Testing Guide

For SHTxx Relative Humidity & Temperature Sensor Series

Introduction

This Qualification Guide defines how Sensirion is testing the various performance parameters of humidity and temperature sensors. Furthermore, it shall help to test and qualify the sensors reliably in due time. It is of great importance that all applicable documents (Datasheet, Users Guide and Handling Instructions) are carefully studied before integration, testing and qualification of the sensor.

Sensor Testing and Qualification

For calibration and end testing of RH sensors Sensirion is using expert calibration equipment and procedures to guarantee highest precision and reliability. In order to ensure consistent testing of Sensirion's SHTxx relative humidity & temperature sensors the following preparing items should be carefully considered:

a) *Test Objects:* The test series should consist of at least 5-10 sensors, which should be taken out of the original packaging.

b) *Conditioning:* Make sure that sensors have not been contaminated prior to the testing. Original packaging should not have been fixed with scotch tape, packaging should not have been stored in plastic bags. If you are unsure whether sensors might have been contaminated or not, follow re-conditioning procedure (80-90°C [176-194°F] at < 5%RH for 24h (baking) followed by 20-30°C [70-90°F] at > 74 %RH for 48h (re-hydration).

c) *Re-hydration after soldering:* In case sensors have been soldered to a PCB board please make sure that re-hydration procedure (20-30°C [70-90°F] at >74%RH for 48 hours) has been applied after soldering.

d) *Test set-up:* Make sure that test and reference sensor experience equal humidity and temperature conditions. If possible apply a professional humidity chamber. If such a chamber is not available put the reference and test sensor into a closed box and give the set up time to homogenize. Please make also sure that in the humidity housing there are no humidity absorbing materials present near the sensors - materials like silicone sealing, rubber, etc.

e) *Reference sensor:* The reference sensor should be of high reliability. If possible apply a dew point mirror or recently calibrated RH probes.

Testing RH Accuracy

It is recommended to run the following test profile: Set temperature to 25°C (77°F) and run a low – medium – high RH profile (e.g. 15% – 50% – 90%) and check hysteresis with a high – medium – low RH profile (e.g. 90% – 50% – 15%). See also Figure 1. Allow at least 45 minutes settling time at each relative humidity set-point, before starting a measurement.

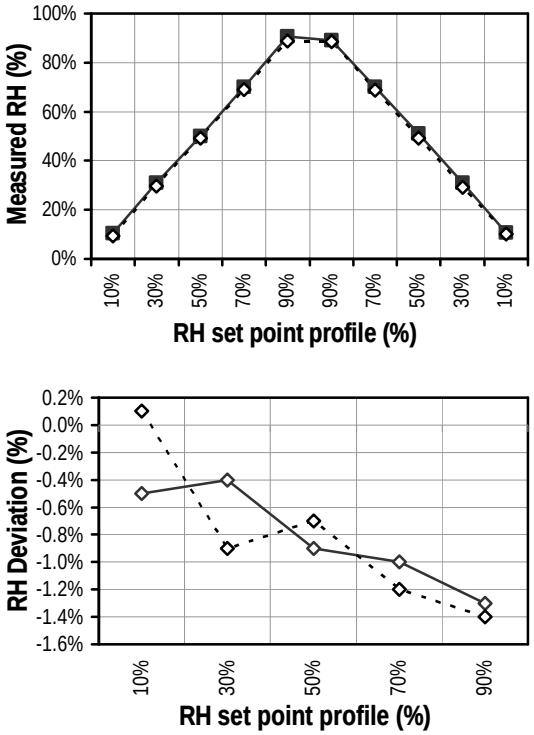

Figure 1 Top Panel: Measurement profile for accuracy testing (full squares: reference, open diamonds: test sensor). Lower Panel: RH deviation profile, full line: ascending order, hatched line: descending order.

IMPORTANT: Relative humidity is highly temperature dependent. During the measurement the temperature of reference and test sensor must show the same value to make RH values comparable. For your test records it is highly

recommended to note RH and T for each set-point and sensor.

It is also recommended to operate the SHTxx sensors with EK-H3 or EK-H4 in order to avoid communication or conversion errors.

