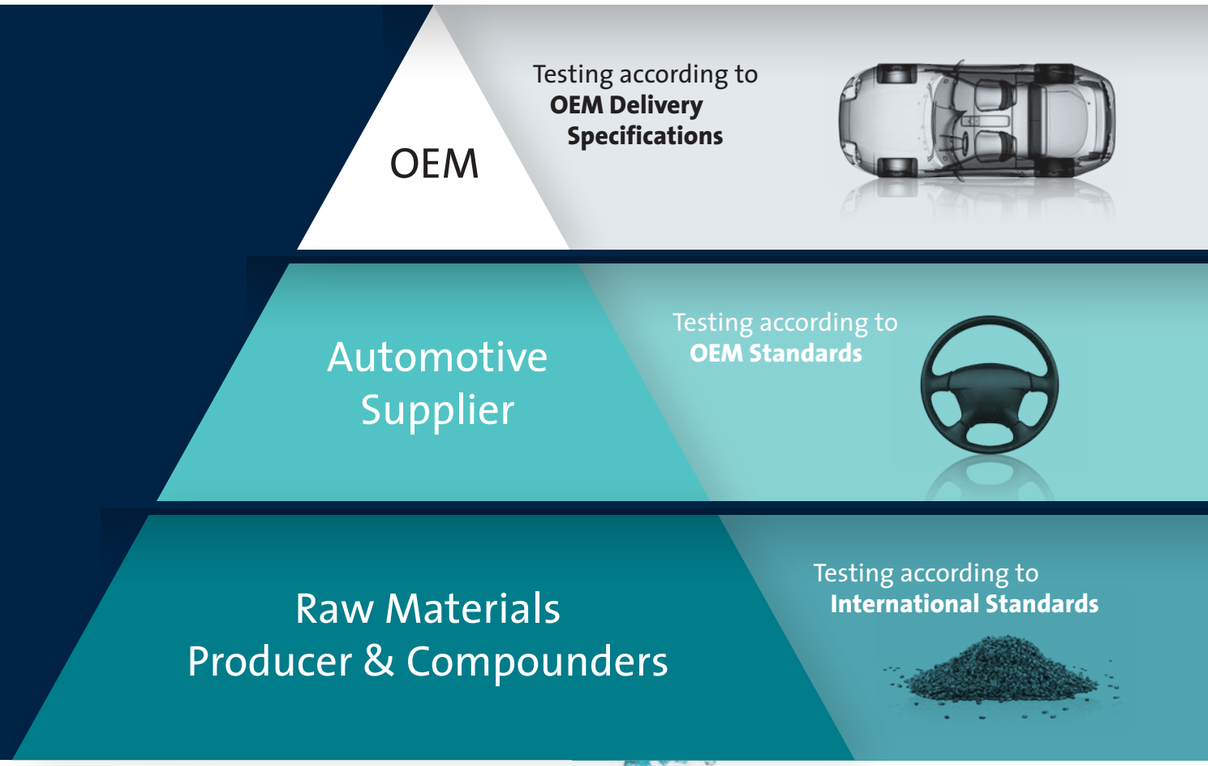
UL PERFORMANCE MATERIALS

# AUTOMOTIVE TESTING AND ENGINEERING SERVICES

# PERFORMANCE MATERIALS FOR AUTOMOTIVE APPLICATIONS




*UL's Performance Materials Division helps car manufacturers and automotive suppliers to reduce costs, improve product reliability and increase efficiency along the entire automotive supply chain by complementing or substituting internal testing capabilities.*

UL's accredited, independent testing centers verify material and product performance according to customer specific requirements, international test standards as well as local and global regulations. UL supports customers from product concept stage to early product development, through to final part production approval process (PPAP) for an optimized time-to-market.

With the UL service portfolio customers have access to a single source for compounding trials, test specimen production via injection molding, as well as, testing and certification of thermoplastics, rubbers, thermosets and textiles. Technical consulting and failure analysis complement our one-stop service.

UL's accredited testing facilities offer large scale testing capacities, short lead times and excellent value for money. UL's global presence ensures easy and clear communication lines to local subject matter experts within the experienced UL Performance Materials team. Each service is available individually or as part of a customized package.

