TERRA UNIVERSAL.COM
Critical Environment Solutions

Installation and Operating Guide *Document No. 1788-07*

ValuLine™ Desiccators

ValuLValuLine™ Desiccators

Proprietary Notice

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Safety Notice

A thorough familiarity with all operating guidelines is essential to safe operation of the product. Failure to observe safety precautions could result in poor performance, damage to the system or other property, or serious bodily injury or death.

The following symbols are intended to call your attention to two levels of hazard involved in operation:

CAUTION — **Cautions are used when failure to observe instructions could result in significant damage to equipment.**

WARNING — **Warnings are used when failure to observe instructions or precautions could result in injury or death.**

The information presented here is subject to change without notice.

1.0 Description

ValuLine Desiccators

Terra Universal's ValuLine Desiccators provide a clean, dry storage environment for moisture-sensitive samples. Configured for use with a flowmeter and Terra's Automatic Relief/Bleed (RB) Valve, they can provide a continuous purge of clean, dry nitrogen to flush out moisture-laden air. ValuLine Desiccators also feature standard reinforced doors and a rear plenum for more uniform gas distribution.

ValuLine Extended Storage (ES) Desiccators

Terra Universal's ValuLine Extended Storage (ES) Desiccators combine low cost and strength for operations that don't require frequent parts access or rapid recovery of critical low-humidity set points. Although these desiccators may be used with nitrogen purging via a flowmeter, they are also ideal for use as general-purpose dust-free storage cabinets (with or without desiccants). The ValuLine ES line also lacks a rear plenum that comes standard with other ValuLine desiccators, so they are better suited for extended storage requirements that don't require frequent door opening and RH recovery.

Photo 1: *Acrylic ValuLine ES 5-Chamber Desiccator (Cat. No. 3949-34C)*

ValuLine SmartDesiccators™

Terra Universal's ValuLine SmartDesiccators provide automated humidity control using an electronic module that regulates nitrogen purge and maintains programmed set-points. This automation prevents nitrogen waste and allows the desiccator to return to set point more quickly after frequent door openings. ValuLine ES desiccators are easy to convert to SmartDesiccators through the addition of Terra's Smart RH Control Module (see description below).

Both ValuLine and ValuLine ES Desiccators feature the following:

- chrome-plated wire racks that allow shelf adjustment to accommodate varying part sizes
- heavy-duty chrome-plated hinges
- reinforced doors with closed-cell gaskets for a long reliable service life
- door expansion latches that provide a positive seal without internal scraping that are caused by rotary-style latches

Critical Recovery Time Requirements: ValuLine Desiccators help to maintain low RH levels but without the fast recovery time of more sophisticated control systems. For optimal RH recovery and product protection, select Terra's Adjust-A-Shelf Desiccators, which operate with the Dual Purge™ and NitroWatch™ automated RH controllers.

Flowmeter

Terra Universal's Flowmeters are our most popular gas regulators for low-volume flows. They are suitable for total pressures of up to 100 psig and temperatures to 150°F (66°C). Bodies are cut and precision-machined from solid, clear acrylic blocks for easy visual inspection and maximum durability. Precision-machined bores provide accuracy to within +/-5% of full scale.

Two-inch reading scales are hot pressed into the plastic. Front scale location and white background provide excellent visibility.

CAUTION

Terra Flowmeters should not be used with fluids or gases that may attack the acrylic plastic body.

Automatic RB® (Relief/Bleed) Valve

The Automatic RB Valve provides two crucial functions. During normal operation, it allows a continuous low-level release of gas to protect the desiccator against overpressure. It also functions as a check valve to ensure that air and contaminants cannot enter the enclosure in the event of momentary negative pressure.

Photo 2b. Automatic RB Valve (Cat. No. 1600-60A)

Most importantly, the Automatic RB Valve provides peace-of-mind to the operator. Its field-proven reliability guarantees that the cabinets are maintaining a safe positive pressure, even if they experience periodic increases in nitrogen flow. It also helps in preventing doors from warping and extends the life of gasket seals.

All ValuLine Desiccators, no matter their number of chambers, are configured with one (1) RB Valve per cabinet.

CAUTION

Because the potential variable inflow of nitrogen requires variable pressure relief, the use of an Automatic RB (Relief/Bleed) Valve (Cat. No. 1600-60A) is mandatory with the Flowmeter. Failure to incorporate an Automatic RB Valve could lead to permanent damage of cabinet seals and doors.

2.0 Installation

CAUTION

Do not position the desiccator so that the power supply connections are inaccessible. The power supply serves as the main disconnect for the system.

