TPS Thermal Product Solutions

Environmental Test Chambers

Chambers built to meet the most demanding testing requirements

Blue M chambers are cooled by non-CFC refrigerants

Blue M

Blue M

- Designed to satisfy the most challenging applications
- Our engineered-to-order skills can accommodate your unique requirements

Other fine Blue M products:

931

912

ETCU-001

LB-106

LB-104

LB-102

Blue M

Environmental Test Chambers





Over a period of five decades Blue M has evolved into a world class facility for the design, engineering, and manufacture of temperature controlled equipment. The people of Blue M have the technical expertise, skill, and experience that create a product, which delivers a greater return on investment time-and-time again.

Take a close look at the environmental chambers outlined is this brochure. If you need further assistance or have any questions regarding any aspect of the equipment presented, please contact us. We would like to be of service.

2121 Reach Road 570.326.1770 or 800.586.2473 Fax: 570.326.7304 www.bluem.com

Full Range Humidity Chambers

FR Series

Temperature and humidity control for a variety of testing applications

Blue M Temperature/Humidity Chambers have earned an enviable reputation for outstanding reliability and long service life in some of the most demanding environmental testing applications known. They cover an exceptionally broad range of operating conditions, are easy to program, and provide results that are measurably better today and over the long haul. You won't find a finer temperature/humidity testing chamber anywhere!

Blue M FR chambers offer unequalled performance in MIL-STD testing. Their sophisticated, yet easy-to-use, control systems allow versatility that goes beyond military testing, tapping on a vast array of temperature and humidity capabilities—while offering traditionally superior Blue M quality.

Unit shown with optional casters and desiccant air dryer

— Model FRP-13B —

Chamber Features

- **Heavy gauge stainless steel exterior/interior**
  - all exterior panels are reinforced type 304 stainless steel.
  - interior features reinforced 316 stainless steel.
- **All welded and sealed construction**
  - prevents migration of moisture and eliminates corrosion of seams.
- **Insulation**
  - 4 full inches of fiberglass.
  - 2 full inches of urethane foam.
- **Shelves**
  - 2 stainless steel, electropolished wire-rod shelves within work chamber can be placed at 2" increments, standard with chamber.
- **Stainless steel, double door design**
  - inner door with Pyrex® window seals chamber work area.
  - outer door is insulated and prevents heat loss.
  - inner glass door includes wiper.

Uniform, Accurate and Reliable Temperature/Humidity Control

- **Programmable controller**
  - ensures precise temperature/humidity regulation.
  - standard chart recorder records relative humidity and temperature. (FRP model only)
- **Steady State Dual Channel Controller**
  - ensures precise temperature/humidity regulation (FRS model only)
- **Waterflow and leveling**
  - assures precise water management and metering.
  - utilitizes "Y" type strainer, pressure regulator valve, flow control, solenoid valves and electronic water leveler.

General Specifications

Temperature range: FRS/FRP: -15°C to 93°C (200°F)

Humidity range: 5% to 98%. See chart. - pg. 3

Stability (over 24-hour period):
Temperature: See chart. - pg 6
Relative humidity: See chart. - pg 6

Control system: FRS: Steady state dual channel controller
FRP: Programmable dual channel controller

Blue M FR Series Temperature/Humidity Chambers

FRS Model Condensed Specifications*

Model	Inside Dimensions WxDxH in. (cm)	Overall Dimensions WxDxH in. (cm)	Full Load Amps	Voltage 60 Hz AC	Cubic Feet (liters)
FRS-09B FRS-09C	25 x 25 x 25 (64 x 64 x 64)	64 x 39 x 71 (160 x 94 x 180)	37 39	208V/1PH 240V/1PH	9 (262)
FRS-13B FRS-13C	37 x 25 x 25 (94 x 64 x 64)	75½ x 39 x 71 (191 x 94 x 180)	41 44	208V/1PH 240V/1PH	13 (385)

APPLICATIONS: MIL-STD 202, Method 103 long term storage tests, all steady-state commercial and industrial testing requiring accurate RH control and unparalleled stability.