# AUTOMOTIVE TESTING AND ENGINEERING SERVICES

## FROM UL PERFORMANCE MATERIALS

EMISSION TESTING

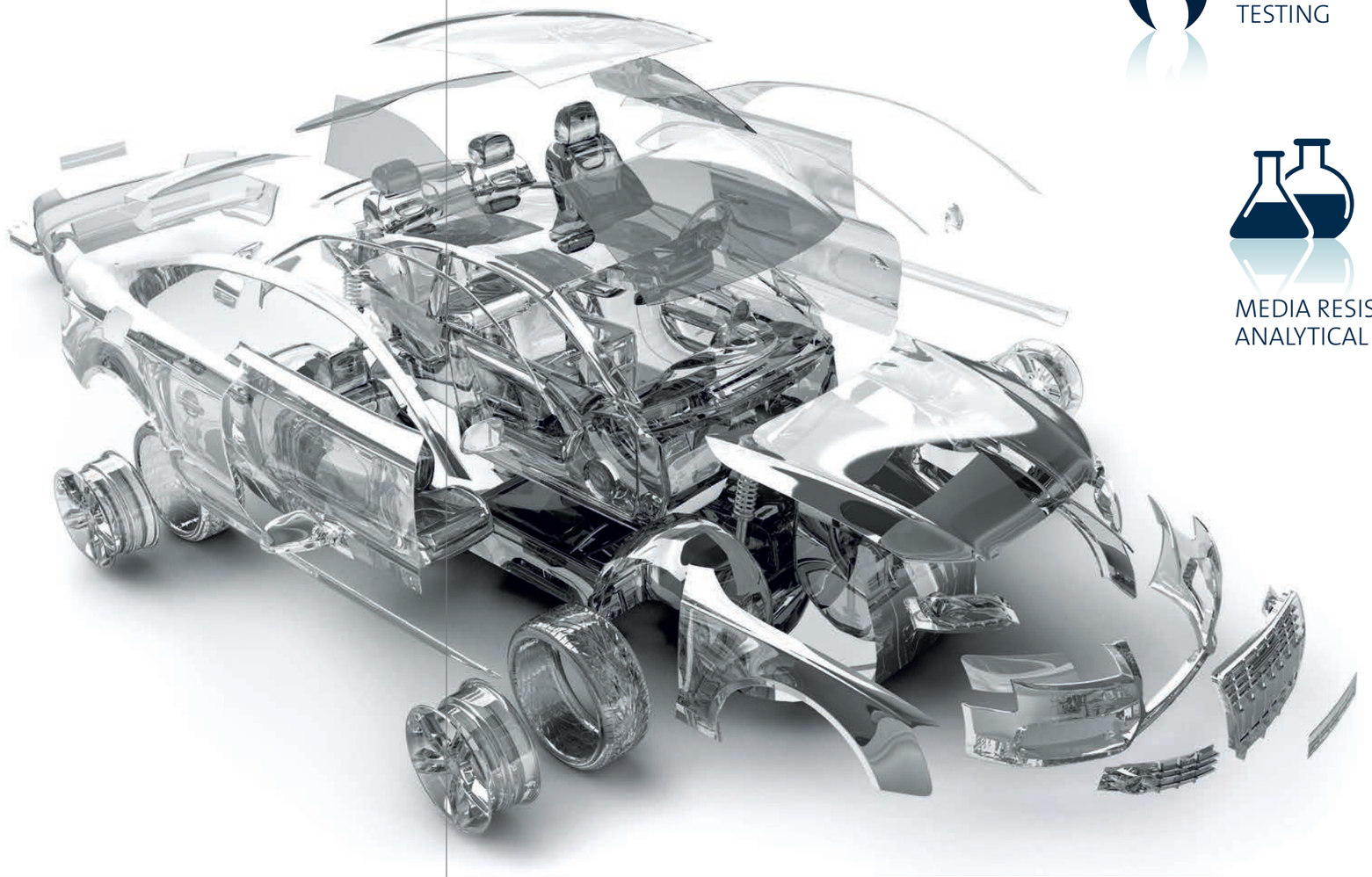
TEXTILE TESTING

SURFACE TESTING

MECHANICAL TESTING

BURNING BEHAVIOR AND ELECTRICAL TESTING

ENVIRONMENTAL TESTING



MEDIA RESISTANCE AND ANALYTICAL TESTING

## OUR SERVICES FOR THE AUTOMOTIVE INDUSTRY INCLUDE:

- Automotive testing in the areas of rheology, mechanics, fire, media resistance, surface performance.
- Prediction of environmental performance via weather, temperature, climate change and ozone stress testing.
- Development, execution and management of test programs according to OEM requirements, standards and regulations.
- Preparation and production of samples for testing.

