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Cyclic Corrosion Test (CCT) Cabinets

For most artificial accelerated tests in laboratory, getting a consistent testing results with outdoor is the most important purpose. Prior to cyclic corrosion testing, conventional salt spray (a continuous salt spray at 35°C), was the most popular way to simulate corrosion in a lab. Because conventional salt spray methods failed to simulate the natural wet/dry cycles of the outdoors, test results frequently provided poor correlation to outdoors. In order to better simulate the complex and changeable external natural environment, cyclic corrosion test has gradually been considered as an important and effective method for the life assessment of industrial products.

The Cyclic Corrosion Test Cabinets is also called CCT Cabinets. Some industrial products need to be exposed to repeated cyclic salt spray, dry and static environment with high humidity and low humidity. These tests were initially switched between several test chambers manually. The multi-functional Cyclic Corrosion Test Cabinets solves this problem well, and realizes the automatic test of these cycles in a chamber.

In a typical cyclic corrosion cabinets, all specimens are exposed to a series of different environments in a repetitive cycle that simulates the outdoors. Simple cycles, such as Prohesion, may consist of cycling between salt fog and dry conditions. More sophisticated automotive methods may ask for multi-step cycles that incorporate humidity, dry air or condensation, along with salt spray and dry-off.

Within one chamber, users can cycle easily through a series of the most significant corrosion environments. Even extremely complex test cycles can easily be programmed with the controller. Biuged CCT Cabinets can perform salt spray, Prohesion, and 100% humidity for most cyclic automotive tests.

The Cyclic Corrosion Test Cabinets developed and produced by Biuged sets and controls various parameters through the touch screen, and combines multiple tests such as salt spray corrosion, humidity (high temperature and high humidity, low temperature and low humidity), air drying (hot drying and air drying) to simulate a variety of cyclic corrosion tests. Of course, special cyclic corrosion test can also be simulated through the combination of other accessories. The instrument can also conduct neutral salt spray test (NSS), acetic acid salt spray test (AASS), copper accelerated acetic acid salt spray test (CASS), water spray test, damp heat test, drying test and standard atmospheric environment test separately.





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Standards

ISO 4611 《Plastics -- Determination of the effects of exposure to damp heat, water spray and salt mist》

ISO 7253 《Paints and varnishes -- Determination of resistance to neutral salt spray (fog) 》

ISO 9227 《Corrosion tests in artificial atmospheres -- Salt spray tests》

ISO 11493 《Corrosion of metals and alloys - Accelerated testing involving cyclic exposure to salt mist, "dry" and "wet" conditions》

ISO DIN EN 16151 《Corrosion of Metals and Alloys - Accelerated Cyclic Tests With Exposure to Acidified Salt Spray, "dry" and "wet" Conditions》

ISO 16701 《Corrosion of metals and alloys -- Corrosion in artificial atmosphere -- Accelerated corrosion test involving exposure under controlled conditions of humidity cycling and intermittent spraying of a salt solution》

ASTM B 117 《Standard Practice for Operating Salt Spray (Fog) Apparatus》

ASTM B368 《Standard Test Method for Copper-Accelerated Acetic Acid-Salt Spray (Fog) Testing (CASS Test) 》

ASTM B 380 《Standard Test Method for Corrosion Testing of Decorative Electrodeposited Coatings by the Corrodokote Procedure》

