IABG. The Future.

Climatic Environmental Simulation

All year round. Realistic. Reproducible.

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Climatic Environmental Simulation • All year round. Realistic. Reproducible.

Climatic environmental simulation is anchored in numerous standards and is a necessary part of the qualification process for technical systems. We provide the required tests for you in a comprehensive manner, independent of industry and manufacturer.

We run your test objects through the desired, tailor-made test program including computer simulations, vibration tests, EMC tests and the actual climatic environmental simulations. A failure analysis, e.g. according to VDI 3822, is a possible option to round off the service package. Talk to us – also about our certification according to TISAX and accreditation by DAkkS. We would be glad to advise you personally.

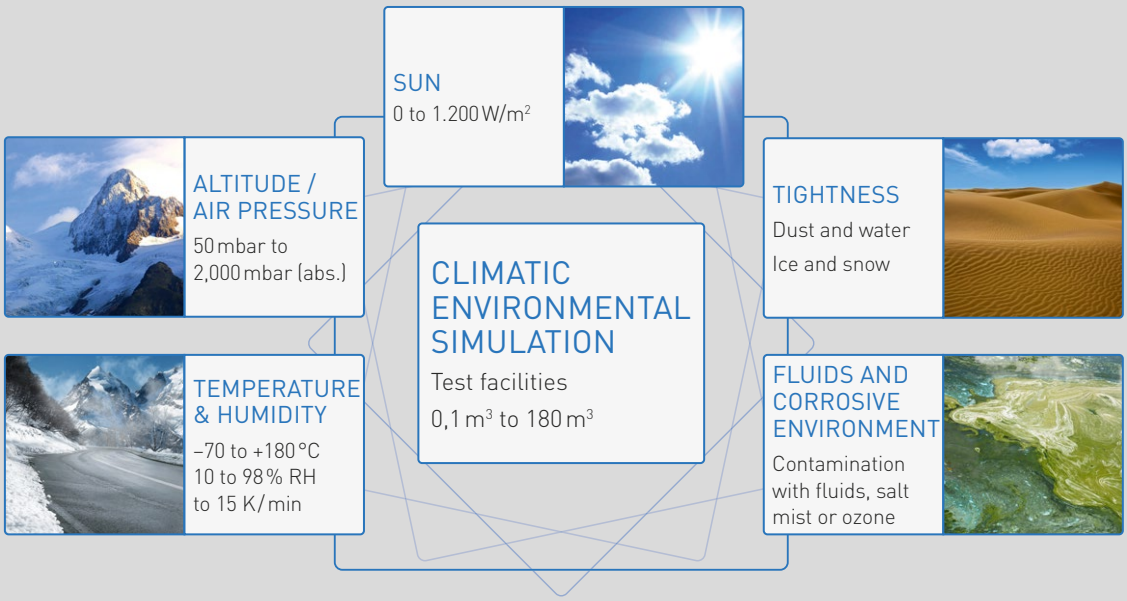
YOUR QUALIFICATION PROCESS

From a material sample to the whole system – all services from a single source

- Individual tests tailored to your requirements
- Accompanying simulations
- Vibration
- EMC
- CLIMATIC ENVIRONMENTAL
- Failure analyses
- Consulting
- Documentation of results

Added value for our customers

- From a material sample to the whole system
- All services customised from a single source
- Optional additional services, e.g. accompanying simulations
- Manufacturer independent



Our Test Facilities at a Glance

Temperature & humidity

- High altitude chamber (GHK) up to 3,800 m above sea level
- Conditioning units and preheating hall
- Temperature chamber (TK)
- Climatic chamber (KK)
- Vehicle chambers I & II
- Combination chamber
- Temperature shock units
- Temperature and climate cabinets

Altitude / air pressure

- Combination test cabinet (BFV 64)
- Vacuum chamber (UK) – up to 20,000 m above sea level
- Pressure change systems

Sun

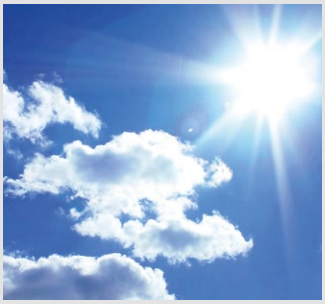
- Solar simulation unit

Tightness

- Splash water test unit
- Dust test cabinets

Fluids and corrosive environment

- Salt fog cabinets
- Contamination units



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DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12001-02-00

Accredited by DAkkS in accordance with DIN ISO/IEC 17025:2018.
Accreditation is only valid for the scope of accreditation listed in the document facility D-PL-12001-02-00.

