1667, Sections 26-31
Water Vapor Transmission	ASTM E 96

Since 1894, UL has been a respected leader in safety science. Today, UL is advancing its commitment to protecting people, products and places through expert advisory and independent quality assurance testing, inspections, and assessments for a wide range of consumer products. Our network of more than 131 laboratory testing and certification facilities in 39 countries helps drive the integrity of global supply chains, optimize product performance and protect brands.

Rheological Testing

Detailed Service	Test Methods
Melt Flow Rate	ASTM D 1238 (Procedure A)
Melt Flow Rate	ISO 1133 (Procedure A)

Thermal Testing

Detailed Service	Test Methods
Brittleness Temperature	ASTM D 746, Locate
Brittleness Temperature	ASTM D 746, Specified (Procedure A or B)
Brittleness Temperature (of Films)	ASTM D 1790
Brittleness Temperature (of Rubber-Coated Fabrics)	ASTM D 2137 (Method B)
Brittleness Temperature (of Rubbers)	ASTM D 2137 (Method A)
Coefficient of Linear Thermal Expansion, Dilatometer	ASTM D 696
Cold Bend/Low Temperature Flexibility (of Insulated Cable)	UL 1581, Sections 580 & 583
Compression Set (of Flexible Closed-Cell Vinyl Foams)	ASTM D 1667, Sections 21-25
Compression Set (of Flexible Urethane Foams)	ASTM D 3574, Sections 37-44 (Test D)
Compression Set (of Rubbers)	ASTM D 395 (Method B)
Compression Set, Low Temperature (of Rubbers)	ASTM D 1229
Deflection Temperature Under Load	ASTM D 648 (Method A), per stress
Softening Temperature, Vicat	ASTM D 1525

Contact us at:

Email: Ctech@ul.com