

Stability & Shelf Life

Test Chambers



Lunaire Environmental provides the largest selection of standard size test chambers as well as temperature/humidity ranges to accommodate all required protocols.

Our chambers incorporate the design features required for present and future ICH (International Committee for Harmonization) guidelines for stability testing conditions that are being adopted by the industry and implemented by the Food and Drug Administration.

Standard chambers sizes are offered in five convenient sizes: 10, 17, 32, 41, and 58 ft³ and are available in four temperature, or temperature and humidity combinations to provide the ICH general stability conditions for room temperature storage, intermediate storage, and accelerated shelf life studies.

Chambers can be equipped with optional lighting systems to comply with guidelines for photostability conditions. Assistance with IQ and OQ protocols or complete chamber validation is available as well as computer interfacing that includes Windows 95[®] based software for multiple chamber monitoring.



Lunaire

Specifications 10, 17, 32, 41, 58 ft³

Overall dimensions in inches/centimeters

Model	Non-Humidified	CEO	CEO			CEO	CEO			CEO	CEO			CEO	CEO			CEO	CEO			
		910-1	910-2			917-1	917-2			932-1	932-2			941-1	941-2			958-1	958-2			
	Humidified			CEO	CEO			CEO	CEO			CEO	CEO			CEO	CEO			CEO	CEO	
				910-3	910-4			917-3	917-4			932-3	932-4			941-3	941-4			958-3	958-4	
Workspace	W	28/71				22.5/57				33/84				43/109				60/152				
	D	25/64				26/66				28/71				28/71				28/71				
	H	24/61				51/130				60/152				60/152				60/152				
Exterior	W	34/86				28.5/72				39/99				50/127				70/178				
	D	29/74				31/79				32/81				32/81				32/81				
	H	49.5/126				79/201				88/224	91/231	88/224	91/231	88/224	91/231	88/224	91/231	88/224	91/231	88/224	91/231	88/224
No. of Shelves		2				4				4				4				8				
No. of Shelf Guides		7				16				19				19				38				

Note: Casters add 3" to exterior height

Temperature Range

Low	C°	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0	10° above ambient	0
High	C°	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99	+99

Utilities, etc.

Refrigeration (HP)		—	1/3	—	1/3	—	1/3	—	1/3	—	1/2	—	1/2	—	1/2	—	1/2	—	3/4	—	3/4
Heater Capacity		1.5 KW				1.5 KW				2 KW				3 KW				6 KW			
Humidifier	KW	—		1.5		—		1.5		—		1.5		—		1.5		—		3	
	GPH	0.5																1.0			
AMPS @ 115V, 1Ø		16.5	—			21	—			21	—			—				—			
AMPS @ 208/230 4-WIRE, 1Ø-60Hz		—	17	24	29	—	20	26	32	—	20	26	32	18	24	30	37	36	43	49	56
AMPS Breaker <small>Over current production recommended</small>		20	20	30	40	30	30	40	40	30	30	40	40	30	30	40	50	50	60	60	70
Unit Weight	LBS	350	475	400	550	550	675	600	750	1000	1300	1150	1350	1300	1600	1450	1650	1550	1850	1700	1900

Humidity capability: above ambient to 96% RH on -3 models; 20% to 96% RH on -4 models. Based on ambient conditions of 22°C and 50% RH, limited by a 5°C dewpoint temperature. Control tolerance: ±0.3°C and ±2% after stabilization.



◀ The 17 cubic foot - chamber, with its floor model configuration, is ideal for laboratory applications. Some available options include interior lighting, viewing window, and casters.



◀ The 58 cubic foot temperature and humidity chamber has the largest workspace of any of the Stability & Shelf Life Test Chambers. This unit features a stainless steel configuration with viewing windows that have light-tight covers.

Note: Recorders and dryers shown are optional equipment.

Standard Features

Construction:

All models feature continuously-welded stainless steel vapor-tight chamber interiors. Reinforcement is used at all critical points; through wall ports are continuously welded; and an optimal combination of fiberglass and polyurethane insulation surrounds the chamber work-space to maximize temperature containment while reducing overall cabinet size.

