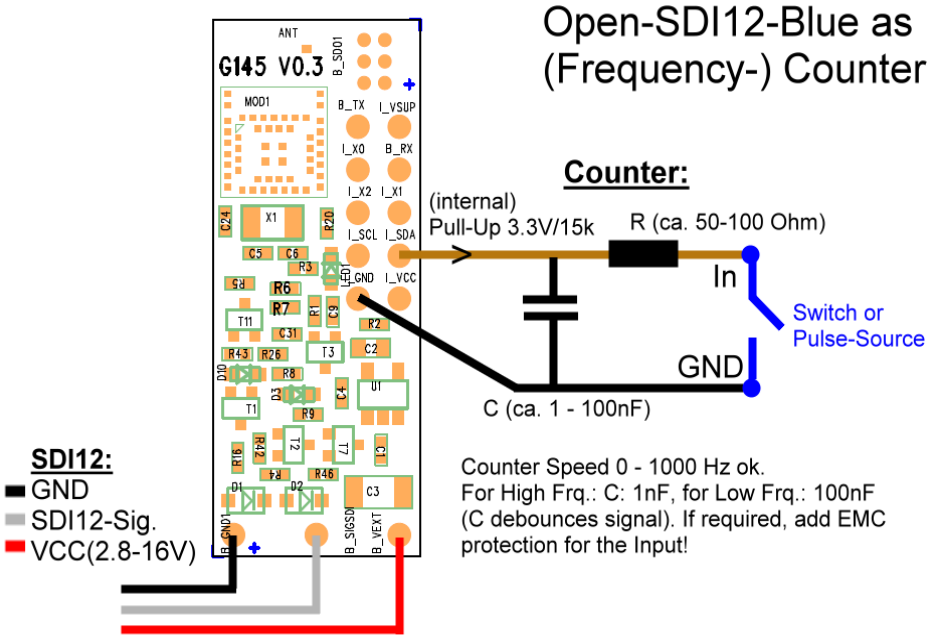
OSX – Open-SDI12-Blue

Version Frequency- / Pulse-Counter, Type 330

1 Quick setup



The **OSX Frequency-/Pulse-Counter** is a PCB for Counting Pulses (e.g. Rain Sensors) or to measure Frequencies from 0 – max. 1000 Hz.

To debounce glitches from the switch, an external capacitor C is recommended. Also, to prevent the switch, it is recommended to ad a small series resistor R. For external or long cables, an additional EMC protection (e.g. via TVS Diode) is highly recommended! The counting input has an internal Pull-Up resistor of ca. 15 kOhm, so in closed state a small current (ca. 220µA) will be drawn while closed.

Operating principle:

- The sensors requires constant power supply to work! The quiescent current is very low (a few µA)
- Each 8 seconds the frequency is calculated, resolution 0.1 Hz (hence after power on a minimum waiting time of 8 seconds is required).
- The counter has a range of max. 9999999, then it rolls over to 0

The command set is based on standard SDI12 (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_CNT_A_0330_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.) Counts (absolute) and b.) Frequency (in Hz)

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.) Counts (absolute) and b.) Frequency (in Hz) and c.) Voltage

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

Error codes (all values lower than -100.000):

-101.0: “Too fast”: For a frequency measure the sensor requires at least 8 seconds.
others: Displayed as text in BLX.JS 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 SDI12 (V1.3) or Bluetooth BLE or SDI12 via Bluetooth.

- BlueShell for PC (Windows 10 / 11)
- BLX.JS (PC (Browsers: Chrome, Edge, Opera, …) or Android). No APP required!