WARNING

To prevent dangerously low oxygen levels and risk of asphyxiation, nitrogen-purged systems should <u>only</u> be installed in a well-ventilated area.

Before installation and operation, carefully unpack the desiccator and accessories and check for signs of damage or missing parts. Wipe down with a particle-free cloth.

Although Terra Universal's ValuLine and ValuLine ES Desiccators are designed with gas-purge hook-up compatibilities, they can also be used simply as dry, dust-free boxes with or without desiccants. For desiccant-based storage, Terra Universal offers Kleer-Vue Sorbent Boxes; order one (1) each of Cat. No. 2010-75 per chamber. If you opt to use a gas-purging system with your desiccator, installation requires a supply of clean, dry air or nitrogen (less than 5 ppm H2O) and 1/4" polyethylene tubing.

All grounded cabinets feature grounding terminals in the upper-right corner of the cabinet. For standard grounding, simply connect the grounding terminal to your in-house ground.

Securing the Desiccator

WARNING

Desiccators taller than 30"H must be secured against a wall to prevent tipping.

1. Position the desiccator flush against the wall.
2. Apply the double-sided VHB tape to the bottom of the supplied wall bracket.
3. Stick the wall bracket onto the top of the desiccator as shown in the photo, making sure that the bracket will sit flush against the wall. Apply firm pressure for a few seconds and then wait 20 minutes for the bond to strengthen (full adhesion occurs after 72 hours)
4. While you wait, mark the screw placement and drill a pilot hole.
5. Ensure that the desiccator is still flush against the wall and then fasten the bracket to the wall using the supplied screw.