High Altitude Chamber (GHK) – up to 3,800 m above sea level

Service description

- High-altitude climatic chamber with roller test bench for vehicle dynamics tests under different environmental conditions (altitude, temperature, humidity)
- Vehicle preconditioning
- Performance of exhaust emission analyses, e.g. according to WLTC Driving Cycle
- Determination of emissions at the tailpipe and upstream of the catalytic converter to optimise exhaust emission treatment

Areas of application

- Proof of functionality of complete vehicles and motorcycles
- Tuning of engine control devices
- Proof of functionality within the scope of the exhaust emission standard
- Securing the homologation of vehicles

Added value for our customers

- Emission and application measurements without additional changeover times
- Variations of environmental parameters height, humidity and temperature in combination with application measurements possible
- Conditioning cells enable parallel campaigns on multiple vehicles

Technical Data

- **Temperature range:** –30 °C to +50 °C
- **Cooling capacity:** max. 180 kW
- **Relative humidity:** up to 95 %
- **Ambient pressure:**
  approx. 960 hPa to 630 hPa
  (approx. 560 m to 3,800 m)
- **Air stream fan:**
  - Rear wheel drive vehicle:
    max. 34,000 m³/h, max. 130 km/h
  - Front wheel drive vehicle:
    max. 26,000 m³/h, max. 100 km/h
  - Suitable for hybrid vehicles due to integrated extinguishing device
- **CVS emission sampler:** 2 sampling lines (diluted emissions in bag and modal emissions at tailpipe, or undiluted emissions at separate sampling point)
- **Dynamometer:** Roller dynamometer (single axle roller) with P_{max} = 210 kW, tractive force = 6 kN, v_{max} = 200 km/h, vehicle weight simulation of up to 8,000 lbs, max. axle load up to 2,000 kg
- **Chamber dimensions** (LxWxH):
  8.50 m x 4.50 m x 4.30 m

Conditioning Units and Preheating Hall

Service description

- Preconditioning of vehicles for testing in the high altitude chamber, in particular for exhaust emission analyses
- Preparation of the vehicles (mounting of roller wheels, application of measuring technology or change of catalytic converters)

Areas of application

- Preparation of vehicles for testing in the high altitude chamber

Added value for our customers

- Efficient preparation of vehicles for testing
- Rapid reaction if repairs are required
- Short distances to the high altitude chamber

Technical Data

Conditioning units

- **Temperature range:** –25 °C to +50 °C
- **Independent temperature control in both units**
- **Chamber dimensions** (LxWxH): 5.70 m x 2.70 m x 2.35 m

Preheating hall

- Vehicle mover for placing the vehicles into the test chamber
- Fully equipped workshop with lifting platform

Temperature Chamber (TK)

Service description

- Drive-in temperature chamber for functional tests at high and low temperatures
- Combined environmental conditions (temperature, snow or ice)

Areas of application

- Proof of functionality of components and systems
- Cold start tests
- Fatigue strength tests
- Test standards: DIN EN 60068-2, MIL-STD 810, RTCA/DO-160, various manufacturer standards

Added value for our customers

- Large temperature chamber for testing a complete system at extremely low temperatures including all the interactions of the individual components

Technical Data

- **Temperature range:** –70 °C to +150 °C
- **Temperature gradient:** max. 1 K/min
- **Cooling capacity:** max. 70 kW
- **Floor loading:** max. 5 kN/m²
- **Cable feedthrough** (Ø)**:** 100 mm (3x)
- **Power supply:**
  230 V or 400 V (16 A, 32 A, 63 A and 125 A CEE); mobile, programmable AC power supply (6,000 VA/15 to 1,200 Hz)
- **Compressed air supply: max. 25 bar**
- **Chamber dimensions** (LxWxH)**:**
  5.50 m x 4.50 m x 4.00 m
  - Door (WxH): 4.50 m x 4.00 m

Climatic Chamber (KK)

Service description

- Drive-in climatic chamber for functional or tightness tests with combined environmental conditions, e.g. temperature, humidity, rain, snow, ice or sun
- Tests under special environmental conditions, e.g. temperature, humidity and argon
- H_2-compatible for hydrogen-powered vehicles

