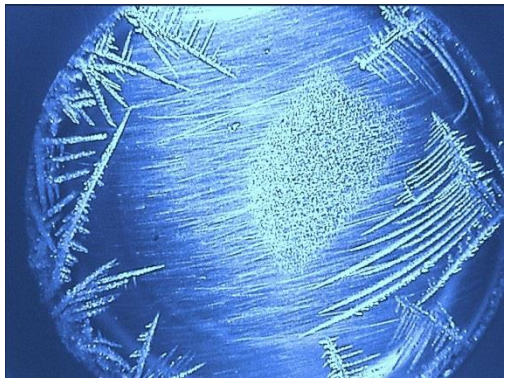
VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD
Centre for Metrology MIKES

MIKES METROLOGY



Calibration of humidity sensors at non-static conditions

14IND11 HIT, M24 Meeting, PTB Braunschweig

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HIT

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MIKES METROLOGY

Contents

- Introduction
- Modular humidity calibration setup
- Measurements
- Future

Introduction

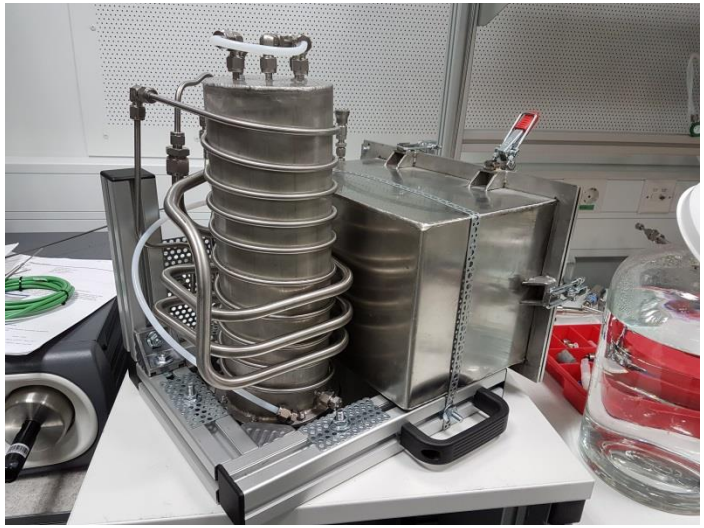
- Calibrations are currently performed at static conditions:
  - Time consuming, i.e. expensive
    - Often a minimum number of measurement points to reduce costs: Representativeness to actual measurement conditions?
    - Hysteresis is often significant but often not included
  - In many cases RH probes are used at non-static conditions
- Target of this work:
  - Efficient but comprehensive calibration procedure based on measurements at non-static conditions

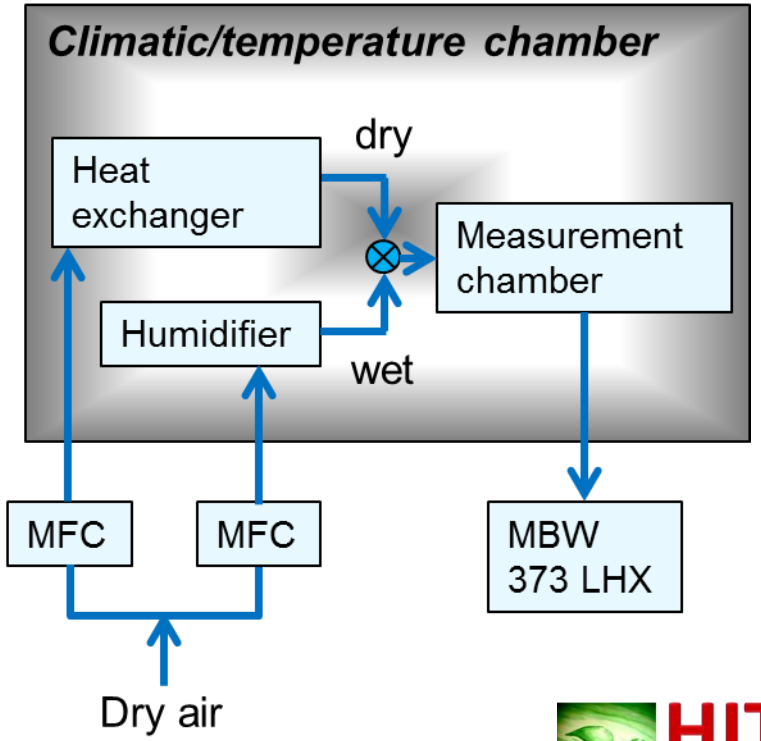
A new modular humidity calibration setup developed at VTT MIKES

