WKM

Thermal process technology
Environmental simulation
Project planning

Whatever you are going to simulate.

We project it.

Corrosion test systems

Corrosion test systems

Contents

We are WKM

WKM has been active as an independent sales company since 1996. We work as Factory representation and sales partner together with renowned manufacturers. Lachendorf in Lower Saxony became our new headquarters in 2014.

You can reach us for a personal conversation - without an automativ telephone waiting loop! Technical consultation on site is a matter of course for us. We would be pleased to arrange an appointment for a visit to your company or on a virtual meeting. For us, advice does not end with the order. After delivery of the system, you will receive a commissioning and equipment training on request.

You are invited to visit our technical centre to get a detailed impression of our work and the quality characteristics of the product range. Here we can also carry out individual training and further education programmes for you.

WKM offers a comprehensive program to determine all project-specific basics. We implement your requirements precisely and consistently and assist you in all phases of your projects.

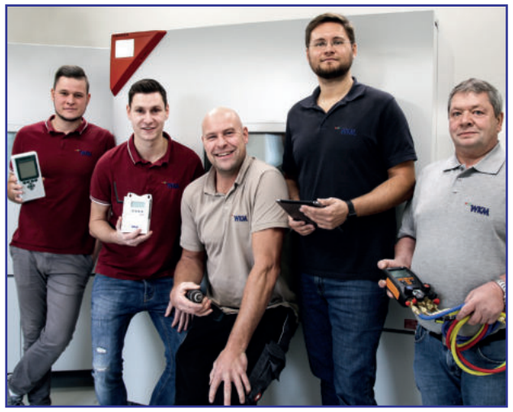
Our key to success: **Listen, Advise, Act**.

Full Service

Our internal service team can be reached by phone workdays from 7:00 a.m. to 5:30 p.m. WKM is also your contact person after purchase and commissioning and ensures a proper function of your equipment and system. Our regularly trained service employees are always at your side. We also help without a maintenance contract.

Our services:

- Maintenance
- Calibration
- Repairs
- DGUV V3 measurements (previous BGV-A3)
- Leakage checks on cooling systems
- Mapping



Salt spray tests

Even the Vikings are said to already have had swords that did not rust. Surely at that time the natural salt spray test, which occurred during their travels, had an influence on this. So it is not surprising that the first targeted salt spray tests at the beginning of the 20th century were performed on military products. In this day and age the salt spray test is used in a great many industries.

Corrosion and current test specifications

Which corrosion test cycle is right for my application?

These questions arise again and again when the purchase of a corrosion test chamber comes up.

With the equipment from the CabS series, the most important single cycles from a test standard can be carried out. Based on the design of a condensation water cabinet, salt mist tests and optionally cyclic corrosion tests can be carried out.

Condensated / Condensation water chambers

The testing device is specifically designed to generate condensation on the test specimen. By heating the water bath the water evaporates and the humid air rises up in the closed test room. The test specimen are not heated and thus are cooler than the surroundings, so that the humidity precipitates as condensate (condensation) on the test specimen.

