BeanAir
WIRELESS IIOT SENSORS

# USER MANUAL

BeanDevice® 2.4 GHz

ProcessSensor

BeanDevice® 2.4GHz

**AN-V**

Wireless IIOT Data Acquisition (DAQ)
voltage inputs (±5V or ±10V)

**AN-420**

Wireless IIOT Data Acquisition (DAQ)
4-20mA (current loop) inputs

**AN-mV**

Wireless IIOT Data Acquisition (DAQ)
low voltage inputs (±20mV)
for load cell sensors

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| VALIDATION | | | |
|---|---|---|---|
| **Function** | **Destination** | **For validation** | **For info** |
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| DIFFUSION | | | |
|---|---|---|---|
| **Function** | **Destination** | **For action** | **For info** |
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# 1. TECHNICAL SUPPORT

For general contact, technical support, to report documentation errors and to order manuals, contact ***Beanair Technical Support Center*** (BTSC) at:

tech-support@Beanair.com

For detailed information about where you can buy the Beanair equipment/software or for recommendations on accessories and components visit:

www.Beanair.com

To register for product news and announcements or for product questions contact Beanair's Technical Support Center (BTSC).

Our aim is to make this user manual as helpful as possible. Keep us informed of your comments and suggestions for improvements.
Beanair appreciates feedback from the users of our information.

## 2. VISUAL SYMBOLS DEFINITION

| *Symbols* | *Definition* |
|---|---|
| | ***Caution or Warning** – Alerts the user with important information about Beanair wireless sensor networks (WSN), if this information is not followed, the equipment /software may fail or malfunction.* |
| | ***Danger** – This information MUST be followed if not you may damage the equipment permanently or bodily injury may occur.* |
| | ***Tip or Information** – Provides advice and suggestions that may be useful when installing Beanair Wireless Sensor Networks.* |

## 3. ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ***AES*** | Advanced Encryption Standard |
| ***CCA*** | Clear Channel Assessment |
| ***CSMA/CA*** | Carrier Sense Multiple Access/Collision Avoidance |
| ***GTS*** | Guaranteed Time-Slot |
| ***kSps*** | Kilo samples per second |
| ***LLC*** | Logical Link Control |
| ***LQI*** | Link quality indicator |
| ***LDCDA*** | Low duty cycle data acquisition |
| ***MAC*** | Media Access Control |
| ***PAN*** | Personal Area Network |
| ***PER*** | Packet error rate |
| ***RF*** | Radio Frequency |
| ***SD*** | Secure Digital |
| ***WSN*** | Wireless sensor Network |

## 4. DOCUMENT ORGANISATION

This manual is organized in 7 chapters, as follows:

| | |
|---|---|
| BeanDevice® product overview | •Details the BeanDevice® product presentation |
| Data acquisition mode description | •Details the data acquisition mode available on the BeanDevice®<br>• ***Related Technical Note:*** TN_RF_008 - "Data acquisition mode available on the BeanDevice®" |
| BeanDevice® installation guidelines | •Details the installation guidelines of the BeanDevice®<br>•***Related Technical Note:*** TN_RF_010 - "Beandevice® Power Management "<br>•***Related Technical Note:*** TN_RF_007- "Beandevice® DataLogger user Guide"<br>•***Related Technical Note:*** TN_RF_006- "Beandevice® wireless network association" |
| BeanDevice® supervision from the Beanscape® | •Details the BeanDevice® supervision from the BeanScape® |
| BeanDevice® maintenance (for experienced user) | •Details the BeanDevice® maintenance (for experienced user) |
| Troubleshooting | •Frequently asked questions (FAQ) |
| Installation procedures | •Details the installation procedures |

# 5. BEANDEVICE® PRODUCT OVERVIEW

***It is highly recommended to read all the user manual related to Beanair software & equipment (BeanScape ®, BeanGateway®, BeanDevice ®) before getting start your BeanDevice®.***

## 5.1 INTRODUCTION TO PROCESSSENSOR PRODUCT LINES

ProcessSensor product line comes with Wireless analog DAQ compatible with a large scale of analog sensors:

- Analog voltage ±5V and ±10V
- Analog low voltage ±20mV compatible with strain gauge sensor
- Analog current loop 4-20 mA

It comes with advanced features:

- ✓ High measurement precision (less than ±0.08% on the full scale)
- ✓ Providing power supply to external analog sensors (user configurable: 4.5V up to 20V)
- ✓ Back Up data acquisition on an internal flash memory (embedded data logger)
- ✓ Transmitting data by wireless
- ✓ Compatible with sleep or active power mode

| | |
|---|---|
| **BeanDevice® AN-420** | Wireless system acquisition for analog 4-20 mA current loop measurement. |
| **BeanDevice® AN-V** | Wireless system acquisition for analog differential measurement ±5 volts or ±10 volts. |
| **BeanDevice® AN-mV** | Wireless system acquisition for analog differential measurement ±20 mV<br>This product is dedicated to sensors integrating a Wheatstone bridge (strain gauge sensors, load cell sensors, pressure…). |

***Industrial sensors commonly use a 4-20 mA DC signal. With this method, the sensor signal is conveyed as a current. Raw output of the sensor will either be 4 mA at the lowest or 20 mA at the highest. By examining the current between 4 and 20 mA an actual reading can be determined. For example, assume an air temperature sensor has a range of 0°C to 100°C. If the output from the temperature sensor is 4 mA, then the temperature is 0°C. If the output from the sensor is 20 mA, then the temperature is 100°C. Readings between 4 and 20 mA are linear and simple to determine.***
***One of the major advantages of using 4-20 mA sensors is the limited signal loss of these devices. By outputting a sensor signal in the form of current, electrically noisy areas do not have an effect on the sensor's readings. Furthermore, accuracy is not affected by changes in line and connection resistance, or by the addition of other loads in the circuit.***

## 5.2 BEANDEVICE® TECHNICAL SPECIFICATIONS

### 5.2.1 Common technical specifications

#### 5.2.1.1 RF specifications

| RF Specifications | |
|---|---|
| **Wireless Protocol Stack** | Ultra-Low-Power and license-free 2.4Ghz radio technology (IEEE 802.15.4E) |
| **WSN Topology** | Point-to-Point / Star |
| **Data rate** | 250 Kbits/s |
| **RF Characteristics** | ISM 2.4GHz – 16 Channels |
| **TX Power** | +18 dBm |
| **Receiver Sensitivity** | -104 dBm |
| **Maximum Radio Range** | 650m (Line of Sight), 30-100m (Non-Line of Sight) |
| **Antenna diversity** | · 2 omnidirectional N-Type antennas<br>· Gain 5.5 dBi<br>· Waterproof IP67 |

*Table 1: RF specifications Table*

#### 5.2.1.2 Embedded Data logger

| Embedded Data logger | |
|---|---|
| **Storage capacity** | up to 1 million data points |
| **Wireless data downloading** | 3 minutes to download the full memory (average time) |

*Table 2: Embedded Data Logger Table*

#### 5.2.1.3 TimeSync: Time Synchronization over the Wireless Sensor Networks (WSN)

| TimeSync function: Clock synchronization over the Wireless IOT Sensor | |
|---|---|
| **Clock synchronization accuracy** | ±2.5 ms (at 25°C) |
| **Crystal specifications** | Tolerance ±10ppm, stability ±10ppm |

*Table 3: TimeSync function Table*

#### 5.2.1.4 Environmental and Mechanical

| Environmental and Mechanical | |
|---|---|
| **Enclosure** | Aluminum, Waterproof IP67 – Fire Protection : ULV94/Getex<br>casing dimensions (w/o antenna, w eyelets )<br>L x l x h : 156mm x 82mm x 57mm<br>Weight : 760g |
| **Shocks resistance** | 50g during 50 ms |
| **Operating Temperature** | -40 °C to +60 °C |
| **Norms** | · CE Labelling Directive R&TTE (Radio) ETSI EN 300 328<br>· FCC (North America)<br>· ARIB STD-T66 Ver 3.6<br>ROHS - Directive 2002/95/EC |

*Table 4: Environmental and Mechanical Table*

#### 5.2.1.5 Power Supply

| Power supply | |
|---|---|
| **Integrated battery charger** | Integrated Lithium-ion battery charger with high precision battery monitoring:<br>· Overvoltage Protection, Overcurrent/Short-Circuit Protection, Undervoltage Protection<br>· Battery Temperature monitoring |
| **Current consumption @ 3,3V** | · During data acquisition: 70mA to 130 mA (depends on external sensor power supply)<br>· During Radio transmission: 70 mA<br>· During Battery Saver Mode: < 35 µA |
| **External power supply** | External power supply: +8-28 VDC with polarity inversion protection |
| **Rechargeable battery** | High density Lithium-Ion rechargeable battery with a capacity of 2.2Ah with polyswitch protection |

*Table 5: Power Supply specifications table*

5.2.1.6 Included Accessories

| Included Accessories | |
|---|---|
| | 4 x M12 Cap<br>1 x M8 Cap<br>2 x High gain antenna 5.5 dBi / V.S.W.R : 1.5 :1 / Waterproof IP67 |

*Table 6: Included Accessories*

5.2.1.7 Options

| Optional Accessories and Services | |
|---|---|
| **External Power Supply** | Wall plug-in, Switchmode power Supply 12V @ 1,25A with sealed M8 Plug (IP67/Nema 6)<br>**Ref: M8-PWR-12V** |
| **M8 extension cable for external power supply** | Molded cable with M8-3pins male plug<br>**Material:** PVC with shield protection<br>**IP Rating :** IP67 \| Nema 6<br>Cable length: 2 meters , **Ref: CBL-M8-2M**<br>Cable length : 5 meters, **Ref: CBL-M8-5M**<br>Cable length: 10 meters, **Ref: CBL-M8-10M** |
| **M12 Plastic ABS plug for sensors** | M12-4 Pins Male plug for sensor interface<br>Coding : A , Locking type: Fix screw, Material: Plastic ABS<br>IP Rating: IP67 in locked condition<br>**Ref: M12-PL-SENSOR** |
| **M12 Aluminum plug for sensors** | M12-4 Pins Male plug for sensor interface<br>Coding : A , Locking type: Fix screw, Material: Aluminum<br>IP Rating: IP67 in locked condition<br>**Ref: M12-AL-SENSOR** |
| **Antenna cable** | N-Type cable (Male/Male),<br>Cable type: RF-5/H155<br>Cable length: 1 meter, **Ref: CBL-ANT-1M**<br>Cable length: 2 meters, **Ref: CBL-ANT-2M**<br>Cable length: 3 meters, **Ref: CBL-ANT-3M**<br>Cable length: 5 meters, **Ref: CBL-ANT-5M**<br>Cable length: 10 meters, **Ref: CBL-ANT-10M** |

| | |
|---|---|
| **High Gain antenna option** | High Gain Omnidirectional antenna<br>Frequency range 2400-2500MHz<br>VSWR < 1.4, Impedance 50 Ohm, Polarization Vertical<br>Vertical plane 24° (7dBi Gain version), 16°(7dBi Gain version), 6°(12dBi Gain version), Horizontal plane 360°<br>Connector N female, Wind load (170km/h) 7.3N<br>Included: N-Type cable (Male/Male), length: 1 meter<br>Gain: 7dBi, Dimensions 360mm x 23mm, Weight 0.44 kg,<br>**Ref: HG-OMNI-OUT-7DBI**<br>Gain: 9dBi , Dimensions 540x23 mm, Weight 0.61 kg ,<br>**Ref: HG-OMNI-OUT-9DBI**<br>Gain: 12dBi , Dimensions: 1125mm x 19 mm, Weight 1.06 kg ,<br>**Ref: HG-OMNI-OUT-12DBI** |
| **Calibration certificate** | Calibration certificate linked to German Accreditation Body (DAkkS)<br>**REF: CERT-CAL-PROCESS** |

***Table 7: BeanDevice® options table specifications***

### 5.2.2 BeanDevice® AN-420

#### 5.2.2.1 Product reference

| *Product reference* |
|---|
| BND-2.4GHZ-AN420-4CH |

#### 5.2.2.2 Analog data acquisition block specifications

| Analog data acquisition specifications | |
|---|---|
| **Signal Conditionning** | Analog current loop measurement |
| **Number of channels** | 4 Channels |
| **A/D Converter** | 16 bits - SAR Architecture (Successive Approximation Register) with temperature compensation |
| **Measurement range** | 4-20 mA Current Loop measurement |
| **Non-linearity error** | ± 0.5 LSB |
| **Repeatability (full scale, @ 25°C, Static Measurement Mode every 2s)** | less than ± 0.01% |
| **Repeatability (full scale, @ 25°C, Dynamic Measurement Mode 10Hz)** | less than ± 0.01% |
| **Sensor Connector** | M12-4Pins , A-Coding, Waterproof IP67 |

*Table 8: BeanDevice® AN-420 - Analog data acquisition table*

#### 5.2.2.3 Sensor Power Supply Specifications

| Sensor Power Supply specifications | |
|---|---|
| **Power Supply** | 4.5 Volts to 20Volts , dynamically configurable from the BeanScape® 2.4GHz software |
| **Power Supply precision (full scale, @25°C)** | ±0.18% |
| **Maximum Output Power (@25°C)** | 1 Watts |

*Table 9: Sensor power supply specifications*

5.2.2.4 Configurable settings

| Configurable settings from the BeanScape® 2.4GHz software | |
|---|---|
| **Data Acquisition mode** | Static Data Acquisition: Low Duty Cycle Data Acquisition (LDCDA) and Alarm Mode (based on alarm thresholds) .<br>Measurement heartbeat 1s to 24 hour<br><br>Dynamic data acquisition(not available on devices with ref. extension XT )<br>Streaming and S.E.T. (Streaming with Event Trigger) Mode |
| **Sampling Rate**<br>**(SPS = samples per second)** | Minimum: 1 SPS<br>Maximum: 400 SPS maximum per channel |
| **Alarm Threshold** | 3 levels of Alarm Threshold **Alert-Action-Alarm** |
| **Sensor power supply** | 4.5 to 20 Volts |
| **Power Mode** | Battery saver mode & Active power mode |

*Table 10: Configurable settings from BeanScape® 2.4GHz software*

### 5.2.3 BeanDevice AN-V

5.2.3.1 Product reference

| *Product reference* |
|---|
| BND-2.4GHZ-ANV–4CH –*MR* |
| ***MR**-Measurement Range*<br>***5 :*** ±5V measurement range , ***10:*** ±10V measurement range |
| ***Example:*** BND-2.4GHZ-ANV-4CH-***5***, ***BeanDevice® AN-V with four channels , measurement range: ±5V*** |

5.2.3.2 Analog data acquisition block specifications

| | **Analog data acquisition specifications** |
|---|---|
| **Signal Conditionning** | Analog voltage measurement |
| **Number of channels** | 4 Channels |
| **A/D Converter** | 16 bits - SAR Architecture (Successive Approximation Register) with temperature compensation |
| **Measurement range (analog polarity is dynamically configurable from the BeanScape® 2.4GHz)** | BND-ANV-4CH –***5***: ±5V (bipolar) or 0-10 V (unipolar) |
| | BND-ANV-4CH –***10***: ±10V (bipolar) or 0-20 V (unipolar) |
| **Non-linearity error** | ± 0.5 LSB |
| **Repeatability (full scale, @ 25°C, Static Measurement Mode every 2s)** | **less than ± 0.01%** |
| **Repeatability (full scale, @ 25°C, Dynamic Measurement Mode 10Hz)** | **less than ± 0.01%** |
| **Sensor Connector** | M12-4Pins , A-Coding, Waterproof IP67 |

*Table 11: BeanDevice® AN-mV - Analog data acquisition table*

5.2.3.3 Sensor Power Supply

| | **Sensor Power Supply specifications** |
|---|---|
| **Power Supply** | 4.5 Volts to 20Volts , dynamically configurable from the BeanScape® 2.4GHz software |
| **Power Supply precision (full scale, @25°C)** | ±0.18% |
| **Maximum Output Power (@25°C)** | 1 Watts |

*Table 12: Sensor power supply*

5.2.3.4 Configurable Settings

| | Configurable settings from the BeanScape® 2.4GHz software |
|---|---|
| **Data Acquisition mode** | Static Data Acquisition: Low Duty Cycle Data Acquisition (LDCDA) and Alarm Mode (based on alarm thresholds) .<br>Measurement heartbeat 1s to 24 hour<br><br>Dynamic data acquisition(not available on devices with ref. extension XT ) Streaming and S.E.T. (Streaming with Event Trigger) Mode |
| **Sampling Rate**<br>**(SPS = samples per second)** | Minimum: 1 SPS<br>Maximum: 400 SPS maximum per channel |
| **Alarm Threshold** | 3 levels of Alarm Threshold Alert-Action-Alarm |
| **Sensor power supply** | 4.5 to 20 Volts |
| **Analog Input polarity** | Bipolar or Unipolar |
| **Power Mode** | Battery saver mode & Active power mode |

*Table 13: Configurable settings from BeanScape® 2.4GHz software*

### 5.2.4 BeanDevice® AN-mV

#### 5.2.4.1 Product reference

| *Product reference* |
|---|
| BND-2.4GHZ-AN-MV–4CH |

#### 5.2.4.2 Analog data acquisition block specifications

| | Analog data acquisition specifications |
|---|---|
| **Signal Conditionning** | Analog low voltage mV , suitable for Strain Gage based sensors |
| **Number of analog inputs** | 4 Channels |
| **A/D Converter** | 16 bits - SAR Architecture (Successive Approximation Register) with temperature compensation |
| **Measurement range** | ±20 mV (bipolar) or 0-40 mV (unipolar) |
| **Non-linearity error** | ± 0.5 LSB |
| **Repeatability (full scale, @ 25°C, Static Measurement Mode every 2s)** | **less than ± 0.025%** |
| **Repeatability (full scale, @ 25°C, Dynamic Measurement Mode 10Hz)** | **less than ± 0.35%** |
| **Sensor Connector** | M12-4Pins , A-Coding, Waterproof IP67 |

*Table 14: BeanDevice® AN-V - Analog data acquisition table*

#### 5.2.4.3 Sensor Power Supply

| | Sensor Power Supply specifications |
|---|---|
| **Power Supply** | 4.5 Volts to 20Volts , dynamically configurable from the BeanScape® 2.4GHz software |
| **Power Supply precision (full scale, @25°C)** | ±0.18% |
| **Maximum Output Power (@25°C)** | 1 Watts |

*Table 15: Sensor power supply specifications*

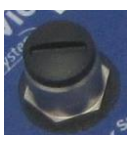
5.2.4.4 Configurable settings

| Configurable settings from the BeanScape® 2.4GHz software | |
|---|---|
| **Data Acquisition mode** | Static Data Acquisition: Low Duty Cycle Data Acquisition (LDCDA) and Alarm Mode (based on alarm thresholds) .<br>Measurement heartbeat 1s to 24 hour<br><br>Dynamic data acquisition(not available on devices with ref. extension XT ) Streaming and S.E.T. (Streaming with Event Trigger) Mode |
| **Sampling Rate**<br>**(SPS = samples per second)** | Minimum: 1 SPS<br>Maximum: 400 SPS maximum per channel |
| **Alarm Threshold** | 3 levels of Alarm Threshold Alert-Action-Alarm |
| **Sensor power supply** | 4.5 to 20 Volts |
| **Analog Input polarity** | Bipolar or Unipolar |
| **Power Mode** | Battery saver mode & Active power mode |

*Table 16: Configurable settings from BeanScape® 2.4GHz software*

## 5.3 PRODUCT FOCUS

*Figure 1: Focus on BeanDevice® AN-V/AN-mV/AN-420*

| Number | Function | Description |
|---|---|---|
| 1 | ***M8-3 Contacts Socket for external power supply***  | ***DC 8-28 volts*** power supply<br>The socket sealing is assured with a screw cap<br>***To keep the BeanDevice® weatherproof, don't forget to protect the M8-3contacts socket with the screw cap provided with your BeanDevice®*** |

| | | |
|---|---|---|
| 2 | ***Radio antenna*** | 2x N-Type Radio antenna, waterproof IP67<br>***Do not try to change or modify the antenna, you will damage your BeanDevice®.*** |
| 3 | ***ON/OFF push button*** | Allows to power up/power off the BeanDevice®<br>**ON: button pushed**<br>**OFF: button not pushed**<br>***Wait for a minimum of 5 seconds before your power-up the BeanDevice®. The BeanDevice® integrates an energy tank allowing a backup of the WSN context before powering OFF.*** |
| 4 | ***BeanDevice® Activity /Failure led*** | Bi-color **GREEN** / **RED Led**<br>Cf. Table for led description |
| 5 | ***M12-5 Pins female socket for sensor interface*** | This socket is compatible with a M12-5 Pins A-Coding male plug. |
| 6 | ***BeanDevice® product version label*** | Three label version are available:<br>***AN-420***: 4-20 mA current loop measurement<br>***AN-V***: +/-5 volts or +/-10 volts analog measurement<br>***AN-mV***: +/- 20 mV or +/-40 mV analog low voltage measurement |
| 7 | ***Network context push button*** | To restore default/factory parameters, you must perform a *Network context deletion*. Push on the push-button ("Network") for more than 2 seconds. |
| 8 | ***Eyelet for wall mounting*** | The BeanDevice® is provided with a wall mounting kit. |
| 9 | ***M12 sensor cap*** | M12 sensor cap<br>***Don't forget to protect the M12 contacts socket with a screw cap. You will lose the tightness of your device if you do not close properly.*** |
| 10 | ***MAC ID Label*** | Unique identifier assigned to the BeanDevice® (64-bytes)<br>***Every wireless network product which is based on the IEEE 802.15.4 standard must have a 64-bit MAC address that allows unique identification of the device within a global network.*** |

## 5.4 LEDS DESCRIPTION

| Operating status | Led Activity Failure |
|---|---|
| **The BeanDevice® is power off & external power supply is connected.** | LED OFF |
| **The BeanDevice® is power down with no external power supply connected** | LED OFF |
| **The BeanDevice® is power on with wireless TX/RX activity** | Green Led: Wireless Network Activity<br>Red Led: Wireless transmission failure |
| **The BeanDevice® is power on** | Green led toggling |
| **The BeanDevice® is power off (was power on before)** | RED LED ON during 2s |

## 5.5 RF ANTENNA

### 5.5.1 Antenna diversity

Antenna diversity is a technique that maximizes the performance of an antenna system. It allows the radio to switch between two antennas that have very low correlation between their received signals. Typically, this is achieved by spacing two antennas around 0.25 wavelengths apart or by using two orthogonal polarizations. So, if a packet is transmitted and no acknowledgement is received, the radio system can switch to the other antenna for the retry, with a different probability of success.

*Figure 2: Antenna Diversity present on the BeanDevice® AN-420/AN-V/AN-mV*

### 5.5.2 Antenna specifications

| *Specifications* | |
|---|---|
| ***Antenna Gain*** | 5.5 dBi |
| ***Frequency*** | 2400-2485 MHz |
| ***Bandwidth*** | 83,5 MHz |
| ***Connector*** | N-Type (male) |
| ***VSWR*** | <2.5:1 |
| ***Polarization*** | Vertical |
| ***Nominal impedance*** | 50 Ohm |
| ***Weight*** | 50g |
| ***Dimensions*** | length 193 mm |
| ***Material*** | TPE |
| ***Operating temperature*** | -40°C to 85°C |

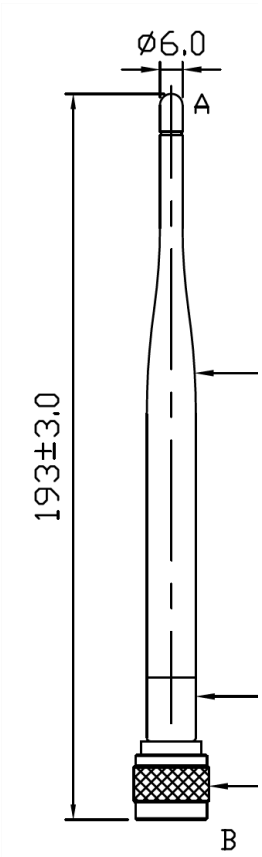



Table 17 : Antenna specifications

## 5.6 SENSOR INTERFACE

### 5.6.1 How to connect a sensor on your BeanDevice®?

Several types of sensor can be plugged on your BeanDevice®:

- ✓ Current loop 4-20 mA
- ✓ Analog low voltage measurement ±20 mV
- ✓ Analog differential measurement ±10 V

Connecting a sensor is very easy but it requests to follow up several steps:

| | |
|---|---|
| ***Step 1:*** Access the configuration tab for the selected sensor channel. | •Mount the M12 Plug on your sensor . Follow the wiring code available on this document;<br>• Don't plug your sensor on your BeanDevice® AN-XX;<br>•From your BeanScape® software, click on the sensor profile associated to your BeanDevice® |
| ***Step 2***: Configure the sensor power supply | • Enter the value of your sensor power supply;<br>• A message appears on the screen, left click on "OK" to confirm. |
| ***Step 3:*** *Connect your sensor on the BeanDevice* | •Plug your sensor on your BeanDevice® AN-XX, an otch on the M12 connector allows a single way connection;<br>•Rotate the dial clockwise until fully tightened (do not overdo the rotating ring)<br>•You can start the calibration of your sensor from the BeanScape®; |

***Sensors are not provided with the BeanDevice® AN-XX series***

*Figure 3: Sensor connection on the BeanDevice®*

### 5.6.2 Sensor power supply

The BeanDevice® AN-XX series can supply power to your external sensor. You can easily configure your sensor voltage from the BeanScape®.

The following table presents technical specifications:

| ***Technical specifications*** | | |
|---|---|---|
| ***Voltage range*** | | 4.5-20Volts DC (configurable from the BeanScape®) |
| ***Voltage accuracy*** | | 0.2% |
| ***Maximum current delivered*** | | 100 mA |
| ***Maximum power delivered to the sensors*** | | 1.5W |
| ***Pre-process (time required to stabilize the measurement signal)*** | ***Max & Min during*** | ***Configurable from the BeanScape® software:***<br>**10 ms minimum**<br>**10000 ms maximum** |
| | ***Resolution*** | 20 ms |

*Table 18: External sensor power supply specifications*

In order to optimize the low consumption on the BeanDevice®, the power supply provided to the sensor operates in switching mode:

- ✓ Before performing a measurement, the sensor is powered by the BeanDevice®. The sensor warm-up time is settled by the end-user, it will reflect the time needed to stabilize the measurement signal after the sensor power-up;
- ✓ When all the measurements are done, the sensor is immediately power down;
- ✓ This cycle is repeated each time a data acquisition or a stream of data acquisition must be made;

***Example:*** ***Sensor power supply is settled at 10 volts with 400 ms warm-up time***

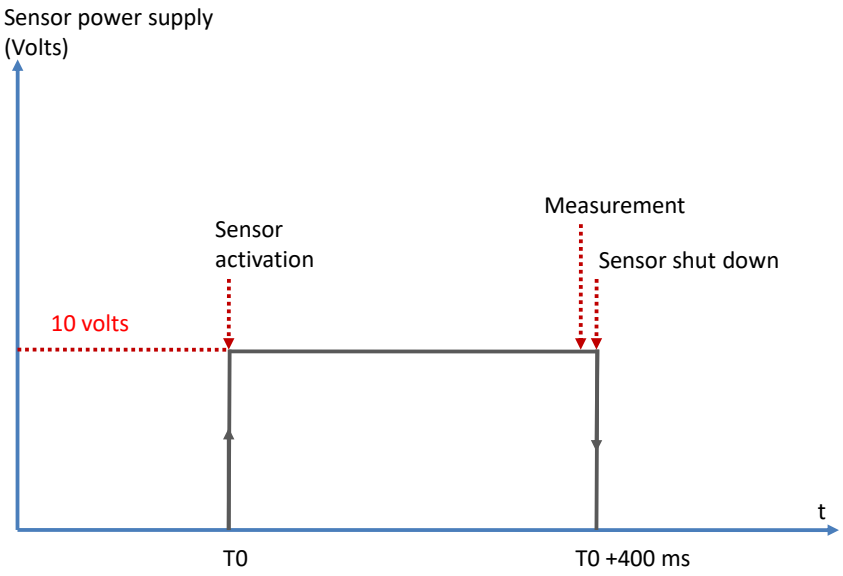



***Figure 4: Sensor warm-up time***

- ✓ ***Choose a sensor that requires a power supply having a pre-process duration as low as possible, otherwise you will decrease the BeanDevice® battery autonomy.***
- ✓ ***Some sensors require a very long pre-process duration (1-2 minutes) and some other sensors will work with a lot of current consumption. In this case we advise you to power up the sensor with an external power source.***
- ✓ ***If your pre-process period is higher than your data acquisition cycle, it will be automatically adjusted by the BeanDevice®.***

***Don't forget to pre-configure the supply voltage and the pre-process duration of your sensor before connecting it. By configuring wrongly, you risk to damage your sensor.***

### 5.6.3 Sensor wiring code (General overview)

*Figure 5: M12 socket location the BeanDevice®*

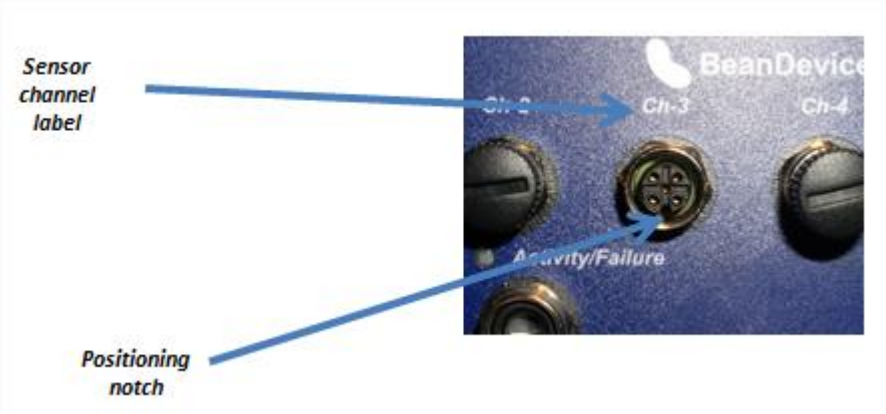



*Figure 6: M12 Socket - positioning notch*

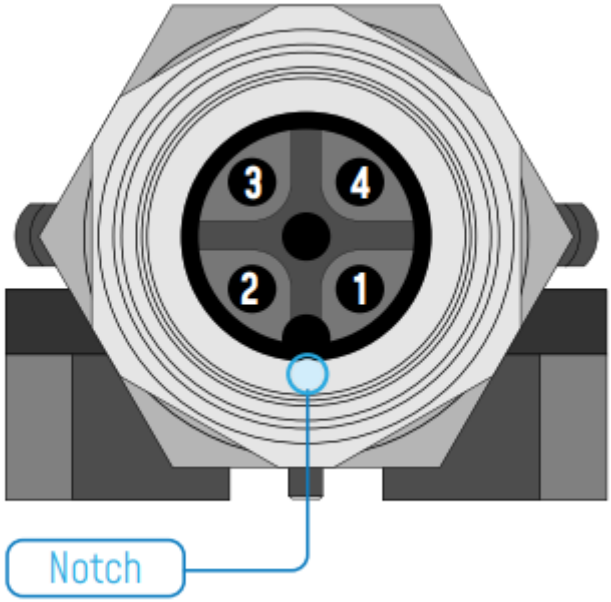



*Figure 7: M12 socket Pin assignation*

M12-4Pins A-coding should be used

### 5.6.4 Sensor wiring code (BeanDevice® AN-420)

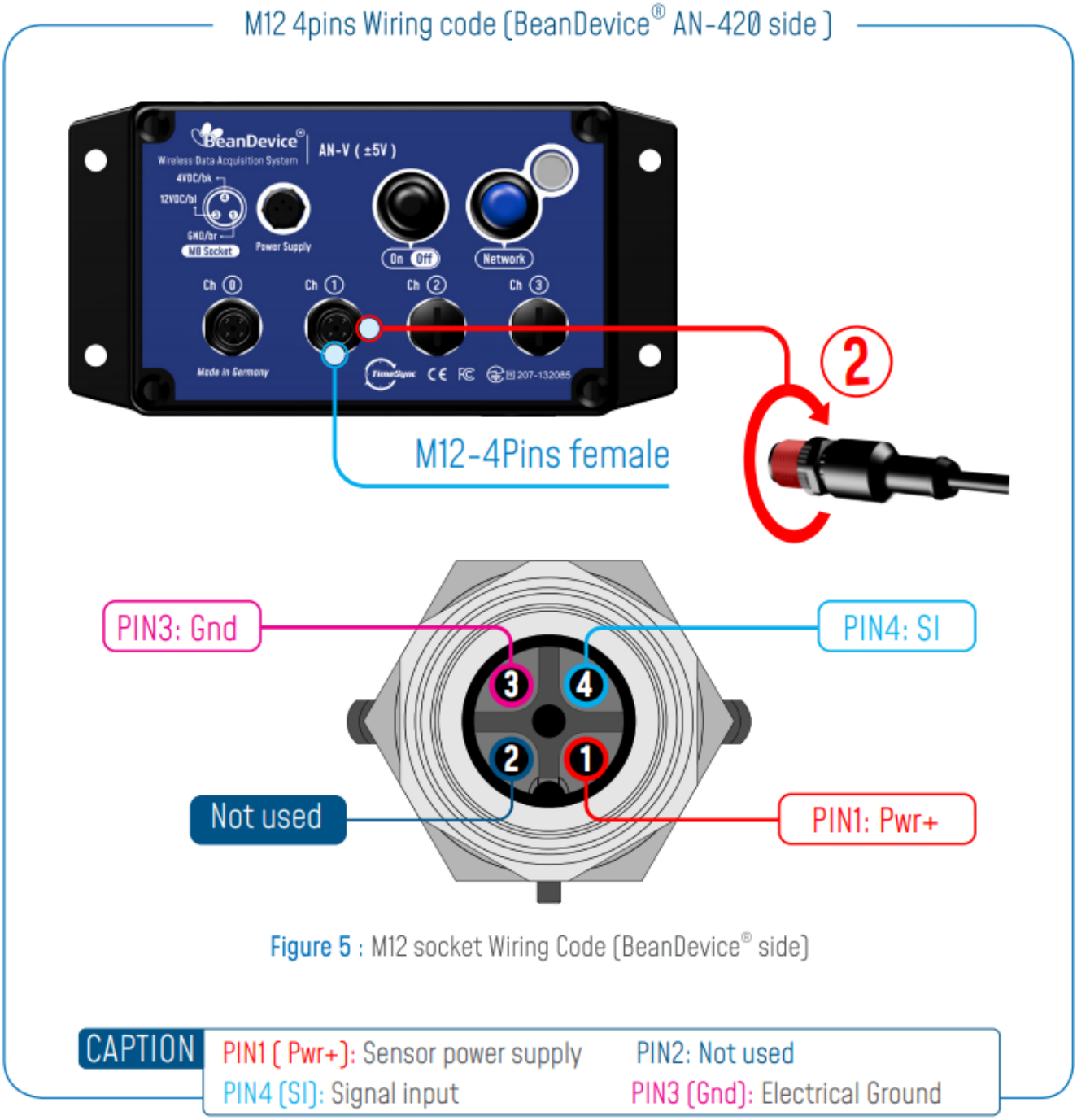



Figure 5 : M12 socket Wiring Code (BeanDevice® side)

***Figure 8 : M12 socket Wiring Code (BeanDevice® side)***

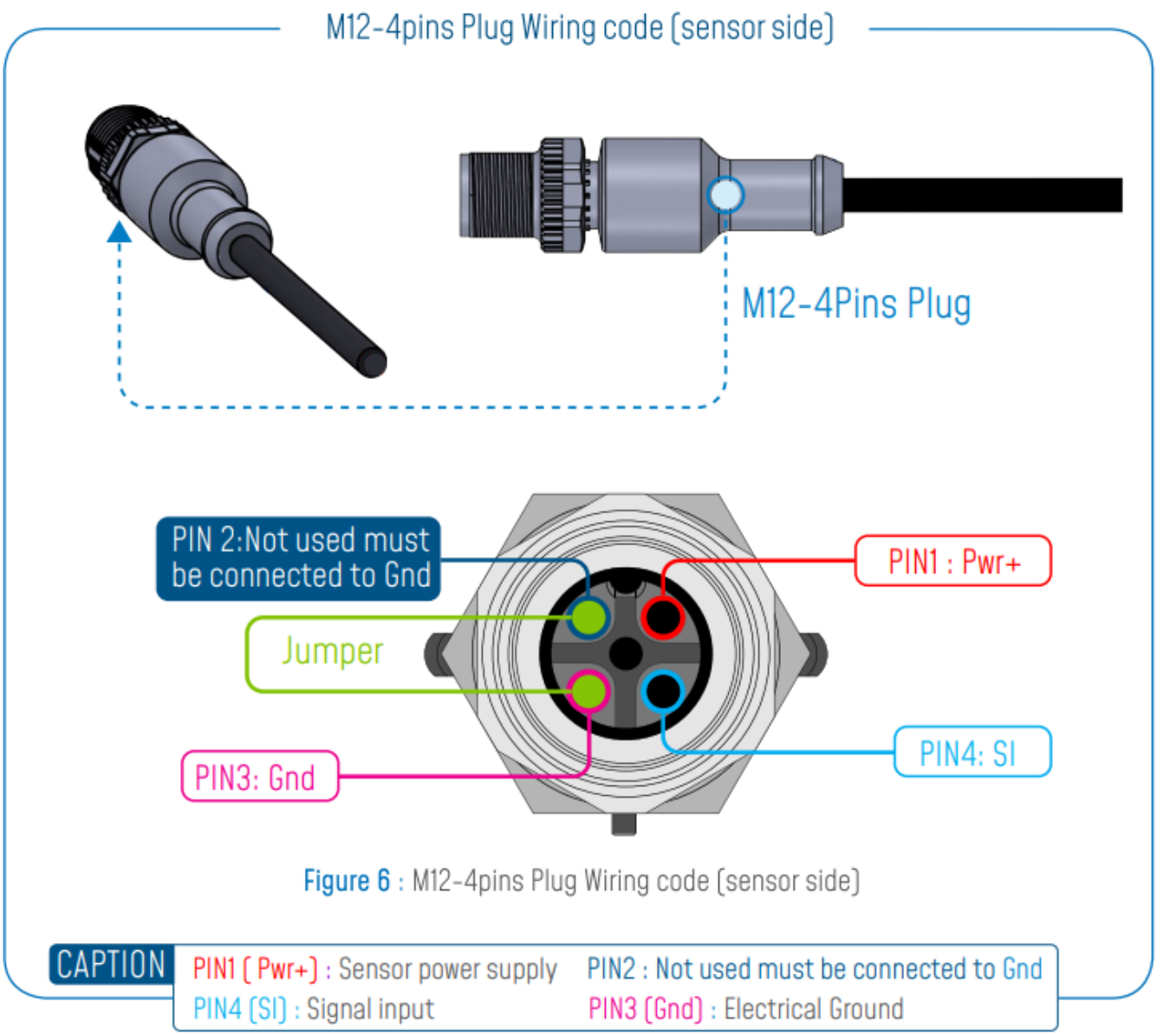



**Figure 9: M12-4pins Plug Wiring code (sensor side)**

**Instructions for connecting a 2-wire sensor:**

- ✓ Connect the sensor wire "**Loop Supply**" to ***PIN1 (Pwr+)***
- ✓ Connect the sensor wire "**Current output**" 4-20mA to ***PIN4(SI)***
- ✓ Use a jumper cable to connect **PIN3(Gnd) to PIN2**

### 5.6.5 Sensor wiring code (BeanDevice® AN-V & AN-mV)

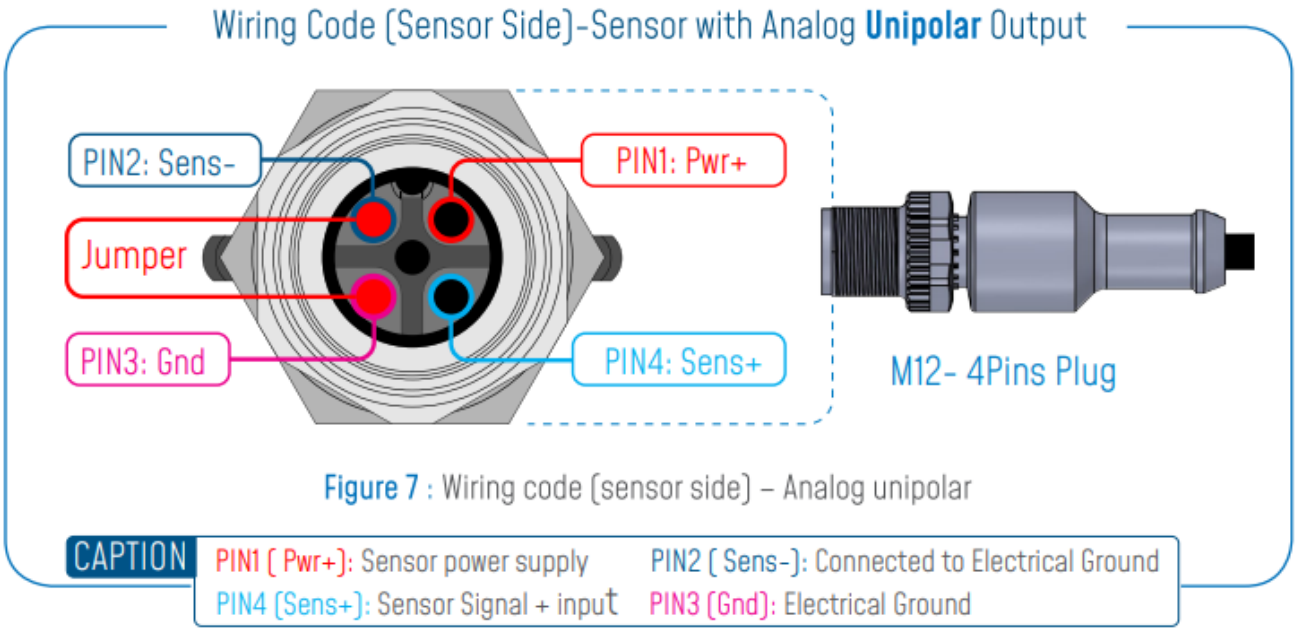



**Figure 10: Wiring code (sensor side) – Analog unipolar**

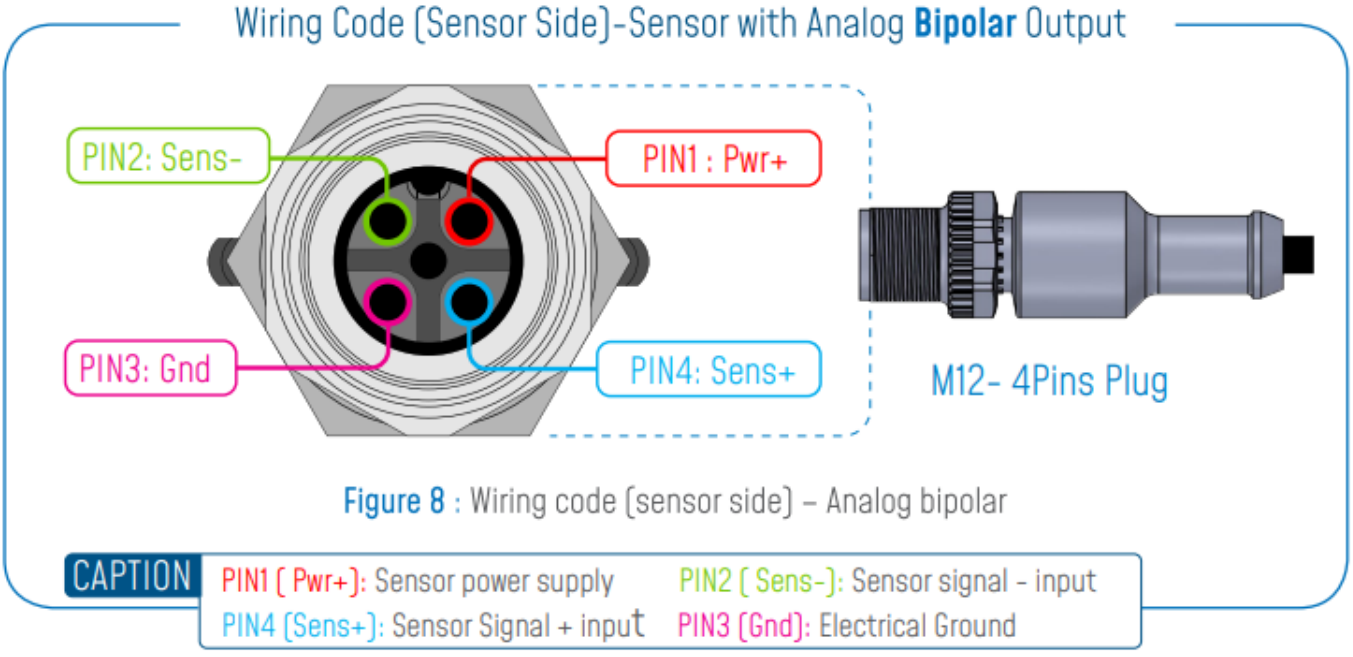



**Figure 11: Wiring code (sensor side) – Analog bipolar**

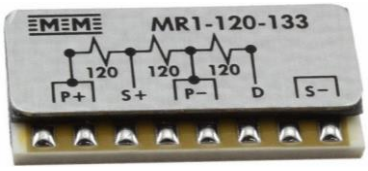
***If you use a unipolar analog sensor, Sens- pin must be connected to the electrical ground***

***You can damage your sensor and/or your BeanDevice® if you don't respect the wiring code.***

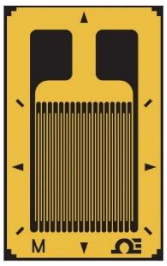
### 5.6.6 Examples of integration with analog sensors

1. Strain Gage sensors

BeanDevice AN-mV/AN-V




Bridge Completion Module




Strain Gauge

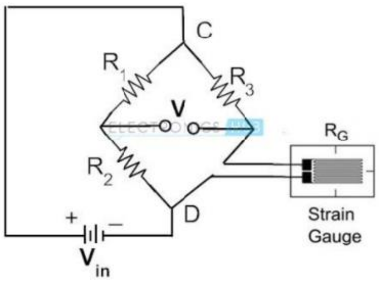



*Figure 12: Strain Gage system*

**R1**, **R2** and **R3** are included in the Bridge Completion Module.
**Vin** is the excitation voltage provided by the BeanDevice: 4.5 to 20V
**V** is the measured voltage by the BeanDevice channel.

