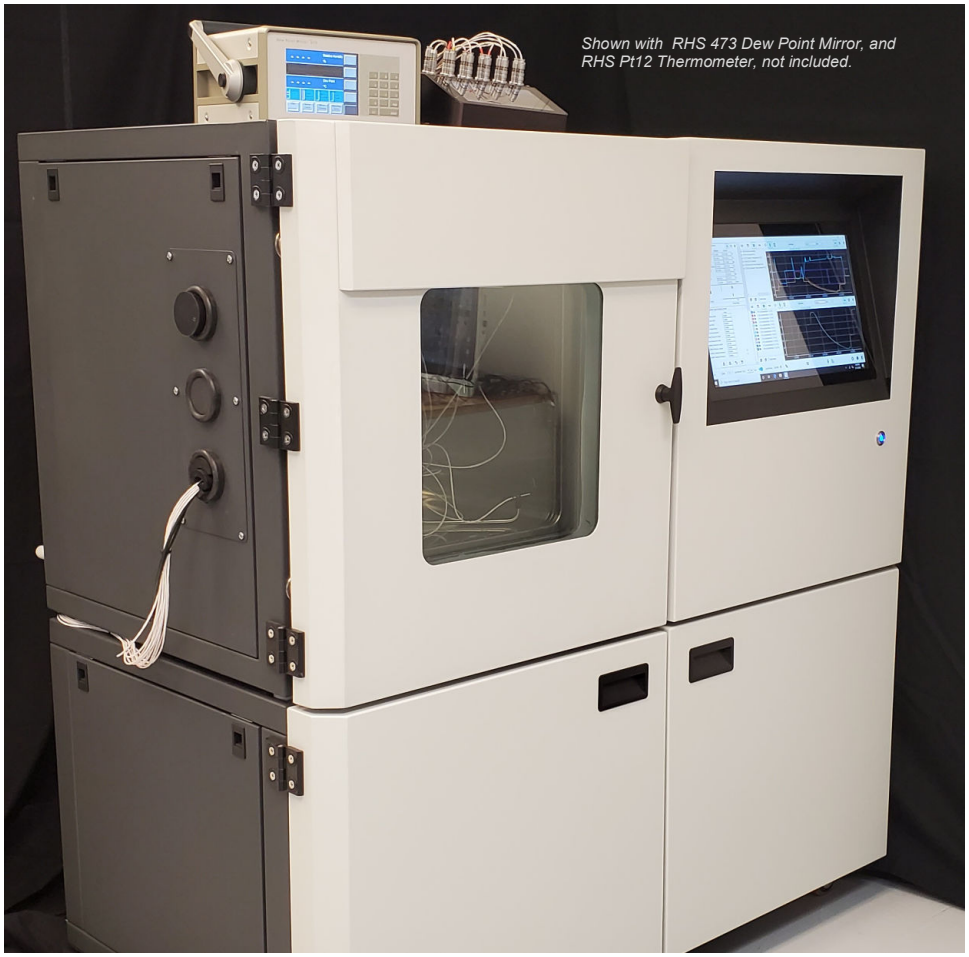
Humidity Generator CGS-240



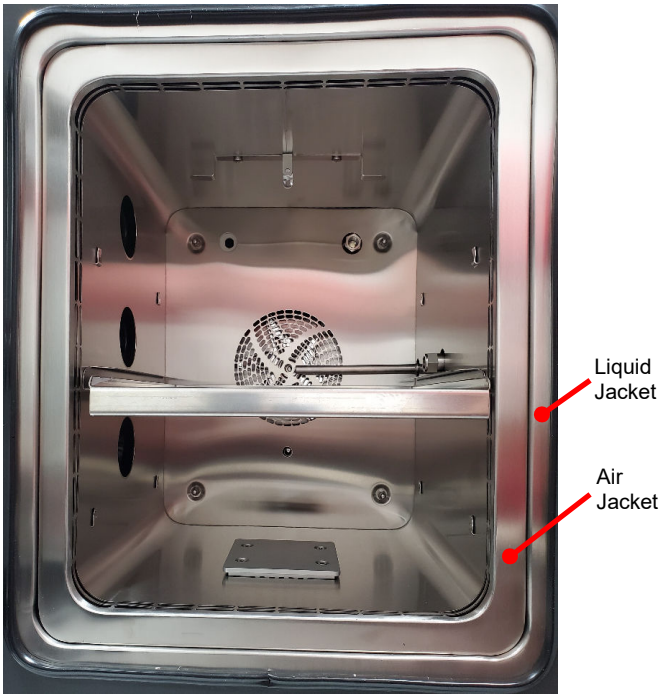
Fully Automated *Two-Pressure Two-Temperature* Humidity Generator

