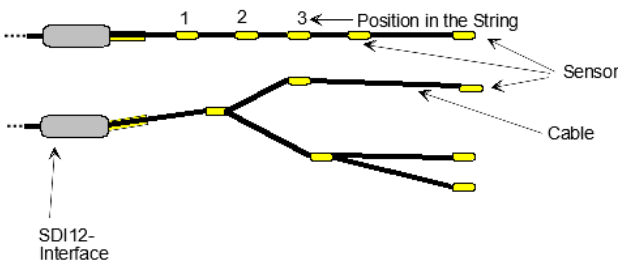
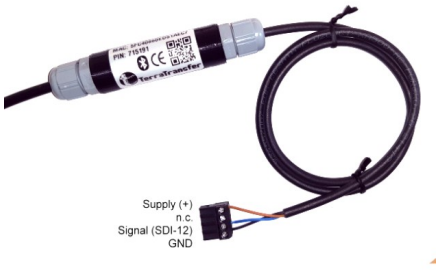
OSX – Open-SDI12-Blue

Version 2Wire, Type 410

1 Quick setup



String of temperature sensors. (Sensors: IP68 for permanent immersion until max. over pressure)



SDI12 / Bluetooth LE - Interface
***Important:** Interface is only IP54!*

2Wire Thermistor String was designed for measuring up to 50 (optionally up to 300) high-precision temperature sensors („TxNODE“ and Variants), pressure sensors (“LevelLD”) or any combination.

The digital sensors can be connected in string- or star-topology. There is no loss in the accuracy due to cable length. Cable length may be up to 500 meters (total sum of all). The sensors are by default designed for pressures up to 5 bar (equals 50 meters water level, IP68 for permanent immersion), higher pressures as option.

The parameters of the SDI12-Interface (based on Open-SDI12-Blue platform) can be changed via Bluetooth.

SDI-12-Cable (core cable ends or optionally with Connector (AKL-169-04 (RIA CONNECT, RM 3.5mm)):

BLACK: GND
BROWN: 3.6V-16V Supply (Info: optionally Version 2.8V-16V available)
BLUE or WHITE: SDI-12 Signal

The recommended cable for the digital sensors colours are (Standard M8-Connector):

BROWN: Signal
BLACK: GND
BLUE: GND (optional)

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_TN_2W_0410_OSXxxxxxxxx’)

aM! : Start measure (also ‘aMC!’). This will start the measure. After finishing all measured values are available in an internal cache. Up to 9 data may be read with the „D“- command.

aD0! : This will read the 1 to max. 9 measures from the preceding „M“- command. The output in degree Celsius (-55.000 to +125.000 °C). The first sensor (at the end of the string) is the first displayed value.

Error codes (all values lower than -90.000):

-98.000:	Sensor internal error (probably sensor broken)
-99.000:	Communication error
-101.00:	No sensor (cable broken?)
-102.00:	Short circuit (short circuit on cable)
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!

