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D-PL-11140-16-01

FRAUNHOFER INSTITUTE FOR CHEMICAL TECHNOLOGY ICT

SERVICE CENTER ENVIRONMENTAL SIMULATION

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Akkreditierung

Die Deutsche Akkreditierungsstelle bestätigt mit dieser **Akkreditierungsurkunde,** dass das Prüflaboratorium

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.
Hansastraße 27c, 80686 München

die Anforderungen gemäß DIN EN ISO/IEC 17025:2018 für die in der Anlage zu dieser Urkunde aufgeführten Konformitätsbewertungstätigkeiten erfüllt. Dies schließt zusätzliche bestehende gesetzliche und normative Anforderungen an das Prüflaboratorium ein, einschließlich solcher in relevanten sektoralen Programmen, sofern diese in der Anlage zu dieser Urkunde ausdrücklich bestätigt werden.

Die Anforderungen an das Managementsystem in der DIN EN ISO/IEC 17025 sind in einer für Prüflaboratorien relevanten Sprache verfasst und stehen insgesamt in Übereinstimmung mit den Prinzipien der DIN EN ISO 9001.

Diese Akkreditierung wurde gemäß Art. 5 Abs. 1 Satz 2 VO (EG) 765/2008, nach Durchführung eines Akkreditierungsverfahrens unter Beachtung der Mindestanforderungen der DIN EN ISO/IEC 17011 und auf Grundlage einer Bewertung und Entscheidung durch den eingesetzten Akkreditierungsausschuss ausgestellt.

Diese Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 18.03.2024 mit der Akkreditierungsnummer D-PL-11140-16.
Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 7 Seiten.

Registrierungsnummer der Akkreditierungsurkunde: **D-PL-11140-16-00**

Berlin, 18.03.2024

Im Auftrag Dr.-Ing. Tobias Poeste
Fachbereichsleitung

Diese Urkunde gibt den Stand zum Zeitpunkt des Ausstellungsdatums wieder. Der jeweils aktuelle Stand der gültigen und überwachten Akkreditierung ist der Datenbank akkreditierter Stellen der Deutschen Akkreditierungsstelle zu entnehmen (www.dakks.de).

