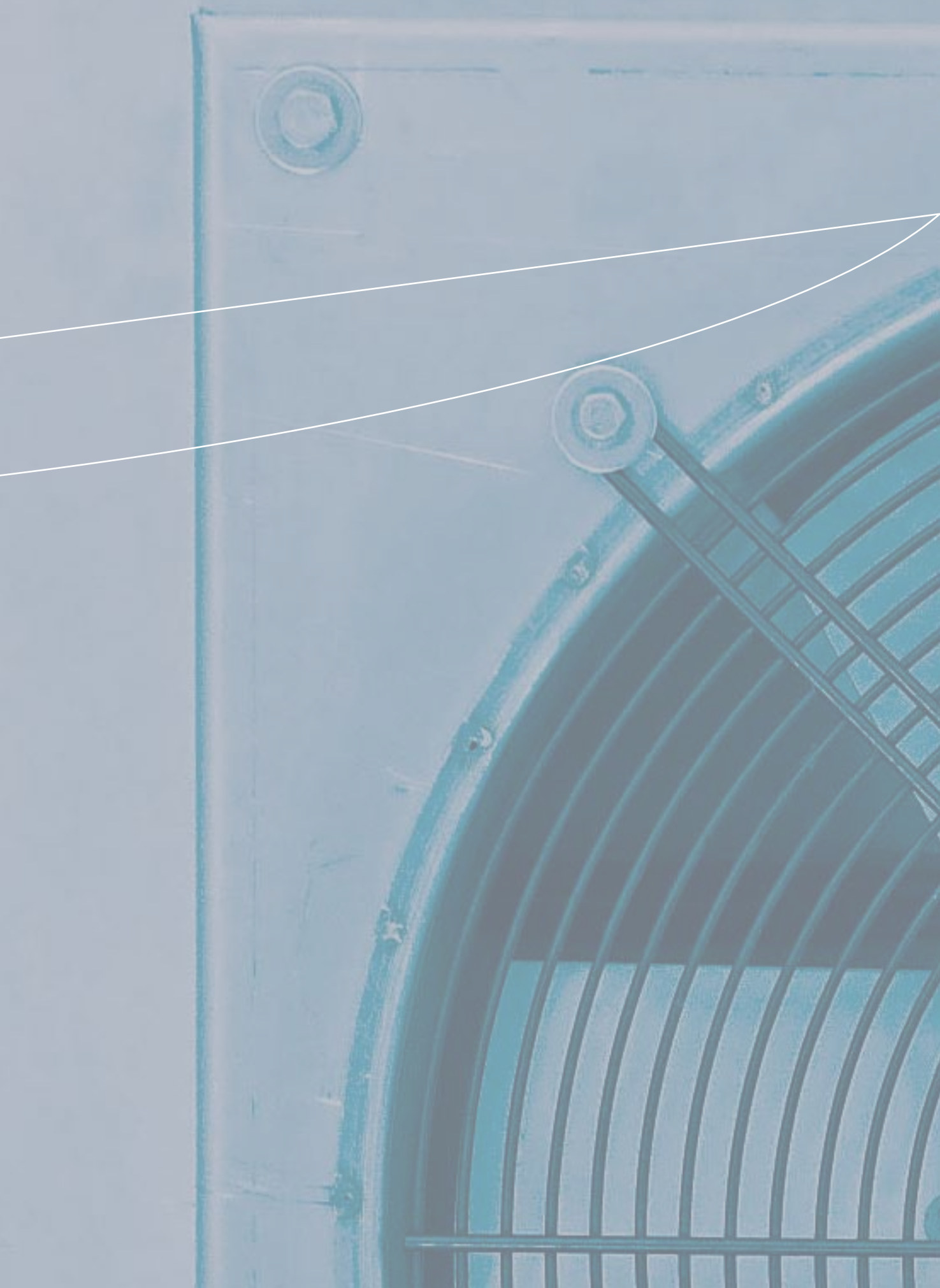


paconsert



Your partner for environmental testing



..... Partner for environmental Tests!



