





Humidity Measurement Instrument Comparison: Why Rotronic Holds the Competitive Edge Worldwide

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The Bubbler Testing System

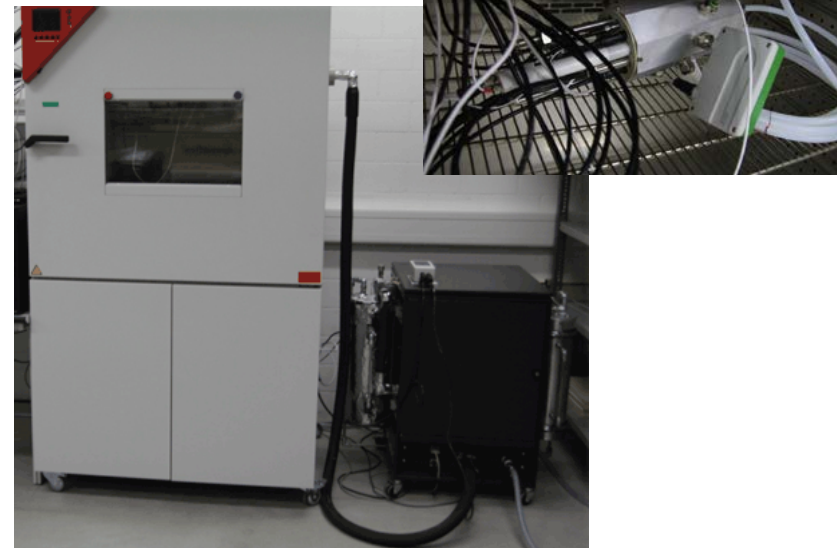
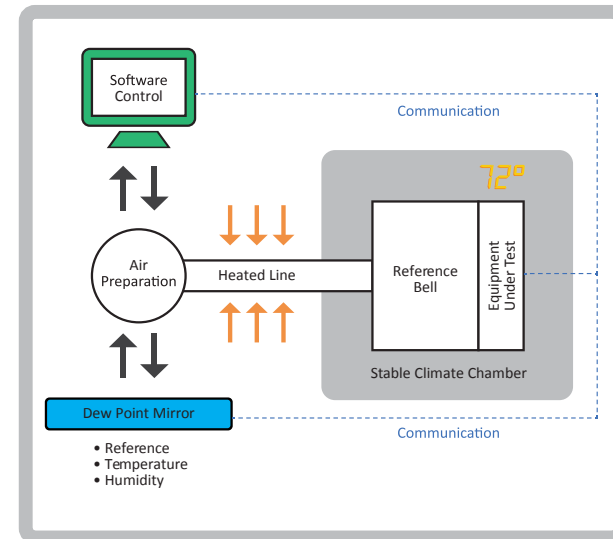
To compare Rotronic humidity testing instruments to those of competitors, the company designed a new high-tech climate system called “The Bubbler.” The machine generates precise relative humidity levels at different temperatures and allows for simultaneous testing of multiple devices in a uniform environment. Because it offers stable temperature and humidity conditions and is large enough to accommodate a variety of instruments, The Bubbler provides a fair and impartial environment for comparison. The Bubbler is software-controlled and provides highly accurate comparisons between the varied humidity instruments tested.

In the initial rounds of testing, The Bubbler was used to analyze and compare instruments made by E+E Elektronik, Vaisala, Testo, Galtec and Rotronic. The results are summarized below.

Product Overview:




Test Reference System





As a reference point during testing, we used the chilled Mirror MBW 373LHX to measure temperature, humidity and dew point. For our control we used the Rotronic Hygroclip HC2-IC.