The RH Systems CGS-240 Humidity Generator is a system capable of continuous, high-accuracy humidity generation over a wide range of humidity, temperature, and flow rates. The CGS-240 design is an RHS hybrid two-pressure two-temperature design based on fundamental NIST developed principles.

- **RH uncertainty ±0.5% of Indicated Value**
- **Embedded full color touch-screen with pinch/zoom capability**
- **Large test chamber w/ multiple shelving options**
- **Full-size, thermally controlled window**
- **Integrated chamber light**
- **Three temperature controlled access ports**

Large, Thermally Uniform Chamber

The chamber utilizes a robust design, with a cable management system for the chamber temperature probe, sample gas injection to the center of an air circulation fan, local pressure measurement, and a multi-position shelving system. It is equipped with high performance thermal insulation surrounding the door and all sides of the test chamber, and features a soft



silicone profile seal for perfect tightness. An integrated chamber fan provides internal air circulation which ensures uniformity and stability throughout the working volume.

Thermal Control and Stability

The liquid jacketed chamber door uses heavy duty hinges, a recessed latching mechanism, a built-in light, and integrated heating for the door frame and window. The window inner pane is liquid jacketed and thermally controlled at the same temperature as the chamber to aid significantly in chamber stability and temperature uniformity. The chamber is also liquid jacketed meaning all 6 walls of the chamber are thermally controlled. An air-jacket is then encased within the liquid jacket to ensure unparalleled stability and uniformity.

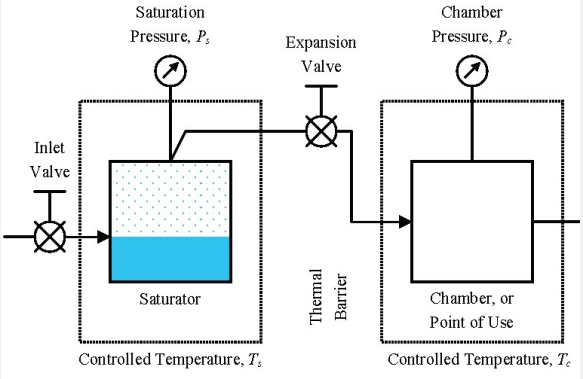
More than just an RH Generator

While %RH is a typical control parameter, the CGS-240 easily controls Dew Point and Frost Point, while automatically distinguishing between the two. When entering a dew or frost point setting, associated functions such as saturation and chamber temperatures are internally adjusted to suitable conditions thereby ensuring that the desired dew or frost point value can be achieved within an uncertainty better than 0.10 °C.

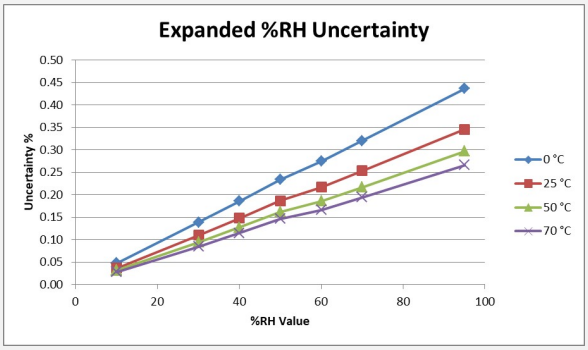
Hybrid Two-Pressure Two-Temperature Design

In competitor's two-pressure designs, the saturator and chamber share a common temperature. While simpler in mechanical implementation, a distinct disadvantage of those basic two-pressure methods is that low humidity generation requires excessively high saturation pressure. This high pressure requirement constrains system design while adding greater burden on air compressor systems.

In contrast, the CGS-240 hybrid design exploits combined capabilities of both the *two-pressure* and *two-temperature* principles where the saturator and chamber temperatures are controlled independently of each other. Operating at a lower saturation temperature results in diminished pressure requirements as compared to basic two-pressure systems. This CGS-240 hybrid design allows for a larger humidity generation range with only modest pressure requirements.