The integrity of the chamber depends heavily on the construction and proper sealing of its door. Each chamber begins with a fully-welded heavy-duty angle iron framework. Likewise, each door has the same durable construction. To insure proper closure, doors are fitted with fully adjustable hinges that are machined from solid blocks of aluminum. A double seal system is used: two pliable neoprene "P" gaskets are applied, with one seal around the perimeter of the door and the other seal around the door opening.

Each chamber comes with a practical number of no-tip stainless steel shelves (see chart). The shelves are adjustable on three inch increments and are capable of holding 135 pounds each. Both the shelves and the chamber side-duct walls are easily removed for cleaning.

Conditioning System:

Each chamber is equipped with a horizontal recirculating conditioning stream to allow flexibility in shelf-loading patterns. The system conditions the air, as required, in a plenum above the work-space. The conditioned air is then dis-charged through the right side duct wall, flows horizontally across the shelves, and is returned to the conditioning plenum through the left side-duct wall. Individually adjustable airflow ports, located in the side-duct walls, provide a uniformity of $\pm 0.5^\circ\text{C}$ throughout the chamber, even with a variety of shelf-loading patterns.

Refrigeration System:

The refrigeration system is self-contained and powered by an air cooled, semi-hermetic compressor utilizing non-CFC environmentally friendly R-134a refrigerant. The high efficiency compressor, and condensing

assembly is top-mounted for accessibility and easy maintenance.

An independent, low-limit controller protects the refrigeration system. Should the temperature fall below setpoint, the control activates an audible and visual alarm and disconnects the cooling circuit. Refrigerated units are equipped with an automatic defrost that will engage at 10°C on non-humidified units and 20°C on humidified units.

Humidity System:

All humidified chambers are equipped with a digital-set, digital readout humidity controller. All chambers are available in two standard humidity ranges: above ambient to 96% RH, and 20% to 96% RH. Lower humidity ranges are attainable with an optional auxiliary dryer system. Refer to the charts on this page for typical performance.

Humidity is measured by an electronic capacitive sensor that does not have a wet wick or water supply. Consequently, the device will not produce humidity as a result of the sensing process. Accuracy is consistent through the entire range with a resolution of 0.1% RH, and control to $\pm 2\%$ RH typical after stabilization.

Heating System:

Heating elements are sealed in stainless steel alloy tubes to maintain cleanliness and to increase longevity. The heaters are introduced to the chamber through sealed penetrations so that all power connections are external to the conditioned zone.

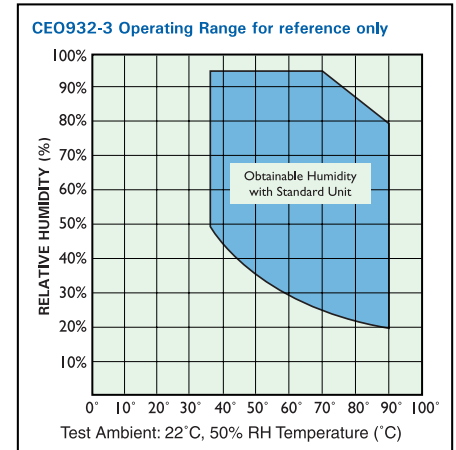
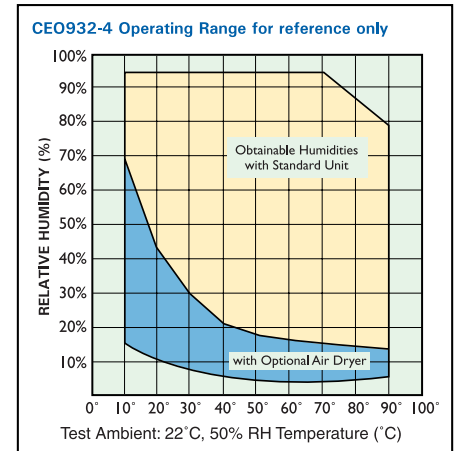
Temperature Control:

Temperature is measured by a highly reliable platinum RTD sensor. Set point and chamber temperatures are displayed with 0.1°C or 0.1°F resolution.