Siehe Hinweise auf der Rückseite

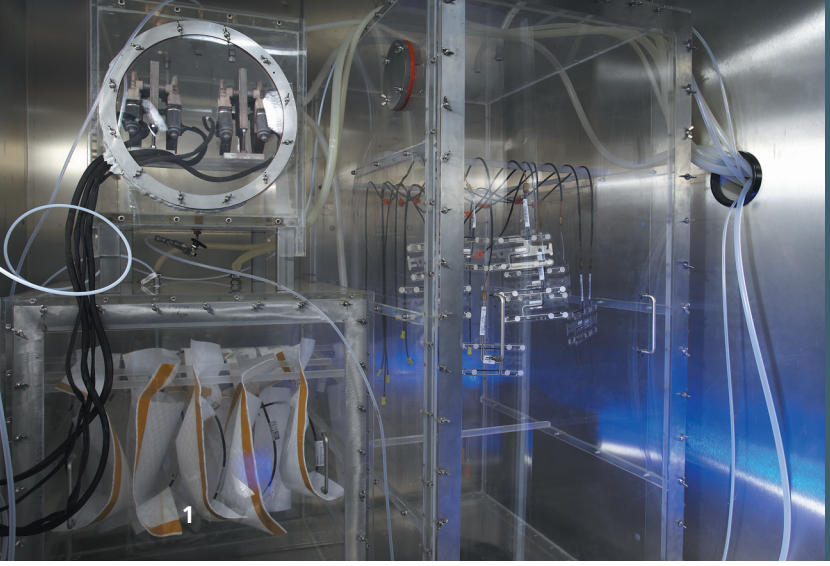
SERVICE CENTER ENVIRONMENTAL SIMULATION

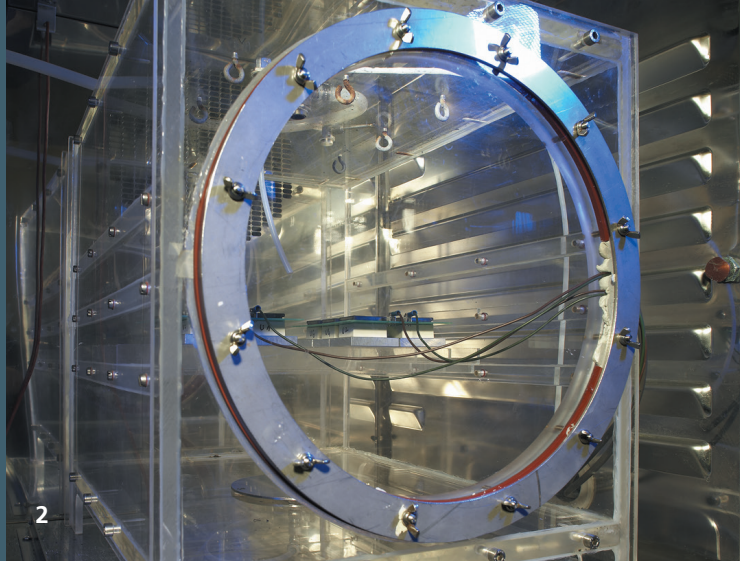
Throughout their service life, technical products are exposed to a wide variety of environmental influences that affect their function, lifespan, quality and reliability. For both technical and economic reasons it is therefore important that technical products are designed and manufactured to withstand the expected loads and to operate reliably. Within this context a manufacturer-independent, neutral group of experts with significant market proximity works in the Fraunhofer ICT's testing laboratory with all the laboratory and pilot plant equipment needed to simulate environmental influences on technical products. In its testing laboratory the Fraunhofer ICT draws on many decades of experience in research and development for environmental simulation and material testing. Our expertise and competences ensure a quick and creative implementation of our customers' testing requirements. We also offer tailored testing programs and validate test results. We are a member of the Gesellschaft für Umweltsimulation GUS (German Society for Environmental Engineering), which itself is a member of the Confederation of European Environmental Engineering Societies CEEES.

Service portfolio

The Service Center Environmental Simulation of the Fraunhofer ICT offers solutions for
- approving your quality requirements
- optimizing the properties of your product
- carrying out failure or weak-point analyses
- meeting your customers' requirements

The following overview lists our technical equipment with the corresponding performance characteristics. We have flexible accreditation for different environmental simulation tests and combinations of tests (qualification tests on technical products). The flexible accreditation certifies that the Service Center has the high-level of technical and scientific competence needed to use both standardized testing methods and testing methods with equivalent standards that are not included in the accreditation certificate within this area of expertise.





CORROSION / CORROSIVE GASES / SALT MISTS

The following tests can be carried out with our corrosion testing facilities:

- salt spray mist (combined tests)
- condensed water constant climate and cyclic corrosion test with and without SO_2 (Kesternich)
- corrosive gas test (single gas or gas mixture of up to 8 components)
- ozone test

Application of these tests:

- assessment of coatings
- corrosion resistance of materials
- investigation of contact materials
- functional testing (online or offline)
- service life prediction
- simulation of industrial climates containing corrosive gases

Ozone

- test chamber volume 580 l
- temperature up to 70 °C
- ozone up to 1000 ppm

Salt mists (for example)

- NSS
- CASS
- ESS
- SWAAT
- Nissan specification
- sea water
- salt mixtures on request
- max. temperature: 60 °C
- test chamber volume: 1000 l to 2000 l
- condensation
- controlled humidity

Corrosive gases

- SO_2 sulfur dioxide
- H_2S hydrogen sulfide
- Cl_2 chlorine
- NO_X nitrous oxides
- O_3 ozone
- HF hydrogen fluoride
- NH_3 ammonium
- HCl hydrogen chloride
- other gases on request
- test chamber volume: 80 l to 980 l
- temperature: 25 °C
- humidity: 75 %
- other temperatures / humidities on request