## ADDITIONAL UL AUTOMOTIVE SERVICES:

- BATTERY TESTING
- EV TESTING
- WIRELESS/EMC TESTING
- ON-BOARD FUNCTIONAL SAFETY
- UL PROSPECTOR SUPPLIER DATABASE
- GLOBAL MARKET ACCESS

# ENVIRONMENTAL TESTING

*UL Performance Materials offers a comprehensive range of tests to determine the effects of the environment on internal and external automotive components. The experts in our labs can provide accelerated processes to help you meet the demands of car manufacturers and end-user expectations.*


## OZONE RESISTANCE

Testing for ozone resistance helps you avoid exposure-related damage that considerably reduces product longevity.

| Typical testing methods |
|---|
| DIN 53509 |
| ASTM 1149 |
| ISO 1431 |
| PV 3305 |
| PV 3316 |
| VDA 675-311 |
| GM 4486P |
| D47 1100 |

## LIGHT AND WEATHERING

Our experts can help you determine whether your components are likely to reveal optical and mechanical changes after long-term exposure to light and weathering.

| Typical testing methods |
|---|
| ASTM G26 |
| ASTM G151 |
| ASTM G155 |
| DIN EN ISO 4892 |
| SAE J2412 |
| SAE J2527 |
| VDA 75202 |
| PV 1303 |
| PV 3929 |
| PV 3930 |
| DIN EN ISO 105-B06 |

## CLIMATE CHANGE TESTING

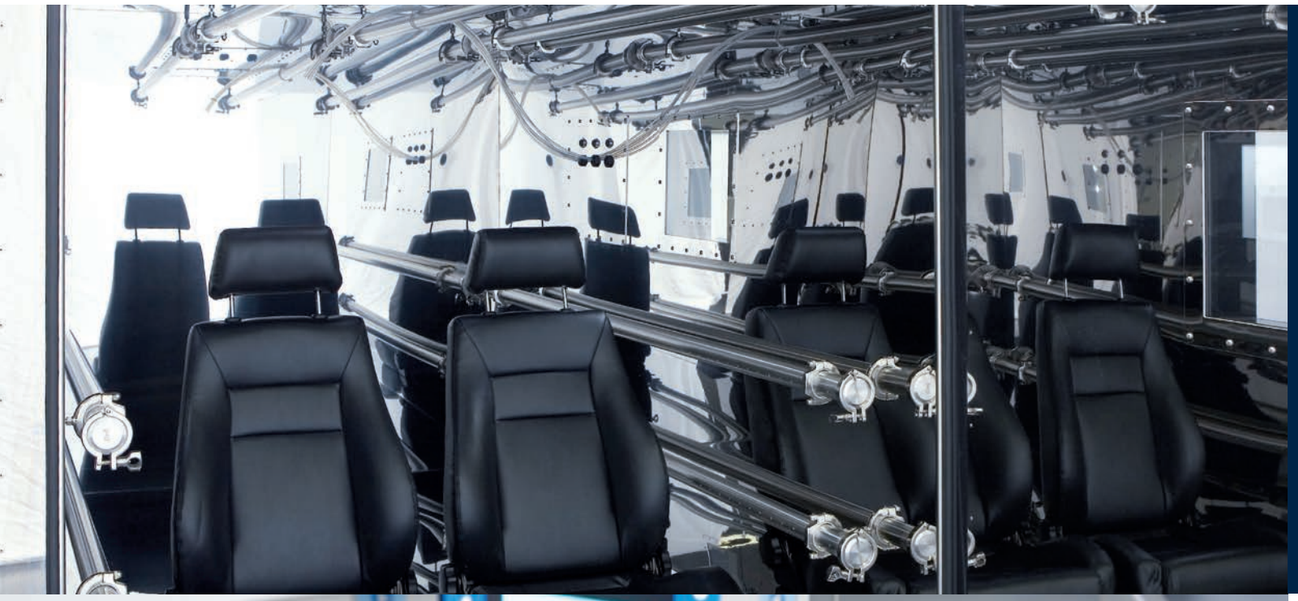
Fluctuating weather and temperature conditions can weaken automotive components. UL's testing capabilities can simulate a broad range of climate conditions and help to create a reliable performance forecast.

| Typical testing methods |
|---|
| PV 1200 |
| DIN 40046 |
| IEC 60721-4 |
| IEC 60068-2 |
| GMW 14729 |
| PR 303.5 |
| PV 2005 |
| D47 1309 |
| GMW 14124 |
| PR 308.2 |