The Watlow 965 controller provides automatic or manual chamber control with digital selection and indication of actual conditions. The control features single input and dual output capabilities.

The primary output operates in either heat or cool modes with autotuning of the heating output, and the secondary output operates in either process or deviation

Obtainable Humidities



alarm modes. The control automatically stores all information in a non-volatile memory upon power failure.

The chamber has a high-limit control circuit to prevent chamber overheat. An over-temperature condition will result in automatic disconnection of the heating circuit and activation of an audible and visual alarm. In order to encourage appropriate correction of an over-temperature condition, the control includes a manual reset. The manual reset will not activate until the temperature has returned to or below the high limit set point.

Electrical:

All wiring is numbered in accordance with NEC. Circuit breakers are used throughout the electrical system and are located, along

Lunaire Environmental **Quick Facts**

Standard Features at a Glance:

Vapor tight interior made of 100% stainless steel
Non-settling, asbestos-free insulation
Watlow 96 controller
Platinum RTD temperature sensor
Semi-hermetic refrigeration system with R-134A refrigerant
Resolution of 0.1% RH, and control to $\pm 2\%$ RH typical after stabilization
NEC wiring compliance
Horizontal recirculating conditioning system
Double silicon gaskets on doors
Adjustable and removable stainless steel shelving
Humidity sensor which requires no wet wick or water supply
VaporFlo [®] humidity system

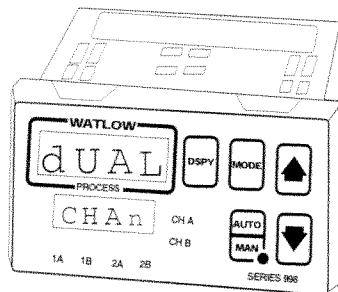
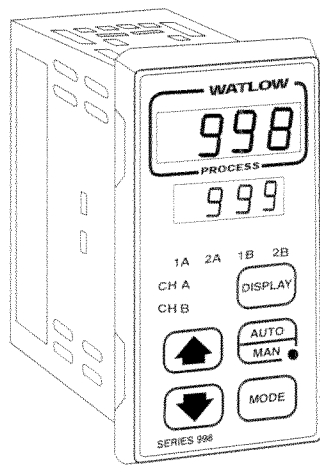
In line with our policy of continual product improvement, Lunaire Environmental reserves the right to incorporate and use material to conform to the latest design of our products in keeping with the specifications of this equipment.

Options:

Exterior constructed of # 4 polished 304 stainless steel
Additional shelving
Insulated viewing window, 18" x 18" or 17" x 47"
Viewing window cover, light-tight and hinged
Interior Lexan doors in many configurations
Interior lighting
Glove ports
Class 100 interior with HEPA-filtered circulation, intake, and exhaust
Through-wall ports with rubber stoppers: standard sizes of 1, 2, 3, 4 inches in diameter
Interior power receptacle
Horizontal split door construction (32 and 41 cubic feet models)
Front and rear door for pass-through applications
Casters
Structural or cabinet support stand (for 10 cubic foot model)
Increased refrigeration capacity
De-ionized cartridge system for pure water supply
Five gallon reservoir
Auxiliary dryer for lower humidity levels
Spark resistant systems and rear blow out panels for use with volatile substances
Microprocessor-based, programmable controller with multiple-step programming capabilities of temperature and humidity over time
Recording instruments
Condensate pump
Circulation airflow switch to protect against a loss of airflow
Additional access ports

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Get Two Controllers in one Compact 1/8 DIN Package

The Watlow Series 998 vertical 1/8 DIN two channel process controller and the horizontal 1/8 DIN Series 999 offer two channels of PID control in a single package. With up to six outputs, the controller is designed to handle most applications where multiple processes need to be controlled.

The two analog inputs accept 11 different thermocouple types, RTD and scaleable process inputs. A single event input allows the operator to reset an alarm remotely, turn controller outputs off, or lock out the front panel.

Six output options provide a wide range of flexibility:

- Two heat/cool (reverse/direct) outputs per channel
- Two alarm outputs
- Scaleable retransmit output of set point or process
- Digital communications

The Series 998/999 is packaged with a NEMA 4X front panel to withstand harsh environments, a four-inch case depth and touch-safe wiring terminal.