1+2 *Corrosive gas test: Climate chamber and climate chamber application.*

3 *Salt spray chamber.*

4 *Condensation chamber (Kesternich chamber).*

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DIN 50018	Testing in a saturated atmosphere in the presence of sulfur dioxide
	Environmental testing, Part 2: Tests:
DIN EN 60068-2-11	Test Ka: Salt mist
DIN EN 60068-2-42	Test Kc: Sulfur dioxide test for contacts and connections
DIN EN 60068-2-43	Test Kd: Hydrogen sulfide test for contacts and connections
DIN EN 60068-2-52	Test Kb: Salt mist, cyclic
DIN EN 60068-2-60	Test Ke: Flowing mixed gas corrosion test
	Connectors for electronic equipment – tests and measurements:
DIN EN 60512-11-6	Climatic tests, test 11f: Corrosion, salt mist
DIN EN 60512-11-7	Climatic tests, test 11g: Flowing mixed gas corrosion test
DIN EN 60512-11-14	Climatic tests, test 11p: Flowing single gas corrosion test
	Electromechanical components for electronic equipment – basic testing procedures and measuring methods:
DIN EN 60512-19-3	Part 19: Chemical resistance tests, Section 3: Test 19c – Fluid resistance
DIN EN ISO 3231	Paints and varnishes – Determination of resistance to humid atmospheres containing sulfur dioxide
	Paints and varnishes – Determination of resistance to humidity:
DIN EN ISO 6270-2	Part 2: Procedure for exposing test specimens in condensation-water atmospheres
DIN EN ISO 6988	Metallic and other non-organic coatings – Sulfur dioxide test with general condensation of moisture
DIN EN ISO 7326	Rubber and plastics hoses – Assessment of ozone resistance under static conditions
DIN EN ISO 9227	Corrosion tests in artificial atmospheres – Salt spray tests
	Rubber, vulcanized or thermoplastic – Resistance to ozone cracking:
DIN ISO 1431-1	Part 1: Static and dynamic strain testing
	Optics and photonics – Environmental test methods:
DIN ISO 9022-4	Part 4: Salt mist
DIN ISO 9022-20	Part 20: Humid atmosphere containing sulfur dioxide or hydrogen sulfide
	Road vehicles – Environmental conditions and testing for electrical and electronic equipment:
ISO 16750-5	Part 5: Chemical loads

Examples of possible standards.

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CLIMATE / TEMPERATURE / SHOCK / SUN

Testing facilities for:

- constant/cyclic temperature and climate tests
- hot / cold storage
- condensation test
- temperature shock test (two chamber method)
- splash test

Application of these tests:

- fitness-for-service in the tropics
- corrosion resistance of materials
- functional testing
- service life prediction
- aging

Temperature and climate chambers from 300 l to 25 m³

- minimum temperature: -75 °C
- maximum temperature: 300 °C
- humidity range: 5 % to 100 %
- ramp: up to 15 K/min

Temperature shock air-air (two chamber method)

- minimum temperature: -75 °C
- maximum temperature: 220 °C / 180 °C
- volume: 120 l / 600 l
- transition time: <10 s

Temperature shock air-water (splash water / immersion / submersion test)

- air temperature up to 180 °C
- water temperature from 0 °C to 4 °C

Solar simulation (in climate chamber 25 m³)

- irradiation intensity of up to 1200 W/m²
- area exposed to irradiation max. 1400 mm x 1600 mm
- wavelength from 280 nm to 3000 nm

5 *Walk-in climate chamber 25 m³ with solar simulation.*
6 *Climate chamber.*
7 *Splash water test.*
8 *Temperature shock cabinet (two chamber method).*