- Your image benefiting from each product -

You have developed a promising product and want to make sure it has already gained the necessary market maturity? Why not use the time until product rollout for quick, targeted and professional testing.

Our Experience – Your Advantage

We offer you comprehensive consulting with the creation of complex trial plans and testing of your product to make it ready for the market. Based on these tests, quality and suitability for the practical application of your product can be enhanced and the service life of the product extended. Altogether, this will ensure your satisfaction with the product well into the future. In this regard, customers from a wide range of industries from all over the world have relied on us for years.

Packaged Safety

Our complete package of services includes all aspects of environmental testing. Furthermore, we assist you with your packaging or logistics questions. And: You will always benefit from our superb organization. For example, this applies to tests we cannot perform on our own. In this case, we refer you to our partner laboratories while handling the entire coordination in the interest of a smooth overall process. This approach enables you to calculate the environmental factors based on experience, competence and safety.

Extensive Capacity Ensures Increased Flexibility

Our laboratory is able to test a broad range of products, from the small PC board to the heavy, complex switching cabinet. Of course, you will be able to observe the tests on site if you desire. Otherwise, we will always keep you posted on the progress of the tests.

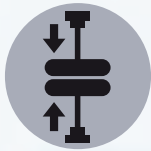
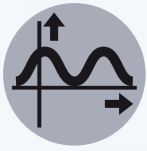
If your product is required to meet technical specifications such as internal quality standards, national approvals or internationally recognized standards, we will assist you with our know-how.

Our customers:



paconsult – everything from a Single Source

- Individual environmental test plans
- Environmental testing, climate, corrosion, drop, buckle, vibration and jolting tests as well as protection class testing (IP)
- Damage prevention through risk analysis
- Broad base of experience, both with small and large components
- Development and design support
- Very flexible, reliable, timely handling and high professional competence
- Accredited for numerous standards



..... Mechanical testing

- To make sure you are always on the safe side -

Your product is not only subject to a variety of physical stresses during transport but also during daily use where it is expected to perform with uncompromised functionality. It is therefore important to meet all these requirements ahead of time to avoid malfunctions.

Head-start Through Technology

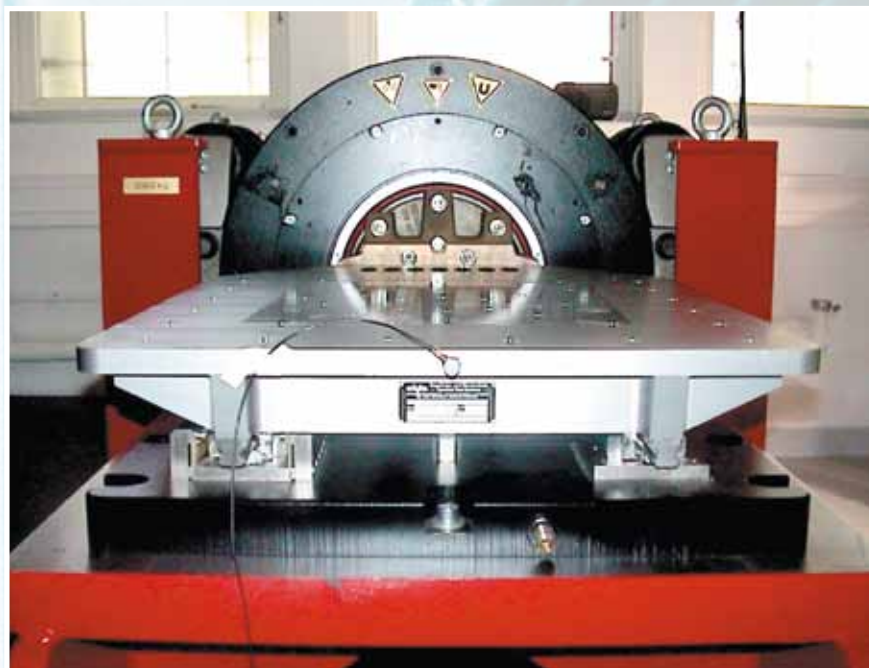
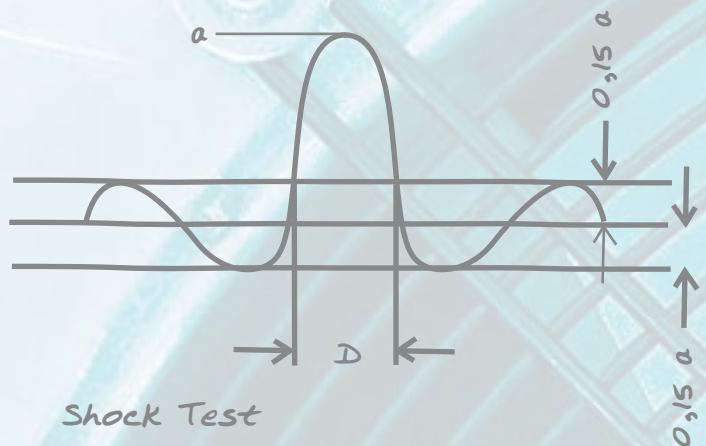
Our laboratory enjoys years of experiences in the field of mechanical testing and, thanks to the large bandwidth of testing devices, is also equipped with comprehensive test arrangements. We offer customized test concepts to ensure effective approaches: either developed by us or according to your specifications based on product-specific standards. As an alternative, we may first develop a characterization of the operating environment together with you and then examine its effects on your product.