## THERMAL AGING AND HEAT RESISTANCE

Our temperature test chambers can simulate aging in an accelerated process and reveal the effects of long-term heat exposure.

| Typical testing methods |
|---|
| IEC 60216-1 |
| UL 746 B |
| D45 1139 PSA |
| D45 1234 PSA |
| PV 3355 |
| ISO 188 |
| EN ISO 2578 |
| VDA 675-310 |



# EMISSION TESTING

*The use of polymers and other performance materials may result in the release of unwanted or disturbing substances. In small spaces, concentrated emissions can affect comfort or user health. The nature and quantity of these emissions are strictly regulated and quantified in specifications that include qualitative smell tests, quantitative fogging measurements and extensive emission tests.*

## FOGGING

Condensing of organic substances can cause window fogging and thus limit visibility. Fogging is a method to simulate desorption of substances out of interior car parts in a measurable, representative and reproducible way.

Typical testing methods

- PV 3015
- D45 1727 PSA
- SAE J1756
- DBL 5306_18.2
- ISO 6452
- ISO 17071
- DIN EN 14288
- DIN 75201

## VOLATILE ORGANIC COMPOUNDS (VOC)

UL can deliver a detailed breakdown of emissions, including the assessment of critical substances.

Typical testing methods

- VDA 276
- ISO 12219-4

## HEADSPACE ANALYSIS

Headspace analysis can be used to determine odor-related issues with polymers, compare material recipes and analyze polymer softening agents.

Typical testing methods

- VDA 277
- PV 3341

## FORMALDEHYDE EMISSIONS TESTING

Formaldehyde emissions may adversely affect user comfort. Mass-related testing, such as the flask method, helps further ensure interior air quality.

Typical testing methods

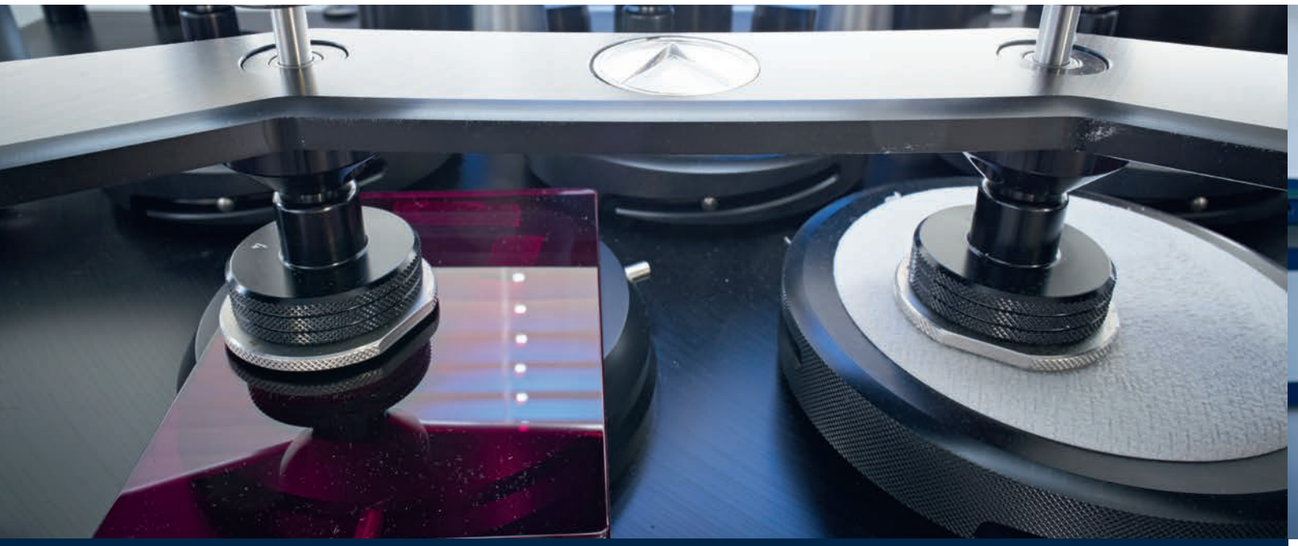
- VDA 275
- PV 3925

## ODOR TESTING

New car odors should not be unpleasant to users. Testing and qualitative ratings are applied per various OEM requirements for user comfort.

