

Add value. Inspire trust.

Quality matters – the choice is yours

With our environmental testing facilities

Corrosion

climatic testing

Ingress protection (IP)

Mechanical testing Transport simulation

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No load too big – with our support

You probably want your technical equipment to have a long life, even when exposed to major stresses caused by extreme mechanical, climatic and environmental conditions. To achieve this, you should test your products in advance under conditions that are as realistic as possible. Offering an array of environmental simulations, we support you right from the outset, helping you to verify the usability of your products.

Add value with environmental simulations

Environmental simulations help you to identify and avoid possible faults at an early stage of the design and development phase. This enables you to cut production costs and improve product safety. You benefit by reducing your product liability risks, being able to offer longer warranty periods and securing important competitive edge.

Our testing facilities

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TÜV SÜD's testing facilities – as varied as the environment itself

At our testing facilities we can expose your products to changing temperatures and air humidity, salt-spray and mechanical vibration as well as shock tests. These conditions enable you to realistically assess the possible risks encountered during transport or later use of your technical equipment.

As products may be exposed to multiple influences simultaneously, combined simulations often make good sense. We are your one-stop source for all your testing needs. We also coordinate multidisciplinary test projects in fields such as EMC, GMA and environmental simulation.

Of course, our services are always in line with your schedules. We supply regular unsolicited reports on our testing progress to ensure the required level of transparency. Together with our dedicated team, we are able to realise even tight schedules. You benefit from our in-depth know-how, our long-standing expertise and our familiarity with current developments, based on our experts' active participation in standardisation committees.

Your benefits at a glance

- One-stop environmental simulation services
- Multidisciplinary handling of your projects
- Parallel and/or sequential performance of complete test series
- On-time performance
- Assumption of project management and coordination
- Automatic reporting within the agreed scope



Test tailoring always the right test

The tests we offer are as varied as your technical equipment and the conditions of its use. On request, we develop a test plan tailored to your specific requirements.

You can rely on these tests tailored to your specific environment and/or application to avoid the risk of over- and/or undertesting your components. You can rest assured that we will only perform tests that are actually necessary and that all tests will be based on the correct testing parameters. This saves you time and money. Beyond this, tailored testing enables us to reflect even the most highly specialist applications.

The right type of testing facility – for a wide variety of product groups and applications

| | Product groups | | | | | Applications | | | | | | | | | |
|----------------------------------------------------------------------------|-------------------|-------------------|--------------------|-------------------|--------------------|-----------------------------------------|-------------------------|-----------------------|-----------------|-----------------------------------------------------------------|---------------------|--------------------|--------------------------------------|----------------------|--------------------------------------------|
| | Avionics products | Rail applications | Mining/deep mining | Consumer products | Vehicle components | Industrial applications and wind energy | Charging infrastructure | Maritime applications | Medical devices | Benchmarking/systematic comparison of products or components | Development support | Fautt/gap analysis | Artificial ageing/product life cycle | Transport simulation | Environmental impact in standard operation |
| 1. Temperature/climatic | | | | | | | | | | | | | | | |
| Temperature and climatic testing | | | | | | | | | | | | | | | |
| Air-to-air thermal shock testing | | | | | | | | | | | | | | | |
| Liquid-to-liquid thermal cycling testing | | | | | | | | | | | | | | | |
| Splash water testing | | | | | | | | | | | | | | | |
| Ice-water shock testing | | | | | | | | | | | | | | | |
| 2. Corrosion | | | | | | | | | | | | | | | |
| Salt-spray testing | | | | | | | | | | | | | | | |
| Harmful gas testing | | | | | | | | | | | | | | | |
| 3. Ingress protection (IP) | | | | | | | | | | | | | | | |
| Protection against accidental access, ingress of foreign objects and water | | | | | | | | | | | | | | | |
| 4. Mechanical testing | | _ | | | | | | | | | | | | | |
| Mechanical vibration and shock testing | | | | | | | | | | | | | | | |
| Laser vibrometry | | | | | | | | | | | | | | | |
| Stone impact testing | | | | | | | | | | | | | | | |
| 5. Transport simulation | | | | | | | | | | | | | | | |
| Inclined impact | | | | | | | | | | | | | | | |
| Compression testing | | | | | | | | | | | | | | | |
| Free-fall | | | | | | | | | | | | | | | |
| 6. Other | | | | | | | | | | | | | | | |
| Positive and negative pressure testing | | | | | | | | | | | | | | | |
| Force-displacement measuring system | | | | | | | | | | | | | | | |

Highlighted in colour = typical, common application



Offering versatile applications – supply, control and monitoring of test samples

And if your test samples are more on the uncommon side, no need to worry! We provide maximum flexibility, e.g. by using our portable high-performance power supply, mobile loads and our 18 m³ climatic chamber. In addition, we offer end-to-end services and even perform testsample control and monitoring on your behalf (for example, with a maskable camera system). Verification of your product's compliance with all requirements is provided in the form of a digital test report in German or English.