Correct Orientation of Wall Bracket On Top of the Desiccator

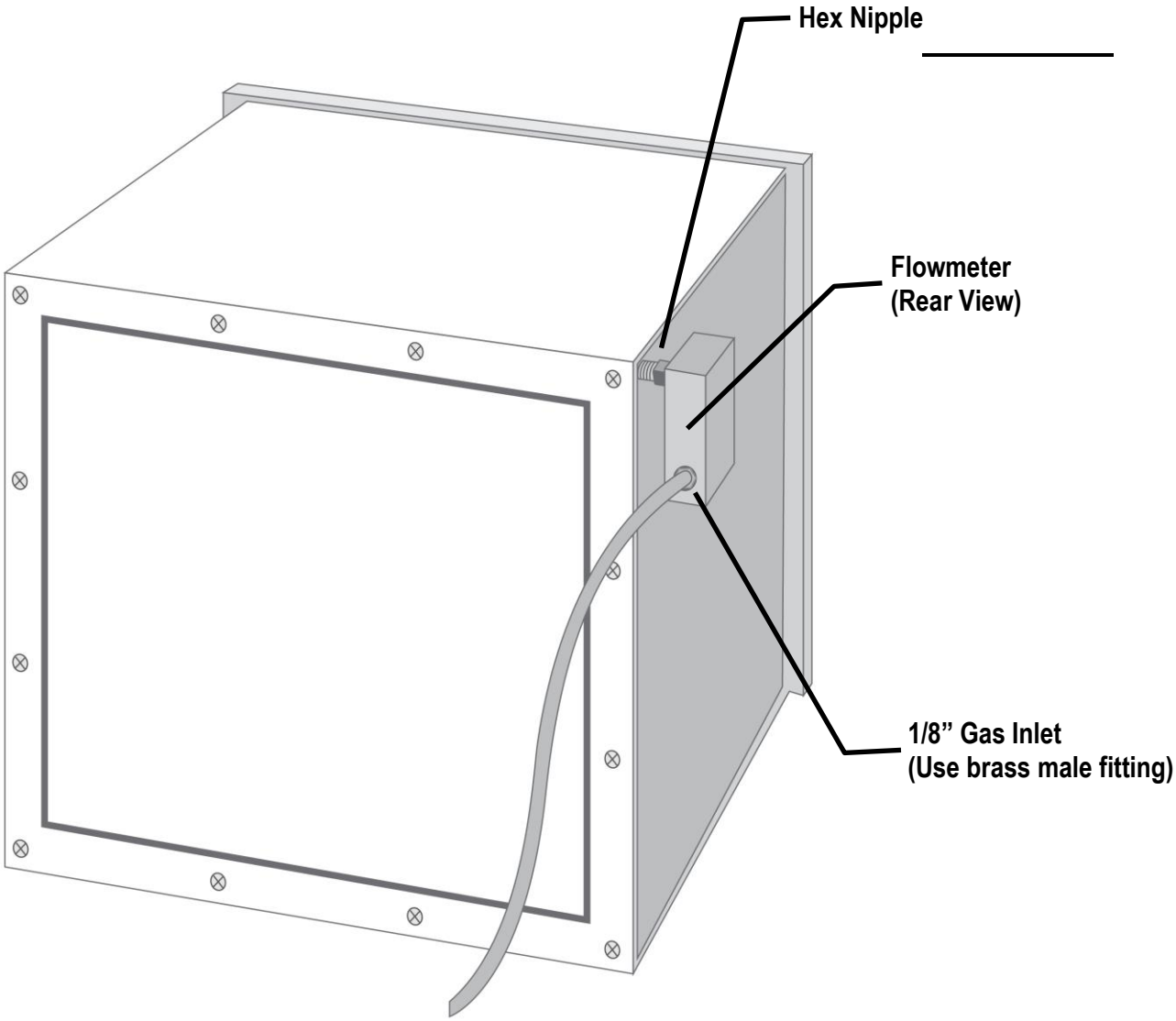
Valve, Meter and Gas Connections

Optional RB Valves and flowmeters are used to regulate gas flow and prevent over-pressurization. RB Valves are required for SmartDesiccators; flowmeters are not compatible with SmartDesiccators. For desiccators with three or fewer chambers, the RB Valve is located in the bottom chamber; in cabinets with four or more chambers (that also require tubing), the RB Valve is located in the top chamber.

RB Valve Installation: First, remove the plastic cap covering the hole; then, reach inside the desiccator and insert the hex nut into the hole. From the outside, thread the valve fitting into the nut and turn the valve clockwise until snug and upright.

Flowmeter Set-Up

1. Thread the hex nipple into the opening on the side of the desiccator.
2. Hand-tighten the flowmeter onto the other end of the hex nipple.
3. Use the brass male connector to attach 1/8" tubing to the gas inlet on the back of the flowmeter.



Upgrading a ValuLine ES Desiccator to ValuLine SmartDesiccator

CAUTION

Do not position the desiccator so that the connection to the main power supply or nitrogen source is inaccessible. These connections serve as the main disconnect for the system in the event of an emergency.

If you currently have a ValuLine ES Desiccator and wish to upgrade to a SmartDesiccator, Terra will send you a Smart RH module. Follow these directions to start using automated humidity control:

Photo 3: Smart RH module.
Front panel: Digital read-out
Side panel: Set-point controls, power hook-up and gas-in port

1) A black polyester adhesive label covers pre-drilled holes on the upper right side of the desiccator. With no Smart RH module in place, the perforations should stay intact. To install the Smart RH module, push out the perforated holes (save the circles to reapply over screw heads later) using one end of a paperclip or a small screw-driver.

Photos 4, 5: Save both adhesive perforated disks where module is fastened.

2) Thread one gas fitting into the back of the Smart RH module (the side opposite the two red buttons): turn clockwise until snug.

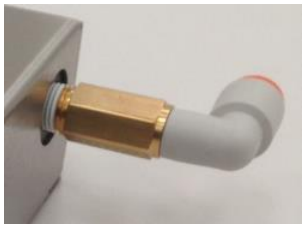
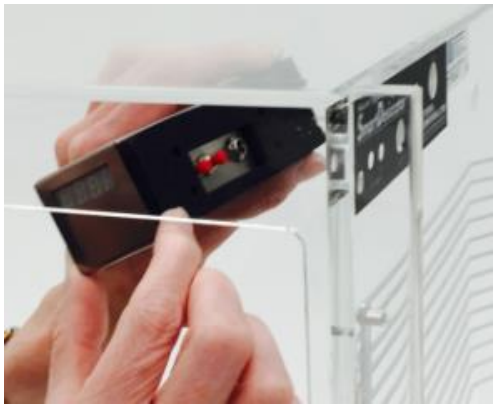


Photo 6: Threaded gas fitting

3) Looking at the front of the Smart RH module, match up holes with foam gasket; hold together. Reach inside the desiccator and place Smart module up to the back of the label (foam next to plastic wall): screw-holes and gas-line feed should line-up. Secure two screws with a small Phillips screwdriver (be sure not to over-tighten). Use the black adhesive disks to cover the screw heads.



