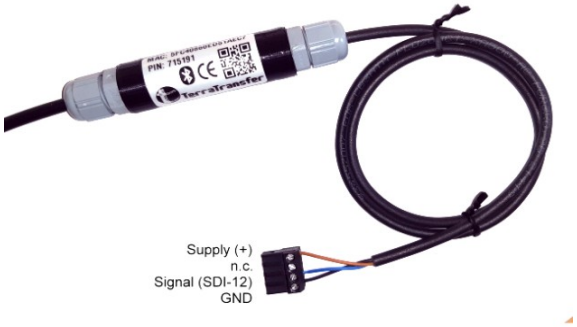
OSX – Open-SDI12-Blue

Version Pressure Level Transmitter 713 (Ceramic) from Huba Control, Type 420

1 Quick setup

Level Transmitter 713 (Sensor, IP68 for permanent immersion until max. over pressure)



SDI-12 / Bluetooth LE Converter (as Interface Sensor to SDI-12).
Important: *- Avoid traction on the cables!*
- The Converter is only IP54!

The **OSX Huba713_Ceramic** is a SDI12 Interface to the Pressure Level Transmitter 713 (Digital Version) with Ceramic membrane from Huba Control (https://www.hubacontrol.com/en/products/pressure-level-transmitter/pressure-level-transmitter-713)

By default the OSX is configured as:

- Pressure range 0..1 bar (equivalent to ca. 10 mtr. Water level)
- Optionally the sensor can be configured to Water level in meters
- 10 mtr. cable (ventilated for atmospheric compensation)
- Ultra-Low-Power operation of the sensor

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

BLACK:	GND
BROWN:	5V-16V Supply (Info: optionally Version 2.8V-16V available)
BLUE or WHITE:	SDI-12 Signal

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_HB0_A_0420_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.) Pressure and b.) Temperature

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.) Pressure, b.) Temperature and c.) Voltage

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

Error codes (all values lower than -900.000):

-999.0: Sensor internal error (‘No Reply’) probably sensor or internal connection broken)
-9xx.0: Data corrupt (may water in the sensor or 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!