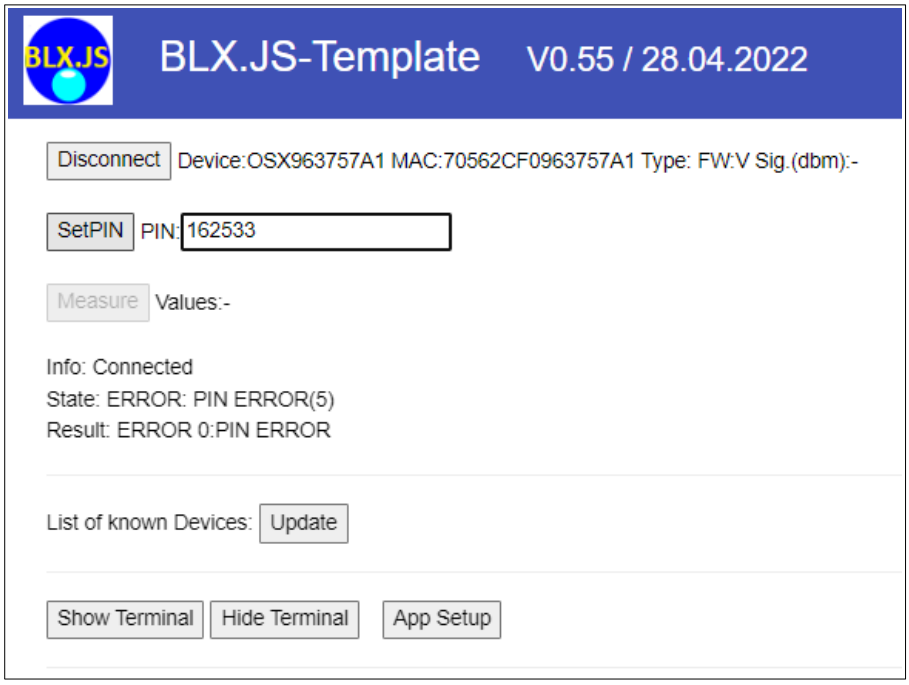
Link: Download Link BlueShell or BLX.JS

3.1.2 Software for SDI12

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

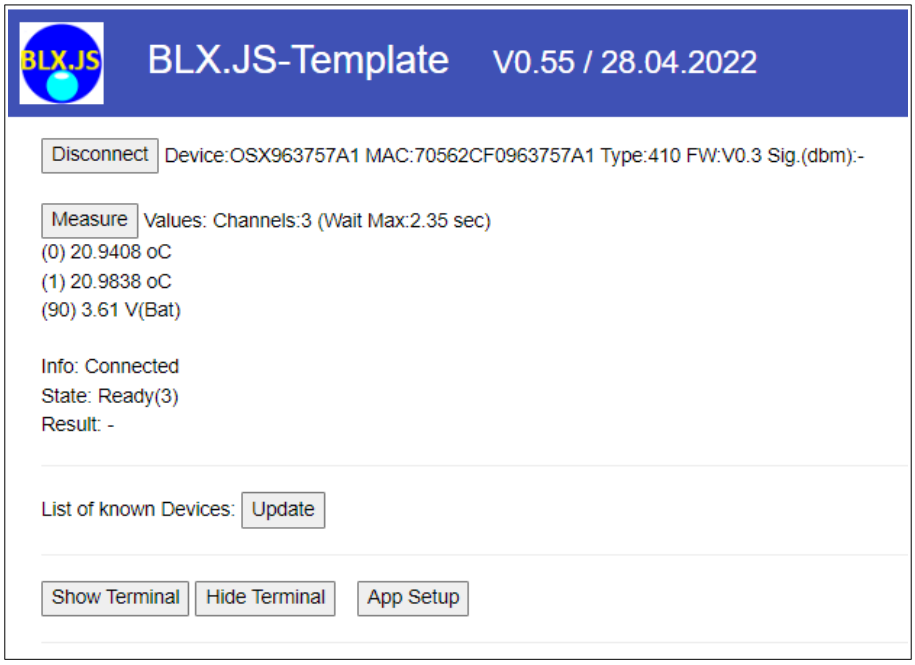
Link: https://github.com/joembedded/SDI12Term

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)

5 Commands

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

5.1.1 Commands for this type (2Wire, Type 410):

Measure:

- M or MC starts the measure, measure takes about 1-3 secs
- D replies the first (max. 9) values (minimum: 1 sensor)
- Subsequent commands M1-Mx .. or MC1-MCx get the subsequent values (without wait)
- Up to 30 sensors are possible
- M9 or MC9 gets the supply voltage

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_TN_2W_0410_OSX963757A1<CR><LF>'
End: 'OK' (Runtime: 229 msec)
> z?M! SDI12: Measure
Reply: '00032<CR><LF>'
Reply: '0<CR><LF>'
End: 'OK' (Runtime: 1058 msec)
> z?D0! SDI12: Values
Reply: '0+20.9408+20.9838<CR><LF>'
End: 'OK' (Runtime: 302 msec)
> z?D1! SDI12: Values
Reply: '0<CR><LF>'
End: 'OK' (Runtime: 306 msec)
> z?MC! SDI12: Measure+CRC
Reply: '00032<CR><LF>'
Reply: '0<CR><LF>'
End: 'OK' (Runtime: 1087 msec)
> z?D0! SDI12: ‚IPA‘ is CRC
Reply: '0+20.9408+20.9838IPA<CR><LF>'
End: 'OK' (Runtime: 290 msec)
> z?XDevice! SDI12: XDevice
Reply: '0M:70562CF0963757A1,T:410,V0.3,P:162533!<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.