Professional Power 'Showdowns'

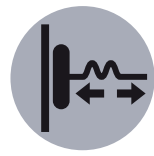
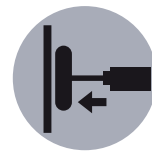
Vibrations or heavy impact of forces should not harm your product. To make sure this is

the case, different types of vibration (e.g. sinus, random- vibration, multi-signal) and shock tests (e.g. half-sine, rectangle, triangle) as well as drop and stacking tests within the framework of type testing or transport simulation are performed.

Conducting such a series of tests on stability and fragility – prior to product delivery – allows weak points in packaging to be detected and remedied thereby optimizing the transport reliability of your product.



Shaker with horizontal slip table



Extract of Test Services Offered:

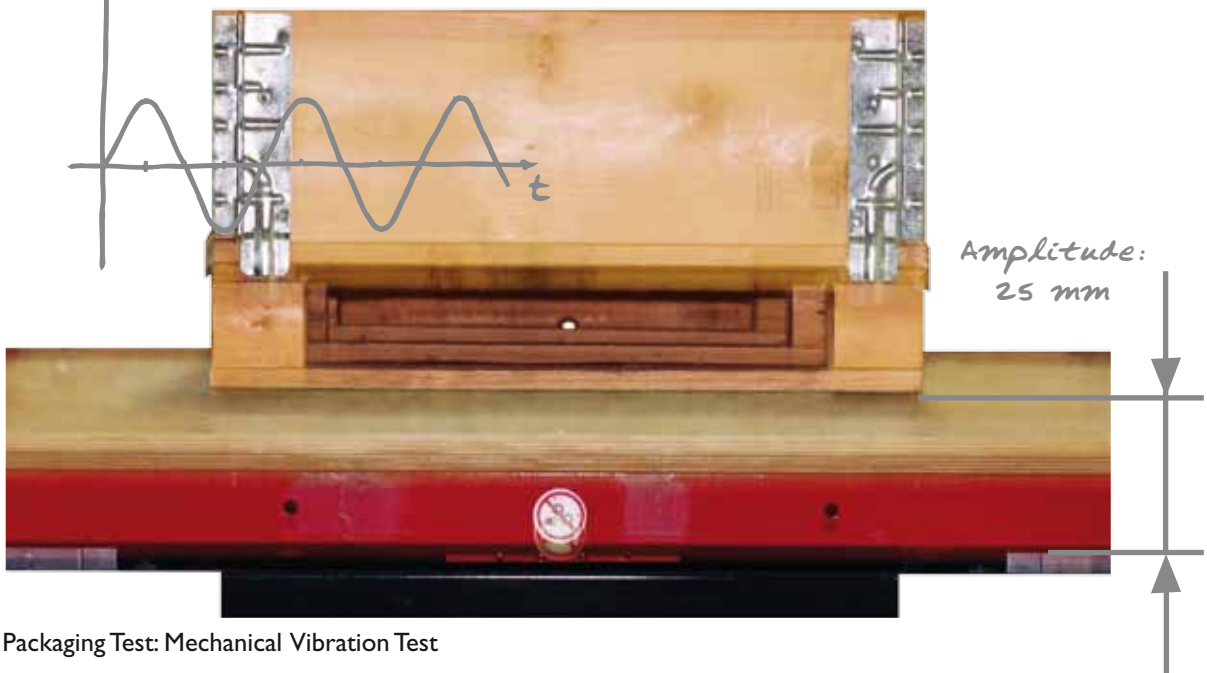
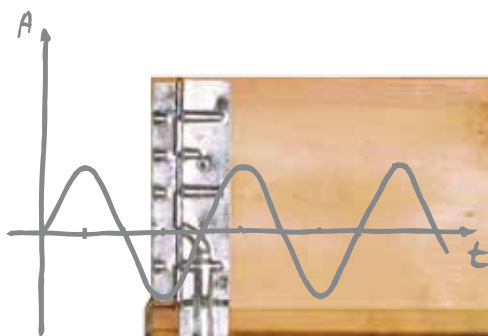
- **Random Vibration:** Simulating the movements of the product and packaging during transport with various means (truck, plane, train or ship)
- **Sinus-Sweep:** Determining the inherent frequency for cushion dimensioning.
- **Permanent shock:** Simulation of shunting shocks and impact stresses through poor road conditions (e.g. pot holes).
- **Loose Load Vibration:** Simulation of stresses of loose packaging items during transport.
- **Drop tests:** Simulation of transfer stresses in shipping processes.
- **Compression Test:** Simulation of loads by stacking in storage compartment or warehouse.

Our special equipment:

- Shaker
- Mechanical Vibration System
- Precision Drop Tester
- Compression Test System
- Climate Test Chamber
- Dust Test Chamber
- Salt Spray Test Chamber
- Splash Water Test Chamber

Loose-Load-Vibration Test

$$A_s = (2\pi f)^2 \cdot a$$



Packaging Test: Mechanical Vibration Test



Climatic Testing

- To enable your product to weather any climate -