— Model FRS-09C —

FRP Model Condensed Specifications*

Model	Inside Dimensions WxDxH in. (cm)	Overall Dimensions WxDxH in. (cm)	Full Load Amps	Voltage 60 Hz AC	Cubic Feet (liters)
FRP-09B FRP-09C	25 x 25 x 25 (64 x 64 x 64)	64 x 39 x 71 (160x 94 x 180)	37 39	208V/1PH 240V/1PH	9 (262)
FRP-13B FRP-13C	37 x 25 x 25 (94 x 64 x 64)	75½ x 39 x 71 (191 x 94 x 180)	41 44	208V/1PH 240V/1PH	13 (385)

APPLICATIONS: MIL-883, Method 1004 and MIL-202, Method 106 moisture resistance tests. MIL-810, Method 507.2 electronic sub-assembly and component qualification, packaging studies, moisture studies.

Unit shown with optional casters and dessicant air dryer

— Model FRP-13B —

Chamber Options:

◆ Wet bulb time delay

- reduces condensation when loading or unloading at set temperature.
- automatically drains heated water from chamber when inner door is opened.
- when reloaded, wet bulb heat is held off until reservoir is refilled with water.

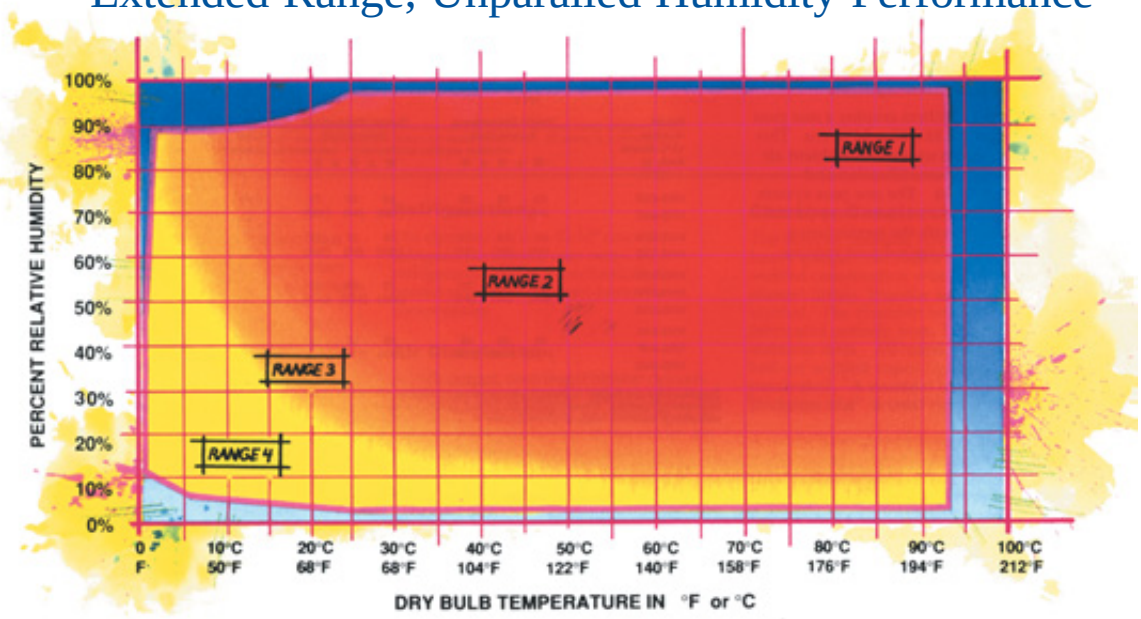
◆ Communications Interface

RS232 OR RS485

Full Range Humidity Chambers

FR & ULH Series

Extended Range, Unparalled Humidity Performance



Performance Chart Tolerance Data for ULH, FRS, and FRP Chambers

Range 1

Operation with reservoir filled and low capacity dehumidification.

Controller Tolerance:
Temperature ±1/2° C.
RH ±1% RH

Operation is intended to allow control of temperature and humidity conditions that are typically higher dry bulb temperature and relative humidity. Little or no wattage dissipation from the product under test is tolerated by this condition.

Range 2

Operation with reservoir filled and time proportioned dehumidification.

Controller Tolerance:
Temperature ±1/2° C.
RH ±2% RH

Provides expanded capabilities in terms of the range of controlled conditions and the amount of wattage dissipation tolerated at each condition.