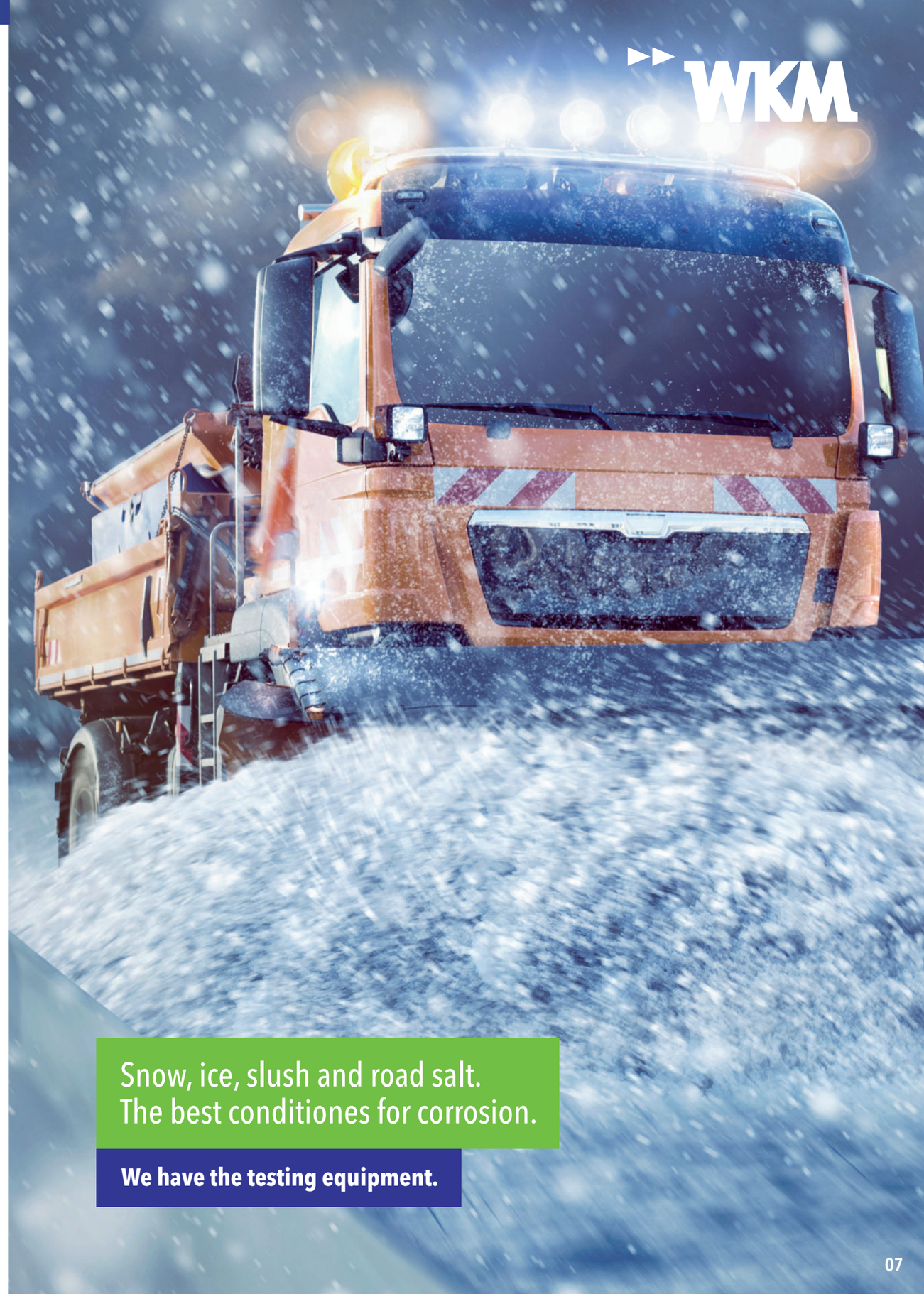
A sloped roof prevents the condensate to drip on the samples, as it runs off via the incline to the chamber walls into the floor trough.

Standards overview

Many test standards are available to the user as test basis for carrying out corrosion tests. At this point our support already begins, to explain these specifications relevant to practice.

Bringing the use of corrosion resistant materials and the expertise in line with the individual required device components, results in a high quality test system for you.