Photos 7, 8: Placing the Smart RH module with gasket and attaching it to the desiccator wall, behind the label

Thread the second gas inlet fitting into the front of the Smart module (twist around until snug). Shown here are the gas fittings installed on a Smart module that is not attached to a desiccator:

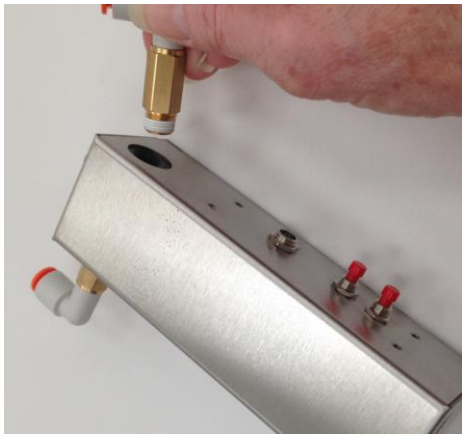


Photo 9: Installing gas fittings to the Smart RH module

NOTE

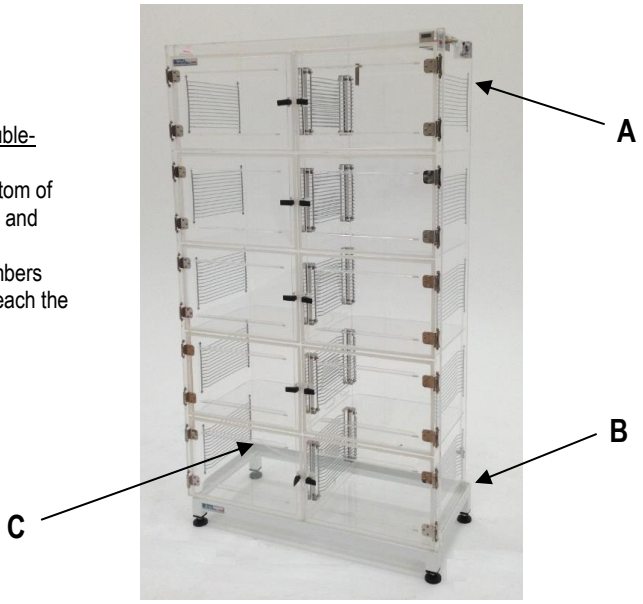
Install one fitting to the back of the module *prior to* attaching to desiccator wall. Install the second fitting to the front of the module *after* attaching it to the desiccator wall.

4) Place gas-in tubing into the Smart RH module connection accessible from the outside of the desiccator. For cabinets with four or more chambers, gas-out tubing should be inserted into the Smart module fitting accessible from the inside of the desiccator (see below for tube routing recommendations). Cabinets with three or fewer chambers do not need gas-out tubing installed in the fitting.

Photos 10, 11:
Push 0.25" tubing into the gas fittings on the Smart RH module from the outside and inside of the desiccator.

5) For desiccators with four or more chambers, install 0.25" tubing to evenly disperse gas throughout desiccator; nitrogen needs to flow to the lower chambers to improve RH recovery efficiency.
Three looped tie-downs with adhesive backs are provided to secure the gas line to the chamber walls. Place one ("A") in the back upper-right corner of the top chamber, the second ("B") straight down from "A" in the bottom corner of the bottom-right chamber, and the third ("C") straight across from "B" in the bottom-left chamber. The tubing will terminate after "C."

Photo 12:
Recommended tube routing for the double-wide desiccator shown here (6, 8 or 10 chambers). Gas is dispersed at the bottom of the cabinet on both sides (locations "B" and "C").
A single-wide cabinet (four or five chambers only) would only require the tubing to reach the bottom and terminate.



Attach tubing to the loops with minimal slack, using plastic zip ties (tighten and cut-off tail).

Photo 13:
Reach inside the desiccator to trim the plastic tie after attaching tubing to adhesive loops

6) Make certain that the T-connection is located in the bottom-right chamber and has tubing going into the top, and exiting the bottom to direct gas supply over to the bottom-left chamber. The T-connection opening should be pointing away from the desiccator wall in order to disperse gas into the chamber.

Photos 14, 15:
T-connector on right-hand side of cabinet allows gas to be released and tubing to continue routing to the chamber's left-hand side, where it terminates

7) If Flowmeter was previously installed, remove it and cap access hole. It will not be used for a Smart Desiccator.

8) Connect the 12VDC power supply to a standard 110VAC/60Hz power outlet and then connect it to the power input on the Smart RH Module (next to the nitrogen gas input).

Photo 16:
Electrical power connection

3.0 Operation

NOTE

The following procedures are for operation of Terra Universal's ValuLine and ValuLine ES Desiccators with a Flowmeter. You may opt to use these desiccators simply as dry, dust-free boxes with or without desiccants; in this case, leave the red Flowmeter cap in place. Terra Universal offers Kleer-Vue Sorbent Boxes (Cat. No. 2010-75, order one (1) per chamber).