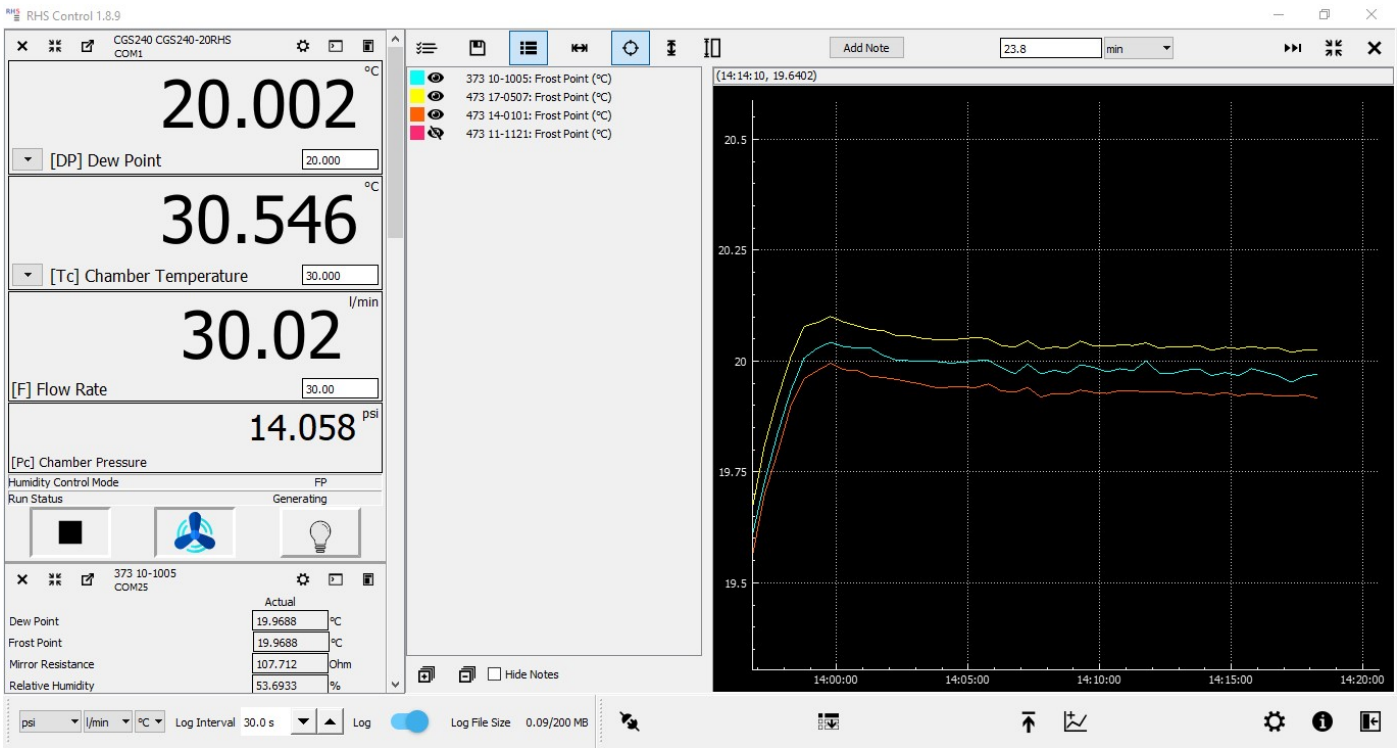


Regardless of whether the saturator and chamber are operated at a common temperature using only the two-pressure method, or independently from each other using our hybrid method, humidity calculations such as %RH, Dew Point and others rely on only four measured parameters; two absolute pressures ($P_{saturation}$, $P_{chamber}$) and two temperatures ($T_{saturation}$, $T_{chamber}$). Uncertainty in humidity is determined from the uncertainty in these four measured parameters.



RHS Control

RHS Control is our custom program allowing the user to operate the humidity generator system from the integrated touch screen monitor. The system may be operated manually through direct entry of desired setpoints, or automatically through a user defined profile. Profiles are a sequence of preprogrammed, user selectable setpoints and dwell times which allow for fully automatic operation and data collection, free of further user intervention.