Range 3

Operation with reservoir drained and time proportioned dehumidification.

Controller Tolerance:
Temperature ±1° C.
RH ±3% RH.

By using Range 3, FRS, and FRP chambers can provide a wider range of humidity control, reaching into the lower relative humidity ranges of chamber capability. Range 3 can provide intermittent use at very low RH conditions, typically up to 8 hours in test duration.

Range 4

ULH Series Only.

Controller Tolerance:
Temperature ±1° C.
RH ±3% RH

Continuous operation at extremely low relative humidities is obtained using the ULH series chambers. The ULH concept eliminates frosting problems normally encountered in low humidity applications.

Ultra Low Humidity Chambers

ULH Series

Temperature and humidity control for a variety of programmable testing applications

Blue M Temperature/Humidity Chambers have earned an enviable reputation for outstanding reliability and long service life in some of the most demanding environmental testing applications known. They cover an exceptionally broad range of operating conditions, are easy to program, and provide results that are measurably better today and over the long haul. You won't find a finer temperature/humidity testing chamber anywhere!

Blue M ULH chambers provide our widest relative humidity operating range, offering arid, desert dryness, and soggy, dense rainforst humidity in a single chamber. ULH chambers are capable of continuous operation at very low relative humidities.

Unit shown with optional casters and leveling legs

— Model ULH-27B —

Chamber Features

- **Heavy gauge stainless steel exterior/interior**
  - all exterior panels are reinforced Type 304 stainless steel.
  - interior features reinforced 316 stainless steel.
- **All welded and sealed construction**
  - prevents migration of moisture and eliminates corrosion of seams.
- **Insulation**
  - 4 full inches of fiberglass.
  - 2 full inches of urathane foam.
- **Shelves**
  - 2 stainless steel, electropolished wire-rod shelves within work chamber can be placed at 2" increments, standard with chamber.
- **Stainless steel, double door design**
  - inner door with Pyrex® window seals chamber work area.
  - outer door is insulated and prevents heat loss.

Uniform, Accurate and Reliable Temperature/Humidity Control

- **Programmable controller**
  - ensures precise temperature/humidity regulation.
  - standard chart recorder records relative humidity and temperature.
- **Waterflow and leveling**
  - assures precise water management and metering.
  - utilitizes "Y" type strainer, pressure regulator valve, flow control, solenoid valves and electronic water leveler.

Chamber Options

- **Wet bulb time delay**
  - reduces condensation when loading or unloading at set temperature.
  - automatically drains heated water from chamber when inner door is opened.
  - when reloaded, wet bulb heat is held off until reservoir is refilled with water.

General Specifications

Temperature range: -15°C to 93°C (200°F)

Humidity range: 1% to 98%. See chart. - pg. 3

Stability (over 24-hour period):
Temperature: See chart. - pg. 6
Relative humidity: See chart. - pg. 6

Control system: Programmable dual channel controller

ULH Model Condensed Specifications

Model	Inside Dimensions WxDxH in. (cm)	Overall Dimensions WxDxH in. (cm)	Full Load Amps	Voltage 60 Hz AC	Cubic Feet (liters)
ULH-09B ULH-09C	25 x 25 x 25 (64 x 64 x 64)	64 x 39 x 71 (160x 94 x 180)	37 39	208V/1PH 240V/1PH	9 (262)
ULH-13B ULH-13C	37 x 25 x 25 (94 x 64 x 64)	75½ x 39 x 71 (191 x 94 x 180)	41 44	208V/1PH 240V/1PH	13 (385)

Specifications are subject to change without notice. Chamber dimensions are nominal, subject to sheet metal variations and engineering changes. If these values are critical, please contact the factory for exact dimensions. All wiring is complete and enclosed to meet the National Electric Code, as amended. International voltages available.

High Temp/High Humidity Chambers

HRS Series

Temperature and humidity control for a variety of steady-state testing applications

Blue M HRS series chambers provide high range steady-state humidity. These chambers are designed to deliver large volume high temperature/high humidity conditions. HRS chambers incorporate horizontal airflow and a one-pass airflow system for an easy-to-use, highly effective, temperature/humidity system. This air system uses room ambient air for cooling, dehumidification and chamber exhaust. The system controls the input of room temperature air, the mixing of room air and chamber air, and the exhaust volume.