Typical testing methods

- VDA 270
- PV 3900
- ISO 12219-7
- DBL 5306_17
- D10 5495 PSA



# TEXTILE TESTING

*Many physical testing methods can be used for automotive textiles. UL provides textile tests in accordance with car manufacturers and industry standards for samples and quality assurance.*

## WET AND DRY ABRASION

Electric Crockmeter equipment is commonly used for wet and dry abrasion testing. This testing can include the determination of color or structural alternations occurring in textiles, leather and carpeting e.g. as a result of long-term wear.

| Typical testing methods |
|---|
| PV 3906 |
| DIN EN 105-X12 |
| ISO 105-D02 |
| DBL 7384_8.9 |
| PV 3987 |

## MARTINDALE ABRASION AND PILLING

OEMs frequently require Martindale abrasion and pilling tests to determine the abrasive wear and pilling properties of textiles and upholstery. In addition meaningful results for plain thermoplastic surfaces can be generated.

| Typical testing methods |
|---|
| DIN EN ISO 12945 |
| DIN EN ISO 12947 |
| ASTM D4966 |
| PV 3356 |
| PV 3968 |
| PV 3961 |
| PV 3975 |

## ABRASION TESTER (SCHOPPER TYPE)

Test equipment like the Schopper abrasion tester forms the basis for the determination of a textile's resistance to soiling, cleaning and abrasion-related wear or discoloring. A subsequent surface analysis complements the textile performance evaluation.

| Typical testing methods |
|---|
| DIN 53863 |
| PV 3908 |
| PV 3353 |

## FLOCK TESTING

UL offers a demonstrative test to determine the wear resistance of flocked surfaces. Typically the APG 1000 abrasion tester is used to evaluate the quality of flocked surfaces.

| Typical testing methods |
|---|
| DBL 5578 |
| PV 3366 |
| PV 3949 |

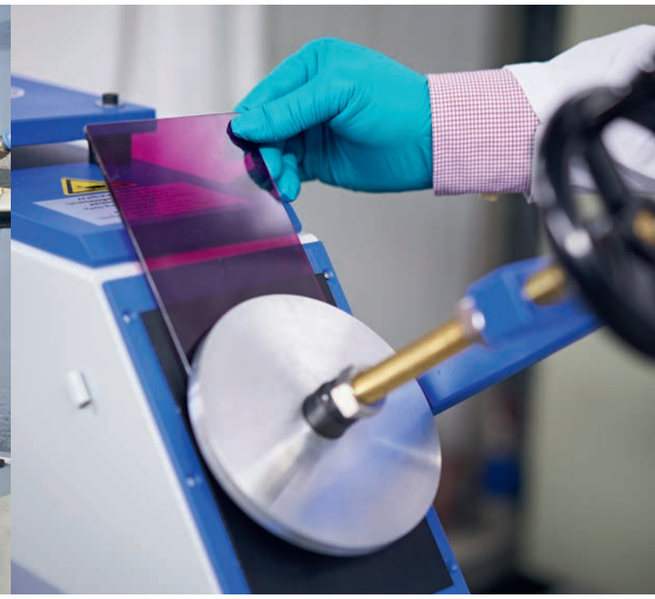
## TUMBLE PILLING

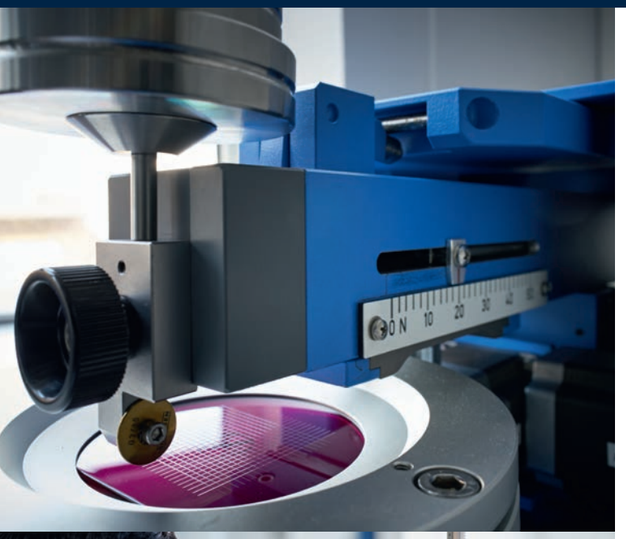
To determine the product resistance to form pills and other wear on textile fabrics UL is using the Random Tumble Pilling Tester. Similar to abrasion test technologies this test relates to micro- and macroscopic changes at the substrate surface.

| Typical testing methods |
|---|
| PV 3360 |
| ASTM D3512 |
| DIN 53867 |
| ISO 12945 - 3 |

