MBW calibration

Chamber Validation

APPLICATION NOTE

Application Overview

Climatic chambers are in widespread use across many industries. They are used to simulate climatic conditions including temperature, humidity, pressure, vibration and light intensity. Conditions are controlled or varied according to user or test specifications. Products and samples are placed within the controlled environment according to defined test specifications that require certain conditions to be maintained. Examples include 40 °C / 75 %rh for drug stability and 85 °C / 85 %rh for military component testing. Confirmation that the correct environmental conditions have been achieved is a pre-requisite for compliance with the respective standards that apply in each industry.

The most common applications scenarios include:

- Pharmaceutical stability testing
- Electronic reliability testing
- Automotive component testing
- Plant growth chambers
- Aerospace/altitude testing
- Engine testing
- Military equipment testing
- Packaging testing

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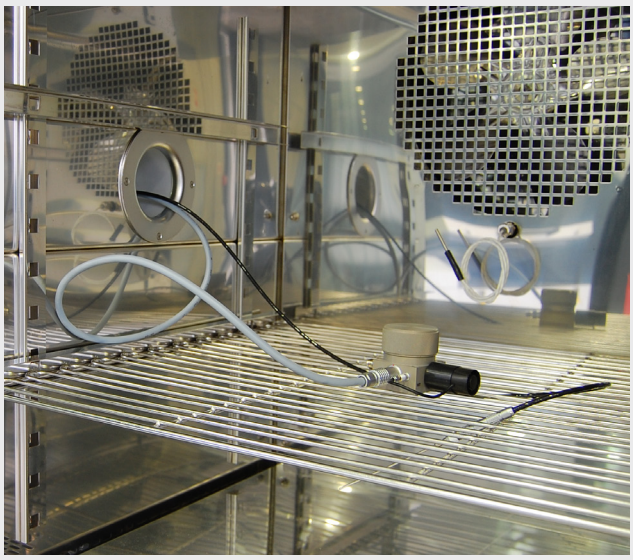
Example Test Specifications

Test Type	Application	Typical Conditions
ICH Protocols (e.g. Q1A)	Drug stability	20, 30, 45 °C, 60 %rh, 75 %rh
MIL	Military equipment	85 °C / 85 %rh
Salt Fog DIN50021	Corrosion testing	Up to an including saturation with respect to humidity



Importance of Chamber Validation

Validation of the chambers capability is performed periodically to achieve the required specifications and to comply with laboratory or regulatory standards. The chamber may be tested with and without load, depending on the nature of the product under test. During the procedure it is subjected to a performance test using calibrated instruments for both humidity and temperature in terms of the actual value attained, control stability and spatial distribution or gradients. The selection of the instrument used to measure the chamber performance will have an influence on the uncertainty that is assigned to the chamber calibration.

Measurement Options

Climatic chambers are typically controlled using RH probes or psychrometers (wet & dry bulb).
Both measurement technologies have certain limitations:

Psychrometers:

- Measurement performance is user and maintenance dependent
- Calibration can be difficult to verify with traceability to National Standards

RH probes:

- Measurement performance is temperature dependent
- Can drift over time, especially when esposed to high humidity and temperature conditions

In both cases, skilled users and good procedures can enable acceptable results, but calibration verification will still be a requirement to comply with best practise or as defined by standards such as ISO17025. Periodic comparison with a reference standard is the typical approach employed by most users or chamber service organisations. Standards vary from salt based systems, through transfer standard RH probes or psychrometers, to chilled mirror instruments.

Chamber Validation

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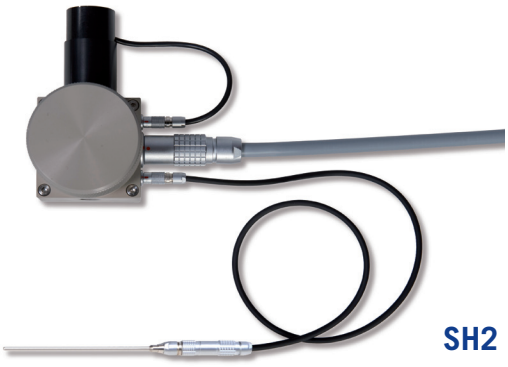
Chilled Mirror Solution for Chamber Validation

MBW Calibration and US partner RH Systems manufacture chilled mirror dew point hygrometers that are internationally used by standards laboratories at national, accredited and industrial level. The chilled mirror instruments are available in a range of versions covering frost/dew points from -95 to +95 °C. The MBW and RHS dew point mirrors incorporate all the features necessary to provide reliable and accurate measurements in all conditions.

The dew point hygrometers Model 473, 573, 973 and 373 can be used for this application. Most widely used is the 473 that features cable mounted dew point and temperature measurement that can be inserted into the test space to validate conditions over a wide range. The fundamental nature of the chilled mirror measurement technique used within dew point mirror hygrometers and their low drift characteristic allow for the lowest possible measurement uncertainty within chamber validation uncertainty budgets.

The frost/dew point measurement can be combined with multichannel temperature measurement such as the MBW T12. With such a measuremnt system spatial temperature and RH distribution can be measured, displayed and recorded for validation purposes.

473 Cable Mounted Measuring Heads with External PRT



SH2

RP2

Lower Measurement Uncertainty

Using a chilled mirror will typically reduce the overall measurement by up to 50% when compared to using an RH probe as a transfer standard. This is as a result of lower long-term drift, more precise temperature measurement and the lower uncertainty of accredited dew point calibration.

Advantages of Chilled Mirrors in Climatic Chamber Applications

- Low drift free measurement of dew/frost points and temperature
- Automated gas sampling at temperatures up to 100 °C
- Probe format chilled mirrors for direct insertion into the chamber working volume
- Self aspirated measurement heads
- Simultaneous measurement of temperature to permit calculation of relative humidity
- Fully self contained and easily transportable
- Integrated calibration verification function to allow on-site verification of instrument performance

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