Set the flowmeter to between 5 and 20 SCFH (depending on desiccator size and moisture requirements). Connect 1/4" tubing from an externally-regulated gas source (20–40 psi, depending on desiccator size) to Flowmeter inlet. Push the tubing in for connection. To release, depress the connector ring and pull tubing out.

CAUTION

For safe operation, pressure should be externally regulated below 70 psi.

As you increase the flow, the internal positive pressure will also increase. You may safely increase this pressure to as high as 0.3" WC as long as the chamber incorporates an Automatic RB Valve, which automatically protect against the possibility of warping or explosion.

On systems with very large plastic access doors, a continuous purge can cause temporary door deflection and gas leakage. This condition does not indicate a permanent leak and generally does not damage the cabinet. When pressure is removed, doors return to their natural position and re-establish an effective seal. This deflection does, however, result in nitrogen waste and reveal the need to reduce the Flowmeter setting.

Because a Flowmeter provides a constant flow rate, it is not ideal for use in large desiccators with doors that are frequently opened. To maintain critical set-points, consider upgrading to a ValuLine SmartDesiccator.

4.0 Desiccator Service and Maintenance

WARNING

Do not attempt to disassemble any of the modules. Contact Terra for assistance.

CAUTION

- **Do not clean acrylic with alcohol or other strong cleaning agents.**
- **Do not expose static-dissipative PVC to extreme heat or direct sunlight.**
- **A Terra stainless steel shield is required on the bottom of each static-dissipative PVC desiccator chamber to prevent scratching.**

Both acrylic and static-dissipative PVC desiccators can be periodically cleaned with clean, lukewarm water and a clean, nonabrasive cloth. If desired, a mild, non-abrasive detergent may also be used. Use only light pressure when cleaning.

If the outside of the acrylic is exceptionally dirty or gritty, rinse the surface first by lightly swabbing a saturated cloth over the surface and allowing surfactants to drain away. Avoid rubbing dirt or grit into the surface. Turn the cloth often and replace with a clean cloth frequently. Dry the acrylic by blotting gently with a clean, dry cloth.

If you clean the inside of a desiccator with water, you should dry the inside surface thoroughly and then purge the cabinet with nitrogen for several hours before reintroducing moisture-sensitive stored materials.

Special Care of Static-Dissipative PVC Plating

Although static-dissipative PVC has greater tensile strength than acrylic, it is not as rigid, and so it tends to bow if it doesn't have adequate support. For this reason, do not stack static-dissipative PVC desiccators or place heavy objects on top of them. These desiccators should also be kept away from extreme temperatures. Avoid prolonged exposure to temperatures over 80°F (26.7°C). Always avoid scratching the surfaces.

Replacing Desiccator Doors

Call Terra Universal for any required replacement doors (have the model number accessible, which is printed on a label affixed to the lower-right side of every standard Terra Universal desiccator). To replace a door, simply remove the screws that hold the door in place and reinstall the new door. The back panel is similarly secured with screws. Make sure to not over-tighten these screws, or the plastic will crack.

5.0 Troubleshooting

Terra Universal's desiccators are designed to provide years of reliable, efficient service. If you should experience any problems that arise during operation of your desiccator with the flowmeter, refer to the troubleshooting procedure below. If the problem persists, or if you encounter any problems not described below, call Terra Universal for additional assistance.

WARNING **Do not attempt to disassemble any of the modules. Contact Terra for assistance.**

PROBLEM: The desiccator is leaking excessively.

POSSIBLE SOLUTIONS:

1. Check the condition of the gasket on the desiccator. If the gasket is cracked or peeling, call Terra Universal for a replacement.
2. Check door alignment. Leaks may develop if doors are out of alignment.

6.0 Specifications

NOTE

Refer to the original order form for the exact specifications/configuration of your desiccator.

Acrylic Desiccators

The acrylic used in Terra desiccators is more rigid than acetates or vinyl, and is much more resistant than glass to thermal shock. The tensile strength of this material is 10,000 PSI at room temperature. However, when continuously loaded, imposed loading should not be allowed to exceed 750 PSI. The desiccator is rated for operation in an environment with temperatures between 32°F (0°C) and 104°F (40°C) and a relative humidity of up to 92%.

Avoid placing the acrylic desiccator in direct sunlight as it may cause the material to warp and distort.