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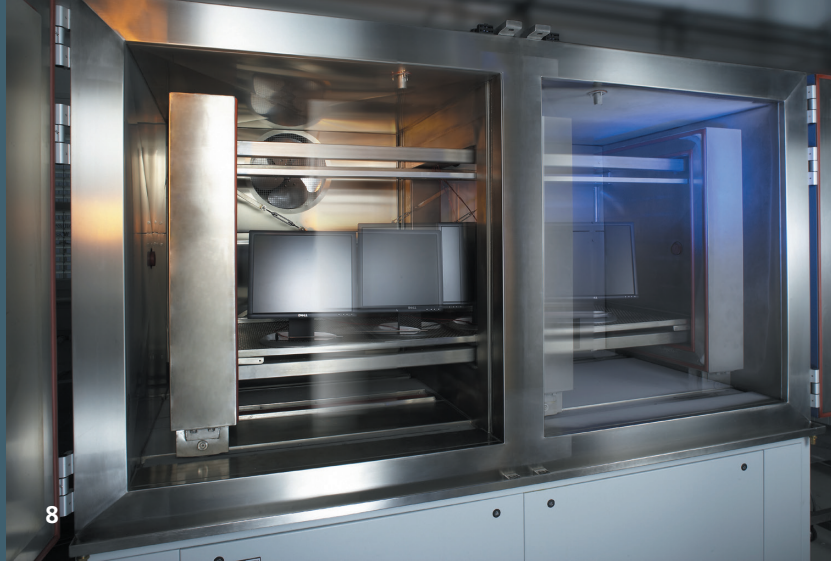

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DIN 75220	Aging of automotive components in solar simulation units
	Environmental testing – Tests:
DIN EN 60068-2-1	Test A: Cold
DIN EN 60068-2-2	Test B: Dry heat
DIN EN 60068-2-5	Test Sa: Simulated solar radiation at ground level and guidance for solar radiation testing
DIN EN 60068-2-14	Test N: Change of temperature
DIN EN 60068-2-30	Test Db: Damp heat, cyclic (12 h + 12 h cycle)
DIN EN 60068-2-38	Test Z/AD: Composite temperature/humidity cyclic test
DIN EN 60068-2-66	Test Cx: Damp heat, steady state (unsaturated pressurized vapor)
DIN EN 60068-2-78	Test Cab: Damp heat, steady state
	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods:
DIN EN 60512-11-1	Part 11: Climatic tests; Section 1: Test 11a: Climatic sequence
	Connectors for electronic equipment – Tests and measurements – Climatic tests:
DIN EN 60512-11-3	Test 11c: Damp heat, steady state
DIN EN 60512-11-4	Test 11d: Rapid change of temperature
DIN EN 60512-11-9	Test 11i: Dry heat
DIN EN 60512-11-10	Test 11j: Cold
DIN EN 60512-11-12	Test 11m: Damp heat, cyclic
	Optics and photonics – Environmental test methods:
DIN ISO 9022-2	Part 2: Cold, heat and humidity
DIN ISO 9022-5	Part 5: Combined cold, low air pressure
	Road vehicles – Environmental conditions and testing for electrical and electronic equipment:
ISO 16750-4	Part 4: Climatic loads

Examples of possible standards.

IP PROTECTION / HIGH AND LOW PRESSURE TESTS

The following tests can be carried out:

- constant / cyclic dust tests
- protection against foreign particles
- protection against contact
- steam jet test
- immersion / submersion tests

Determination of protection category

Dusts

- talc (IP5X, IP6X)
- "Portland cement" / flue dust (IP5KX, IP6KX)
- Arizona dust (IP5KX, IP6KX)
- JIS dusts
- other dusts on request

Leakage tests

- protection against water and dust
- protection against access to dangerous parts

Water

- dripping water (IPX1, IPX2)
- splash water (IPX4, IPX4K)
- spray water (IPX3)
- water jet (IPX5, IPX6, IPX6K)
- immersion / submersion (IPX7, IPX8)
- high pressure / steam jet cleaning (IPX9K and IPX9)
- hot water jet
- engine cleaning

High / low pressure (pressurizing medium: air)

