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Cincinnati Sub-Zero

Your One-Stop Testing Solution
Who is CSZ?

- CSZ is a third generation family owned company which opened for business in 1940.

- The CSZ organization is certified to the ISO-9001:2008 standard.

- CSZ is comprised of three divisions: Industrial Products, Medical Products, and CSZ Testing Services.
Who is CSZ?

- CSZ’s Industrial Division provides a full range of standard and custom-designed environmental test chambers.
- CSZ’s Medical division produces equipment and supplies for managing patient temperature – hypo and hyperthermia.
- Our Testing Division is an A2LA Accredited test laboratory with locations in Cincinnati, OH and Sterling Heights, MI. Capabilities include vibration, temperature, humidity, salt spray, shock, and altitude testing.
- Check out the logo
CSZ Industrial provides a Full Range of Environmental Test Chambers

- Temperature Cycling Chambers
- Temperature & Humidity Chambers
- Stability Chambers & Stability Rooms
- Thermal Shock Chambers
- Altitude Chambers
- Accelerated Stress Test Chambers
- Dust Chambers
- Combined Temperature/Humidity and Vibration Chambers
- Low Temperature Freezers
- Custom Liquid Chillers
- Other Custom Built Systems

From benchtop to full walk-in / drive-in chambers
Capabilities

CSZ offers a variety of environmental chambers and contract testing services for:

- Accelerated Aging
- Expiration Date Testing
- Stability Testing
- Package Testing & more
- New product development
- Reliability testing
- Stress screening
- Temperature, humidity, altitude
- Burn in and drop testing
Testing Services Division
An A2LA Accredited Test Laboratory
Ohio and Michigan Lab
What We Do

- Verify conformance to specifications
- Authenticate your internal testing
- Design validation
- Production Validation
- Accelerated Aging Tests
- Ensure Product Quality and Reliability
- Take the hassle out of testing
CSZ Testing Services

- Quality reports and testing
- Fast turnaround Testing
- Detailed documented test reports included at no charge.
- Experienced Lab personnel at both labs.
- Both labs are A2LA accredited laboratories.
- A backup to your customers, able to handle overflow, expansion and shutdown periods
- We provide an independent third party testing solution
- We have experience in setting up test labs
Package Testing

- ASTM F1980
Why should you buy an environmental chamber?

Example of Combined environments with vibration, temperature and humidity

- 2,000-14,000 force/lb.
- 2” displacement
- Random, Sinusoidal, Mixed Mode
- Up to 100 G’s shock
Accelerated Aging

1. To predict the long-term effects of temperature/humidity exposure
2. To study the point of material degradation
3. To predict the lifespan of a particular product

- Typical long term temperature exposure at warmer temperatures can accelerate the aging process and shorten testing time.

- In our lab we have seen typical long term temperature tests at 60°C for medical products and 85°C for automotive products.

- Each product can withstand varying degrees of temperature/humidity resistance and end use exposure.

- Adhesives also need tested in conjunction with given material and assembly

- After test is completed, products evaluated for both physical properties and integrity (i.e. degradation of seals, etc)
Battery Pack Testing
Examples of Accelerated Aging & Shelf Life Tests

- ASTM D 3611 - Accelerated Aging of Pressure-Sensitive Tapes
- ASTM F 1980 - Accelerated Aging of Sterile Barrier Systems for Medical Devices
- ASTM 3889 - Standard Test Method for Adherence to Linerboard of Pressure-Sensitive Tape at Low Temperature
- SAE J2100 - Accelerated Environmental Testing for Bonded Automotive Assemblies
- Mil Std 810 - DOD Test Standard for Environmental Engineering Considerations And Laboratory Tests
ASTM D 3611
Accelerated Aging of Pressure-Sensitive Tapes

- Accelerates natural aging of rolls to approx. 2 years. Simulates aging of tape in a closed fiberboard container in the variable climate of either the warm moist south or warm dry southwest or moderate USA midcontinent.

- Environmental Exposure for rolls of tape to 80% RH ±5% and 66°C ±2°C for 96 hours allowing free air space around the rolls.