Our specifications at a glance

Standard supply options

- DC supply: max. 1,500 V_{pc}; max. 160 A
- AC supply: max. 690 V_{AC} with max. 400 kW; max. 580 A per phase
- Powerful AC and DC sinks
- Compressed air at max. 35 bar
- Cooling/process water and waste water
- Active cooling and conditioning system

Testing and monitoring options

- CAN communication
- Measurement of
- AC
- DC
- Frequencies
- Temperature
- RPM
- Events
- Acceleration
- Material expansion
- Pressure (absolute and relative)
- Pressure leakage test of closed systems

In addition, we have an array of standard laboratory equipment, including oscilloscopes and data loggers all of them in multiple versions.

Better than standard

We always strive to find the right solution for your needs, even if your technical requirements go beyond the norm. Just contact us!

From climatic impacts to mechanical stresses – our testing facilities in detail

Our temperature and climatic testing facilities



Temperature and climatic testing

What tests can we perform?

- Thermal testing
- Climatic testing

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, LV 124, LV 123, MIL, EUROCAE, DNV GL, BV, ISTA, ASTM
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Primarily voluntary, but also mandatory testing for various product groups including medical devices, rail products and products for installation in aircrafts

Heat, cold, humidity and moisture, wind and weather many technical products are exposed to adverse climatic conditions in their daily use but are still expected to function perfectly. We offer a wide variety of different temperature and climatic simulations, enabling you to assure comprehensive protection of your products.

What does our testing facility offer?

- Number of chambers:
- Test chamber volume:
- Max. dimensions:
- Max. temperature range:
- Max climate range:
- Max. temperature gradient: 15 K/min

Our special services

Climatic testing with flammable substances

75 to 33,600 l

> 20

- 4.000 × 3.000 × 2.800 mm
- -75 to +300°C
- 10 to 98% (RH)

Our temperature and climatic testing facilities



Air-to-air thermal shock testing

What tests can we perform?

Rapid temperature changes in air

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, LV 124, LV 123, MIL, EUROCAE
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Primarily voluntary, but also mandatory testing for various product groups including medical devices, rail products and products for installation in aircrafts

What does our testing facility offer?

- Number of chambers: > 10
- 750 × 1,200 × 670 mm (600 l) Max. dimensions:

300 kg

- Max. ground load:
- Max. temperature range: -70 to +220°C
- Transition time: < 10 s
- Rotary and lifting systems, Test-chamber systems: as well as stationary test chambers Special features:

3-chamber tests possible $(T_{max} - RT - T_{min})$

Our special services

 Large test chamber for heavy test samples such as electrical machinery (faster, simultaneous testing of multiple test samples)

Our temperature and climatic testing facilities



Liquid-to-liquid thermal cycling testing

What tests can we perform?

 Verification of resistance to thermal cycling of the products (enclosures, seals, etc.)

What testing requirements do we apply?

- For example requirements in accordance to ISO/IEC 60068-2-14
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Voluntary tests

What does our testing facility offer?

| Temperature range of | |
|------------------------------------------|---------------|
| the primary circuit: | –55 to +250°C |
| Temperature range of the | |

secondary circuit:

-40 to +160°C 30 kW

Heat exchanger capacity:

- Conditioning of test samples
- Precision cooling of test samples

Our temperature and climatic testing facilities



Splash water testing

What tests can we perform?

 Rapid cooling of heated test samples with cold water splashes between 0 and 4°C

What testing requirements do we apply?

- Standards, e.g. LV 124, LV 123, the ISO 16750 series
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Primarily voluntary, but also mandatory testing for various product groups including medical devices, rail products and products for installation in aircrafts

What does our testing facility offer?

- Dimensions: 1,100 × 950 × 800 mm
- Temperature range in chamber: 0 to 160°C
- Water temperature:
- Nozzle width:
- Water flow rate:
- Load:

Our special services

• The test can be extended to include the use of Arizona dust.

Our temperature and



Ice-water shock testing

What tests can we perform?

 Automated thermal shock by immersion of the heated test sample in conditioned/tempered water

What testing requirements do we apply?