2. Potentiometer sensors

*Figure 13: Potentiometer sensor*

3. LVDT sensors

*Figure 14: LVDT sensor integrated with M12-4Pins Plug*

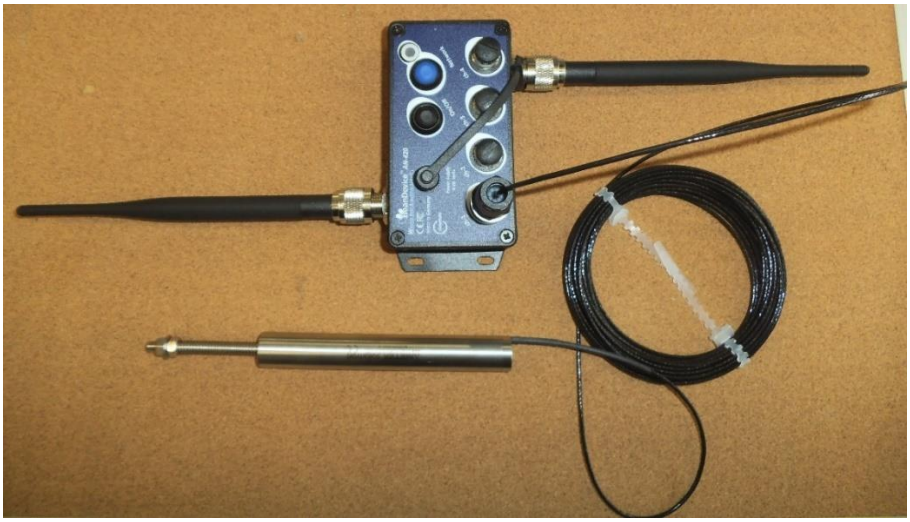


*Figure 15: LVDT sensor mounted on the BeanDevice® AN-420*

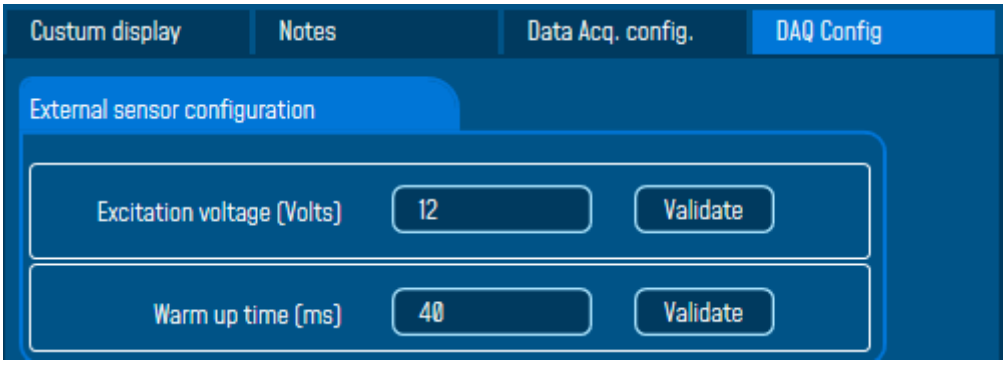



*Figure 16: DAQ Config tab*

***Recommended Voltage: 12V***

***Sensor warm-up time: 40ms***

***Use the conversion Assistant:***

***4 mA => 20 mm (sensor probe fully out)***

***20 mA => 0 mm (sensor probe fully in)***

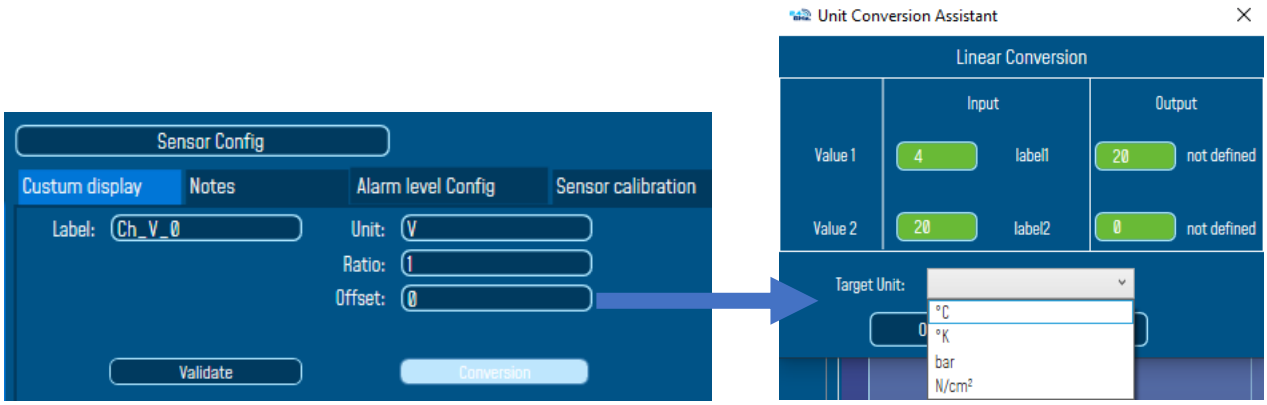
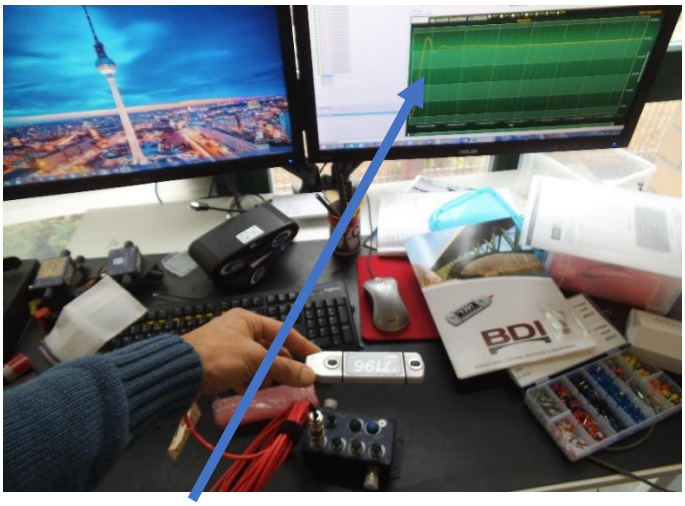



*Figure 17: Conversion Assistant*

4. BDI sensors

*Figure 18: Load strain transducer combines with the BeanDevice AN-mV*



***Load strain sensor reacting to a traction effort***

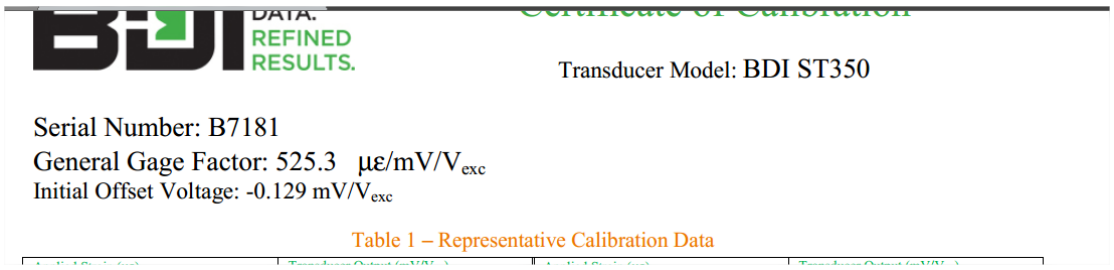
- ***Sensor configuration***

## *Bipolar Polarity, Excitation Voltage: 5V, Sensor warm-up time: 40ms*

*Figure 19: BeanDevice® Dashboard*

- **Applying calibration settings**

***Do not change DAQ Calibration Settings***



DATA. REFINED RESULTS.

Transducer Model: BDI ST350

Serial Number: B7181
General Gage Factor: 525.3 με/mV/$V_{exc}$
Initial Offset Voltage: -0.129 mV/$V_{exc}$

Table 1 – Representative Calibration Data

This example is using a ST350 with a supplied GGF = 525.3.32 με/mVout/Vexc. The BeanDevice AN-mV supplies a +5VDC excitation voltage. The current reading on the data acquisition system is 3.2312 mV

If the Excitation Voltage is 5VDC, GGF (με/mV) = 525.3/5VDC = 105.6 με /mV
Reading(με) = GFF*Vout(mV)/5 = 105.6 x 3.2312 = 341.21 με

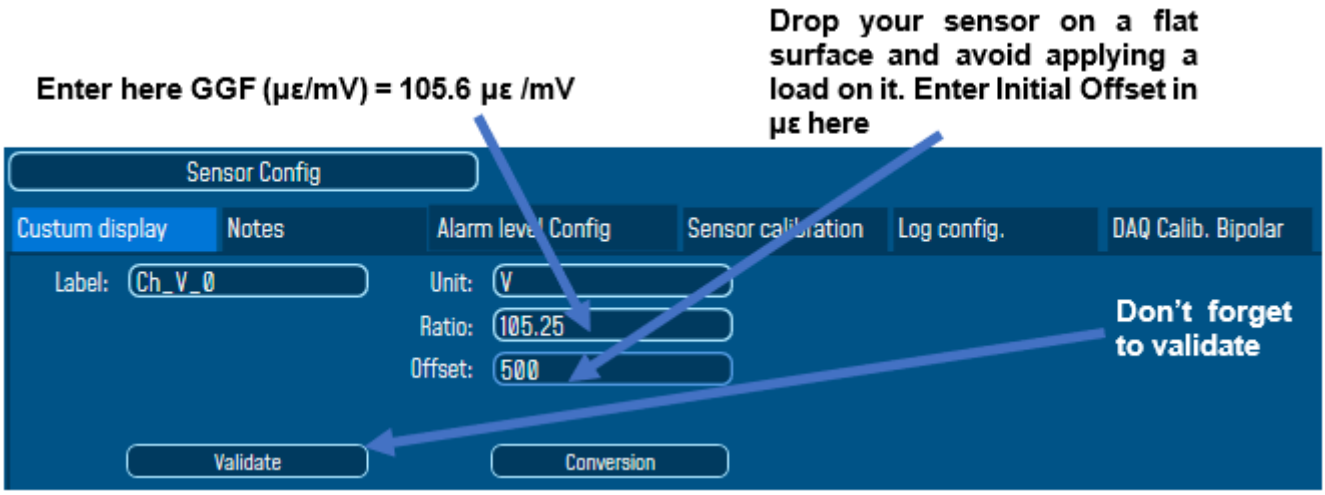



*Figure 20: Sensor Config section*

## 5.7 MECHANICAL DRAWING

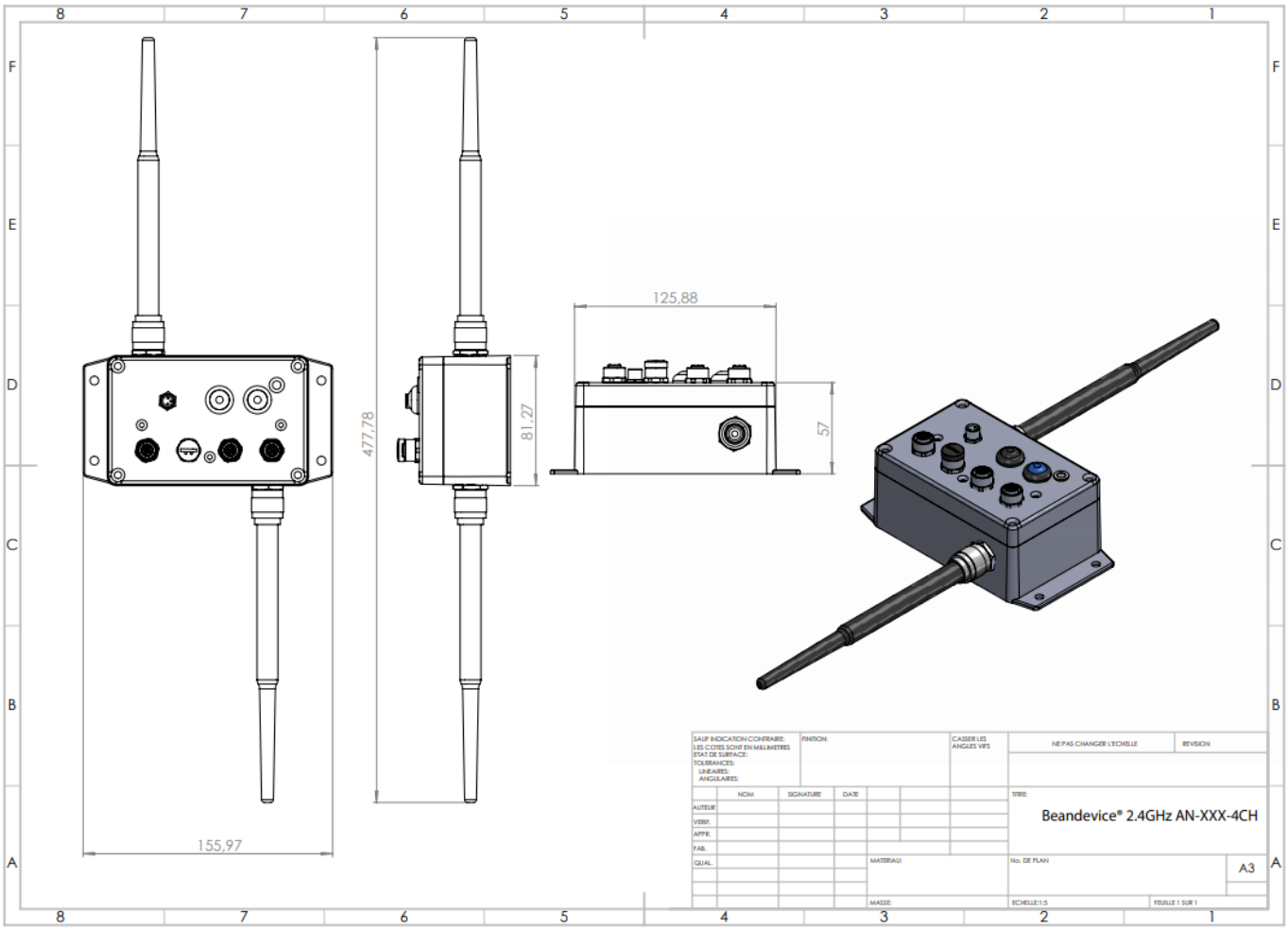



Figure 21: Mechanical Drawing

## 5.8 LITHIUM-ION RECHARGEABLE BATTERY

The BeanDevice® integrates a Lithium-Polymer rechargeable battery:

| *Battery Capacity* | *Nominal Voltage* | *Charge/Discharge cycle* |
|---|---|---|
| 950 mAh | 4,2V | 300 cycles |

***The rechargeable battery can be used as an UPS (uninterruptible power supply) battery on your BeanDevice®. It provides an emergency power when the input power source, typically the utility mains, fails.***

***Do not try to change the battery. You will void the guarantee of the product.***

## 5.9 AC-TO-DC POWER ADAPTER

The BeanDevice® can also be powered by an AC-to-DC adapter ***8-28Volts***. The power adapter can be used for recharging Lithium-Ion battery or to power supply continuously the BeanDevice®.
A M8-3Pins standard plug is used for connecting the power adapter to the BeanDevice®.
If battery charge is very low, connect the power adapter in order to recharge your internal battery.

***Only the M8 plug is fully sealed, the power adapter is not sealed.***

## 5.10 EXTERNAL POWER SUPPLY WIRING CODE

***Caption:***

***PIN3 (Pwr+)*** : power supply 8-28 V DC

***PIN1 (Gnd)*** : electrical ground

***External power supply wiring code (M8-3Pins Socket)***

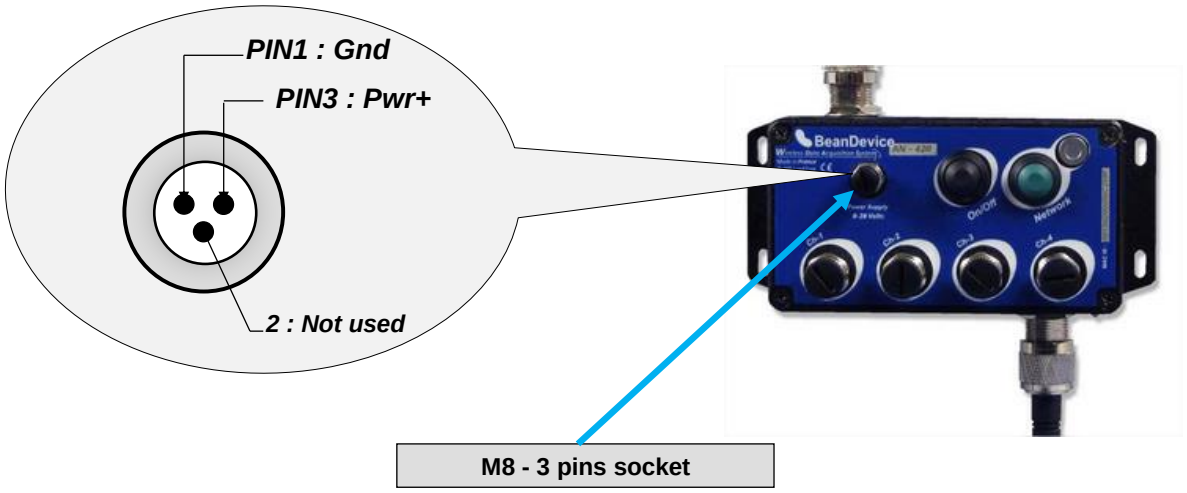
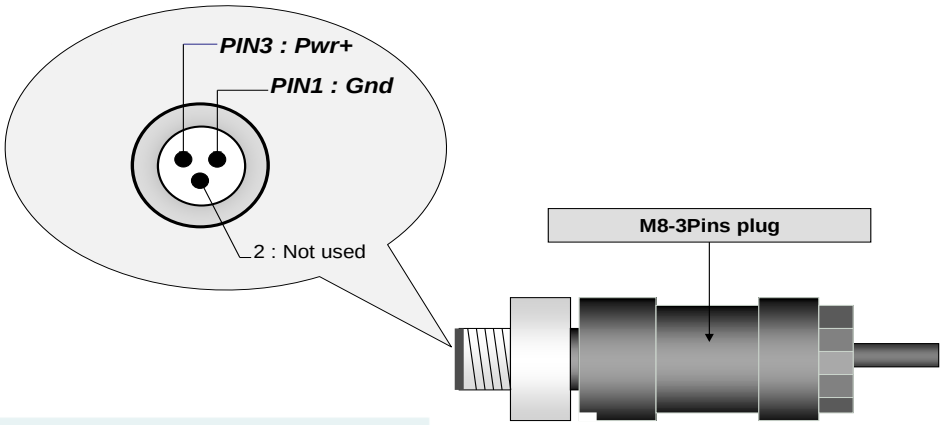



***Figure 22 : External power supply M8-3Pin Socket - BeanDevice® side***

***External power supply wiring code***




**Caption:**

**Pwr+ :** Power supply 8-28V DC

**Gnd :** Ground

***Figure 23 : External power supply wiring code (M8-3Pin Plug side)***

**If you are using a molded M8 cable (Ref: CBL-M8-2M, CBL-M8-5M, CBL-M8-10M) the wiring code and color will be as follow:**

| *Pin Number* | *Description* | *Color code* |
|---|---|---|
| **PIN3** | **Pwr+ : Power supply 8-28VDC** | **Blue** |
| **PIN1** | **Ground** | **Brown** |

*Table 19: Wiring code table for molded M8 cable*

**Reversing the power supply polarity may damage your BeanDevice®/BeanGateway® product**

# 6. DATA ACQUISITION MODE DESCRIPTION

***Please read the technical note TN_RF_008 – "Data acquisition modes available on the BeanDevice®"***

# 7. BEANDEVICE® PROCESSSENSOR INSTALLATION GUIDELINES

## 7.1 POWER MODE MANAGEMENT

*Please read the technical note TN_RF_010 – « BeanDevice® Power Management »*

## 7.2 BEANDEVICE® NETWORK ASSOCIATION

*Please read the technical note TN_RF_006 – "WSN Association process"*

## 7.3 DATALOGGER FUNCTION

*Please read the technical note TN_RF_007 – "BeanDevice® Datalogger User Guide "*

## 7.4 OTAC (OVER-THE-AIR-CONFIGURATION) PROCESS

*Please read the technical note TN_RF_010 – « BeanDevice® Power Management »*

## 7.5 FACTORY SETTINGS

If desired, the user can restore factory settings on the BeanDevice® with the following default parameters:

| *Parameter* | *BeanDevice® 2.4GHz version* | | |
|---|---|---|---|
| | *AN-420* | *AN-V* | *AN-mV* |
| *Power Mode* | *Active* | | |
| *Data Acquisition duty cycle* | *10s* | | |
| *Data Acquisition mode* | *LowDutyCycle* | | |
| *Alarms Threshold* | *H1 :20*<br>*H2 :20*<br>*S2 :4*<br>*S1 :4* | *H1 :10*<br>*H2 :10*<br>*S2 :0*<br>*S1 :0* | *H1 :20*<br>*H2 :20*<br>*S2 :0*<br>*S1 :0* |
| *Pre-process duration time* | *30 ms* | | |
| *Sensor polarity* | *N.A.* | *Unipolar* | *Unipolar* |

*Table 20: Factory settings*

To restore these defaults parameters, you must perform a *Network context deletion*. Push on the push-button ("Network") for more than 2 seconds.

***If you fix the TX power at its minimum value (-7dBm), and the wireless range is more than 5m, you will lose the radio signal. To find a configuration with a maximum RF: by pressing the Network Context button, you can reset to factory settings (default RF power is fixed at its maximum: 18 dBm)***

BeanDevice® supervision from the beanscape

***Don't hesitate to read the BeanScape® user manual for further information about the BeanScape®***

## 7.6 STARTING THE BEANSCAPE®

BeanScape® is a supervision software monitor fully dedicated to Beanair WSN (Wireless Sensor Networks):

1. ***Start the BeanScape® by double-clicking on the BeanScape® icon***
2. ***Click on the button « start »***
3. ***All the BeanDevice® connected to the WSN will appear on your left window***
4. ***Select the BeanDevice® you want to configure. You can configure your BeanDevice® and its attached sensors.***

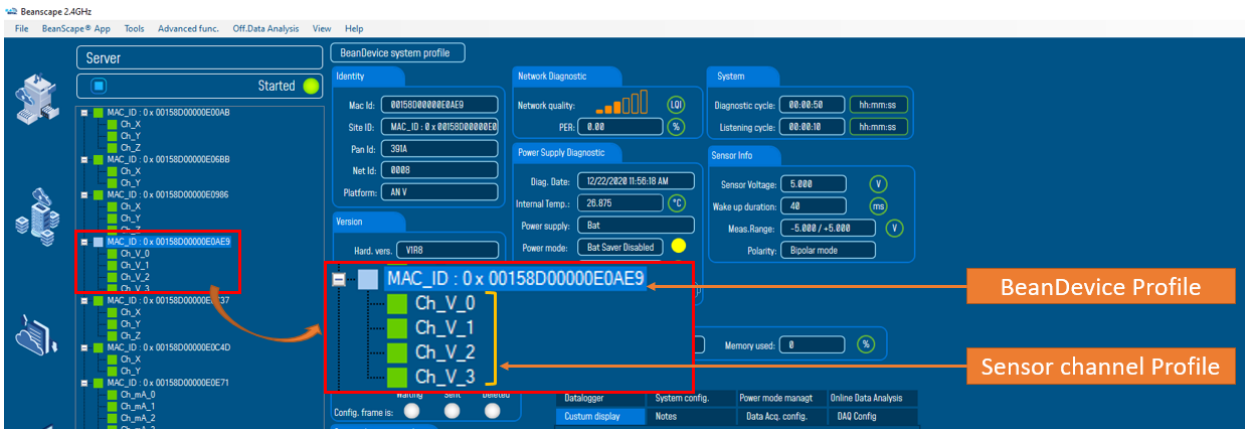
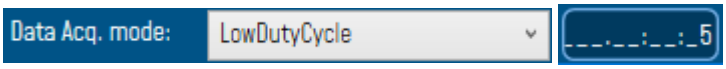



*Figure 24: BeanDevice® profile*

***The User interface is organized as follow***:

- White on blue background is displaying information

- Black on white background and white on blue background are customizable field;




You can configure your BeanDevice® from the page "***BeanDevice® System Profile***". This page is composed of two parts:

- ✓ BeanDevice® information display
- ✓ BeanDevice® configuration

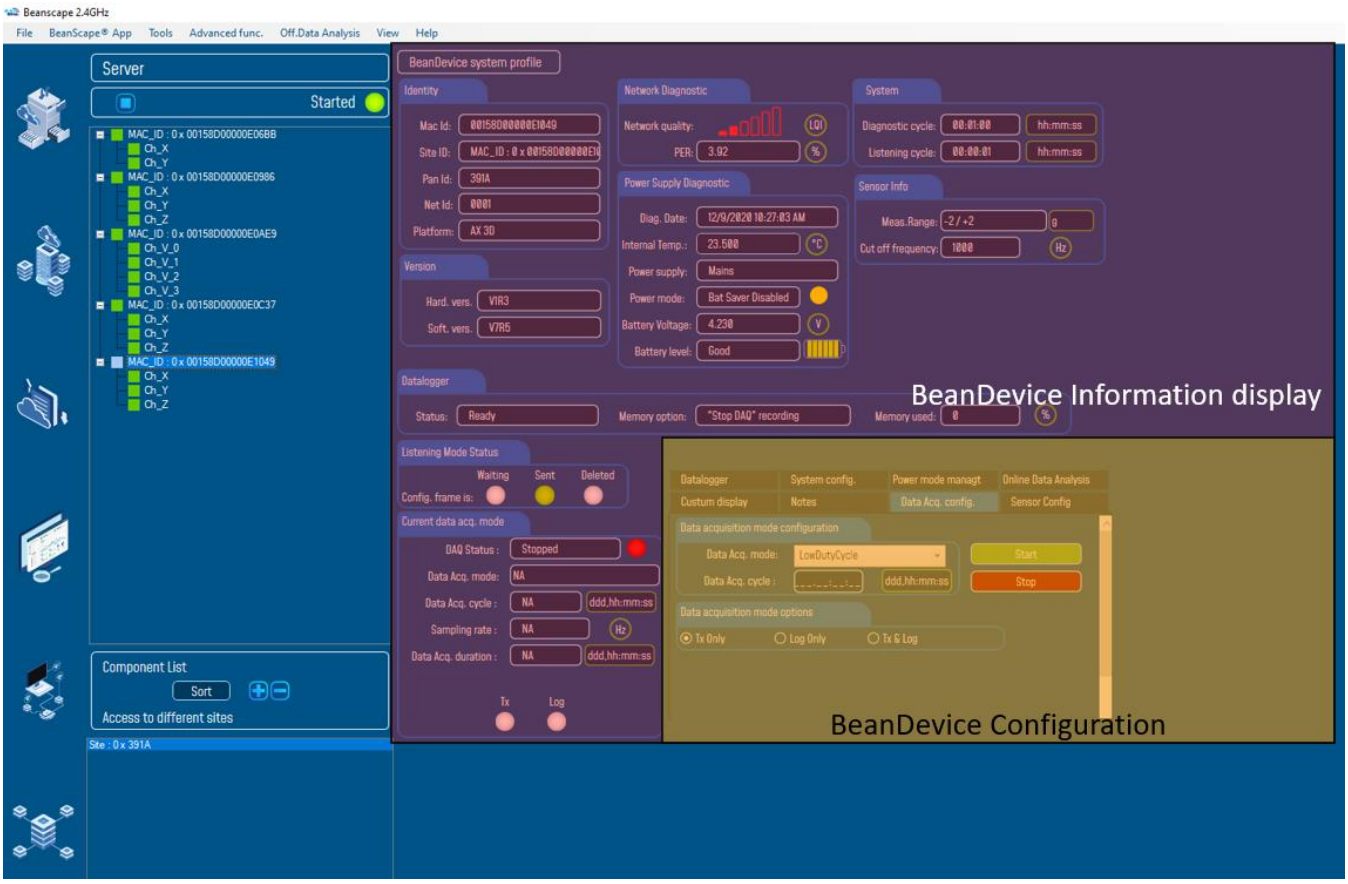



*Figure 25: BeanDevice® dashboard*

## 7.7 DISPLAYING THE BEANDEVICE® INFORMATIONS

You will find below a description of the data information fields making up for each frame.

### 7.7.1 Frame: Identity

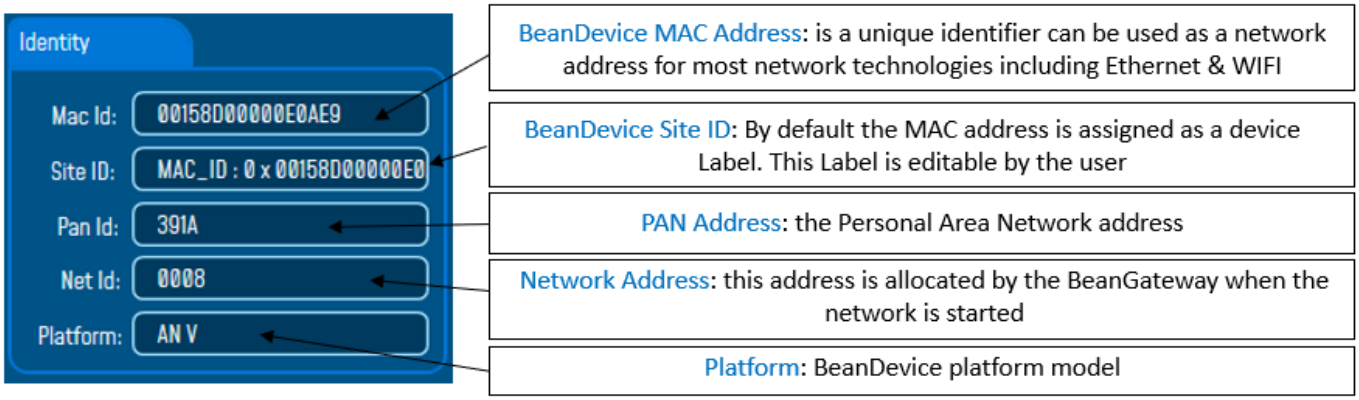



*Figure 26: BeanDevice® Identity*

***How PAN ID is assigned?***

***The BeanGateway® starts the WSN, assigning a PAN ID (Personal Area Network identifier) to the network. The PAN ID is pre-determined and cannot be modified. If you use several WSN, before deploying your BeanDevice® check to which WSN is assigned your BeanDevice®.***

### 7.7.2 Frame: Wireless Network Diagnostic

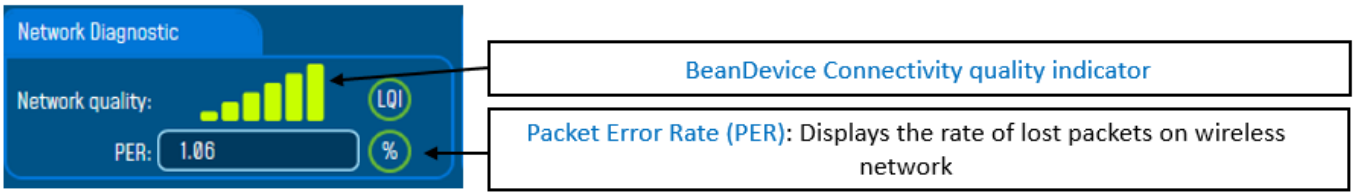



***Figure 27: BeanDevice® network link status***

*PER = Number of lost packet/Total of packet transmitted*

| *Number of bars* | *Color* | *Link quality indicator* |
|---|---|---|
| *5 to 6 bars* | *Green* | *Very good* |
| *4 bars* | *Green* | *Good* |
| *3 bars* | *Orange* | *medium* |
| *1 to 2 bars* | *Red* | *bad* |

***Table 21: LQI status***

### 7.7.3 Frame: Power supply diagnostic

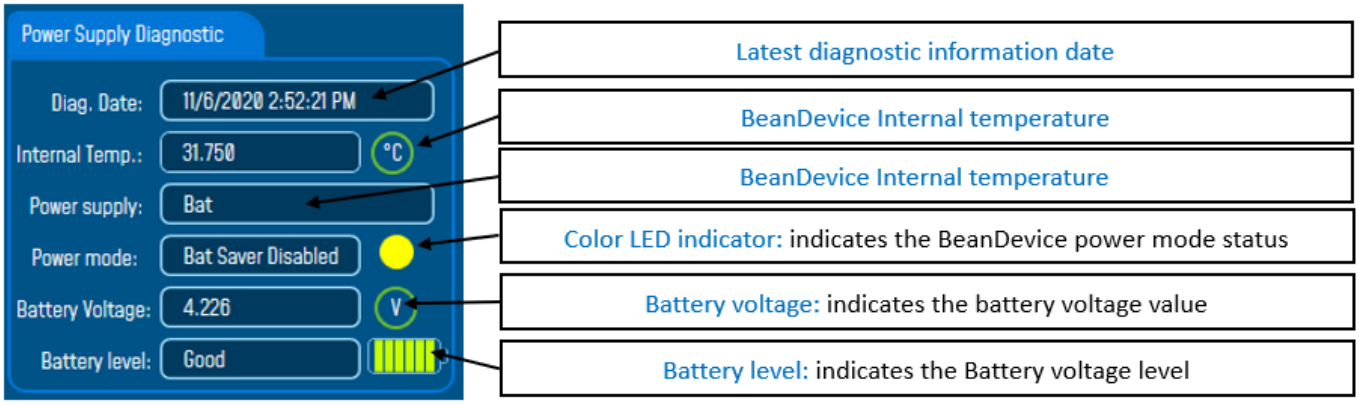



***Figure 28: BeanDevice® power supply information***

***The BeanDevice® incorporates an internal temperature sensor dedicated to the following tasks:***

- ***Battery temperature monitoring during charging;***
- ***Temperature compensation of the analog conditioning chain;***
- ***An alarm notification is sent to the BeanGateway® if the internal temperature is abnormally high;***

***When you plug the BeanDevice® on an external power supply, the power supply status is automatically detected.***

#### 7.7.3.1 BeanDevice® Power Mode status

***For further information about Power mode management, please read the technical note TN_RF_010 – « BeanDevice® Power Management »***

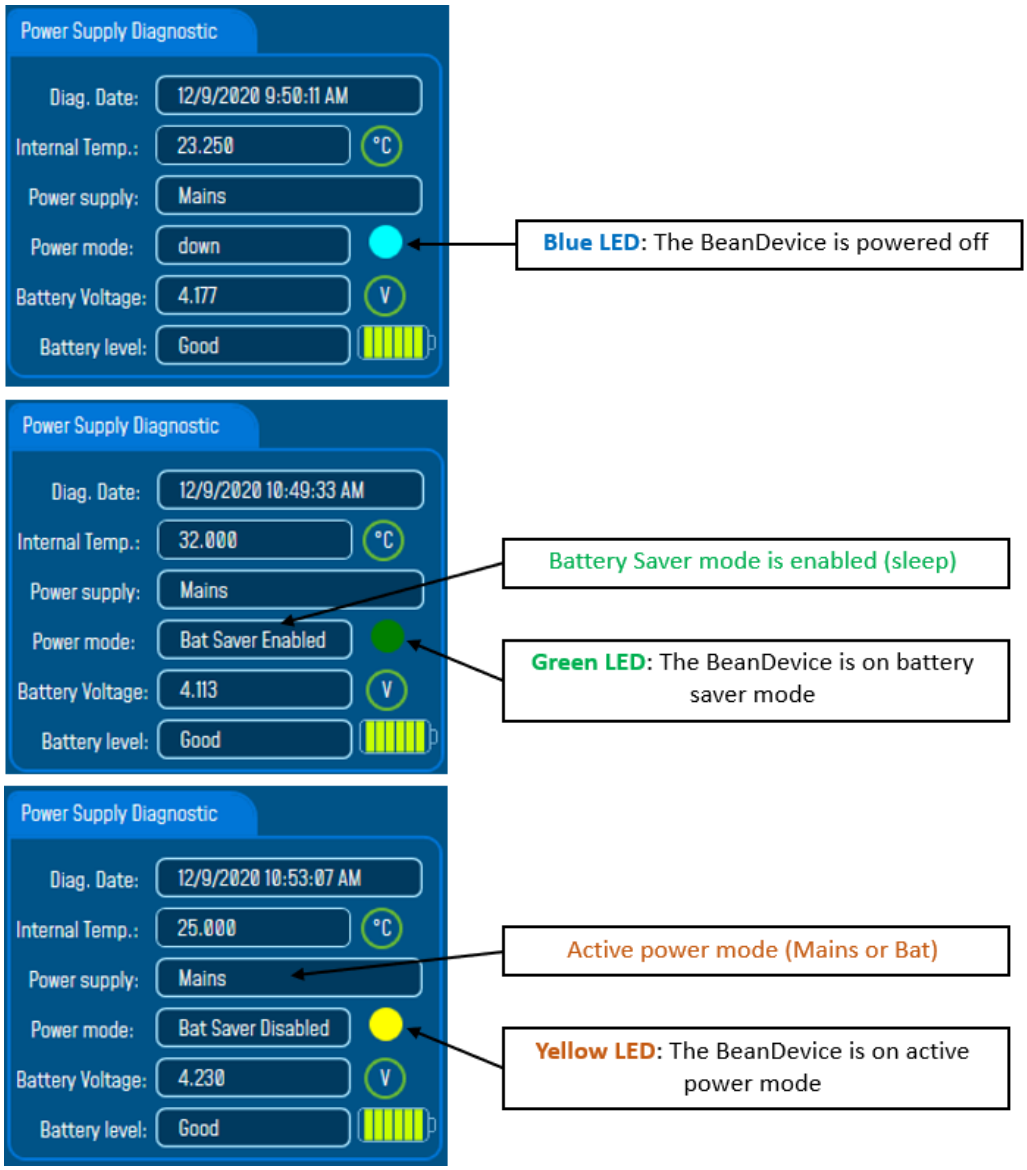



*Figure 29: BeanDevice® power modes*

### 7.7.4 Frame: System

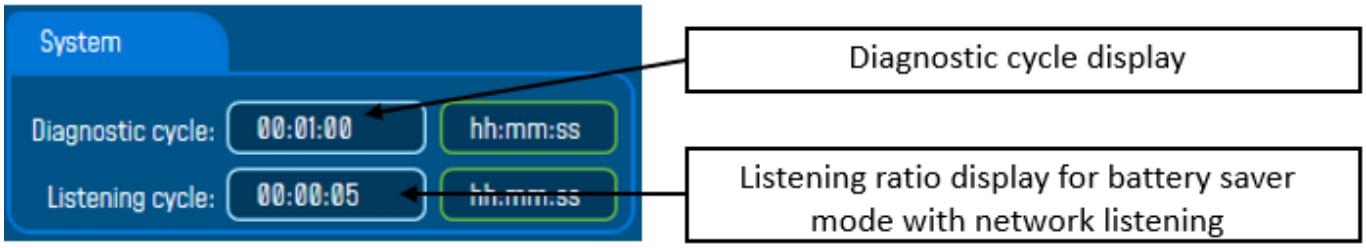



*Figure 30: BeanDevice® Diagnostic cycle information*

***How to convert dBm to mW***

***Zero dBm equals one milliwatt. A 3dB increase represents roughly doubling the power, which means that 3 dBm equals roughly 2 mW. For a 3 dB decrease, the power is reduced by about one half, making –3 dBm equal to about 0.5 milliwatt. To express an arbitrary power P as x dBm, or go in the other direction, the following equations may be used:***

$$x = 10\log_{10}(1000P) \text{ Or, } x = 10\log_{10}P + 30$$

***And***

$$P = 10^{(x/10)}/1000 \text{ Or, } P = 10^{(x-30)/10}$$

***Where P is the power in W and x is the power ratio in dBm.***

### 7.7.5 Frame: BeanDevice®

According to the BeanDevice® version, the information displayed in the frame will not be the same.

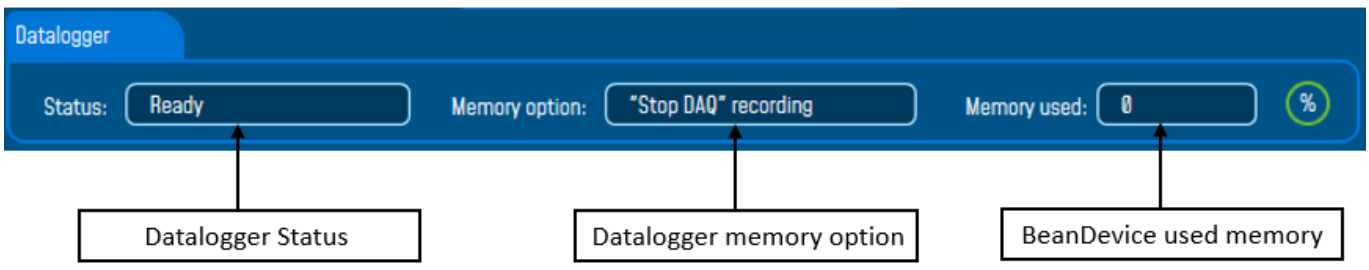



*Figure 31: Frame BeanDevice® on BeanScape®*

### 7.7.6 Frame: Product Version

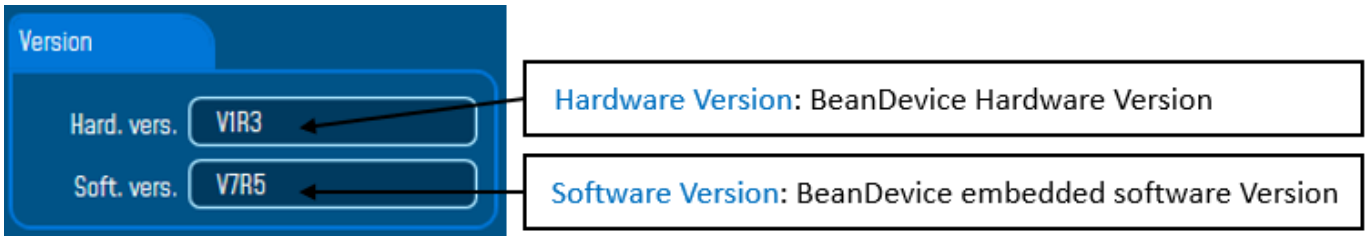



*Figure 32: BeanDevice® Product version frame*

***V (version)*** related to a major modification of the embedded software.

***R (Release)*** related to a minor modification of the embedded software

***These ID versions should be transmitted to our technical support center when you encountered a material or software dysfunction.***

### 7.7.7 Frame: Actual Data Acquisition mode

This frame displays all the information returned by the BeanDevice® on its actual data acquisition mode:

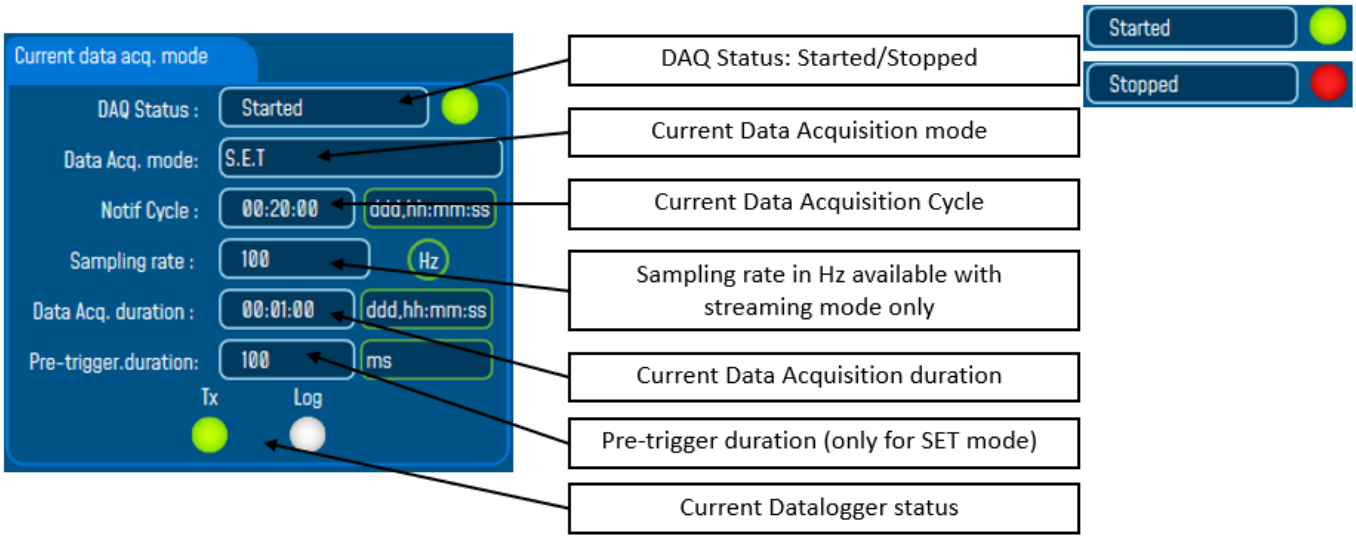



*Figure 33: Current data acquisition mode*

### 7.7.8 Frame: DAQ Info

This frame displays all the information on the ProcessSensor.

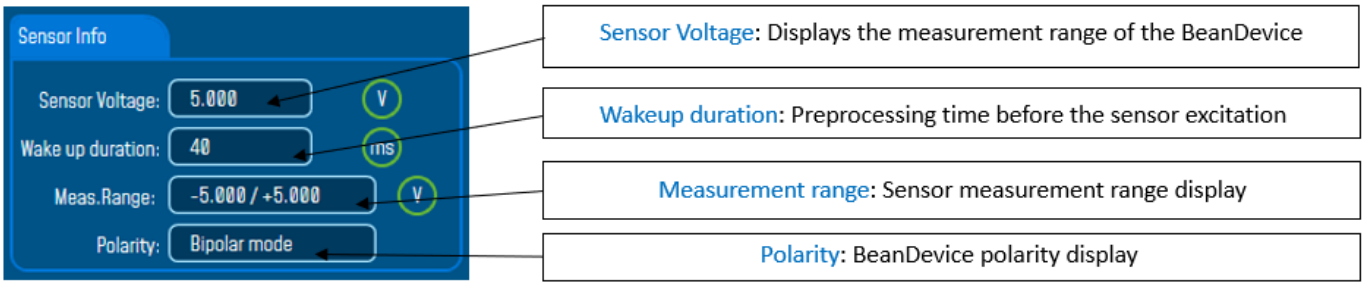



*Figure 34: Sensor Info frame*

## 7.8 BEANDEVICE® CONFIGURATION

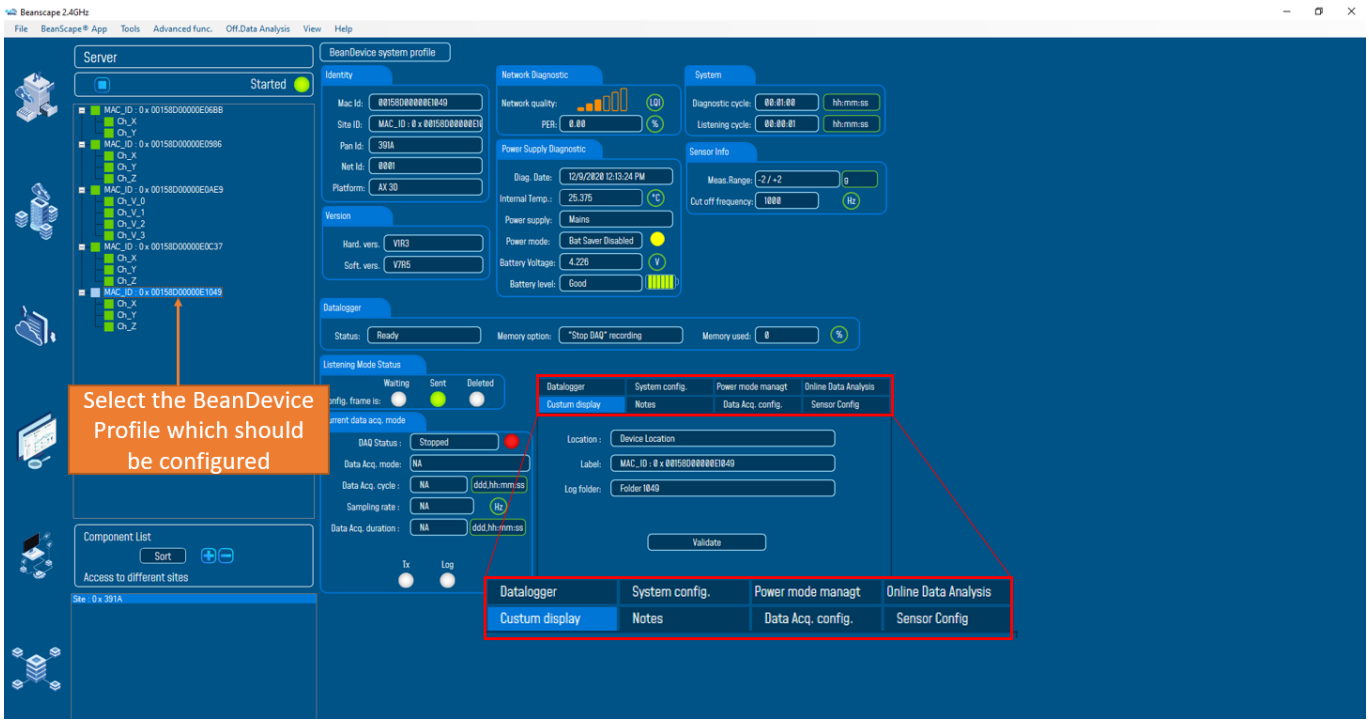



*Figure 35: BeanDevice® configuration frame*

This frame is composed of several Tabs and includes BeanDevice® OTAC (Over the Air Configuration) Parameters:

| Tab | Description |
|---|---|
| ***Custom Display*** | Customize the BeanDevice® label |
| ***Notes*** | This area contains the notes related to the BeanDevice®. |
| ***Data Acquisition configuration*** | Configure the Data acquisition mode on your BeanDevice®, set the acquisition cycle or the sampling rate, enable/disable the datalogger function. |
| ***Datalogger*** | Manage the Datalogger function on the BeanDevice® |
| ***System configuration*** | Configure the diagnostic cycle and the TX Power |
| ***Power Mode Management*** | Configure the Power mode on your BeanDevice® (Active mode, Sleep power mode) |

### 7.8.1 Tab: Custom Display

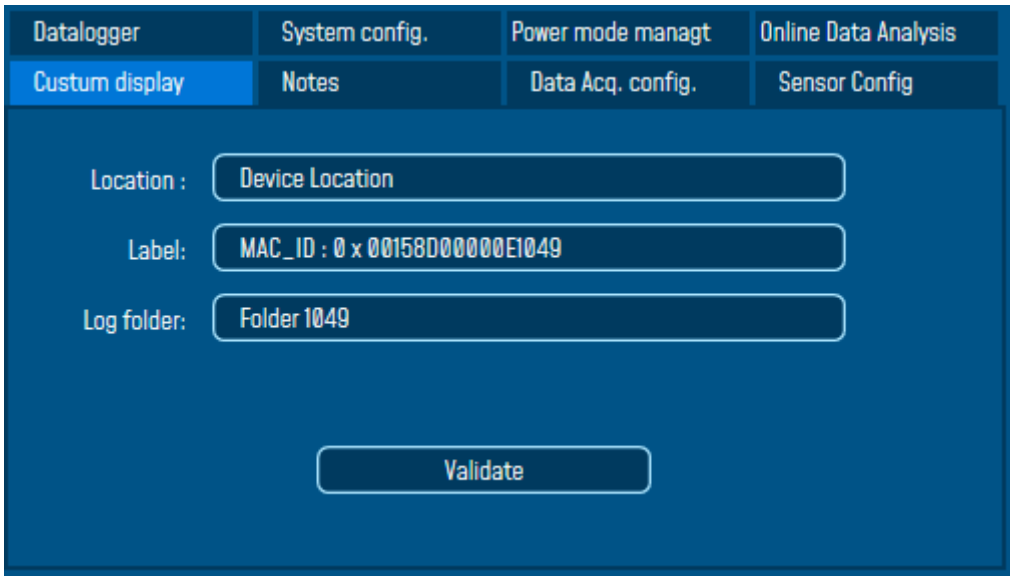
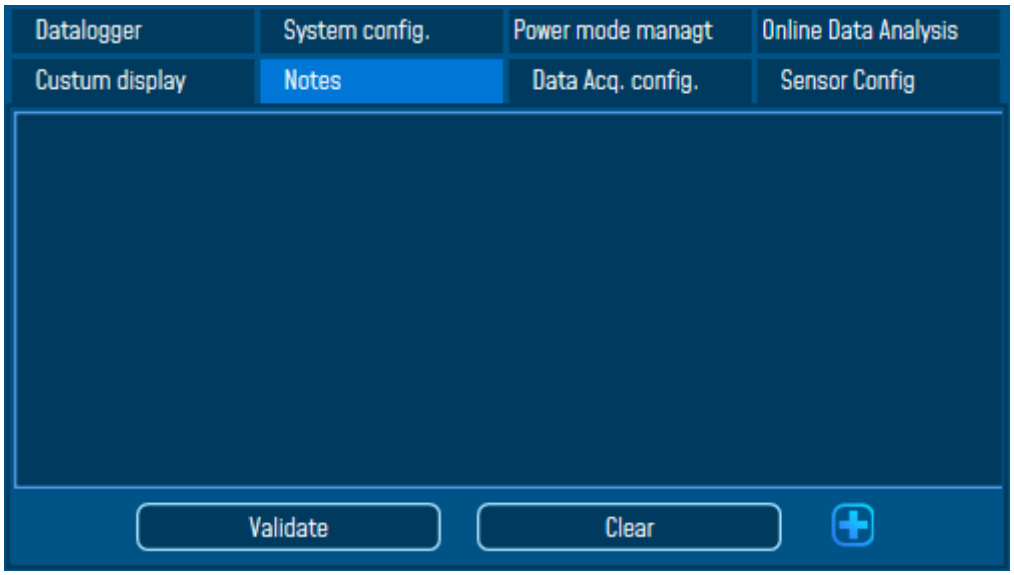



*Figure 36: BeanDevice® custom display tab*

| Parameter | Description |
|---|---|
| *Type* | You can enter here the type of BeanDevice® you want to use |
| *Reference* | You can assign an internal reference to the BeanDevice® you have purchased. |
| *Label* | You can assign any sort of Label to your BeanDevice®. Therefore, the user can easily associate the BeanDevice® with its equipment (example: Room_N521_Second_Floor) |

Click on "***Validate***" if you want to validate your configuration.