# SURFACE TESTING

*In order to engineer and produce automotive parts with consistent and superior quality, it is vital to use appropriate test technologies to analyze surface characteristics. The test results can help to predict real world product characteristics and life time behavior. UL conducts a wide range of destructive and non-destructive surface tests on standardized specimens and finished components.*





## SURFACE SCRATCH TEST

With equipment like the Scratch Hardness Tester, multiple cut, scratch and tear tests can be carried out on all types of coatings and materials.

| Typical testing methods |
|---|
| DIN EN ISO 2409 |
| ASTM D 3359 |
| VDA 621-411 |
| GME 60 280 |
| GMW 14829 |
| PV 3952 |
| PV 3964 |

## OPTICAL ASSESSMENT

UL offers a full range of standard and special optical and color measurement services.

| Typical testing methods |
|---|
| DIN 67530 |
| ASTM D523 |
| ISO 2813 |
| DIN 5033 |
| DIN 5036 |
| DIN 6174 |
| ASTM E308 |
| ASTM D1003 |
| ASTM E179 |
| ISO 13468 |
| ISO 105-A02 |

## METALLIC COATING THICKNESS

UL's experts can provide coulometric coating thickness measurements for nearly all metallic coating types. These coatings can be single- or multi-layer structures on polymers, which are analyzed by the STEP test.

| Typical testing methods |
|---|
| DIN EN ISO 2177 |
| ASTM B764-94 |
| DIN 50022 |
| PV 1065 |

## CAR WASH SIMULATION

With the car wash simulation apparatus at UL our experts can help determine how surfaces with or without coatings resist the influence of specifically-defined brushes of a common car wash system.

| Typical testing methods |
|---|
| ISO 20566 |
| PV 3.3.3 |
| DIN 55668 |

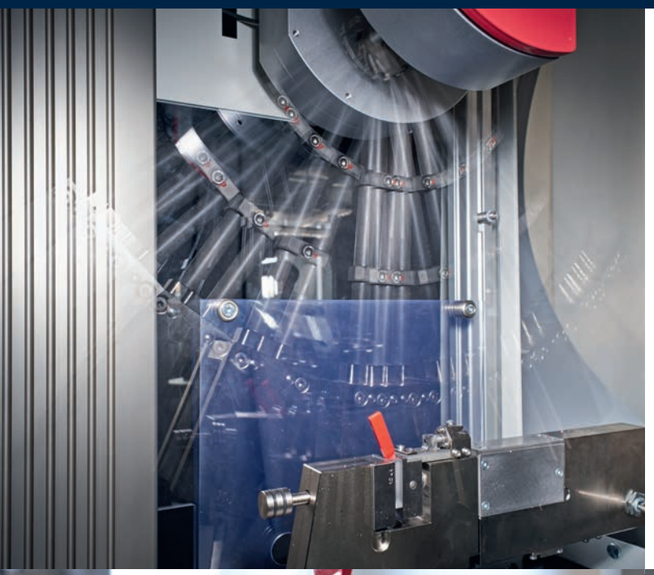
## IMPACT RESISTANCE

The Stone Hammer Blow Test is used to determine a coating's ability to withstand impacts of small objects, such as stones.

| Typical testing methods |
|---|
| PSA D24 1312 |
| VDA 508 |
| DIN EN ISO 20567 |
| FLTM BI 157-06 |
| PV 3.14.7 |
| DBL 5416_13.5 |

# MECHANICAL TESTING

*Particularly for polymers, UL Performance Materials is a known specialist with a global network of laboratories offering a diversified range of destructive testing in a fully automated start-to-finish sequence.*



## TENSILE TEST

This test method is used to assess the behavior of plastics when subjected to uniaxial tensile stress.