The self-ignition temperature is 830°F (443°C), measured in accordance with ASTM D–1929. The products of combustion, when sufficient air is present, are water and carbon dioxide. However, as with many other common combustible materials, toxic carbon monoxide will be produced when sufficient air is not present during combustion.

Static-Dissipative PVC Desiccators

Static-dissipative poly-vinyl chloride (PVC) features surface resistance between 106 and 108 ohms/square - much less than that of other treated plastics. Tests show that when 10KV is applied to the surface, electrostatic potential remains less than 15V and static decay time is less than 1 second. And because this plating offers such effective static dissipation, it will not attract dust or other contaminating particles that could damage sensitive microelectronic components.

In a test conducted in accordance with Mil-B-81705B, the plating was conditioned for 24 hours at a relative humidity of 12% and a temperature of 70°F. The sample exceeded the 2.0 second static decay requirement to zero (0) as specified with a decay time of 0.01 seconds for each measurement taken. It had a surface resistivity of 1.7×10^7 ohms/square on one side and 2.8×10^7 ohms/square on the other side.

This plating is durable, noncombustible, and features superb resistance to UV radiation. Tests have indicated no loss of static protection after 500 hours of continuous exposure to a fadeometer. In temperature tests, it maintained its dissipative properties after 100 cycles of temperature fluctuations from –5°C to 60°C.

The plating offers all of the chemical-resistance of standard PVC plating. It remains unaffected by a wide range of chemical solutions.

Gaskets

Terra desiccators use one-piece neoprene gaskets and are mechanically attached to door frames without the use of adhesives or other materials that could outgas.

Flowmeter

Operating Temperature:	
Volumetric Flowrate Capacity:	0–20 SCFH
Line Pressure Gauge:	0–60 psi
Inlet/outlet:	1/4" OD polyethylene tubing
Case Material:	Stainless steel, chrome-plated, or stainless steel internal fittings
Maximum Pressure:	100 psig

Automatic RB (Relief/Bleed) Valve

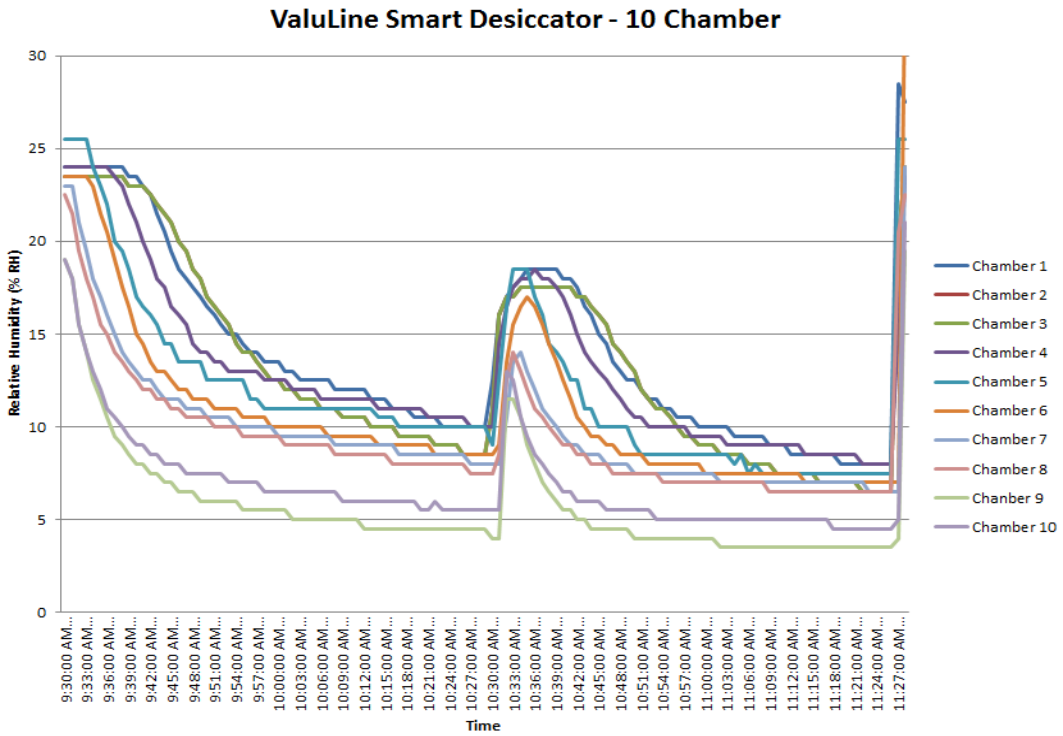
Operating Temperature:	
Dimensions:	0.5"W x 0.5"D x 1.5"H
Material:	Styrene-acrylonitrile (SAN) resin

