BeanAir
WIRELESS IIOT SENSORS

USER MANUAL

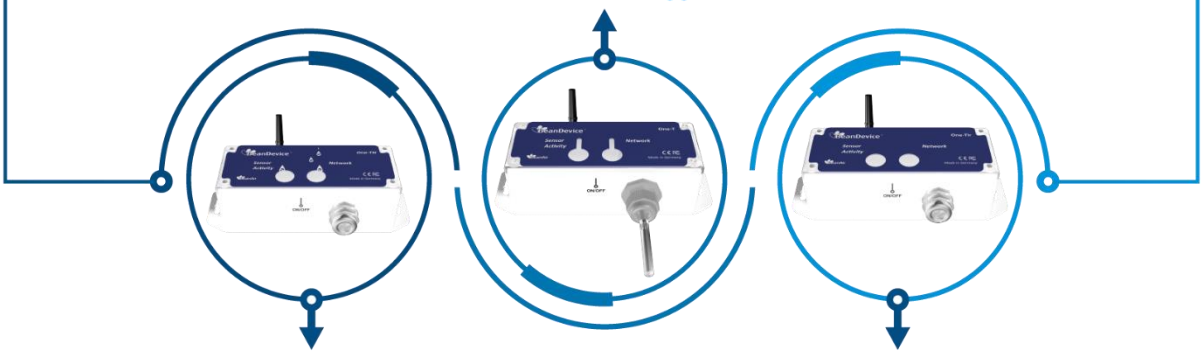
BeanDevice® 2.4 GHz

EcoSensor

BeanDevice® 2.4GHz

ONE-T

Wireless IIOT temperature sensor
built-in datalogger



ONE-TH

Wireless IIOT Temperature & humidity sensors
built-in datalogger

ONE-Tir

Wireless IIOT Sensor | IR(Infrared)
temperature sensor
built-in datalogger

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1.10	21/03/2016	Rasha Friji	• Standalone option • Battery level display
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Such changes will, nevertheless be incorporated into new editions of this document.

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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

1. DOCUMENT ORGANISATION

This manual is organized in 7 chapters, as follows:

BeanDevice® product presentation	•Introduces BeanDevice® Ecosensor products line : •BeanDevice® ONE-T •BeanDevice® ONE-TH •BeanDevice® ONE-TIR
Data acquisition mode description	•Details the data acquisition mode available on the BeanDevice®
BeanDevice® installation guidelines	•Details the installation guidelines of the BeanDevice®: •Power Management •BeanDevice® power supply •BeanDevice® network association •Datalogger feature •OTAC (over-the-air configuration) process
BeanDevice® supervision from the Beanscape®	•Details the BeanDevice® supervision from the BeanScape®
BeanDevice® maintenance & supervision (for experienced user)	•Details the BeanDevice® maintenance (for experienced user)
Installation procedures	•Details the installation procedures

2. ECOSENSOR PRODUCT LINE PRESENTATION

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

2.1 COMMON SPECIFICATIONS

This section describes the common technical features for the following BeanDevice®

- ✓ ***BeanDevice® ONE-T***
- ✓ ***BeanDevice® ONE-TH***
- ✓ ***BeanDevice® ONE-TIR***

RF Specifications	
Wireless Protocol Stack	IEEE 802.15.4 (2006 version)
WSN Topology	Point-to-Point / Star
Data rate	250 Kbits/s
RF Characteristics	ISM 2.4GHz – 16 Channels
TX Power	-7 dBm to +18 dBm
Receiver Sensitivity	-95.5 dBm to -104 dBm
Max. Radio Range	300 m (L.O.S)
Antenna	Omnidirectional antenna 2.2dBi

Over-the-air configuration (OTAC) parameters	
Data Acquisition mode	Low Duty Cycle Data Acquisition (LDCDA) Mode: 1s to 24 hours
	Survey mode: 1s to 24 hours
Alarm Threshold	2 high levels alarms & 2 low levels alarms
Power Mode	Sleeping power mode
TX Power	-7 dBm / -1 dBm / 5 dBm / 11 dBm / 15 dBm / 18 dBm

Embedded data logger	
Storage capacity	up to 1 000 000 data points
Wireless data downloading	3 minutes to download the full memory (average time)

Environmental and Mechanical	
Enclosure	Polycarbonate, Watertight IP67 – Fire Protection: ULV94 Enclosure dimensions (Lxlxh) : 119 mm x 35 mm x 35 mm Weight (battery included): 120g
Operating Temperature	-40°C to +75°C

Norms	FCC & CE compliant ROHS - Directive 2002/95/EC

Power supply	
Current consumption @3.3 Volts	· During data acquisition: 20 to 30 mA · During Radio transmission: 40 mA @ 5dBm, 70 mA @ 18 dBm · During sleeping: < 10 µA
Included primary cell	Lithium-thionyl chloride battery with 1800 mAh capacity (AA size)