STANDARDS	OLD STANDARD	DESCRIPTION	TEST TIME	°C / % r. F.	REMARKS
DIN EN ISO 6270-2	DIN 50 017				
DIN EN ISO 6270-2 CH	DIN 50 017 KK	Condensation water Constant climate	Continuous	40 ± 3 °C	Condensation (100 % humidity)
DIN EN ISO 6270-2 AHT	DIN 50 017 KFW	Condensation water Constant climate Ventilation without floor water	8 h 16 h	40 ± 3 °C 18 – 28 °C	Condensation (100 % humidity) Chamber opened or ventilated
DIN EN ISO 6270-2 AT	DIN 50 017 KTW	Condensation water Constant climate Heat stop w. floor water without ventilation	8 h 16 h	40 ± 3 °C 18 – 28 °C	Condensation (100 % humidity) Chamber closed
DIN EN ISO 9227	DIN 50 021				
DIN EN ISO 9227 NSS	DIN 50 021 SS	Salt spray with 5 % NaCl	Continuous	35 ± 2 °C	Typical 96 h to 1000 h
DIN EN ISO 9227 AASS	DIN 50 021 ESS	Salt spray with 5 % NaCl (pH = 3.3)	Continuous	35 ± 2 °C	
DIN EN ISO 9227 CASS	DIN 50 021 CASS	Salt spray with 5 % NaCl and Copper chloride (pH = 3.3)	Continuous	50 ± 2 °C	24 h to 96 h
DIN EN ISO 22479	DIN 50 018 DIN EN ISO 6988	Cyclical corrosion test with corrosive gas condensation water Constant climate with SO^2 with ventilation	8 h 16 h	40 ± 3 °C 18 – 28 °C	Depending on the chamber volume, 0.2 to 2.0 l SO^2 is dosed Chamber is ventilated
DIN EN ISO 11997-1 Cycle B	VDA 621-415	Cyclical corrosion test Salt spray acc. to DIN EN ISO 9227 NSS 4 cycles acc. to DIN EN ISO 6270- 2 AHT Ventilation (typical 23 °C / 50 % RH ± 20 %)	24 h (1 day) 96 h (4 days) 48 h (2 days)	35 ± 2 °C 40 °C / (18 – 28 °C) 23 ± 2 °C	1 cycle= 1 week
PV 1210		Cyclical corrosion test Salt spray acc. to DIN EN ISO 9227 NSS Standard climate Condens. water acc. to DIN EN ISO 6270- 2 CH After 5 days: Standard climate	4 h 4 h 16 h 48 h	35 ± 2°C 23 °C / 50 % RH 40 ± 3 °C 23 °C / 50 % RH	 Typical: as weekend storage
DIN EN IEC 60068-2-11		Salt spray with 5 % NaCl	Continuous	35 ± 2°C	16 h to 672 h
DIN EN IEC 60068-2-52 test method 1 test method 2 test method 3 test method 4 test method 5 test method 6 test method 7 test method 8		Cyclical corrosion test Salt spray (5 % NaCl) Humid storage Salt spray (5 % NaCl) Humid storage Salt spray (5 % NaCl) Humid storage After 3 days: Standard climate 2 Cycles after Severity 3 4 Cycles after Severity 3 8 Cycles after Severity 3 Salt spray (5 % NaCl) Hot drying Humid storage As Severity 7, however acidified saline solution	 2 h 6 days 22 h 2 h 22 h 2 h 22 h up to 1 day 72 h 2 h 4 h 2 h	 35 ± 2 °C 40 ± 2 °C / 93 % RH 35 ± 2 °C 40 ± 2 °C / 93 % RH 35 ± 2 °C 40 ± 2 °C / 93 % RH 23 °C / 50 % RH 35 ± 2 °C 60 ± 2 °C <=30 % RH 50 ± 2 °C >=95 % RH	 4 weeks 3 days 1 day 1 cycle = 8 h (3 - 180 cycles)
SWAAT /PV 1208 ASTM G85 A3		Cyclical corrosion test Salt spray (5 % NaCl) (pH=2.8 to 3) Heating without salt spray	 30 min 90 min	 50 ± 2 °C 50 ± 2 °C	 Floor remains covered with water Floor remains covered with water
DIN 55635 Cycle A Cycle B Cycle C	VDA 233-102 (Daimler KWT) (SEP 1850)	Cyclical corrosion test Salt spray (1 % NaCl) Temperature (35 °C – 50 °C) with humidity change 50 – 95 % RH Temperature (35 °C – 50 °C) with humidity change 70 – 95 % RH Deep-freezing (– 15 °C to + 50 °C) Temperature (35 °C – 50 °C) with humidity change 70 – 95 % RH	 3 h 21 h 24 h 9 h 15 h	 35 ± 2 °C 35 – 50 °C / 50 – 95 % RH 23 – 50 °C / 70 – 95 % RH -15°C 35 – 50 °C / 70 – 95 % RH	Consists of Cycles B A C A B B A
Volvo VCS 1027, 149 STD 423-0014 Volvo VCS 1027, 1449 Ford CETP: 00.00 L-467		Cyclical corrosion test with sprinklings & various Humid and drying phases		35 – 45 °C / 50 – 95 % RH 25 – 50 °C / 70 – 95 % RH	Complex day and week cycles



Our icons

Overview of important corrosion test phases

Salt spray (NaCl)

Salt spray tests allow predictions on the corrosion behaviour of the test specimen in an environment with saline contamination. Especially the stress caused by ocean climate and through road salt on vehicles is the focus here. The salt spray condenses on the surface of the test specimen and acts as an electrolyte.