Areas of application

- Climate tests on components and systems
- Blowing-rain and IP protection class testing
- Test standards: DIN EN 60068-2, MIL-STD 810, RTCA/DO-160, various manufacturer standards

Added value for our customers

- Realistic and varied tests under different combined environmental conditions in a large space

Technical Data

- **Temperature range:** –40 °C to +120 °C
- **Temperature gradient:** max. 1 K/min
- **Cooling capacity:** max. 120 kW
- **Relative humidity:**
  10 % to 95 % relative humidity (at a temperature of +10 °C to +80 °C)
- **Cable feedthrough** (Ø): 150 mm (2x)
- **Power supply:** 230 V or 400 V (16 A, 32 A, 63 A and 125 A CEE) mobile, programmable AC power supply (6,000 VA / 15 to 1,200 Hz)
- **Compressed air supply: max. 25 bar**
- **Water supply:**
  Well water (inlet and outlet)
- **Emission volume flow:** max. 1,500 m³/h
- **Chamber dimensions** (LxWxH):
  9.00 m x 4.50 m x 4.30 m
  - Door (WxH): 4.00 m x 3.90 m

Vehicle Chamber I

Service description

- Temperature chamber with roller test bench for functional tests at high and low temperatures
- Temperature shock tests even for large test specimens, e.g. control cabinets
- TISAX certification

Areas of application

- Proof of functionality of components and systems
- Tuning of control devices
- Cold start test on vehicles
- Test standards: EN 60068-2-14 Na, various manufacturer standards

Added value for our customers

- Cost-effective test chamber with high cooling capacity

Technical Data

- **Temperature range:** –70 °C to +80 °C
- **Cooling capacity:** max. 190 kW
- **Dynamometer:**
  Roller test bench with one roller (single axle roller) P_{max} = 40 kW, v_{max} = 120 km / h
- **Chamber dimensions** (LxWxH):
  7.00 m x 3.50 m x 2.60 m

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Vehicle Chamber II

Service description

- Temperature chamber with roller test bench for functional tests at high and low temperatures
- Suitable for hybrid vehicles due to mobile extinguishing device
- Temperature shock tests even for large test specimens, e.g. control cabinets
- TISAX certification

Areas of application

- Proof of functionality of components and systems
- Tuning of control devices
- Cold start test on vehicles
- Driving dynamics measurements
- Test standards: EN 60068-2-14 Na, various manufacturer standards

Added value for our customers

- Cost-effective test chamber with roller test bench

Technical Data

- **Temperature range:** –40 °C to +60 °C
- **Cooling capacity:** max. 110 kW
- **Dynamometer:**
  Roller test bench with one roller (single axle roller) P_{max} = 53 kW, v_{max} = 120 km/h driver guidance system (default driving curve)
- H_2-compatible, explosion-proof for hydrogen-powered vehicles, for example
- **Chamber dimensions** (LxWxH):
  8.00 m x 5.00 m x 2.50 m
- **Air stream fan:**
  26,000 m³/h, v_{max} = 100 km/h

Climate Combination Chamber

Service description

- Walk-in climatic chamber for functional or ageing tests at various temperatures and controlled humidity

Areas of application

- Proof of functionality of components and systems
- Ageing through temperature / climate cycles
- Test standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, various manufacturer standards

Added value for our customers

- All possible climate conditions in one facility
- Powerful climatic chamber for tests with high temperature gradients or high relative humidity

Technical Data

- **Temperature range:** –70 °C to +120 °C
- **Temperature gradient:** max. 5 K/min
- **Cooling capacity:** max. 70 kW
- **Relative humidity:** up to 95 %
- **Cable feedthrough** (Ø)**:** 125 mm (3x)
- **Power supply:** 230 V or 400 V (16 A, 32 A, 63 A and 125 A CEE) mobile, programmable AC power supply (6,000 VA / 15 to 1,200 Hz)
- **Air pressure:** max. 25 bar
- **Water supply:**
  Well water (inlet and outlet)
- **Chamber dimensions** (LxWxH)**:**
  4.00 m x 2.20 m x 2.70 m

Temperature Shock Units

Service description

- Facilities for simulating the thermal load on a component through shock temperature changes in a two-chamber process (air/air)

Areas of application

- Ageing of electric motors and power electronics
- Verification of the resistance of components to faults caused by temperature changes, e.g. cracking in soldered, glued and welded joints
- Test standards: LV124, DIN EN 60068-2-14 Na, MIL-STD 810