Your product should not only be able to resist the impact of forces. Extreme temperatures or rapidly changing climatic conditions must not affect its operational readiness. These possible sensitivities must therefore be detected ahead of time.

One Laboratory – Many Climate Zones

Our climatic tests allow time-saving, cost-efficient and reproducible tests for the suitability of your product based on climate and weather-relevant criteria.

We possess several different climate chambers where specific conditions can be simulated. This includes extreme temperatures and also relative humidity ranges, rapid temperature fluctuations and corrosive atmospheres. These tests also help determine the response of your product to high relative humidity or condensate. Furthermore, in our salt spray fog chamber we are able to simulate special climatic conditions as they prevail, for example, in coastal regions or on the high sea. We offer special test series to determine the corrosion sensitivity or risk of deterioration of your product. All chambers are continuously monitored by an independent

computer-assisted data recording system and the data is graphically displayed.

This enables us to provide you with flawless test results contributing decisively to improving the durability and reliable function of your product.

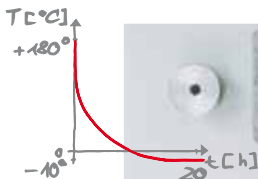
Extract of test services offered:

- Operating temperature: testing of your product under extreme temperatures from -70°C to 180°C .
- Operating climate: testing of your product under extreme climatic conditions (temperature from 10°C to 95°C and humidity from 10% to 98% relative humidity).
- Bedewing tests: testing of your product at high condensation.
- Changing climate tests: testing of your product at changing climate.