ASTM G85 - 11 《Standard Practice for Modified Salt Spray (Fog) Testing》

ASTM D 1735 《Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus》

DIN 50021 《Salt Spray Testing》

Features

1. Cabinet Material

- ◆ The inner box is welded with imported 1mm high corrosion preventive pure titanium panel, and the outer box is made of stainless steel and the surface is treated with baking paint.
- ◆ The inner layer of sealing cover of working room is welded with pure titanium panel, and the outer layer is made of stainless steel and the surface is treated with baking paint. The top angle is 110° , prevent condensate water during the test from dropping to specimen surface and affect testing results. Moreover, there is a transparent observing window made of tempered glass (400mm×280mm).
- ◆ Box cover lifting operation: The box cover lifting is controlled by air cylinder. The lifting speed can be adjusted by air pressure. The operation is easy.
- ◆ The outer box is sealed with thermostability and corrosion preventive silicone strips to ensure that the corrosive gas in the box does not leak.
- ◆ Thermostability and flame retardant insulation panel is used around the test cabinets to make an insulation layer.
- ◆ Salt solution supplement box (200L) is made of external transparent food grade PVC.
- ◆ Sample Holder: The upper sample holder is a U-shaped slot strip made of corrosion preventive insulating resin material, with evenly distributed bayonets on both sides of each slot strip to ensure that the angle of the placed test piece meets the standard requirements ($20^\circ \pm 5^\circ$ to the vertical plane); The lower sample holder is specially used to place workpieces, special-shaped samples or large samples. The sample holder is designed as a solid mesh platform. The platform is placed above the heating layer at the bottom of the instrument, about 150mm from the bottom panel of the inner box. The platform surface is evenly perforated to prevent the accumulation of solution after fog falling, which is also conducive to the air circulation in the instrument. The mesh panel can be removed. The mesh material is made of reinforced glass fiber reinforced plastic, and the bearing capacity is $\geq 600\text{kg/m}^2$ (when the samples are evenly distributed).
- ◆ Saturation Pressure Barrel: It is welded with SUS304# stainless steel. In order to ensure that the compressed air used for spray is pure and constant temperature compressed air, an air filtering and heating device is specially designed, and the water level control device, heating device and temperature control system are set in the pressure barrel. At the same time, a circle of compressed air overflow fine holes are uniformly drilled at the bottom of the pressure barrel, and the outside is connected with



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the compressed air source oil-water separator and the air source pressure regulating valve, After the compressed air is adjusted to the required pressure value, it enters the heating pressure barrel, enters the water in the pressure barrel through the fine hole at the bottom, overflows in the form of bubbles, and then supplies the spray nozzle from the top of the heating pressure barrel; At the same time, a water level sensing probe is set near the bottom and the top of the pressure barrel to realize automatic water supply; When the water level of the heating pressure barrel is constant at the specified water level, pure saturated steam is obtained and the temperature of the saturated compressed air is kept within the set range for a long time, and the liquid level monitoring and liquid level limit alarm functions are provided.

- ◆ Circulating Fan: Thermostability, long shaft motor is adopted. The motor is installed in the outdoor, the shaft extends indoors, and the stirring fan is installed at the end of the shaft; Special heat insulation measures and heat dissipation system improve motor safety.
- ◆ The electrical control part and the working room are of integrated left and right structure, the left is the working room, and the right is the dry, damp heat control electrical part. The water and electricity separation structure effectively prevents water from entering the electrical control part to damage the accessories, which is safe and reliable.
- ◆ The whole instrument is a desktop structure. The bottom of the instrument is welded with a frame structure with channel steel. The bottom is equipped with mobile casters and positioning foot cups to move and positioning the instrument .
- ◆ Installation state display on the top of the instrument: Cylindrical three color sound-light alarm (with LED lamp beads): The yellow light is on when waiting for startup or operation completion; The green light is always on during normal operation; In case of emergency stop or instrument fault alarm, the red light is on and the buzzer buzzes.

2. Spray Fog System

- ◆ Spray Fog Principle: Use Bernoulli's principle to absorb salt solution then atomize it, uniform atomization and no any salt would crystallize at the spray nozzle and ensure a uniform fog distribution in whole the working room and continuous testing. Air Compressor→Oil-water Separator(first)→Air Storage Tank→Relief Valve→Total Solenoid Valve→Oil-water Separator(second)→Saturator→Pressure Regulating Valve→Solenoid Valve for spraying→Spray Nozzle
- ◆ Spraying Apparatus: There is one or two atomizer towers in the middle of working room, ensure a uniform fog distribution in the room.
- ◆ Fog Collectors: Two fog collectors(tapered funnels whose diameter are 100mm)are used to monitor spray fog amount, one is near the atomizer tower and the other is far from. At the bottom of the funnel, there is a silicone pipe which connect with graduated cylinder installed outside. Operator can check the spray fog amount to ensure the test accuracy of the test sample.
- ◆ Spray Nozzle: Made of special glass, can control fog amount and spraying angle and ensure that there is no crystallization during the test.
- ◆ Spray Fog or Drain-away Fog: Spray fog can be done by manual or setting a program. Draining-away fog also can be run by manual or setting a program(feed fresh compressed air to working room then drain away the fog of the working room quickly).