The Series 998/999 features a three-year warranty and four day shipment on all model numbers.

Features

- Two analog inputs, six control/alarm outputs
- Auto-tuning
- Optional dual alarm
- Optional digital communications
- Hardware and software lockout options
- NEMA 4X front panel (IP65 equivalent)
- 5Hz sampling rate per channel and burst-fire control option

Benefits

- Two complete controls in a single package
- One step tuning of system parameters for each channel
- User-selectable output alarms to monitor either channel
- Remote operation using serial communications
- Provides several parameter levels of operator security
- Provides watertight corrosion resistant front
- Smooth, accurate control of the process



Watlow Controls

A subsidiary of Watlow, Designer and Manufacturer of Industrial Heaters, Sensors and Controls

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ISO 9001



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Specifications

Control Mode

- Two input, six output, optional retransmit, alarms or digital communication outputs
- Programmable direct and reverse acting controller outputs
- One step auto-tuning

Operator Interface

- Dual, four digit LED displays: upper: 0.4" (10 mm), lower: 0.3" (8 mm)
- MODE, AUTO/MANUAL, DISPLAY, UP and DOWN keys

Input

- Contact input for software function select
- Type J, K, T, N, C, R, S, B, Pt 2, W3, W5 thermocouple, 1" or 0.1" RTD, or 0 to 100mV, 0 to 20mA, 4 to 20mA, 0 to 5V=(dc), 1 to 5V=(dc), or 0 to 10V=(dc) options
- Sensor break protection de-energizes controller output to protect system or selectable bumpless transfer to manual operation; latching or non-latching
- 'F' or 'C' display or process units, user selectable

Output Options

- Dual solid state relay, 0.5A @ 24V~(ac) minimum, 253V~(ac) maximum, opto-isolated, zero cross switching; with or without contact suppression
- Dual switched dc signal provides a source voltage of 23.5 to 30.2 V=(dc), with a source resistance of 1500Ω
- Dual electromechanical relay, Form A, 2A @ 120/240V~(ac), 2A @ 28V=(dc); without contact suppression
- Single process, 0 to 20mA, 4 to 20mA, 0 to 5V=(dc), 1 to 5V=(dc) or 0 to 10V=(dc) reverse acting
- Electromechanical relay, Form A/B, 5A @ 120/240V~(ac), 6A @ 28V=(dc), ½ hp @ 120V~(ac), 125VA @ 120V~(ac); without contact suppression
- External transmitter power supply
- EIA-232 or EIA-485/EIA-422 communications, opto-isolated

Accuracy

- Calibration accuracy and sensor conformity: ± 0.1% of span, ±1 LSD, 77°F ± 5°F (25°C ± 3°C) ambient & rated line voltage ±10%
- Accuracy span: 1000°F (540°C) minimum
- Temperature stability: ± 0.2°F/F (0.1°C/C) change in ambient

Agency Approvals

- UL®, CSA, NEMA 4X, and CE

Terminals

- #6 compression universal head screws, accepts 28 to 14 gauge wire

Power

- 100 to 240V~(ac) +10%/-15%, 50/60Hz, ± 5%
- 24 to 28V=(ac/dc) +10%/-15%, 50/60Hz, ± 5%
- 16VA maximum

Operating Environment

- 32 to 149°F (0 to 65°C), 0 to 90% RH, non-condensing

Mechanical

- ½ DIN panel mount, NEMA 4X (IP65 equivalent) front panel
- Overall width x height x depth
Horizontal: 4.03" x 2.18" x 4.74", (102 mm x 55 mm x 120 mm)
Vertical: 2.18" x 4.03" x 4.74", (55 mm x 102 mm x 120 mm)
- Depth behind panel: 4.06" (103 mm)
- Weight less than or equal to 14.0 oz (0.40 kg)

Allowable Operating Range

Available with basic or universal signal conditioner:

J T/C:	32	to	1500°F	or	0	to	816°C
K T/C:	-328	to	2500°F	or	-200	to	1371°C
T T/C:	-328	to	750°F	or	-200	to	399°C
N T/C:	32	to	2372°F	or	0	to	1300°C
E T/C:	-328	to	1470°F	or	-200	to	799°C
C T/C:	32	to	4200°F	or	0	to	2316°C
D T/C:	32	to	4200°F	or	0	to	2316°C
Pt 2:	32	to	2543°F	or	0	to	1395°C

Available with universal signal conditioner:

R T/C:	32	to	3200°F	or	0	to	1760°C
S T/C:	32	to	3200°F	or	0	to	1760°C
B T/C:	32	to	3300°F	or	0	to	1816°C
1"RTD (JIS):	-328	to	1166°F	or	-200	to	630°C
1"RTD (DIN):	-328	to	1472°F	or	-200	to	800°C

0.1"RTD (JIS and DIN):

	-99.9	to	999.9°F	or	-73.3	to	537.7°C
	0-5V=(dc), 1-5V=(dc), 0-10V=(dc), 0-20mA, 4-20mA, 0-100mV=(dc):						
	-999	to	9999				

Ordering Information

Series 998/999

9 9

Dual channel microprocessor based, dual input, six output temperature control, ½ DIN vertical or horizontal

Hardware

- 6 = 24 to 28V=(ac/dc) nominal, vertical mounting
- 7 = 24 to 28V=(ac/dc) nominal, horizontal mounting
- 8 = 100 to 240V=(ac/dc) nominal, vertical mounting
- 9 = 100 to 240V=(ac/dc) nominal, horizontal mounting

Software

- D = Dual channel software (includes Modbus™)
- S = Special customer features

Channel A Input

- 1 = Basic thermocouple signal conditioner (excluding Type R, S and B thermocouple)
- 2 = Universal signal conditioner (see Range Information)

Channel B Input

- 1 = Basic thermocouple signal conditioner (excluding Type R, S and B thermocouple)
- 2 = Universal signal conditioner (see Range Information)

Channel A Outputs

- C = Dual switched dc, isolated
- E = *Dual mechanical relay, Form A, 2A, without suppression
- F = Single universal process, 0 to 5V=(dc), 1 to 5V=(dc), 0 to 10V=(dc), 0 to 20mA, 4 to 20mA, isolated
- K = Dual solid state relay, Form A, 0.5A, without suppression

Channel B Outputs

- C = Dual switched dc, isolated
- E = *Dual mechanical relay, Form A, 2A, without suppression
- F = Single universal process, 0 to 5V=(dc), 1 to 5V=(dc), 0 to 10 V=(dc), 0 to 20mA, isolated
- K = Dual solid state relay, Form A, 0.5A, without suppression

Output 3

- A = None
- B = Solid state relay, Form A, 0.5A, with suppression
- C = Switched dc, open collector, isolated
- J = *Mechanical relay, Form A/B, 5A, without suppression
- K = Solid state relay, Form A, 0.5A, without suppression
- M = Retransmit, 0 to 20mA, 4 to 20mA
- N = Retransmit, 0 to 5V=(dc), 1 to 5V=(dc), 0 to 10 V=(dc)
- T = External signal conditioner power supply, 5, 12 or 20 V=(dc) @30mA

Output 4

- A = None
- B = Solid state relay, Form A, 0.5A, with suppression
- C = Switched dc, open collector, isolated
- D = *Mechanical relay, Form C, 5A, with suppression
- E = *Mechanical relay, Form C, 5A, without suppression
- K = Solid state relay, Form A, 0.5A, without suppression
- R = Isolated EIA-232 communications
- S = Isolated EIA-485/EIA-422 communications
- U = Isolated EIA/TIA 232 and EIA/TIA 485 communications
- T = External signal conditioner power supply, 5, 12 or 20 V=(dc) @30mA

Display/Overlay

- GR = Green/Red displays
- RR = Red/Red displays
- GG = Green/Green displays
- RG = Red/Green displays
- XX = Custom overlays, parameters or software

* Electromechanical relays are not recommended for PID control.

They are warranted only for 100,000 contact closures.

Modbus™ is a trademark of AEG Schneider Automation.