Equipment Tested

	Name:	Technical Data:	Measurement Range:	Specification at 23°C:
	E+E Elektronik EE31	Output: Analog Power: 24VDC	-40...+180°C	±1.3% RH + (0.3% of MV) @ ≤90%RH ±1.7% RH @ >90%RH
	Galtec #PMU-VZS.H	Output: Digital Power: 5VDC	-60...+200°C	±1.5% (10...90%RH) ±2.0% (<10 and >90%RH)
	Rotronic HF532+HC2-S	Output: Analog + digital Power: 24VDC	-50...+100°C	±0.8% RH (10°C... +35°C)

	Name:	Technical Data:	Measurement Range:	Specification at 23°C:
	Rotronic HF532+HC2-IC102	Output: Analog + digital Power: 24VDC	-100... +200°C	±0.8% RH (10°C... +35°C)
	Testo Testo6617+6681	Output: Analog Power: 24VDC	-40... +180°C	±1.2% RH +(0.007mv) @ ≤90% RH ±1.6% RH +(0.007mv) @ > 90% RH
	Vaisala HMT335	Output: Analog Power: 24VDC	-40... +180°C	±1%RH (0...90%RH) ±1.7 % RH (90...100%RH)
	Vaisala HMT360	Output: Analog Power: 24VDC	-70°... +180°C	±1%RH (0...90%RH) ±1.7 % RH (90...100%RH)

Accuracy Control Testing

The Process:

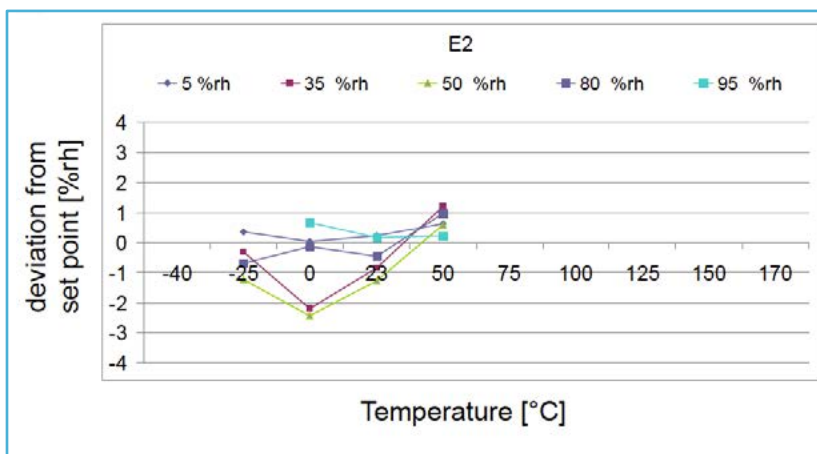
To compare the accuracy of the devices, they are all mounted in The Bubbler's reference bell, which provides equal conditions for testing.

The test conditions follow:

1. Full humidity range at 0°C, 23°C, 50°C and 70°C
2. Humidity range limited by the product specification at -25°C and -40°C
3. Humidity range limited by the product specification at 100°C, 125°C, 150°C and 170°C

Instruments are acclimatized for at least two hours as the conditions are changed and the measured reference values must be stable for 20 minutes prior to beginning each test. As soon as these conditions are met, the initial measurement is recorded and the testing phase begins.





Name:

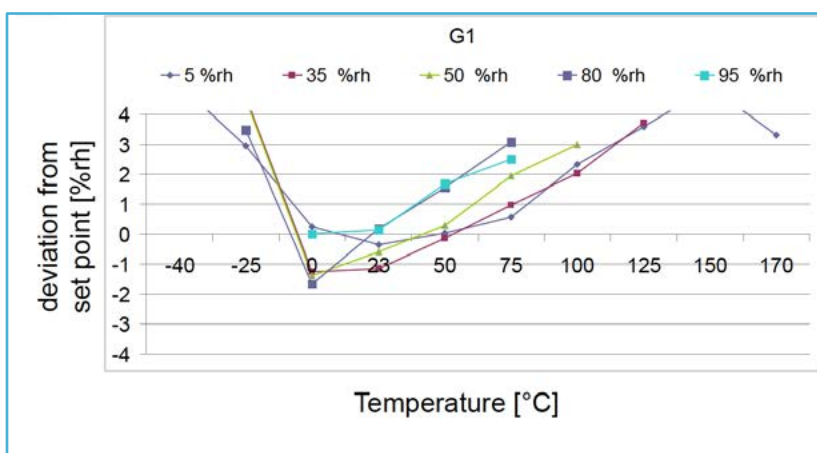
E+E Elektronik EE31

Specification:

$\pm 1.3\% \text{ RH} + (0.3\% \text{ of MV})$
 @ $\leq 90\% \text{ RH}$
 $\pm 1.7\% \text{ RH}$ @ $> 90\% \text{ RH}$

Results:

Out of spec at 35% and 50% RH at 0C.