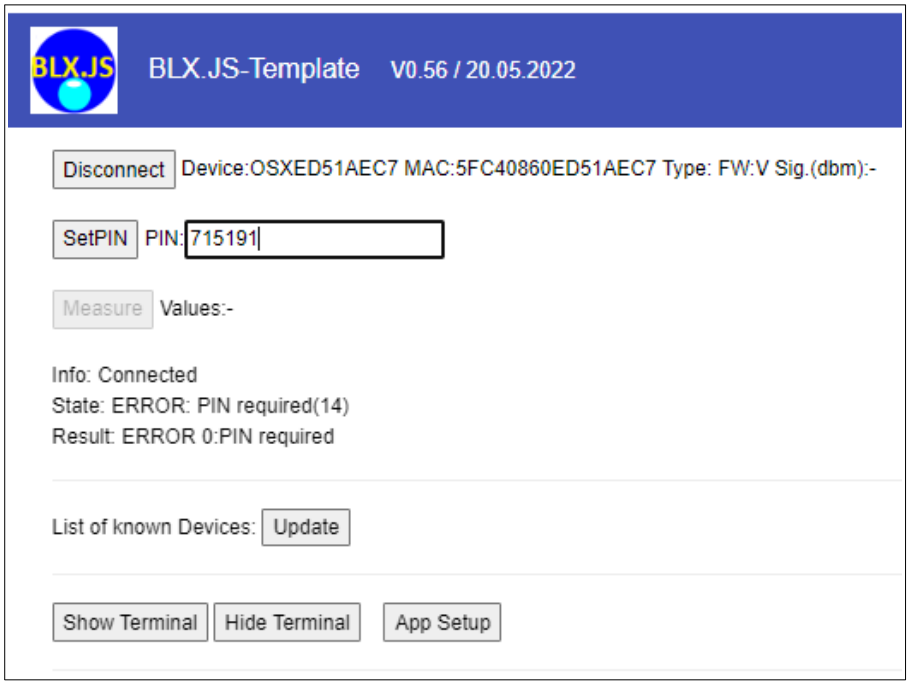
Link: Download Link BlueShell or BLX.JS

3.1.2 Software for SDI12

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

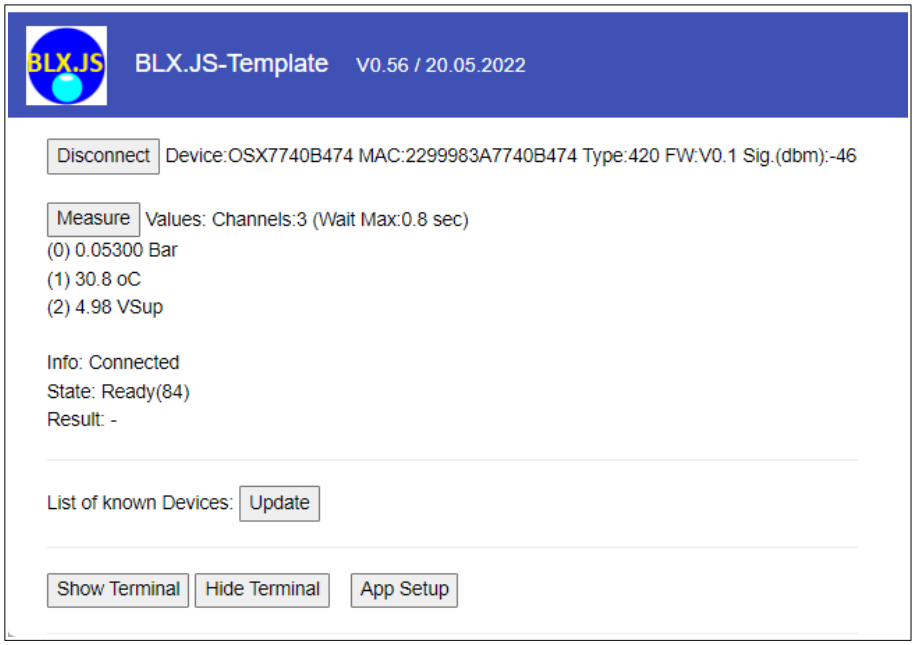
Link: https://github.com/joembedded/SDI12Term

4 Sample session BLX.JS



Enter PIN only required once!

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



Measure

5 Commands

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

5.1.1 Commands for this type (Huba713_Ceramic Type 420):

Measure:

- M or MC or M1 or MC1 starts the measure, measure takes < 1 sec
  (optionally the Warm-Up Time can be changed, see below)
- 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_HB0_A_0420_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+0.00032+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: ‚@|‘ is CRC
Reply: "0+0.00025+30.8@C|<CR><LF>'	
End: 'OK' (Runtime: 290 msec)	
> z?XDevice!	SDI12: XDevice
Reply: '0M:2299983A7740B474,T:420,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 normally 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 or for changed setup (e.g. output in Water Level)

- 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. The Pressure Level Transmitter 713 sensors are internally factory calibrated to Bar and °C (units may be changed).
- It is possible to set the sensor to Water Level. Because Water Level depends on the weight of the water, this calibration is dependant to water salinity and geographical gravity:
  - Sweet / drinking water (with a salinity of <0.1%) has a density of 1.00 kg per liter
  - The geographical gravity varies from ca. 9.83 m/s^2 (equator) tp 9.79 m/s^2 (earth poles). For Central Europe 9.806 m/s^2 is a good average, hence 1 Bar is equal to 10.19711 mtr. Water level with a salinity of <0.1%.
- The 4 Coefficients:
  Formula is (BLX standard): Formula: VALUE = (MEASURED * Multi) – Offset.
  K0: Pressure Multi (Default: 1.0)
  K1: Pressure Offset (Default: 0.0)
  K2: Temperature Multi (Default: 1.0)
  K3: Temperature Offset (Default: 0.0)
- Example how to change the Coefficients to Water Level (for sweet / drinking water (with a salinity of <0.1%):
  - Set K0 to 10.19711 (see above)
  - Set Unit of pressure channel from “Bar” to “mtr”
- The coefficient ‘P’ is the Level Transmitter's Warm-Up Time. Default is 250 msec. However it can be set to 1..9999 msec with the “P”-Command. If the P is set to 0, the Level Transmitter is constantly powered (Higher Power consumption!).
- The “Write” command writes changed parameters to Flash.

In this example the sensor is set to Water Level:

> e	Measure
Measure (2 Channels in 750 msec)	
(0)0.53222 Bar	
(1)25.8 oC	
> z?XK0!	Check K0 (Multi)
Reply: '0K0=1.000000<CR><LF>'	
End: 'OK' (Runtime: 389 msec)	
> z?XK0=10.19711!	Set K0 to Water Level
Reply: '0K0=10.197112<CR><LF>'	
End: 'OK' (Runtime: 246 msec)	
> z?XU0!	Check Unit 0
Reply: '0U0='Bar'<CR><LF>'	
End: 'OK' (Runtime: 206 msec)	
> z?XU0=mtr!	Set Unit 0 to ‘mtr’
Reply: '0U0='mtr'<CR><LF>'	
End: 'OK' (Runtime: 269 msec)	
> e	Check results
Measure (2 Channels in 750 msec)	
(0)5.42333 mtr	
(1)25.8 oC	
> z?XWrite!	Save Settings to Flash
Reply: '0<CR><LF>'	
End: 'OK' (Runtime: 162 msec)	

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

> e	Measure
Measure (2 Channels in 300 msec)	
(0)0.0003 Bar	
(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)0.0003 Bar	
(1)25.24 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).

However, for Level Transmitter 713 at least 5.0V are required, recommended: 5.0V-16V (Info: Optionally Version 2.8V-16V available)

Measure: <5mA for ca. 300 msec (Default, if Warm-Up Time is set to 0, Level Transmitter 713 is constantly powered).