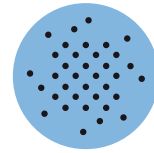
Salt Mist Test

nach
1,5 ml/h



Oversize Climate Test Chamber

IP Testing



- To make sure you always play it safe -

Can the resistance of your product to solid foreign objects or water be proven? We use the IP protection class test to test the leak-tightness of your product. The standardized test methods used for this purpose allow the assignment to an IP protection class.

The IP Code. A Class on its Own

Our laboratory enables us to conduct a large bandwidth of IP protection class tests for you. This includes the check of all function parameters and characteristics of your product using high-capacity monitoring and measuring devices.

IP 1X to IP 6X – Resistance against penetration of solid foreign objects

Apart from using test sensors we utilize our dust chamber where we apply both various dusts and different dust directions and are able to generate different forms of vacuums.

IP X1 to IP X9 – Protection against penetration of water and other liquids

Our laboratory is equipped with many different types of devices in this area as well. This includes the rain test chamber for drip water tests, various water jet and spray devices and also basins for immersion testing.



IP 5X (Dust Test)

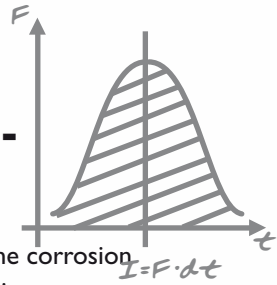


IP 5X (Water Proofness Test)



Packaging Test

- To make sure your product arrives absolutely safely -



Your packaging was designed to protect your product during transport. But does it really fulfill this claim? We are equipped with extensive test options to answer this question for you, and we are also glad to help with other types of packaging issues.

- **Climate tests:** Determining the corrosion resistance, deterioration properties or protective effect of packaging against humidity and temperature.

More Safety in Transit

Transported goods are exposed almost daily to hazards such as vibrations, forces or extreme climates. Is your packaging ready to handle these conditions? Our tests where we simulate any transport condition will give the answer. This includes vibration, shock or pressure impacts. We also test the tilting stability and susceptibility to drop or jolting damages. We also possess special climate chambers where the product or packaging is exposed to extreme temperatures or variations of relative humidity.

$$\frac{1}{2}mv^2 = mgh$$



Drop Test



Supplemental tests check the fragility of your product. This allows us to analyze the type of protection the package must provide. All these tests optimize your packaging costs and reduce the risk of transport damage. This allows you to

be at ease while your product is being transported.

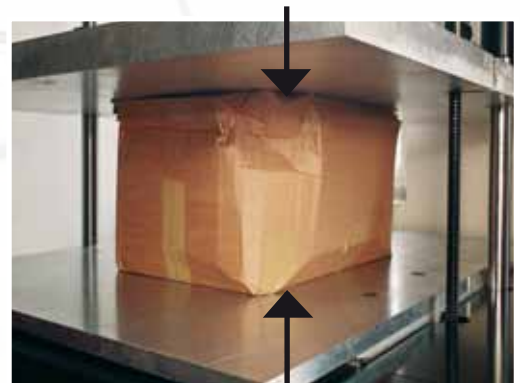
Our special equipment (among others):

- Shaker
- Mechanical Vibration System
- Precision Drop Tester
- Compression Test System
- Climate Chambers

Extract of Test Services Offered:

- **Random Vibration:** Simulating the movements of the product and packaging during transport with various means (truck, plane, train or ship)
- **Sinus-Sweep:** Determining the inherent frequency for cushion dimensioning.
- **Permanent shock:** Simulation of shunting shocks and impact stresses through poor road conditions (e.g. pot holes).
- **Loose Load Vibration:** Simulation of stresses of loose packaging items during transport.
- **Drop tests:** Simulation of transfer stresses in shipping processes.
- **Compression Test:** Simulation of loads by stacking in storage compartment or warehouse.

$$F_{Load} = \frac{H-h}{h} \cdot S \cdot m$$



Compression Test



Engineering Services

- To make sure you experience the success you expect -

The trust of your customers in your brand depends entirely on the quality and safety of your products. This is sufficient reason to determine and remedy potential weak points ahead of time. We support you in this regard with the following services:

1. Developing the Test Requirements

Based on the specifications of the specimen, the test scope of a test specification is defined. Of course, we also support you with the selection of the applicable standards and specifications.