- The system can easily be installed any commercial temperature test chamber with inner volume of 200 dm^3 or larger
- A LabView program enables automatic calibrations in static and non-static conditions

A new modular humidity calibration setup developed at VTT MIKES

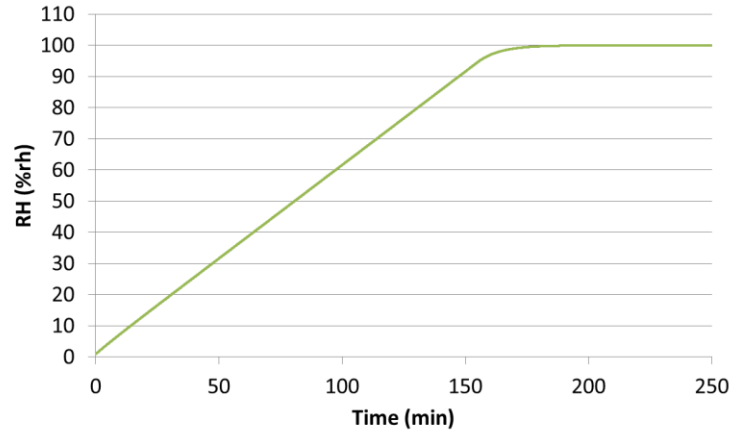
- Humidity is controlled by two mass flow controllers located outside the temperature test chamber
- Quick couplings for easy assembling
- Heater in the humidifier to compensate evaporative cooling

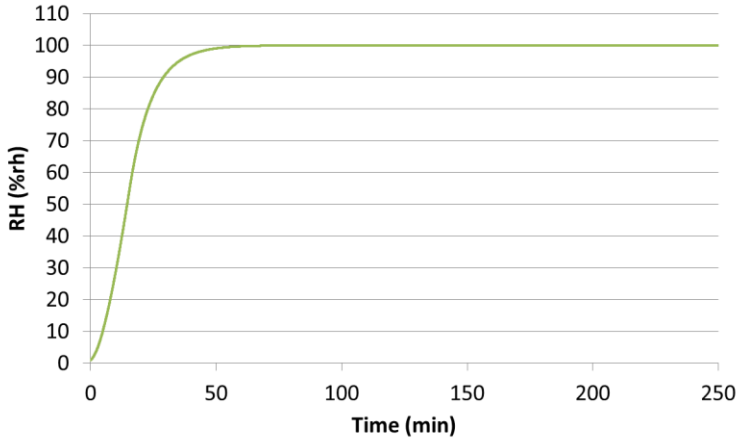




Slow ramp configuration

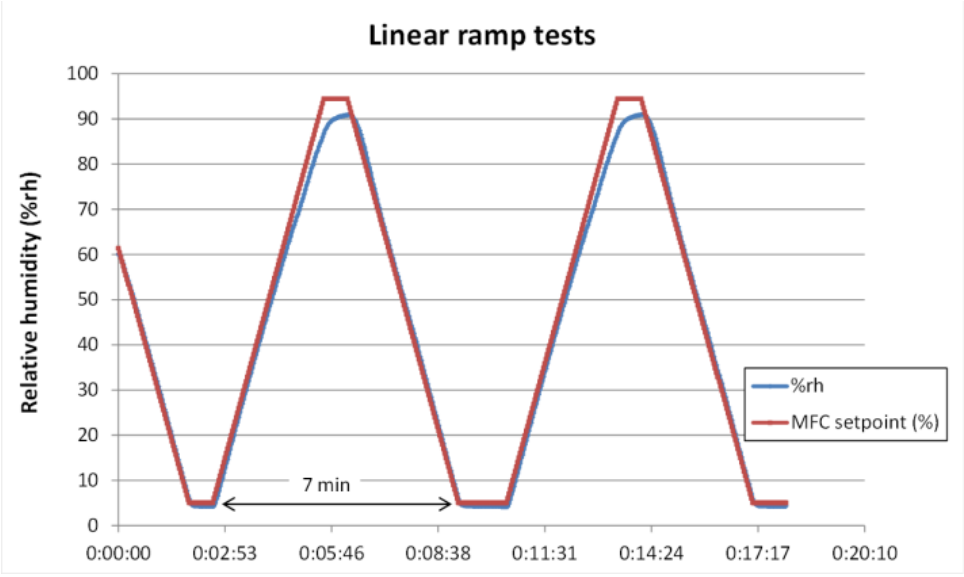
- Speed is limited by the volume (12 dm^3; flow rate 1 dm^3/min)