Added value for our customers

- Accelerated validation of development stages

Technical Data

- **Temperature range:** –70 °C to +220 °C
- **Change time:** <10 sec
- **Cable feedthrough** (Ø)**:** 35 mm and 125 mm
- **Chamber dimensions unit 1** (LxWxH)**:** 640 mm x 460 mm x 400 mm
- **Chamber dimensions unit 2** (LxWxH)**:** 680 mm x 850 mm x 610 mm
- **Test item weight:** max. 35 kg to 100 kg

Temperature and Climate Cabinets

Service description

- Climate cabinets with volumes of up to 1,500 litres for the qualification of electric, electronic and mechatronic components and systems
- Operation of the test items using equipment directly at the test cabinet (control cabinet, notebook, power supply units, etc.)

Areas of application

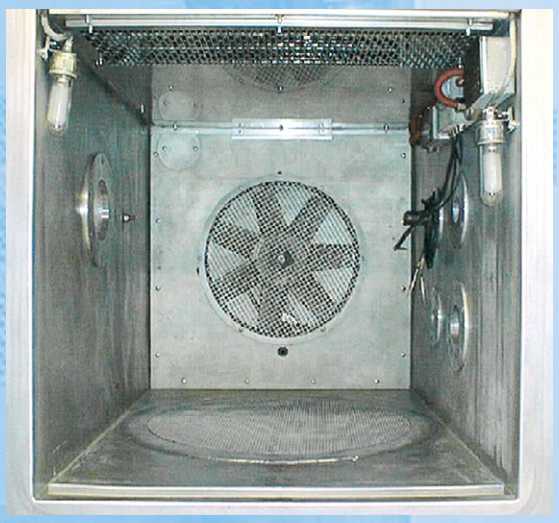
- Rapid temperature change tests
- Temperature and humidity tests
- Low and high temperature tests
- Icing tests
- Ageing tests
- Test standards: LV124, DIN EN 60068-2, MIL-STD 810, RTCA / DO-160, various manufacturer standards

Added value for our customers

- Extensive climatic and mechanical testing options in one test laboratory
- Function monitoring during the tests

Technical Data

- **Temperature range:** –70 °C to +180 °C
- **Temperature gradient:** up to 15 K / min
- **Relative humidity:** 10 % to 98 %
- **Cable feedthrough (Ø):** 125 mm
- **Test item weight:** max. 100 kg to 250 kg
- **Dimensions of the 7 climate cabinets:**
  - Length: 450 mm to 1,600 mm
  - Width: 580 mm to 1,100 mm
  - Height: 750 mm to 950 mm



Combination Test Cabinet (BFV 64)

Service description

- Test chamber for simulating combined environmental conditions (temperature, altitude and humidity)

Areas of application

- TAH test (Temperature, Altitude & Humidity)
- Low pressure and overpressure tests
- Icing tests
- Test standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160

Added value for our customers

- Cost-effective simulation for take-off and landing cycles
- Combination of several environmental parameters in a test chamber possible for vacuum tests up to 20,000 m

Technical Data

- **Temperature range:** –70 °C to +150 °C
- **Ambient pressure:** approx. 25 hPa to 1,000 hPa (abs.)
- **Relative humidity:** up to 95 %
- **Cable feedthrough** (Ø)**:** 35 mm, 55 mm and 85 mm
- **Test Cabinet dimensions** (LxWxH)**:** 1.10 m x 0.79 m x 0.70 m