2. Developing and Realizing the Test Arrangement

Together with you, we develop a suitable test arrangement. If required, we support you with the technical implementation.

3. Coordination of the Test Process

If desired, we function as interface between you and the certification agencies and thus as central point of contact for the project. This includes both scheduling and organizational planning of the tests and notification of the current test status to all parties involved.

4. Referral to External Services

For other tests which we are not able to realize we establish contacts to partnering laboratories (e.g. EMC testing) and accompany these tests if you prefer.

Tests in accordance with RTCA DO 160 D

<i>(Reference)</i>	<i>Test parameters</i>	<i>Test</i>
<i>Operational Vibration (RTCA DO 160 D, Section 8, Curve C1)</i>	<i>10 to 40 Hz 10,024 g²/Hz 40 Hz 10,024 g²/Hz 51,7 to 500 Hz 10,04 g²/Hz 2000 Hz 10,003 g²/Hz 5,83 r/m/s</i>	<i>1 h 3 a</i>
<i>Shock & (RTCA DO Section 7 Section 7)</i>		<i>Tests in Boxes 1 Mms 0,5 hours 3 a</i>
<i>World (CTN SAO.5.ME.10A)</i>		<i>peaks; 0,5 octave minute 160 minutes 3 a</i>
	<i>3-6 Hz / 0,01 Hz/sec.</i>	



5. Accompanying and Supporting the Laboratory Tests

We conduct the tests in our laboratory and protocol the individual proofs of function. Access to your specimen is always ensured and also the test reports can be queried at any time.

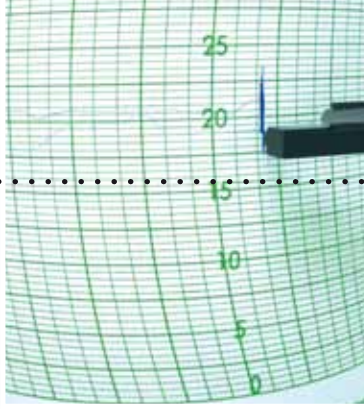
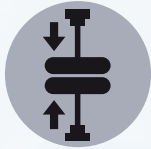


7. Developing the Technical Documentation

We document the trial setup, the tests performed and the test results.



Accredited laboratory according to DIN EN ISO/IEC 17025 by DAkkS Deutsche Akkreditierungsstelle GmbH (National Accreditation Body). The Flexible Accreditation is valid for the test ranges listed in the certificate.



Test Equipment /

Test Equipment / Technical Data

1. Precision Drop Tester & Drop-Hook:

Lansmont PDT-56ED-CE

- Drop Height Range: 305 - 1830 mm
- Maximum Table Load: 56 kg
- Impact Plate: 900 x 1000 mm
- Optionally: Measurement of the Shock (Triaxial Accelerometers)
- Ausrichtung der Packstücke: alle Lagen

Drop-Hook

- Maximum Drop Height: 2000 mm
- Maximale Stress: 250 kg
- Optionally: Measurement of the Shock (Triaxial Accelerometers)
- Adjustment of the Packages: All Directions

2. Shaker

Shaker No. I

RMS –SW 8130/TGD 18000

- Possible Testprofiles: Sinus-, Random-, Multi-signal-Vibration and Shock
- Sliding Desk Top: 600 x 800 mm
- Vertical Plate Nr. 1: 600 x 600 mm
- Vertical Plate Nr. 2: 700 x 1000 mm
- Maximum Table Load: 300 kg
- Maximum Amplitude: ± 22 mm
- Test Directions: Horizontal and Vertically
- Frequency Range: 5 Hz to 3 kHz
- Optionally: Stroboscope

Random-Vibration

- Maximum Vector Force: 26 kN
- Maximum Acceleration: $330 \text{ m/s}^2_{\text{eff}}$ (with 60 kg of Additional Load)

Continuous Shock

- Maximum Vector Force: 45 kN
- Maximum Acceleration: 330 m/s^2 (with 60 kg of Additional Load)
- Maximum Acceleration: Halfsine, Trapezoid, Sawtooth