- Standards, such as the ISO 16750 series, LV 124, LV 123
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers

- 0 to 4°C 2 × 220 mm 3 to 4 l per splash
- nozzle (in 3 s) max. 200 kg

What does our testing facility offer?

| Water volume: | 1,000 l |
|-----------------------------------------|----------------------|
| Maximum mass of | |
| test sample: | 180 kg |
| Internal dimensions | |
| of test chamber: | 1,000 × 800 × 700 mm |
| Water temperature: | 0°C |
| Max. temperature | |
| of heating chamber: | 160°C |
| | |

Our corrosion testing facilities

Corrosion can reduce the service life of materials, particularly if they are exposed to water splashes, spray or harmful gases. Benefit from our extensive test services in this area: our range of corrosion tests is unequalled in Germany.



Salt-spray testing

What tests can we perform?

• Simulation of the impact of salt water on components

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, ISO 9227, LV 124, LV 123, MIL, EUROCAE, DNV GL, BV, ASTM, VDA
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Primarily voluntary, but also mandatory testing for various product groups including medical devices, rail products and products for installation in aircrafts

What does our testing facility offer?

- Max. dimensions: 2,100 × 1,000 × 1,200 mm
- Temperature range:
 - re range: -20 to +80°C
- Test types: A
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All common requirements of leading automotive manufacturers

Our special services

- Soil bearing capacity of 500 kg
- Testing with various salt mixtures, including Nordic country salt, MgCl₂, CaCl₂ and NaCl
- CASS test according to DIN EN ISO 9227

Our corrosion testing facilities



Harmful gas testing

What tests can we perform?

Simulation of the impact of harmful gases on certain components

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, LV 124, LV 123
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Primarily voluntary, but also mandatory testing for various product groups including medical devices, rail products and products for installation in aircrafts

What does our testing facility offer?

- Relative humidity:
- Temperature:
- Dimensions:
- Harmful gases:

up to 80% up to 30°C 780 \times 770 \times 770 mm SO₂ (sulphur dioxide) H₂S (hydrogen sulphide) NO₂ (nitrogen dioxide) Cl₂ (chlorine)

Our special services

 Testing can cover variations in the number and combinations of pollutant components.

Our ingress protection testing facilities

Ingress of solid foreign objects, dust or water can cause failure of a device. Equipment enclosures provide essential protection for the sensitive systems inside. Use the IP code to document your product's resistance to environmental impacts.





Protection against accidental access, ingress of foreign objects and water

What tests can we perform?

 Verification of ingress protection against foreign objects and water

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, LV 124, LV 123, MIL, EUROCAE, DNV GL, BV, ISTA, ASTM
- EN 60529, ISO 20653
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers

What does our testing facility offer?

Accidental access:

Foreign objects:

IP 1x to IP 6x for IP 5x and IP 6(K)x incl. talcum, Arizona dust, Portland cement + flue ash, China dust

IP x1 to IP x9(K)

IP 1x to IP 6x

Water:

Our special services

- Dust chamber also suitable for larger test samples (max. test chamber volume 2.6 m³)
- On-site performance of some tests possible

Our mechanical testing facilities



Mechanical vibration and shock testing

What tests can we perform?

 Simulation of mechanical loads caused by vibrations and shocks

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, LV 124, LV 123, MIL, EUROCAE, DNV GL, BV, ISTA, ASTM
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers
- Primarily voluntary, but also mandatory testing for various product groups including medical devices, rail products and products for installation in aircrafts

From equipment in power stations and radar systems to consumer products, the simulation of mechanical loads plays a major role for ensuring the resilience of your equipment. Our testing facilities offer a range of simulations, including vibration and shock testing, to meet all testing requirements.

What does our testing facility offer?

- Max. force vector:
- Frequency range:
- Amplitude:
- Mounting table:
- Temperature range:
- Humidity range:

Max. 111 kN 3 to 3,000 Hz 3" (75 mmpp) max. 1,500 × 1,500 mm -70 to +180°C 10 to 98% (RH)

- 8 shaker systems (35 kN to 111 kN) and large mounting table
- Testing in correct position thanks to slip tables
- Simultaneous application of temperature and climate profiles during mechanical testing

Our mechanical testing facilities



Laser vibrometry

What tests can we perform?

- Non-contact full-field vibration measurement
- 3D visualisation of vibration parameters using mathematical models in animated false-colour image
- Support with noise vibration harshness (NVH), finding solutions to issues in acoustics and structural dynamics, ultrasound analyses, FEM validation (Finite Element Method) and non-destructive testing – by means of detected vibration forms and normal modes

Our special services

Know-how transfer and use of high-quality measuring instruments at attractive terms and conditions

Our mechanical



Stone impact testing

What tests can we perform?