Name:

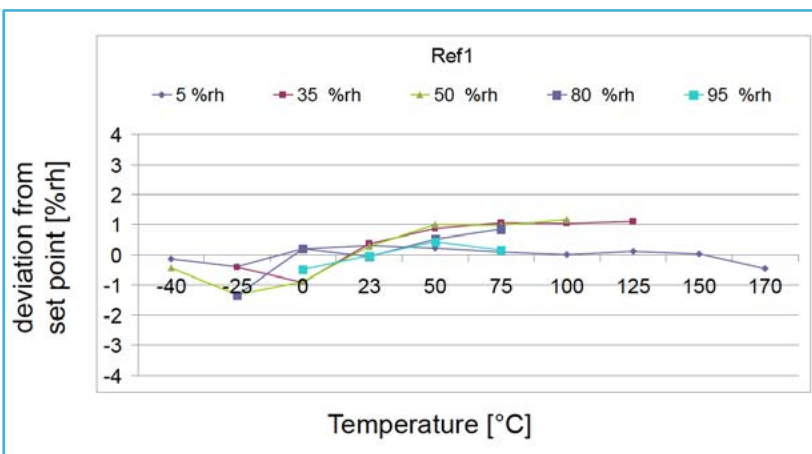
Galtec #PMU-VZS.H

Specification:

Output: Digital
 Power: 5VDC
 $\pm 1.5\%$ (10...90%RH)
 $\pm 2.0\%$ (<10 and >90%RH)

Results:

In spec from 0-30°C,
 Out of spec above and below.



Name:

Rotronic HC2-IC

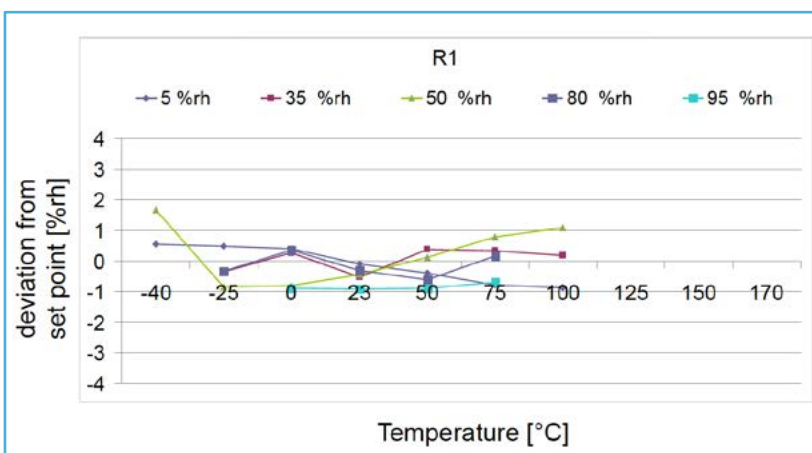
Specification:

Output: Analog + digital
Power: 24VDC

±0.8% RH (10°C... +35°C)

Results:

Meets specifications at all points.