APPLICATIONS: Processing silicone rubber compounds and other products requiring a high moisture content for thorough, rapid curing. These chambers are also used to test rigid and flexible membranes and for aggressive high temperature, high humidity tests such as 85°C/85% humidity.

— Model HRS-09C —

Chamber Features

- **Heavy gauge stainless steel exterior/interior**
  - all exterior panels are reinforced Type 304 stainless steel.
  - interior features reinforced 316 stainless steel.
- **All welded and sealed construction**
  - prevents migration of moisture and eliminates corrosion of seams.
- **Insulation**
  - 4 full inches of fiberglass.
  - 2 full inches of urethane foam.
- **Shelves**
  - 2 stainless steel, electropolished wire-rod shelves within work chamber can be placed at 2" increments, standard with chamber.
- **Stainless steel, double door design**
  - inner door with Pyrex® window seals chamber work area.
  - outer door is insulated and prevents heat loss.
  - inner glass door with wiper

Uniform, Accurate and Reliable Temperature/Humidity Control

- **Steady State Dual Channel Controller**
  - ensures precise temperature/humidity regulation.
  - standard chart recorder records relative humidity and temperature.

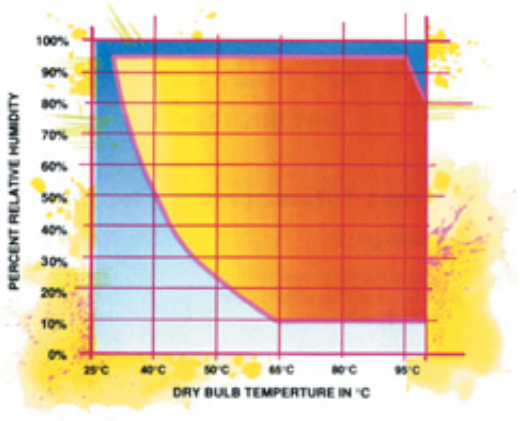


Chart is based on 25°C ambient/50% RH. If your ambient conditions are substantially different, chamber performance could be affected.

General Specifications

Temperature range: 15°C above ambient to 150°C (302°F)

Humidity range: 10% to 98%. See chart.

Stability (over 24-hour period):
Temperature: See chart.
Relative humidity: See chart.

Control system: Steady State dual channel controller

Specifications are subject to change without notice. Chamber dimensions are nominal, subject to sheet metal variations and engineering changes. If these values are critical, please contact the factory for exact dimensions. All wiring is complete and enclosed to meet the National Electric Code, as amended. International voltages available.

HRS Model Condensed Specifications

Model	Inside Dimensions WxDxH in. (cm)	Overall Dimensions WxDxH in. (cm)	Full Load Amps	Voltage 60 Hz AC	Cubic Feet (liters)
HRS-09B	25 x 25 x 25	64 x 39 x 71	37	208V/1PH	9
HRS-09C	(64 x 64 x 64)	(160x 94 x 180)	39	240V/1PH	(262)
HRS-13B	37 x 25 x 25	78 x 39x 71	32	208V/1PH	13
HRS-13C	(94 x 64 x 64)	(191 x 94 x 180)	36	240V/1PH	(385)

Chamber Controls

PRO-600 Programmable

FRP, and ULH Series Chambers

These chambers are supplied with a PRO-600 programming control system as standard. The basis of this powerful control package is a JC Systems Model 600® environmental chamber controller. Time versus temperature and relative humidity profiles are programmable through the PRO-600. Chamber temperature and relative humidity are monitored and controlled by this microprocessor-based instrument. Two independent sets of control functions for each channel are provided. These consist of proportional, integral, and derivative parameters, plus reset windup inhibit and reset clipping facilities. The PRO-600 control system provides control setting and indication resolution of ±0.1° and ±01% relative humidity.

Profile Programming

Program entry is made via an LED backlit display. Programmer memory can hold up to 300 program steps which may be organized into as many as 99 program recipes. "Ramp/Soak, "Loop", "Goto", and "pause" commands simplify programming and enhance control system versatility.