### 7.8.2 Tab: Notes




This field contains your notes concerning the BeanDevice®. To change this field, enter your text and click on « ***Validate*** » button. To back up your text, press the icon

***Example***: Machine failure n°XX, requested intervention.

### 7.8.3 Tab: Data Acquisition configuration

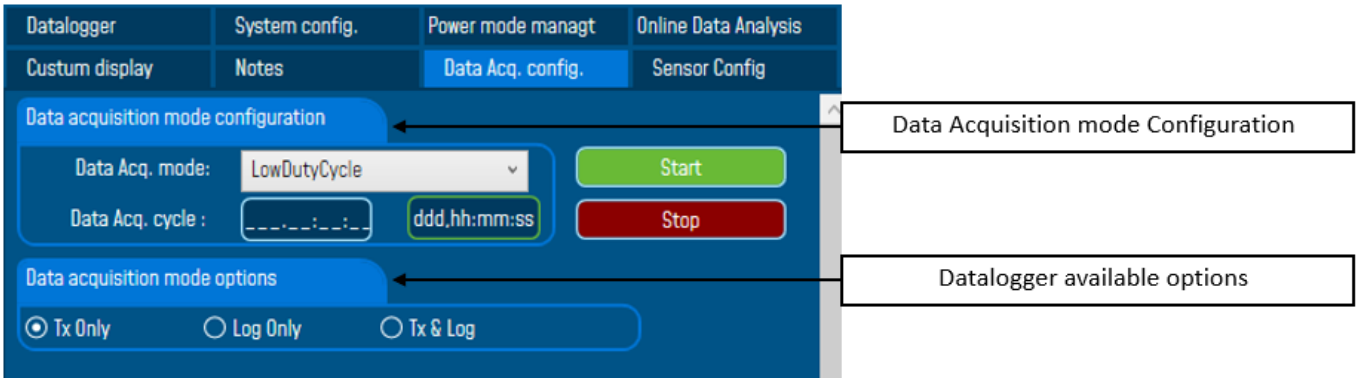



*Figure 37: Tab : Notes*

| *Parameter* | *Different values* | *Description* |
|---|---|---|
| Data Acquisition mode | ***Low duty cycle Data Acquisition (LDCDA)*** | Low duty cycle data acquisition is adapted for static measurement (tilt, pressure, temperature) requiring a low power consumption on your BeanDevice®. The duty cycle can be configured between 1 data acquisition & transmission per second to 1 data acquisition & transmission per day. |
| | ***Survey*** | Survey mode is a mix between the LDCDA mode and Alarm mode. A data acquisition is transmitted<br>▪ Whenever an alarm threshold (fixed by the user) is reached (4 alarm threshold levels High/Low).<br>▪ A transmission cycle is reached, the transmission cycle is configurable through the BeanScape® 1s to 24h; |
| | ***Streaming*** | Streaming is more suitable for users requiring a high data sampling rate (maximum 5 KHz). In order to achieve these performances, data sampling is transmitted by packet; |
| Data acquisition Cycle | Select the Data acquisition cycle between 1s and 24hours.<br>The format is: Day: Hour : Minute :Second | |

| | |
|---|---|
| Sampling rate | Select the sampling rate of your BeanDevice® between 1 sample per second and 5000 Samples per second maximum. The resolution is 1 sample per second.<br><br>If Datalogger is selected, the maximum sampling rate is 2000 samples per second.<br><br>This field is available in streaming, and math mode<br><br>Choose carefully the Sampling rate value:<br><br>✓ The PER (Packet Error Rate) can increase if the Sampling rate is high on your BeanDevice®. For further information, read the technical note ***TN_RF_003- "Wireless Network capacity"***<br><br>✓ Power consumption increases with the sampling rate of your BeanDevice® |
| Data acquisition duration | Data acquisition duration in streaming, and math mode.<br><br>The format is Day: Hour: Minute: Second<br><br>The Data acquisition duration value can be higher than Data acquisition cycle. |
| Options | ***TX only***: The BeanDevice® transmits the data acquisition without DataLogging<br><br>***Log only***: The BeanDevice® logs the data acquisition without wireless transmission<br><br>***TX & Log***: The BeanDevice® transmits and logs the data acquisition;<br><br>***SA: Standalone:*** The BeanDevice® logs the data acquisition without wireless transmission. The BeanDevice stores all the measurements on its embedded Datalogger.<br>Thus, a direct connection with the BeanGateway® is not needed. |

***For further information about the Datalogger, please read the technical note TN_RF_007 – "BeanDevice® Datalogger User Guide "***

All your modifications are displayed on "***Current data acquisition mode***" frame:

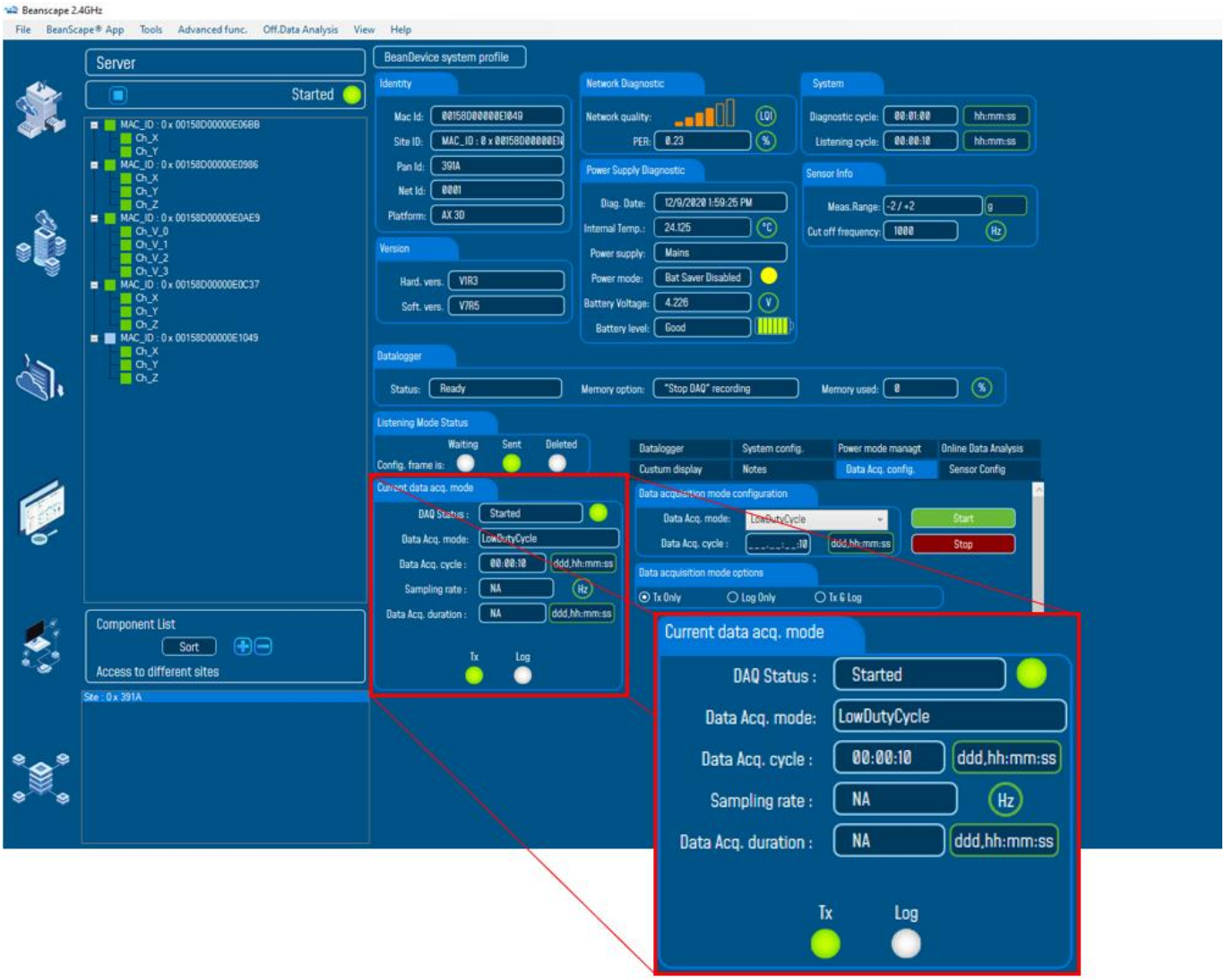



*Figure 38: Current data acquisition mode display*

***For further information, please read to the technical note TN_RF_008 – "Data acquisition modes available on the BeanDevice®"***

### 7.8.4 Tab: DAQ Config

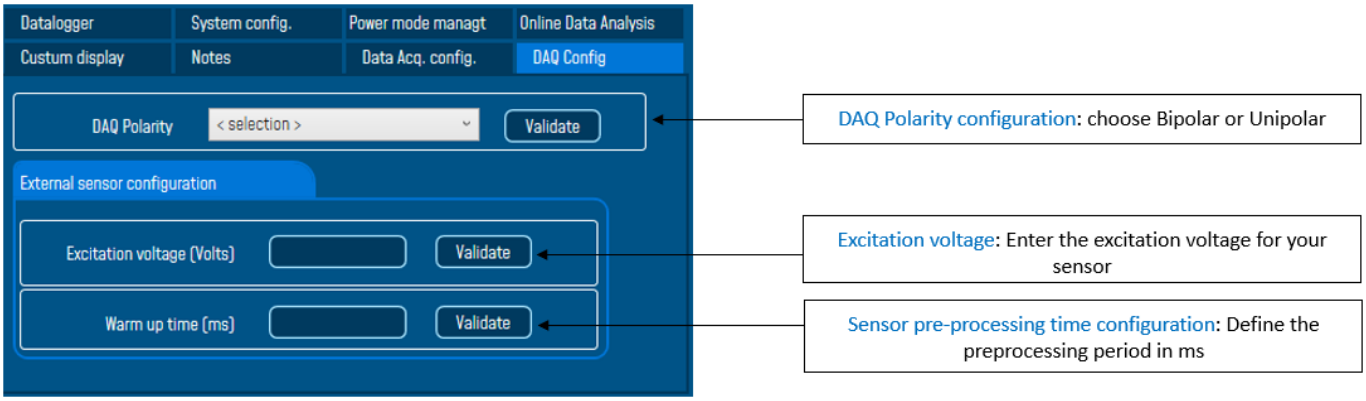



*Figure 39: DAQ config tab*

### 7.8.5 Tab: Datalogger

***For further information about Datalogger, please read the technical note TN_RF_007: "BeanDevice® Datalogger User Guide".***

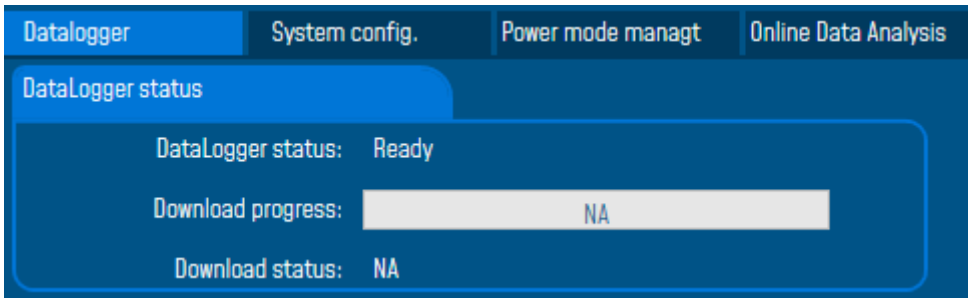
*Figure 40: Data logger tab*

The Logger tag is composed of five different fields:

- ***Datalogger Status***
- ***Datalogger manager***
- ***Download manager***

- ***Acquisition information***
- ***Datalogger memory configuration***

#### 7.8.5.1 Datalogger status

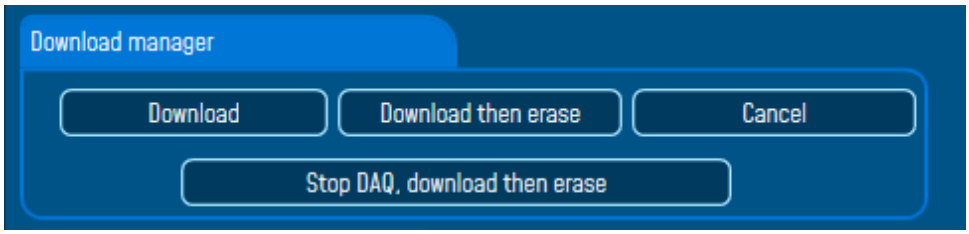



- ***Datalogger status***: Displays logger's status, four statuses are available:
  - ***Ready***: the Datalogger is ready to register data
  - ***NotInit***: the Datalogger is not initialized;
  - ***Active logs only***: Data acquisition is logged only;
  - ***Active Tx and Log***: Data acquisition is logged & transmitted by Radio;
  - ***Stopped***: Datalogger is stopped;
- ***Download process***: Displays the download process 0 to 100%. If 100%, all the data logs are successfully downloaded on your PC.
- ***Download status***: Displays the download status, two types of status are available:
  - ***Processing***: Data logs download is under process;
  - ***Completed:*** Data Logs are completely downloaded on your PC;

#### 7.8.5.2 Logger manager

- ***Stop***: Stops Data Logging process
- ***Erase***: Stops & Erases all the logs on flash memory

#### 7.8.5.3 Download manager




- ***Download***: Starts to download all the logs on the flash memory

- ***Download then erase***: downloads all the logs and the erase them.
- ***Cancel***: Stops the download process
- ***Stop DAQ, download then erase***.

### 7.8.6 Tab: System Config.

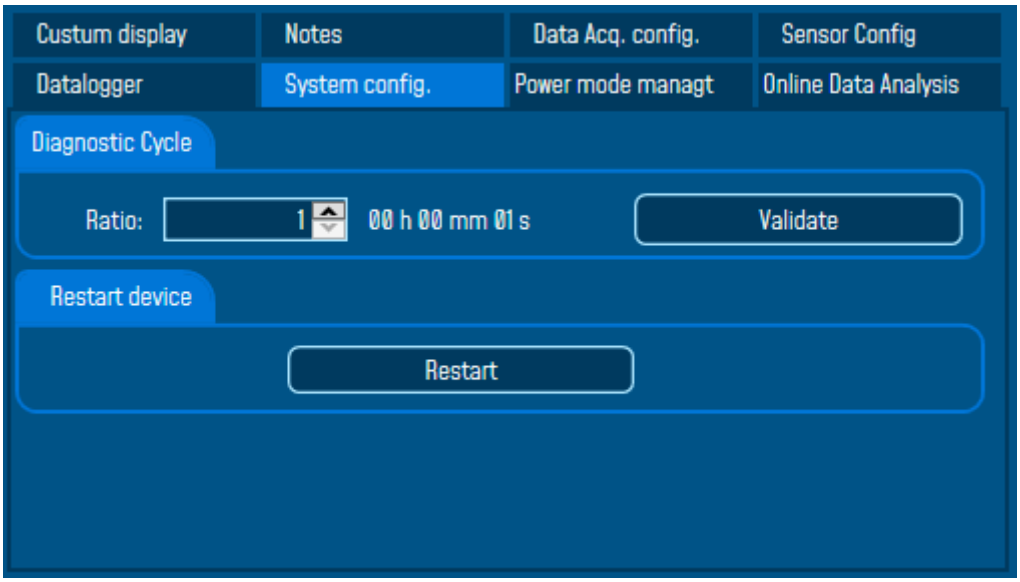



*Figure 41: System Configuration Tab*

| Parameter | Description |
|---|---|
| ***Diagnostic cycle*** | You can set the BeanDevice® diagnostic cycle (Battery status, LQI, PER ...). The Diagnostic cycle is modulo the data acquisition cycle.<br>***Ex***: If you try to set the diagnostic cycle at 10s while the data acquisition cycle is set at 20s, the diagnostic cycle will be adjusted to 10s ; |
| ***Restart device*** | You can restart the BeanDevice® from BeanScape |

### 7.8.7 Tab: Power mode management

***For further information about Power mode management, please read the technical note TN_RF_010: "BeanDevice® Power management"***

This Tab is composed of three options:

- ✓ ***Battery Saver Power mode configuration:*** Configure the Power mode on your BeanDevice® (active / Battery saver mode)

- ✓ ***BeanDevice Listening Ratio:*** Configuration settings for Battery Saver power mode with network listening
- ✓ ***Delete Pending OTAC frame:*** Delete the last performed OTAC

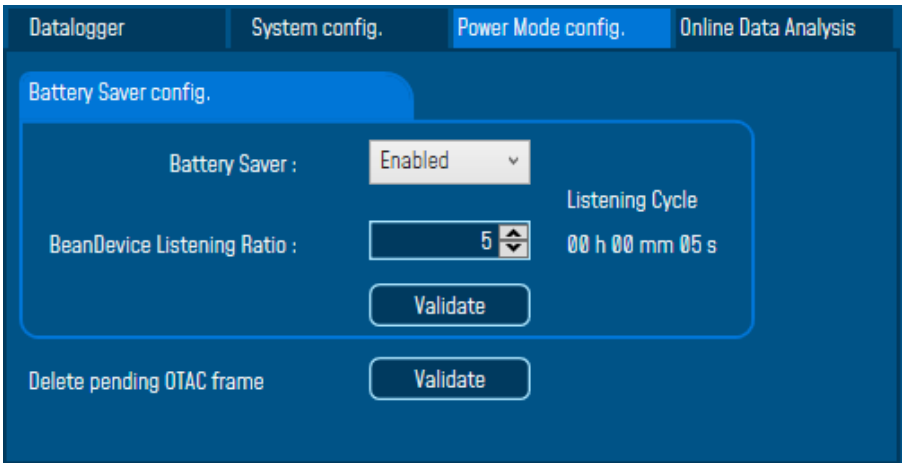



Figure 42 : Power mode management

| Parameter | Description |
|---|---|
| ***Battery saver configuration*** | ***Enable:*** Battery Saver power mode is enabled. The BeanDevice® operates on Saver battery power mode to decrease the power consumption.<br>***Disable:*** Battery Saver power mode is disabled, the BeanDevice® works in active power mode.<br>***Ratio***: Fix the Ratio of the listening cycle. This ratio depends on the data acquisition low duty cycle.<br>*Example*: If the data acquisition is 30 seconds and the ratio is set to 5, the Listening cycle will be 150 seconds (5*30). |
| ***Delete pending OTAC frame*** | By clicking on "validate", the pending OTAC is deleted |

***How to enable battery saver power mode***

### 7.8.8 Right click functionalities

BeanScape® offers access to quick functionalities in relation with BeanDevices®. By using the mouse, Right Click on the BeanDevice® profile then you can quickly

- ***Change the Device Label***
- ***Restart the Device***
- ***Remove the Device***

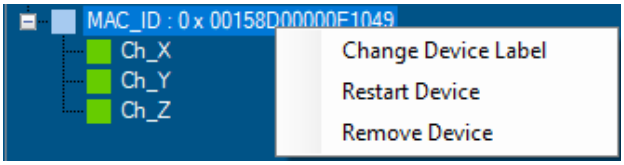



*Figure 43: Right Click on BeanDevice® Profile*

## 7.9 SENSORS CONFIGURATION

The screen « ***Sensor profile*** » consists of three parts:

**1** ***General information on the measurement channel***

**2** ***Measurement channel configuration;***

**3** ***A graph, which displays in real-time sensor signals during data acquisition;***

**4** ***Clear graph, which erase the displayed graph;***

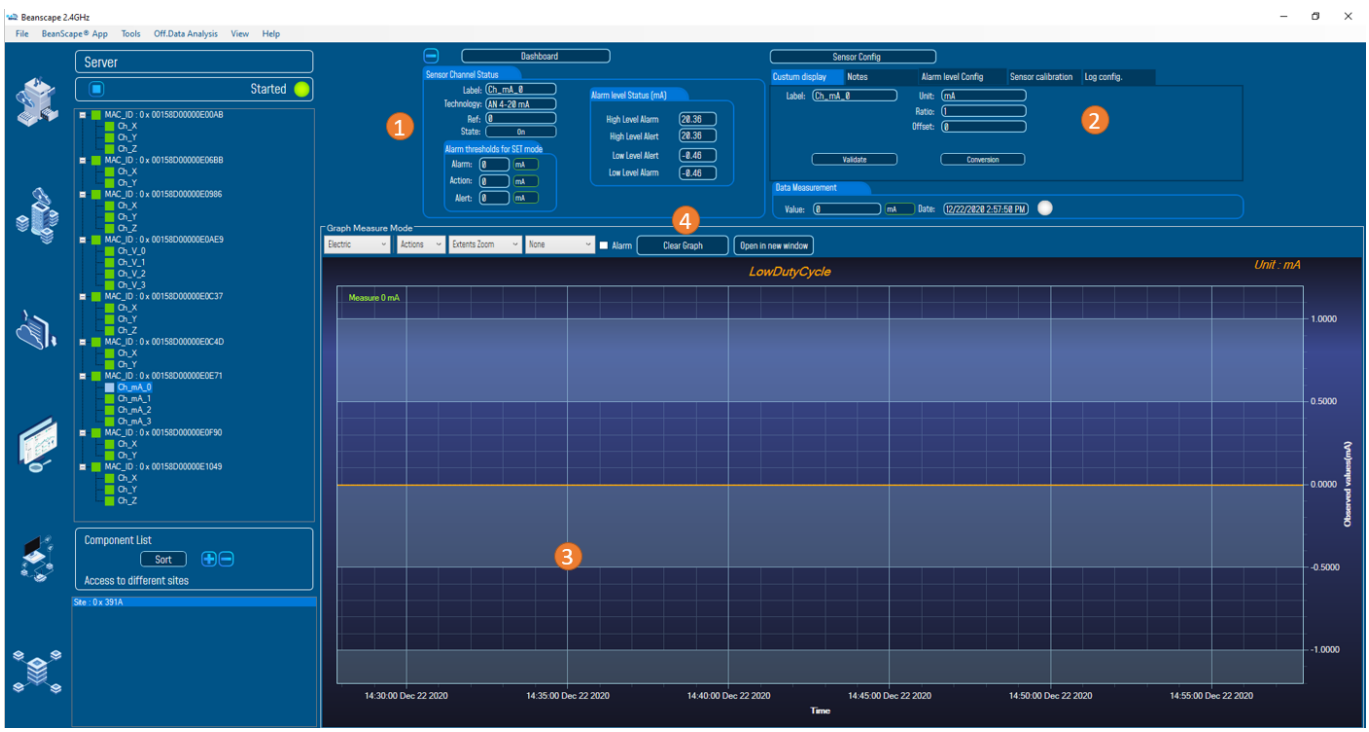



*Figure 44: Sensor channel profile*

### 7.9.1 Sensor profile

#### 7.9.1.1 Frame: General information

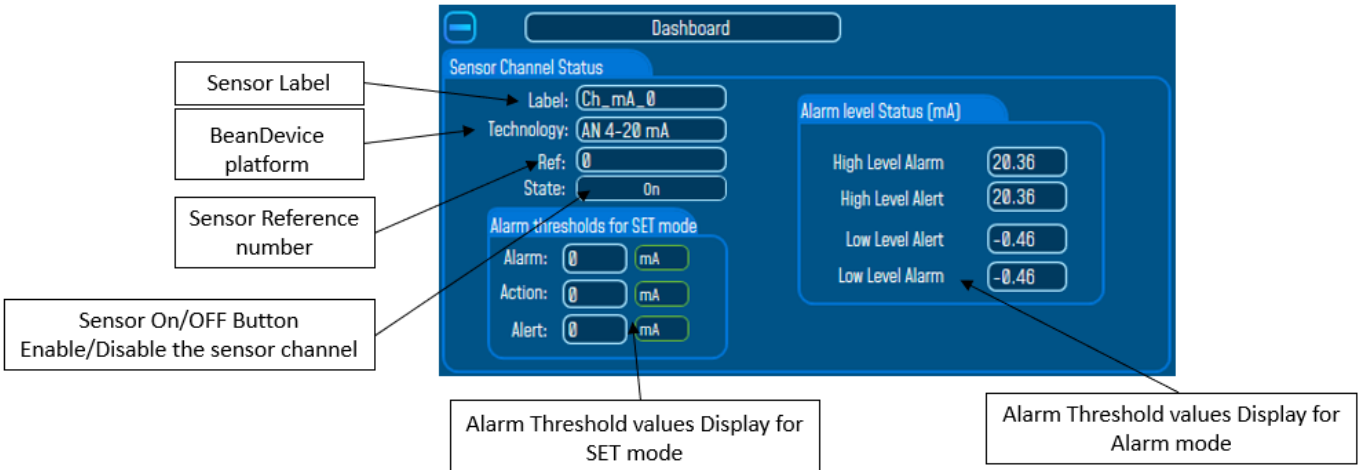



*Figure 45: Sensor Channel General information frame*

#### 7.9.1.2 Frame: Measurement data

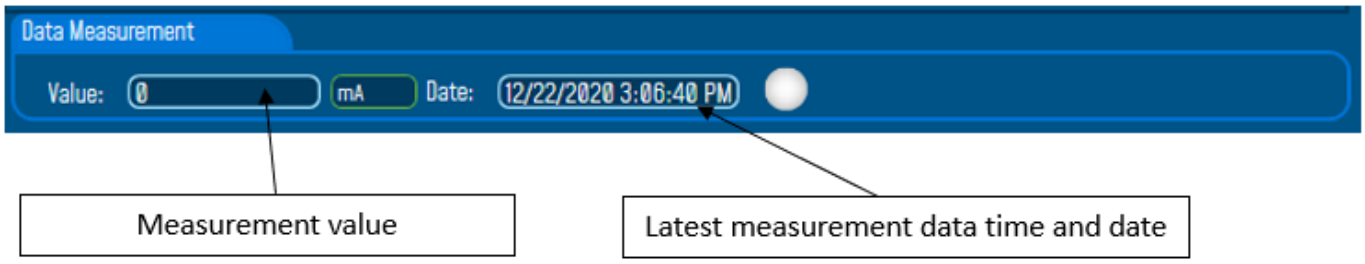



*Figure 46: Measurement data frame*

By default, sensor unit format is

- ✓ BeanDevice® AN-V : V
- ✓ BeanDevice® AN-mV : mV
- ✓ BeanDevice® AN-420 : mA

### 7.9.2 Sensor configuration & calibration

This frame contains a set of five tabs:

| | |
|---|---|
| Custom Display | • Allows the end user to customzie the sensor |
| Notes | • Contains notes relating to the BeanDevice® sensor |
| Alarm Config | • Sensor configuration interface. The user can configure the alarm thresholds related to the sensor<br>• Depending on the BeanDevice® version which is used, other configuration parameters are available |
| Sensor calibration | • Sensor or measurement channel calibration |
| Log config. | • Logs configuration on the BeanScape® |
| S.E.T Config | • thresholds of S.E.T mode |

#### 7.9.2.1 Tab: Custom display

These parameters allow the user to customize his sensor:

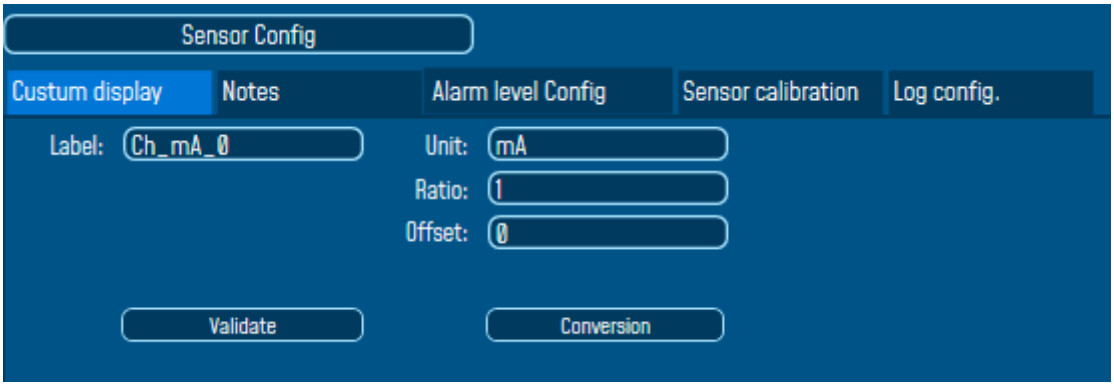



*Figure 47: Hi-Inc sensor channel custom display tab*

- ✓ ***Unit***: customer sensor unit (bar, °C, l/h….)
- ✓ ***Ratio***: Sensor Ratio coefficient (RAT);
- ✓ ***Offset***: Sensor Offset Coefficient (OFF);
- ✓ ***Label***: Give a name to your sensor. (ex: Sensor on Stator Machine 1, sensor in Room 2 Floor 3)

***Measurement conversion formula:***

***Converted Measurement = Measurement x RAT + OFF***

***Example with a temperature sensor:*** By default the temperature unit is in degree Celsius. The user wants to convert the unit of his temperature sensor in degree Fahrenheit.

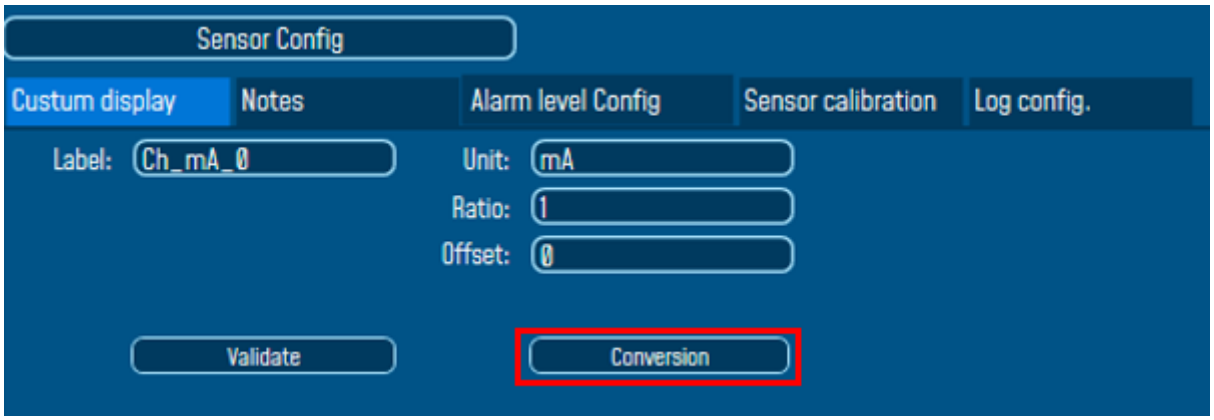
***Converted Measurement [°F] = Measurement [°C] x RAT + OFF***

With **RAT** = 1.8 and **OFF** = 32

***Conversion assistant***

To avoid conversion error, a conversion assistant is available to help you to setup quickly your measurement channel of your BeanDevice®.

Click on conversion assistant from the tab “Custom display”, a window will open allowing you to do a linear conversion.




On the left column, the user can enter the non-converted measurement data. On the right column, the user can enter the converted measurement values with the desired unit.

The ratio and offset values are calculated automatically by the conversion assistant.

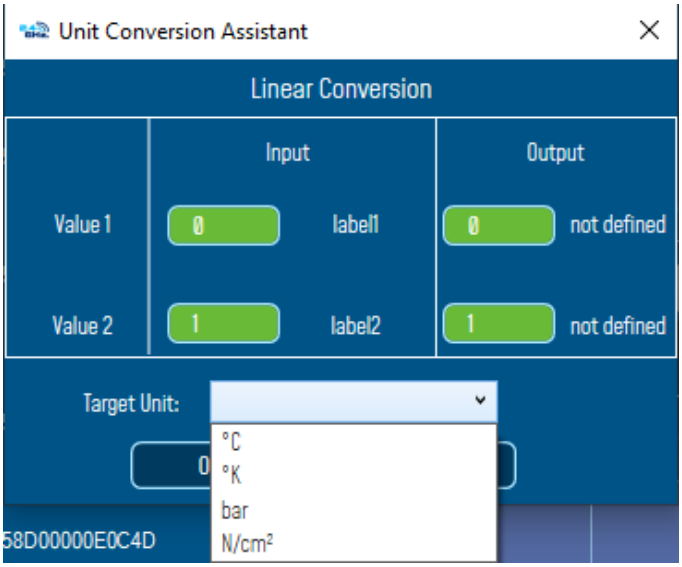



***Figure 48: Unit Conversion Assistant***

7.9.2.2 Tab: Notes

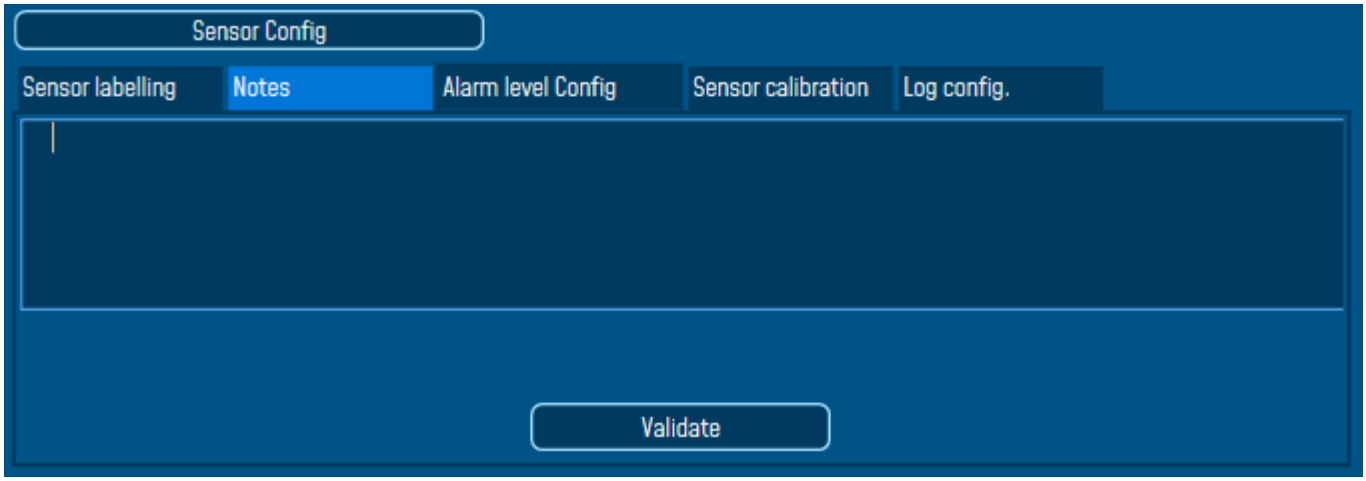
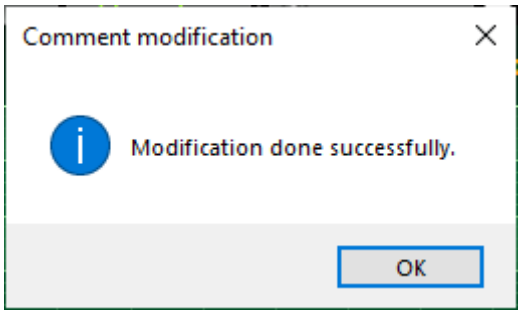



*Figure 49: Sensor channel notes tab*

This field contains notes relating to the BeanDevice® sensor. To change this field, enter a value or free text and click the "Validate" button.

A new window opens; accept your modifications by clicking on "OK".




To back up your text click on the icon "Backup your Database"

### 7.9.3 Calibrate the BeanDevice ProcessSensor

The CALYS 50 is a multifunction calibrator. It is specially designed for calibration and maintenance and can measure and simulate physical and electrical quantities, either on site or in the laboratory.

Measurement and transmission can take place simultaneously, with a double display.

Connect the channel of the BeanDevice to the calibrator's Output: Sens+ to the V and Sens- to COM

Then enter 1V from the calibrator and press ENTER to validate.

From the Beanscape software choose Unipolar mode as DAQ Polarity and configure the BeanDevice on LowDutyCycle with 6s.

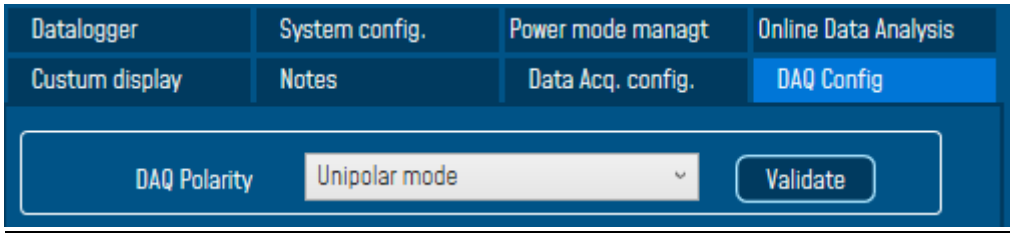



*Figure 50: Polarity config*

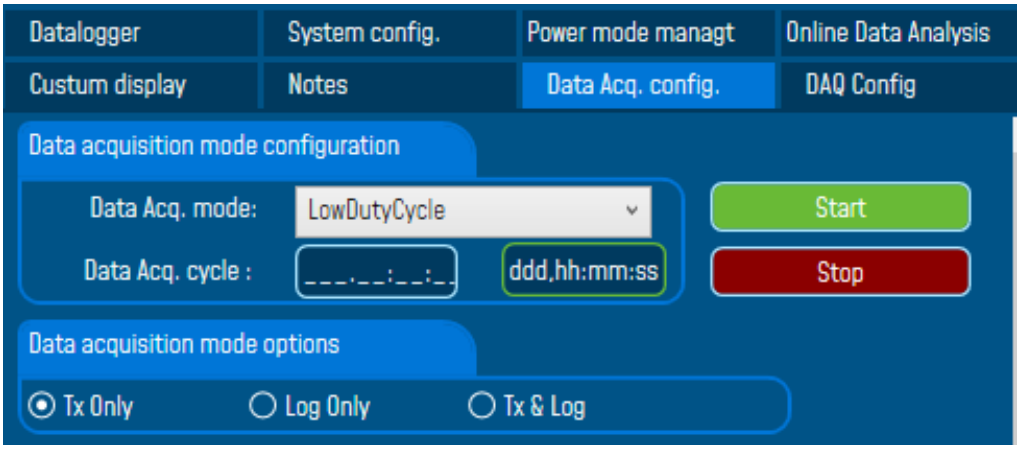



*Figure 51: DAQ configuration tab*

Then select the sensor profile used for calibration and copy the displayed value from the Measurement data frame.

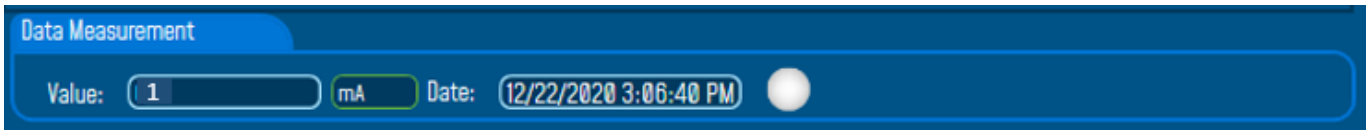



*Figure 52: Current Data measurement frame*

Paste the value in the excel sheet in front of the corresponding injected value

| CH0 | | Bipolar | Unipolar | Injected value (Volts) |
|---|---|---|---|---|
| sample1 | | | | 1 |
| sample2 | | | | 4 |
| Ratio | | | | |
| offset | | | | |

The ratio will be automatically displayed.
Do the same steps with the second injected value, then copy the ratio and the offset values.

| CH0 | | Bipolar | Unipolar | Injected value (Volts) |
|---|---|---|---|---|
| sample1 | | | 1.1893 | 1 |
| sample2 | | | 4.0914 | 4 |
| Ratio | | | 1.033734192 | |
| offset | | | -0.229420075 | |

Now from the BeanScape software select DAQ Calib. Unipolar and past the ratio and offset values then validate.

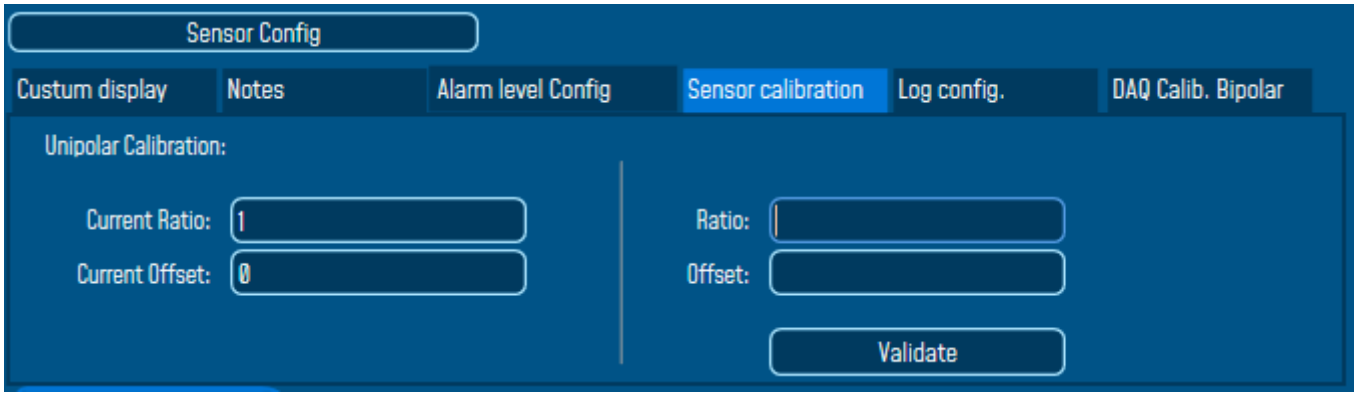



*Figure 53: Sensor calibration*

For Bipolar calibration you repeat the same steps.

7.9.3.1 Tab: Configuration

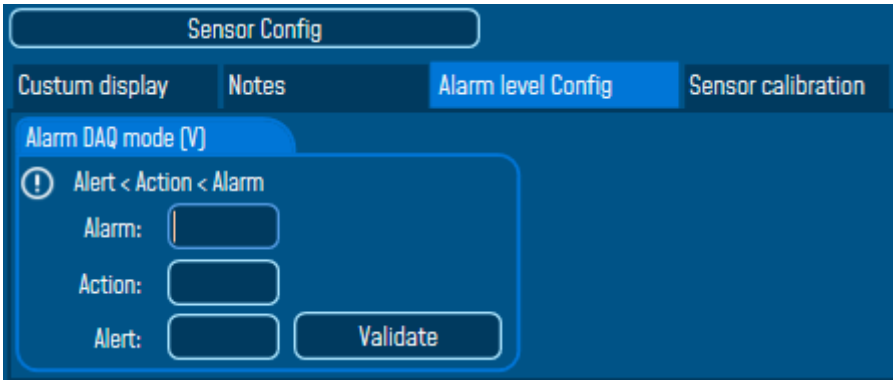



*Figure 54: Alarm level config tab*

| *Parameter* | *Description* |
|---|---|
| **Alarm threshold configuration** | You can configure threshold high values (High level alarm, High level alert) and low values (Low level alarm, Low level alert). In alarm mode, when a higher low threshold value is reached, an alarm notification is transmitted to the BeanGateway;<br>If the sensor value is higher than High level alarm/High level alert, notification is send to the BeanGateway/BeanScape;<br>If the sensor value is lower than Low level alarm/Low level alert, notification is send to the BeanGateway/BeanScape.<br>Threshold values must be organized in this manner:<br>High level alarm >=High level alert > Low level alarm >= Low level alert |

7.9.3.2 Tab: DAQ calibration Bipolar

These coefficients are used to calibrate the external sensors & Light sensor

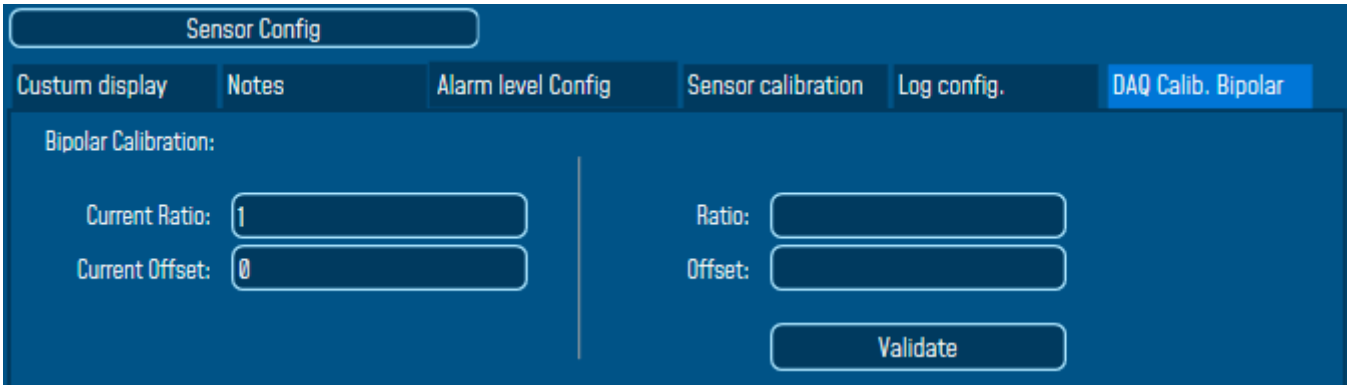



*Figure 55: DAQ Calibration tab*

The BeanScape® provides a calibration interface for each measurement channel:

- ***Ratio*** : multiplier coefficient
- ***Offset***: adder/subtracted coefficient. Its unit is the sensor unit.

