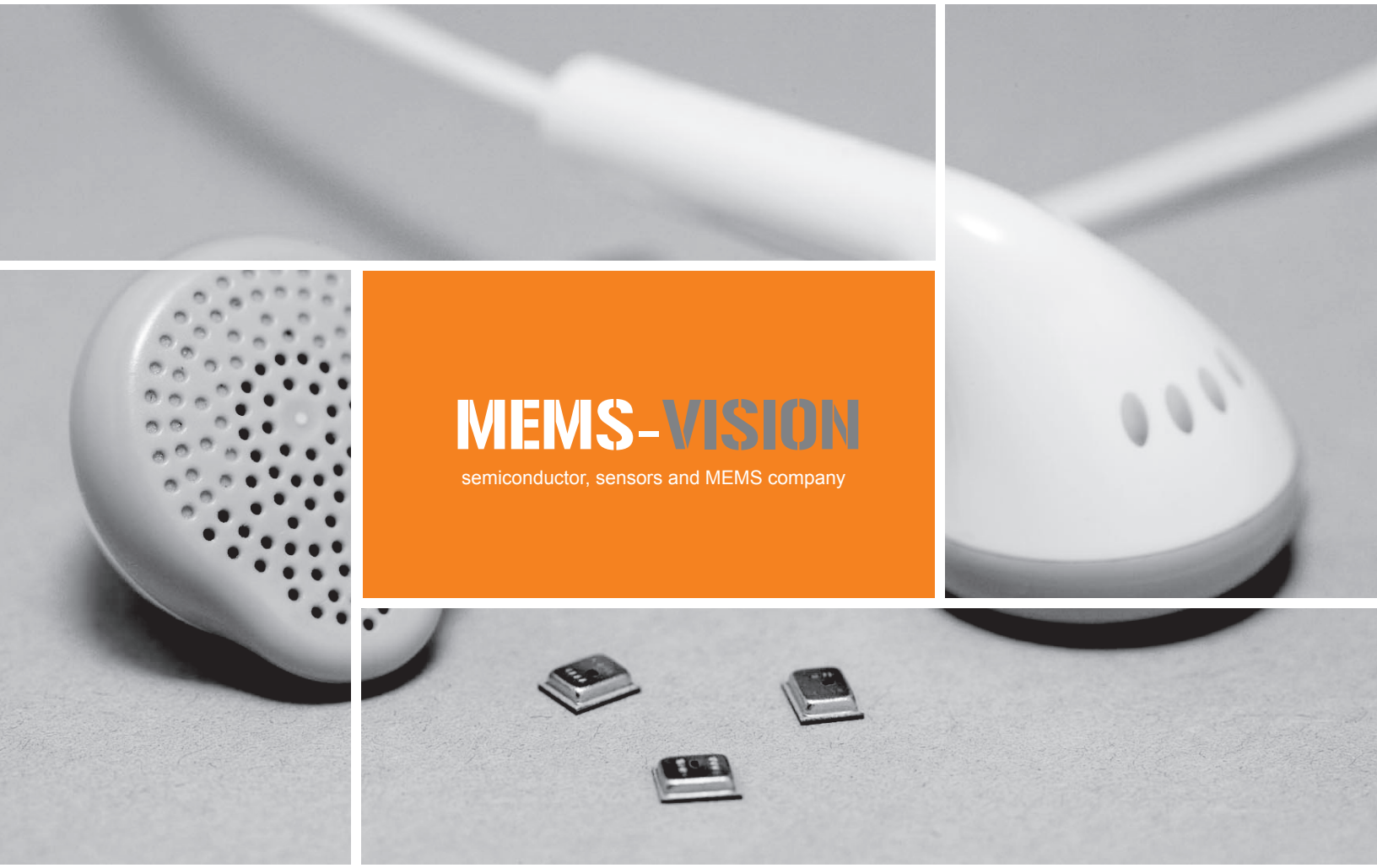


MEMS-VISION

semiconductor, sensors and MEMS company

Technical Note – Measurement Guide for MVH Relative Humidity and Temp. Sensors

This technical note presents guidelines on how to accurately test the performance of MEMS Vision's high-quality relative humidity / temperature sensors. This document applies to the following series of sensors:

- MVH3200D digital relative humidity and temperature sensor series
- MVH3200D-M digital relative humidity and temperature sensor modules

It is also important to carefully review the datasheet of the sensor in use before integrating it into a system and performing tests.