Serial Communications

A host computer can communicate with PRO-600 programmer via EIA RS-232C serial communications protocol. This interface is provided as standard in the PRO-600 control system. A free diskette for the PRO-600 containing programs for setting up communications is available upon request. Interface protocols RS-422 and IEEE-488 are available as options.

Swing-Out Recorder

A programmable, microprocessor-based circular chart recorder is a standard feature on all chambers. A ten-inch diameter chart provides a dual-range graphic record of chamber temperature and relative humidity. Chart rotation is programmable for 24 hour or seven-day rotation. A special swing-out mounting bracket allows the recorder/controller to pivot from the side of the control compartment to the front if desired.

Steady-state Recorder/Controller

FRS and HRS Series Chambers

These chambers are controlled using a steady-state control system. The heart of this microprocessor-based instrumentation package is an integral recorder/controller.

Temperature/humidity conditions are controlled via setpoints entered into the instrument. A membrane keypad and operator prompts are used to program the instrument. When not used for programming, the instrument's two digital displays revert to process variable (actual temperature and humidity) display. The recorder uses ten-inch diameter printed charts to record temperature and relative humidity conditions. Chart rotation is programmable for 24 hour or seven-day rotation. A special swing-out mounting bracket allows the instrument to pivot form the side of the control compartment to the front is desired.

The control system provides control setting and indication resolution of ±1° and ±1% relative humidity. In addition to a full function, microprocessor-based circular chart recorder, this instrument contains two separate full PID temperature controllers.

Standard Control Features

Non-adjustable Overtemperature Protection for the Chamber

The second level of overtemperature protection is a fixed value, bimetallic thermostat. This device is located in the conditioning space above the chamber air heater. The thermostat opens on temperature rise, interrupting power to the chamber heating system This device is set to trip at a value just above the unit's maximum rated operating temperature.

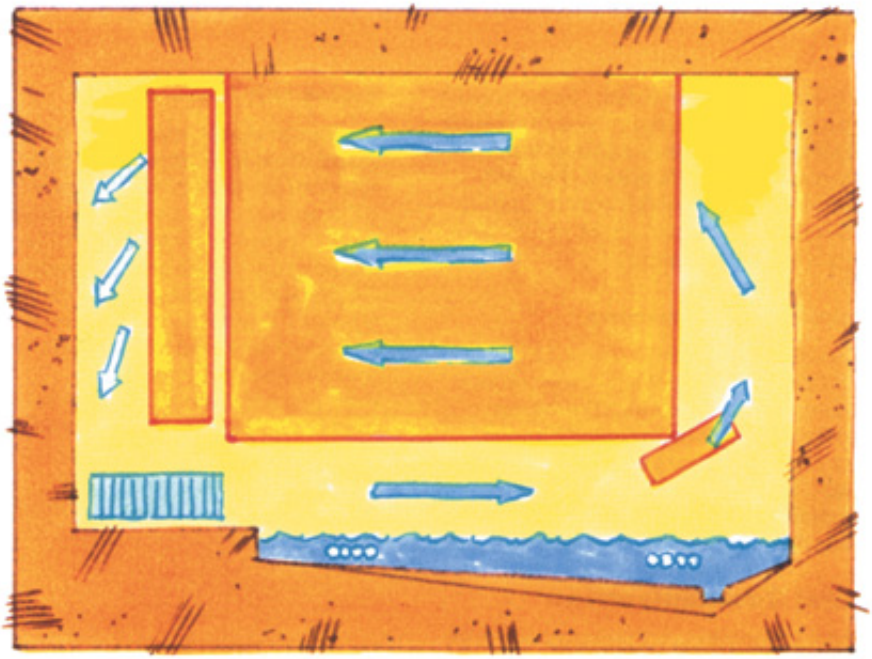
Adjustable Overtemperature Protection for the Workload

An adjustable, electronic controller with independent sensor allows the operator to set the desired trip temperature. Power is removed from the heating system during overtemperature faults. When the fault occurs, the operator is notified by an audible alarm and visual indicator. Normal chamber operation after the fault condition is restored automatically.