3. Operation System

- ◆ Programmable Controller(Touch screen): 7 inches, 800×480 lattice, TFT colorized LCD screen, Chinese / English / Russian free switching.It supports constant temperature salt water spray fog, salt water spraying, high temperature drying, constant damp heat, alternating damp heat, salt spray damp heat cycle and other functions. The operation mode can be program mode, constant value mode or timed start and stop.
- ◆ Programmable: Spray time and interval time can be set freely, max.continuous spraying time is 9999 hours, max. spraying time for discontinuous spray is 99 hours and 59 minutes,max interval time(no spray)is 99 hours and 59 minutes; Can edit 120 programs, each program consists of 1~99 segments. Memory capacity is 1,200 segments and can execute command repeatedly(each command can be executed for 999 times).Different program time can be combined to run, segment time can be set from 1minute to 999 hours.

- ◆ Data Recording Method: RAM with battery protection, 8-10 years, can save the set value, sampling value and time of sampling time of the instrument; The curve recording cycle can be set to 30 ~ 180 sec. The maximum memory time storage can continuously store the historical curve for 90 days. The historical data (when the sampling time is 1min) can be stored for more than 10 years without continuous use.
- ◆ Communication Function: RS-485/RS-232 interface, RJ45 Ethernet interface and USB2.0 interface, which can be used to remote control and assist the instrument after connecting the computer through professional software, display the test curve and collect data (1G-16G U disk can be inserted to download the historical curve, historical data, control system parameters, and hot plug function), so as to realize the monitoring and remote control functions, and can also synchronously control multiple machines.
- ◆ Power Failure Memory Function: The power failure recovery mode can be set as hot start / cold start / stop.
- ◆ Reserved Startup Function: The startup time can be set at will. After the power is turned on, the machine will run automatically when the time comes.
- ◆ Open Software Function: It supports the third-party upper computer to send codes, and can control the start, stop and data recording functions of the instrument. The controller provides function code, and the user can edit the upper computer software program to realize unified monitoring and control.



4. Other Main Control Systems

- ◆ **Air Circulation System:** There is a air room and a stainless steel circulating fan, through ventilation door and air diffuser, air is blown out through the air duct. Thus the air which have been adjusted to required temperature and humidity would be distributed to working room, then attain the goal which can ensure to get a stable working room with uniform temperature and humidity.
- ◆ **Damp Heat Cycle Heating System:** Titanium tube fin heater is adopted, circulating fan is used for forced air supply and circulation, and P.I.D controls the heating amount to achieve temperature balance.
- ◆ **Salt spray cycle Heating System:** Adopt thermal radiation heating mode. Control heating amount by PID, then arrive a temperature balance.
- ◆ **Saturation Barrel Heating System:** Uses a Armoured SUS316# stainless steel heating tube to heat water. Pressured air enter the hot water, then overflow by the bubbles, P. I.D control heating amount thus get constant temperature and pure air for spraying.
- ◆ **Humidification System:** Uses a Armoured SUS316# stainless steel heating tube to heat water and the water vapor humidification mode is adopted. P.I.D controls the humidification amount to reach the required humidity.
- ◆ **Cooling and Dehumidification System:** Use a set compressor as cooling system, including a low-temperature cooling compressor imported from Europe, fined tube radiator, air-cooled scale-type condensation evaporator and throttle device(thermal expansion valve/capillary).The evaporator is made of pure titanium tube and titanium heat fin, which has good corrosion



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Preventiveness. And use environment-friendly refrigerant R404a/R23 as this cooling medium of this system. Heating system and cooling system is separated completely. All programs run cooling system are controlled by micro-computer completely. At the bottom of compressor, there is a drain pan which is used to collect condensation water generated from frosting. And compressor comes with PTC temperature sensor, can protect itself once the temperature is over. With high or low pressure protection device, it can monitor the pressure of refrigerant when the chamber is working. Once the refrigerant pressure is higher than limiting pressure or lower than the lowest pressure set by system, it can alarm and power off till troubleshoot all problems.

◆ Safety Protection System:

1. Cooling System: For compressor, over-heat, over-load, over-pressure and over-temperature protection.
2. Chamber: Over limiting temperature protector, balance pressure automatically protector.
3. Humidifying System: Dry heating protector, water shortage protector for humidifying tube.
4. Heating System: Over limiting temperature protector and short circuit protector for heating tube.
5. Power: Over-load protector, short circuit protector for main power. Over-load protector, short circuit protector.
6. Circulating Fan: Over-load protector, short circuit protector and anti-reversal protector.