• Simulation of repeated stone impacts on surfaces

What testing requirements do we apply?

- Standards, e.g. multi-impacts according to LV 124 and EN ISO 20567-1
- Performance and requirements specifications of our customers and their clients

What does our testing facility offer?

| Blasting medium: | 500 g |
|--------------------------------------|-------|
| Atmospheric pressure: | 2 bar |
| Time allotted for examination: | 10 s |

Our special services

• On-site performance of some tests possible

Our transport simulation testing facilities

Transport poses a particular challenge, especially with respect to highly sensitive devices for which transport damage could be disastrous. Our testing facilities can simulate a host of transport situations and even the loading process, thereby facilitating decisions such as the type of protection needed from product packaging.



Inclined impact

What tests can we perform?

• Simulation of impacts acting on the packing unit while shifting during transport

What testing requirements do we apply?

- Standards, e.g. IEC/EN, ISTA, ASTM
- Performance and requirements specifications of our customers and their clients

What does our testing facility offer?

- Sled size:
- Max. mass of test sample:
- Velocity:

1,520 × 1,520 mm max. 1.8 t up to 2.1 m/s

Our transport simulation testing facilities



Compression testing

What tests can we perform?

• Simulation of loads when packing units are stacked (e.g. in the warehouse)

What testing requirements do we apply?

- Standards, e.g. IEC/EN, ISTA, ASTM
- Performance and requirements specifications of our customers and their clients

What does our testing facility offer?

- Compression force:
- Width of opening:
- up to 60 kN 2,100 mm
- Pressure plate:

max. 1,220 × 1,220 mm

- Testing according to ASTM and ISTA can also be performed for large packing units.
- Simulation of static loads acting on test samples

Our transport simulation testing facilities



Free-fall

What tests can we perform?

Simulation of impact after free-fall

What testing requirements do we apply?

- Standards, e.g. IEC/EN 60068 series, ISTA, ASTM
- Performance and requirements specifications of our customers and their clients

What does our testing facility offer?

 Max. mass of test sample:

80 kg (300 kg incl. additional free-fall device) up to 1,800 mm

Max. drop height:

Our special services

- Reproducible free-fall tests based on pneumatic drop triggering
- Targeted intentional impact on corners, edges and areas

Our other test facilities



Positive and negative pressure testing

What tests can we perform?

 Verification of the product's resistance to positive and/or negative pressure

What testing requirements do we apply?

- Standards, such as the IEC/EN 60068 series, LV 124, LV 123, MIL, EUROCAE, DNV GL, BV, ISTA, ASTM
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers

Exposure to high pressure or use at high altitudes impose stresses on your products. We offer testing at positive and negative pressure as well as at altitude and pressure fluctuations, thereby giving you the certainty you need.

What does our testing facility offer?

Dimensions:

Cylindrical test chamber with diameter = 740 mm; height = 800 mm

- Min. pressure:
- Max. pressure:
- Temperature range: -60 to +85°C 50 mbar absolute 35 bar

- Pressure testing combined with thermal testing
- Rapid pressure cycling possible
- Cable bushing from/into the pressure area possible

Our other testing facilities



Force-displacement measuring system

What tests can we perform?

- Determination of tensile or compressive forces in relation to distance covered, e.g. for plug connectors, buttons and keyboards
- Graphic presentation of the measured values in force-displacement diagrams

The measurement device is used before and after environmental testing. Comparison of the measurement results then shows the influence of testing on the test sample.

What testing requirements do we apply?

- Standards, such as LV 124
- Performance and requirements specifications of our customers and their clients
- Factory standards of all major automotive manufacturers

What does our testing facility offer?

- Max. tensile and
- compression force: 500 N
- Measurement range: 400 mm
- Velocity: 0.1 to 900 mm/min

We will be happy to be of assistance: Our testing facilities and locations

Our locations in Straubing and Mannheim offer the complete range of environmental simulation services.



Add value. Inspire trust.

TÜV SÜD is a premium provider of quality, safety, and sustainability solutions specialising in testing, inspection, auditing, certification, training, and knowledge services. Represented at over 1,000 locations worldwide, we hold accreditations in Europe, the Americas, the Middle East, Asia and Africa. By delivering impartial third-party solutions, we add tangible value to businesses, customers and the environment.



Take the first step - contact us!

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Each company faces slightly different challenges in environmental simulations. We will be happy to assist you in reliably managing these challenges in the future. Simply visit our website or contact us directly. We look forward to meeting you!

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