Name:

Rotronic HF532+HC2-s

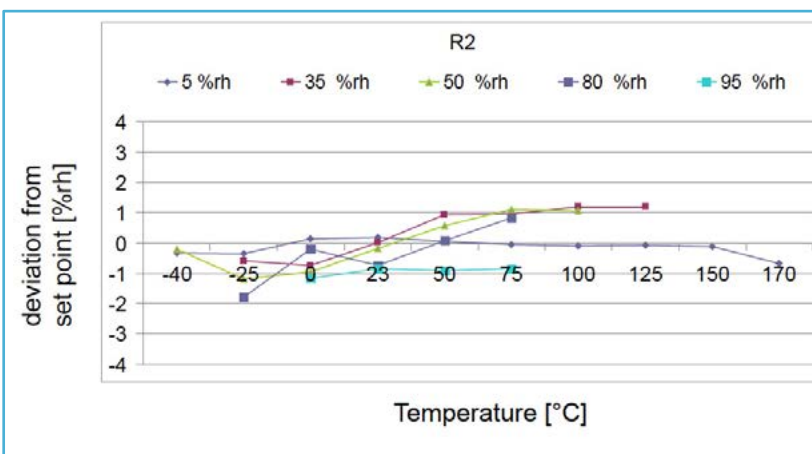
Specification:

Output: Analog + digital
Power: 24VDC

±0.8% RH (10°C... +35°C)

Results:

Meets specifications at all points



Name:

Rotronic HF532+HC2-IC102

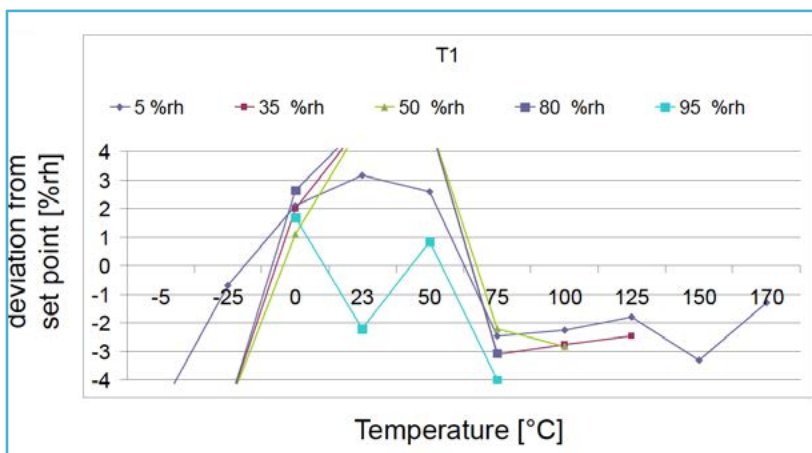
Specification:

Output: Analog + digital
Power: 24VDC

$\pm 0.8\%$ RH (10°C... +35°C)

Results:

Meets specifications at all points



Name:

Testo - Testo6617+6681

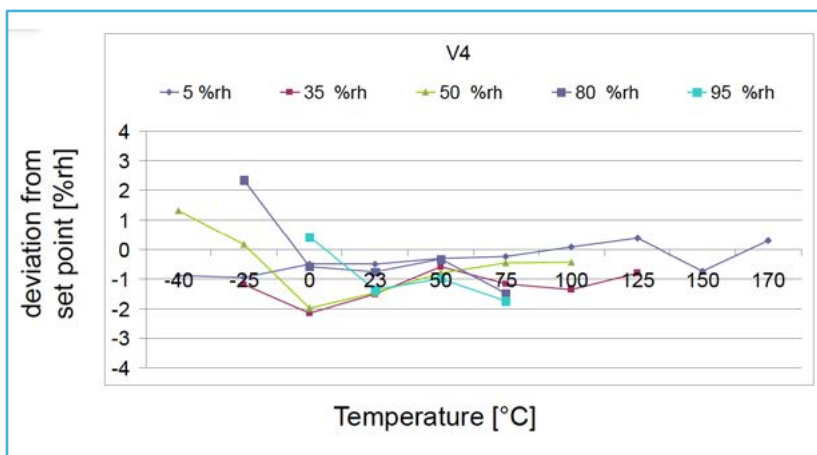
Specification:

Output: Analog
Power: 24VD

$\pm 1.2\%$ RH +(0.007mv) @ $\leq 90\%$ RH
 $\pm 1.6\%$ RH +(0.007mv) @ $> 90\%$ RH

Results:

Out of spec with a typical deviation of $\pm 4.5\%$ rh.