*Calibrated value = (Ratio **x** Non Calibrated Value) + Offset*

Enter the calibration coefficients and then click on Validate.

***The calibrations coefficients are saved on the BeanDevice® flash memory and are conserved during the lifetime of your product.***

***WARNING: These calibration coefficients should be accessible to an advanced user. A wrong calibration will result in false measurements.***

Tab: Log configuration

***This tab should not be confused with the Datalogger function available on the BeanDevice®***

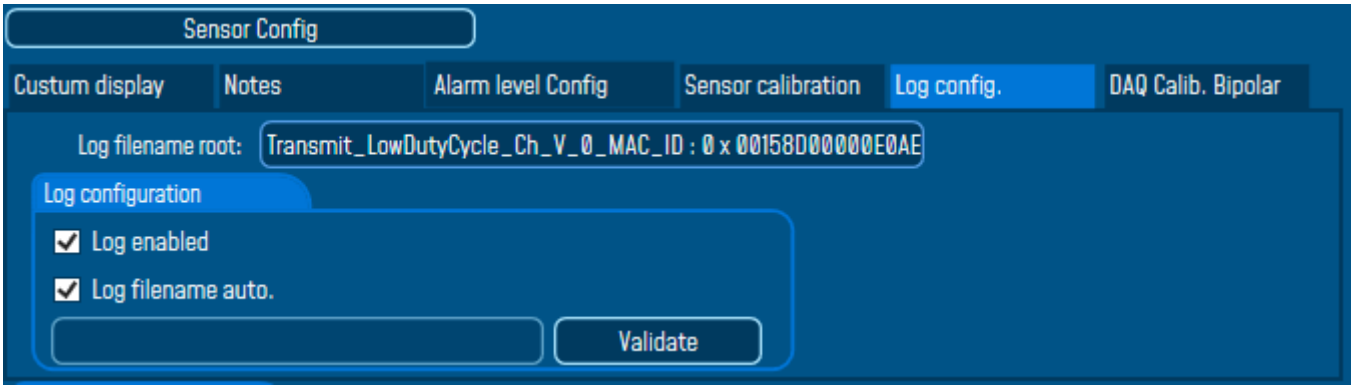



*Figure 56: Log configuration tab*

By default, Log file name is built with the measurement channel & BeanDevice® MAC Address:

< Sensor Channel Number > <MAC_ID>

- ✓ ***Log enabled***: If checked, Log is enabled on the BeanScape®
- ✓ ***Log filename auto***.: If checked, Log file name is named automatically

Click on ***validate*** in order to validate all your modifications.

For users who want to rename the log file, two solutions are provided:

| | |
|---|---|
| ***Solution 1*** | ***Add automatically the channel "Label" in your log file name:***<br>***<Label><Sensor channel Number> <MAC_ID>*** |
| ***Solution 2*** | ***The log file name can be fully customized:***<br>***Uncheck the case « Log filename auto" and add your own label*** |

### 7.9.4 Graphical display

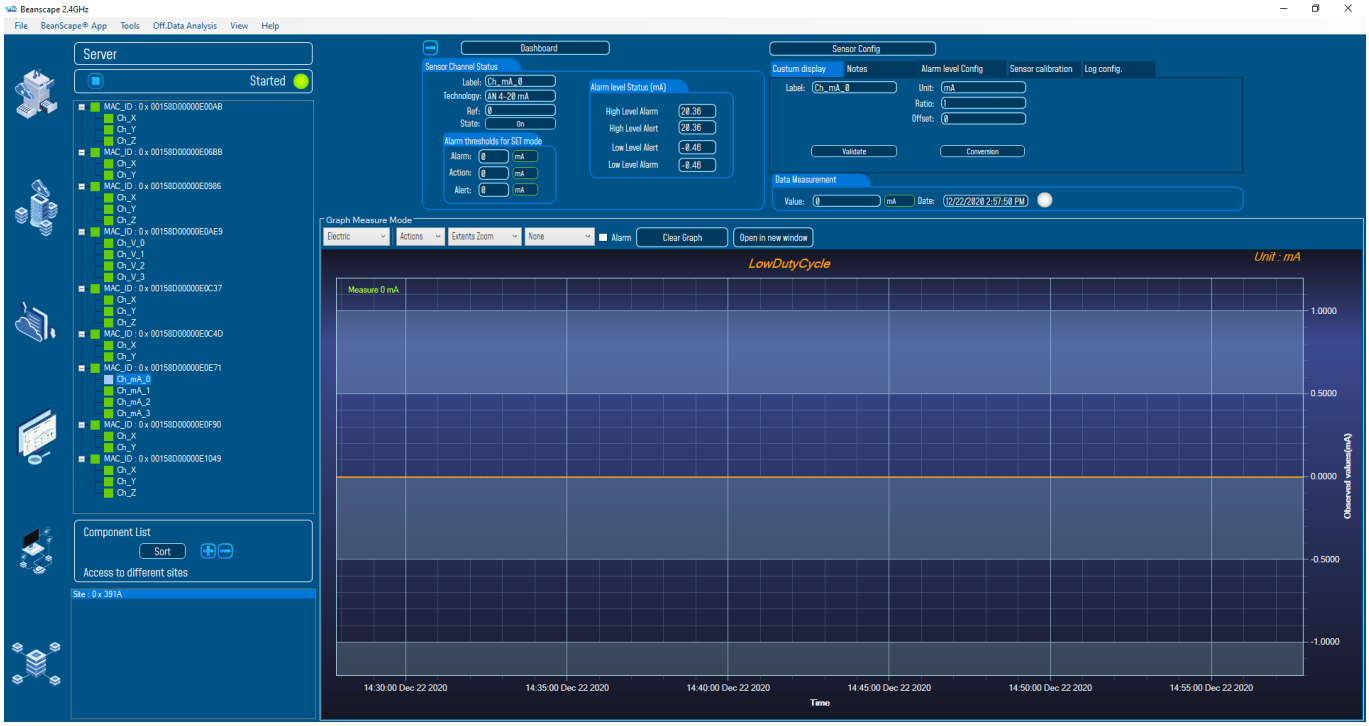
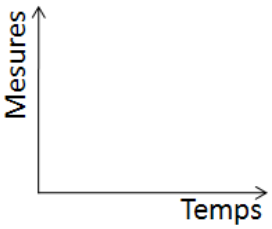



*Figure 57: Channel acquisition graph visualization*

The chart is composed of two parts:

- ***Part 1***: This is a preview window, allowing you to observe sensors acquisitions:
- ***Part*** 2: A strip on the side composed of different frames allows customizing the graph;

The graph has two axes:



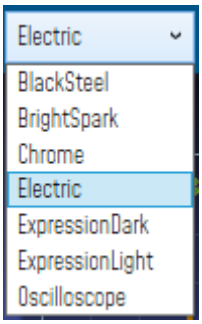

**Axe-X**: Timeline

**Axes-Y:** received sensor acquisitions

The BeanDevice® data acquisition mode and the last data acquisition can be visualized directly from the graph.

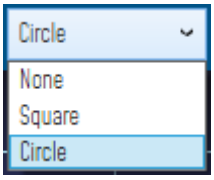
***Figure 58: Graph visualization***

7.9.4.1 Frame: Display




7.9.4.2 Frame: Symbols

From this frame, you can select the display mode of action of the chart. Three types of symbols are available:




***Circle***: Brings up a point on each bar graph

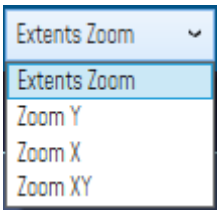
***Square***: brings up a square on each measure of the graph

***None***: No logs is displayed on the graph

*Figure 59: Graph measure mode: Frame Marks*

7.9.4.3 Frame: Scale

From this frame, the scaling of the graphics can be customized to suit your needs.




**Checkbox "Zoom X and Y Zoom"**

These boxes are useful for performing a graph zoom from the mouse wheel, there are four cases:

- ***Case 1***: Case "Zoom X" ticked. The graph zoom will only affect the X axis.
- ***Case 2***: Case "Zoom Y" ticked. The graph zoom will only affect the Y axis.
- ***Case 3***: Case "Zoom XY" ticked." Zoom will affect both X and Y axes
- ***Case 4***: Case "Zoom X ", "Zoom XY" and "Zoom Y" not ticked. The zoom function from the mouse wheel is disabled.

## 7.10 DATALOGGER CONFIGURATION

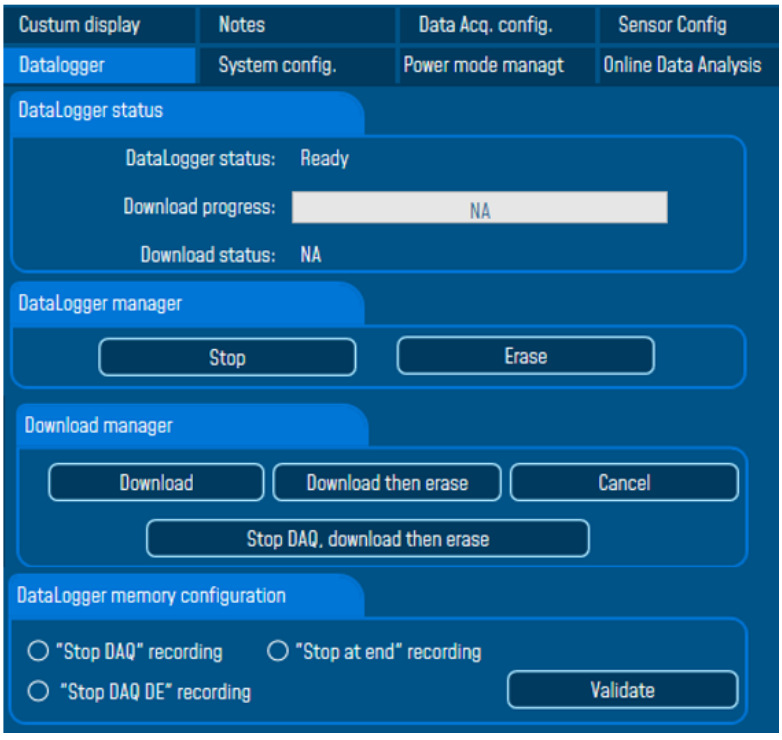
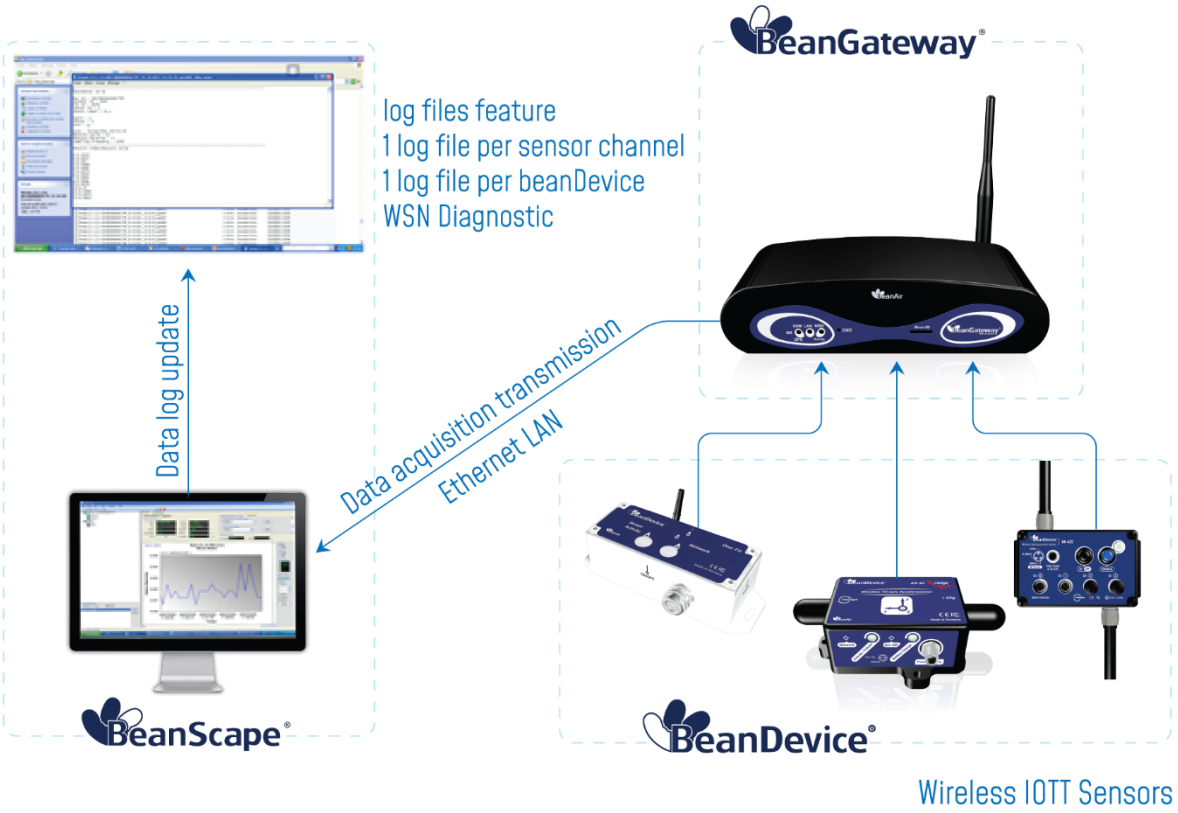



*Figure 60: BeanDevice® Datalogger tab*

***Please read the technical note TN_RF_007 – "BeanDevice® Datalogger User Guide "***

## 7.11 LOG FILE ORGANIZATION

### 7.11.1 Log File System Overview




### 7.11.2 Log file directory

By default, the Log file directory is: ***C:\log_beanscape***

***The following procedure applies only for advanced users***

Click on the tab Tools then Options to configure advanced settings in BeanScape®:

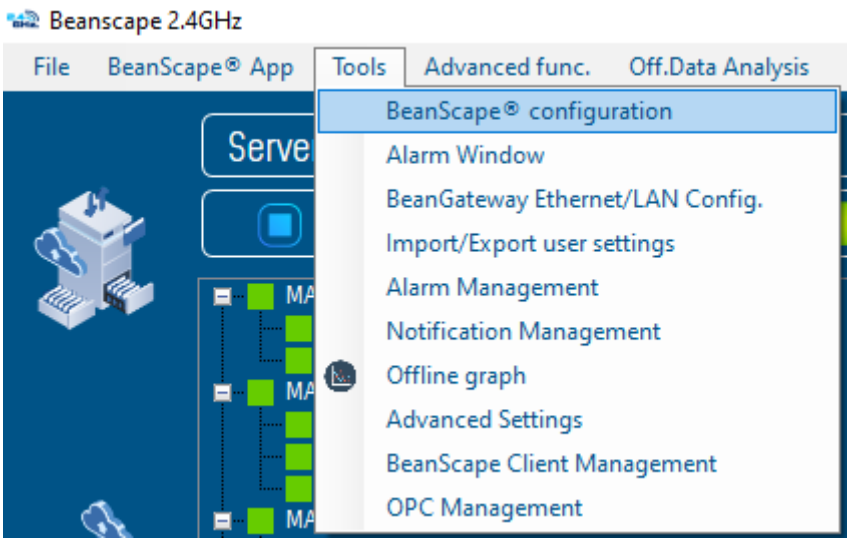



*Figure 61: BeanScape® configuration menu*

This window lets you configure the logs, and the data cache.

- You will see the following window:

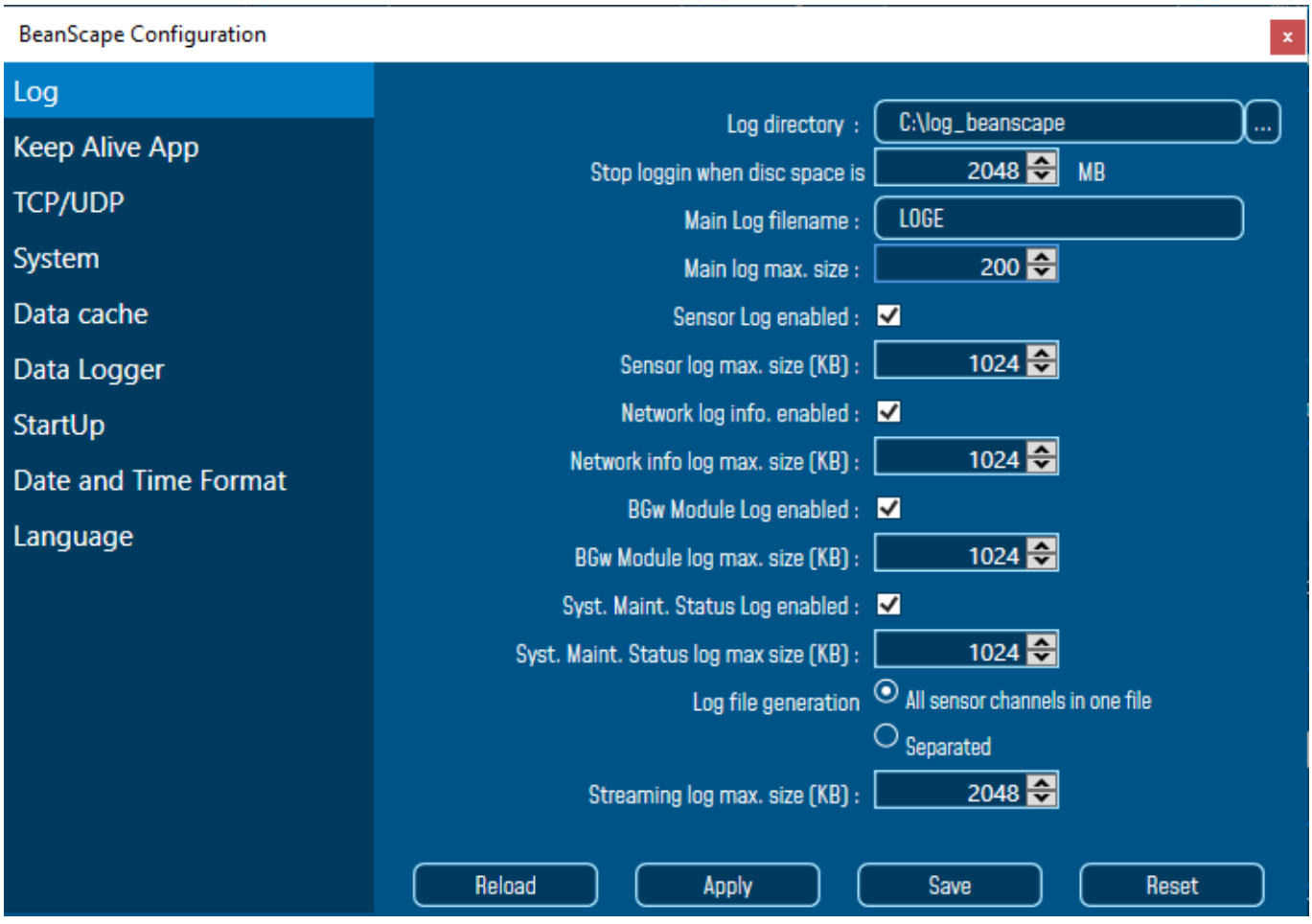



*Figure 62: BeanScape® configuration window*

- Clicking the button

reverts back to its original configuration.

Log Folder

By Default, log files linked to the ***BeanDevice®*** are stored in the log folder (located in C:/log_beanscape directory):

"***Folder MAC_ID***"

Only the last 4 Char of BeanDevice® MAC ID are displayed.

User can change log folder name by clicking on "Custom display" tab located on the **BeanDevice®** profile:

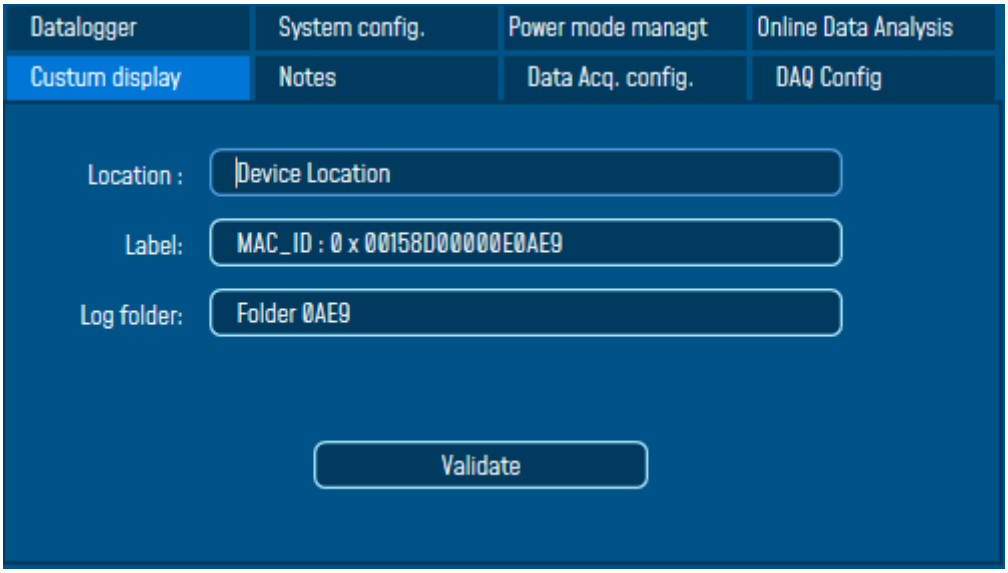



***Figure 63: BeanDevice® Custom Display tab***

Enter your own log folder name, then click on validate.

The following example shows the log folder changed to "Factory2":

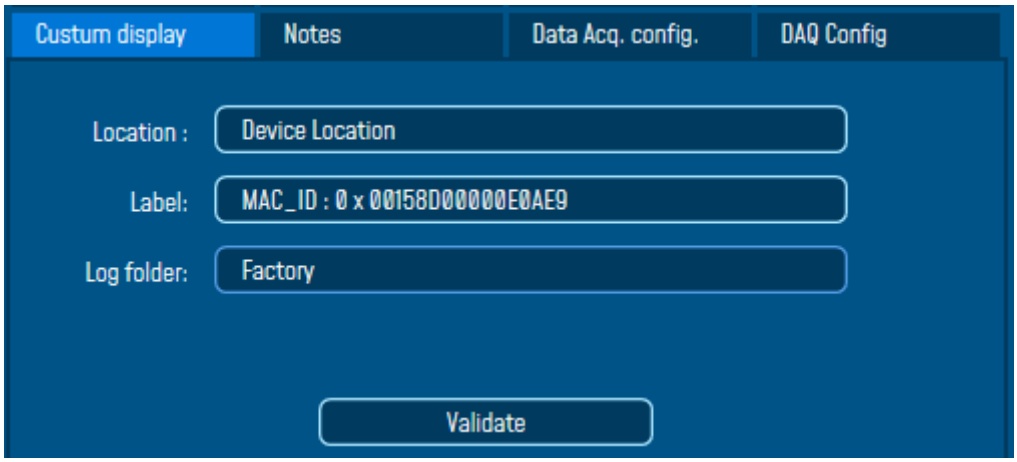



***Figure 64:BeanDevice® custom display settings***

### 7.11.3 Log file size configuration

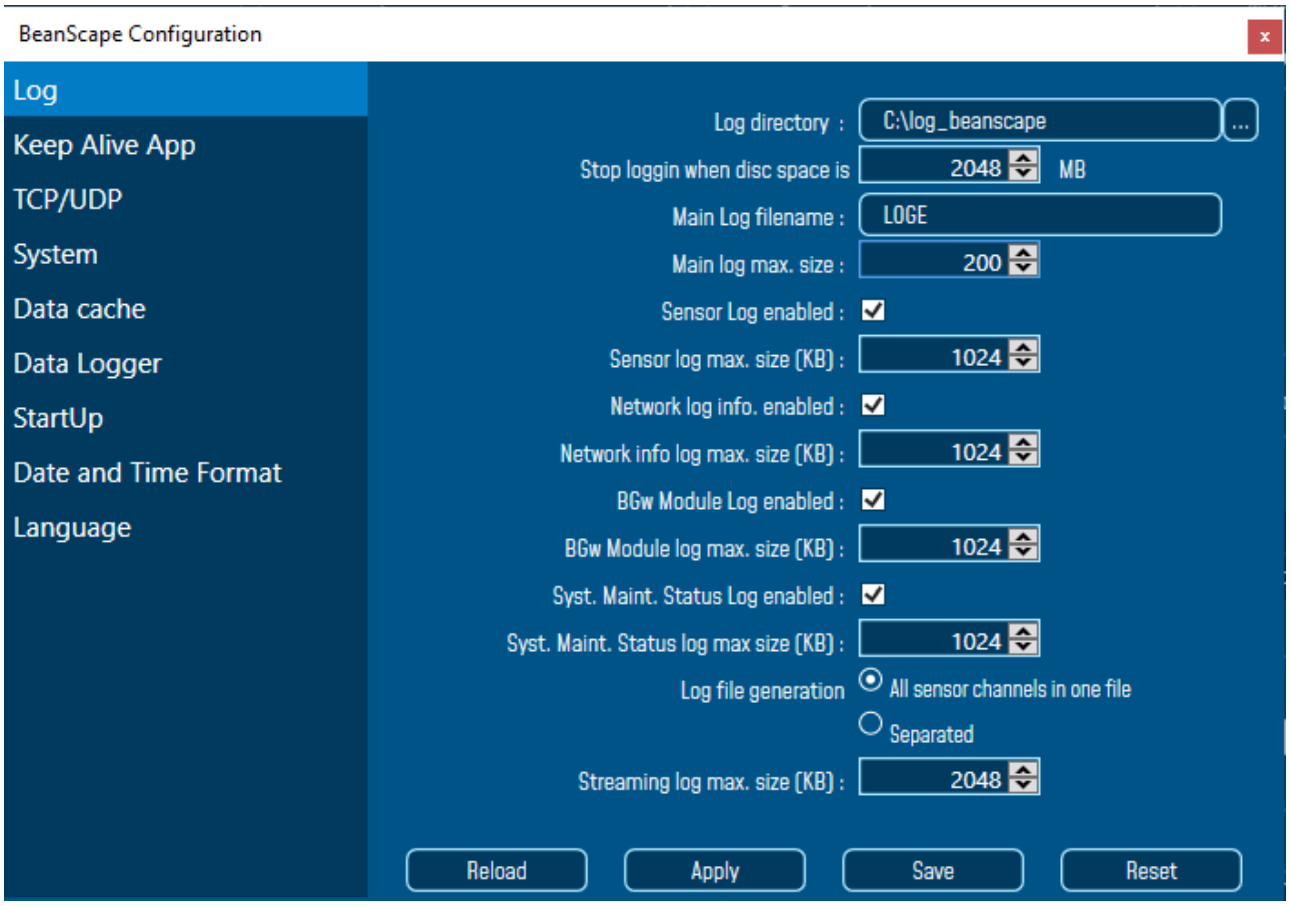



*Figure 65: Logfile settings*

- ✓ ***LOG directory***: Enter here the path/folder where you would want to save the LOG files.
- ✓ ***Main log filename***: Here you may enter the desired name in order to save the LOG file.
- ✓ ***Main log max. size (KB):*** Maximum file size in Kilobytes (KB) for your principal LOG file
- ✓ ***Sensor Log Enabled***: Check this box if you want to enable the sensor(s) data acquisition in your LOG file
- ✓ ***Sensor log max. size (KB)*** : Maximum size in Kilobytes (KB) of sensor log files (**except** for streaming data acquisition mode)
- ✓ ***Network log info. enabled*** : Check this box if you want to enable network information in your LOG file
- ✓ ***Network info log max. size (KB)*** : Maximum size in Kilobytes for your network information LOG file
- ✓ ***Streaming log max. size :*** Maximum size in Kilobytes (KB) of sensor log files (***only*** for streaming data acquisition mode)

### 7.11.4 Log file generation

By default, 1 log file is linked to 1 sensor channel. The user can select a log file linked to all the sensor channels present on the BeanDevice®.

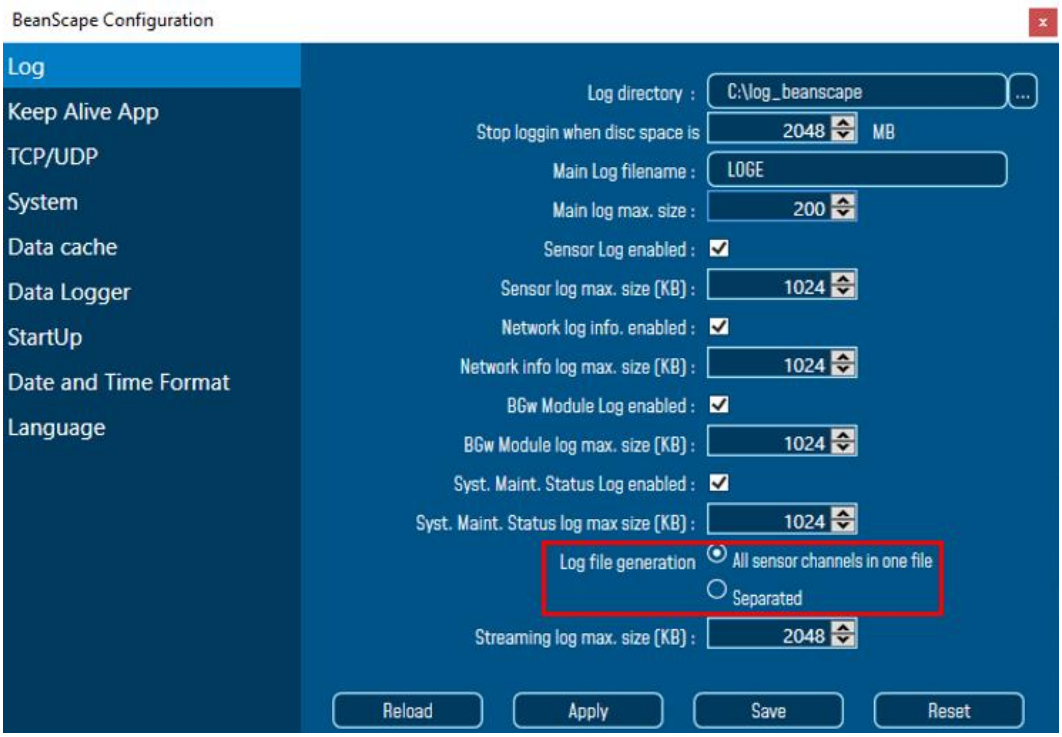



*Figure 66: Log file generation options*

- You should have all channels data recorded in one single file located in your C:\log_beanscape directory

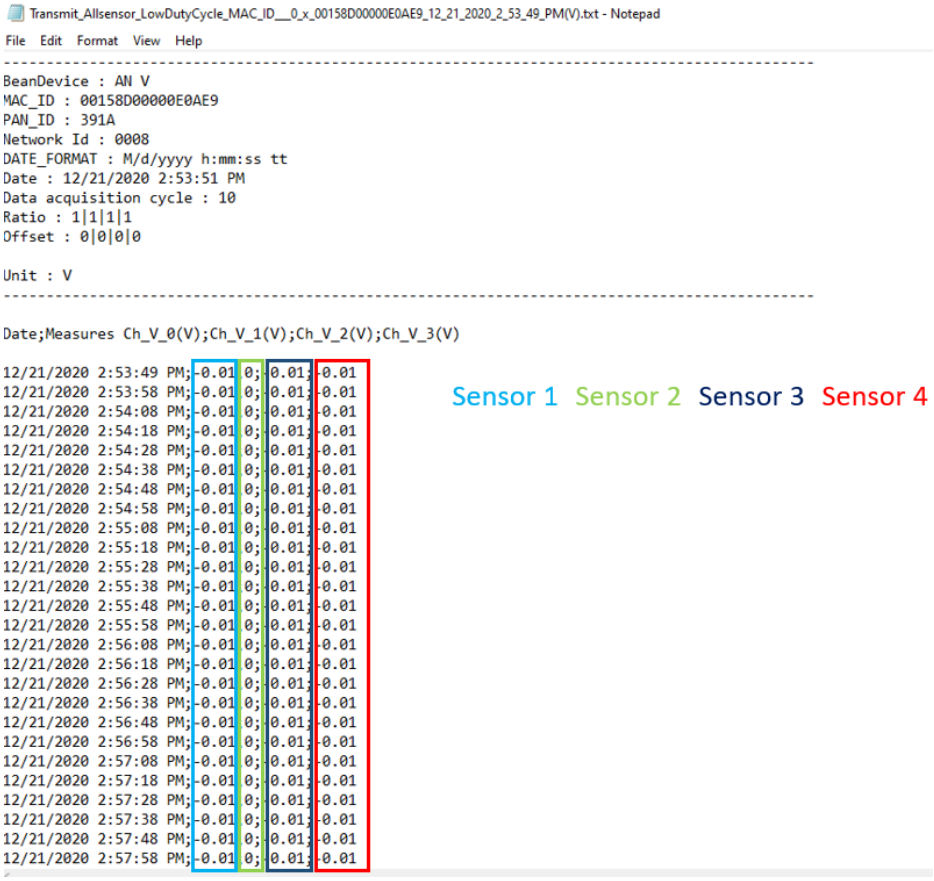



*Figure 67: Example of Log file*

### 7.11.5 Cache Data Configuration (for Graph)

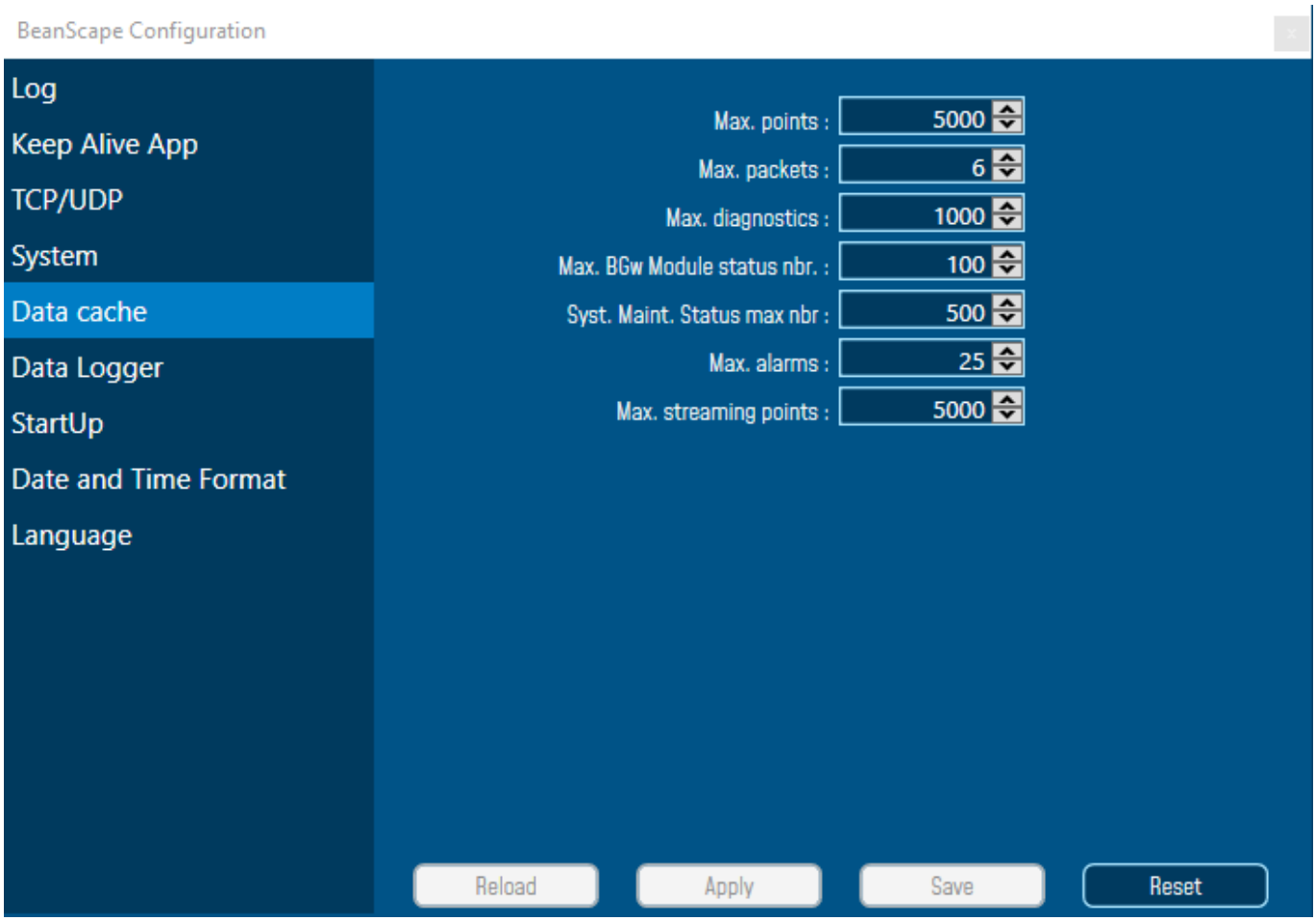



*Figure 68: Data cache configuration options*

- ✓ ***Maximum number of points***: Set here the maximum number of points displayed on the BeanScape® graph
- ✓ ***Maximum number of packets***: Set here the maximum number of packets displayed on the BeanScape® graph
- ✓ ***Max number of diagnostics***: Set here the maximum number of diagnostics displayed on the BeanScape® graph
- ✓ ***Max number of alarms***: Set here the maximum number of alarms displayed on the BeanScape® graph
- ✓ ***Maximum streaming points***: Set here the maximum number of points displayed in Streaming on the BeanScape® graph

***Please note that the values backed up by the BeanScape® may affect the memory capacity of your computer depending upon the size of every file.***

### 7.11.6 Log file related to data acquisition

#### 7.11.6.1 Log filename root

For each sensor channel a log file is automatically created by the BeanScape®.

The user can easily change the log file root:

*Figure 69: Log Config tab on BeanScape®*

***This tab should not be confused with the Datalogger feature available on the BeanDevice®.***

For further information, please refer to the section Log configuration.

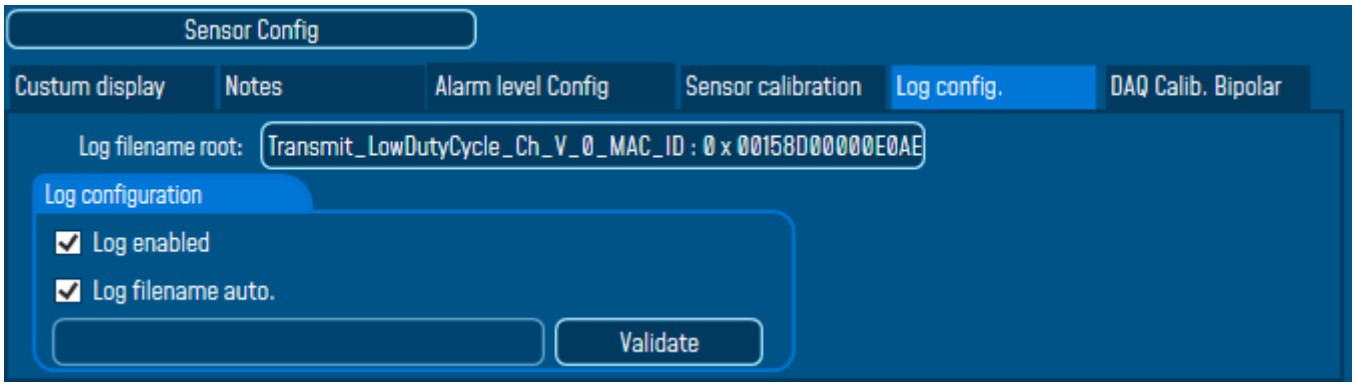



*Figure 70: Log config tab*

By default, Log file name is built with the measurement channel & ***BeanDevice®*** MAC Address:

< Sensor Channel Number > <MAC_ID>

- ✓ ***Log enabled***: If checked, Log is enabled on the BeanScape®
- ✓ ***Log filename auto.***: If checked, Log file name is named automatically

Click on ***validate*** in order to validate all your modifications.

For users who want to rename the log file, two solutions are provided:

| | |
|---|---|
| ***Solution 1*** | ***Add automatically the channel "Label" in your log file name:***<br>***<Label><Sensor channel Number> <MAC_ID>*** |
| ***Solution 2*** | ***The log file name can be fully customized:***<br>***Uncheck the case "Log filename auto" and add your own label*** |

7.11.6.2 Specific case: log filename creation in "Streaming " mode

In Streaming mode, log filename is built as follow:

**Stream**_Sensor_channel_MAC_ID_DATE_partXXX

- ✓ ***Sensor channel = Sensor channel***
- ✓ ***MAC_ID: BeanDevice® MAC ID***
- ✓ ***DATE: date when the streaming mode starts***
- ✓ ***partXXX : Log file sequence number, part000 corresponds to the first log file***

***Example***:

Stream_0 x 0_0 x 00158D000004C79F_02-11-2011_17.55.05_part000

Stream_0 x 2_0 x 00158D000004C79F_02-11-2011_17.55.05_part001

Stream_0 x 1_0 x 00158D000004C79F_02-11-2011_17.55.05_part001

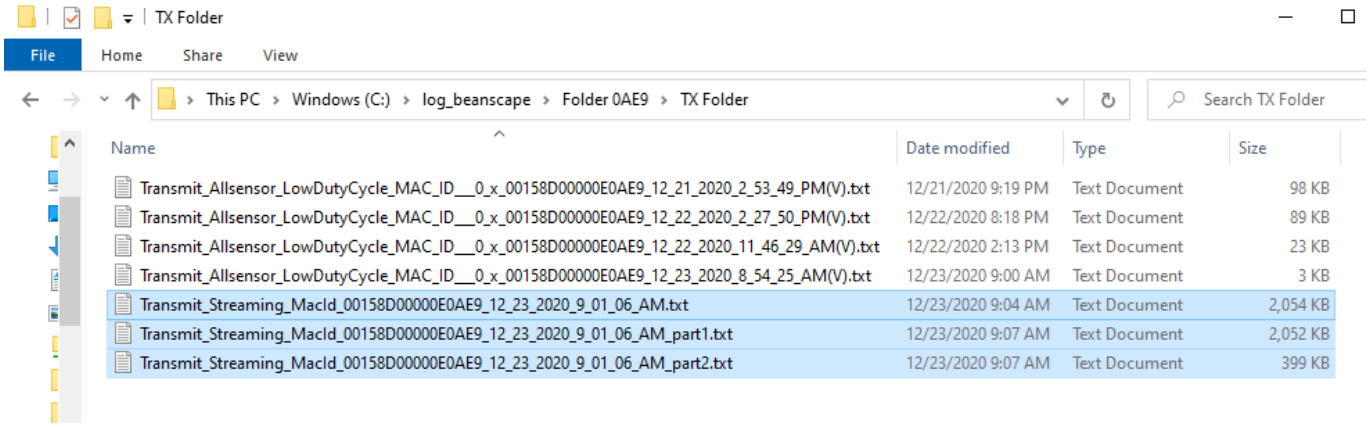



***Figure 71: log file parts***

7.11.6.3 Log file analysis

Transmit_Streaming_MacId_00158D00000E0AE9_12_23_2020_9_01_06_AM.txt - Notepad

File Edit Format View Help

```
------------------------------------------------------------
BeanDevice : AN V

Mac Id : 00158D00000E0AE9
Network Id : 0008
Pan Id : 391A
Ratio : 1|1|1|1
Offset : 0|0|0|0

Unit : V
DATE_FORMAT : M/d/yyyy h:mm:ss tt
Date : 12/23/2020 9:01:06 AM

Data acquisition cycle : NA
Data acquisition duration : NA
Sampling rate : 400
------------------------------------------------------------
Index;Measures Ch_V_0(V);Ch_V_1(V);Ch_V_2(V);Ch_V_3(V)

0;0;0;-0.01;-0.01;
1;0;0;-0.01;-0.01;
2;-0.01;0;-0.01;-0.01;
3;-0.01;0;-0.01;-0.01;
4;-0.01;0;-0.01;-0.01;
5;-0.01;0;-0.01;-0.01;
6;-0.01;0;-0.01;-0.01;
7;-0.01;0;-0.01;-0.01;
8;-0.01;0;-0.01;-0.01;
9;-0.01;0;-0.01;-0.01;
10;-0.01;0;-0.01;-0.01;
11;-0.01;0;-0.01;-0.01;
12;-0.01;0;-0.01;-0.01;
13;-0.01;0;-0.01;-0.01;
14;-0.01;0;-0.01;-0.01;
15;-0.01;0;-0.01;-0.01;
16;-0.01;0;-0.01;-0.01;
17;-0.01;0;-0.01;-0.01;
18;-0.01;0;-0.01;-0.01;
19;-0.01;0;-0.01;-0.01;
20;-0.01;0;-0.01;-0.01;
21;-0.01;0;-0.01;-0.01;
22;-0.01;0;-0.01;-0.01;
```

*Figure 72: Log file example (Streaming mode)*

The date which is displayed in the log file corresponds to the date when the streaming mode starts.

***Measure index*** allows the user to use a timestamp, the time value between the Index N and N+1 corresponds to the period rate.

***Example***: Data acquisition starts at 17h55min05s

A data acquisition with a measurement index of 30 (value -0,0035) corresponds to a time 17h55min05s30ms.