Typical testing methods

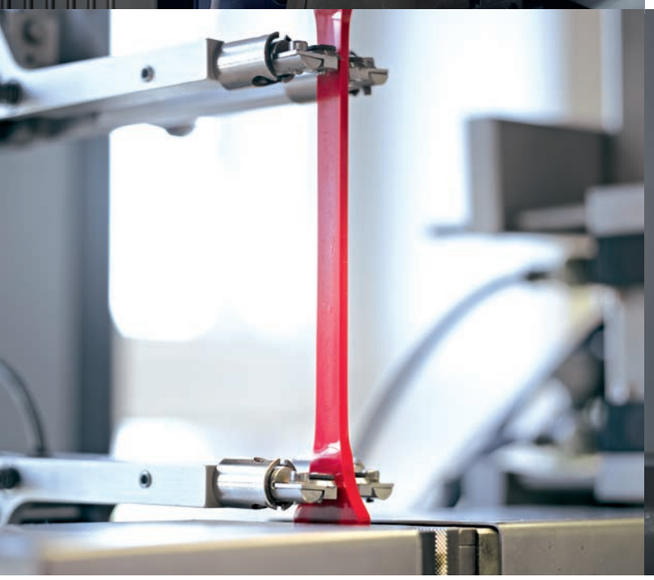
- DIN EN ISO 527
- DIN EN 20527
- DIN 53455/53457
- DIN EN 61
- ASTM D638

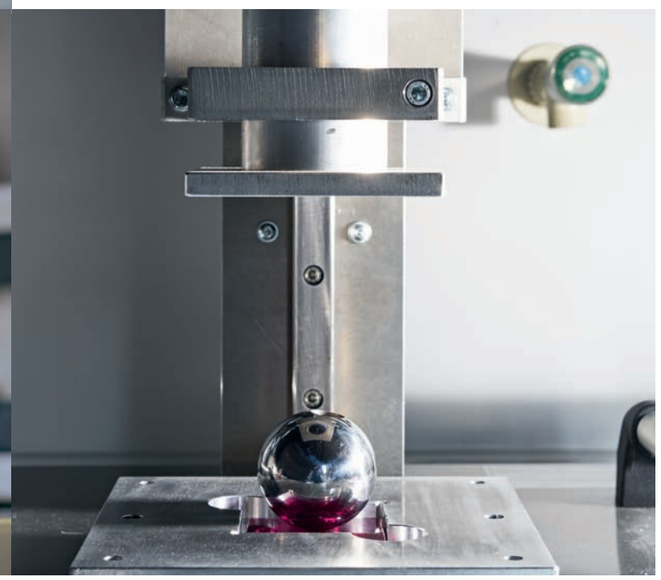
## HIGH SPEED TENSILE TEST

This complex test method is used to determine the data of plastic materials at very high pull rates.

Typical testing methods

- IN-HOUSE STANDARD





## TENSILE IMPACT TEST

The tensile impact test is a test with a very high deformation speed.

Typical testing methods

- DIN EN ISO 8256
- DIN EN 28256
- DIN 53448

## IZOD & CHARPY IMPACT TEST

These are quick and simple tests to facilitate a comparative assessment.

Typical testing methods

- DIN EN ISO 180
- EN ISO 20180
- ASTM D256
- DIN EN ISO 179
- DIN EN 20179
- DIN 53453

## PENETRATION TEST

The instrumented test in accordance with this standard describes a test method that is used to determine the penetration behavior of solid plastics.

Typical testing methods

- DIN EN ISO 6603-2

## BALL INDENTATION

The ball indentation hardness is the quotient of the applied load and the surface area of the indentation that is present underneath a ball.

Typical testing methods

- DIN EN ISO 2039-1
- DIN EN 53456

## ROCKWELL HARDNESS

This test method is used to determine the hardness of a test specimen as a function of the depth of indentation, taking the elastic recovery into consideration.

Typical testing methods

- DIN EN ISO 2093-2
- ASTM D785

## BALL DROP TEST

This test method is to determine the penetration resistance and flexibility of coatings and the adhesion at low temperatures of acoustic damping systems.

Typical testing methods

- PV 3905
- PV 3966
- PV 3971
- DBL 5306_7.3

## STEERING WHEEL HARDNESS

The steering wheel hardness measurement is used for the comparative evaluation of the material hardness on steering wheels.