Products Tested: Suturing Kits & Syringes in sealed packaging

- The loss of sterile barrier system integrity may occur as a result of the materials and adhesive or cohesive bonds degrading over time and exposure to shipping and handling.
- Test specification to determine the long-term effects of distribution, handling, and storage when devices are included in the protective packaging.
ASTM F 1980
Accelerated Aging of Sterile Barrier Systems for Medical Devices

ASTM 3889
Standard Test Method for Adherence to Linerboard of Pressure-Sensitive Tape at Low Temperature

- Tape adhered to linerboard or other like material, exposed to elevated temperature and then a cool temperature. Assembly flexed around mandrel and observed for bond failure.

- Procedure:
  - Expose specimen assembly to 66°C ±1°C for 24 hrs
  - Expose the specimen assy. with 1.5” mandrel to specified temp (if other than 66°C) for 2 hrs.
  - -54°C ±1°C for 2 hrs. if no other temp is specified.
  - Test per procedure to see if any evidence of release of tape

SAE J2100
Accelerated Environmental Testing for Bonded Auto Assemblies

- Low Temperature (-30°C)
- High Temperature (+88°C, +204°C)
- Water Immersion
- Heat Aging (23°C, 50% RH)
- Humidity Aging (38°C, 100% RH)
- Salt Spray (ASTM B117)
- Thermal Cycle (-30°C, 88°C, 38°C/100% RH)
- Corrosion Cycle (-30°C, 23°C/50% RH, 70°C, salt spray per ASTM B117, 38°C/100% RH)

Mil-Std 810

- Products used in defense/military
- Life Cycle testing describes environmental conditions that materials will experience from its release from manufacturing to the end of its useful life.
- Tests vary per types of product handling & transportation, storage, and end use environment.
- Environmental tests for shock, vibration, altitude simulation, high & low temperature, sand & dust, thermal shock, salt fog & solar radiation

How do you select the right Environmental Chamber?

- Wide variety of size options
- -75°C to 190°C temperature range with up to 12°C/min ramp rate.
Defining your Application

• The first steps are yours
  – Type of Application
  – Understand your Application
  – Document your Requirements
  – Write a Specification or reference your specification (sections that apply)
  – Communicate with Supplier
  – Designate a Primary Contact
What do You Need to Know (Defining the Application)

- What is being tested?
  - Materials of construction, weight and configuration of DUT
  - Are there fixtures involved?
  - Is the material hazardous?

- Is the requirement long or short term?
  - Can impact solution and cost

- Do you want minimum or maximum transition rates
  - Reference IEC 61646 solar panel testing
What do You Need to Know
(Defining the Application)

• What is the temperature range?
  • -34°C to -40°C is the practical limit of single stage
  • -40°C to -50°C is the practical limit of two-stage or Tundra®
  • -73°C for cascade
  • Or LN₂ for lower temperatures
  • What is your high temperature requirement?

• What is required ramp rate?
  • Speed is money; how fast do you want to go?
  • Air temp or part temp
  • Linear rate or average rate
  • Be sure to specify not only the minimum highs and lows, but also what range your test will be in
What do You Need to Know
(Defining the Application)

- Are there air flow requirements?
  - Part temperature requires high velocity air flow
  - Does part configuration dictate air flow requirement?
  - Will a “standard” chamber work?
  - Is temperature and/or humidity uniformity a requirement?
What do You Need to Know
(Defining the Application)

- Is humidity required?
  - Standard range is 10-98%
    - Low end limited by 5-7°C dew point
    - High end by 85°C dry bulb
  - Extended ranges is 5-98%
    - Frozen coil and dry air purge required
    - High end by 95°C dry bulb
  - Special requirements
    - Maintained RH during transitions
What do You Need to Know
(Defining the Application)

- Any special requirements?
  - Explosion Proof
  - Local and State Codes
  - Facility or Corporate standards
  - MIL-STD, ASTM, SAE standards
  - IEC or UL specifications
  - Sound power levels
  - Regulatory agencies

- Test and Acceptance?
  - Testing with customer product
  - Customer witnessed testing - Most vendors welcome this
What do You Need to Know
(Defining the Application)

• What utilities are required?
  • Power
  • Water
  • Air
  • LN₂
• What utilities are available?
• Are there “move-in” restrictions?
• Do you want installation/start-up/training?
Cooling Options

• Expendable Refrigerant
  • Liquids/gases that can be injected directly into the space being cooled
  • Two most popular refrigerants are:
    – Liquid Nitrogen \((\text{LN}_2)\)
      » Cryogenic temperatures down to \(-184^\circ\text{C}\)
    – Liquid Carbon Dioxide \((\text{CO}_2)\)
      » Temperature down to \(-68^\circ\text{C}\)