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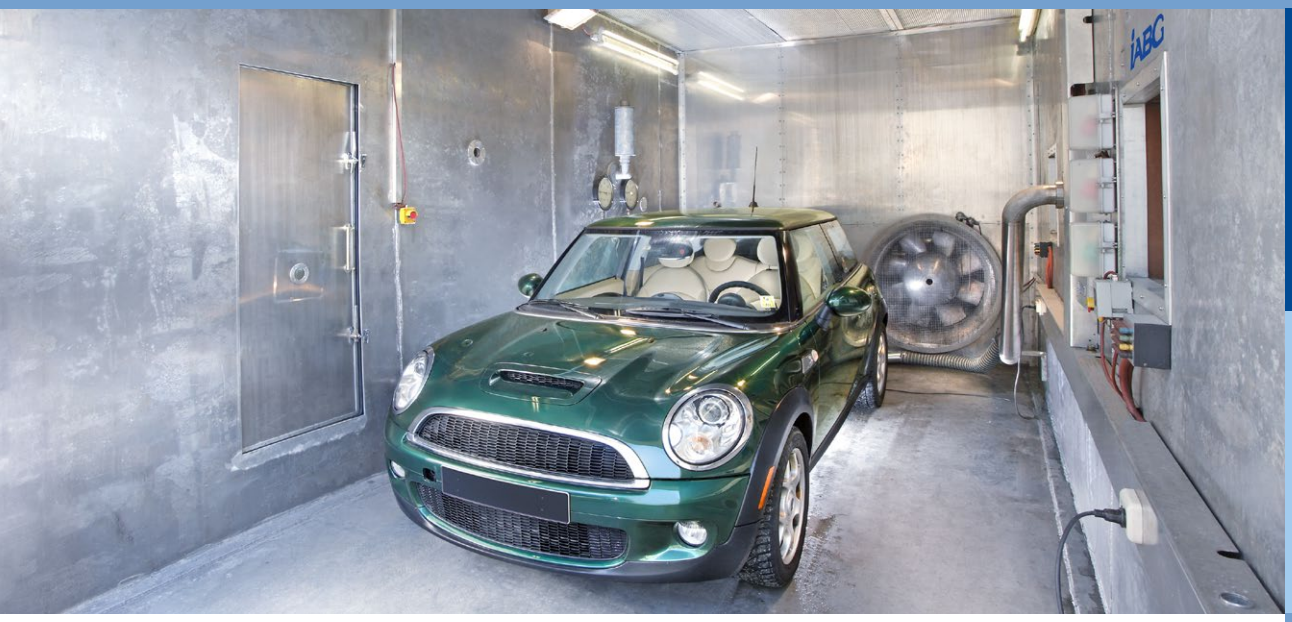

Vacuum Chamber (UK) – up to 20,000 m above sea level

Service description

- Drive-in vacuum chamber with temperature control for carrying out functional tests at high or low temperatures in combination with height simulation (low pressure)
- HV-vehicle-compatible by mobile extinguishing device

Areas of application

- Proof of functionality and accuracy for components and systems
- Simulation of transport loads in the cargo hold
- Test standards: DIN EN 60068-2,MIL-STD 810, RTCA / DO-160, various manufacturer standards

Added value for our customers

- Combination of vacuum tests with extreme temperatures in a test facility possible

Technical Data

- **Temperature range:** –70 °C to +80 °C
- **Ambient pressure:** approx. 960 hPa to 50 hPa (approx. 560 m to 20,000 m)
- **Cooling capacity:** max. 70 kW
- **Floor loading:** max. 10 kN/m²
- **Cable feedthrough** (Ø)**:** 100 mm and 140 mm
- **Power supply:** 230 V or 400 V (16 A, 32 A, 63 A and 125 A)
- **Compressed air supply:** max. 25 bar
- **Water supply:** Well water (inlet and outlet)
- **Exhaust emission extraction system:** max. 4,500 m
- **Chamber dimensions** (LxWxH)**:** 5.50 m x 2.80 m x 2.90 m

Pressure Change Systems

Service description

- Effect of air pressure changes on technical systems
- Three pressure vessels for tests with high or low air pressure

Areas of application

- Rapid and explosive pressure drop test
- Low pressure and overpressure tests
- Test standards: DIN EN 60068-2, MIL-STD 810, RTCA / DO-160

Added value for our customers

- Functional tests at low pressure up to 20,000 m, pressure loss and overpressure on large components and systems under operation possible

Technical Data

- **Ambient pressure:** 10 hPa to 2,500 hPa (abs.)
- **Temperature range:** room temperature
- **Test chamber dimensions:**
  Pressure vessel 1:
  Length 600 mm || Ø 345 mm
  Pressure vessel 2:
  Length1,300 mm || Ø 1,090 mm
  Pressure vessel 3:
  Length 2,000 mm || Ø 1,580 mm
- **Cable feedthrough:**
  Via pressure-tight flange (Ø): max. 125 mm

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Solar Simulation Unit

Service description

- Solar simulation unit for conducting tests on components and systems under artificial sunlight with realistic UV and infrared parts and variable climatic environmental conditions (temperature and relative humidity)

Areas of application

- Functional tests under extreme conditions
- Realistic ageing of components through strong solar radiation and high temperatures
- Measurement of the temperature distribution on components
- Test standards: DIN 75220, MIL-STD 810