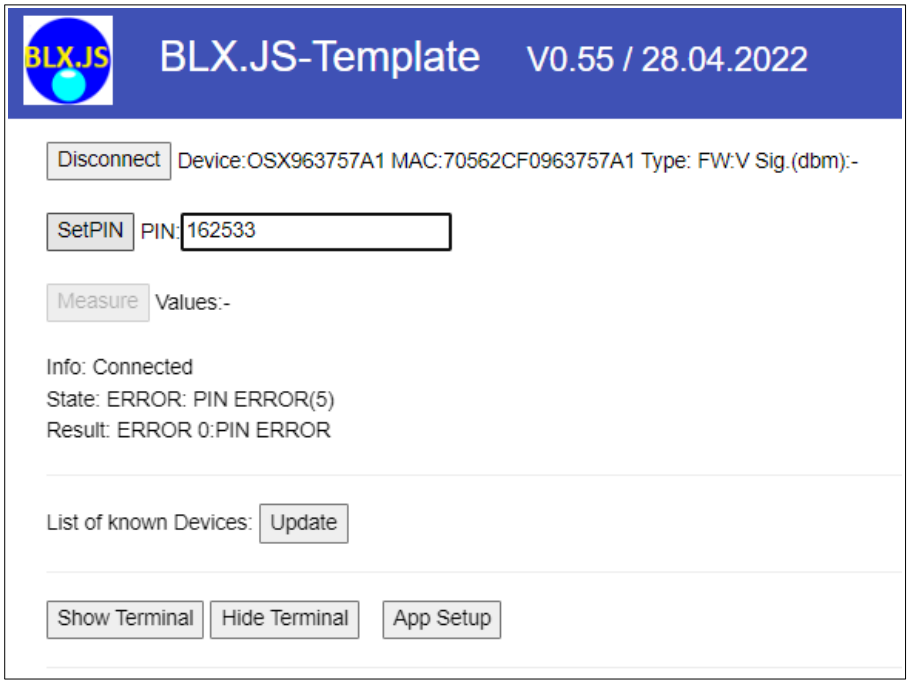
Link: Download Link BlueShell or BLX.JS

3.1.2 Software for SDI12

- A simple SDI12Term for PC (Windows) (connect SDI12 sensors via RS232)

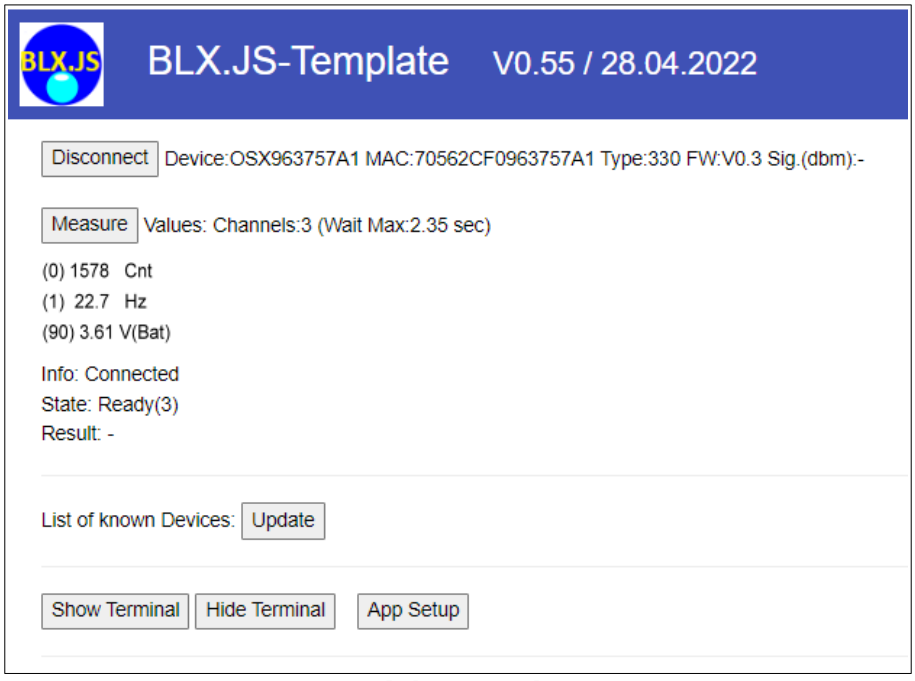
Link: https://github.com/joembedded/SDI12Term

4 Sample session BLX.JS



Enter PIN only required once!