Smart Relative Humidity (RH) Module

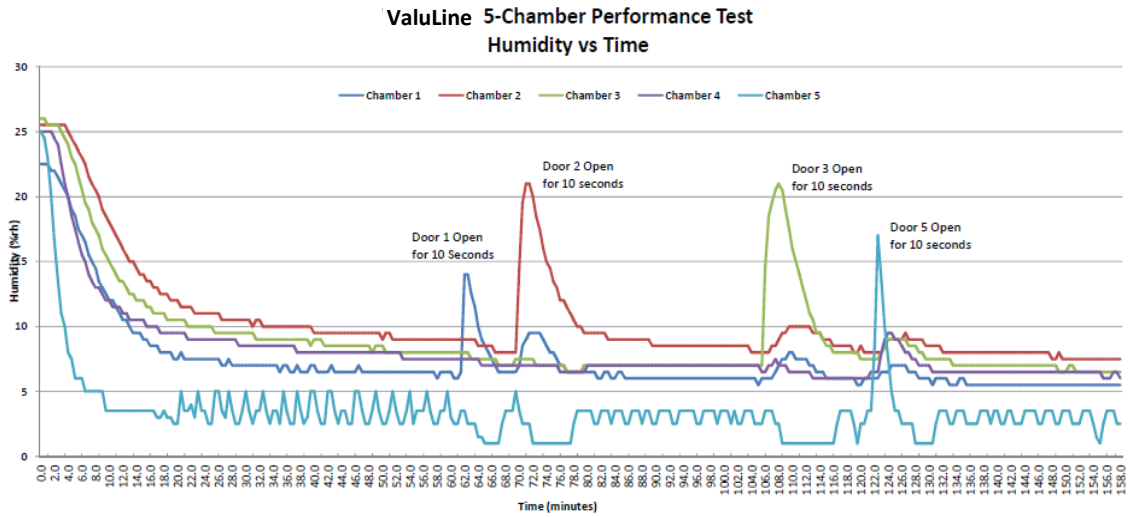
Operating Temperature:	
Dimensions:	1.75”W x 5.5”D x 1.5”H
Case Material:	304 Stainless steel
Power Requirements:	120/240 VAC, 50/60Hz
Gas Inlet:	1/4” OD polyethylene tubing

6.0 Performance Data

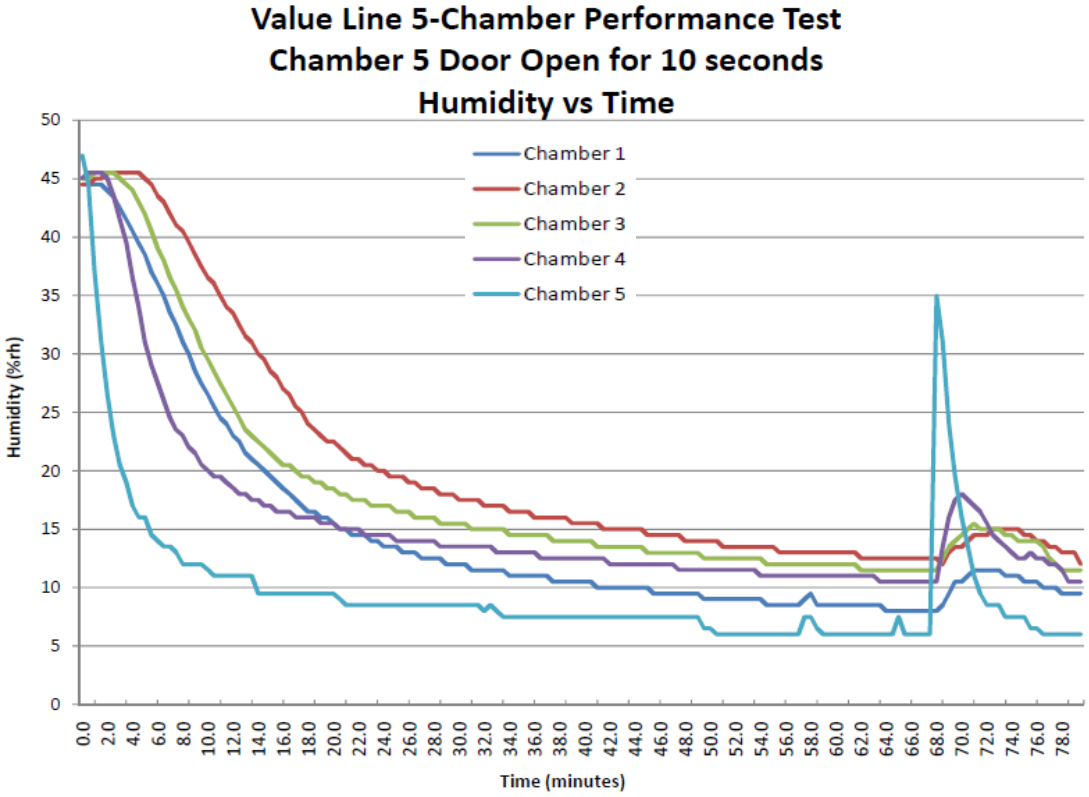
Smart Relative Humidity (RH) Module Set-point recovery tests: A 10-chamber ValuLine SmartDesiccator was tested to determine length of recovery time with a set-point of 5% RH. The chamber remained closed for 60 minutes, achieving the programmed set-point. All 10 doors were opened for 2 minutes and then closed. Set-point recovered after 50 minutes.