Added value for our customers

- Realistic testing with variable environmental conditions

Technical Data

- **Solar radiation:** up to 1,200 W/m²
- **Temperature range:** –30 °C to +90 °C
- **Relative humidity:** up to 95 %
- **Variable distance to panel**
- **Usable solar radiation area** (LxWxH): 2.00 m x 3.00 m

Splash Water Test Unit

Service description

- Splash water tests to verify the resistance to thermal shocks of components and systems that are located in the splash water zone of a vehicle (hot test item – cold water)

Areas of application

- Thermal shock test (air/water)
- Test standards: ISO 16750-4, LV124
- Other tightness tests: IP protection class tests (e.g. immersion tests, water jet tests, steam jet tests)

Added value for our customers

- Large splash zone due to the use of two nozzles

Technical Data

- **Temperature range (air):** room temperature up to +120 °C
- **Temperature range (water):** 0 to +4 °C
- **Number of nozzles:** 2
- **Splash zone:** approx. 700 mm
- **Distilled water and Arizona road Dust**
- **Splash duration:** 3 sec every 30 min or 60 min
- **Cabinet dimensions** (LxWxH): 800 mm x 1,200 mm x 800 mm

Dust Test Cabinets

Service description

- Effect of dust on objects
- Tests for dustproofness, contamination, surface resistance and function
- Dust types: Arizona Dust, talcum powder

Areas of application

- Proof of protection against the penetration of foreign substances and solid bodies
- Test standards: IEC EN 60529, ISO 20653, LV124, IP protection class test

Added value for our customers

- Fast and cost-effective proof of tightness and function
- Further leak tests possible, e.g. under water influence
- Tests on heavy, large test specimens, e.g. on charged high-voltage storage systems and battery dummies

Technical Data

Dust test cabinet 1

- **Cabinet dimensions** (LxWxH): 2.90 m x 1.90 m x 1.90 m
- **Temperature range:** room temperature
- **Floor loading:** max. 2,000 kg
- **Cable feedthrough** (Ø): 100 mm
- **Power supply:** 230 V, 16 A / 32 A (test supply)

Dust test cabinet 2

- **Cabinet dimensions:**
  - Height 0.80 m || Ø 0.80 m
- **Access door** (WxH): 0.40 m x 0.40 m

Dust test cabinet 3

- **Test Cabinet dimensions:**
  - Height 0.45 m || Ø 0.50 m
- **Access door** (W x H): 0.30 m x 0.30 m

Salt Fog Cabinets

Service description

- Systems for simulating the influence of saline environment corrosion on components

Areas of application

- Salt spray tests
- Temperature control, humidification
- Test standards: RTCA/DO-160, MIL-STD 810, LV124, ASTM B 117, ISO 9227

Added value for our customers

- Additional material testing enable a conclusion for product optimization

Technical Data

- **Salt spray and fog**
  Temperature range:
  room temperature up to +60 °C
- **Climate tests**
  Temperature range:
  room temperature up to +50 °C
  Humidity: 20 % to 95 % relative humidity
- **Drying/Ventilation**
  Temperature range:
  room temperature up to +50 °C
  Temperature gradient: 5 K/min
  Humidity: up to 30 % relative humidity
- **Test chamber dimensions** (LxWxH):
  1,560 mm x 510 mm x 740 mm
- **Floor loading:** max. 100 kg
- **Cable feedthrough** via water basin

Contamination Units

Service description

- Contamination tests to verify the resistance of surfaces to various liquids and substances on material samples or complete components

Areas of application

- Contamination with fluids
- Exposure at high temperature
- Test standards: MIL-STD 810, RTCA/DO-160, LV124

Added value for our customers

- Additional material testing enable a conclusion for product optimization

Technical Data

- **Number of fluids:**
  Approx. 300, e.g. insecticides, lubricating oils, hydraulic fluids, solvents, cleaning agents, alcohols, fuels, de-icing agents, grease, fire extinguishing agents and more.
- Conditioning of fluids and temperate storage up to +180 °C possible


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IABG offers integrated, ground-breaking solutions in the sectors Automotive • InfoCom • Mobility, Energy & Environment • Aeronautics • Space • Defence & Security. We provide independent and competent consulting. We implement with future viability and target orientation. We operate reliably and sustainably. Our success is based on an understanding of market trends and requirements, on our staff's technological excellence and a fair relationship with our customers and business partners.

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