Parameter	Value
RUN TIME	01:30:00
TEMP SLOPE	0.0°C/Min
HUMI SLOPE	0.0%/Min
PRESS SLOPE	0.0°C/Min
TEMP2 SLOPE	0.0°C/Min



Setting	Value
LITGHT OFF	0MIN
BRIGHTNESS	0
LIGHT TIME	0MIN
LOCK PASSWORD	*****
TUNING KEY	ON
ON/CLOSE DOOR ACTION MODE	CLICK

Parameter	Value
CONTROLLER IP	192.168.1.220
SUBNET MASK	255.255.255.0
NET GATE	192.168.1.1
MAC	CD:02:16:16:03:13
DNS1	192.168.1.1
DNS2	192.168.1.1

NO.	RAIN	TEMP	HUMI	PRESS	TEMP2	SPRAY	TIME	TS1	TS2
001	D - H TEST	50.0	65.0	-200.0	-200.0	OFF	0.20	OFF	OFF
002	D - H TEST	50.0	65.0	-200.0	-200.0	OFF	1.00	OFF	OFF
003	SALT TEST	60.0	OFF	100.0	90.0	OFF	0.20	OFF	OFF
004	SALT TEST	60.0	OFF	100.0	90.0	OFF	1.00	OFF	OFF
005	SALT TEST	60.0	OFF	100.0	90.0	OFF	1.00	OFF	OFF

Setting	Value
LOGIN PASSWORD	0
PASSWORD	0
LOCK PWD2	6636
PARA PASSWORD	5525
LANGUAGE	ENGLISH



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Main Technical Parameters

Ordering Information → Technical Parameters ↓	BGD 886/T	BGD 887/T	BGD 888/T
Working Room Size (W×H×D), mm	1200 × 800 × 1000	1600 × 800 × 1000	2000 × 800 × 1200
Working Room Capacity (no including V shape cover)	960 L	1280 L	1920L
Overall Size (W×H×D), mm	2500 × 1650 × 1220	2900 × 1650 × 1220	3300 × 1720 × 1420
Power/Max. Current	30.8KW/37A	30.8KW/37A	32.8KW/40A
Power Supply	AC 380V 3 phase 37A	AC 380V 3 phase 37A	AC 380V 3 phase 40A
Temperature Range	20°C ~ 70°C (Continuously adjustable)		
Temperature Uniformity	≤ 2°C(When RH ≥ 75%); ≤ 3°C(When Rh < 75%)		
Temperature Stability	± 0.5°C		
Temperature Rise and Fall Rate of Working Room / Saturation Barrel	≥ 1°C/min(Whole process average)		
Humidity Range	20%~98%		
Humidity Uniformity	≤ 2%RH ~ 3%RH(When RH ≥ 75%); ± 5% RH(When Rh < 75%)		
Humidity Stability	± 2%RH		
Salt Fog Precipitation	1ml ~ 2ml/ 80cm ² .h(Adjustable)		
Spray Method	Continuous or Cyclical		
Required Work Environment	Tem: 5 ~ 30°C; RH: 45% ~ 85%RH; Barometric Pressure: 86kPa ~ 106kPa		
Required Air Supply	Air consumption: 4m ³ /h, Pressured air without water and oil which has been dried and filtered, pressure is (0.4 ~ 0.8)Mpa.		
Required Water Supply	It meets the secondary water standard specified in ISO 3696 water specification and test method standard for analytical laboratory. The water supply pressure is within the range of 0.1MPa~0.4MPa. The instrument reserves 1/4" internal teeth for water supply interface. Note: Distilled water or deionized water is required for preparing spray solution, water consumption is near 60L/24hour under continuous spraying.		
Exhaust and drainage	The exhaust pipe of the instrument shall be extended to the outdoor designated position, and shall be led out of the room through opening in the wall near the instrument installation. The exhaust pipe shall not be kept unblocked without water. The exhaust pipe diameter shall be Φ 50mm; The instrument drainage pipeline shall be extended to the outside, and the drainage pipeline shall be unblocked. The drainage outlet shall be lower than the instrument drainage outlet, and the drainage pipe diameter shall be Φ 1/2".		

Note: Temperature uniformity and stability datas are tested under 25°C environment temperature, RH ≤ 85% and no any samples