Operating Temperature: -40°C - +85°C
(Medium Temperature for Level Transmitter 713: -20°C - +80°C, see data sheet)

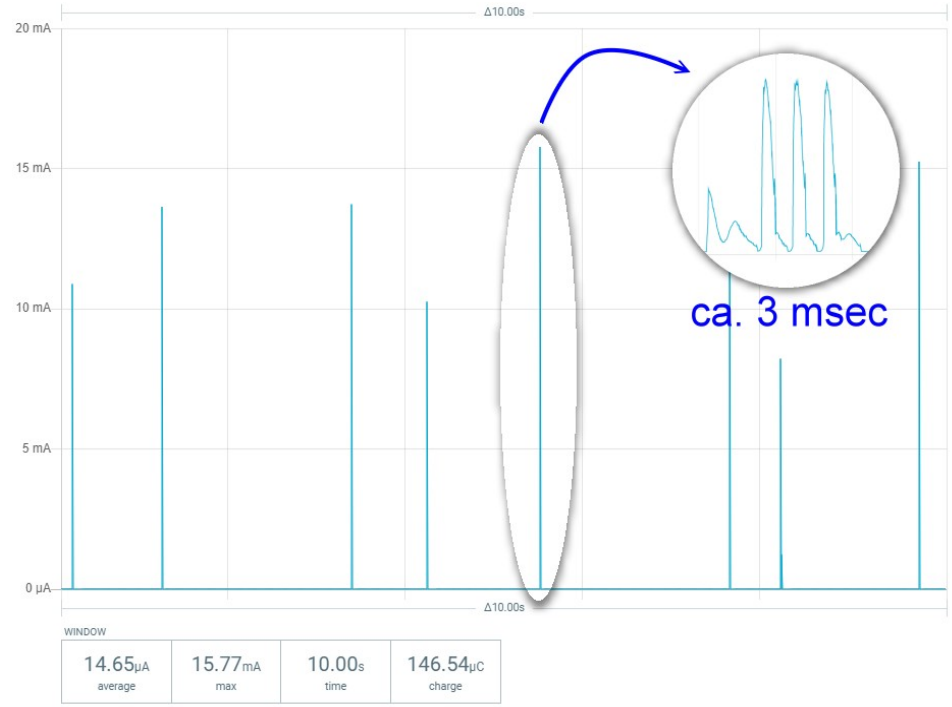
6.1 Power Profile

6.1.1 Power Up Sequence

The Sensor is ready after ca. 250 msec.

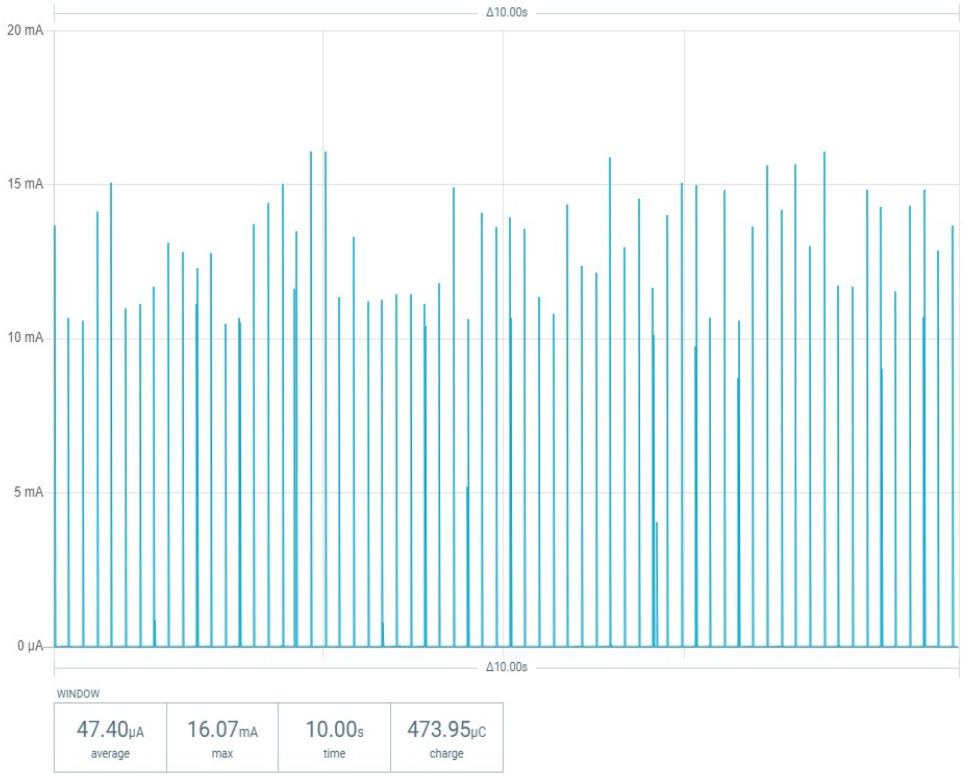
6.1.2 Advertising (in deep sleep)

Average power consumption in deep sleep is <15 µA @ 5V



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: Huba713_Ceramic)

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 Huba713_Ceramic, Type 420 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).

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