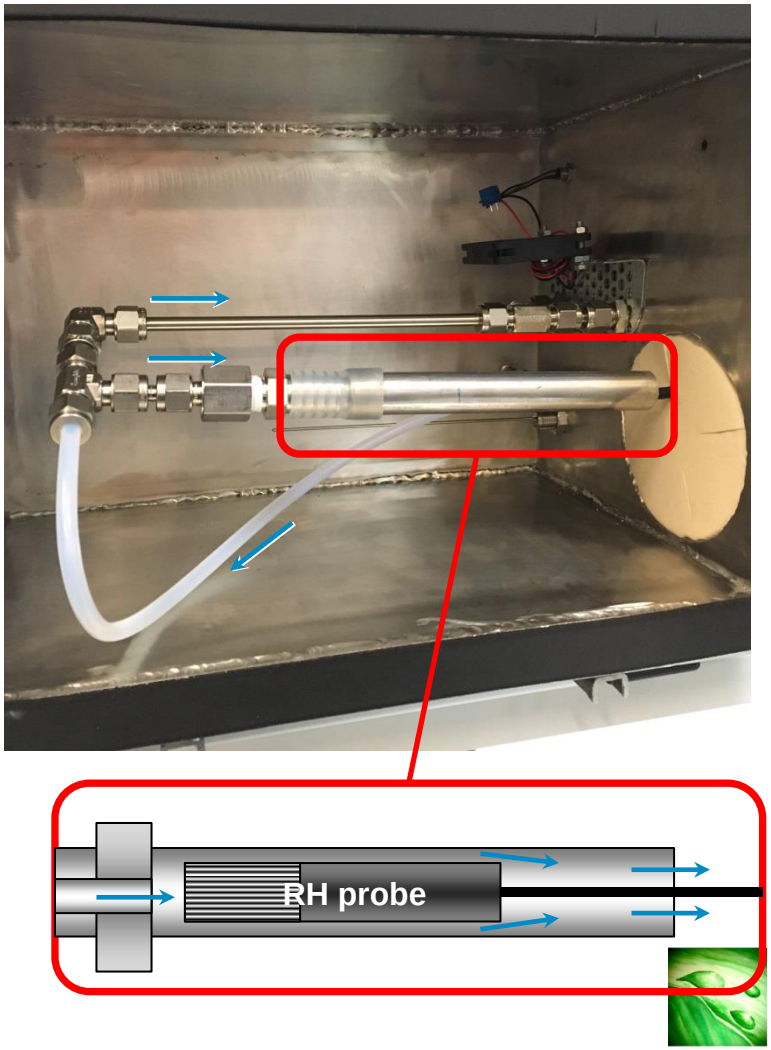




Fast ramp configuration

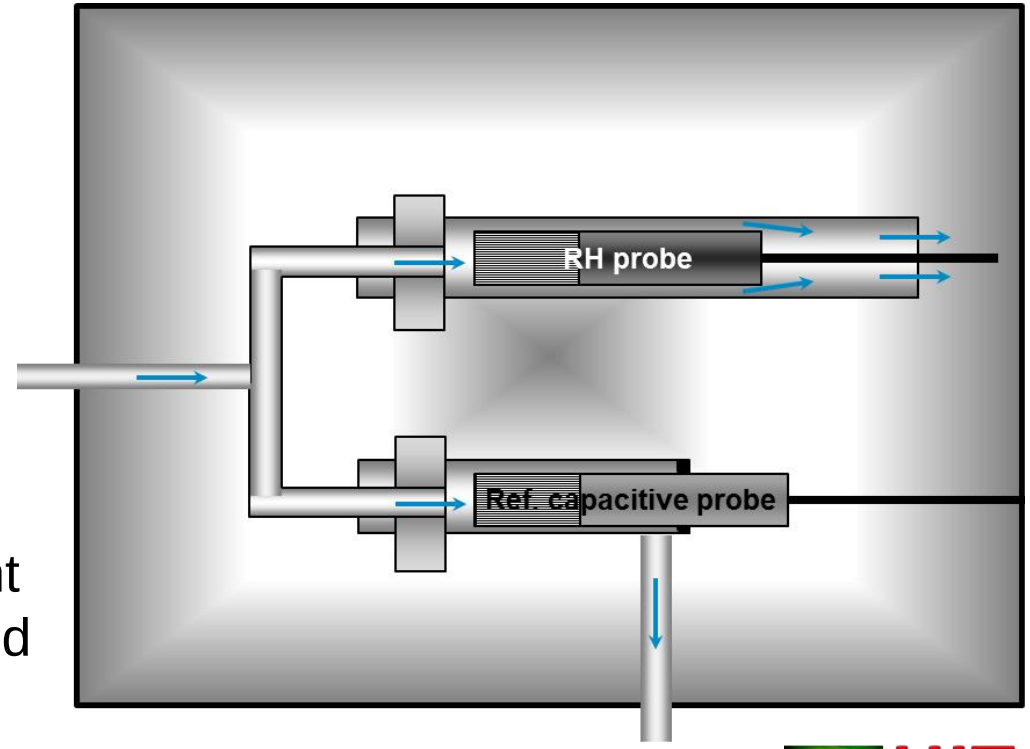
- Sensors have to be tested separately





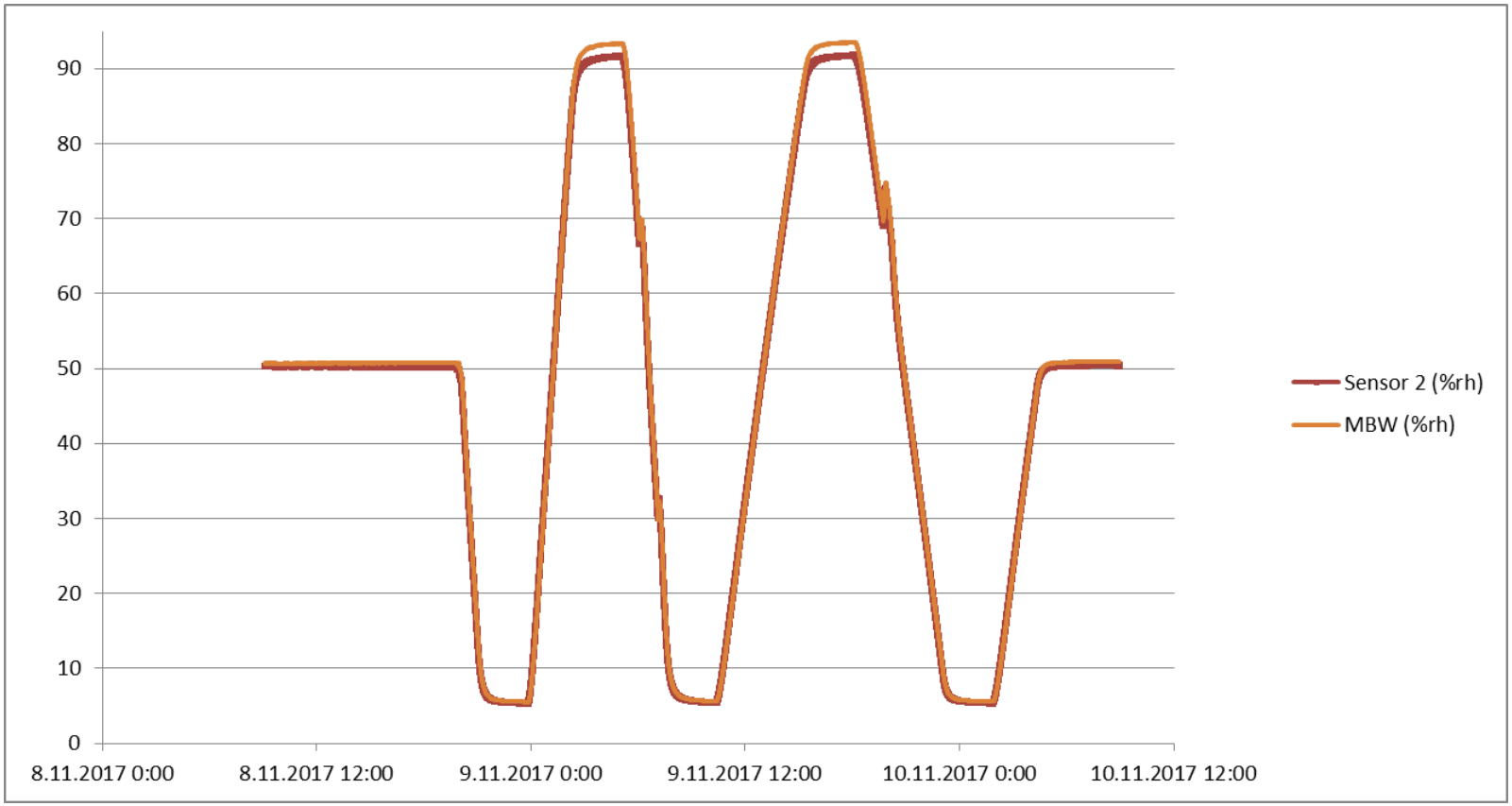
Dynamic characteristics of a reference

- Chilled mirror hygrometer:
  - Accurate but suffer from instabilities and limited speed in non-static measurements
- Capacitive sensors:
  - Can be fast but suffer from drift
- Solution:
  Combination of a chilled mirror hygrometer and a capacitive reference sensor
  - During calibration measurement the capacitive sensor is checked against the chilled mirror hygrometer at static conditions.



Measurements

- Measurement scheme (different speed rates)



Measurements at +40 °C

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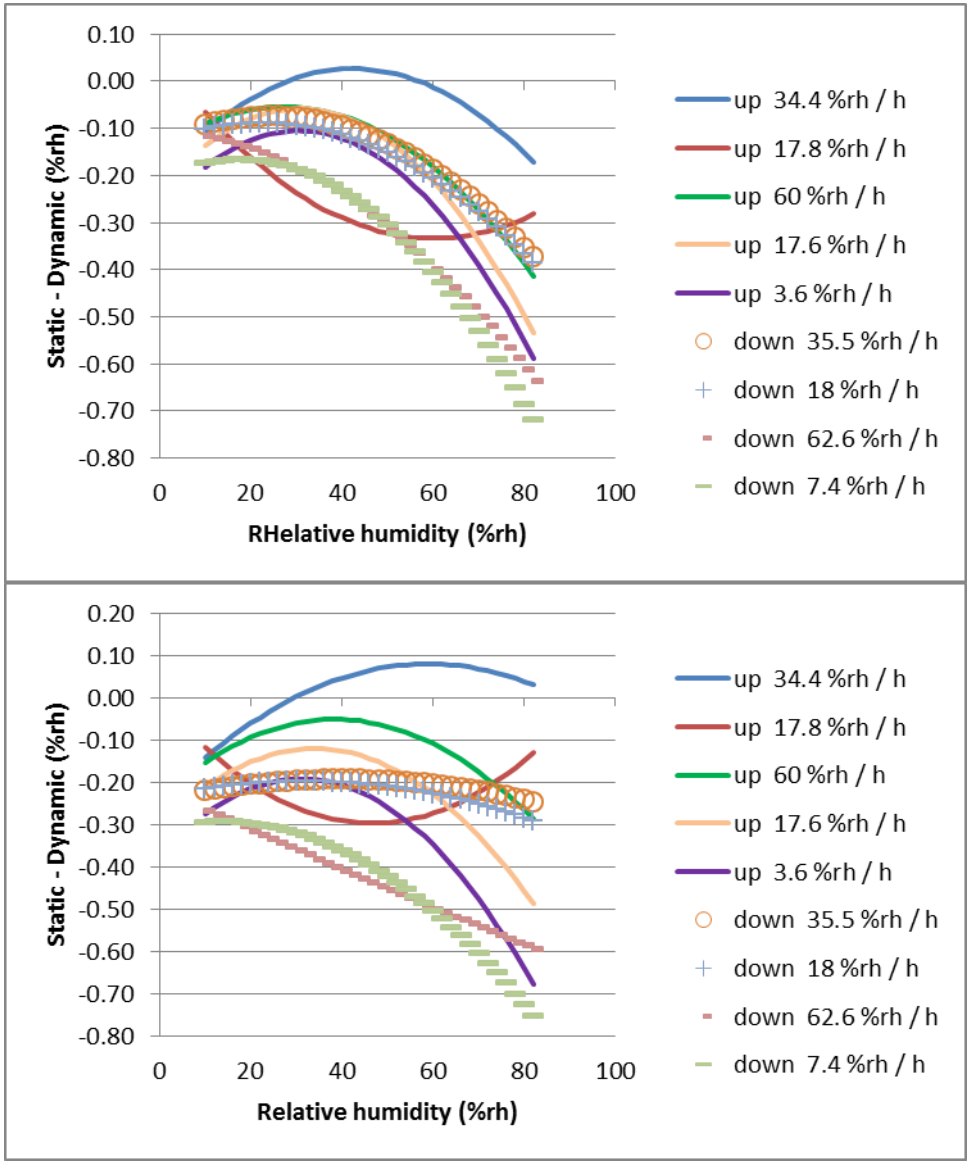