### 7.11.7 Log file organization in" Streaming" mode

7.11.7.1 Log file naming format

In Streaming mode, log file is built with a different format:

Stream_Sensor_channel_MAC_ID_DATE_partXXX

- ✓ ***Sensor channel = Sensor channel***
- ✓ ***MAC_ID: BeanDevice® MAC ID***
- ✓ ***DATE: date when the streaming mode starts***
- ✓ ***partXXX: Log file sequence number, part000 corresponds to the first log file***

***Example***:

Stream_0 x 0_0 x 00158D000004C79F_02-11-2011_17.55.05_part000

Stream_0 x 2_0 x 00158D000004C79F_02-11-2011_17.55.05_part001

Stream_0 x 1_0 x 00158D000004C79F_02-11-2011_17.55.05_part001

7.11.7.2 Log file analysis

Log file related to wireless network diagnostic provides the following information:

- ***Date*** : diagnostic date
- ***LQI TX***: Link quality indicator on the BeanDevice® side
- ***LQI RX***: Link quality indicator on the BeanGateway® side
- ***Local PER Tx***: Local Packet Error Rate on the BeanDevice® side
- ***Local PER Rx***: Local Packet Error Rate on the BeanGateway® side
- ***Global PER***: N.A.
- ***Battery voltage***: internal battery voltage
- ***Battery level***: battery level of charge
- ***Internal temperature***: Local temperature of the BeanDevice®

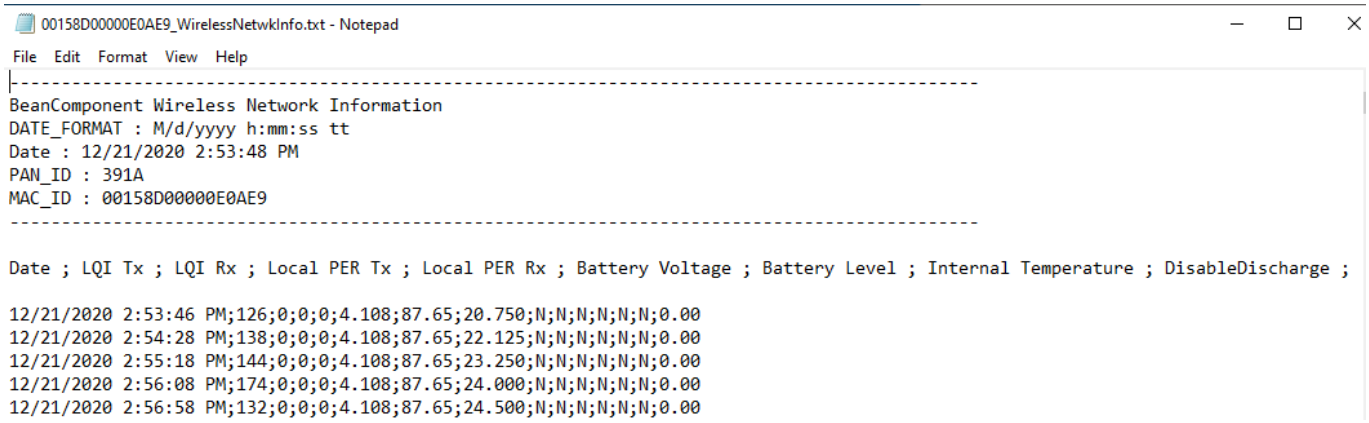



*Figure 73: Wireless Network Info log file*

If the BeanDevice® is configured with the streaming data acquisition mode, the following diagnostic information are not refreshed:

- ***Battery voltage***
- ***Battery level***
- ***Internal temperature***

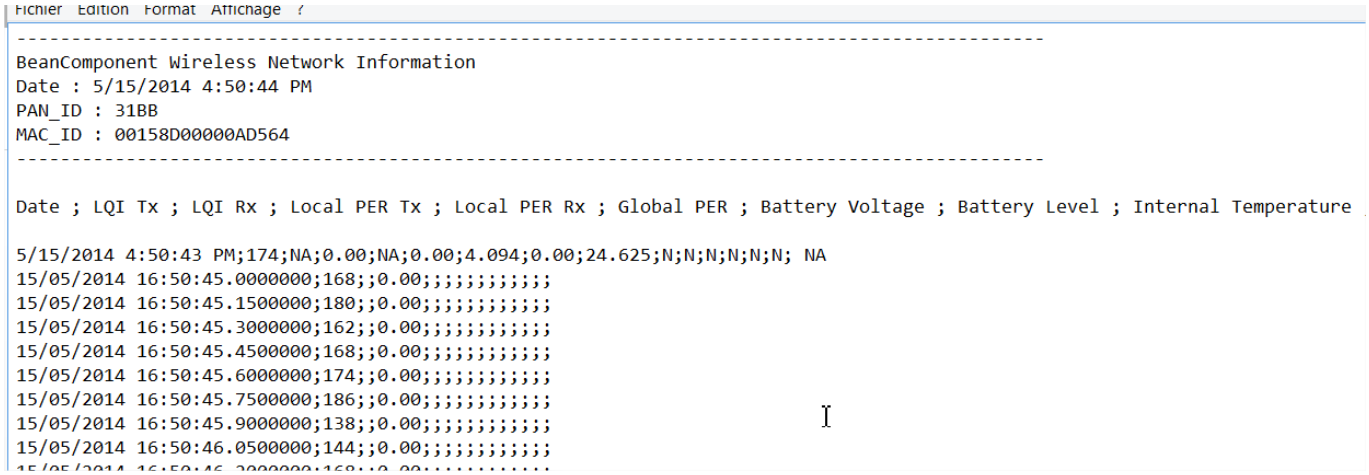
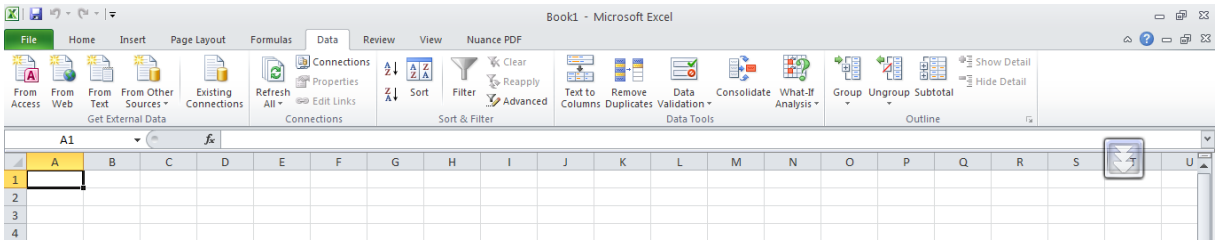


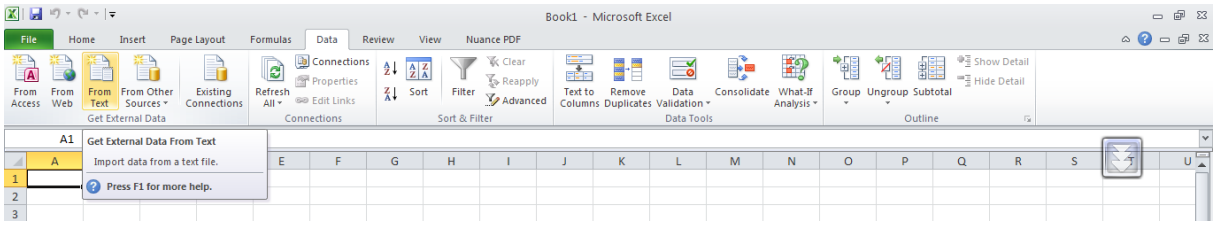

*Figure 74:Wireless Network Info log file during streaming mode*

### 7.11.7.3 How to open a measurement file with excel

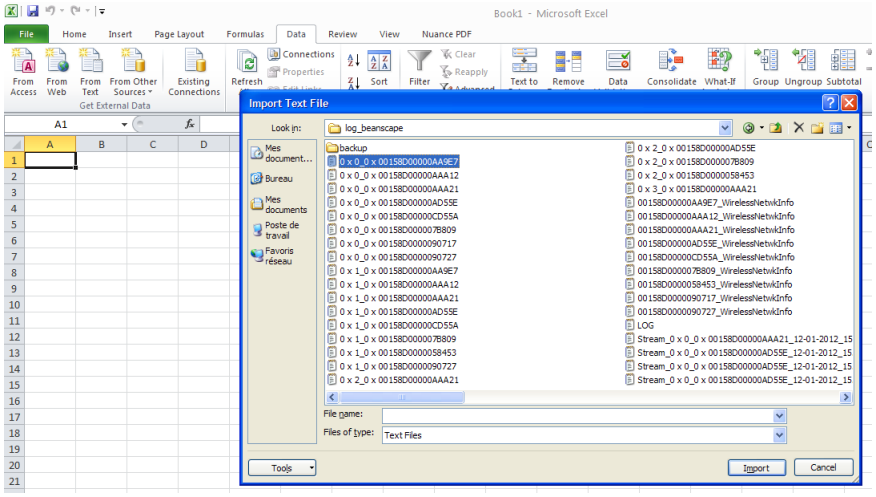
***Step 1 : Open Excel***




***Step 2: Go on « Data » Tab, then select "From Text"***

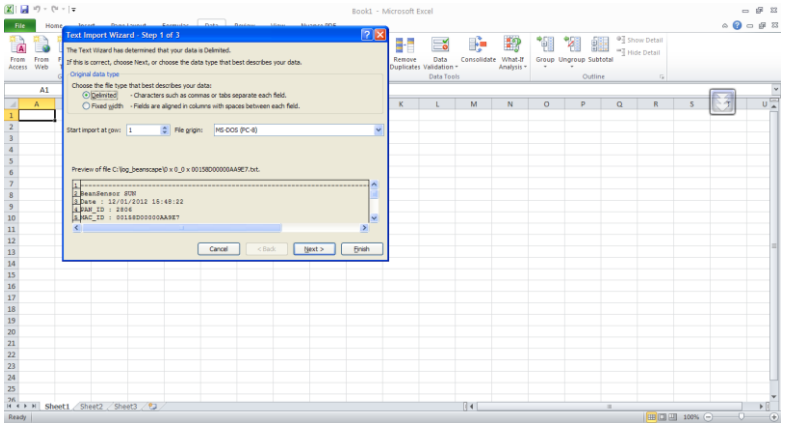



## *Step 3 : Choose your log file*

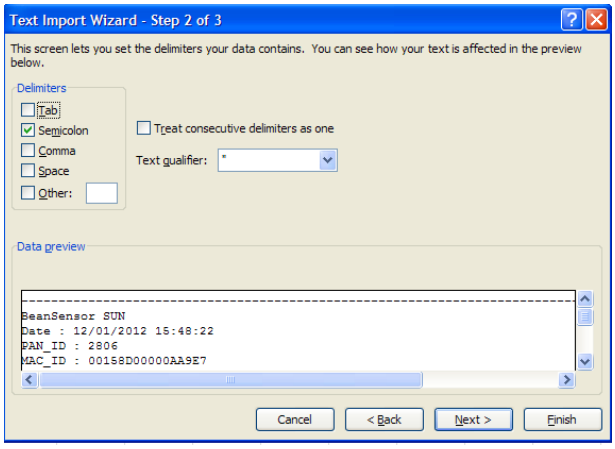



## *Step 4: Text import wizard will open, select « Delimited » for Characters such as commas or tabs separate each field.*

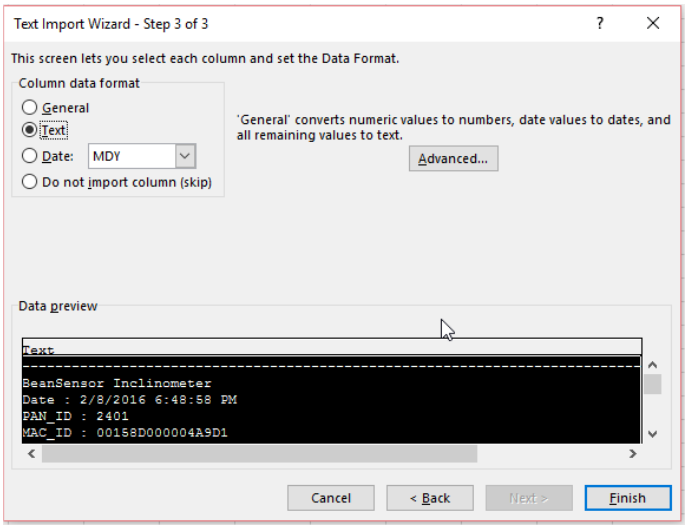
On "***Start import at row***" field: Select the number of lines that you want to suppress from the header:



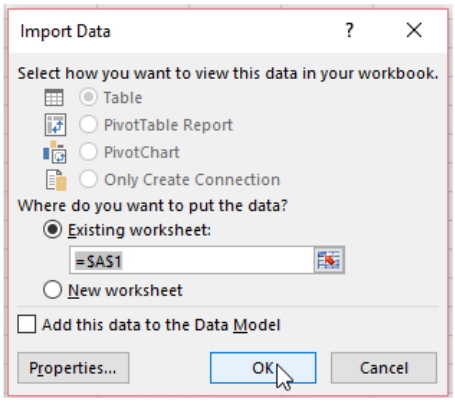
**Select semicolon**



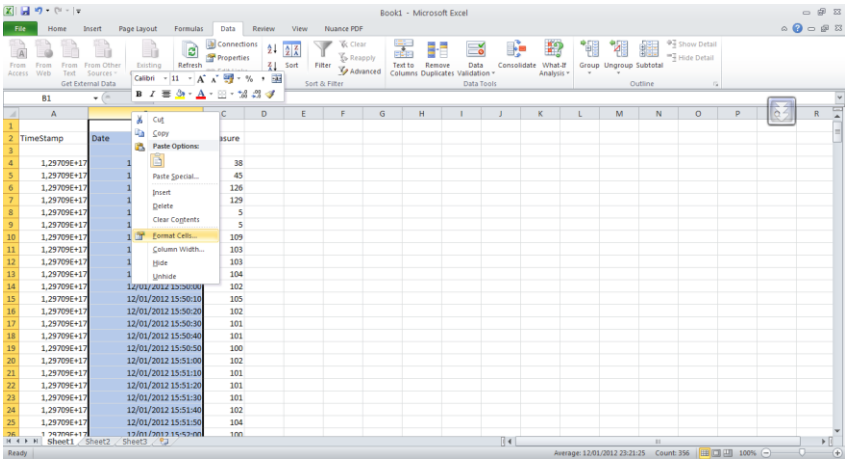
**Select Text**




**Click on OK**




Click on format cells:



See “Exporting a log file to Excel” YouTube video

7.11.7.4 Calibration settings log file

Once you connect the BeanDevice® to the BeanGateway® for the first time, all the calibration values will be backed up in the Calibration settings log file inside the BeanDevice folder.

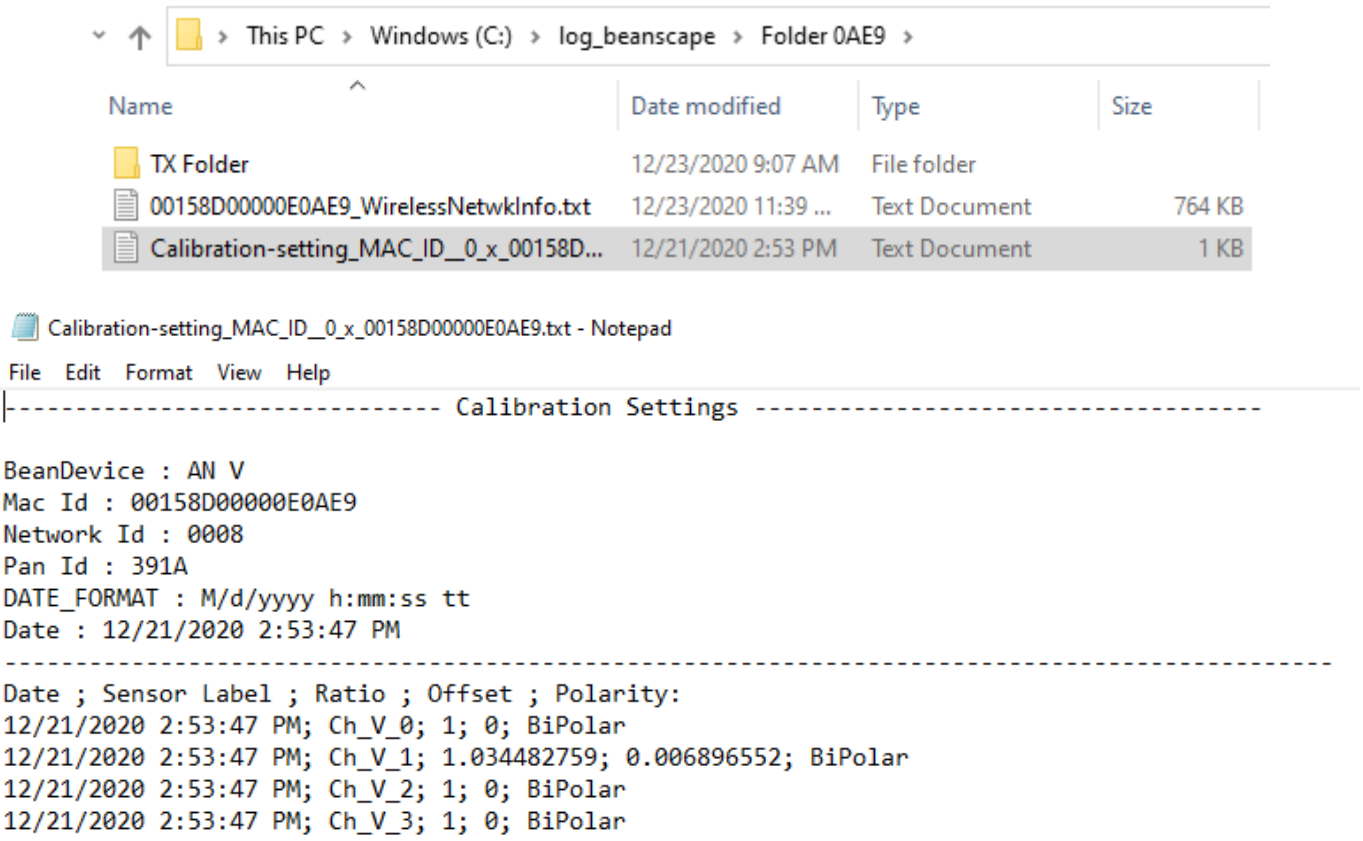



*Figure 75: Calibration log file*

If you change the your BeanDevice® calibration values, you can easily retrieve them from the calibration settings log file.

# 8. ALARM MANAGEMENT

## 8.1 EMAIL CONFIG

User can receive alarms notification by email. This function is only available with "**Alarm**" data acquisition mode and "**S.E.T**" mode.

From your BeanScape® software click on **"Tools"** tab then **"Alarm Management"**

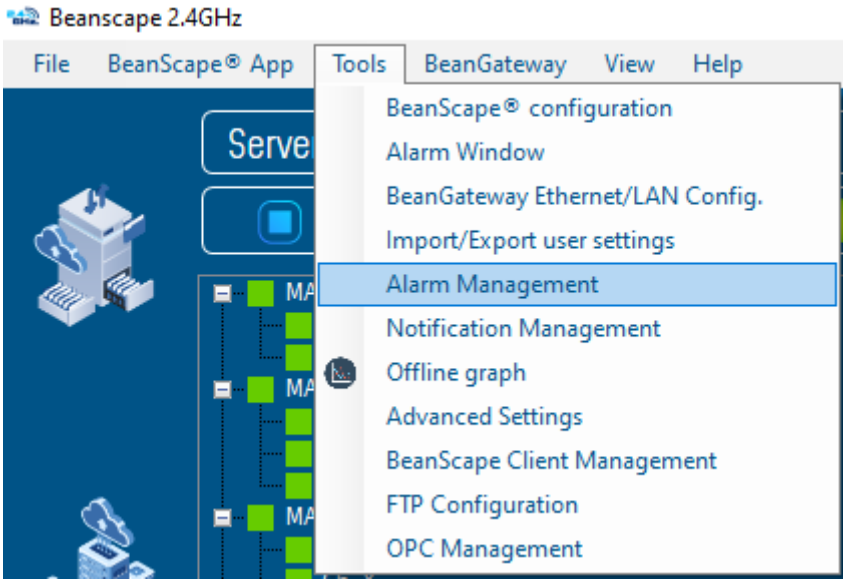



*Figure 76: Alarm management menu*

A new window will pop up with **SMTP configuration** and reports management, also other system related to alarm notification (Internal temperature, Battery level, Packet Error Rate, Link Quality Indicator) are configured from this window

Check on **Enable Notification by email**: ☑ Enable Notification by email and fill out the parameters described below:

| Field | *Description* |
|---|---|
| *From* | *Enter the email address sending the alarm notification* |
| *To* | *Enter the receiver(s) address(es) for alarm notification (max. 3)* |
| *SMTP server* | *Enter your Outgoing SMTP server* |
| *Port* | *Enter your port Number for your outgoing SMTP server* |
| *User name* | *Enter your full email address* |
| *Password* | *Enter the password (case sensitive) of your email account* |
| *Max Email per minute* | *Maximum number of emails allowed to be sent in one minute* |

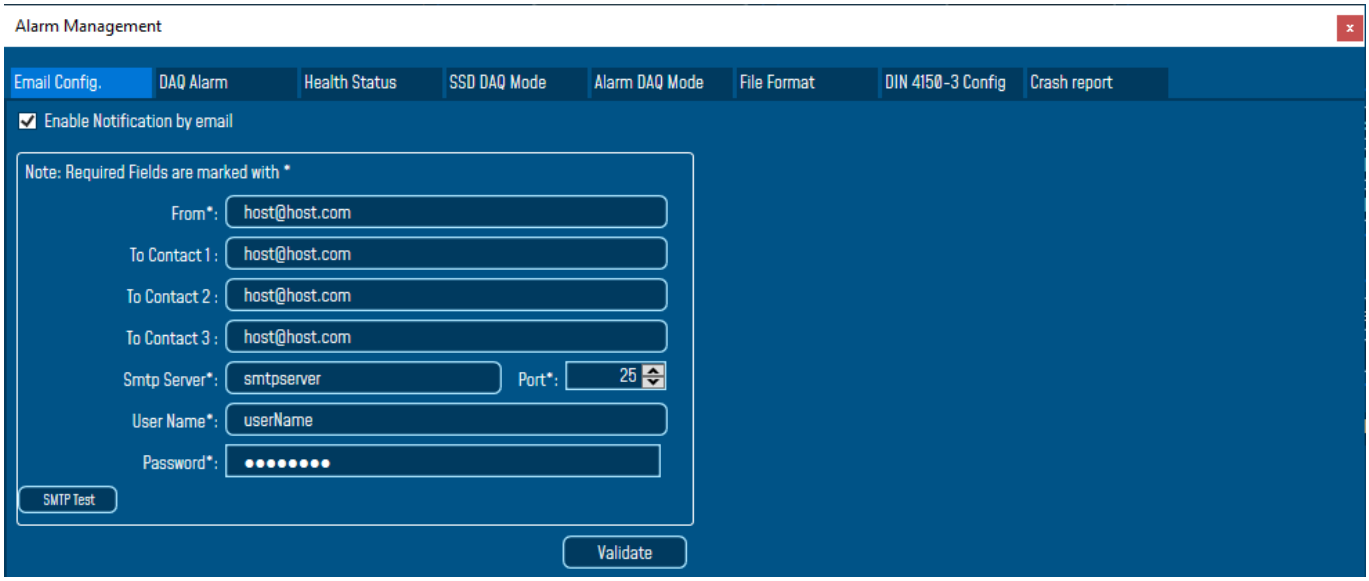



*Figure 77: Alarm management window*

**Users who use the Gmail or Hotmail emails, it's recommended to use the port number 25 while setting the SMTP configuration. Otherwise, users will face issues concerning receiving the Alarm emails.**

**Do not use the port number 488 instead of 25 while configuring the SMTP server in order to cancel all the issues that might affect the process of receiving the Alarm Emails.**

**Concerning the number port of the Gmail and Hotmail SMTP, it's highly recommended to use the port number 25 for both servers. DO NOT use any other port number**

## 8.2 DAQ ALARM

The **DAQ alarm** is related to the **S.E.T mode**, you can select Report format (word, PDF, png) and the specific Report/File related to the S.E.T mode to be sent via email.

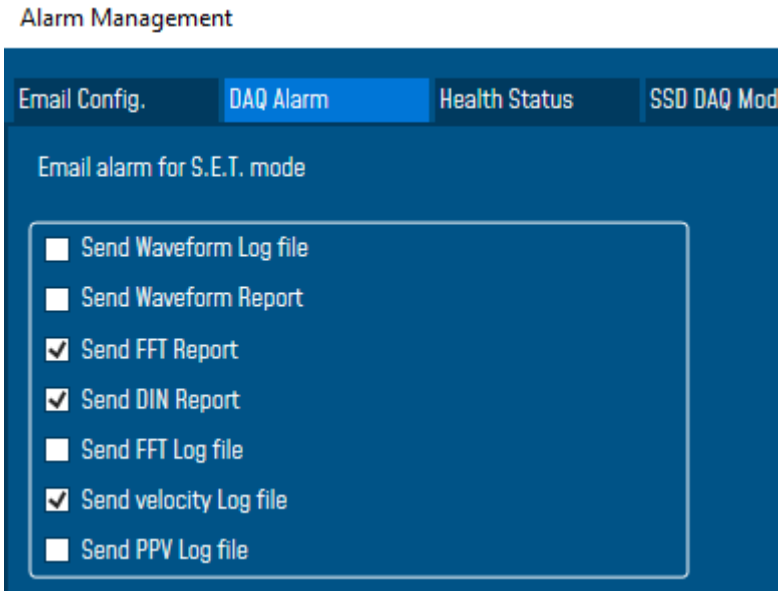



*Figure 78: Frame: Email alarm for S.E.T mode*

***More details about FFT Report/ Log files can be found on the Data acquisition modes available on the BeanDevice Technical note***

**See « Alarm by email » Youtube video**

**See «S.E.T mode for 2.4GHz» Youtube video**

If a threshold is reached, it is possible to have audio alarm on your PC, it is also possible to import your own MP3 sound.

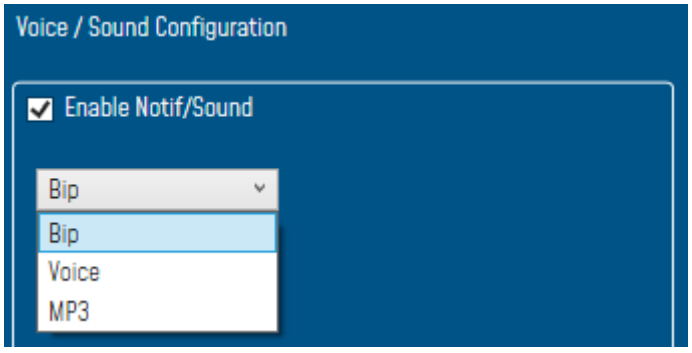



*Figure 79: Frame: Sound config*

## 8.3 ALARM DAQ MODE

To enable email notification for Alarm mode, navigate to Alarm DAQ Mode tab check Enable email, for Audio notification on PC check Enable Notif/Sound

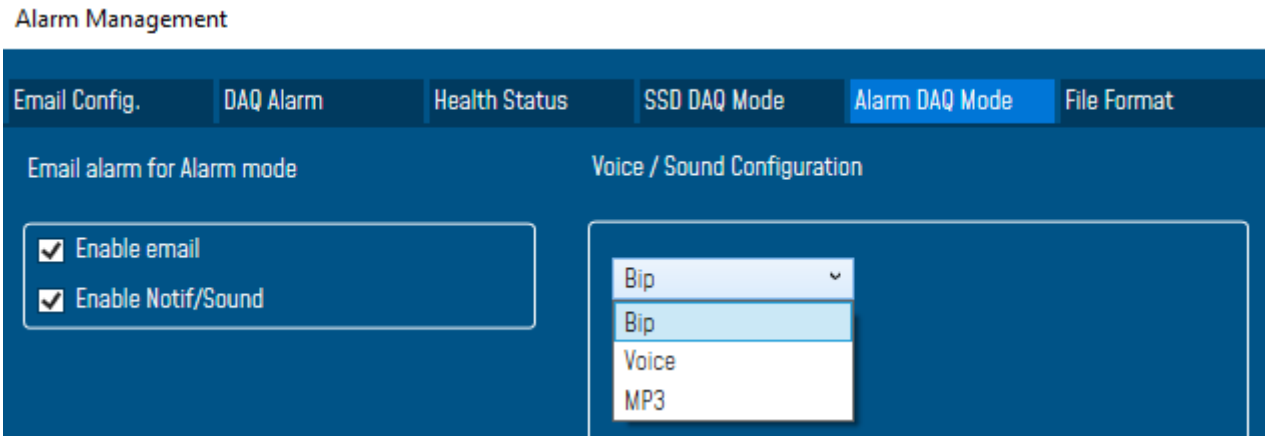



*Figure 80: Email alarm for Alarm mode*

To Test your Configuration, you can send a test email by clicking on SMTP Test, if everything is ok, you will receive a validation email then Validate and close the window.

*Figure 81: Alarm Mailing SMTP Test*

## 8.4 SYSTEM ALARM

Same as the DAQ Alarm tab, the **System Alarm tab** contains SMTP configuration in order to receive notification on system status:

*Figure 82: BeanDevice® Health Status management*

- **Internal temperature**: email notification if the internal temperature reached the pre-defined levels.
- **Battery level**: email notification if the battery level reached the pre-defined minimum and maximum voltages.
- **Packer error rate (PER)**: email notification if the PER reaches the pre-defined levels
- **Link quality indicator (LQI)**: email notification when the LQI reaches the pre-defined levels

Check Send System Log file to receive all the related information within a log file.

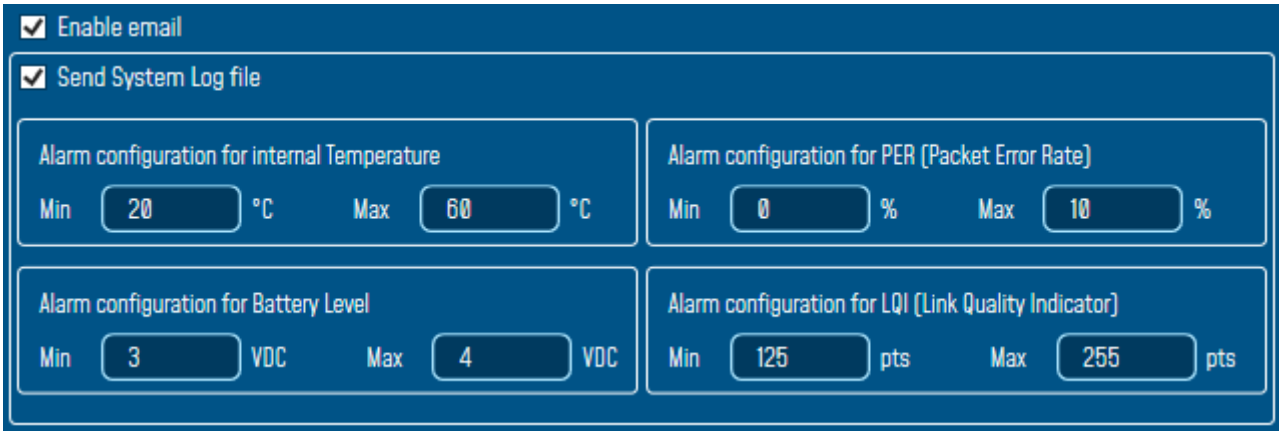



*Figure 83: System Alarm Settings*

From System Alarm, user can receive Alert for Datalogger by enabling Notification or Emails, also receiving Alert for Diagnostic.

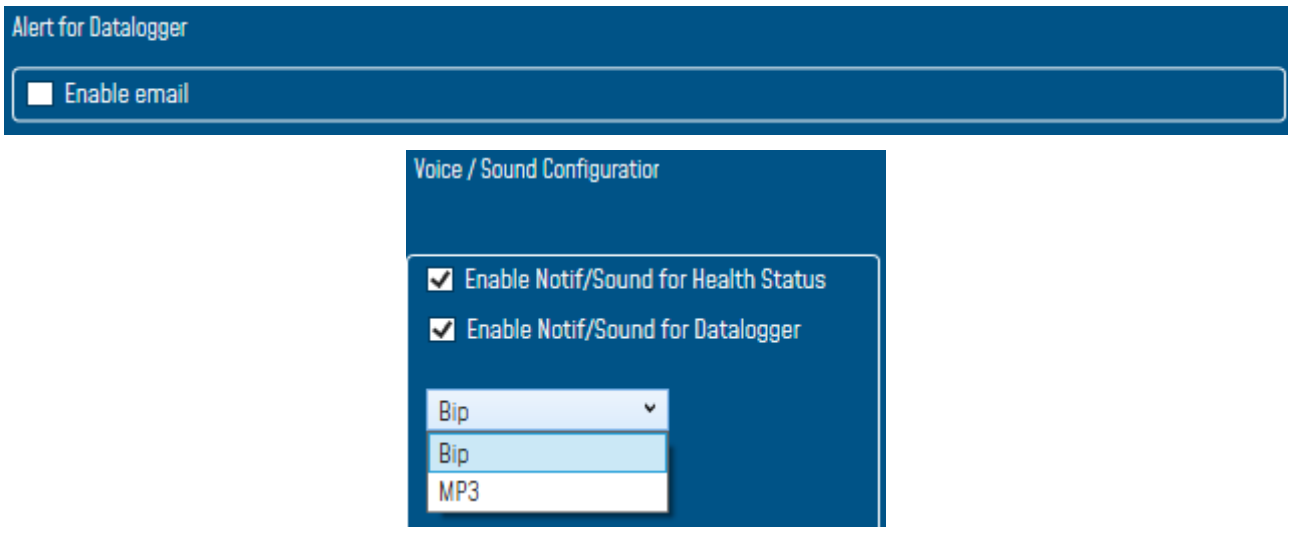



*Figure 84: Enable/Disable Notif/mail for Diagnostic and Datalogger*

## 8.5 FILE FORMAT

In this area, user can choose the report format and apply a custom document header setting as uploading a logo and other textual information related to monitoring site:

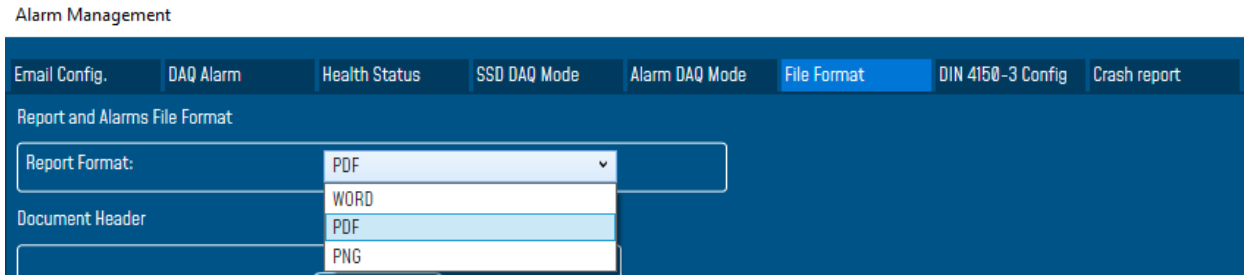



*Figure 85: File Format settings*

- **Logo:** Choose a picture to define it as a logo
- **User Name:** Use a specific User name
- **Monitoring Site:** Name you Monitoring Site
- **Location:** Your Monitoring Site location

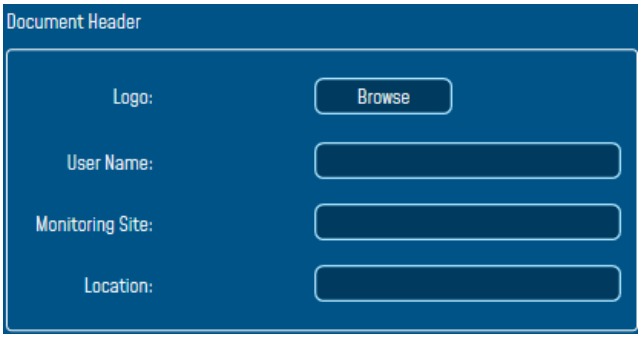



*Figure 86: Alarm Note settings*

## 8.1 CRASH REPORT

If the software crashes down, the user can send us a detailed report within all the information related to this crash.

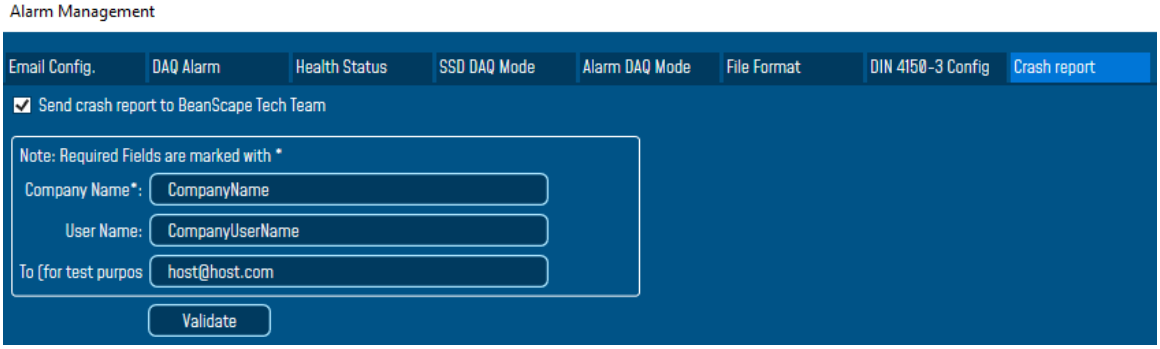



*Figure 87: Crash Report settings*

# 9. TOOLS TAB

Many features are available in the tools tab, so user has access to several options and configurations related to BeanScape® & BeanDevice® management.

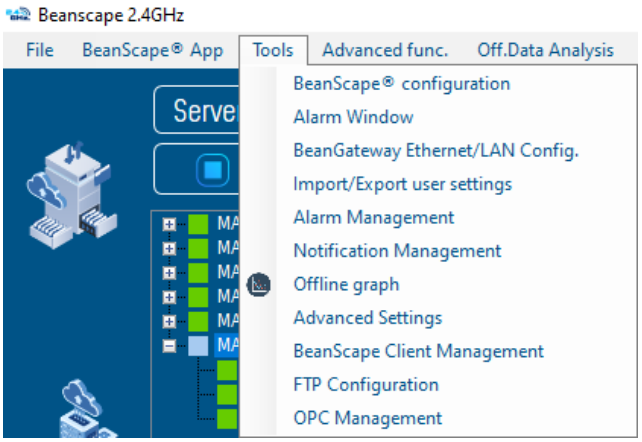



*Figure 88: Tools tab main menu*

## 9.1 BEANSCAPE® CONFIGURATION

BeanScape® menu window contains several configuration options related to the system configuration, Log file management and many other options.

### 9.1.1 Log file configuration

Here the user can manage the log file size, log file name, log file generation option and so on.

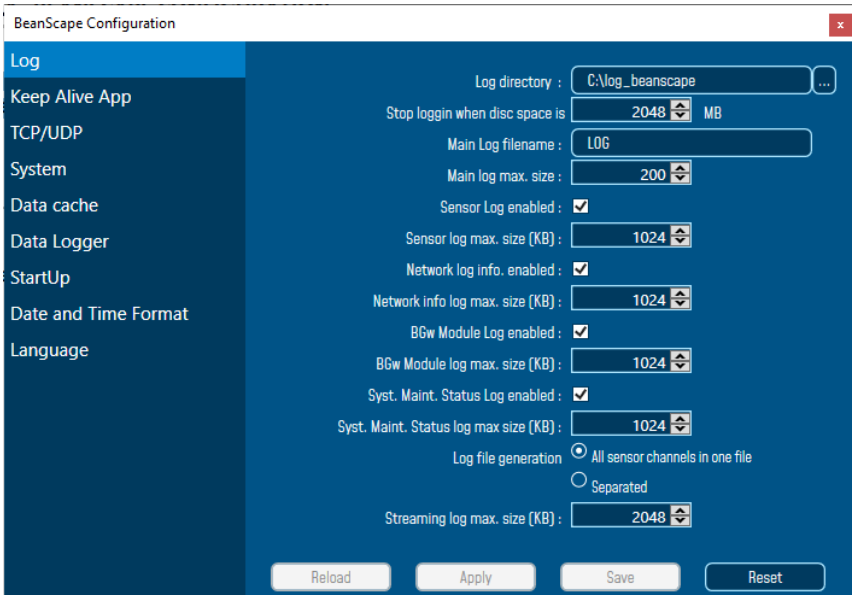



*Figure 89: Log file configuration*

### 9.1.2 Keep Alive App

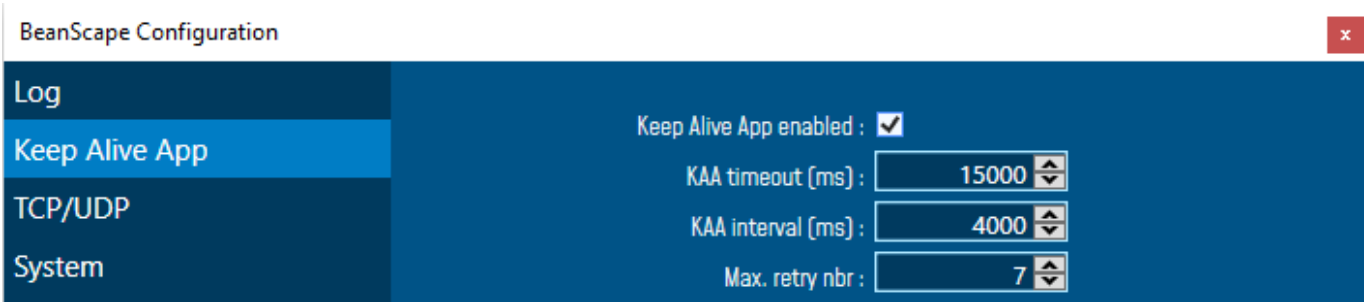



*Figure 90: Keep Alive app*

Three parameters related to keepalive are available:

- **Keep alive timeout** is the duration between two keep alive transmissions in idle condition. TCP keepalive period is required to be configurable and by default is set to no less than 2 hours.
- **Keep alive interval** is the duration between two successive keep alive retransmissions, if acknowledgement to the previous keep alive transmission is not received.
- **Max retry** is the number of retransmissions to be carried out before declaring that remote end is not available.

Keepalive packet contains null data. In a TCP/IP over Ethernet network, a keepalive frame is of 60 bytes, while acknowledge to this also null data frame and is of 54 bytes.

### 9.1.3 BeanGateway® Configuration via TCP/UDP

User can change the TCP/UDP ports and UDP server. By default, the TCP port is set to 5313, UDP port 53130 and the UDP server is 127.0.0.1

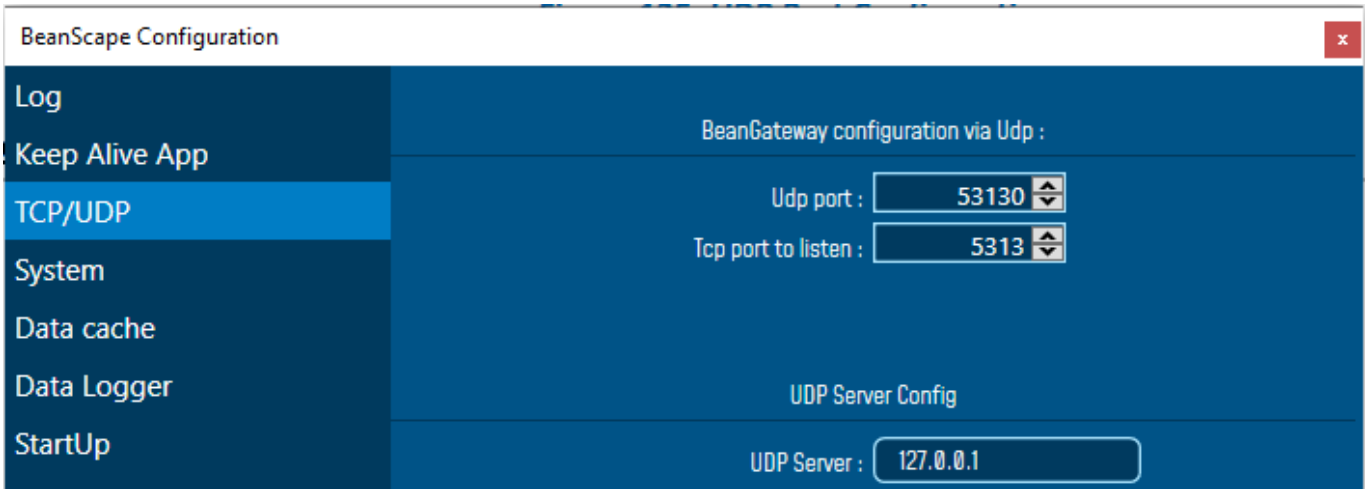



*Figure 91: TCP/UDP configuration*

### 9.1.4 System Configuration

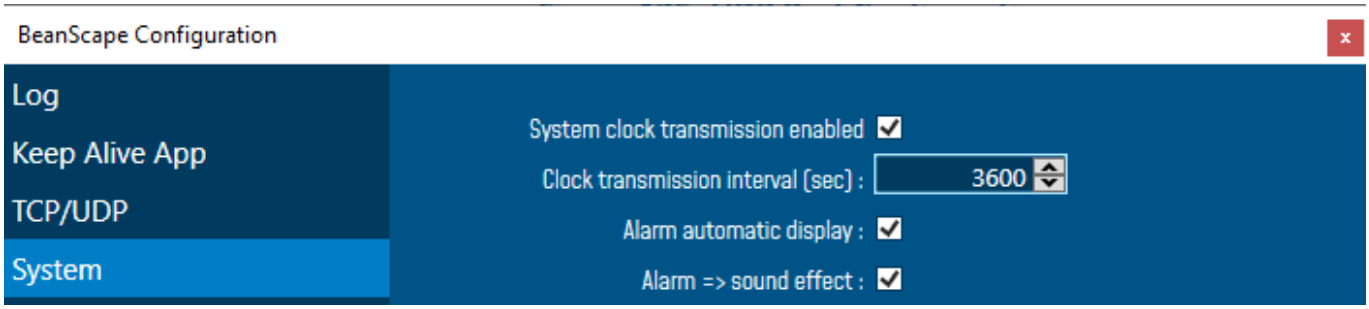



*Figure 92: System Config*

- ✓ ***System clock transmission enabled:*** Check this box to enable the system clock transmission.
- ✓ ***Clock transmission interval:*** Choose the clock transmission interval in seconds.
- ✓ ***Alarm automatic display:*** Check this box if you want to see an alarm window displayed automatically when a window alarm threshold is exceeded.
- ✓ ***Alarm ➔ Sound Effect:*** Check this box if you want to hear a sound effect when a threshold is exceeded.

### 9.1.5 Data cache configuration

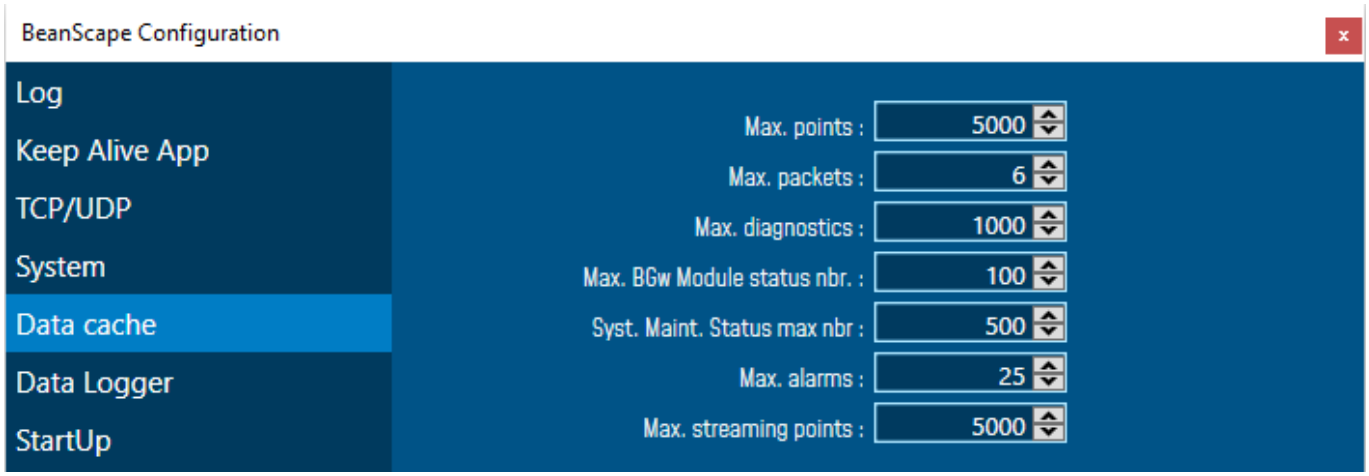



*Figure 93: Data Cache configuration*

- ***Maximum number of points:*** Set here the maximum number of points displayed on the BeanScape® graph
- ***Maximum number of packets:*** Set here the maximum number of packets displayed on the BeanScape® graph
- ***Max number of diagnostics:*** Set here the maximum number of diagnostics displayed on the BeanScape® graph
- ***Max BGw Module status number:*** Set here the maximum number of modules displayed on the BeanGateway® Status graph on BeanScape® graph

- ***System Maint Status max number:*** Set here the maximum number of points displayed on the BeanGateway® Status graph on BeanScape® graph
- ***Max. alarms:*** Set here the maximum alarms number
- ***Max. Streaming points:*** Set here the maximum streaming points number.

### 9.1.6 Data Logger configuration

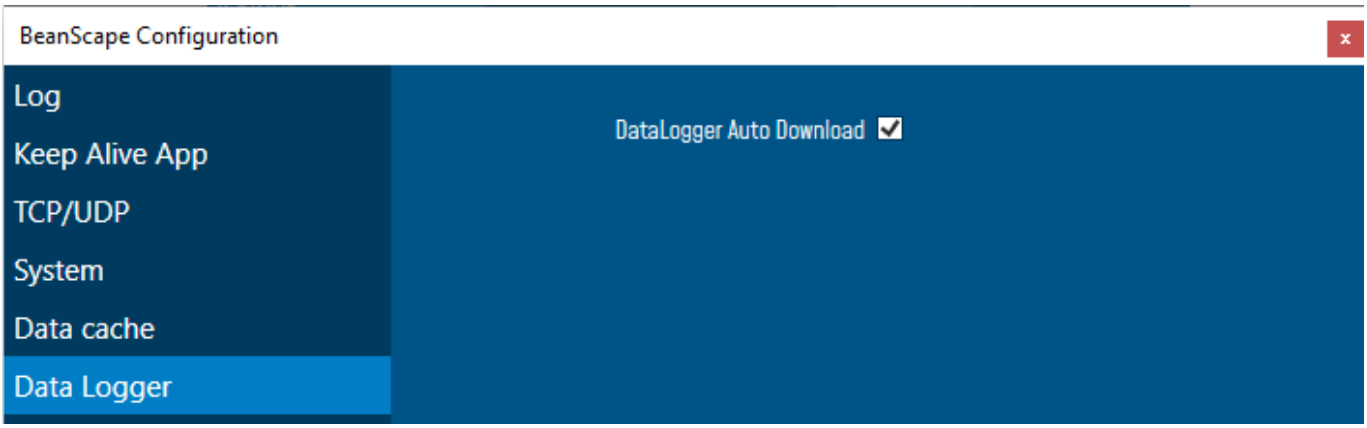



*Figure 94: Data logger configuration*

Check the data logger downloader check box to enable the automatic downloading process once, you start the connection.