Name:

Vaisala HMT335

Specification:

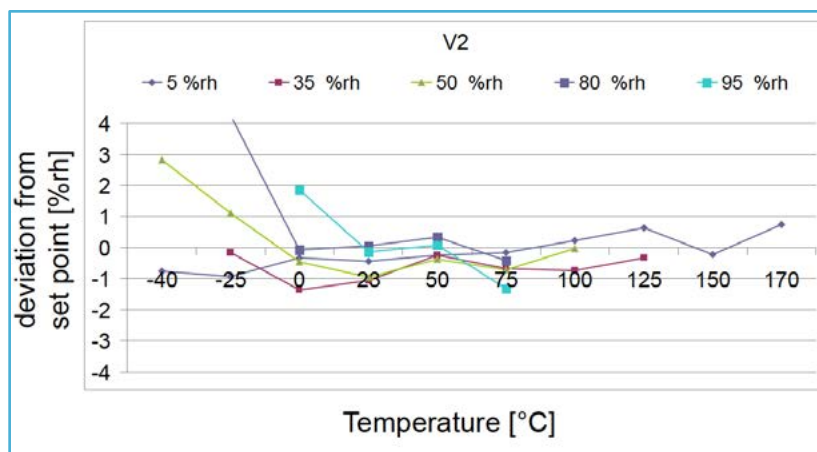
Output: Analog
Power: 24VDC

±1%RH (0...90%RH)

±1.7 % RH (90...100%RH)

Results:

Out of spec at lower than -25°C and in the higher humidity range.



Name:

Vaisala HMT360

Specification:

Output: Analog
Power: 24VDC

±1%RH (0...90%RH)

±1.7 % RH (90...100%RH)

Results:

Out of spec at lower than -25°C, with over 1.5%rh error.

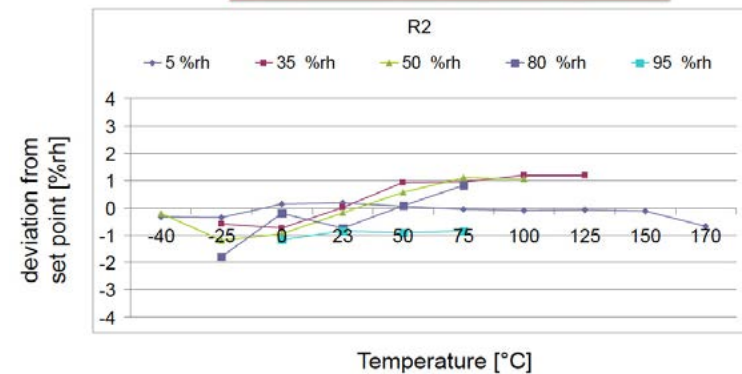
Summary

After exhaustive testing under stringent and controlled conditions, it is clear that only Rotronic humidity probes were demonstrated to meet their own published specifications. Although some other brands were close, they were not able to demonstrate 100% compliance.

When reliability, repeatability and accuracy are your primary concerns, only Rotronic has been proven to deliver on its specifications.