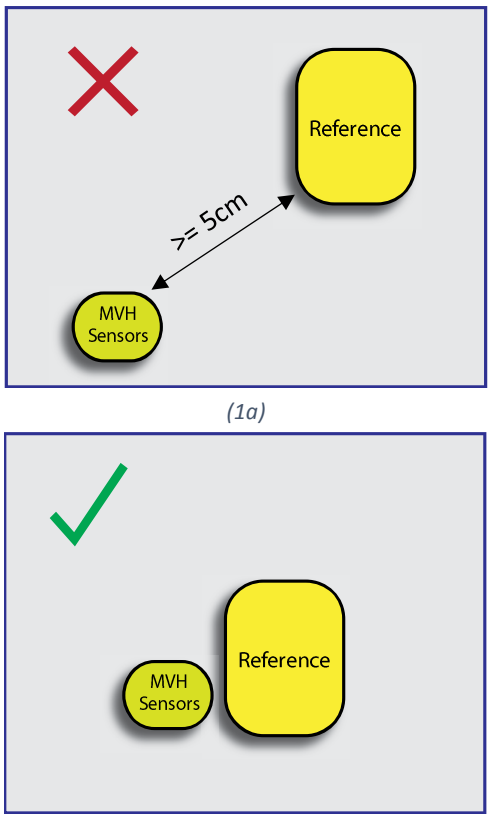
1. General Testing Guidelines

Each MVH sensor is calibrated individually before shipment using:

- Precision equipment to control the relative humidity / temperature.
- High accuracy relative humidity and temperature references that are periodically calibrated by an ISO / IEC 17025 accredited laboratory to provide traceability to national standards, e.g., the National Institute of Standards and Technology (NIST) in the USA.

This high-quality equipment, combined with our rigorous testing protocols, ensures that all MVH series sensors are of the highest quality. In order to properly test the MVH series of sensors, the following guidelines should be followed:

- Always take sensors from their **original packaging**.
- It is best to use a sample size of **5 to 10 sensors**.
- Ensure the **guidelines for proper soldering of humidity sensors are followed**. These guidelines can be found in the technical note "Soldering Considerations for MVH Sensors".
- **Ensure the sensors have been re-hydrated after soldering** by exposing the sensors to a relative humidity of 75% RH at room temperature (20°C to 30°C) for at least 12 hours, or a relative humidity of 40% to 60% RH for 5 days.
- **If the storage conditions of the sensors are unknown** (e.g., not in their original packaging, or soldered on a PCB and not stored properly), expose the sensors to the re-conditioning procedure of:
  1. Baking the devices at a temperature of ~100°C with a humidity < 10% RH for 10-12 hours.
  2. Rehydrating the sensors at a humidity of 75% RH at room temperature (20°C to 30°C) for at least 12 hours, or a relative humidity of 40% to 60% RH for 5 days.
- When testing the sensors, it is important to use a **high-quality RH reference** (e.g., a recently calibrated RH probe, or a recently calibrated chilled mirror) for comparison purposes.
- **Make sure that the RH reference and the sensors being tested experience the same relative humidity and temperature conditions during the test (see Fig. 1)**. If possible, it is best to use a professional humidity chamber that is known to provide a stable and uniform relative humidity and temperature. If this type of equipment is not available, a closed box can be used. Please ensure that there are no materials that can affect the humidity and temperature inside the closed box. It is recommended to use a stainless steel box for this type of setup.



(1a)

(1b)

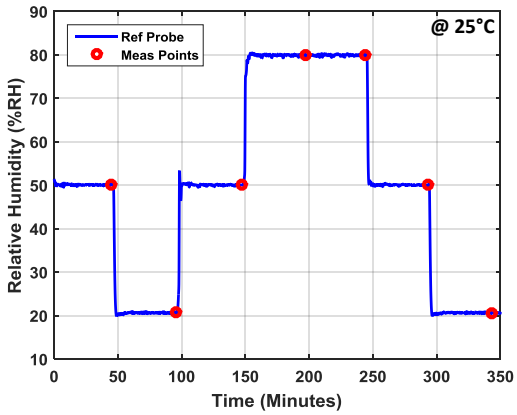
Fig. 1 – Example of (a) an appropriate measurement setup and (b) an inappropriate measurement setup

- **Allow at least 45 minutes** for the relative humidity conditions inside the test enclosure to stabilize before measuring the devices. **Additional stabilization time may be required for the first point or after a temperature change** to ensure that all devices are at the same temperature.
- When measuring the devices, it is recommended to use a frequency of **1 measurement per second**, and to **take the average of 10 measurements at each point** to account for any noise in the humidity / temperature conditions within the chamber.
- **Relative humidity is strongly dependent on temperature.** As such, it is recommended to record both relative humidity and temperature data for all measurements to see if this could be a source of measurement error.