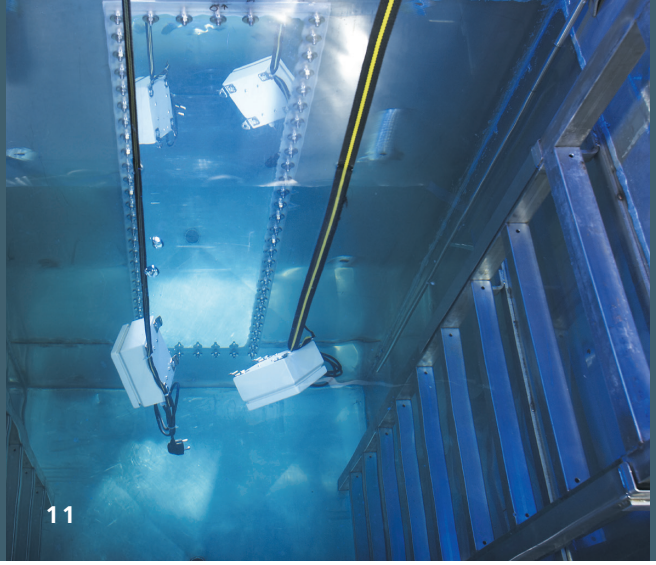
Tests conducted with:

- constant pressures
- pressure ramps
- pressure change

Low pressure:

- temperature: -55 °C to +80 °C

9 *Dust chambers.*
10 *Dust test.*
11 *Immersion / submersion test.*
12 *Splash water test.*



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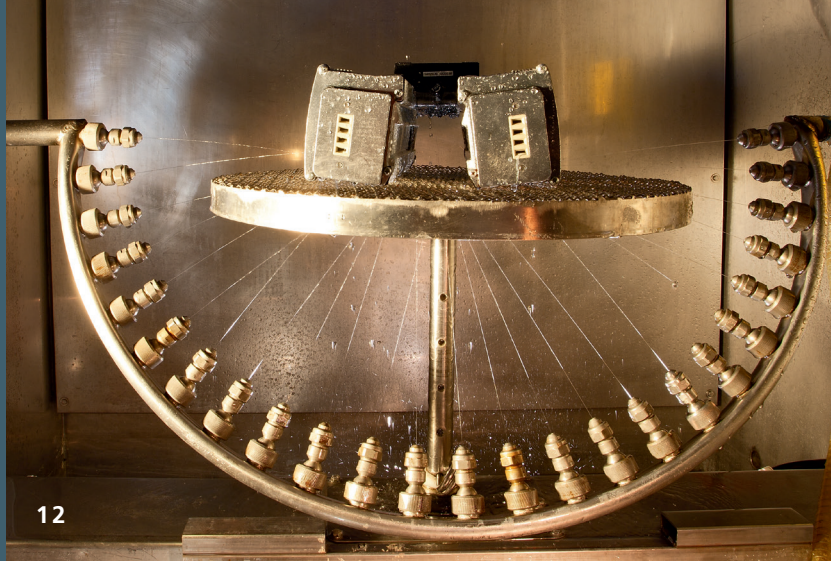