### 9.1.7 Startup

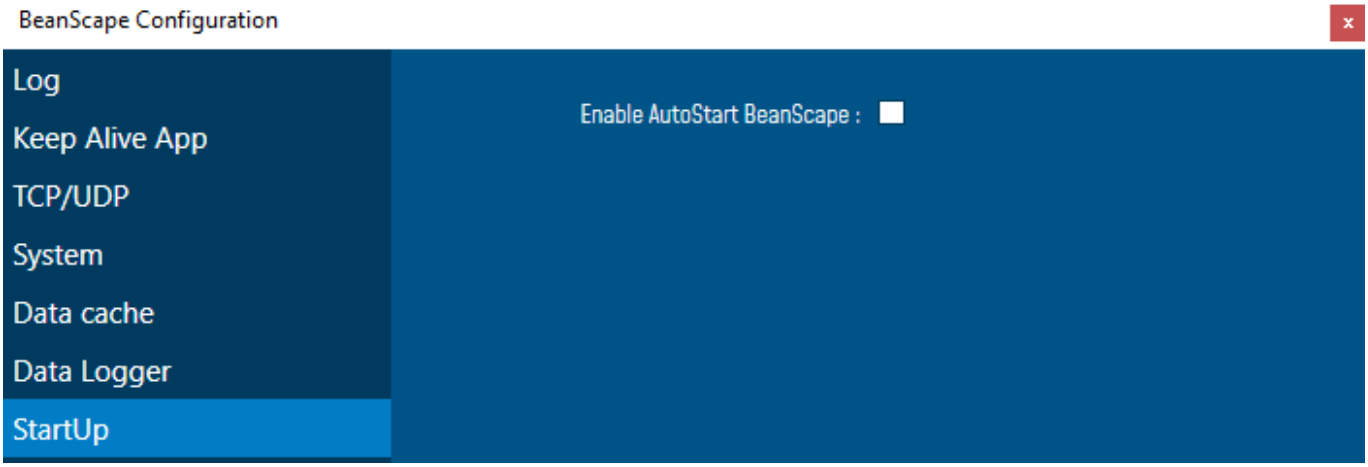



*Figure 95: BeanScape® startup*

Check the AutoStart check box to enable auto launch BeanScape® software once you start your PC.

### 9.1.8 Date & Time format

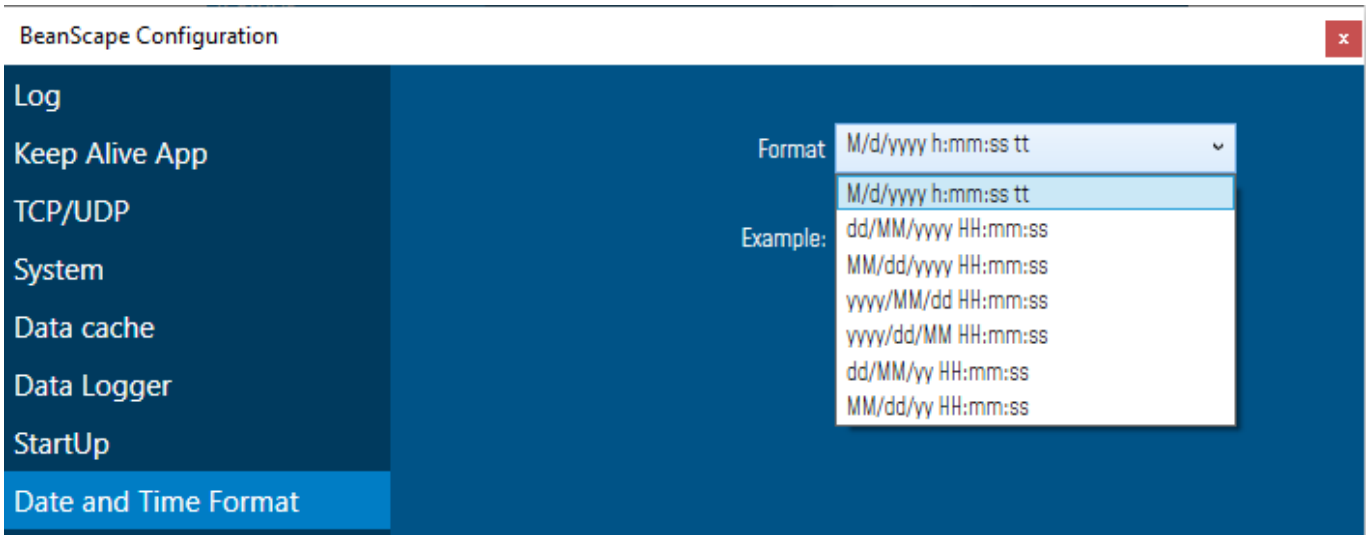



*Figure 96: Date & time settings*

Select the suitable date and time format from the scroll down menu then validate.

### 9.1.9 Language

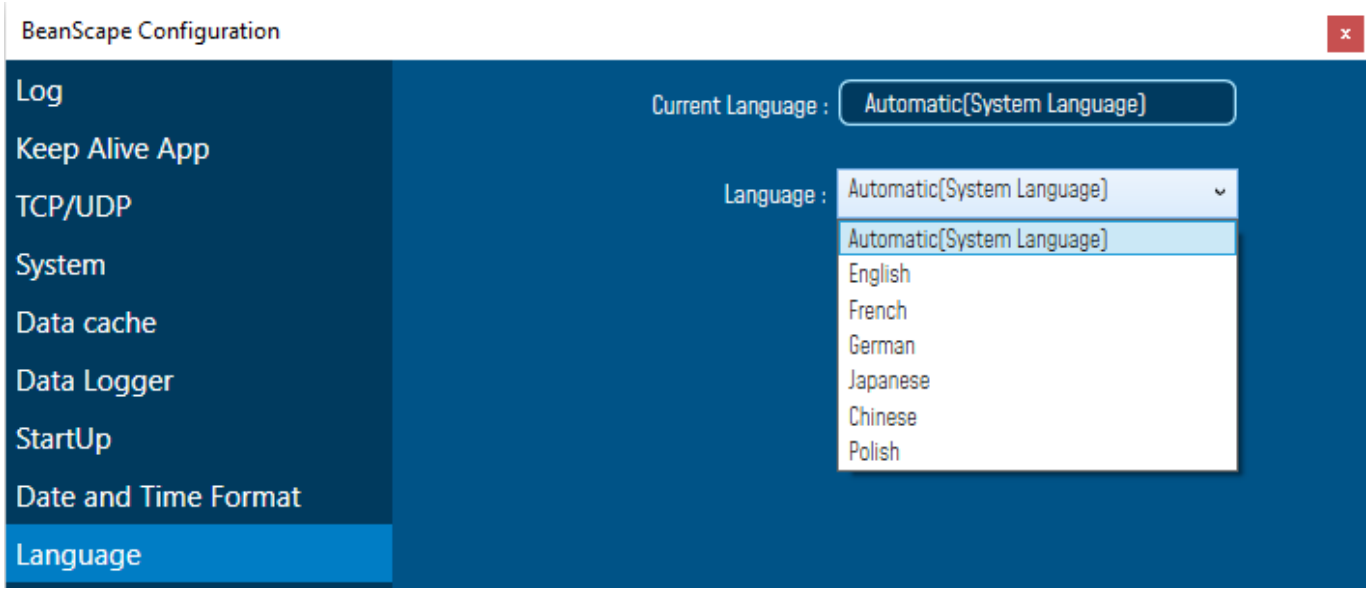



*Figure 97: BeanScape® language*

BeanScape® software support several languages, select your suitable one from the scroll down list.

## 9.2 ALARM WINDOW

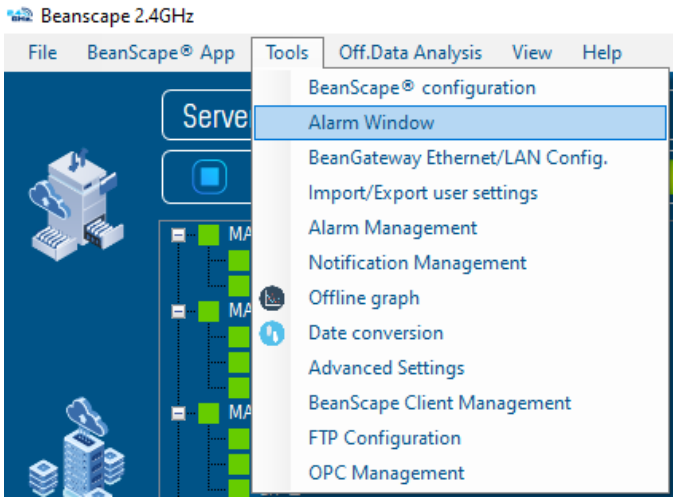



*Figure 98: Alarm Window*

All the Alarm events will be displayed on the alarm window with the corresponding date and time and on which sensor the alarm was occurred.

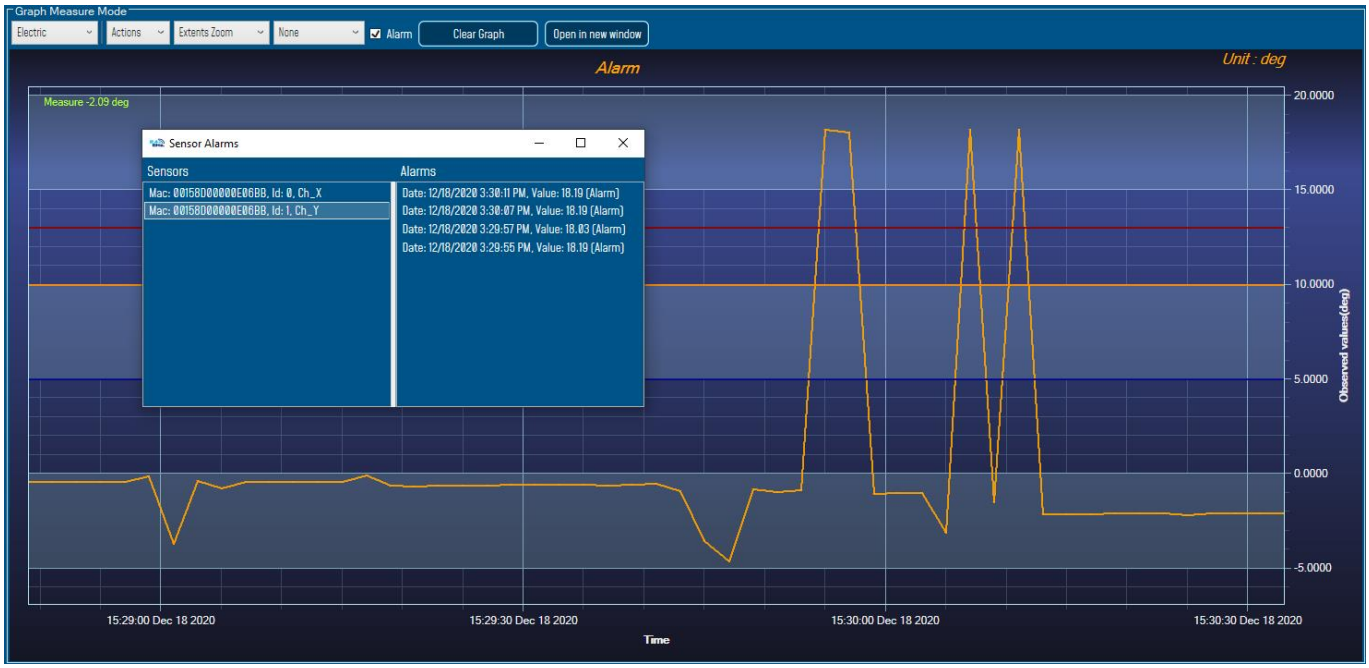



*Figure 99: Alarm window display*

## 9.3 IMPORT/EXPORT USER SETTINGS

### 9.3.1 Custom User Configuration

#### 9.3.1.1 Export Function

Click on the tab ***Tools*** then "***Export/Import user settings***"

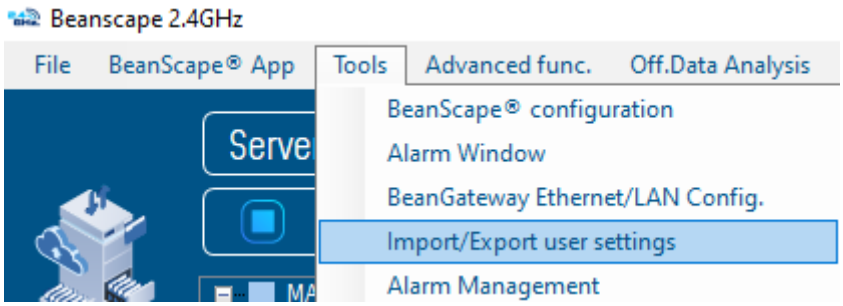



***Figure 100: Import/Export feature***

A new window will appear, which contains the **Custom User Configuration** and the **BeanScape Configuration**,

- **Custom User Configuration** represent the settings that have relationship with the BeanGateway and the BeanDevices®.
- **BeanScape Configuration** is related to BeanScape settings.

Under Custom User Configuration click on ***Export***:

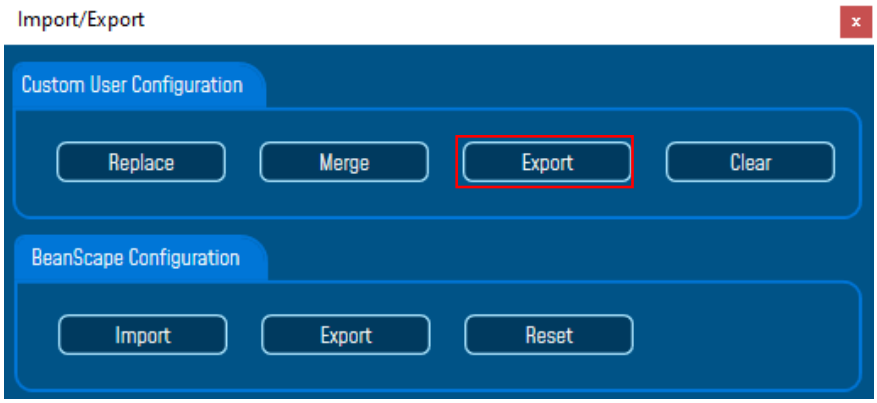



***Figure 101: Custom user configuration section***

User configuration is exported in XML format:

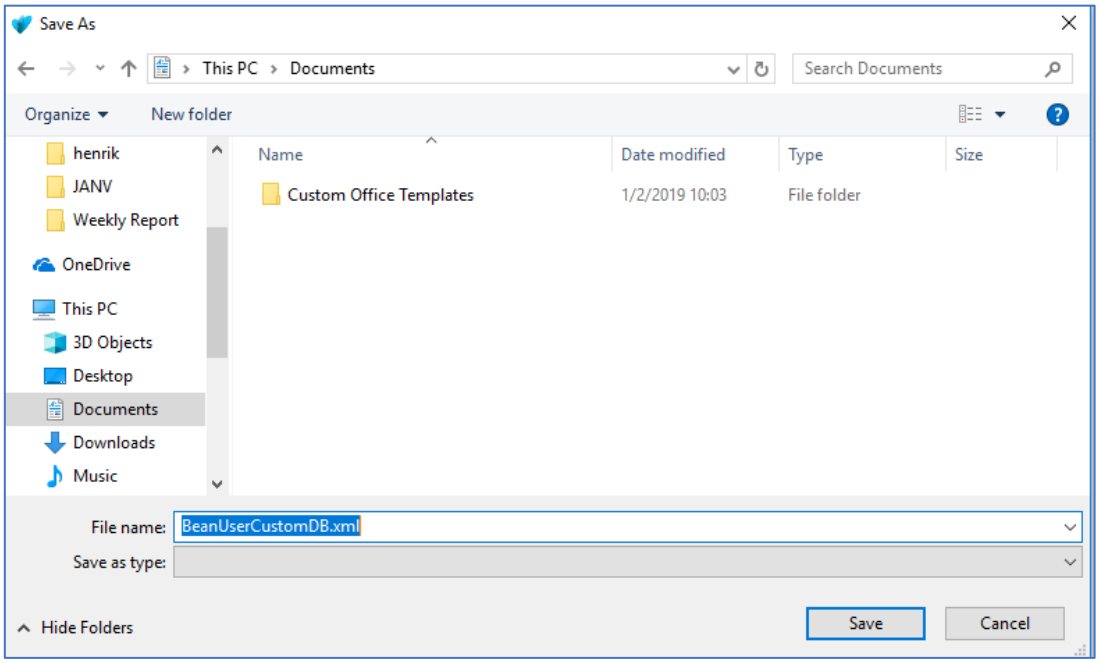



*Figure 102: user export settings*

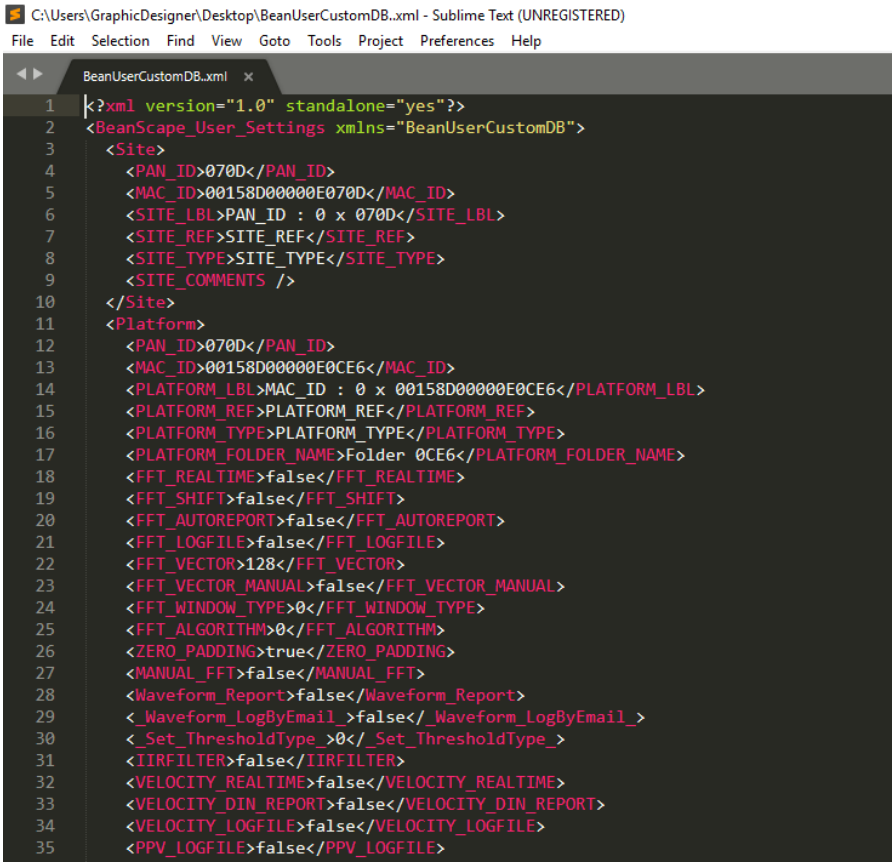



*Figure 103: Custom_DB example*

#### 9.3.1.2 Import Function

Click on ***Replace*** to import user configuration, by choosing replace function the old Custom_DB will be replaced with the new one.

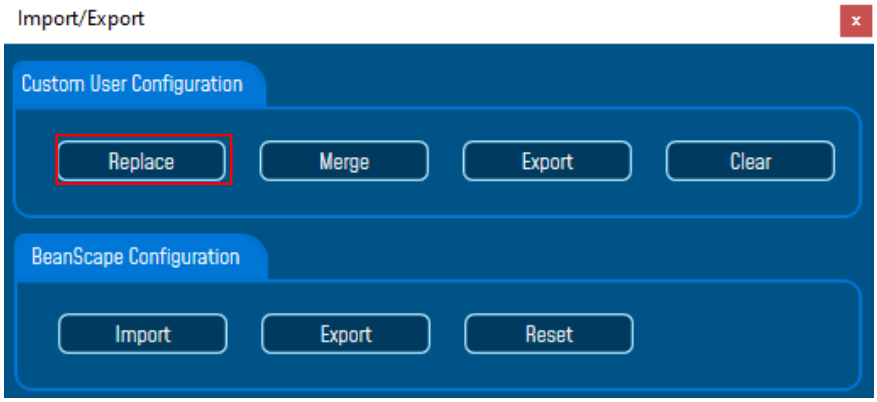



*Figure 104: Custom user configuration window*

By choosing ***Merge*** function the old Custom_DB will be merged with the new one.

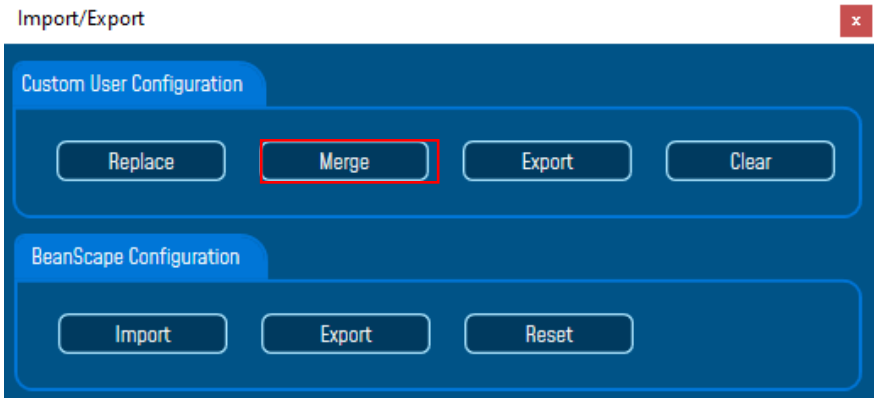



*Figure 105: Custom user configuration (merge)*

Click on **Clear** to clear the Custom_DB.

***Don't try to change manually the XML file, there is a high risk to corrupt it.***

### 9.3.2 BeanScape® Configuration

#### 9.3.2.1 Export Function

Click on ***Export*** to export BeanScape configuration

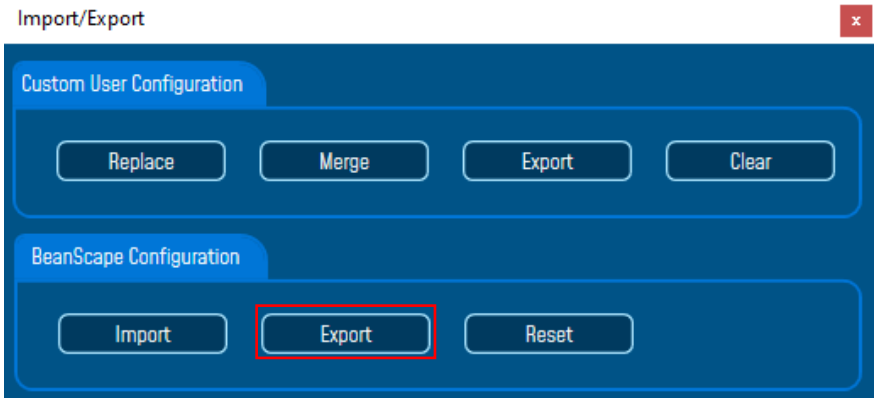



*Figure 106: Export window for BeanScape Config*

BeanScape configuration is exported in XML format:

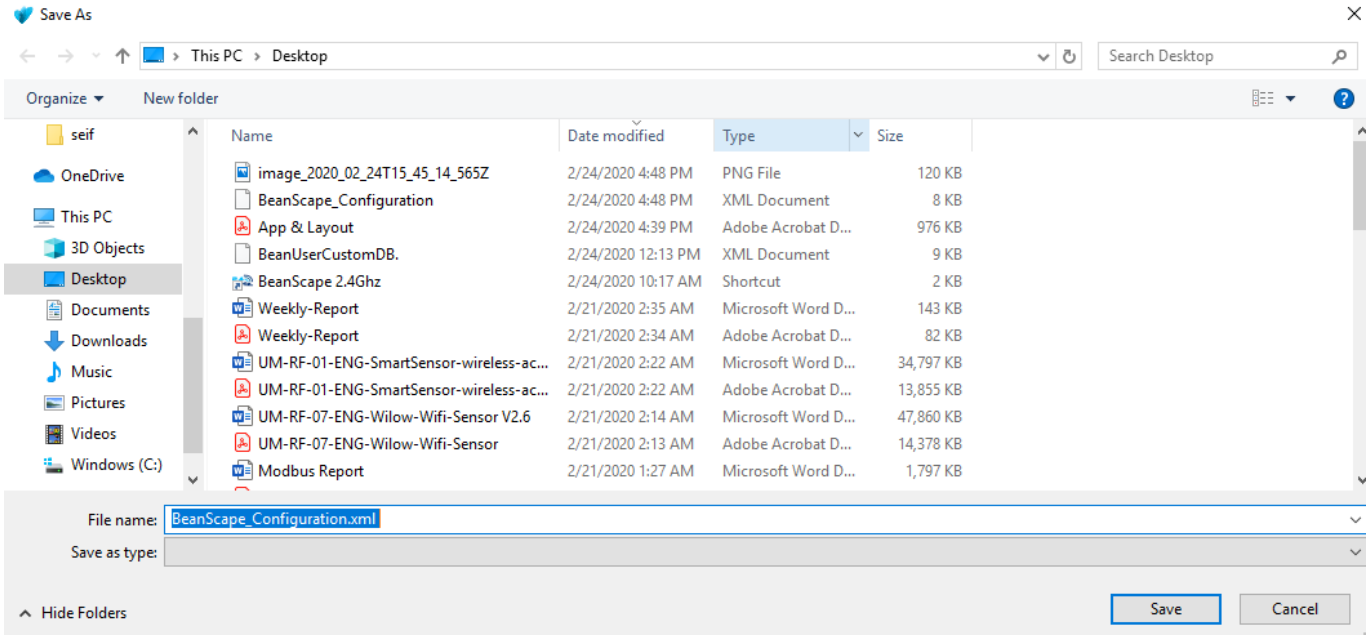



*Figure 107: BeanScape Config exportation*

### 9.3.2.2 Import Function

Click on ***Import*** to import BeanScape configuration

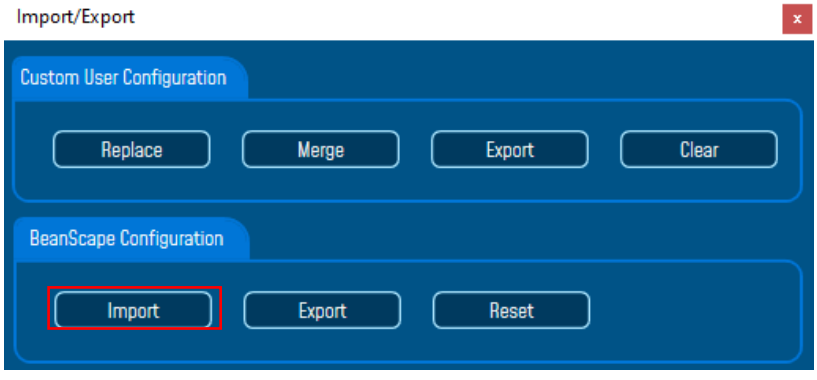



*Figure 108: Import function for BeanScape Config*

Click on **Reset** to reset the BeanScape configuration.

## 9.4 NOTIFICATION MANAGEMENT

Several notification options are available, linked to the BeanDevice® status information and BeanScape® software.

Click on Tools Tab and navigate to Notification Management option, new window will pop up.

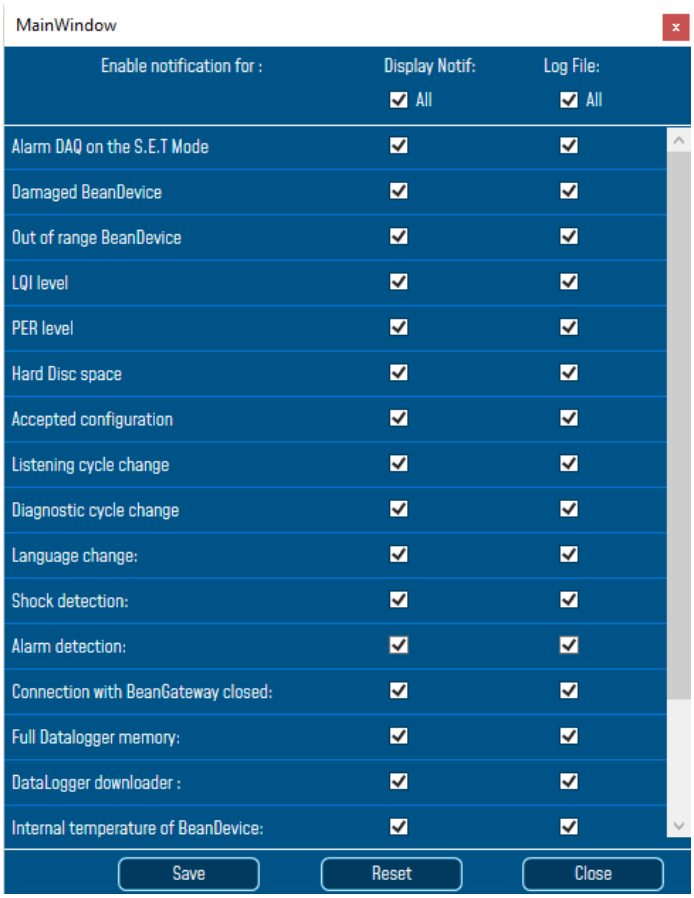



*Figure 109: Notification Management Window*

By enabling the notification option, user have the possibility to choose a displayed notification message on the screen of his PC and a received Log file containing the notification details.

## 9.5 OFFLINE GRAPH

Offline Graph gives the ability to read previous measurements files, proceeding by browsing the files and then clicking on view.

Under the Tool menu on the BeanScape® software, select Offline Graph option, a new window will pop up, and will be ready to be used to display graphs from the saved measurements.

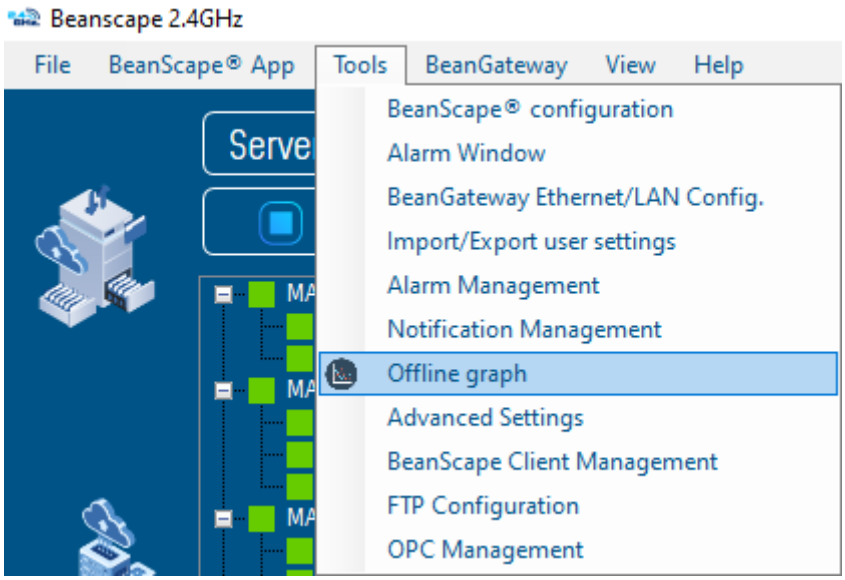



*Figure 110: Offline graph menu on BeanScape®*

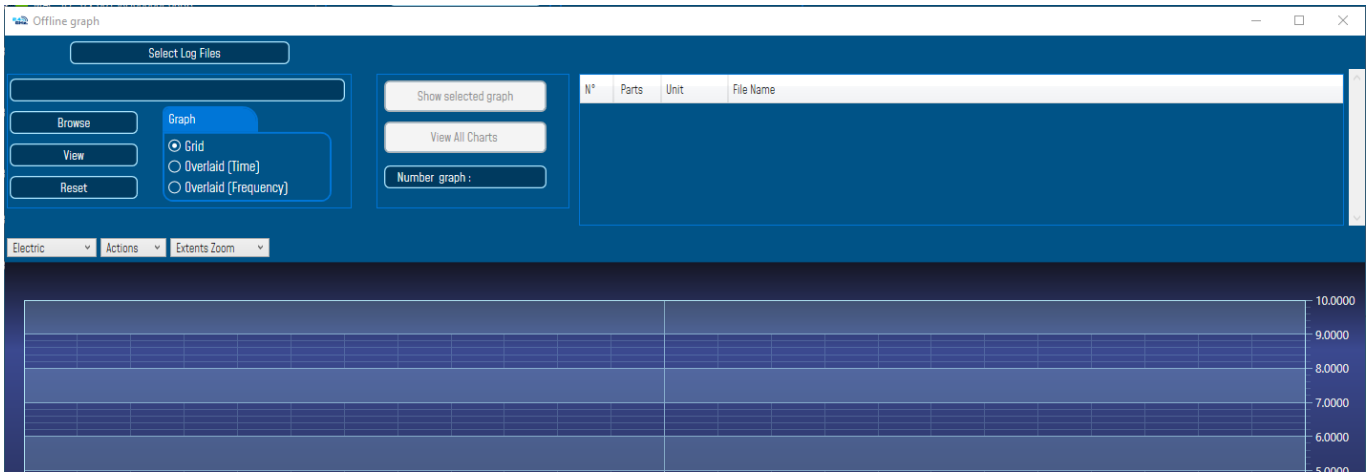



*Figure 111: Offline graph window*

- Chose Grid if you want to see the graphs displayed on a grid
- Chose overlaid if you want to see the graphs displayed overlaid (pick Time for temporal x axis or frequency for frequential x axis)

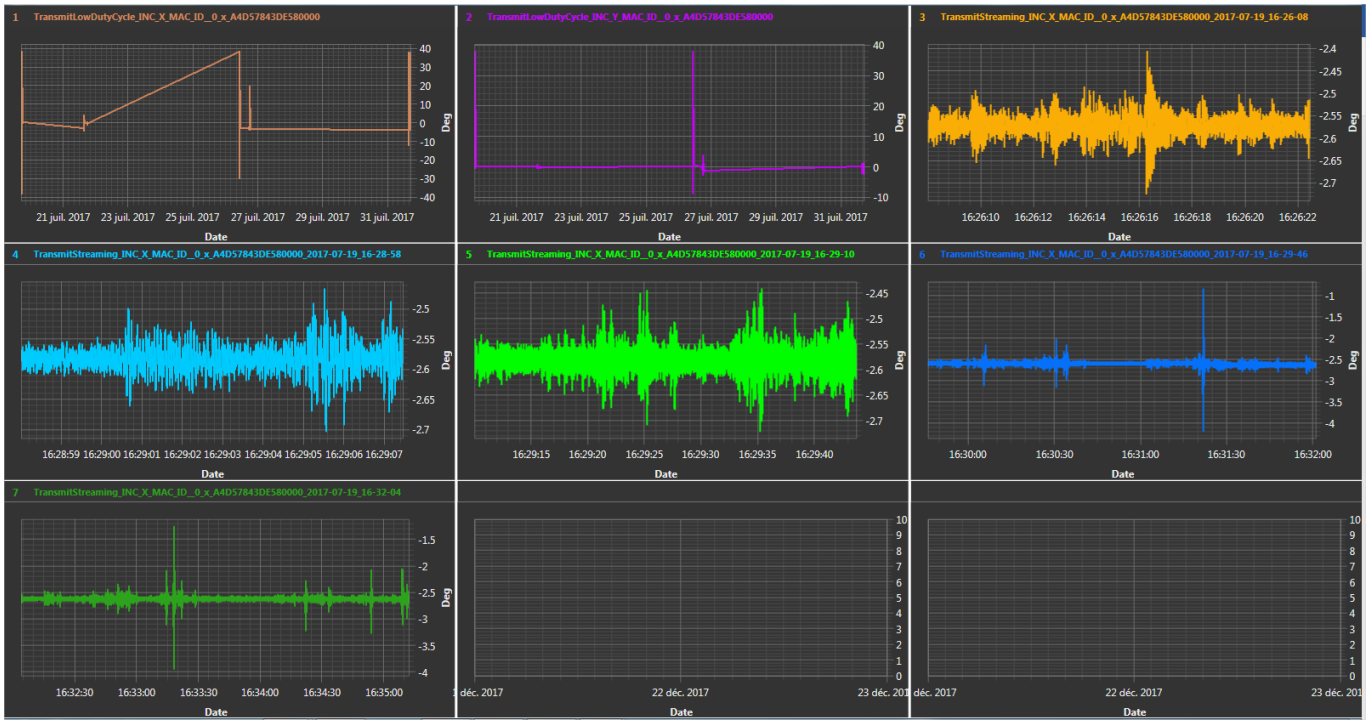



*Figure 112: Grid display of graphs*

## 9.6 DATE CONVERSION

Data downloaded from the data logger are organized in a system well optimized to minimize non-important data and leave maximum storage space for measurement values, hence using indexation to refer to measurement timing.

To make these files more readable we use the Data Conversion tool.

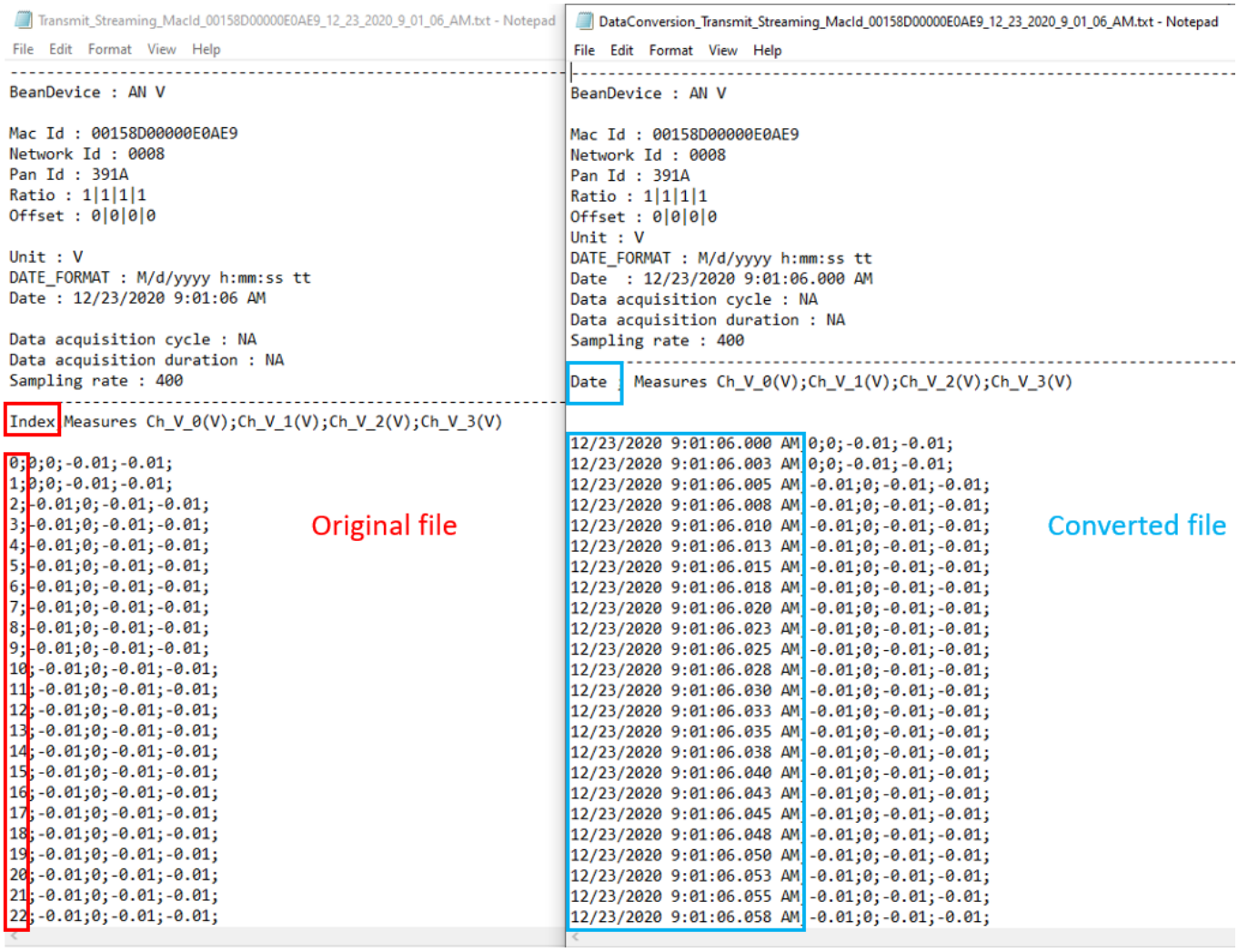



*Figure 113: Data conversion example*

Under the Tool menu on the BeanScape® software, select Data Conversion, a new window will pop up, where downloaded data can be converted.

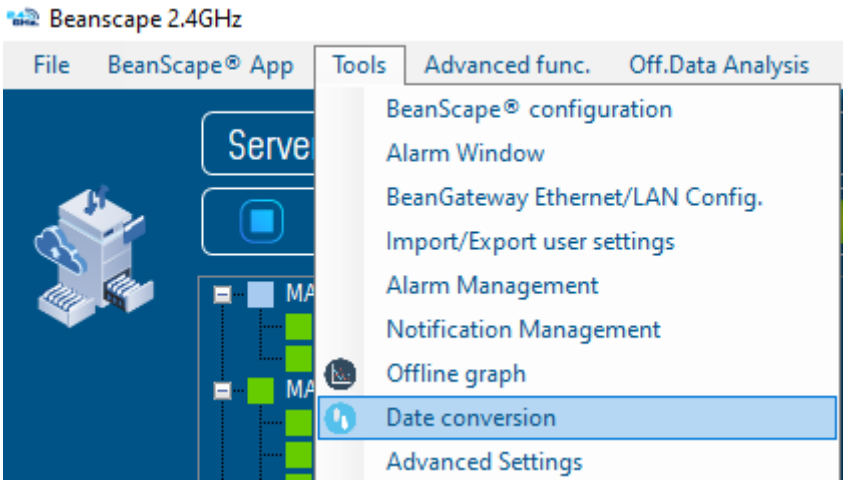



*Figure 114: Data Conversion menu on BeanScape®*

A new window will open:

*Figure 115: Data Conversion window*

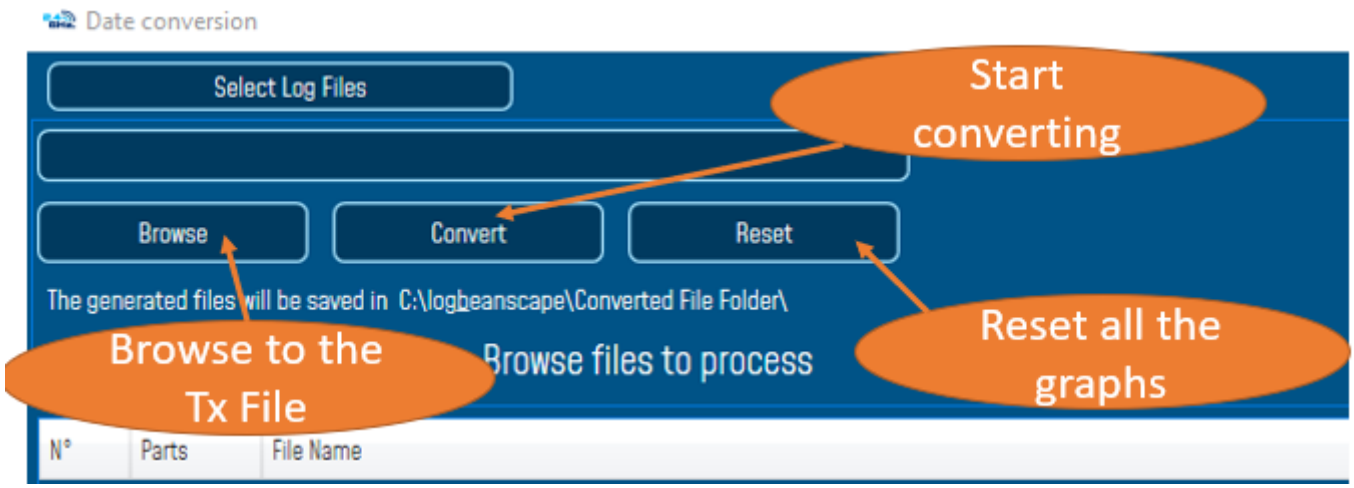



*Figure 116: Data Conversion main options*

- Click on browse and import streaming file containing the logged measurement.

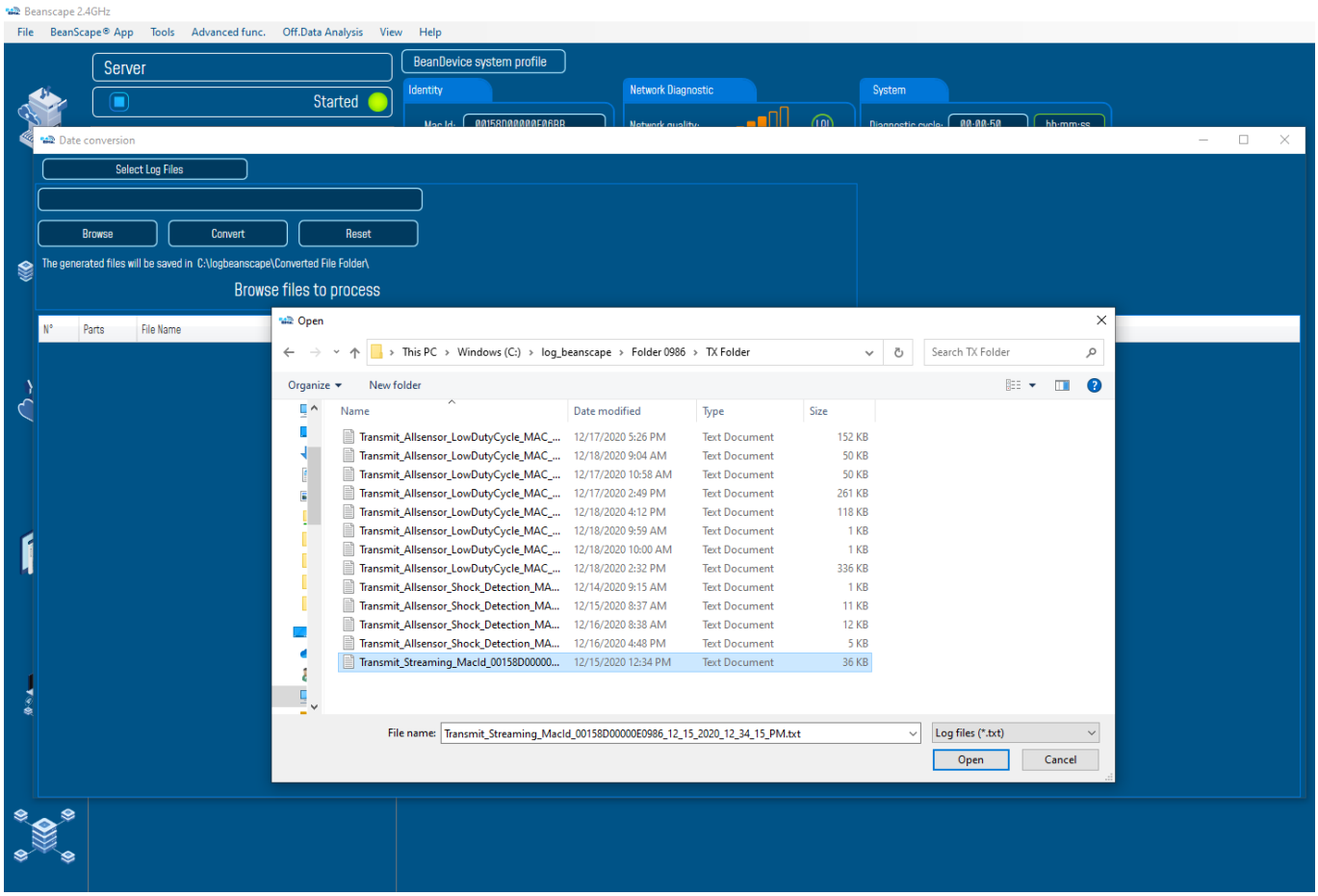



*Figure 117: Importing files into Data Conversion tool*

- Overview of the selected files

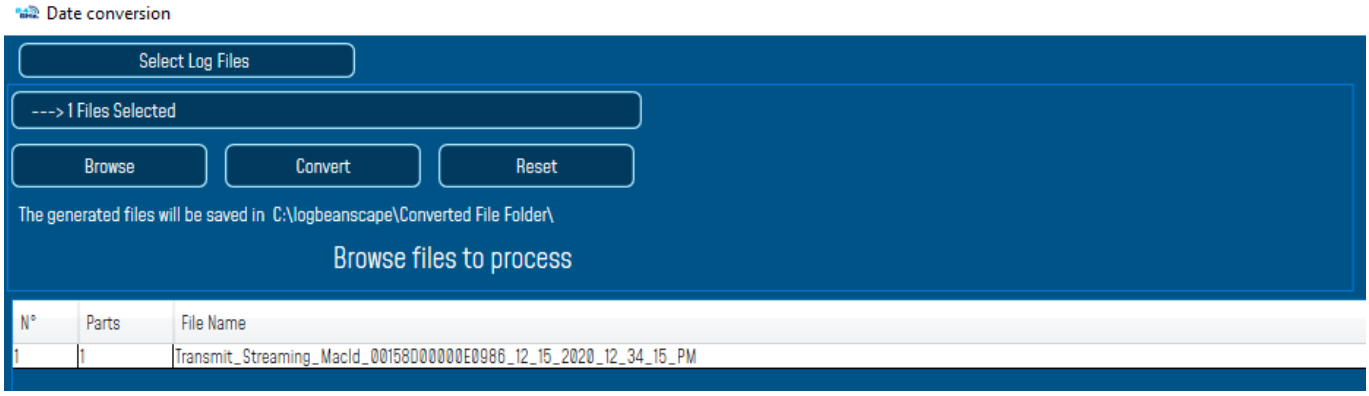



*Figure 118: Overview of the selected files on Data Conversion window*

- Select the converted file to view or go to your log directory and you will find all the converted files in a new generated folder named **Converted File Folder**

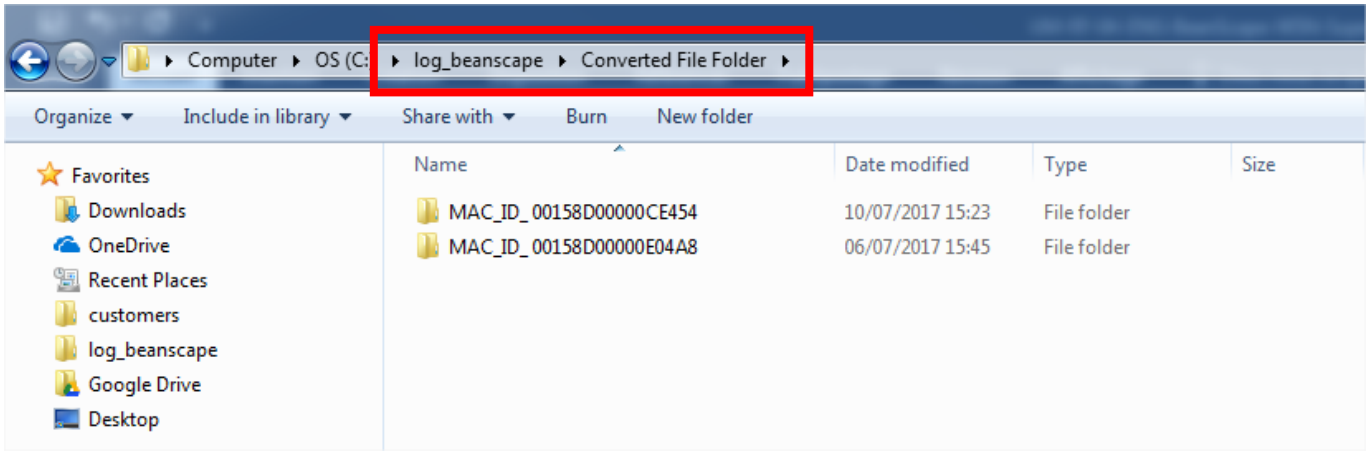



*Figure 119: Overview: Converted File Folder*

## 9.7 ADVANCED SETTINGS

Navigate to **Tools** and click on Advanced settings.