In the first five-chamber ValuLine Desiccator test, the RH set-point was programmed for 10%. The chamber doors were opened one-at-a-time for the time periods specified on the chart. Chamber 1 is the top chamber, while chamber 5 is at the bottom of the cabinet. Nitrogen was fed through a line that entered the bottom of the cabinet, and the purge valve located at the top of the cabinet released excess nitrogen. Each chamber recovered set-point in 5-8 minutes.
Note: The fluctuations seen in Chamber 5 resulted from the ebb and flow of nitrogen caused by other doors being opened, as controlled by the programmable humidity module.



The second five-chamber ValuLine Desiccator cabinet test evaluated set-point recovery after only one door (Chamber 5) was opened for 10 seconds. The relative humidity of Chamber 5 increased to 35% and regained the 10% RH set-point after 6 minutes. The other chambers were affected by the open door, but only got above 15% RH; set-point for all chambers was achieved in that 6 minute window.



7.0 Warranty

Products Manufactured by Terra: Terra Universal, Inc., warrants products that it manufactures to be free from defects for a period of 12 months for parts and 90 days for labor, commencing from the date of shipment. Terra's sole responsibility is to repair or replace, at its option, any part of the product that proves defective or malfunctioning during this time limit. In some cases, components incorporated in Terra Universal products are covered by additional warranties from component manufacturers; obtain specific information from Terra sales representatives. This warranty is void if the equipment is abused or modified by the customer, is operated outside Terra's operating instructions or specifications, or is used in any application other than that for which it is specified. This warranty does not include routine maintenance or service procedures, breakage of quartz baths after 60 days, shipping damage, nor damage from misuse, intentional or unintentional abuse, neglect, natural disasters, or acts of God.

Products Manufactured by Others: Terra Universal, Inc., warrants that, to the best of its ability, Terra's representations of products that are manufactured by others reflect the manufacturer's representations, subject to change without notice. Sole warranty for these products is the original manufacturer's warranty that is passed forward to the purchaser and constitutes the customer's sole remedy for these products. Detailed warranties for distributed products are available through Terra sales representatives.

Freight Shortage or Damage: Upon receipt of any equipment from Terra Universal, Inc., customer shall immediately unpack and inspect for damage or shortage. The customer shall not accept a damaged package or a short shipment until the carrier makes a "damage or shortage" notation on both the carrier's and customer's copy of the freight bill or delivery receipt. Service title passes when the shipment is loaded, so customer is responsible for filing and collecting a freight claim. Any replacement products must be ordered and paid for separately. For Terra's "Policy and Procedures for Returning Goods," see Terra's Internet site: www.TerraUniversal.com.

Generally, customers can improve the chance of collecting on a freight claim by following these procedures: 1) formally requesting that the carrier inspect the shipment immediately upon suspecting damage or shortage to verify condition; 2) notifying the carrier upon discovery of concealed damage and requesting an inspection within 15 days of receipt, both in person or phone and following up via mail; 3) keeping the shipment as intact as possible, including retaining original packaging materials and keeping the product as close to the original receiving location as possible; 4) holding salvage for disposition by the carrier.

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Warranty Returns: All warranty returns must be authorized in advance by Terra Universal and approved under an RMA. Unless approved in advance for good reason, all returns must be in original condition, including all manuals, and must be packaged in original packaging materials. All returned goods are to be shipped to Terra Universal, freight prepaid at customer's expense. See Terra's "Policy and Procedure for Returned Goods."

Thank you for ordering from
Terra Universal!