Condensation water climate

An atmosphere with 100% humidity generates a sustained heavy condensation on the surface of the test surface. Due to the very small size of the dewdrops, these also diffuse in the smallest cracks and defects on the surface of the test specimen.

Test chamber flushing

Used for fast cooling and intermediate cleaning of the test chamber via an automatic flushing of the test chamber walls with demineralised water.

Ventilation with ambient air

Blowing in fresh air is used to dry the test specimen, as resting phase or for removal of the corrosive test chamber atmosphere after completion of the test.

Recirculating air ventilation

The recirculating air ventilation ensures uniform conditions by high air circulation during the test phases standard climate, warm drying or humidity climate within the test chamber.

Humid air climate (%RH)

During this phase the relative humidity used is very high, without condensation occurring on the test specimen. This prevents washing off of the corrosive medium and enables the electrical operation of the test specimen during the corrosion stress.

Warm drying phase

In the warm drying phase the test goods can be quickly dried by a higher temperature. Along with the (mechanical) stress due to the temperature change, also the existing concentration of the electrolytes on the warm surfacer can be a desired stress.

Standard climatic phase (%RH)

A standard climatic phase of 23°C/50% RH is required to insert resting phases in the cyclical test run. The reproducibility in comparison with uncontrolled ambient air phases is significantly improved by the use of the standard climate.

Climate phase

Various temperature and humidity cycles can be run during the climate phase. The goal is to recreate variable climatic conditions in order to improve the correlation between the practical use and the corrosion test.

Frost climatic phase

Through the temperature change to negative temperatures for organic coating a mechanical stress is additionally generated for the actual corrosion test.

Sprinkling phase

The brief sprinkling is used for wetting the test specimen with a corrosive liquid. The critical corrosion stress is then done in the following climatic phases.

Condensation water climate with gas addition (SO2)

In order to perform condensation tests under more stringent conditions, additional corrosive gases can be introduced into the test chamber. Often sulphur dioxide is used as a corrosive gas, which leads to an acidic condensation.

Corrosion test systems

Cab Series
Condensation water and Kesternich test cabinet

SO2 | Cab 300

The resistance of coating materials to moisture is determined by exposing the test samples to condensation water.

With this simple but very effective quality test a permanent condensation on the test specimen is generated. The optional use of sulphur dioxide enables a test run for higher stresses (Kesternich test).

Included in the features of the RSI condensation water and Kesternich test cabinets are:

- standard-conforming structure acc. to **ISO 6270-2, ISO 6988, DIN 50018, DIN EN ISO 22479**
- high-quality stainless steel materials for the chamber
- test chamber door and glass panes made of ESG safety glass
- manual or fully automatic gas dosing

CabS Series
Combination test cabinet

CabS 430 | NaCl

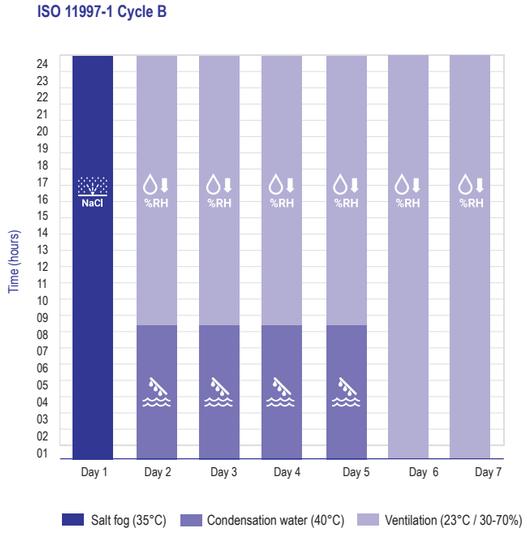
The combination test cabinets offer a simple and inexpensive entry into corrosion testing. Through its basic structure they are suitable as a condensation water device or also as salt spray test cabinet. Optionally an automatic combination of condensate and salt spray test is available as change test device.