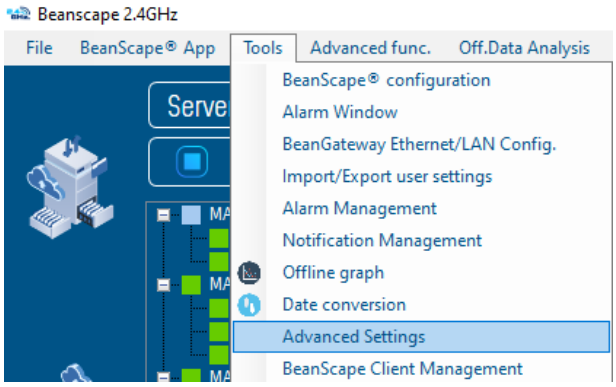



*Figure 120: Advanced settings*

A new window will pop up in which user can find several settings

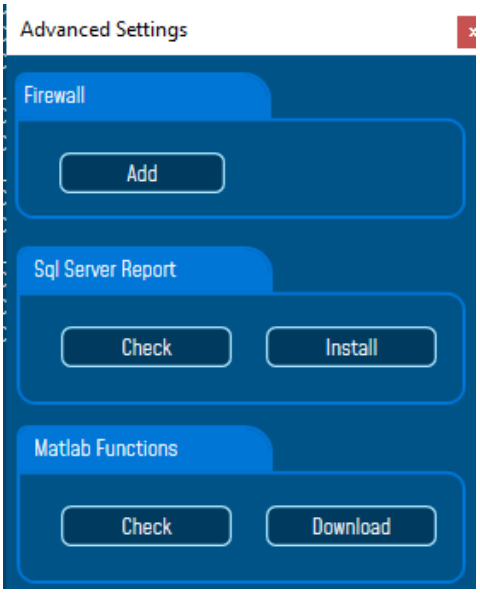



*Figure 121: Advanced settings*

### 9.7.1 Firewall

Click on **Add** button in order to add BeanScape on firewall, with that user will be sure that the firewall will not interrupt the connection between BeanScape software and the BeanGateway.

*Figure 122: Add BeanScape to Firewall*

Right after clicking on Add a notification message will be displayed on the screen saying that BeanScape was added to firewall successfully.

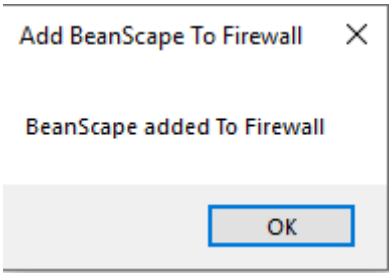



*Figure 123: Notification message*

### 9.7.2 SQL Server Report

Click on Check to check if the SQL Server was installed on your PC.

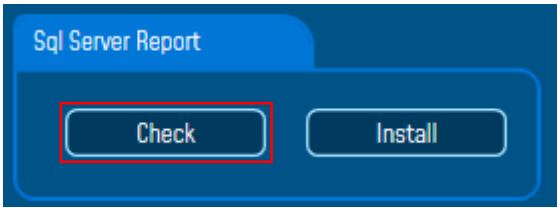



*Figure 124: SQL Server installation*

If the SQL Server is installed a pop-up notification will be displayed on the PC screen saying that the SQL Server is already installed.

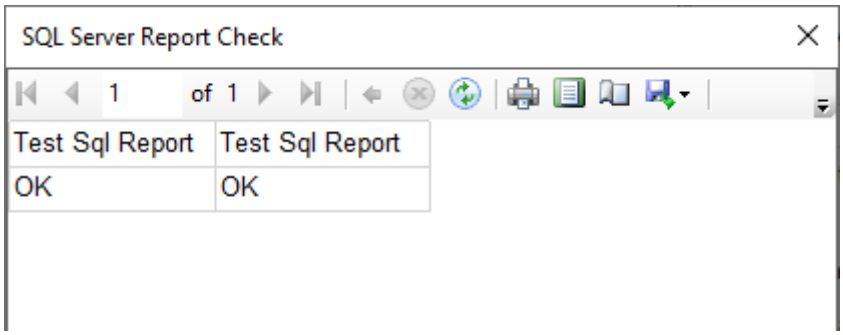



*Figure 125: installation notification for SQL Server Report*

If it is not the case just click on Install button to install it.

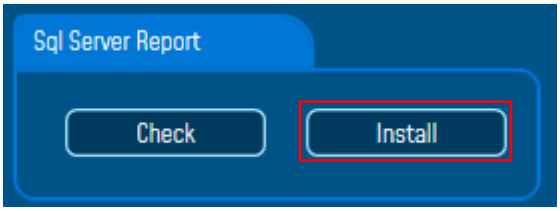



*Figure 126: SQL Server Report Installation*

### 9.7.3 MATLAB Function

Click on Check to check if the SQL Server was installed on your PC.

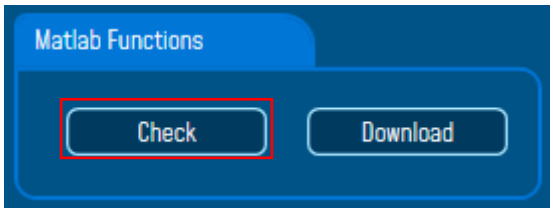



*Figure 127: Check MATLAB extension*

If the MATLAB extension was already installed a pop-up notification will be displayed on the PC screen saying that is installed.

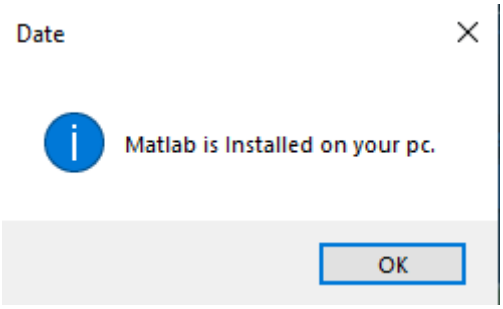



*Figure 128: Notification message*

Otherwise Click on Download button to download the extension then install it on your PC.

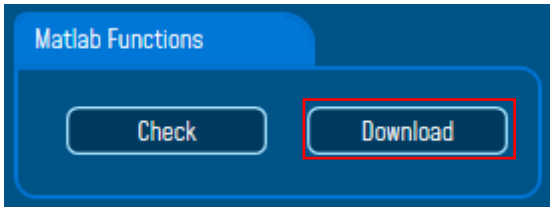



*Figure 129: Download MATLAB extension*

## 9.8 BEANSCAPE® CLIENT MANAGEMENT

This option is available only on BeanScape® Multiview version

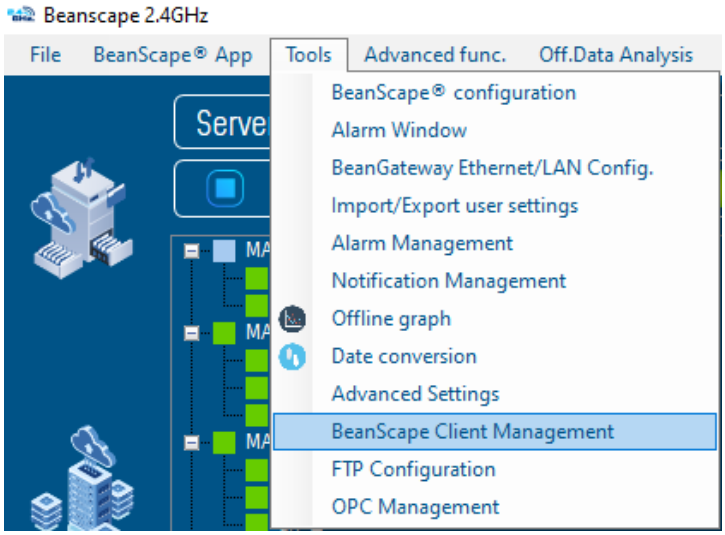



*Figure 130: Client management*

Based on Client/Server paradigm, this option allows user to switch between client and server mode by entering a right serial key, and it gives the possibility also to give the client the rights to manage the system.

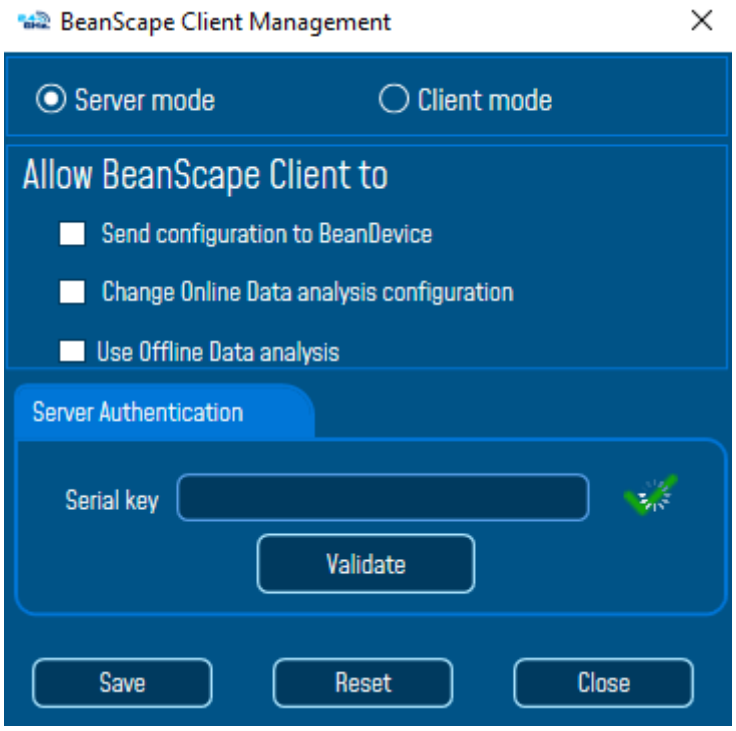



*Figure 131: Client/Server Management*

## 9.9 FTP CONFIGURATION

The user has the ability to send all his measurement data log files to the FTP Server through the FTP feature.

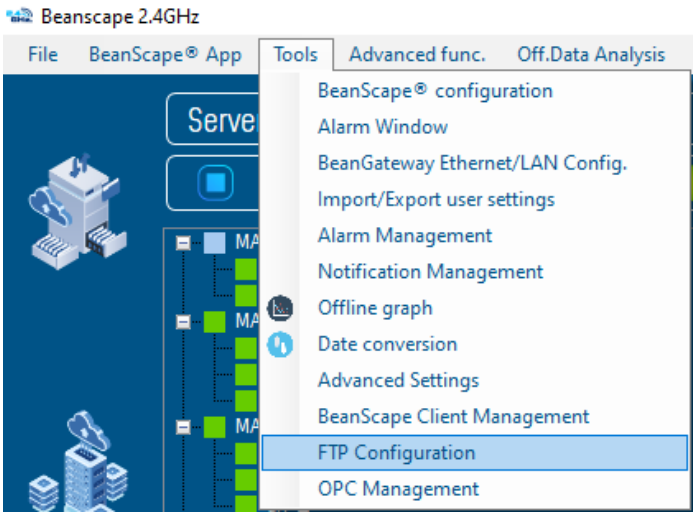



*Figure 132: FTP Configuration*

Check FTP enable check box then enter the right FTP Server setting using the following window

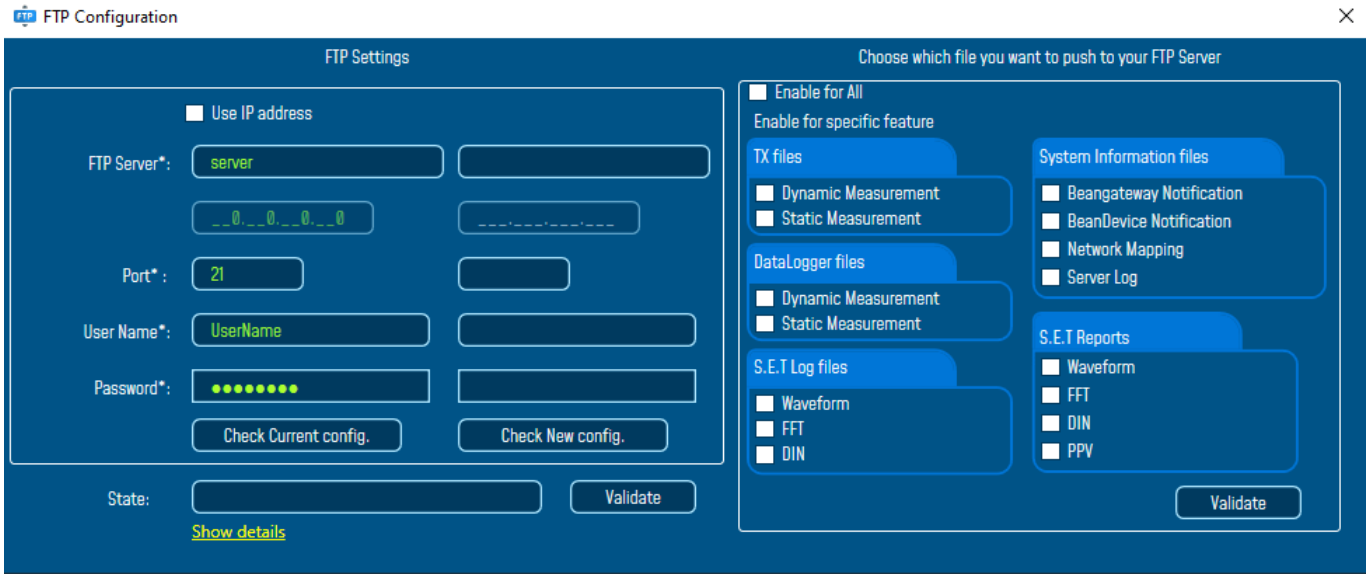



*Figure 133: FTP configuration window*

You should connect to your FTP server before setting up the FTP configuration on the BeanScape software.

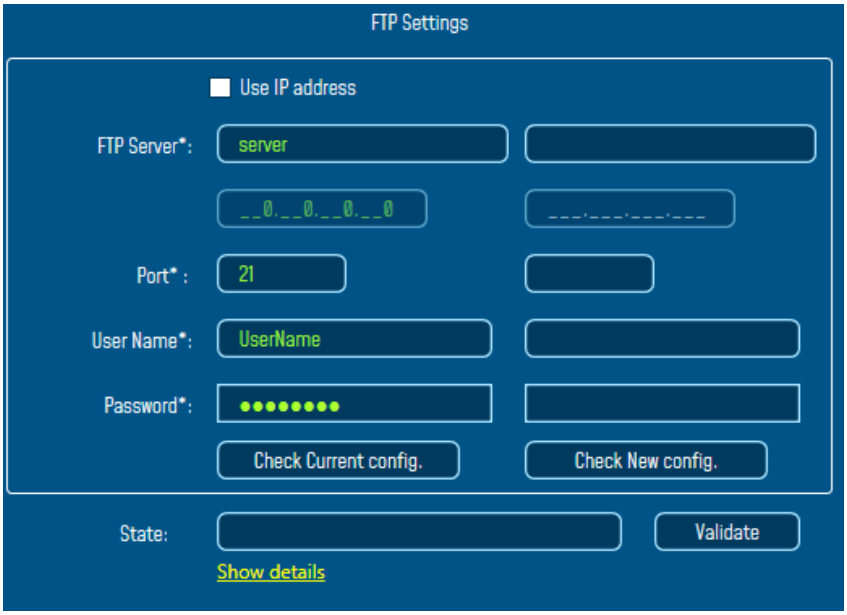



*Figure 134: FTP Server settings*

- **FTP Server:** Enter your FTP Server DNS or IP address by checking use IP address checkbox
- **User Name:** Enter your FTP user name
- **Password:** Enter your right FTP password
- **Port:** By default, the FTP port is 21, you can change it also
- **Check New Configuration:** click on check new configuration to make sure the settings are correct.
- **Validate:** click on validate to save the setting and proceed
- **State:** display if the connection status successfully established or failed.

If the connection was failed please click the Show details link to see the cause of the issue.

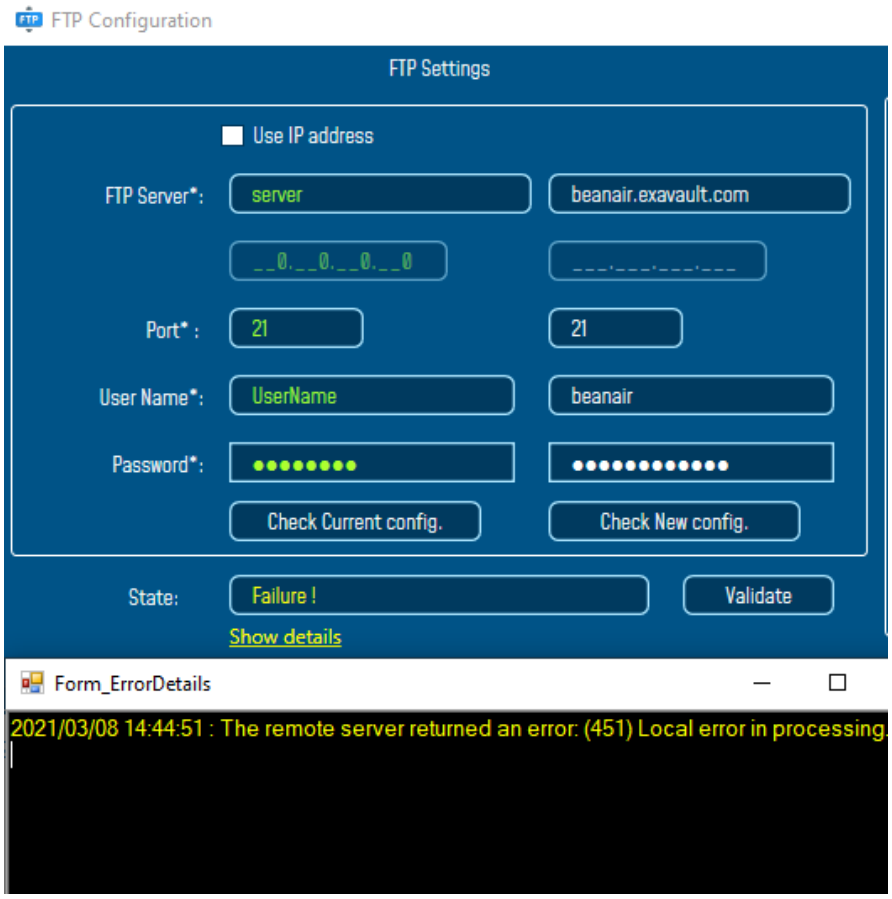



*Figure 135: Failure details*

Then check the type of files which you want to send to you FTP server, and click on Validate

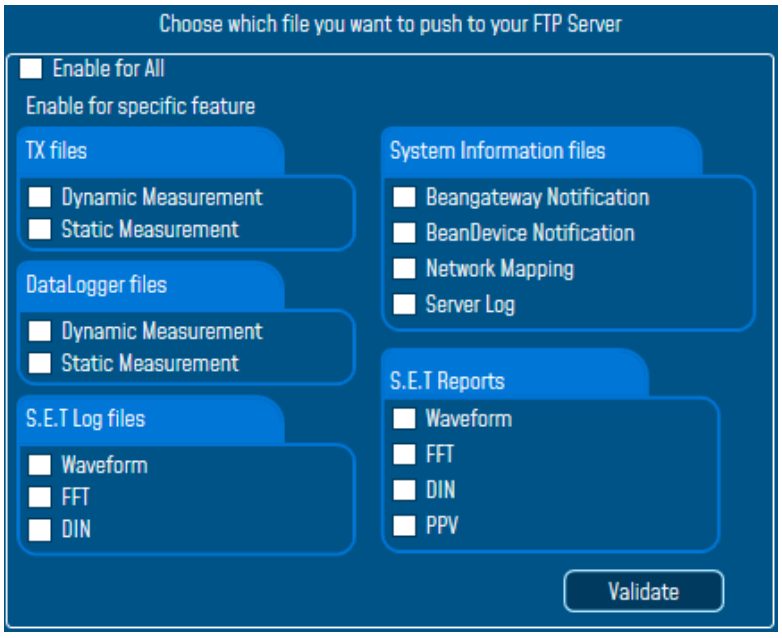



*Figure 136: the available type of files*

The files will be stored on your FTP server every 1 min.

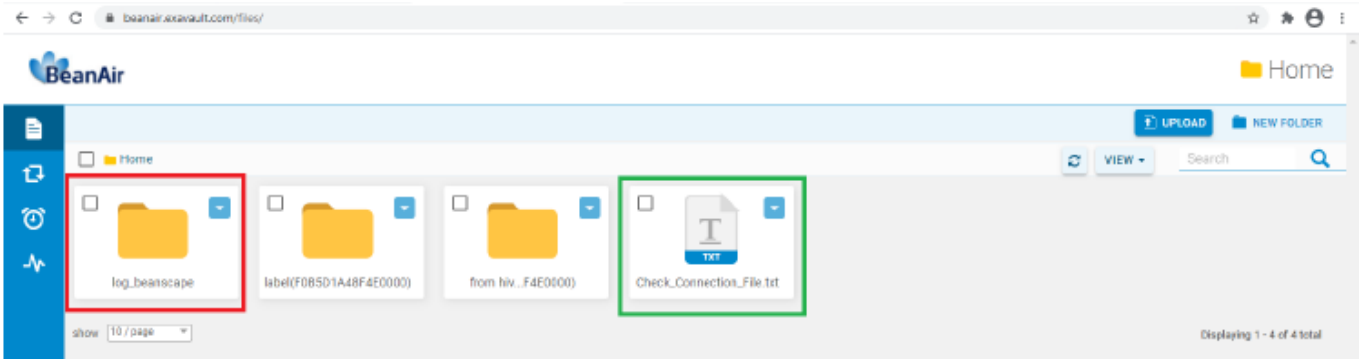



*Figure 137: Files stored on the FTP server*

***The FFT, DIN report and PPV reports/files are not available on the BeanDevice AN-XX, the user can receive only the SET mode waveforms on his FTP Server.***

# 10. VIEW TAB

BeanScape® 2.4GHz software comes with two view options, a Standard view and an Expert view.

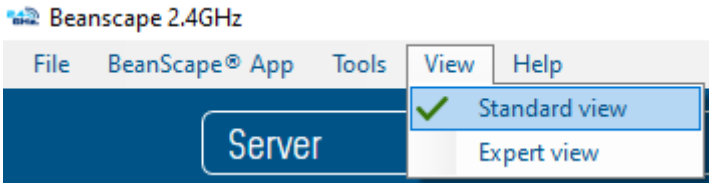



*Figure 138: View tab*

## 10.1 STANDARD VIEW

Once you open BeanScape® software and start the server, the standard view is selected as default view.

The standard view is just a simplified dashboard displaying the needed information that makes the system easy to use.

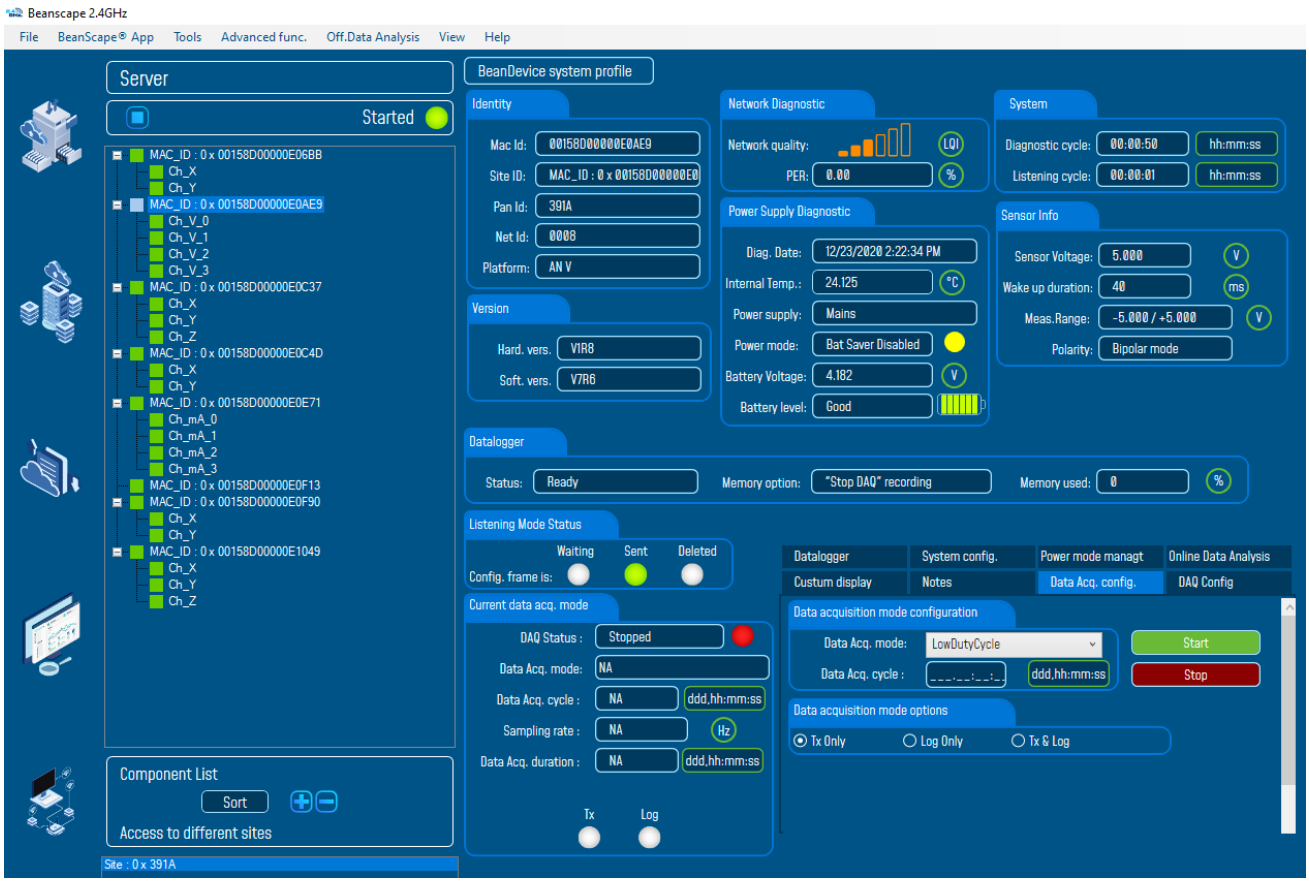



*Figure 139: Standard View dashboard*

***By connecting the BeanGateway® directly to the PC, the Expert view should be the selected view.***

## 10.2 EXPERT VIEW

The expert view contains more technical features for expert using.

To change the view simply go to **View** tab then **select Expert** view.

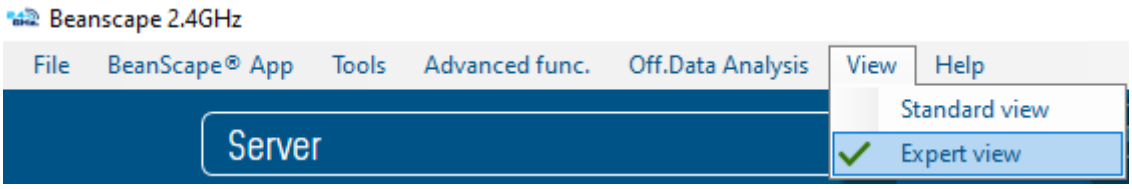



*Figure 140: Expert View*

You need to enter the right serial key in order to have access to the expert view

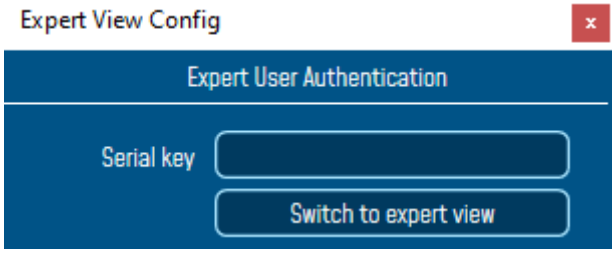



*Figure 141: Serial Key*

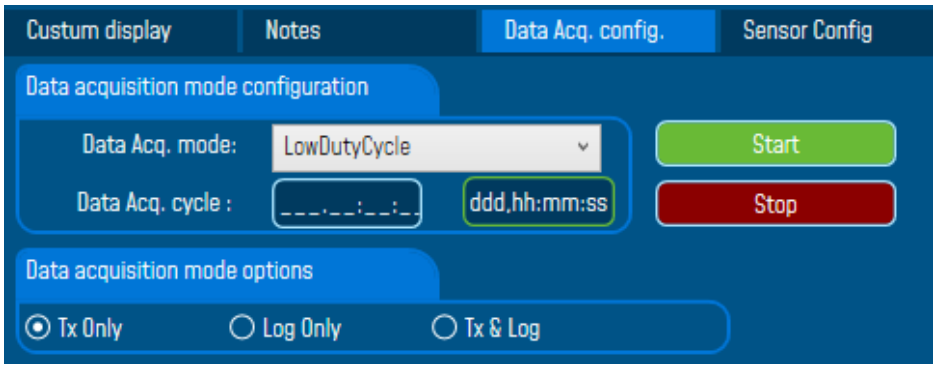
Once you choose the Expert view you notice that the dashboard display looks quite different and that there are more information and features were added to the chart.

*Figure 142: Expert view dashboard*

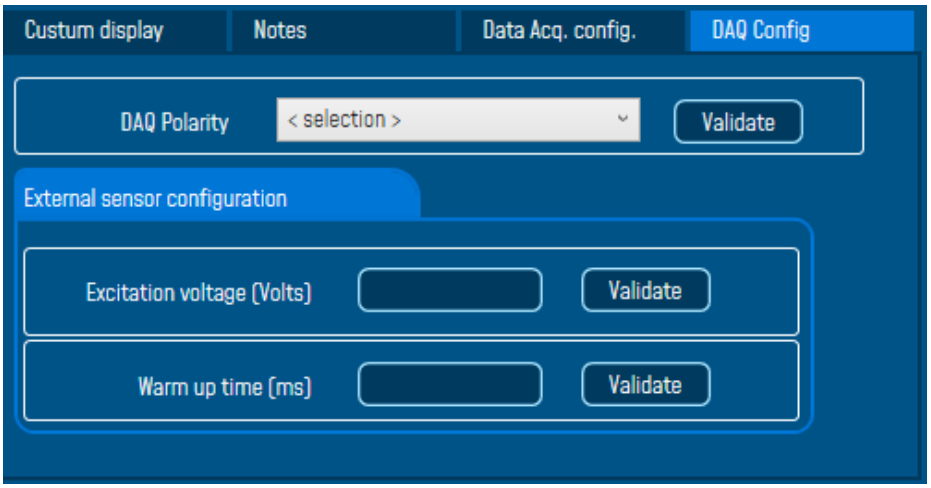
The PAN ID, Net ID, PER level, the system information and much more options are accessible from only the expert view.

### 10.2.1 Data Acquisition configuration

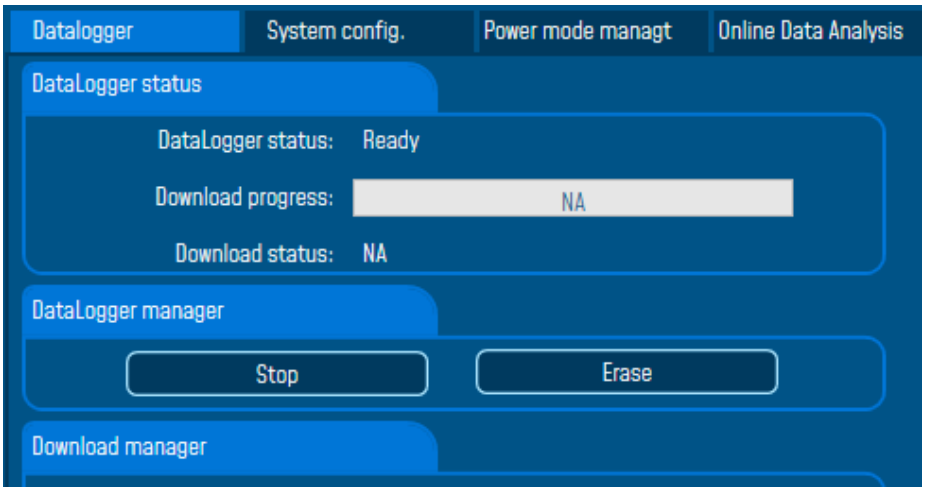
- Data Acq Config tab



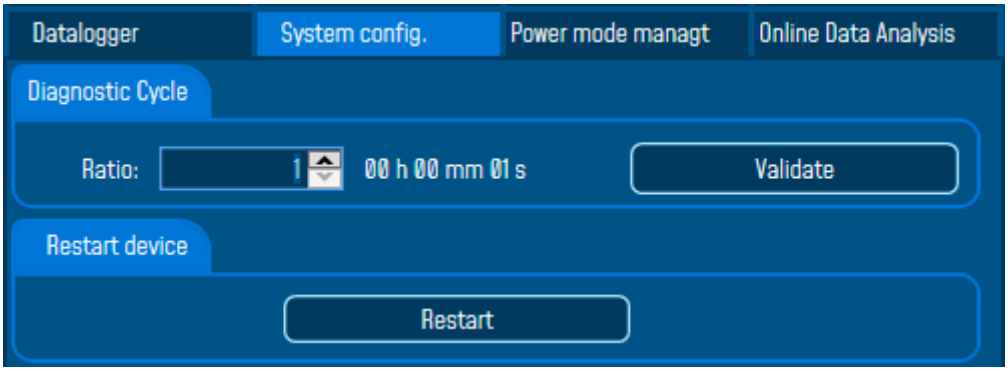

- DAQ Config tab



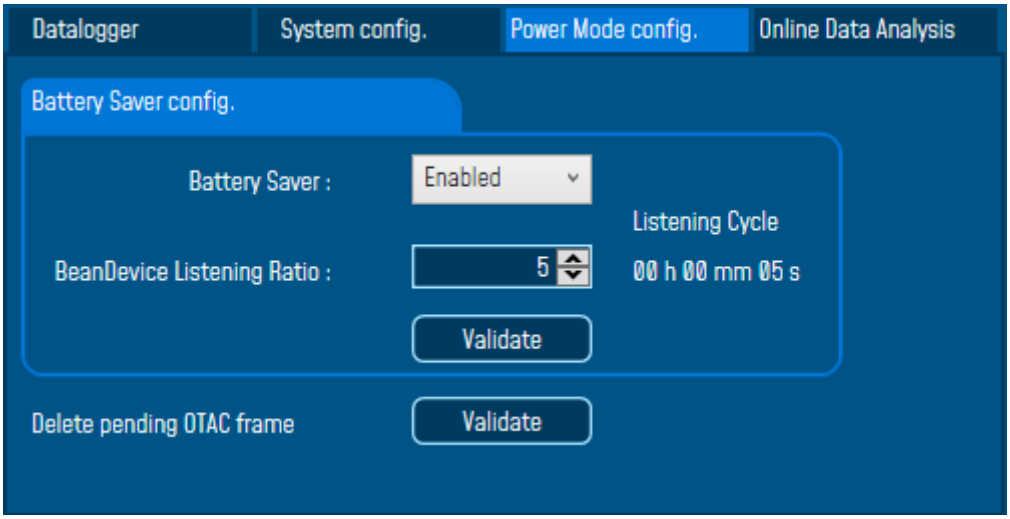

- Datalogger tab



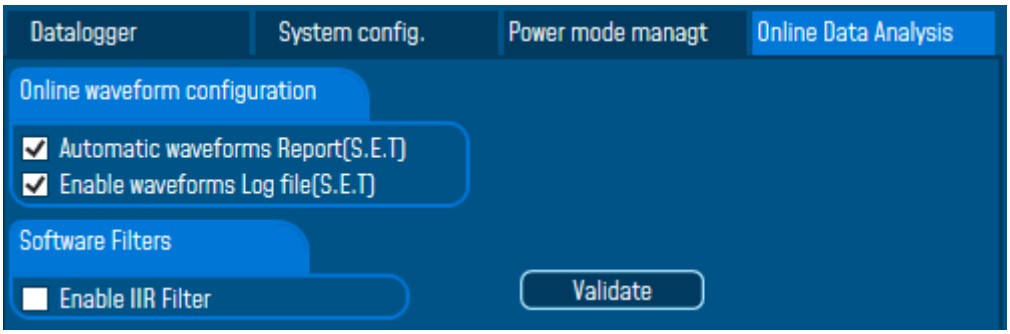
- System config tab




- Power management tab




- Online Data Analysis



### 10.2.2 Tools tab

More options are available on the expert view

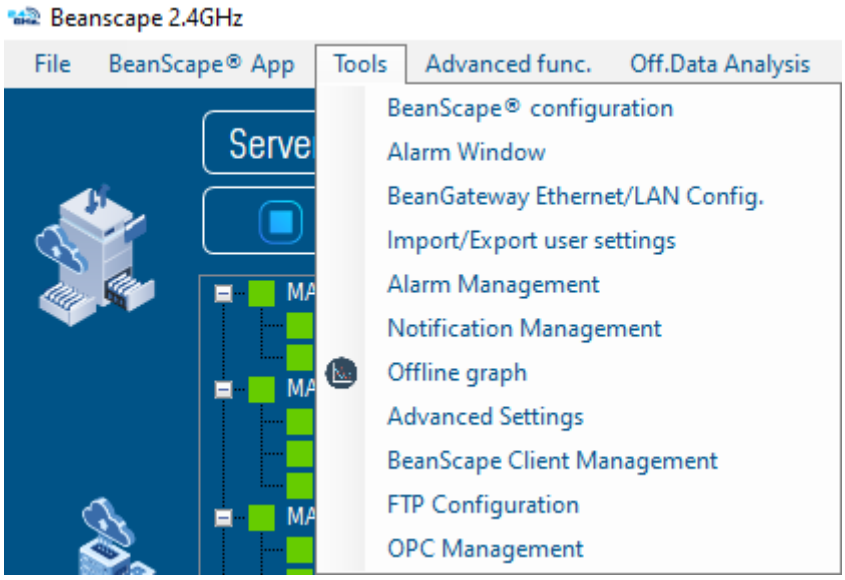
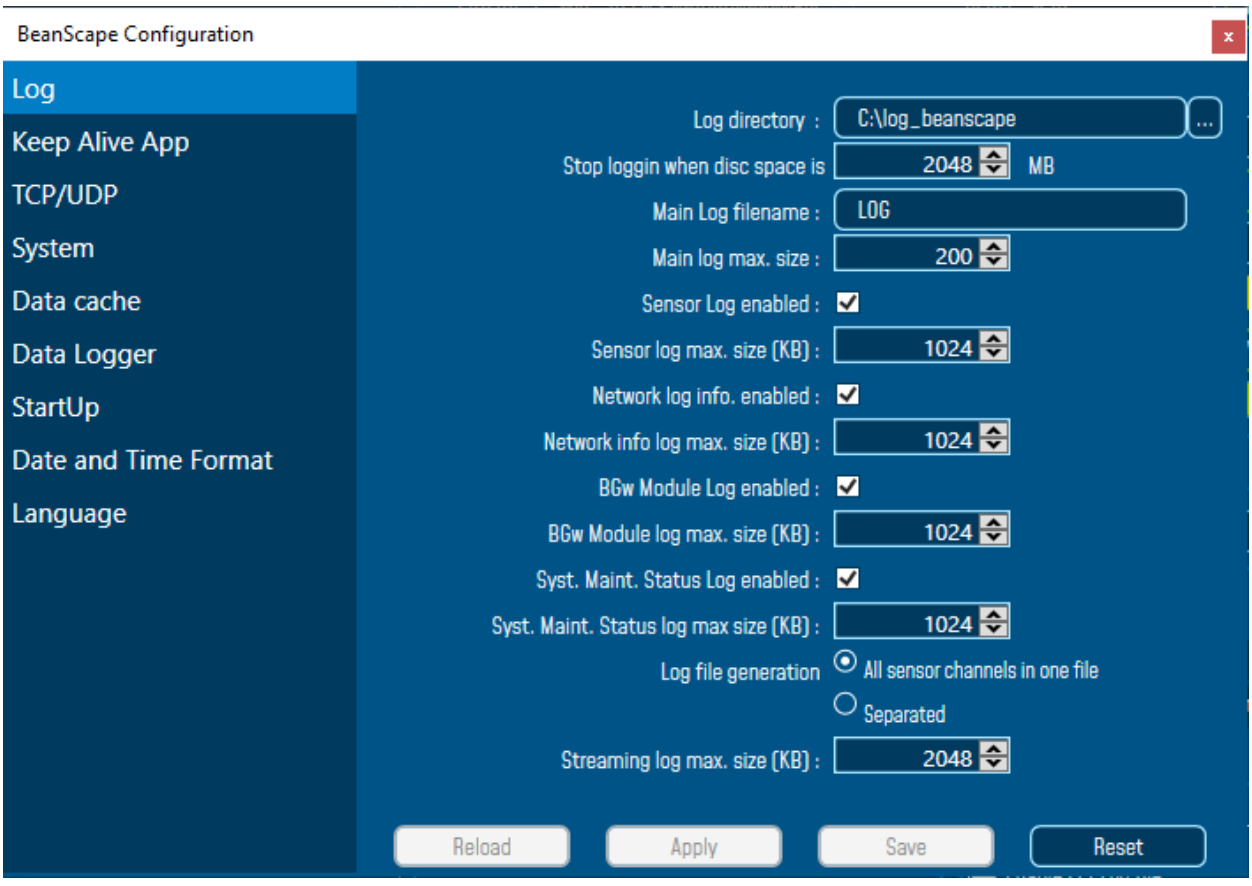
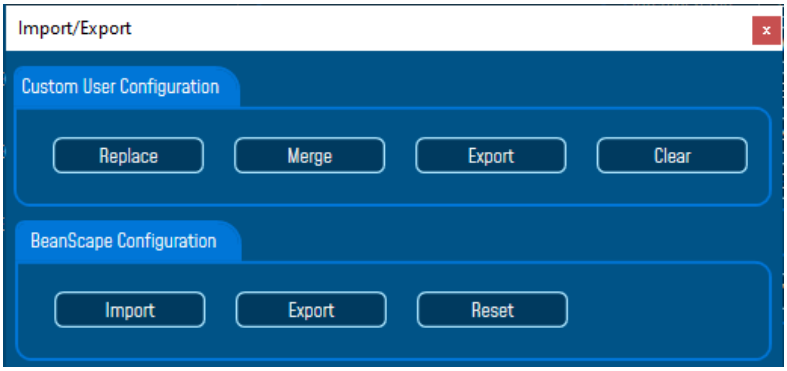