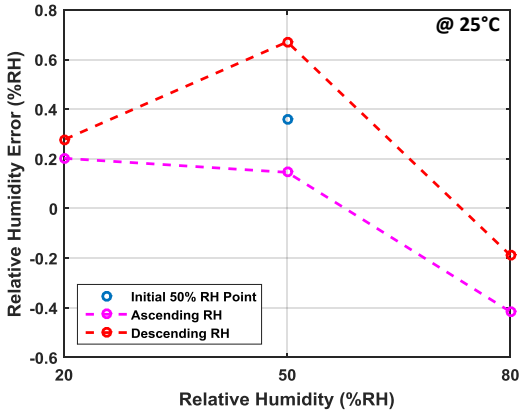
2. Testing Relative Humidity Accuracy

It is recommended to run the following profile to compare the measurements of the sensors to datasheet specifications:

- **Temperature: 25°C**
- **RH Points: 20% RH -> 50% RH -> 80% RH**
- **Stabilization Time at each Point: 45 minutes**



(2a)



(2b)

Fig. 2 – Example of (a) the recommended relative humidity profile and (b) the resulting RH error for the ascending and descending portions of the profile.

This profile can also be run in ascending and descending humidity levels to measure the hysteresis of the humidity sensors. Fig. 2a shows the recommended profile with a 45-minute stabilization time at each point before the measurements are made, and Fig. 2b shows the resulting error with respect to the reference probe for an MVH3201D sensor. The error for the ascending and descending humidity levels is shown, and this data can be used to calculate the hysteresis of the sensor.

3. Testing Temperature Accuracy

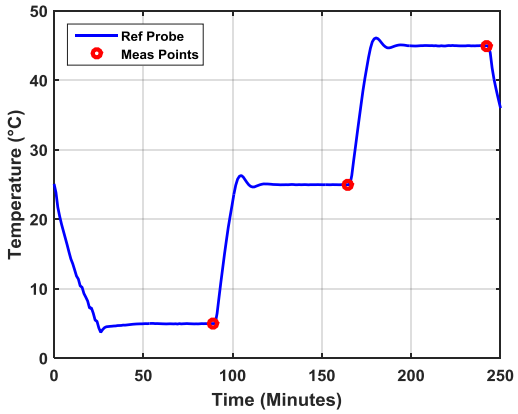
The same general guidelines apply for testing the accuracy of the temperature sensor in the MVH3200D sensors **– a high accuracy reference must be used, and the setup must ensure that the reference and the MVH3200D sensors experience the same temperature.**

Changes in the ambient temperature typically take longer than changes in relative humidity, and this will depend strongly on the size and weight of the products being tested, as well as the environmental chamber in use. **It is recommended to wait at least 60 minutes each time the temperature is changed, although this stabilization time may need to be longer depending on the setup in use**.

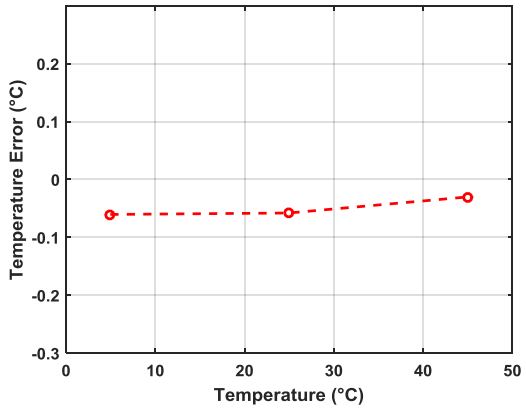
It is recommended to run the following profile to compare the measurements of the sensors to datasheet specifications:

- **Temperature Points: 5°C -> 25°C -> 45°C**
- **Stabilization Time at each Point: 60 minutes**

Fig. 3a shows the recommended profile with a 60-minute stabilization time at each point before the measurements are made, and Fig. 3b shows the resulting error with respect to the reference probe for an MVH3201D sensor.



(3a)



(3b)

Fig. 3 – Example of (a) the recommended temperature profile and (b) the resulting temperature error.

MEMS VISION is a leading semiconductor, sensors and MEMS company providing cutting-edge miniaturization solutions to the $5B sensors and high performance electronics markets. The company capitalizes on a strong portfolio of patents and intellectual property on MEMS and ICs, and a team of highly qualified personnel, to offer a wide range of sensors related products and services to its customers and partners.

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