INFOSHEET

# Building product reliability through rigorous environmental testing

## Trust forms the foundation of remarkable products.

At UL Solutions, we work with manufacturers, original equipment manufacturers (OEMs) and their suppliers to bring safer, smarter products to the marketplace.

We apply our expertise to test your components against relevant performance standards and protocols. We work closely with key international regulatory agencies, code authorities and manufacturers on the development of consensus-based standards and services that apply to emerging technologies within your industry.

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## Covering the elements of environmental testing

If your products and their components spend most of their existence outdoors, evaluating their performance under varying conditions is even more critical. Our environmental testing combines a variety of real-world simulations and accelerated testing options to help you demonstrate resistance, durability, safety and performance.

## Some of the simulated environments we offer:

- Temperature
- Humidity
- Altitude
- Vibration
- Thermal shock
- Water ingress
- Ingress protection (IP)
- Dust
- Salt fog
- Ozone
- Ultraviolet (UV)
- Combine environments (thermal with vibration)

## Components tested against applicable standards provide confidence to your customers

We provide environmental testing to evaluate aspects of your components' performance covered by the following standards:

- LV 124
- EC 60529
- ISO 20653:2023
- JIS D 0203
- IEC 60068 series
- Automotive manufacturer standards

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## Temperature

Our array of thermal testing equipment can produce a range of temperatures from -70 degrees Celsius (°C) to 180°C. They can also incorporate noncondensing relative humidity from 10%-95% and offer a ramp rate up to 15°C per minute.

Standards include:

- IEC 60068-2-1
- IEC 60068-2-2
- IEC 60068-2-30
- IEC 60068-2-38
- IEC 60068-2-67
- IEC 60068-2-68

## Thermal shock

Our thermal shock testing exposes and evaluates component resistance to sudden changes of temperature within short time periods. Hot chambers range from 50°C to 210°C, while cold chambers range from -190°C to -75°C.

Standards include:

- GMW 3172
- SAE J1455
- IEC 60068-2-14
- LV 124-2
- ISO 16750-4:2023

## Altitude

Our standard and large-capacity altitude testing ranges from sea level to 70,000 feet at temperatures that range from -73°C to 177°C with ramp rates of 2.5°C-5°C per minute.

Standards include:

- IEC 60068-2-13

## Ingress protection, water and dust

Our IP water and dust testing evaluates liquid ingress and solid particle protection. Tests include various substances such as hands, steel balls, steel wires, dust and water. Others may be available upon request.

Standards and IP test ratings include:

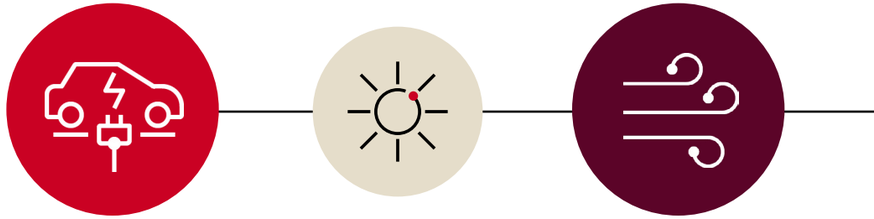
- IEC/EN 60529
- IPx1, IPx2, IPx3, IPx4, IPx5, IPx6, IPx7, IPx8
- Water IP
- Dust IP (talcum powder only)
- IP5x, IP6x

## Ozone testing

Our ozone testing chamber simulates ranges from 0 to 250 parts per hundred million by volume (PPHM/VOL) and 0 to 1,000 PPHM/VOL at 0 to 6 cubic feet per minute air flow.

Test methods include:

- ASTM D1149
- ASTM D1171
- ASTM D1149
- ASTM D3395
- ASTM D4575 (Method A only)
- ISO 1431-1:1989
- ISO 1431-2:1994
- ISO 1431-3:2000



## Weathering

Weathering is an environmental simulation and describes the testing of materials or products through targeted weather exposure. It is used for quality assurance with regard to weather resistance and durability. The aim is to determine the service life of products exposed to the weather as accurately as possible.

The extent to which the tested properties are maintained is referred to as weather resistance or weathering stability. Weather fastness differs from light fastness, which is purely an exposure test. The latter only represents the influences of radiation, whereas weather fastness also refers to influences such as humidity, temperature and temperature changes.

Tests can be carried out outdoors or in the laboratory. Depending on the type of exposure, a distinction is made between natural weathering (outdoor weathering) and artificial weathering (laboratory weathering). In the case of natural weathering, a distinction is made between real-time and accelerated weathering. Artificial weathering is always an accelerated weathering test.

Weathering tests are among the most important material tests in the automotive and aviation industries, as well as in the paint, plastics and textile industries. Weathering testing is also used in the field of high-light fastness printing inks. There are numerous standards and quality seals relating to weathering tests.

UL Solutions offers a wide range of laboratory weathering tests. We also have a wide range of testing equipment, including the Atlas Weather-Ometer Ci4000 and Ci5000, Atlas Xenotest Alpha HE, Beta+ and 440 as well as Atlas Suntest XXL+.

Listed are a few of the common standards (others are available upon request):

- ISO 4892-2, ISO 16474
- ISO 105-B02, ISO 105-B04
- ISO 105-B06, PV1303
- PV1306, PV3929
- PV3930, VDA 75202
- SAE J2412, SAE J2527
- Ford FLTM BO 116-01
- FIAT 50451/01 A-2 Xenon-arc Method B
- ASTM G155, BMW AA-0235
- BMW AA-0236

For more information about UL Solutions' complete environmental testing services and offerings, visit UL.com/EnvironmentalTesting.

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