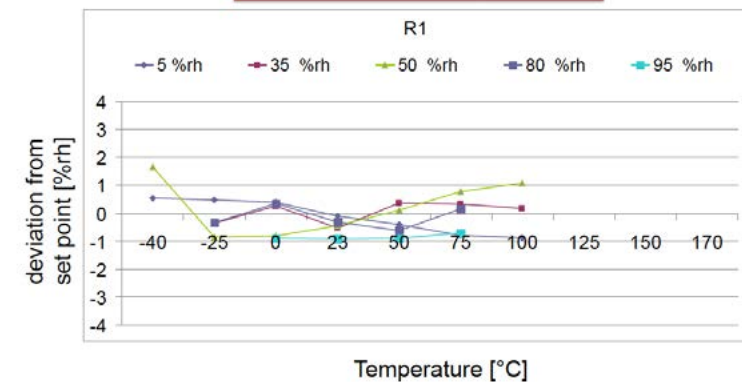


Rotronic HF532 & HC2-IC102



Complete range, very good

Rotronic HF532 & HC2-S



Good results

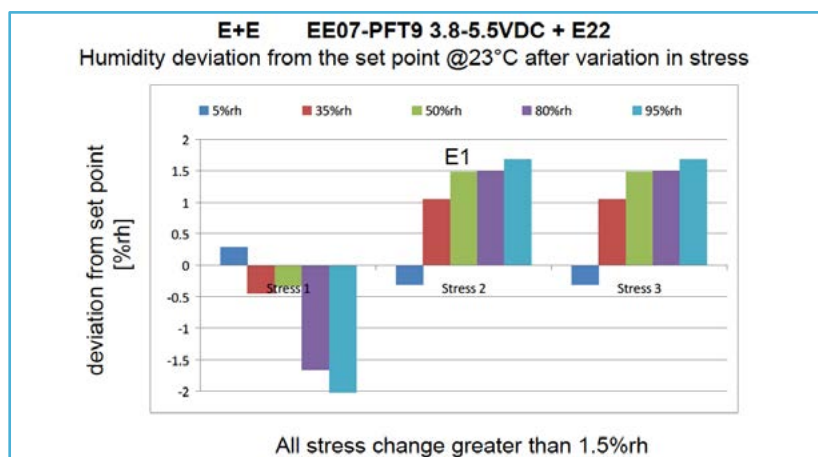
Stress Testing

The Process:

The Stress Test is designed to measure long-term stability tolerance of the sensors. Stress testing is performed in three phases. In the first, the instruments are calibrated at 5%, 35%, 50%, 80% and 95% at 23°C followed by a two hour immersion of the instruments at 70°C and 95%rh. After the two-hour period, each instrument is calibrated again at the same points and temperature. In the second phase stress test, each humidity instrument is again calibrated at the same points as listed above prior to beginning the test. The instruments are immersed for two hours at 90°C and 90%rh followed by another calibration. In the third phase, the instruments are calibrated again before and after two hours immersed at 140°C and 0.5%rh.



Stress Testing Results, as measured by the humidity deviation from the set point at 23°C after variation in stress:



Name:

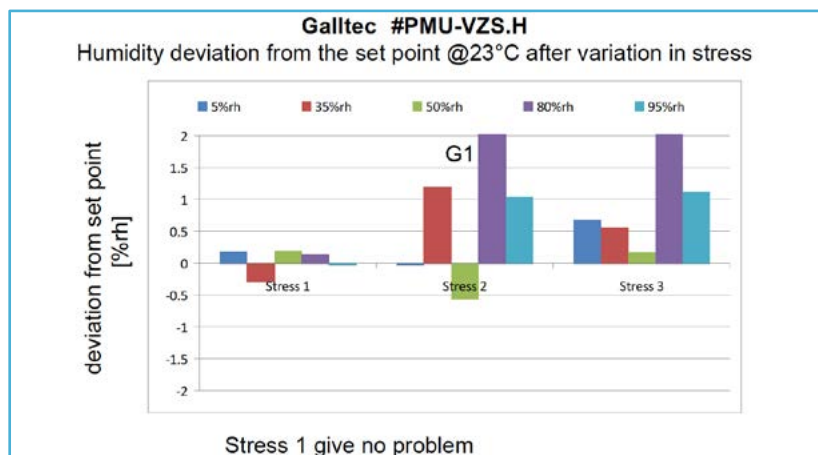
E+E Elektronik EE31

Specification:

None Specified

Results:

Stability not specified. Stress1 and Stress 3 caused > 1.5% variance at several points.