Sinus-Sweep

- Maximum Vector Force: 28 kN
- Maximum Acceleration: 360 m/s^2 (with 60 kg of Additional Load)

Shaker No. II

RMS –SW/TGA 6000

- Possible Testprofiles: Sinus-, Random-, Multisignal-Vibration and Shock
- Clamping Plate: 500 x 500 mm
- Maximum Table Load: 250 kg
- Maximum Amplitude: $\pm 12,7$ mm
- Maximum Vector Force: 11,7 kN
- Test Direction: Vertically
- Frequency Range: 5 Hz bis 3 kHz
- Optionally: Stroboscope

3. Mechanical Vibration System/

Lansmont MS 400

- Test Plattform: 1200 x 1200 mm
- Maximum Table Load: 181 kg
- Frequency Range: 2 Hz to 5 Hz
- Amplitude: $\pm 12,5$ mm
- Maximum Acceleration: 100 g (Depends on the Weight)

4. Compression Test System

Lansmont Squeezer

- Test Plattform: 760 x 760 mm
- Maximum Opening Height: 1230 mm
- Maximum Force: 22 kN
- Testprofiles: Constant Load, Linear Load Increase

5. Walk-In Climate Test Chamber

Weiss SB/8'/20

- Internal Dimensions (S x H x D): 1860 x 2010 x 2100 mm
- Door dimensions (S x H): 1400 x 2000 mm
- Maximum Floor Loading: 30000 N/m^2 (Load/Unit Area)
- Cable Entry: 1 x, $\varnothing 100$ mm

Work Area Temperature:

- Temperature Range: -40 °C to $+85$ °C, intermittent
- Temperature Constance: ± 1 K (temporally)
- Cooling speed: 1 K/min in average, between $+85$ °C to 0 °C with test specimen mass 250 kg (0,25 Wh/kgK)
- Heat-Up Speed: 1 K/min in average, between -40 °C and $+85$ °C with test specimen mass 250 kg (0,25 Wh/kgK)



Work Area Climate:

- Temperature Range: + 10 °C to + 60 °C
- Temperature Constancy: ± 0,5 K (temporally)
- Humidity Range: 15 % to 95 % r.H. without Specimen
- Humidity Constancy: ± 5 % r.H (temporally)
- Dew Point Temperature Range: +6 °C to + 49 °C

6. Climate Test Chambers

Climate Test Chamber No. I

Weiss WK 340-70

- Internal Dimensions (S x H x D):
540 x 765 x 750 mm
- Distance betw. Editions: ~ 540 mm
- Cable Entry: 2 x, left ø 50 mm,
right ø 125 mm

Work Area Temperature:

- Temperature Range: - 70 °C to +180 °C
- Temperature Derivation: ± 0,1 K to ± 0,5 K (temporally), ± 0,5 K to ± 2,0 K (spatially)
- Cooling Speed: 2 K/min in average
- Heat-Up Speed: 3 K/min in average

Work Area Climate:

- Temperature Range: + 10 °C to + 95 °C
- Temperature Constancy: ± 0,1 K to ± 0,3 K (temporally)
- Humidity Range: 10 % to 98 % r.H.
- Humidity Derivation: ± 1 % to ± 3 % r.H. (temporally)
- Temperature Derivation: ± 0,1 K to ± 0,3 K (temporally), ± 0,5 K to ± 1,0 K (spatially)
- Dew Point Temperature Range:
+ 4 °C to + 94 °C

Climate Test Chamber No. II

Weiss WK 340-70-5

- Internal Dimensions (S x H x D):
540 x 750 x 765 mm
- Cable Entry: 2x, left ø 50 mm,
right ø 125 mm, 1 x front-laterally Notching
Execution 50 x 80 mm

Work Area Temperature:

- Temperature Range: - 70 °C to + 180 °C,
intermittent
- Temperature Derivation: ± 0,1 K to ± 0,5 K

(temporally), ± 0,5 K to ± 2,0 K (spatially)