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



Measure (2 sensors connected (here another sensor type))

5 Commands

A selection of commands for setup (enter via BLX.JS or BlueShell Terminal)

5.1.1 Commands for this type (Type 330):

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 (SDI12 via BLE):

All „SDI12 via BLE“ commands are preceded by ‚z‘:

> z?I!	SDI12 via BLE: Identify
Reply: '013TT_SHT_A_0330_OSX7740B474<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+0.36<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+0.36CAa<CR><LF>'	
End: 'OK' (Runtime: 290 msec)	
> z?XDevice!	SDI12: XDevice
Reply: '0M:2299983A7740B474,T:330,V1.0, P:321144!<CR><LF>'	SDI12: Red: Dev.PIN
End: 'OK' (Runtime: 299 msec)	
> z?XFactoryReset!	SDI12: Factors Reset:
Disconnected while Busy('z?XFactoryReset!')	SDI12: New setup
ERROR: Disconnected ('z?XFactoryReset!')	SDI12: required!

5.1.3 Some standard commands for BLX.JS (not available with BlueShell):

(Remark: BLX.JS is our BLE driver written in JavaScript, it could easily be used with other HTML too).

> .a	.a or .audio: „Finder♪“
Audio: RSSI: OFF, Term: ON	
> .audio 1 1	Audio & Finder♪ ‚ON‘
Audio: RSSI: ON, Term: ON	
> .firmware	Secure firmware update
Select new firmware (*.sec)...	

5.1.4 Special commands for Open-SDI12-Blue (SDI12 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 SHT2x 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 K0 (Multi for Counter) is ‘adjusted’ to display mm Rain level (for a rain gauge with 10 counts per mm Rain):

> e	Measure
Measure (2 Channels in 300 msec) (0) 430 Cnt (1) 0.1 Hz End: 'OK' (Runtime: 564 msec)	
> z?XK3!	Coefficient for Temperature
Reply: '0K0=0.000000<CR><LF>' End: 'OK' (Runtime: 271 msec)	
> z?XK3=0.1!	10 Pulses per mm
Reply: '0K3=0.10000<CR><LF>' End: 'OK' (Runtime: 191 msec)	
> e	And check result
Measure (2 Channels in 300 msec) (0)43 Cnt (1)0.1 oC	
> z?XWrite!	Save Settings to Flash
Reply: '0<CR><LF>' End: 'OK' (Runtime: 162 msec)	

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6 Power Supply

The OSX Sensor works from 2.8V to 16V (see Open-SDI12-Blue documentation).