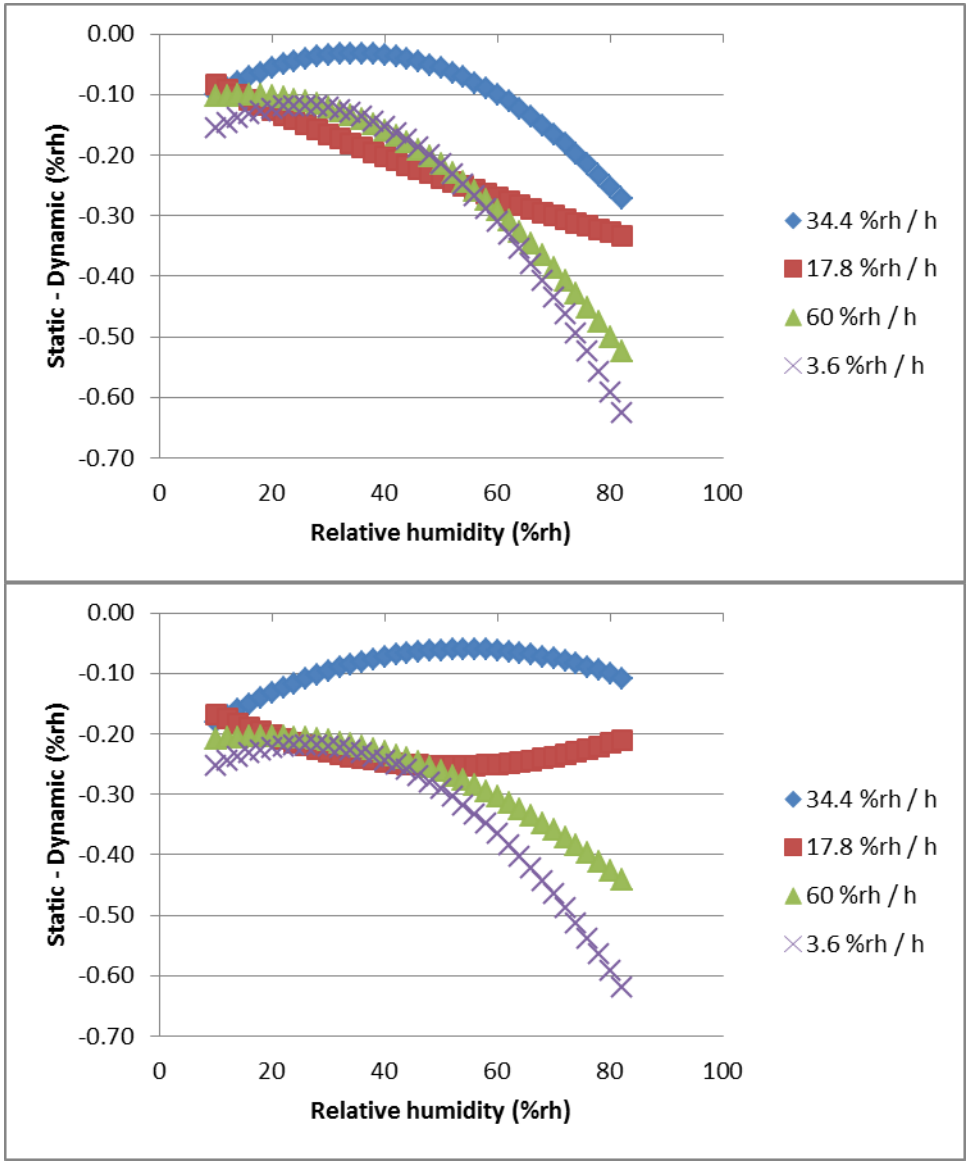

Future

- Tests with different humidity sensors will be completed
- Recommendation on a non-static calibration procedure will be prepared
- VTT MIKES is developing a field calibrator operating with non-static (and also static) calibration scheme

Thank you!

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TECHNOLOGY FOR BUSINESS