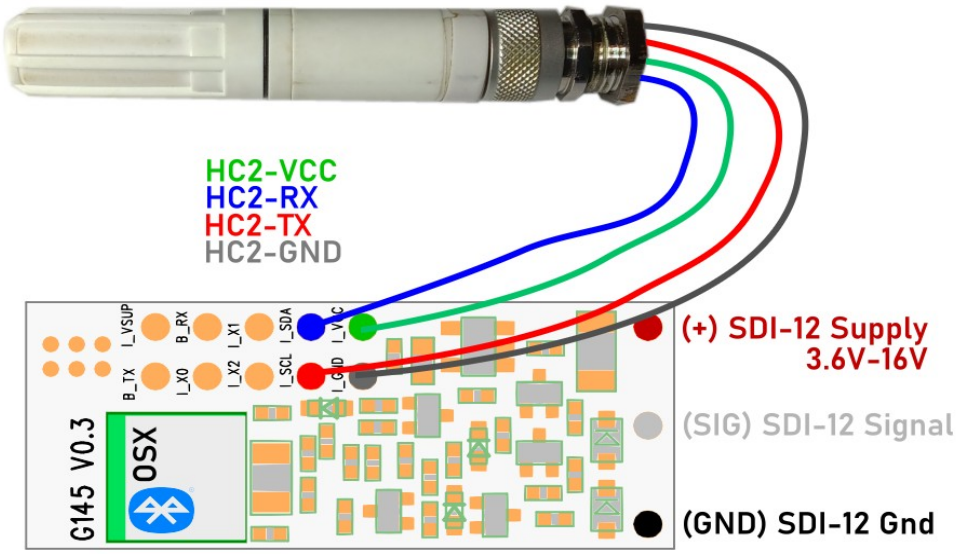
OSX – Open-SDI12-Blue

Version OSX-HC2 – Interface to HC2-xx Precision Temperature / Relative Humidity, Type 380



1 Quick setup

The HC2-xx is a precision temperature and relative humidity sensor. The suffix “-xx” refers to several available versions. The OSX-HC2 is an interface to Low-Voltage SDI-12 (V1.3) and also provides Bluetooth for local configuration. The signal levels are extended to support Low-Voltage SDI-12 operation down to a supply voltage of 3.6 V. This manual describes the OSX-HC2 only, not the HC2-xx sensor.

HC2 Standard Accuracy: 10…30 °C: ±0.8 %RH (±1.2 %RH) / ±0.1 K (HC2-ICxx-HH)

The parameters of the SDI-12 interface (based on the Open-SDI12-Blue platform) can be configured via Bluetooth. A custom 2-point calibration can also be applied.

SDI-12 Cable Wire Assignment

BLACK: Ground (GND)
BROWN: Supply Voltage (3.6 V–16 V for SDI-12) / 2.8 V–3.6 V (Bluetooth-only mode)
WHITE: SDI-12 Signal

Warning: The OSX-HC2 is internally protected against normal transients and spikes, however reverse polarity or incorrect wiring may damage the device.

The command set is based on standard SDI-12 (V1.3) command set. Most important commands:

aAn! : Change Address from ‘a’ to ‘n’. (a might be always be a ‘?’ as wild card).

aI! : Identify Node (should identify as ‘a13TT_HC2_A_0380_OSXxxxxxxxx’)

aM! : Start measure (also ‘aMC!’). This will start the measure. After finishing all measured values are available in an internal cache. Up to 2 data may be read with the „D“- command: a.) rel. Humidity (in %) and b.) Temperature (in °C)

aM1! : Start measure (also ‘aMC1!’). This will start the measure including Supply Voltage. After finishing all measured values are available in an internal cache. Up to 3 data may be read with the „D“- command:
a.) relative Humidity (in %), b.) Temperature (in °C) and c.) Voltage

aD0! : This will read the 1 to max. 3 measures from the preceding „M“- command.