Name:

Galtec #PMU-VZS.H

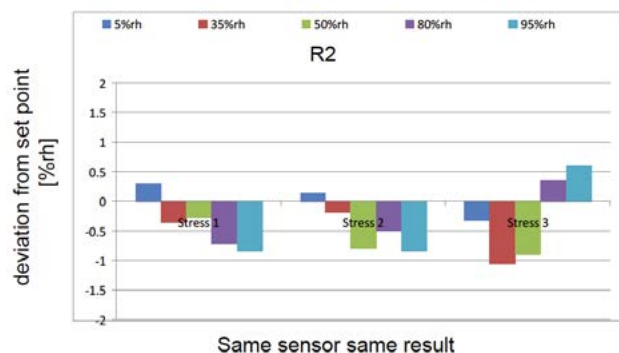
Specification:

None Specified

Results:

Stability not specified. Stress 3 caused > 2% variance at 80% in both step 2 and 3

ROTRONIC HF532 + HC-IC 102
Humidity deviation from the set point @23°C after variation in stress



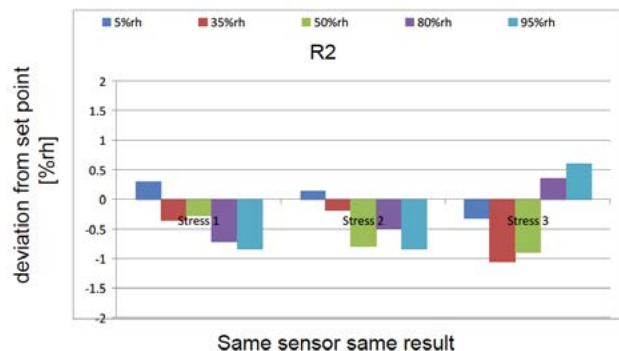
Name:

Rotronic HC2-IC

Specification: < 1% RH drift per Year

Results: Meets specifications

ROTRONIC HF532 + HC-IC 102
Humidity deviation from the set point @23°C after variation in stress



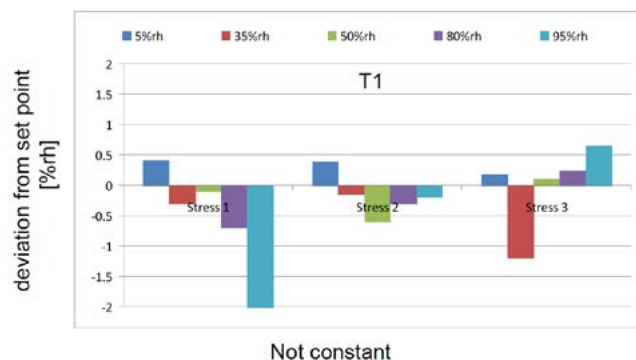
Name:

Rotronic HF532+HC2- IC102

Specification: < 1% RH drift per Year

Results: Meets specifications

Testo testo 6617 + 6681
Humidity deviation from the set point @23°C after variation in stress



Name:

Testo - Testo6617+6681

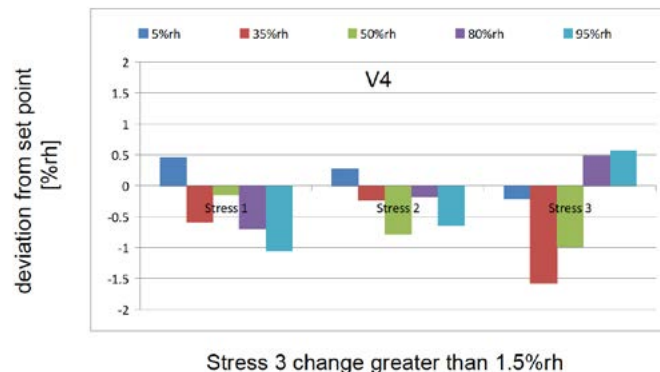
Specification:

None Specified

Results:

Stability not specified. Stress 1 and Stress 3 show high variances

Vaisala HMT335
Humidity deviation from the set point @23°C after variation in stress



Name:

Vaisala HMT335

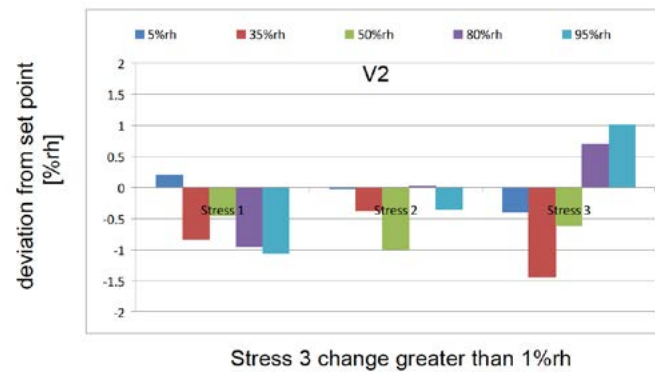
Specification:

None Specified

Results:

Stability not specified. Stress 3 caused > 1.5% variance at 35% RH

Vaisala HMT360
Humidity deviation from the set point @23°C after variation in stress



Name:

Vaisala HMT360

Specification:

None Specified

Results:

Stability not specified. Stress 3 caused > 1.5% variance at 35% RH

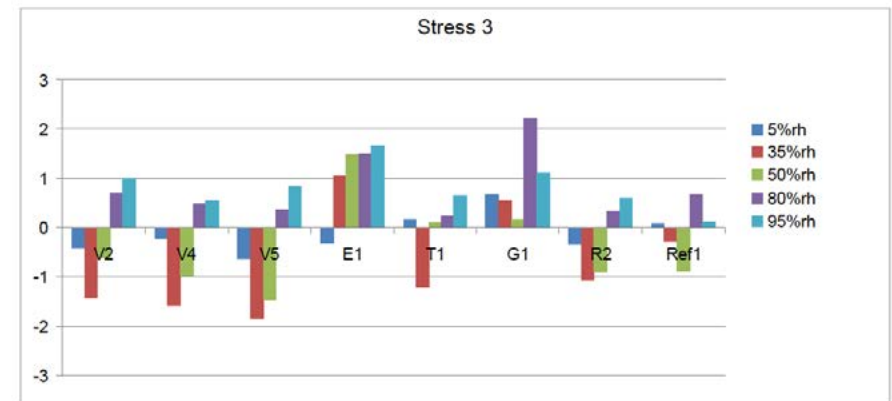
Summary

The graph shows the humidity deviation from the set point after phase 3. As you can see, the Rotronic devices show the most stable values across all of the varied climate conditions. Stress testing gives a strong indication of the long-term stability of the various sensors. Rotronic is the only company to specify stability and the only sensor to meet accepted drift range of 1%RH or less per year.

When tested under stress conditions designed to test the long-term stability performance of the probes, Rotronic was the only humidity probe with published stability specifications able to meet the strict specifications under the rigorous stress test conditions.



Humidity deviation from the set point after **Test phase 3**



most stable values by ROTRONIC



Summary

As demonstrated by the Bubbler testing, specifications do not equate to performance. Because there is no real physical standard for relative humidity calibration, inaccurate specifications for humidity instruments is a rampant problem among instrument providers – more common than with many other types of instruments. This abuse leads to specifications that are of limited value when comparing instruments from various manufacturers. You must closely assess the specifications and claims of instrument manufacturers.



Carefully examine the supplier's claims and support documentation in the following areas:

- Sensor linearity
- Temperature constants
- Hysteresis
- Calibration errors
- Long-term stability of sensor and electronics

>> About Rotronic

Rotronic offers a comprehensive line of reliable humidity probes, humidity indicators and meters, humidity data loggers and fixed installed humidity transmitters to precisely measure relative humidity, dew point, water activity, temperature and other psychrometric parameters. Our water activity instruments give accurate results within a few minutes and are primarily used in the food and pharmaceutical industries. We also offer a fast equilibrium humidity temperature generator - calibrator as well as humidity sensors and custom designed modules for OEM customers.

Applications range from commercial HVAC and building management systems, to weather stations, test and research laboratories, industrial process measurement / control, and product quality control.

Problem-free, accurate humidity measurement results from the most stable sensor in the industry combined with our unique HygroClip® digital probe technology, designed to practically eliminate any maintenance downtime.

Learn more at rotronic-usa.com. If you have any questions, please contact your Rotronic representative.

Our main office number is **631-427-3898**.