Control Compartment

The control compartment is a slim line design. (Its width is less than half that of a standard 19-inch EIA rack mount console.) All instrumentation, controls, and switch gear are housed in this side-mounted control compartment, located on the right hand side of the chamber. A side opening service access door allows full access to all electrical components within.

Chamber Design Characteristics



Humidity Control Method

Rather than using a moisture injection system, Blue M temperature/humidity chambers utilize a true vapor pressure system for humidity control. Chamber air is humidified or de-humidified using an integral water reservoir. By controlling the temperature of the water in the reservoir (thereby changing the vapor pressure above the liquid), moisture is added or subtracted from the chamber air. This technique closely approximates natural humidity control. Superior accuracy and stability, out-stripping any moisture injection method, are achieved using this method.

Horizontal Air Circulation

A high efficiency air circulation system, delivering horizontal airflow, is an integral part of chamber construction. This direct drive design has an extended shaft electric motor coupled to a stainless steel centrifugal blower wheel. Smaller models feature single blowers; large units have dual blowers.

Solid State Water Levelers

Chamber water usage is regulated by solid state water level controls of Blue M design and manufacture. Leveler control circuitry is designed to automatically control the Blue M water purification option. An integral reducing pressure regulator is provided for reliable operation on high pressure, in-house deionized (D.I.) water systems.

Temperature/Humidity Measurement

All of the models incorporate a relative humidity transmitter, or dry sensor, to measure chamber relative humidity. These sensors offer excellent control and display accuracy while eliminating the routine maintenance involved in the wet/dry bulb sensing method.

The temperature is measured using a seperate 100 Ohm platinum Resistance Temperature Detector (RTD)”

Heating

Two separate heating systems are supplied in Blue M temperature/humidity chambers; one is a dry bulb (air temperature) heater and the other a wet bulb (humidity) heater.

The dry bulb heater is a Blue M "Eterna" heating element. It has an open wire resistance heating element that provides fast, accurate response to controller demands.

Stainless-steel sheathed heating elements are used for wet bulb heating—immersed in the chamber water reservoir. Electric power is regulated by a solid state relay and controlled by the programmer/temperature controller.

All Stainless Steel Chamber Construction

Blue M temperature/humidity chambers look good in any operating environment and they are built to last—chamber exteriors are fabricated of Type 304 stainless steel with a brushed finish; Interior surfaces are fabricated of 316 Stainless Steel. All seams are heli-arc welded and passivated for strength and durability. Gasketed service panels ensure vapor barrier integrity and maximum insulation effectiveness. A nominal insulation of four inches is used to minimize heat gain/loss across the insulated wall.

Door Construction

All chambers include inner and outer chamber door as standard. The inner glass door provides the primary seal for the temperature/humidity environment and permits the work in the chamber to be observed during operation. Inner and outer doors are sealed around the entire perimeter by silicone sponge rubber gaskets.

Chamber inner door is supplied with a wiper blade to clear window condensation for improved viewing.

Refrigeration System

On FRS, FRP, and ULH models, a dual capacity cooling system—non-cycling hermetic type—utilizing a non-CFC refrigerant, fulfills refrigeration requirements. A service panel is supplied in the left hand side of the chamber's machinery base. The use of desuperheater heat exchangers make it possible to dissipate live load wattage and/or lower the chamber temperature.

Test-Cable Lead-In Port

A three-inch diameter port with rubber stopper is included as standard for passing cabling etc. into the chamber workspace for testing purposes.

Shelves

Two Type 304 stainless steel, electro-polished shelves are included as standard with each temperature/humidity chamber.

Chamber Options

Several optional accessories are available to help tailor Blue M temperature/humidity chambers to your application requirements.

Water Purification Unit

The WP-4800 water purification unit provides 48 gallons of conditioned water for use on the chamber's humidity and wet bulb measurement systems. The major components of the unit are a Type 304 stainless steel water tank, a quiet electric water pump, a sediment filter, and a demineralizing cartridge. Provision for the WP-4800 is designed into the chamber control circuitry—the pump is activated by water leveler demand. The chamber reservoir may be drained into the tank of the WP when the chamber needs to be drained. This water is passed through the sediment and demineralizing cartridges before being reused to remove contaminants. This feature aids the chamber in avoiding corrosion damage from accumulated contaminants.