Testing RH Response Time

For properly measuring RH response times a test set-up shall guarantee a step function from dry air to humid air at the very same temperature, or vice versa. Therefore, the following test set-up is recommended – compare with Figure 2. The sensor is placed into a small box. Across a rotary valve this test chamber shall be fed with dry air – taken from compressed, oil-free air – and humid air – taken from a humidity chamber. As the compressed air cools down with expansion, the temperature shall be brought to room temperature by a heater. The heater alternatively can be placed between air bottle and rotary valve or between rotary valve and test chamber. The tubing between the valve and the test chamber shall be kept as short as possible. This allows for an abrupt change from dry to humid air.

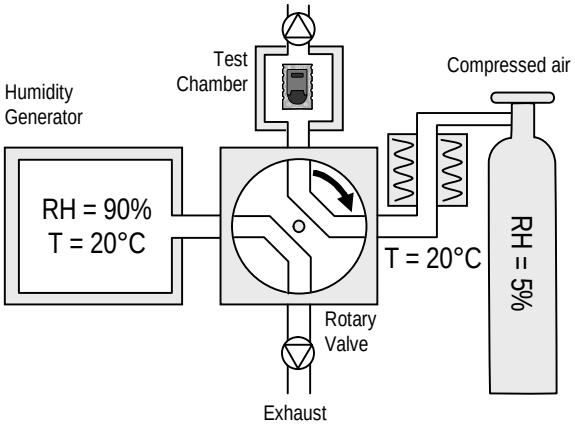

Figure 2 Response time test set up. Dry air from compressed air is blown into test chamber with sensor – a heater makes sure the air is at room temperature. With a rotary valve the relative humidity is taken from a humidity chamber and therefore abruptly changed from low to high.

To start the measurement blow dry air into the sensor box and give the sensor time to display a constant value. It should be in the range of 5 - 10%RH. Control the temperature carefully as well. Then change the air source abruptly and make sure the temperature remains constant. In order to avoid any temperature changes it is recommended to run the measurement at ambient temperature.

The data should behave roughly inverse exponential – see Figure 3. The SHTxx sensors readings shall change 63% of the full RH step within less than 8 seconds. For example if the RH step is between 10% and 90% then the RH value shall read >60% within 8 seconds. Please note, that for the last few percentages to complete the full step the response curve will develop with a ilower time constant.

There is an alternative option to measure response time in a very simple and effective way – which, however, may not fulfill scientific standards: Put the sensor into a humidity chamber with high humidity (90% for example) or if no humidity chamber is available, put the sensor into a closed box with an open glass of water. Make sure that the temperature inside the chamber or box is equal to the outside temperature. Start measuring (for example with the EK-H2 system) and when the values are high and stable immediately quit the sensor from the box or chamber and expose it to the outside conditions. Give the sensor enough time to stabilize the RH value and this way define the full RH step. Now, response time can be derived from the data.

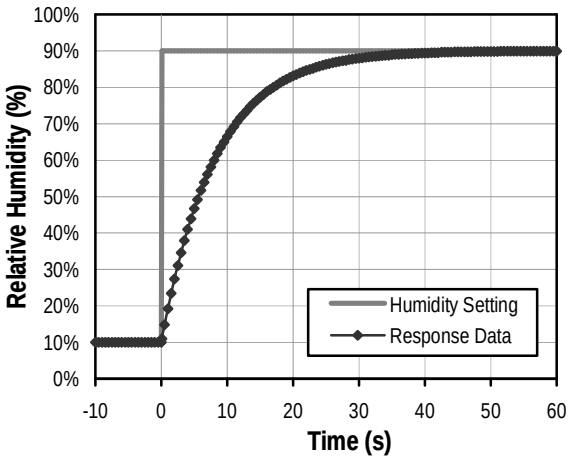

Figure 3 Measurement profile of response time testing

Revision History

Date	Revision	Changes
10 March 2008	1.0	First Release
04 September 2008	1.1	Add Section 1.1
5 May 2010	1.2	Complete rework: New title (former title was “Qualification Guide” and more information how Sensirion does the out going quality test. No changes to the existing contents.

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