

# Test i2c humidity sensors

## Project Goal

To create Arduino based device to compare data for as many t/RH sensors as possible (without manual sensor switch), optionally with data logging for further analysis.

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## Preparation

Use of the same sensor on i2c usually limited by 1 or 2 (using ALT i2c address) of the same type. And SHT20, SHT21, SHT25, HTU21 is actually the same type, so to be able to compare measurement there is a need to use i2c multiplexer. In the case of 8 line multiplexer, there is a possibility to have 8-16 sensor at the same time to be connected with Arduino.

## Sensor i2c addresses and voltages

to divide between multiplexers

| Sensor                                     | address    | alt address | spec                     | Vmin-Vmax  | Vtyp | 1.8v | 3.3v | 5v** |
|--------------------------------------------|------------|-------------|--------------------------|------------|------|------|------|------|
| <a href="#">AOSONG AHT10</a>               | 0x38 (62)  | 0x39 (63)   | <a href="#">*pdf</a>     | 1.8-3.6v   | 3.3v | ?    | ✓    | —    |
| <a href="#">AOSONG AHT15</a>               | 0x38 (62)  |             | <a href="#">*pdf</a>     | 1.8-3.6v   | 3.3v | ?    | ✓    | —    |
| <a href="#">Senserion SHT2x</a>            | 0x40 (64)  | 0x41 (65)   | <a href="#">20,21,25</a> | 2.1-3.6v   | 3v   | —    | ✓    | —    |
| <a href="#">Senserion SHT3x</a>            | 0x44 (68)  | 0x45 (69)   | <a href="#">SHT3x</a>    | 2.15-5.5v  | 3.3v | —    | ✓    | ✓    |
| <a href="#">Senserion SHT8x</a>            | 0x44 (68)  |             | <a href="#">SHT85</a>    | 2.15-5.5v  | 3.3v | —    | ✓    | ✓    |
| <a href="#">Meas<sup>(1)</sup> HTU21D</a>  | 0x40 (64)  |             | <a href="#">HTU21D</a>   | 1.5v-3.6v  | 3v   | ✓    | ✓    | —    |
| <a href="#">Silicon Labs Si7021</a>        | 0x40 (64)  |             | <a href="#">pdf</a>      | 1.9v-3.6v  | -    | —    | ✓    | —    |
| <a href="#">Bosch<sup>(2)</sup> BMEx80</a> | 0x76 (118) | 0x77 (119)  | <a href="#">680</a>      | 1.71v-3.6v | 1.8v | ✓    | ✓    | —    |
| <a href="#">Bosch<sup>(2)</sup> BME280</a> | 0x76 (118) | 0x77 (119)  | <a href="#">280</a>      | 1.71v-3.6v | 1.8v | ✓    | ✓    | —    |
| <a href="#">Ti<sup>(3)</sup> HDC1080</a>   | 0x40 (64)  |             | <a href="#">pdf</a>      | 2.7v-5.5v  | 3v   | —    | ✓    | ✓    |

|                           |           |           |                       |            |    |   |   |   |
|---------------------------|-----------|-----------|-----------------------|------------|----|---|---|---|
| Ti <sup>(3)</sup> HDC2080 | 0x40 (64) | 0x41 (65) | <a href="#">pdf</a>   | 1.62v-3.6v | -  | ✓ | ✓ | ✗ |
| AOSONG DHT12              | 0x5C (92) |           | * <a href="#">pdf</a> | 2.7-5.5v   | 5v | ✗ | ✓ | ✓ |
| AOSONG AM2320             | 0x5C (92) |           | * <a href="#">pdf</a> | 3.1-5.5v   | 5v | ✗ | ✗ | ✓ |