TRULINE® Circular Chart Recorder

Certain testing criteria require greater chart resolution than obtainable using Blue M's standard circular chart recorder. For these applications, a Honeywell TRULINE circular chart recorder option is available. This recorder has a 12-inch diameter chart that provides 34% greater chart area than a standard 10-inch diameter recorder chart.

The unit prints its own chart with a thermal dot matrix stylus at the same instant that it is printing the process temperature and relative humidity.

Caster/Leveling Legs

Large, phenolic, swivel casters and sturdy leveling legs can be installed to enhance the mobility and setup of Blue M chambers. The legs are threaded rods, with locking nuts and no-mar phenolic feet. Once the unit is in position, the leveling legs may be adjusted to level the unit and pick the casters up off the floor.

Drip Shield

Certain high temperature/high humidity conditions can produce condensation on the ceiling and walls of the chamber workspace. The addition of the Type 316 stainless steel drip shield prevents condensation on the ceiling of the chamber from falling on the workload and causing damage. (It is routed down the back wall of the chamber, where it returns to the chamber water reservoir.)

Dessicant Air Dryer

Blue M ULH series chambers are fitted with a regenerative dessicant air dryer. This allows the chamber to operate with dry air dewpoint temperatures of -40°F or -100°F, unlocking even greater low relative humidity performance potential from your Blue M chamber.

Interior Light

This option provides the installation of an interior work light in the chamber work space, mounted at the top rear of the chamber, centered in the work space width dimension. This light is enclosed in a vapor sealed housing to prevent premature bulb failure. The light is controlled by an illuminated, panel mounted toggle switch. This option is recommended when purchasing the glove port or port plug options.

Glove Ports or Port Plugs

Glove ports can be installed in the inner door to allow the operator to maintain the product under test. This option includes neoprene rubber gloves installed through the inner glass door, below the viewing window. Some processes require small parts or tools to be introduced to the workspace during chamber operation. In these cases, port plugs are installed through the inner door. These six inch diameter stainless steel plugs are held in place by DeStaco clamps. Like the glove ports, these entrances are installed below the viewing window. *Use of these options is not recommended at chamber temperatures over +50°C.*

Lead-In Ports

Additional lead-in ports may be installed in the chamber in addition to the standard port. Larger port diameters are available upon special request.

Extended Temperature Range

The temperature range of Blue M temperature/humidity chambers can be extended to +150°C with this option. It permits dry bulb "temperature only" testing at temperatures above the normal relative humidity operating range.

The chamber water reservoir is protected by a temperature sensitive switch that automatically drains the water reservoir when the chamber temperature exceeds the boiling temperature of water.

PRO-750 Programmable Controller

All chambers are available with a Blue M PRO-750 programmable temperature controller in lieu of the PRO-600 controls. Please consult with your local Blue M representative for details.

Computer Interfaces

Blue M programmable controller comes with an RS-232 digital communications port as standard. However, some customers find that other interface protocols are desired for their particular use. Blue M offers an RS-422/485 serial communications option and an IEEE-488 parallel communications option for those customers not wishing to use RS-232.

Engineered-to-Order Options

A wide variety of Engineered-to-Order (ETO) options are available to configure your chamber for its intended use. We can assist you with your needs.

TPS Thermal Product Solutions

DEMAND

Genuine Replacement Parts

For Your Blue M Equipment

When it comes to replacement parts for your Blue M equipment, why accept anything but the real thing?

No one gives you the parts, service, and on-time delivery you'll receive from our factory-direct parts team.

- **On-time shipments**
- **Emergency service/shipments**
- **24-hour shipment on in-stock parts**
- **Technical engineering support**
- **Guaranteed replacement fit**
- **Regional service contractors**

Blue M

TPS Thermal Product Solutions

Blue M

ENVIRONMENTAL TEST CHAMBERS

OUTSTANDING CUSTOMER SUPPORT

- Highly qualified, factory trained technical support staff to assist you in identifying your equipment problems and parts needs.
- Customized maintenance agreements available to meet your equipment's preventive maintenance needs.

This brochure outlines a number of products available for the applications described. If you have any questions or need assistance on any aspect of what is presented here, please contact us.

SPX Blue M