Measure (SDI-Communication): <5mA for ca. 200 msec

Operating Temperature: -40°C - +85°C

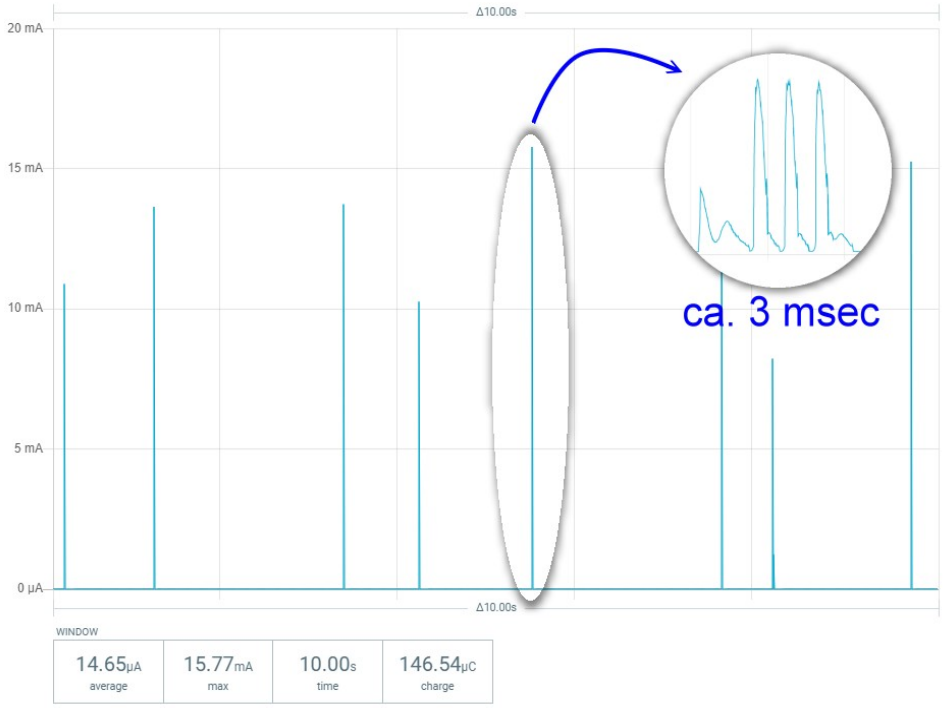
6.1 Power Profile

6.1.1 Power Up Sequence

The Sensor is ready after ca. 250 msec.

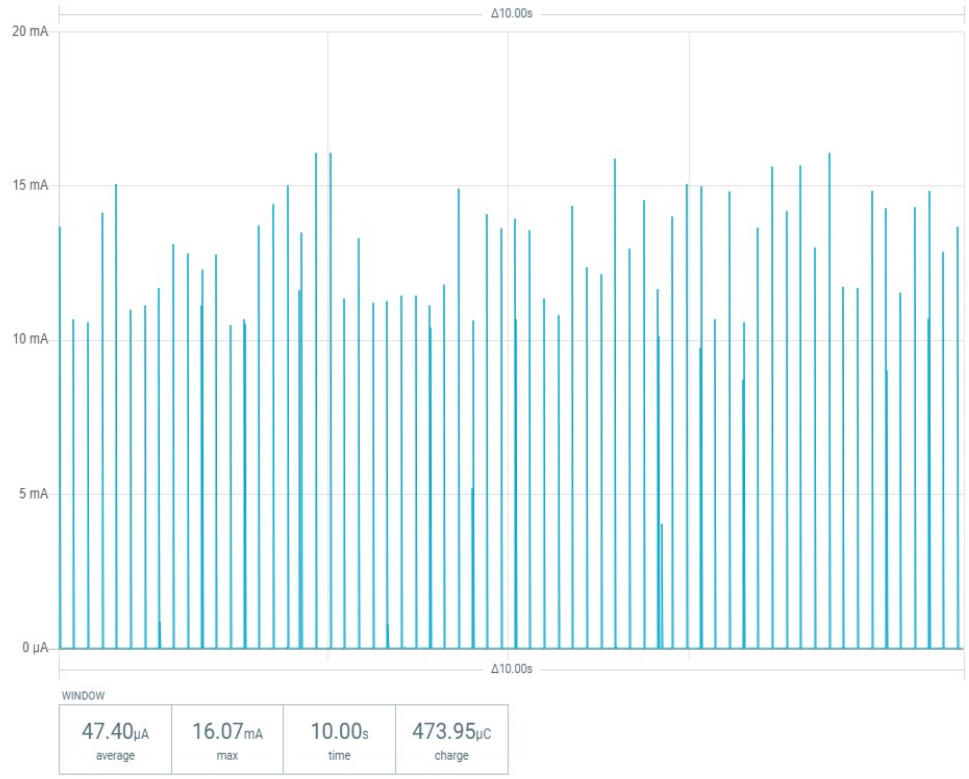
6.1.2 Advertising (in deep sleep, Counter Input assumed as ‘open’)

Average power consumption in deep sleep is <15 µA @ 4V



Advertising power consumption (one peak zoomed)

6.2 Connected Mode (Counter Input assumed as ‘open’)



Connected power consumption

In Connected Mode (active BLE connection) the average power consumption is <50 µA @ 4V

7 Compliance (Version: Frequency-/Pulse-Counter)

7.1 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

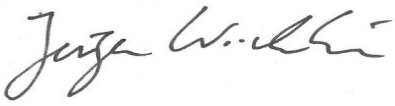
The sensor OSX – Version Frequency-/Pulse-Counter, Type 330 complies with the essential requirements of Radio Equipment Directive (RED) 2014/53/EU and with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

Manufacturers:

GeoPrecision GmbH
Am Dickhäuterplatz 8
D-76275 Ettlingen

Terratransfer GmbH
Ottostr. 19a
D-44867 Bochum

17.02.2023



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