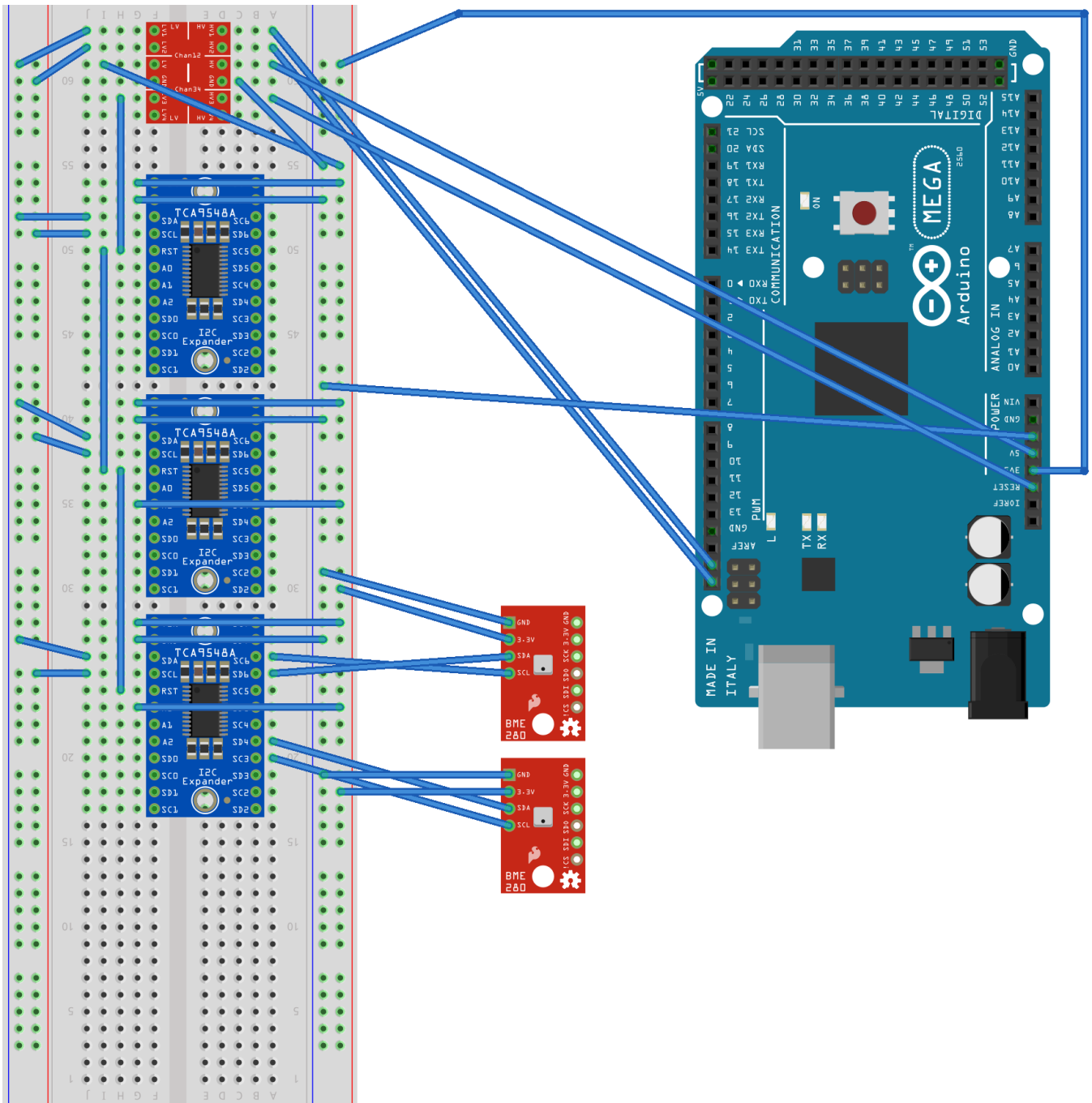
<sup>1</sup> TE Connectivity Measurement Specialties

<sup>2</sup> Bosch Sensortec

<sup>3</sup> Texas Instruments

\*\* some sensors board have voltage regulators and level converter (and may support voltages above mentioned in sensor datasheet)

## Draft schematic



fritzing

## Versions

### v1

- Single multiplexer breadboard draft project with 26 Sensors

### v2

- Use less wires and more soldering and connectors
- SD data logging (with filenames auto increment)
- Add more columns to the screen

## v3

- Use 3+ multiplexers to include twice more sensors (incl. hdc1080 and Si7021, SHT85)
- Add more SHT85 sensors to see results repeatability (for the most expensive sensor)
- remove some libraries (multiplexor, sensor reading) not compatible with multiple mux projects
- substitute i2c scan every cycle with pre-defined array processing
- (Hardware) i2c 3.3v/5v level converter
- (Hardware) 2500mAh battery with related circuits
- (Hardware) New case,
- (Hardware) New 2m wire between the main unit and the board
- (Hardware) New plastic shields for connectors

## v4 - failed

- AHT10 sensors (both wiring and code needed) - fail
- Change board wiring for new Adafruit sensors
- replace DHT12 with additional BME280
- Change board sensors (HDC1080 to HTU21d)

## v5

- New board for both mux and sensors with fewer wires and connectors
- Wire new additional 5v sensor board with mux #4
- AM2302 5v sensors and code
- HDC1080 moved to 5v additional board
- Separate AHT10 to additional multiplexor (mux #5)

## v6 - unstable

- AHT15 sensors (AHT10 code reuse)
- HDC2080 sensors and code
- connect and enable mux #6

## v7 - unstable

- hardware RTC clock
- SD files with correct timestamps

## v8 - unstable

- Updated Power circuit
- i2c voltage converter board and new wiring
- SHTC1 and SHTC3 sensors added
- mux #1 address changed (to solve i2c address conflict)
- 2x BME680 removed (to solve i2c address conflict)
- 1x BME280 removed (to solve i2c address conflict)
- DHT12 sensors added instead of three BMEx80 (8a)
- ChipCap Sensor added instead of DHT12 (8b)

## v9 - current

- [AHT20](#) instead of [AHT10](#)
- two [HIH7120](#) added (code reused from [CC2D33](#))
- 3 fan added

## v10 - abandoned

- code optimization
- trend visualization
- hardware controls
- menu options (like format SD card)

- got some kind of home-made "calibration" tests with resolutions

## v10-AHT

- New small density sensor board
- AHT10, AHT20, AHT21, AHT25 sensors only
- exclude voltage conversion (that is why AHT15 is missing)
- a single sensor on one i2c multiplexer lane
- Single read for temperature and humidity data for AHT
- simplified code to support only AHT type of sensors