

Percival Scientific Sets the Industry Standard in Chamber Testing

A Quick Overview of Our Testing Capabilities and Expectations

- 1. Our main purpose when testing our chambers is to ensure the end user gets a product that can achieve the specifications they need for their research.** We offer an incredible number of options and customization that our competitors cannot match. Along with every option on our list, there is a testing procedure to ensure proper function and desired specifications are met. Our testing and quality inspection employees have decades of combined experience with our chambers.
- 2. We understand that research depends on conditions that can be reliably met and repeated.** All options on a customer's chamber are tested to ensure that the unit can meet the end user's requirements. It is also important to know that the Testing Department works closely with Engineering to ensure that any changes are reflected on all labels, diagrams and production notes.
- 3. The Testing Department is guided by one simple rule: If it doesn't pass, it doesn't ship.** Our testing setup and record-keeping do not allow corners to be cut. Our Customer Support Team makes the call on all testing charts and is the go-to team if customers have any issues with a chamber. Working closely together across departments helps the team care, both professionally and personally, about how well a chamber performs. We take that responsibility seriously.

Percival's Testing Protocol

The most common tests we perform are temperature and humidity. This report will use a common temperature and humidity range on a chamber with temperature control, added humidity and dehumidifying as an example of our testing procedures (model I36VL).

Temperature range specification: 2°C TO 44°C ± 0.5°C (LIGHTS OFF),
4°C TO 44°C ± 0.5°C (LIGHTS ON)

Humidity range specification: 40% TO 85% ± 10% OVER 15° TO 30°C

Each chamber's testing starts with a generic temperature calibration. The humidity is calibrated at this time if the unit is equipped with that option. Since we do not know exactly at what temperature or humidity our customer will be running the chamber, we select 25°C as a middle-of-the-road temperature calibration point. For chambers with dehumidification, we select 65% RH. For chambers with added humidity only, we select 85% RH.



Pre-Test Calibration Steps:

Note: We use the industry's best calibration logging devices that connect to temperature, humidity and CO₂ sensors. We send these devices to the manufacturer every six months to be tested for accuracy and to ensure we meet the standards set by the National Institute of Standards and Technology (NIST).

For this chamber example, we place the temperature and humidity sensors in the centermost point of the chamber. With the sensor placed, the chamber temperature is set to 25°C, and the humidity, in this case, is set to 65% RH with the lights off. The chamber is left to run until the temperature and humidity are stable at the above-mentioned set points.

1. Now, the testing technician notes what the display on the calibration logging device reads compared to the display on the chamber's IntellusUltra controller. Using the "Night" calibration offset, the controller on the chamber will be set to match the temperature and humidity readings on the logging device. (Example: Chamber reads 25°C and 65% RH, but the logging device reads 25.2°C and 68% RH.) The "Night" calibration offsets are used to harmonize the readings from the logging device to those of the chamber's controller.
2. Once these are stable, the lights are turned up to 100% intensity. Using the same temperature and RH set points, the "Night" offsets are repeated using the "Daytime" calibration offsets.



Note: We sell many different units that can operate within a large range of set points. There is no such thing as a one-size-fits-all approach to calibration. An end user who wants to operate a chamber at 18°C and 72% RH with lights set to 43% will get the most accurate results by calibrating at these specific set points.

Dehumidification Testing:

Now that the unit is calibrated, we can move on to the testing. The first test for this chamber is a dehumidification test. Our humidity range is 40% TO 85% ± 10% OVER 15° TO 30°C. This means that the lowest humidity level this unit is specified to make is 40% at temperatures between 15°C-30°C. Anything below this requires special components and will be noted on the production order. For both a dehumidification/humidification test, we run a full 24-hour test. A standard dehumidification test includes these four steps at the following set points:

- 12:00 AM: 30°C, 40% - Lights on 100%
- 5:00 AM: 15°C, 40% - Lights on 100%
- 12:00 PM: 15°C, 40% - Lights off
- 6:00 PM: 30°C, 40% - Lights off

The test is set up this way to push the refrigeration kit to heat up when the heat load is at its lowest and cool down when it is at its highest. If the test does not meet specifications at any of the four stages, the unit is flagged by the Testing Department, and they begin troubleshooting to find the source of the failure. After any changes are made, the entire 24-hour test is re-run until all four stages pass.

Humidification Testing:

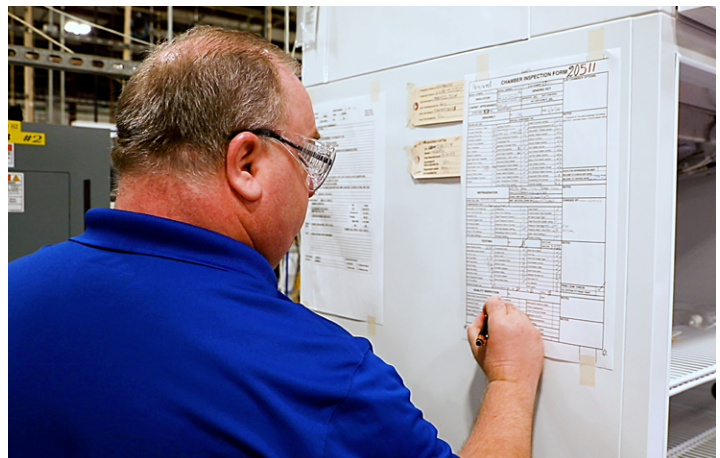
Once dehumidification testing is complete, we move on to the humidification test. This test ensures that the chamber can make and maintain the high end of the humidity level (85% in this case). The same four steps are used with the humidity set point changed from 40% to 85%. The procedure and retesting for any failures are the same as the dehumidification test.

Temperature Testing:

Once all humidity-related testing is done, we move on to the temperature test. Notice we only tested from 15°C-30°C on the previous two tests. The temperature range for this chamber is: 2°C TO 44°C ± 0.5°C (LIGHTS OFF), 4°C TO 44°C ± 0.5°C (LIGHTS ON). We turn off the humidity and dehumidifying channels and do a 24-hour test pushing the chamber to the high- and low-temperature ends of the specified range. This chamber will be programmed to run for several hours at 2°C with the lights off. After that, it is run up to 44°C with the lights off. This is to make sure the unit can reach the high end of the specified range with no help from the lights for heat. The unit is then run for 3.5 hours at 44°C to ensure the condensing unit will not overheat in these conditions. Next, it will be set to run down to what the specified lowest temperature is with lights on (in this case, 4°C). This will make sure the chamber can cool down from the highest end of the specified temperature range to the lowest against the heat load added by the lights.

Retesting and Check-Off:

If the chamber fails a test at any point in the process, it is flagged, and the issue is fixed. Then the test is repeated. Once the Testing Department has completed its testing checklist, the chamber is turned over for final check-off to a qualified Customer Support Team member with years of experience before it is allowed to go to shipping. No chamber goes to shipping without a check-off signature. Any flaws or issues found during check-off are shared with senior production staff to ensure proper training has been completed and the appropriate employees are made aware of the issue and why it is unacceptable.



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