Error codes (all values lower than -999):

999: No Reply from Sensor
998: Sensor not Ready (after Power On needs ca. 1500 msec)
997: Data Corrupt
others: Displayed as text in BlxDashboard or BlueShell

2 The Open-SDI12-Blue platform

OSX Sensors are based on an open platform:

Link: https://github.com/joembedded/Open-SDI12-Blue

3 Software

3.1.1 Software to access the sensor

OSX Sensors can accessed by SDI-12 (V1.3) or Bluetooth BLE or SDI-12 via Bluetooth.

- BlueShell for PC (Windows 10 / 11)
- BlxDashboard (PC (Browsers: Chrome, Edge, Opera, …) or Android). No installation of an APP required, however BlxDashboard can be installed as “Progressive Web APP” (PWA) for offline use!
  (The complete BlxDashboard is written in JavaScript and available as Source Code)

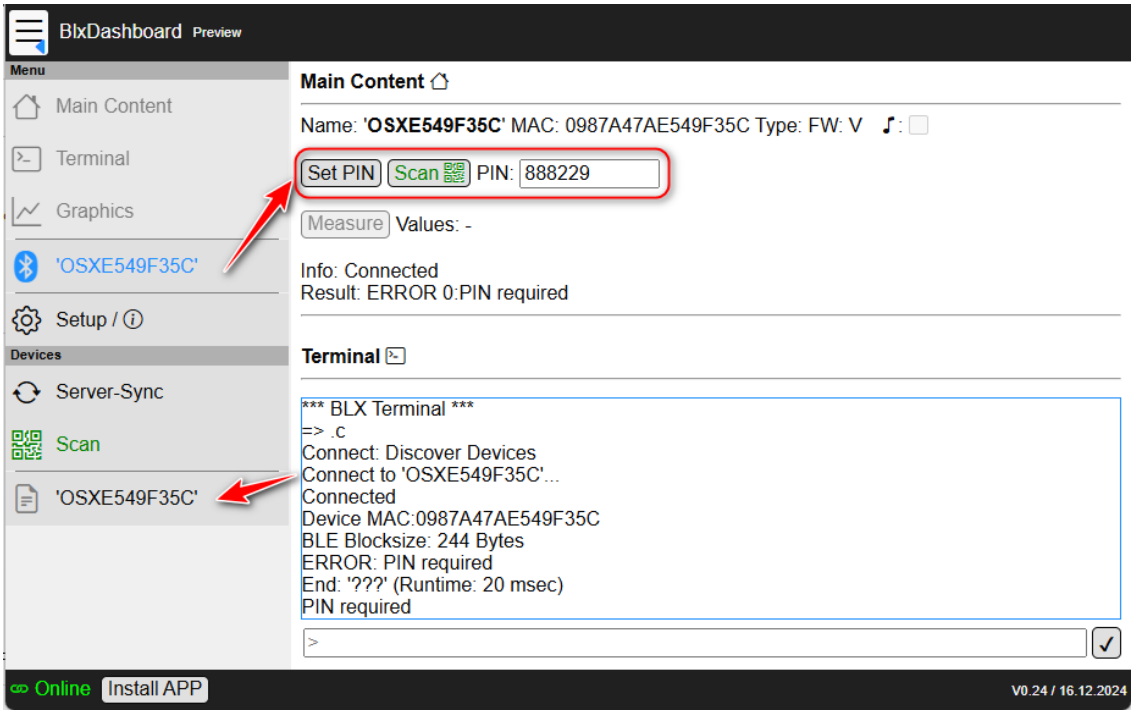
Link: Download Link BlueShell or BlxDashboard

3.1.2 Software for SDI-12

- A simple SDI12Term for PC (Windows) (connect SDI-12 sensors via RS232)