• Mechanically Cooled
  • Use a compressor and circulate a refrigerant around a closed-loop system

The ultimate low temperature required by your testing determines the type of refrigeration system needed.
Mechanical Refrigeration Options

- **Single Stage:** -34°C
  - Traditional single stage refrigeration system is rated to -40°C
  - However, due to the refrigerant used there is very little cooling capacity at -40°C

- **Tundra® and Two-Stage Systems:** -40 to -50°C

- **Cascade:** -73°C
  - Two separate systems working to cool the chamber down
Refrigeration Decisions

• Compressors:
  • Semi-Hermetic (7-1/2 to 30 hp)
  • Hermetic (1 to 3 hp)
  • Scroll (2 to 15 hp)
  • Tandem Configurations

• Integral Water-or-air cooled condenser

• Options:
  • Remote Power Pack
  • Remote air-cooled condenser
Methods of Humidity Generation

- Boiler - Good generator, should not be used with live loads
- Atomizer - Good control, especially with live loads, but must be very clean
- Water Pan - Very stable, but slow response
Moisture at Extreme Temperatures

- Warmer air can hold more moisture
  - 85°C (185°F) & 95%RH = 5191 Grains

- Cooler air holds less moisture
  - 8°C (46°F) & 95%RH = 45 Grains
  - 4.4°C (40°F) & 8%RH = 3 Grains (Low RH option)
  - -40°C (-40°F) & 100%RH = 1 Grain (cannot be accurately measured or controlled)
Controller Options

CSZ EJT-560i
Touch Screen Controller

Reduces programming time with fewer steps

- Ethernet Control & Monitoring
- Automated Alarm Notifications via email or text message.
- Automated back-up of data files provides easy file management saving valuable time.
- Program the profile in one chamber and import to the others to saving valuable profile entry time.
CSZ EZT-560/
Touch Screen Controller

- Integrated email sends data files directly to an email address from the controller with a touch of a button.

- Data logging - Easily download profiles, alarm files, audit trail files and data files to a removable i-stick via USB port.

- Full system security allows up to 30 users with three levels of security.

- X-Y Graphs (Real Time & Historical)
- Autostart
- Product Control
Based on the information you provide us we can then select the proper chamber

- Don’t buy more or less than you need
  - Conventional temperature or temp & RH chamber
  - Air to air thermal shock
  - Modular walk-in or welded walk-in
  - Liquid thermal shock
  - Stress screening or Halt Hass
  - Altitude simulation with & w/o temp. and/or RH
  - Liquid conditioners
  - Storage - many types
  - Custom - Clean sheet of paper
MicroClimate®
Benchtop Temperature/Humidity Chambers

- Ideal for small products
- Plugs into 115V, 20 Amp Circuit
- Compact Size
- Size: 1.2 cubic foot (34 Liters)

**Temperature Range:**
Cascade:
-73 °C to +190 °C

**Humidity Range:**
10% to 98% RH
Extended Humidity Ranges are optional
MicroClimate®
Compact Temperature/Humidity Chambers

- Ideal for small products & labs
- Models ranging from 1°C to 5°C per minute
- Compact Size
- Size: 3 cubic foot (85 Liters)

Temperature Range:
Cascade: -73 °C to +190 °C

Optional Humidity Range:
10% to 95% RH
StableClimate® Stability Chambers

CSZ stability chambers are ideal for stability, shelf life, package testing and more. Meets ICH Q1A & ASTM test standards.

• One Door models are available in 24 or 33 cu. ft.
• Two door models are 52 cu. ft.
• Three door models are 80 cu. ft.

Temperature Range:
Cascade: 0°C to +70 °C

Optional Humidity Range:
10% to 95% RH
Z-Plus Series
Temperature/Humidity Chambers

- Sizes from 8 to 64 CU FT. (226 Liters to 1812 Liters)
- Basic to Accelerated Testing
- Enhanced Air Flow
- Energy Efficient
- Includes start-up & training DVD

Temperature Range:
Single Stage: -34°C to +190 °C
Tundra: -45°C to +190 °C
Cascade: -73°C to +190 °C

Humidity Range:
10% to 98% RH
SALT SPRAY/CYCLIC CORROSION

- ASTM B-117
- MIL Std 810-F
- Your custom test specification
Questions?