Included in the features of the RSI combination test cabinets:

- standard-conforming structure according to **ISO 6270-2, ISO 9227**
- dosing the salt spray solution via diaphragm dosing pump
- high-quality stainless steel custom materials for the chamber
- ergonomic touch panel
- test chamber door and glass panes made of ESG safety glass
- solution tank

Corrosion tests

Cyclical corrosion tests



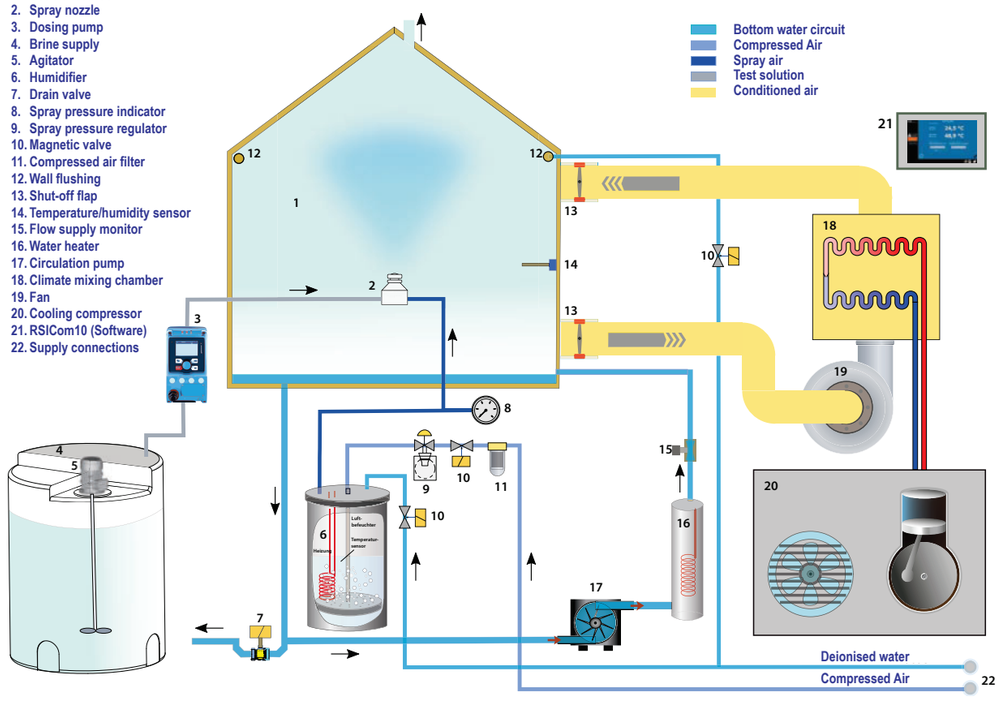
The uniformly running corrosion tests are mainly used for examinations on very different surfaces for comparison tests between customers and suppliers. In the customer/supplier relationship and between the extremely diverse production levels there is always the desire to create a comparison between a shortened test time and the actual material stresses.

To achieve this goal there are continually more complex cyclical sequences of a wide variety of corrosion stresses tested.

The current state of the technology are test sequences that are made up of combinations of impingements with corrosive electrolytes and a sequence of a very different climatic conditions. Practically every large automotive manufacturer relies on its own factory standard. Frequently the ISO 11997-1 Cycle B is used in practice as the generally recognised test.

Functional diagram
of a corrosion test system in a simple representation

1. Usable test room
2. Spray nozzle
3. Dosing pump
4. Brine supply
5. Agitator
6. Humidifier
7. Drain valve
8. Spray pressure indicator
9. Spray pressure regulator
10. Magnetic valve
11. Compressed air filter
12. Wall flushing
13. Shut-off flap
14. Temperature/humidity sensor
15. Flow supply monitor
16. Water heater
17. Circulation pump
18. Climate mixing chamber
19. Fan
20. Cooling compressor
21. RSICom10 (Software)
22. Supply connections



Corrosion test systems

FLC Series
Corrosion test cabinets

During the salt spray test the test specimen are exposed to a salt spray atmosphere with increased temperature and so the stress through oxidising corrosive substances is simulated in time-lapse effect. Salt spray tests are also combined with other corrosion tests into so-called cyclic corrosion tests, in which a wide variety of phases are run cyclical.