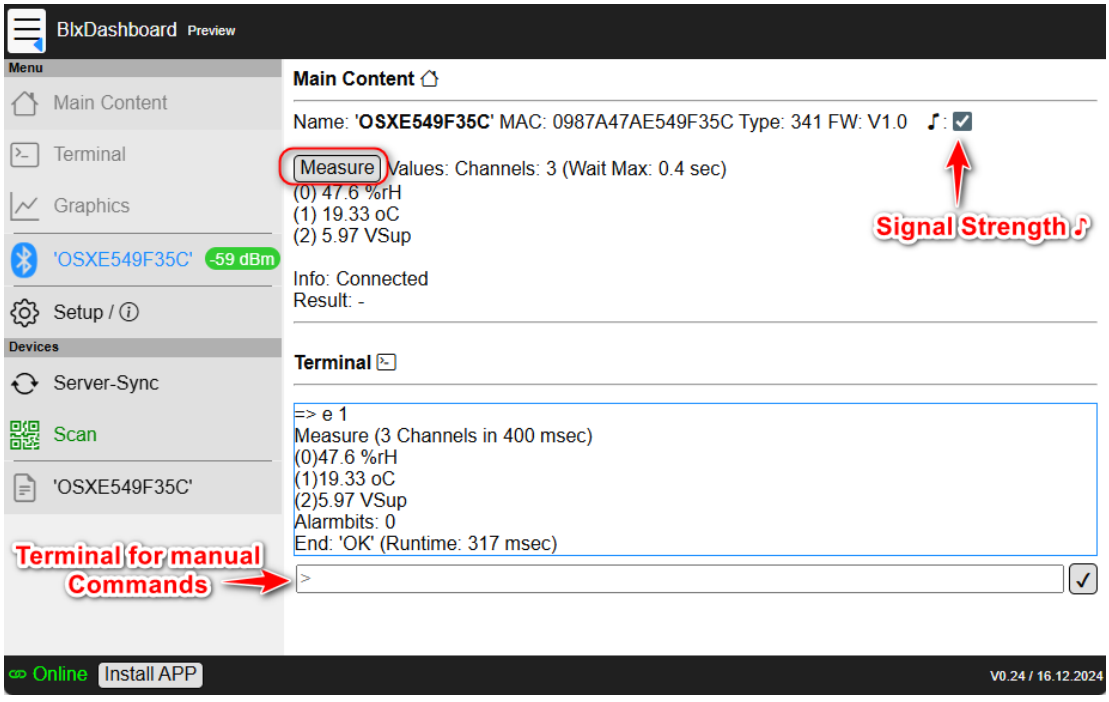
Link: https://github.com/joembedded/SDI12Term

4 Sample session BlxDashBoard



PIN required: Scan (via Camera) or enter manually

The sensors are locked with a 6 digit PIN (Authentification method: Challenge-Response)



A Test Measure

5 Commands

A selection of commands for setup (enter via BlxDashboard or BlueShell Terminal)

5.1.1 Commands for this type (OSX-HC2 Type 380):

Measure:

- M or MC or M1 or MC1 starts the measure, measure takes < 1 sec
- D replies the values

5.1.2 Standard commands for Open-SDI12-Blue (SDI-12 via BLE):

All „SDI-12 via BLE“ commands are preceded by ‚z‘:

> z?I! SDI12 via BLE: Identify
Reply: '013TT_HC2_A_0380_OSX9E44D7D6<CR><LF>'
End: 'OK' (Runtime: 229 msec)
> z?M! SDI12: Measure
Reply: '00012<CR><LF>'
Reply: '0<CR><LF>'
End: 'OK' (Runtime: 358 msec)
> z?D0! SDI12: Values
Reply: '0+45.3+26.36<CR><LF>'
End: 'OK' (Runtime: 302 msec)
> z?MC! SDI12: Measure+CRC
Reply: '00012<CR><LF>'
Reply: '0<CR><LF>'
End: 'OK' (Runtime: 387 msec)
> z?D0! SDI12: ‚CAa‘ is CRC
Reply: '0+45.3+26.37CAa<CR><LF>'
End: 'OK' (Runtime: 290 msec)
> z?XDevice! SDI12: XDevice
Reply: 'M:8AD5C05A9E44D7D6,T:380,V0.2, P:888229!<CR><LF>' SDI12: Red: Dev.PIN
End: 'OK' (Runtime: 299 msec)
> z?XFactoryReset! SDI12: Factors Reset:
Disconnected SDI12: New setup