- ‚ts‘ scans the strings sensors: coefficients and positions of each sensors retrieved into a temporary list. In the example below this list has the 2 entries #0 and #1. Each sensor (depending on the version) has a number of coefficients. Here: 12 coefficients.
- ‚tm‘ performs a measure of this temporary list and shows also the positions (sorted)
- ‚tp ENTRY,NEWPOS' assigns a new position (range -32768..+32767) to entry number #ENTRY. The position is stored in the sensor. Then a measure is shown.
- ‚tw‘ writes the temporary list to the SDI12 parameters. After this the measures can be accesses with SDI12 commands M or MC and D, as shown above.
- ‚ti‘ inspects the SD12 parameters (positions are not shown or stored)
- ‚tx‘ (display) or ‘tx XUS’ (set) displays or sets the speed of the digital bus (XUS: range 0..1500, default: 300) This command is only required for scanning existing strings e.g if cables are wet or damaged or if additional over voltage protection was added: due to higher electrical capacity, slower signals are required. As a rule of thumb a value of 600 makes communication ca. 30% slower.
  Change/increase this value only if error occur while scanning or operating strings. The value is stored with ‘tw’ (above).
- ‚tr‘ (display) or ‘tr X’ (set) sorting direction for scanned list (standard: direction up (set with ‘tr 0’), reverse: direction down (set with ‘tr 1’)).

> ts — ts: Scan 2W

```
Wait 30000 secs
Reply: 'Scan 2Wire Bus...'
Reply: 'Found 2 Sensors'
Reply: 'Scan Coefficients...'
Reply: 'Measure (scanned) 2Wire…'
Reply: '#0: Addr:4B6C Pos.:99 -> Temp: 20.940767 oC'
Reply: '#1: Addr:4B08 Pos.:101 -> Temp: 20.975221 oC'
End: 'OK' (Runtime: 11408 msec)
```

> tm — tm: Measure 2W

```
Reply: 'Measure (scanned) 2Wire...'
Reply: '#0: Addr:4B6C Pos.:99 -> Temp: 20.975221 oC'
Reply: '#1: Addr:4B08 Pos.:101 -> Temp: 20.940767 oC'
End: 'OK' (Runtime: 804 msec)
```

> tp 1,98 — tp: Ser Pos #1 to 98 and resort Sensors

```
Reply: 'Measure (scanned) 2Wire…'
Reply: '#0: Addr:4B08 Pos.:98 -> Temp: 20.940767 oC'
Reply: '#1: Addr:4B6C Pos.:99 -> Temp: 20.975221 oC'
End: 'OK' (Runtime: 1685 msec)
```

> tw — tw: Write Coeffs (Flash)

```
Reply: 'Write SDI12 Coefficients'
Reply: 'Inspect SDI12 Coefficients (2 Sensors, Power Wait:200 msec)'
Reply: '#0: Addr:4B08 Type:0900 Coeff[12]: 52 16 aa 1c 7c 3e 6e 58 79 85 b4 a6'
Reply: '#1: Addr:4B6C Type:0900 Coeff[12]: 52 16 aa 1c 7c 3e 48 58 1f 85 b4 a6'
End: 'OK' (Runtime: 535 msec)
```

> ti — ti: Inspect SDI12 Coeffs

```
Reply: 'Inspect SDI12 Coefficients (2 Sensors, Power Wait:200 msec)'
Reply: '#0: Addr:4B08 Type:0900 Coeff[12]: 52 16 aa 1c 7c 3e 6e 58 79 85 b4 a6'
Reply: '#1: Addr:4B6C Type:0900 Coeff[12]: 52 16 aa 1c 7c 3e 48 58 1f 85 b4 a6'
Driver X_us:300                    300: Standard speed
Sort Direction:1 (Reverse(Down))   Sort direction
End: 'OK' (Runtime: 529 msec)
```

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6 Power Supply

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

However, for 2Wire at least 3.3V are required, recommended: 3.6V-16V.
(Info: optionally Version 2.8V-16V available)

Operating Temperature: -40°C - +85°C

Sensors: IP68 for permanent immersion until max. over pressure
SDI12 / Bluetooth LE – Interface: IP54