Included in the features of the RSI corrosion test cabinets:

- standard-conforming structure according to **ISO 9227, DIN EN 600068-2-11, ISO 6270-2, ISO 11997-1, PV 1210**
- test chamber made of polypropylene or stainless steel custom materials
- ergonomic touch panel
- integrated measurement data acquisition
- metering of the salt spray solution via regulated diaphragm pump
- solution tank with free access for the operating personnel
- diverse options and customer-specific solutions

TLC Series
Corrosion test chest

TLC 550 chest | NaCl | %RH | %RH | FLC 1000 cabinet

WLC series walk-in test chambers

For very large and heavy test specimen we offer walk-in and drive-in chambers. In addition to series designs, these systems are laid out specifically for the planned test concept. These chambers can also be laid out for very heavy test specimen. Customer-specific cells up to 100 m³ are possible.

Included in the features of the walk-in RSI corrosion test chambers:

- standard-conforming structure acc. to **ISO 9227, PV 1210, DIN EN 600068-2-11, ISO 6270-2, ISO 11997-1**
- test chamber made of polypropylene or stainless steel custom materials
- underneath accessible designs possible
- extension rails
- ergonomic touch panel
- integrated measurement data acquisition
- dosing the salt spray solution via diaphragm dosing pump
- solution tank with free access for the operating personnel
- diverse options and customer-specific solutions

PLUS⁺ Series corrosion test devices with deep-freezing

Modern corrosion tests are becomingmore complex and multi-layered. Through the sequence of ingenious temperature and humidity processes up to frost storage, an attempt is made to simulate real environmental conditions in a comparable and time-related manner. For this purpose, we offer test cabinets and chambers with a wide range of options.

Included in the features:

- standard-conforming structure according to **DIN 55635 (VDA 233-102), ISO 9227, ISO 6270-2**
- temperature expansion for frost phase
- expanded climate control
- test chamber made of plastic or stainless steel custom materials
- ergonomic touch panel
- integrated measurement data acquisition
- ergonomic touch panel
- dosing the salt spray solution via diaphragm dosing pump
- diverse options and customer-specific solutions

WKM

Whatever you are going to simulate.

We project it.

You can also benefit from our expertise

Environmental simulation

- Temperature
- Shock test
- Climate
- Plant growth
- Sunlight
- Vibration
- Leakage test
- Tempering Medium Oil
- Corrosion
- Height simulation
- Container systems
- Tempering Medium Water / Glycol

Thermal process technology

- Drying
- Tempering Heating
- Vulcanising
- Vacuum
- Solvents
- Coil-Coating Test
- Annealing - Hardening- Tempering
- Elastomer Plastic

We will be pleased to advise you in the fields of thermal process technology and environmental simulation, in order to project an individual solution for your application. Contact us under the phone number +49 (0) 5145-28666-10.

References

Airbus Operations GmbH
AKUVIB Engineering and Testing GmbH
Amazonen-Werke H.Dreyer GmbH & Co. KG
AUCOTEAM GmbH
Axalta Coating Systems Germany GmbH
BASF Coatings GmbH
Bertrandt Ingenieurbüro GmbH
Continental AG
Daimler Benz AG
ELANTAS Europe GmbH
F. Reyher Nchfg. GmbH & Co. KG
FES GmbH Fahrzeug-Entwicklung Sachsen
FILK gGmbH
Grohe AG
HARTING Deutschland GmbH & Co. KG
Hella GmbH & Co. KGaA
Huf Hülsbeck & Fürst GmbH & Co. KG
IGOS GmbH & Co. KG
iLF Magdeburg GmbH
Kiekert AG
Plastic Institute Lüdenscheid
LABCO GmbH
Mankiewicz Gebr. & Co. (GmbH & Co. KG)
MENNEKES Elektrotechnik GmbH & Co. KG
OBO Bettermann KG
RST Rail System Testing GmbH
Schüco International KG
SGS Institut Fresenius GmbH
SPAX International GmbH & Co. KG
Still GmbH
thyssenkrupp Steel Europe AG
Treo - Labor für Umweltsimulation GmbH
TÜV Rheinland Product Safety GmbH
Volkswagen AG
Westfalia Automotive GmbH
Zumtobel Lighting GmbH

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