5.1.3 Firmware update

> .firmware Secure firmware update
Select new firmware (*.sec)…

5.1.4 Special commands for Open-SDI12-Blue (SDI-12 via BLE):

Sensor setup / scan commands:

Important: our sensors are are delivered “ready-2-run” and no special setup is required (except e.g. after Factory Reset or if sensor configuration was changed). The following commands are only listed for technical completeness.

- Each channel has 2 coefficients for (optional) user calibration.
  By default these coefficients are 1.0 (Multi) and 0.0 (Offset), this means the values of the sensor are not changed. Since the HC2-xx sensors are internally factory calibrated, user calibration coefficients are normally also not required. Mentioned only for completeness.
- The 4 Coefficients:
  Formula is (BLX standard): Formula: VALUE = (MEASURED * Multi) – Offset.
  K0: Humidity Multi (Default: 1.0)
  K1: Humidity Offset (Default: 0.0)
  K2: Temperature Multi (Default: 1.0)
  K3: Temperature Offset (Default: 0.0)
- The “Write” command writes changed parameters to Flash.

In this example K3 (Offset for Temperature) is ‘adjusted’ to display 1.23°C less:

> e	Measure
Measure (2 Channels in 300 msec)	
(0)43.9 %rH	
(1)26.47 oC	
End: 'OK' (Runtime: 564 msec)	
> z?XK3!	Coefficient for Temperature
Reply: '0K3=0.000000<CR><LF>'	
End: 'OK' (Runtime: 271 msec)	
> z?XK3=1.23!	Decrease Temp. by 1.23°C
Reply: '0K3=1.230000<CR><LF>'	
End: 'OK' (Runtime: 191 msec)	
> e	And check result
Measure (2 Channels in 300 msec)	
(0)43.8 %rH	
(1)25.24 oC	
> z?XWrite!	Save Settings to Flash
Reply: '0<CR><LF>'	
End: 'OK' (Runtime: 162 msec)	

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6 Sensor infos (HC2-xx)

- Operating range humidity: 0...100%RH
- Operating range temperature:
  HC2-Sxx -50...100 °C
  HC2-HKxx, HC2-ICxx, HC2-IMxx, HC2-IExx -100...200 °C* (> +85°C :HC2 sensor only)
  HC2-ICxx-HH -50...120 °C (> +85°C :HC2 sensor only)
  *Short term peak load

7 Power Supply

The OSX-HC2 works from 3.6V to 16V (see Open-SDI12-Blue documentation).
For Low-Voltage SDI-12 a minimum supply voltage of 3.6V-16V is recommended, below this only Bluetooth should be used.

- Measure: <10mA
- Operating Temperature: -40°C - +85°C (Interface)

7.1 Power Profile

7.1.1 Power Up Sequence

The Sensor is ready after ca. 250 msec.

8 Compliance (Version: OSX-HC2)

8.1 Compliance: CE, RoHS

- EN 55022 Emission, class B < 30 dBµV/m (0.03...1 GHz)
- EN 61000-4-2 Electrostatic discharge 4 kV contact / 8 kV air
- EN 61000-4-3 Irradiated RF 10V/m (0.1...1 GHz)
- EN 61000-4-4 Transients (burst) 4 kV
- EN 301 489-1 V2.1.1 and EN 301 489-17 V3.1.1 EMC
- EN 300 328 V2.1.1 EN 300 330 V2.1.1 Radio Emission
- Bluetooth SIG listed: ID 138612

The OSX-HC2, Type 380 complies with the essential requirements of Radio Equipment Directive (RED) 2014/53/EU and with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

Manufacturers:

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