Continuous Run Time

The CGS-240 may run continuously without the need to shut-down; the only requirement being that sufficient water level is maintained in the 20 liter (5 gallon) distilled water reservoir. The reservoir may be filled at any time without the need to stop the system, thereby allowing uninterrupted generation of humidity for days, weeks, or months. The only expected limit to operational run time is when chamber or saturation temperatures operate below 0°C (32 °F) where water freezing within the saturator will temporarily limit gas flow due to eventual ice blockage. In the event of blockage, the simple remedy is to warm the system above freezing for a short period to allow the blockage to melt away. While a saturator bypass circuit is utilized to extend run-time under these expected icing conditions, a limit of approximately 8-12 hours of continuous sub-zero run time is typical before warming is needed.

Data Collection

RHS Control allows for connection of various instruments via digital communication for continuous monitoring, control, and associated data collection. Many instruments with RS-232 or RS-485 communication capability require only an RHS or user-written description file (.json file) to enable data monitoring and collection. Collected data is viewable both numerically and graphically. All data from the CGS-240 and any connected instruments may be viewed together on a common graph. Data is automatically stored to files during collection for later import to Excel and other post process analysis and graphing programs.

Model:	CGS-240	
Generating Range:		
Relative Humidity	10…95 %RH (5 %RH optional)	
Dew/Frost Point	-25…70 °C DP, -23…0 °C FP	
Chamber Temperature	-0…72 °C (-10 & +85 °C extended ranges optional)	
Chamber Pressure	Ambient	
Flow Rate	5…20 SLPM (5…50 SLPM optional)	
Accuracy (0 to 70 °C, 10 to 40 l/min):		
Relative Humidity	The larger of ±0.1 %RH or ±0.5% of indicated RH value	
Dew/Frost Point	±0.10 °C	
Temperature (T_S, T_C)	±0.030 °C	
Pressure (P_S, P_C)	±0.02% of full scale	
Chamber Temp Uniformity[1]	<0.035 °C	
Flow Rate	±1 SLPM	
Integrated Sensors:	Cal Range:	Cal Uncertainty:
Low Range Pressure (P_L)	Ambient…25 psia	±0.005 psia
High Range Pressure (P_H)	Ambient…150 psia	±0.030 psia
Saturator Temperature (T_S)	-15…72 °C	±0.03 °C
Chamber Temperature (T_C)	0…72 °C	±0.03 °C
Chamber Liquid Temp[2] (T_{CL})	0…72 °C	±0.10 °C
Presaturator Temp[2] (T_P)	0…75 °C	±0.10 °C
Flowmeter[2]	0…50 SLPM	±1 SLPM
Chamber:		
Dimensions	15”H x 12”W x 12”D (380 x 300 x 300 mm)	
Type	Circulating air-jacket encased within liquid jacket	
Adjustable Shelf	Three shelf positions, one shelf supplied	
Access Ports	Three 50 mm diameter thermally controlled access ports 14”H x 12”W x 12”D (370 x 300 x 300 mm)	
Window size		
Window thermal control	Liquid jacketed, multi-pane, thermally controlled	
Chamber light	Integrated light with on/off touchscreen control	
Integrated control interface:		
Operation Software	RHS Control Software	
Calibration Software	RHS Plateau Software	
Display	18.5” Multi Touch Monitor with pinch/zoom/drag	
Gas inlet pressure:		
Using external pressure source[3]	120 psig max	
Using supplied air compressor[4]	60…90 psig @ 20 l/min typical	
Environmental conditions:		
Operating environment	15…30 °C, 20…75 %RH	
Storage environment	0…50 °C, <95 %RH non-condensing	
Power requirements:		
Voltage	208…240 VAC, 50/60 Hz, single phase	
Current[5,6]	20 Amps	
Physical Dimensions:	55”H x 52”W x 29”D (1.4 x 1.3 x 0.7 m)	

Notes:
1 Between any two points 1” or more from inner chamber perimeter (walls, door) while chamber fan is operating
2 Calibration not required since data is not used in humidity calculations
3 When using external pressure source, set regulator to a value below lowest source pressure
4 Supplied air compressor cycles within the range 60~90 psig. Set internal regulator to approx. 50~55 psig
5 Upper cabinet fused at 15 amps through circuit breaker power switch. Typical load <12 amps
6 Lower cabinet fused at 10 amps through circuit breaker power switch. Typical load <8 amps

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We reserve the right to change design or technical data without notice.