- Cooling Speed: 6,7 K/min in average
- Heat-Up Speed: 6,8 K/min in average

Work Area Climate:

- Temperature Range: + 10 °C to + 95 °C
- Temperature Constancy: ± 0,1 K to ± 0,3 K (temporally)
- Humidity Range: 10 % to 98 % r.F.
- Humidity Derivation: ± 1 % to ± 3 % r.F. (temporally)
- Temperature Derivation: ± 0,1 K to ± 0,3 K (temporally), ± 0,5 K to ± 1,0 K (spatially)
- Dew Point Temperature Range:
+ 4 °C to + 94 °C

7. Temperature Test Chamber

Köttermann 2718

- Internal Dimensions (S x H x D):
900 x 600 x 500 mm
- Cable Entry: ø 24 mm (above)
- Temperature Range: Ambient Temperature
to +260 °C

8. Salt Spray Test Chamber

Weiss S400

- Internal Dimensions (S x H x D):
600 x 700 x 700 mm
- Temperature Range: 20 °C to 55 °C
- Salt Spray

9. Dust Test Chamber

Weiss ST 1000

- Internal Dimensions (S x H x D):
950 x 900 x 950 mm
- Door Dimensions (S x H):
900 x 900 mm
- Maximum Floor Loading: 30 kg
- Different Types of Dust possible

10. Splash Water Test Chamber

- Internal Dimensions (S x H x D):
2700 x 2700 x 3000 mm
- Door Dimensions (S x H):
760 x 1950 mm
- Turntable dimensions:
700 x 700 mm
- Maximum Table Loading: 150 kg

Competence builds bridges...

Experienced staff members and a well-equipped laboratory: The optimal combination and your first choice in matters of environmental simulation.

Accredited laboratory according to DIN EN ISO/IEC 17025 by Deutsche Akkreditierungsstelle (DAkkS). Accreditation is valid for the testing procedures listed in the certificate.

ASTM D 642	(2000)	DIN EN 60601-1	(06-2005)
ASTM D 999	(2001)	DIN EN 60721-3-2	(03-1998)
ASTM D 4169-01	(2001)	DIN EN 60945	(07-2003)
ASTM D 4728	(2001)	DIN EN 61373	(11-1999)
ASTM D 5276	(1998)	DIN EN ISO 2234	(12-2002)
DIN EN 1789	(10-2004)	DIN EN ISO 2247	(12-2002)
DIN EN 20187	(11-1993)	DIN EN ISO 12048	(04-2001)
DIN EN 22206	(02-1993)	DIN ISO 9022-3	(09-2000)
DIN EN 22248	(02-1993)	MIL-STD 810 C	(1981-04)
DIN EN 22876	(02-1993)	MIL-STD 810 E	(1989-07)
DIN EN 50155	(01-2004)	MIL-STD 810 F	(2000-01)
DIN EN 60068-1	(03-1995)	RTCA/ DO 160 D	(2004-06)
DIN EN 60068-2-1	(03-1995)	RTCA/ DO 160 E	(2004-09)
DIN EN 60068-2-14	(08-2000)		
DIN EN 60068-2-2	(08-1994)		
DIN EN 60068-2-2/A2	(01-1995)		
DIN EN 60068-2-27	(03-1995)		
DIN EN 60068-2-29	(03-1995)		
DIN EN 60068-2-30	(02-2000)		
DIN EN 60068-2-31	(03-1995)		
DIN EN 60068-2-32	(03-1995)		
DIN EN 60068-2-33	(09-2000)		
DIN EN 60068-2-38	(02-2000)		
DIN EN 60068-2-55	(03-1995)		
DIN EN 60068-2-6	(05-1996)		
DIN EN 60068-2-66	(06-1995)		
DIN EN 60068-2-67	(07-1996)		
DIN EN 60068-2-78	(09-2002)		
DIN EN 60255-21-1	(05-1996)		
DIN EN 60255-21-2	(05-1996)		
DIN EN 60255-21-3	(11-1995)		
DIN EN 60512-11-1	(08-1999)		



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