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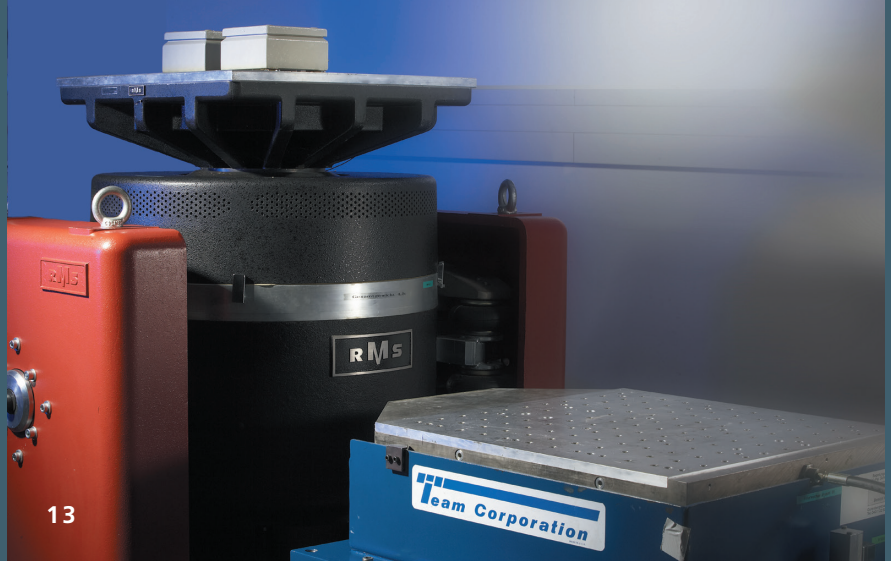
DIN 40050 Part 9	Road vehicles, degrees of protection (IP-code), protection against foreign objects, water and contact
	Environmental testing – Part 2: Tests:
DIN EN 60068-2-13	Test M: Low air pressure
DIN EN 60068-2-17	Test Q: Sealing
DIN EN 60068-2-18	Test R and guidance: Water
DIN EN 60068-2-68	Test L: Dust and sand
	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods:
DIN EN 60512-11-8	Part 11: Climatic tests; Section 8: Test 11h: Sand and dust
DIN EN 60512-11-11	Part 11-11: Climatic tests; Test 11k: Low air pressure
DIN EN 60512-14-7	Part 14: Sealing tests; Section 7: Test 14g: Impacting water
DIN EN 60529	Degrees of protection provided by enclosures (IP Code)
	Optics and photonics – Environmental test methods:
DIN ISO 9022-8	Part 8: High pressure, low pressure, immersion
ISO 20653	Road vehicles - Degrees of protection (IP code) – Protection of electrical equipment against foreign objects, water and access
JIS D0207	General rules of dust test for automobile parts

Examples of possible standards.



VIBRATION AND MECHANICAL SHOCK

Types of load:
- sine-wave
- random noise
- shock

in combination with temperature and humidity

Applications:
- transport simulation
- packaging optimization
- determination of strength / durability
- functional testing
- service life prediction
- resonance measurement

Shock

- type of shock: semi sine-wave
- max. acceleration: 20,000 g
- duration of shock: up to 60 ms

Vibration

- force: -11.7 kN
- amplitude: ± 12.7 mm
- temperature control: -40 °C to 180 °C
- humidity: 5 % to 98 %
- sliding table

	Environmental testing – Tests:
DIN EN 60068-2-6	Test Fc: Vibration (sinusoidal)
DIN EN 60068-2-27	Test Ea and guidance: Shock
DIN EN 60068-2-31	Test Ec: Rough handling shocks, primarily for equipment-type specimens
DIN EN 60068-2-32	Test Ed: Free-fall
DIN EN 60068-2-50	Test Z/AFc: Combined cold/vibration (sinusoidal) test for both
DIN EN 60068-2-64	Test Fh: Vibration, broadband random and guidance
	Road vehicles – Environmental conditions and testing for electrical and electronic equipment:
ISO 16750-3	Part 3: Mechanical loads
	Optics and optical instruments – Environmental test methods:
DIN ISO 9022-3	Part 3: Mechanical stress
DIN ISO 9022-10	Part 10: Combined sinusoidal vibration and dry heat or cold
DIN ISO 9022-13	Part 13: Combined shock, bump or free fall and dry heat or c
DIN ISO 9022-15	Part 15: Combined digitally controlled broad-band random vibration and dry heat or cold
DIN ISO 9022-19	Part 19: Temperature cycles combined with sinusoidal or random vibration
	Connectors for electronic equipment – Tests and measurements – Dynamic stress tests:
DIN EN 60512-6-2	Test 6b: Bump
DIN EN 60512-6-3	Test 6c: Shock
DIN EN 60512-6-4	Test 6d: Vibration (sinusoidal)
	Electromechanical components for electronic equipment – Basic testing procedures and measuring methods:
DIN EN 60512-6-5	Part 6: Dynamic stress tests; section 5: Test 6e: Random vibration

Examples of possible standards.

SERVICE CENTER
ENVIRONMENTAL SIMULATION

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