Typical testing methods

- PV 3931

## BENDING TEST

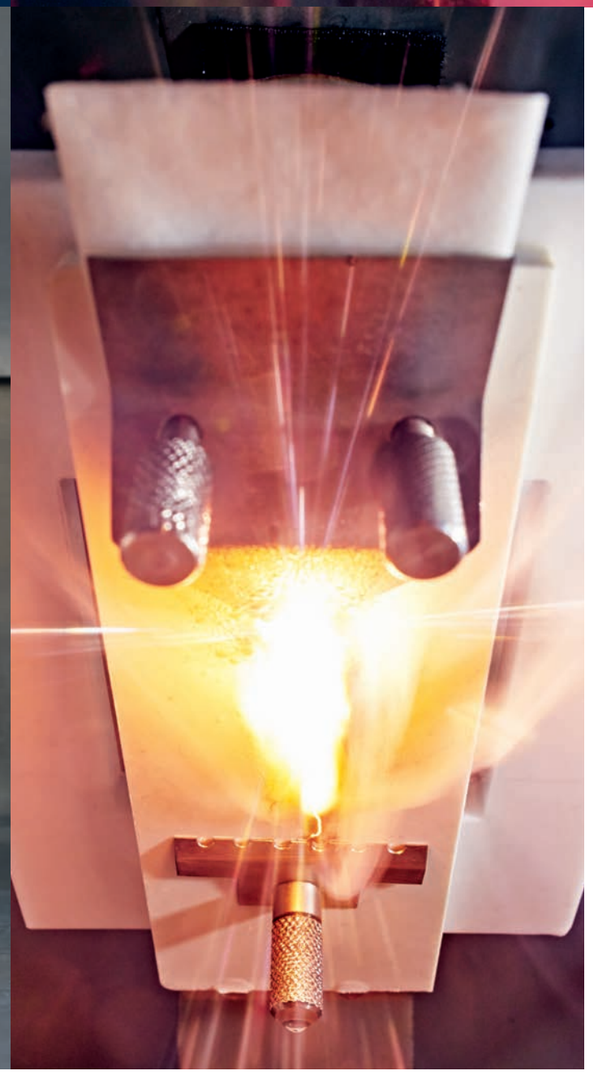
This test method determines the strength and dimensional change properties of plastics when subjected to three-point loading.

Typical testing methods

- DIN EN ISO 178
- DIN EN 20178
- DIN 53452/53457
- DIN EN 63
- ASTM D790

# BURNING BEHAVIOR

*Combustion and ignition tests are used to determine the quality and safety of materials in critical applications. Many requirements of the automotive industry can be met using standard test methods.*

## BURNING BEHAVIOR

UL has a wide range of testing capabilities to determine the burning characteristics of raw materials, components and finished products.

| Typical testing methods |
|---|
| US FMVSS 302 |
| TL1010 |
| ISO 3795 |
| UL 94 |
| IEC 60695-2-13 |
| IEC 60695-2-12 |
| PV 3343 |
| PV 3357 |
| DIN 75200 |

## ELECTRICAL TESTING

UL has a long history of testing for electrical safety and performance with respect to many materials and multiple industries. The following tests are most common for automotive applications.

| Typical testing methods |
|---|
| IEC 60250 |
| DIN IEC 60093 |
| VDE 0303 Part 30 |
| DIN IEC 60243-1 |
| DIN IEC 60112 |
| ASTM D495 |
| IEC 60426 |
| VDE 0303 Part 10 |
| VDE 0441 Part 1 |
| PV 3977 |
| PV 1063 |

# MEDIA RESISTANCE AND ANALYTICAL TESTING

*Automotive applications have to be aligned with global regulations, international standards as well as legal requirements. In addition automotive products need to comply with dedicated OEM and supplier delivery specifications. With the help of chemical and analytical testing, vehicle and part manufactures can help ensure that consumers are protected from potential risks through early development reviews combined with a root cause analysis.*

## CHEMICAL AND MEDIA RESISTANCE

Common for many of the industries UL serves, chemical and media resistance testing measures a material's resistance to oil, gas, aqueous liquids, cleaning agents and other chemicals.

| Typical testing methods |
|---|
| DIN EN ISO 22088-3 |
| ISO 175 |
| DIN 53521 |
| PV 3004 |
| DIN 53449-3 |

## ANALYTICAL TESTING

Very common test methods, such as TGA, DSC, IR, TMA or MCC also form the basis for material analyses relevant for the automotive industry.

| Typical testing methods |
|---|
| DIN 51005 |
| DIN 53752 |
| DIN 53765 |
| DIN 51006 |
| ASTM D7309 |

**EUROPE**
T: +49.2151.5370.370
E: ttc@ul.com

**NORTH AMERICA**
T:+1. 877.854.3577
E: PMSales@ul.com

**CHINA**
T: +86.512.6808.6400
E: SUZ.AutoMaterials@ul.com

**INDIA**
T: +91.80.4138.4400
E: customerservice.in@ul.com

**JAPAN**
T: +81.3.5293.6200
E: customerservice.jp@ul.com

**KOREA**
T: +82.2.2009.9100
E: sales.kr@ul.com

**ASEAN**
T: +65.6274.0702
E: sales.sg@ul.com

**ULTTC.com** | UL.com



502.01/16.7.en.1200