*Figure 143: Tools options list on the expert view*

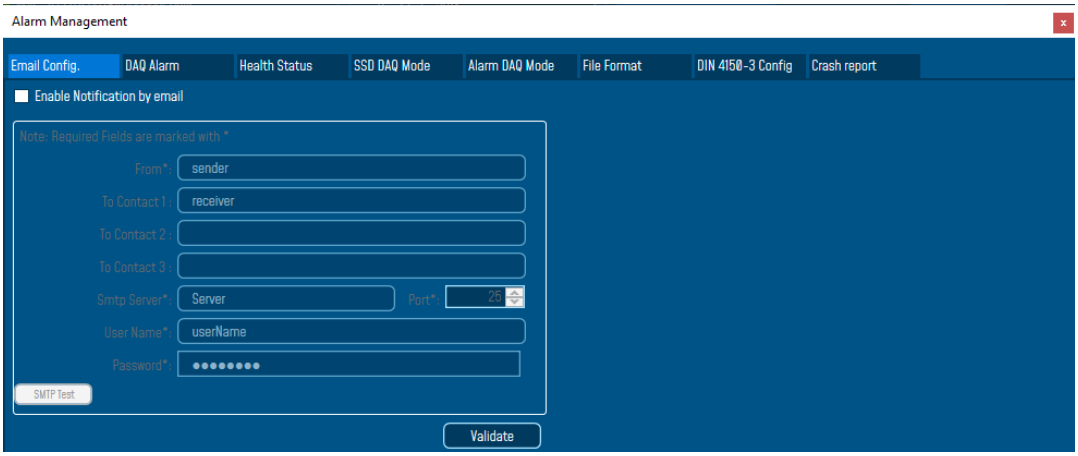
- BeanScape® configuration



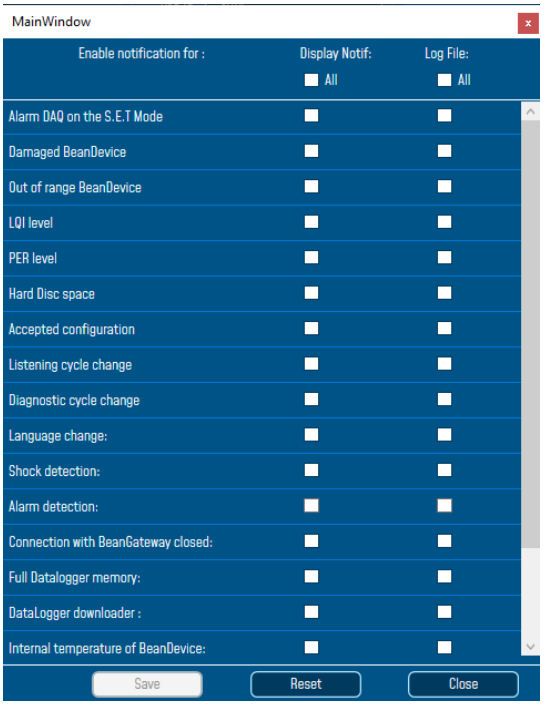
- Import/Export user settings



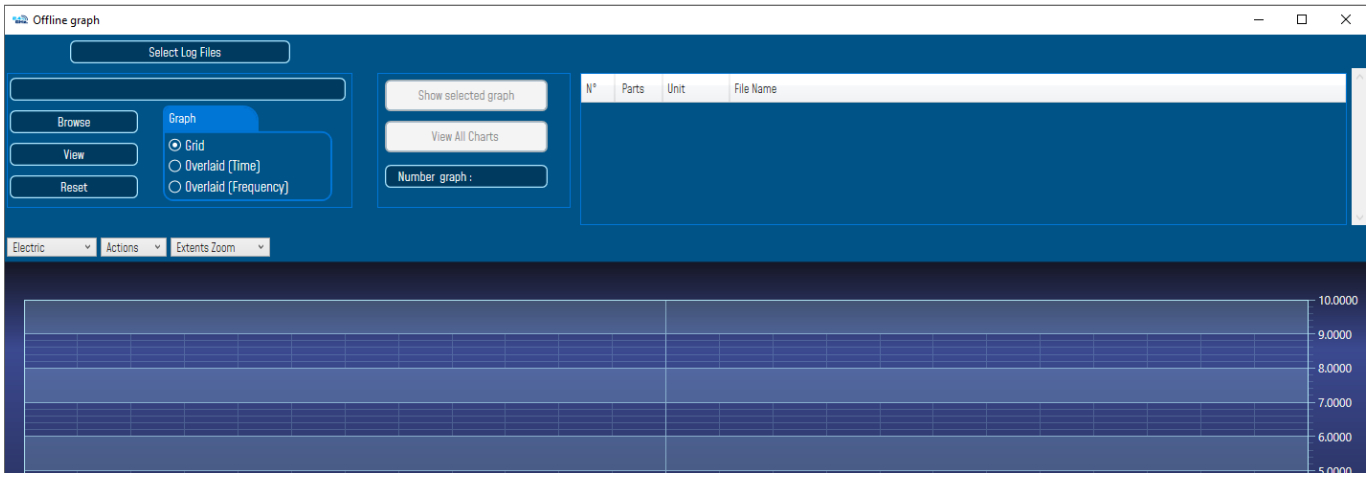

- Alarm Management Toolbox



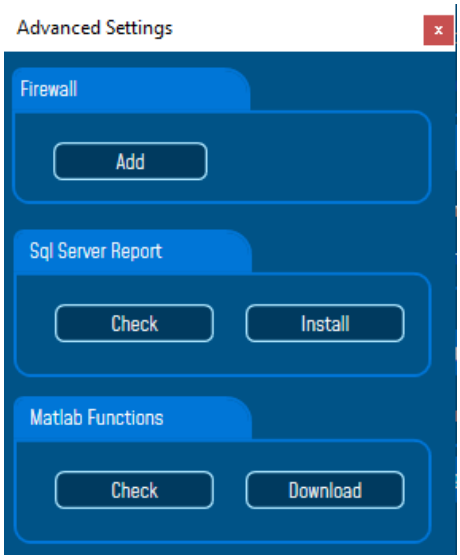

- Notification Management



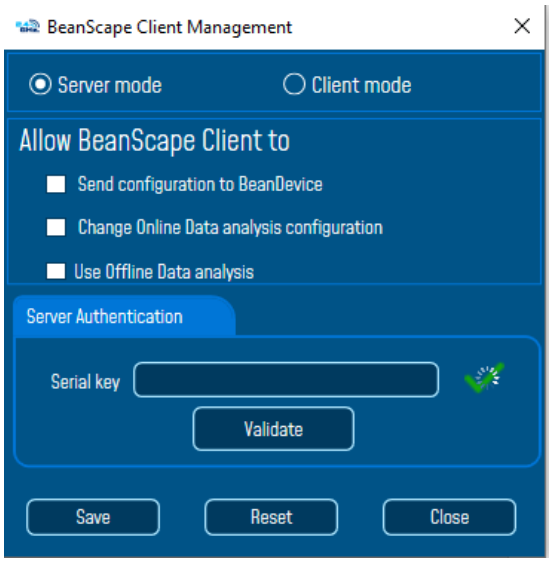
- Offline Graph



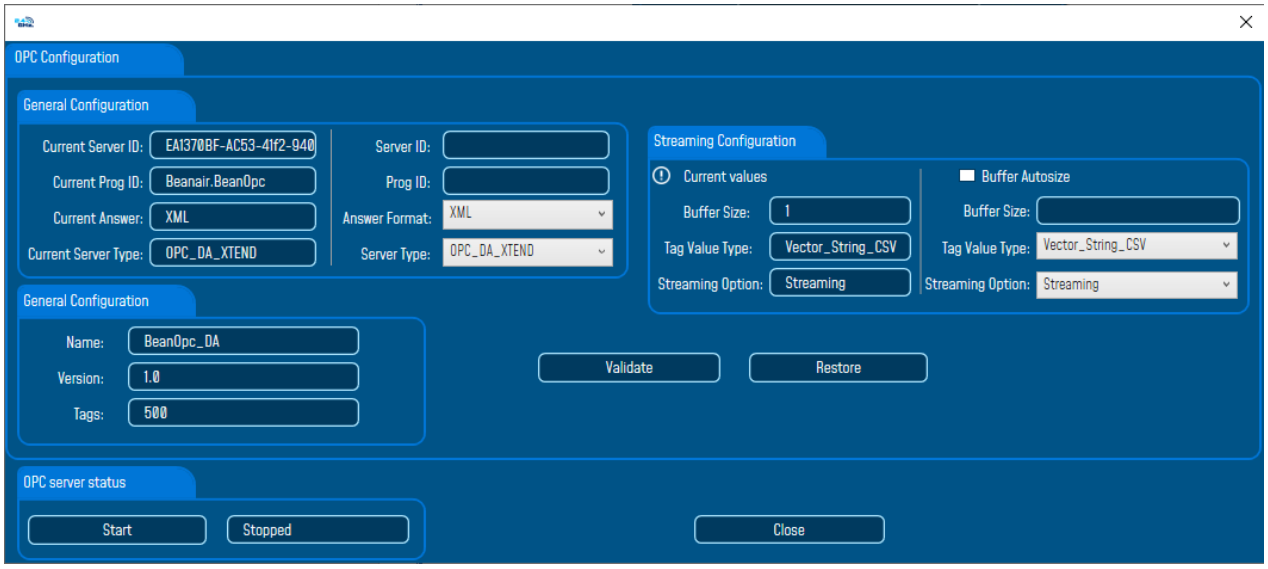

- Advanced Settings




- BeanScape Client Management



- OPC Management




### 10.2.3 Advanced Functions

This option is related to the BeanDevice®

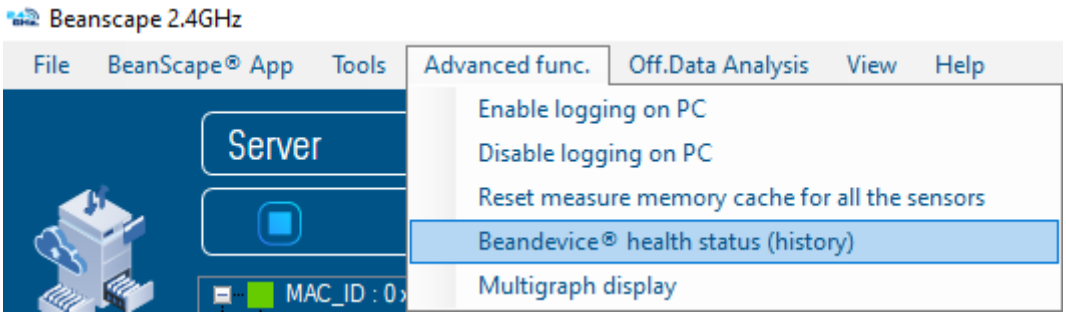
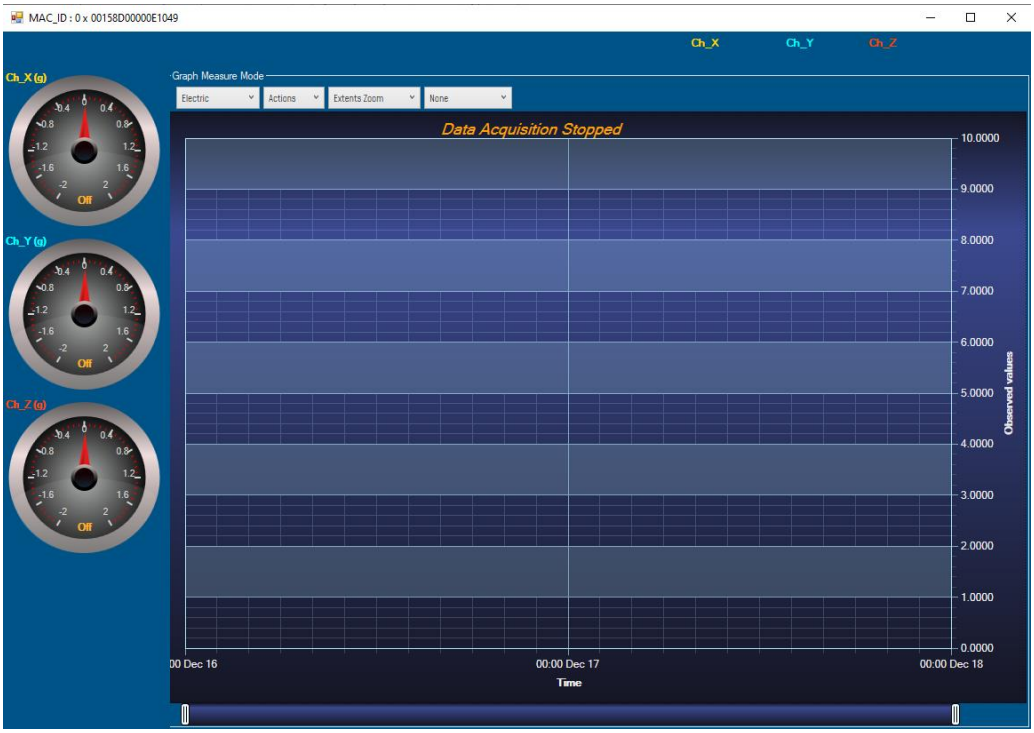



*Figure 144: BeanDevice® health history*

- Enable logging on PC: to generate a log file which contains all the data and will be backed up on your PC
- Disable logging on PC: there is no log file containing the data stored on your PC
- Reset measure memory cache for all sensors: to Reset the cache
- BeanDevice® health status

- Multigraph display



# 11. BEANDEVICE® MAINTENANCE & SUPERVISION (FOR EXPERIENCED USER)

This section allows to an experienced user to configure correctly the Wireless Sensor Networks.

## 11.1 HOW TO OPTIMIZE THE BATTERY AUTONOMY ON YOUR BEANDEVICE®

The battery autonomy depends on several parameters:

- ✓ The environment where the BeanDevice® is deployed
- ✓ Data acquisition mode which is configured

The table below presents the BeanDevice® current consumption during radio TX or during Sleep mode:

| *BeanDevice® version* | *Current consumption during radio TX at 25°C, powered by a battery of 3,6V* | *Current consumption in sleep mode at 25°C, powered by a battery of 3,6V* |
|---|---|---|
| BeanDevice® AN-mV | 60-61 mA (external sensor power supply not included) | < 40 uA |
| BeanDevice® AN-420 | 60-61 mA (external sensor power supply not included) | < 40 uA |
| BeanDevice® AN-V | 60-61 mA (external sensor power supply not included) | < 40 uA |

***For further information, please read the technical note TN_RF_002 - Current consumption in active & sleeping mode***

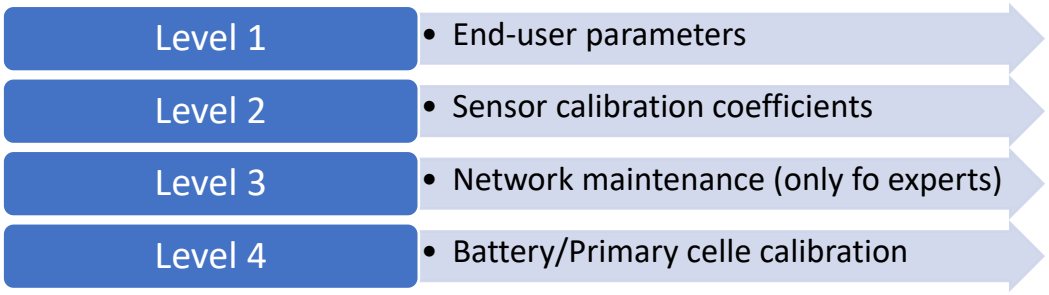
The following table gives you a list of recommendations in order to extend the battery autonomy of your BeanDevice®:

| Influence factors on battery autonomy | Observations | Recommendations |
|---|---|---|
| ***Sleep power mode on the BeanDevice®*** | The BeanDevice® can be configured with sleep mode from the BeanScape® interface | By activating sleep power mode on your BeanDevice®, you will dramatically decrease battery autonomy of your BeanDevice®.<br>By activating sleep mode, the BeanDevice® current consumption can decrease from 30 mA to 10-45 micro-amperes.<br>***For further information, please read the technical note TN_RF_010 – « BeanDevice® Power Management »*** |
| ***Sampling rate in streaming mode*** | The higher your sample rate, the higher the RF transmissions are more consistent and your consumption will grow. | Choose the right sampling rate on your BeanScape® interface. |
| ***TX Power*** | More your TX power is important more the current consumption of the BeanDevice® is important | If your wireless range is low, try to use a lower TX Power. |
| ***Packet Error Rate (PER)*** | A high packet error rate can cause a higher retransmission data and this increase the current consumption. | Try to replace your BeanDevice® in an area where the radio link is much better (see Link Quality Indicator value). |

## 11.2 OVER-THE-AIR CONFIGURATION (OTAC) PARAMETERS BACKED UP ON FLASH

The BeanDevice® integrates an internal flash memory used to backup OTAC (Over-the-air configuration) configuring parameter backups and restoration.

This memory is organized into several levels:




### 11.2.1 Level 1: End-user OTAC parameters

The following table presents all the defaults configuration parameters:

To restore these defaults parameters, you must perform a *Network context deletion*. The "Network" push button is outside the product.

| *Parameter* | *BeanDevice® version* | | |
|---|---|---|---|
| | *AN-420* | *AN-V* | *AN-mV* |
| *Power Mode* | *Active* | *Active* | *Active* |
| *Data Acquisition duty cycle* | *10s* | *10s* | *10s* |
| *Acquisition duration time* | *OK* | *OK* | *OK* |
| *Sampling rate* | *OK* | *OK* | *OK* |
| *Data Acquisition mode* | *LowDutyCycle* | *LowDutyCycle* | *LowDutyCycle* |
| *TX Power* | *+18dBm* | *+18dBm* | *+18dBm* |
| *Alarms Threshold* | *H1 :20*<br>*H2 :20*<br>*S2 :4*<br>*S1 :4* | *H1 :10*<br>*H2 :10*<br>*S2 :0*<br>*S1 :0* | *H1 :20*<br>*H2 :20*<br>*S2 :0*<br>*S1 :0* |
| *Pre-process duration time* | *30 ms* | *30 ms* | *30 ms* |
| *Sensor polarity* | *N.A.* | *Unipolar* | *Unipolar* |

***Level 2, 3 & 4 of Configuration parameters are not affected by network context deletion (by hardware or software)***

### 11.2.2 Level 2: Sensor calibration parameters

The table below shows the sensor calibration parameters depending on BeanDevice® version:

| *Parameter* | *BeanDevice® Version* | | |
|---|---|---|---|
| | AN-420 | AN-V | AN-mV |
| *Sensor gain* | *OK* | *OK*<br>*2 gains value (unipolar & bipolar)* | *OK*<br>*2 gains value (unipolar & bipolar)* |
| *Sensor offset* | *OK* | *OK*<br>*2 offset value (unipolar & bipolar)* | *OK*<br>*2 offset value (unipolar & bipolar)* |

### 11.2.3 Level 3: Network maintenance (only for expert in wireless sensor networks)

The table below shows the sensor calibration parameters depending on ***BeanDevice®*** version:

| **Parameter** | **BeanDevice® Model** | | |
|---|---|---|---|
| | AN-420 | AN-V | AN-mV |
| *Software reset counter* | *OK* | *OK* | *OK* |
| *Physical reset counter* | *OK* | *OK* | *OK* |
| *Threshold value on software reset* | *OK* | *OK* | *OK* |

### 11.2.4 Level 4: Primary cell/Rechargeable battery calibration

The table below shows Primary cell/Rechargeable battery calibration depending on ***BeanDevice®*** version:

| Parameter | BeanDevice® Model | | |
|---|---|---|---|
| | AN-420 | AN-V | AN-mV |
| ***Battery, primary cell ID*** | OK | OK | OK |
| ***Calibration battery/pile*** | OK | OK | OK |

## 11.3 NETWORK DIAGNOSTIC FROM YOUR BEANSCAPE® SOFTWARE

The BeanScape® provides network diagnostic information which is described in this chapter.

### 11.3.1 Displaying Network information

1. Launch your BeanScape® application
2. Select your BeanDevice® profile, a new tab “Advanced func." will appear in your BeanScape® toolbar;
3. Click on this tab, and then click on "BeanDevice health status (history)”.

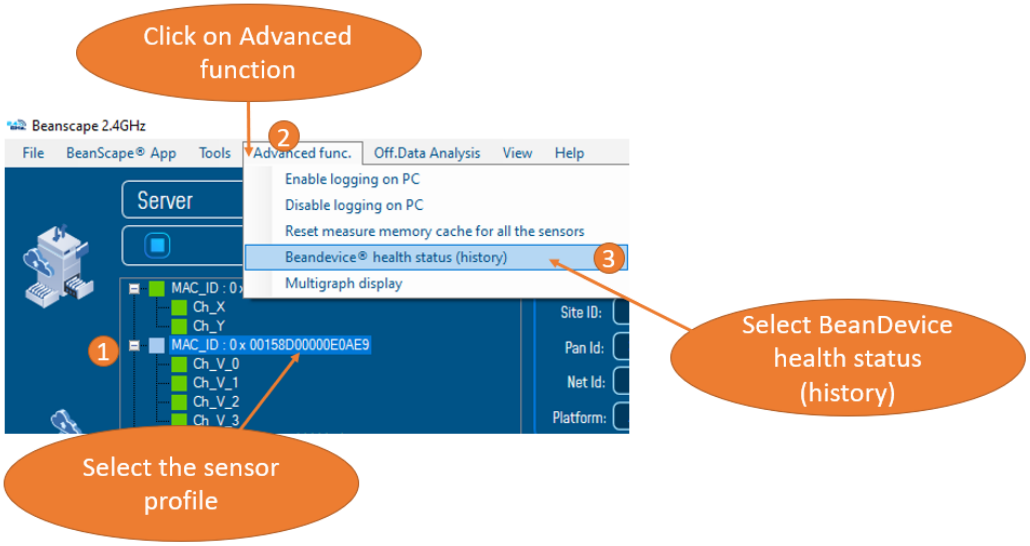



*Figure 145: BeanDevice® health status option*

***A new window pop up:***

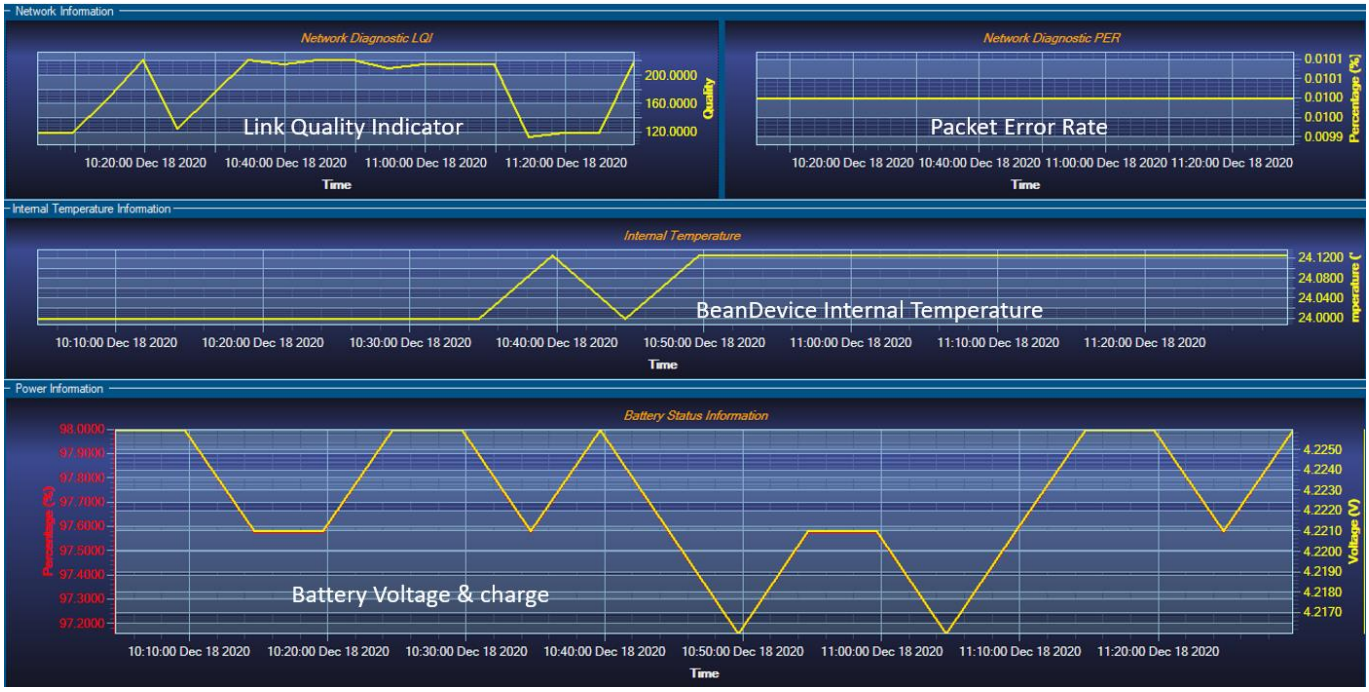



*Figure 146: BeanDevice® health status window*

11.3.1.1 Packet Error Rate

**Packet error rate** (PER) is the number packet errors divided by the total number of transferred packets during a studied time interval. PER is a unit less performance measure, often expressed as a percentage number.

PER is only available with IEEE 802.15.4 Network, it represents the ratio of "lost data/data send" between the BeanDevice® and the BeanGateway®.

11.3.1.2 LQI (Link Quality Indicator)

LQI (Link Quality Indicator) represents the radio signal quality in your Environment. It is possible that LQI is low due to EMC interference or metal presence in the environment.

**If you encounter such problems, several solutions are proposed to increase your LQI:**

- ✓ Try to configure your receiver antenna and your transmitter antenna on the same antenna pattern (cf. the Beam with of your antenna)
- ✓ Use a high gain antenna (in outdoor use only) for a better RF Link Budget
- ✓ Fix your BeanDevice® & BeanGateway® on a top of a mast or a building.

***For further information, read the application note on "How to extend your wireless range?"***

11.3.1.3 Internal temperature monitoring

An internal temperature sensor is used for onboard & battery temperature monitoring

#### 11.3.1.4 Battery charge monitoring

Battery charge is based on current accumulation. The BeanDevice® integrates a current accumulator circuit which facilitates remaining capacity estimation by tracking the net current flow into and out of the battery. Current flow into the battery increments the current accumulator while current flow out of the battery decrements it.

Voltage measurement corresponds to battery voltage.

### 11.3.2 Scrolling menu « BeanSensor »

The BeanDevice® Advanced function feature provides access to several options and settings: like the multi-graph mode (display of multiple windows on a graph measuring the same screen), deleting graphs displayed and the activation / deactivation of logging measurements.

To access to the menu list, click on the sensor profile attached to your BeanDevice®. You will then see the BeanDevice® Advanced functions tab.

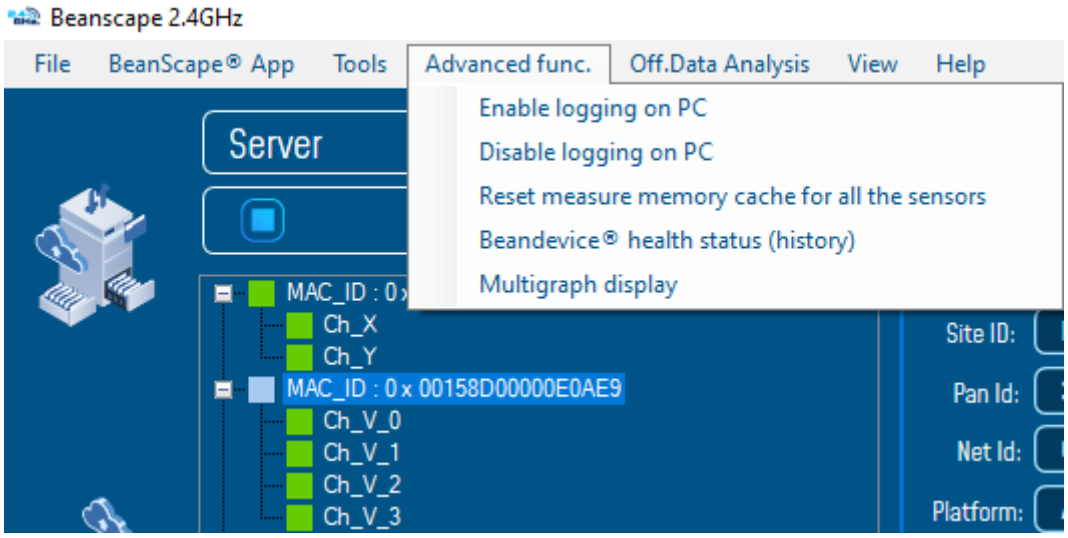



*Figure 147: BeanDevice® Advanced functions*

By clicking on the scrolling menu « BeanSensor », you can access to the following features:

#### 11.3.2.1 Disable/Enable log

All the data received on the BeanScape® are stored in a log file in CSV format.

This feature allows you to enable / disable data logging on your log file.

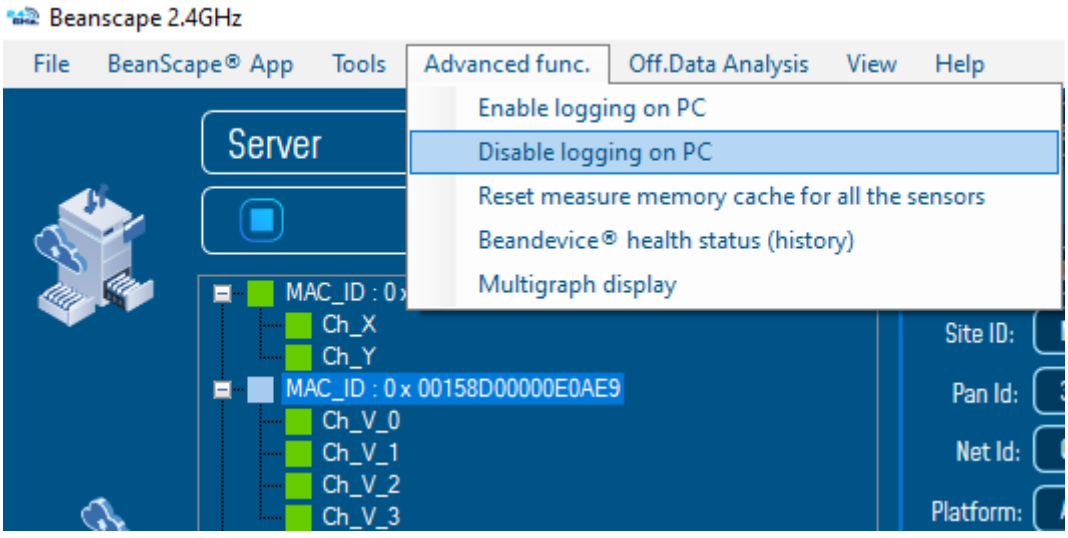



*Figure 148: Disable logging on PC*

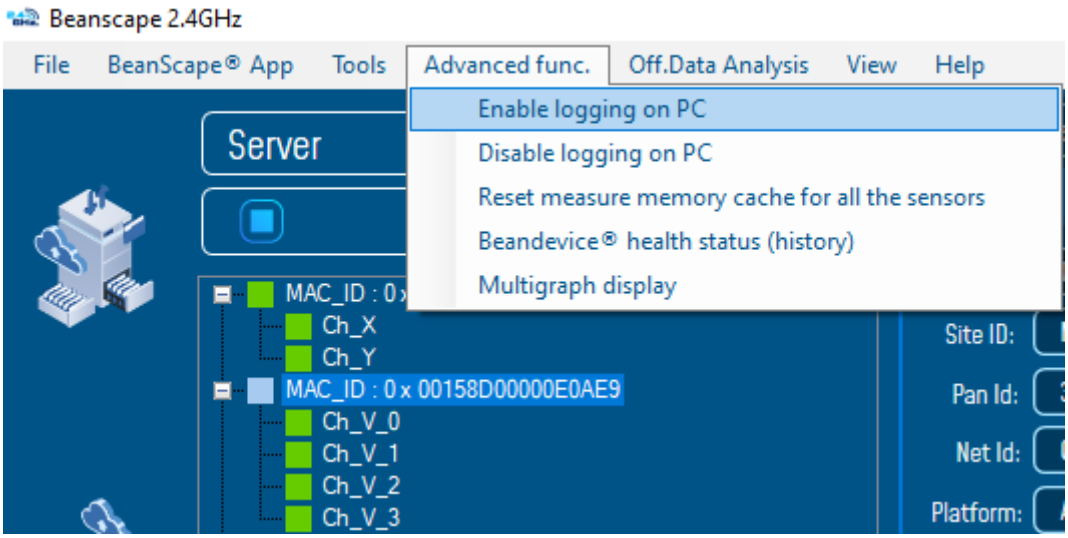



*Figure 149: Enable logging on PC*

***For further information about CSV log file, please read the BeanScape® user manual.***

11.3.2.2 Buffer reset

This function clears the graphical display concerning recorded measurements of your sensor. The data stored in a log are not affected by this function.

By clicking on « Buffer reset », a second window appears asking you to confirm your choice:

- Yes, you accept to delete the whole measure data of this BeanSensor;
- No, don't delete the whole measure data of this BeanSensor;

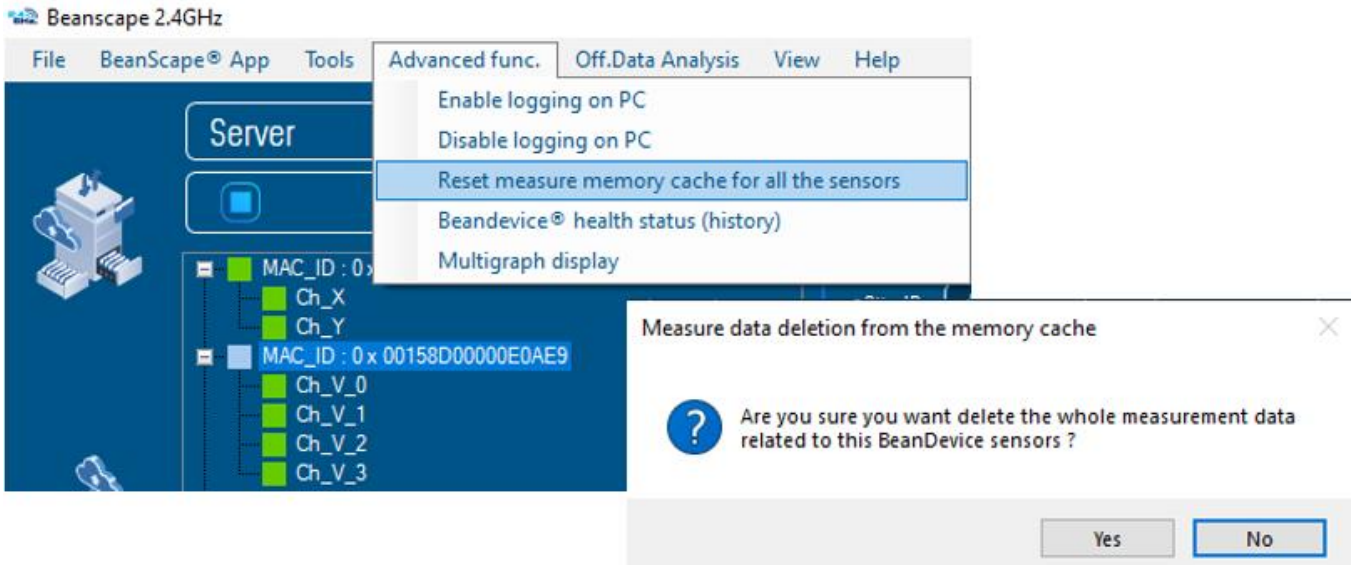



*Figure 150: Buffer Reset option*

### 11.3.2.3 Open the graph in a new window

By clicking on “Open the graph in a new window”, you can open a graph corresponding to your sensor.

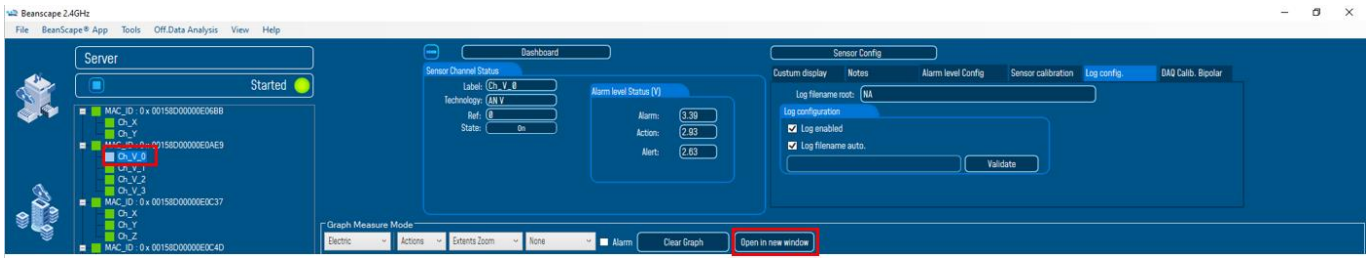



*Figure 151: BeanSensor: Open the graph in a new window*

You can easily open several graphs in a window.

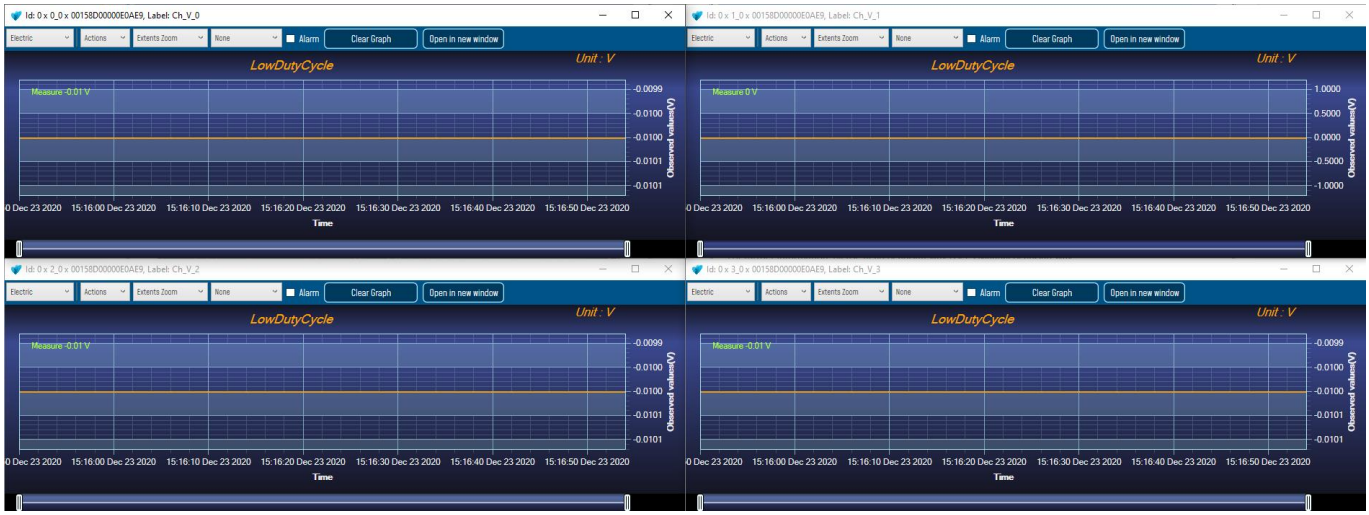



*Figure 152: Graphs opened in separated windows*

***The multi-graph mode requires a lot of resources on your computer, it is recommended to install the BeanScape® software on a powerful computer.***

# 12. TROUBLESHOOTING

- ***Why the Red LED is flashing?***

Each time a packet is lost by the BeanDevice®, Nwk/Activity led will blink in red. Try to decrease the wireless range between the BeanGateway® and the BeanDevice®.

- ***Why the BeanDevice® LEDS are not activated?***

If there is no wireless network activity, the led will be inactive. Make sure you have powered your BeanDevice® with a charged battery.

- ***What should I do if the radio channel is perturbed?***

Please turn off your BeanDevice ®, and then choose an appropriate channel. The channel selection is done from the BeanGateway ®.
For further information, please Read BeanGateway User's Manual BeanGateway ®.

- ***Why the BeanDevice® does not provide the right measurement value?***

  - Check if your sensor channel is activated on your BeanScape® interface (ON Position)?;
  - Check if your BeanDevice® is powered up;
  - Check your LQI quality, if your LQI is under 50-60. You must change your antenna position, or your product position;
  - Check your data acquisition mode, maybe you have specified a data acquisition which is too long;
  - If you use a BeanDevice® AN-XX :
    - Check your sensor power supply, maybe you need to increase/decrease your power supply;
    - Check your sensor preprocess time. Maybe your sensor preprocess time is too short?
    - Check the wiring code of your sensor plug;

- ***Why the BeanDevice® doesn't respond when I try to configure it (Over-the-air-configuration)?***

  ✓ If your BeanDevice® operates in sleep mode, the RF Hardware is also in sleep mode. Therefore an Over-the-air-configuration will not be possible.

  ✓ Check the LQI (Link Quality Indicator) value, if this value is under 80, the over-the-air configuration will not be easy. Try to decrease the wireless range between the BeanDevice® and the BeanGateway®.

  ✓ If your BeanDevice® works in streaming mode, in order to keep a full synchronization of the data acquisition, any over-the-air-configuration is authorized.

- ***Why do I have too much noise on my sensor signal?***

  ✓ If you use a BeanDevice® AX3D/HI-INC/AX-HD: don't forget to configure the cutoff frequency of your anti-aliasing filter

  ✓ If you use a BeanDevice® AN-mV: use a shielded cable.

# 13. INSTALLATION PROCEDURES

## 13.1 SEALING

The product BeanDevice® comes with an *IP66* rating. So, do not install the BeanDevice® in a marine environment with high turbulence.
If you use the BeanDevice® AN-XX/TSI/TH, do not install the BeanDevice® up front to prevent the accumulation and infiltration of water from the front of the case.

## 13.2 COEXISTENCE WITH OTHER FREQUENCIES AT 2.4 GHZ

The BeanDevice ® is sensitive to noise 2.4GHz (Wi-Fi as a source for example), but many protections are already in place, particularly in the IEEE 802.15.4®.
It should however be careful when installing the product, check all the possibilities of radio channels on the frequency range 2.4-2.5GHz. The operation of the product will be improved.

***For further information, read the application note: TN_RF_011 – "Coexistence of Beanair WSN at 2.4GHz"***

## 13.3 TEMPERATURE & HUMIDITY

The table below shows temperature operating of the different BeanDevice®:

| Product Version | Temperature range |
|---|---|
| *BeanDevice® AN-XX* | *-20 ° C to +75 ° C* |

BeanDevice® products can operate in an area with 90% humidity.
However, the wireless range can be reduced in the presence of water. Avoid mounting the BeanDevice® in an enclosure surrounded by water, or near bushy plants (plants are composed of 90% water), ...

## 13.4 REFLECTIONS, OBSTRUCTIONS AND MULTIPATH

***For further information, read the application note: AN_RF_007 :" Beanair_WSN_Deployment"***

## 13.5 SHOCK & VIBRATION RESISTANCE

Shock resistance on BeanDevice® products are:

| *BeanDevice® Type* | *Shock resistance* |
|---|---|
| *BeanDevice® AN-XX* | 10g during 50 ms |

Avoid dropping the BeanDevice®. BeanDevice® mechanical mounting on a wall, pole or on a DIN rail must be well performed.
*Do not force connections.*

## 13.6 ANTENNA

Check the LQI (Link Quality Indicator) of your BeanDevice® for being sure that your antenna is right oriented.

***For further information, read the application note: AN_RF_007 :" Beanair_WSN_Deployment"***

# 14. APPENDIX

## 14.1 FIREWALL EXCEPTION FOR BEANSCAPE®

By default, firewall blocks all unknown network traffic coming into the network. To permit traffic through the firewall we create exceptions (or rules) that allow certain traffic on the network. In our case the rules are defined by the software which is BeanScape.

Usually when launching BeanScape for the first time your Windows OS will ask you to add an exception and to allow the software to use your network resources, however in case this doesn't occur or rejected, manually adding BeanScape to exceptions list is possible through these following steps:

1. Use your Search bar at the windows launcher and look for "Allow an app through Windows Firewall"

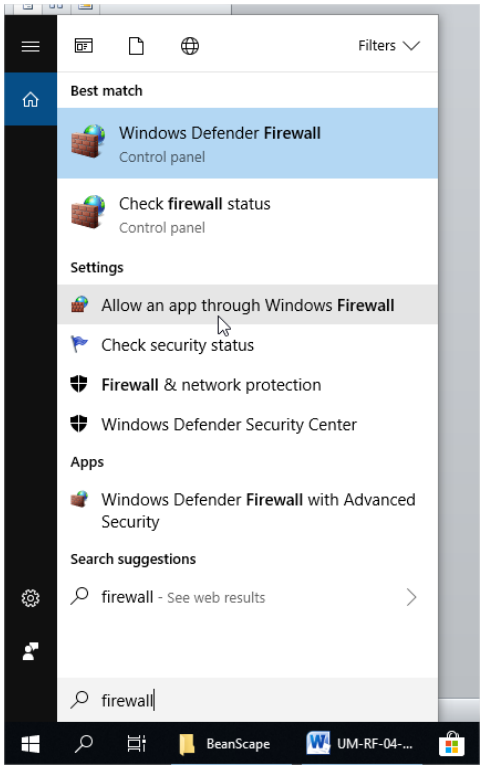



*Figure 153 :Windows search for firewall screenshot*

2. Look for BeanScape in the list and check its box, check Private if you are only willing to use BeanScape in your LAN or Public for allowing remote access from outside the LAN.Validate and your BeanScape will be allowed in your network.

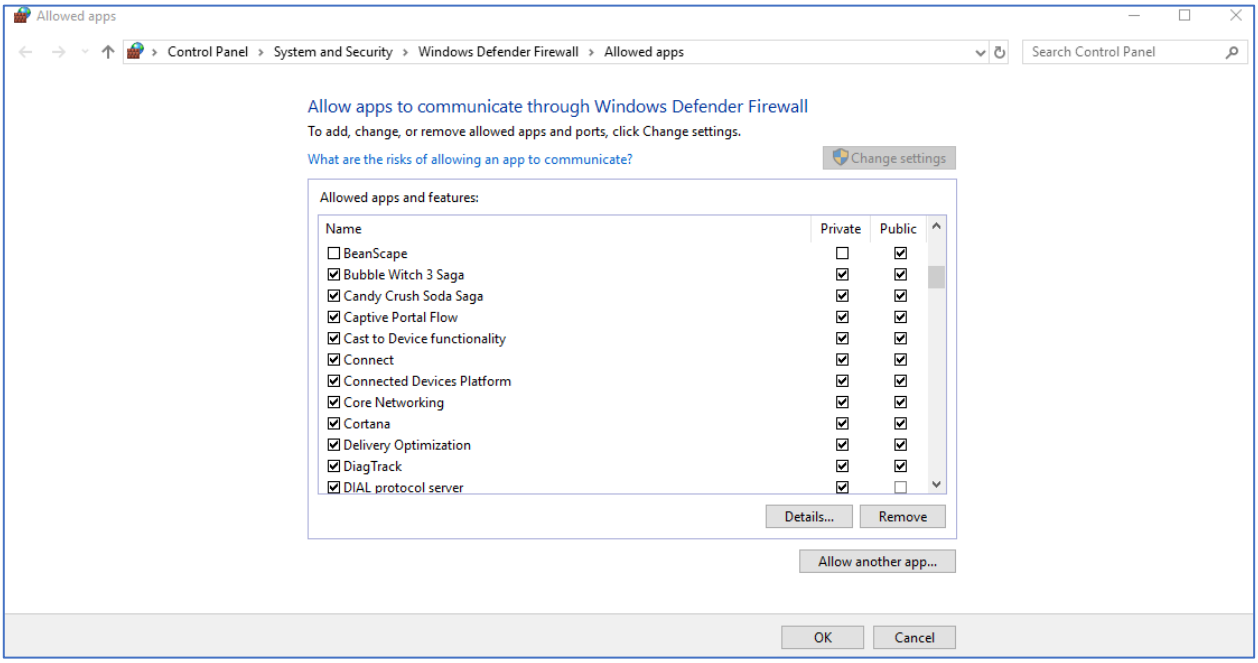



*Figure 154: allowed apps window*

If you are not familiar to configure a firewall exception, you can directly from BeanScape® add this rule automatically.

On the BeanScape® menu select Tools, then Advanced Settings then click on validate to add BeanScape® to the Firewall.

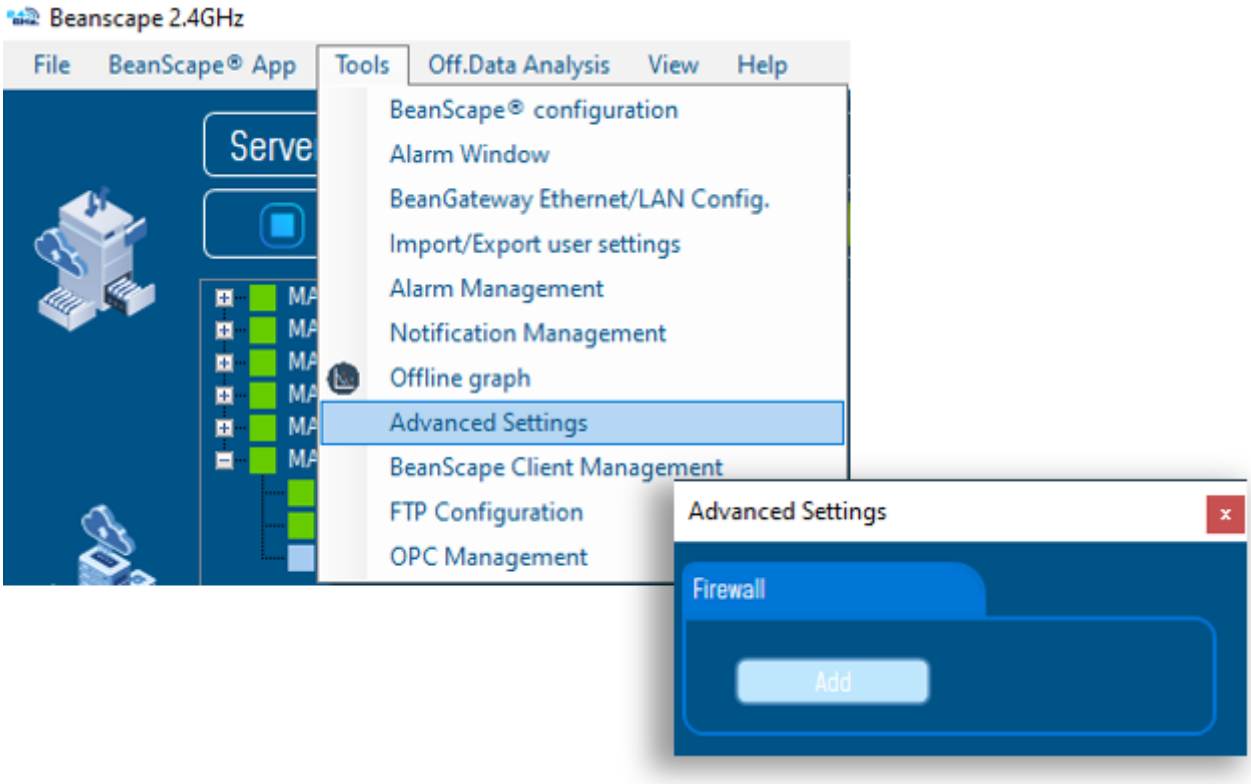



*Figure 155: Firewall auto exception*