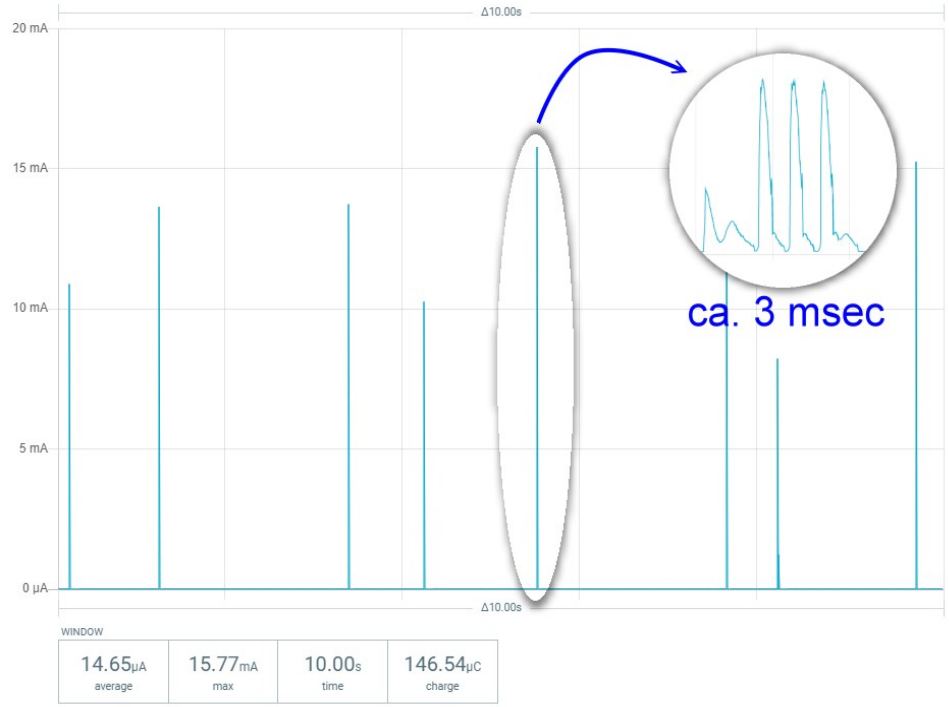
6.1 Power Profile

6.1.1 Power Up Sequence

The Sensor is ready after ca. 250 msec.

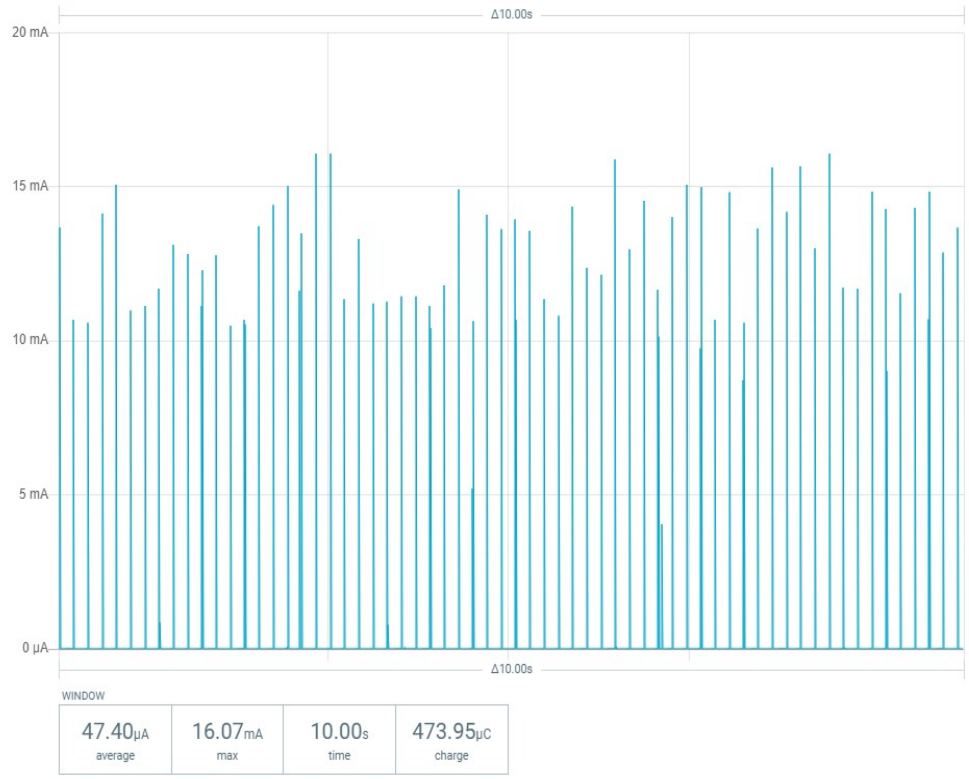
6.1.2 Advertising (in deep sleep)

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



Advertising power consumption (one peak zoomed)

6.2 Connected Mode



Connected power consumption

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

7 Compliance (Version: 2Wire)

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 2Wire, Type 410 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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