Option(s)	
Calibration	COFRAC connected calibration (on 1 point)

Choose an ultra low power wireless sensor	
RF transmission	**Battery life (temperature room 25°C)**
Every 2 minutes	22 months
Every 5 minutes	51 months
Every 10 minutes	102 months

2.2 BEANDEVICE® ONE-T

Figure 1: BeanDevice® ONE-T

2.2.1 Applications

This product is adapted for the following applications:

- ✓ Technical Building Management
- ✓ Cold chain traceability
- ✓ Medical lab & white room
- ✓ Solar Panels Monitoring
- ✓ Transport
- ✓ Air-conditioning System (HVAC)

2.2.2 Product reference

Product Reference	
BND-ONE-T-*SA*-*CL*	
SA—temperature sensor accuracy & design · **ST** : standard accuracy · **HA**: High accuracy · **HAEY**: High accuracy with eyelet probe for wall mounting (minimum cable length 25 cm)	**CL—Sensor Cable length** Sensor cable length in cm **Maximum cable length**: 150 cm If this field is empty: no cable length
Example 1 : **BND-ONE-T-ST**, wireless temperature sensor with 1 probe, standard accuracy (temperature range -25°C to +75°C), no cable length **Example 2**: **BND-ONE-T-HA-120,** wireless temperature sensor with 1 probe, High accuracy (temperature range -10°C to +60°C), cable length 120 cm **Example 3**: **BND-ONE-T-HAEY-25,** wireless temperature sensor with eyelet probe for wall mounting, high accuracy (temperature range -10°C to +60°C), cable length 25 cm	

2.2.3 Temperature sensor specification

Temperature probe types	
Probe type HAEY	Temperature probe with eyelet mounting  (Length 50 mm, Diameter 6 mm, Hole diam. 5.3 mm)
Probe type ST & HA	Length 40 mm, Diameter 6 mm 

Temperature sensor specifications		
Temperature Sensor technology	Silicon temperature probe —Probe water tightness: IP67 Mechanical assembly type: steel tube	
Measurement range	High accuracy temperature probe: BND-ONE-T-HA-CL BND-ONE-T-HAEY-CL	-10 °C to +60 °C
	Standard accuracy temperature probe with cable length: BND-ONE-T-ST-CL	-50 °C to +150 °C
	Standard accuracy temperature probe without cable length: BND-ONE-T-ST	-25°C to +75°C
Measurement accuracy		±0.2°C between -10°C and -5 °C

	High accuracy temperature probe: BND-ONE-T-***HA-CL*** BND-ONE-T-***HAEY-CL***	±0.1°C between -5°C and +45°C ±0.2°C between +45°C and +60°C
	Standard accuracy temperature probe: BND-ONE-T-***ST-CL***	±0.3 °C between -10 °C and +60 °C ±(0.3 + 0.012(T-60)) °C between +60 °C and +150 °C +/- (0.3 - 0.012(T+10)) °C between -50 °C and -10 °C
Sensor resolution	**High accuracy temperature probe:** BND-ONE-T-***HA-CL*** BND-ONE-T-***HAEY-CL***	0.0034 °C
	Standard accuracy temperature probe : BND-ONE-T-***ST-CL***	0.1 °C

2.3 BEANDEVICE® ONE-TIR

Figure 2 : BeanDevice® ONE-TIR

2.3.1 Applications

This product is adapted for the following applications:

- ✓ Railway temperature control
- ✓ Industrial temperature control of moving parts
- ✓ Gas detection
- ✓ Plastic, glass & metal processing
- ✓ Movement Detection
- ✓ Chemistry & pharmaceutical industry
- ✓ Automotive diagnosis
- ✓ Electrical Systems & equipment monitoring
- ✓ Healthcare

2.3.2 Product reference

Product reference
BND-ONE-TIR

2.3.3 IR temperature sensor specifications

IR temperature Sensor Specification	
Measurement range	-40°C to +85°C for ambient temperature (Ta) -70°C to +380°C for object temperature (To)
Sensor Technology	Thermopile
Emissivity coefficient	0 to 1 (Configurable from the BeanScape®)
Accuracy	CF. IR Temperature Table
Measurement resolution	0.02 °C
Field of View (FOV)	Peak zone ±0°, Width Zone ±90°C . See curve

2.3.4 Sensor field of view and accuracy

All accuracy specifications apply under settled isothermal conditions only. Furthermore, the accuracy is only valid if the object fills the FOV of the sensor completely.

Ta (Ambient temperature) and To (Object temperature)

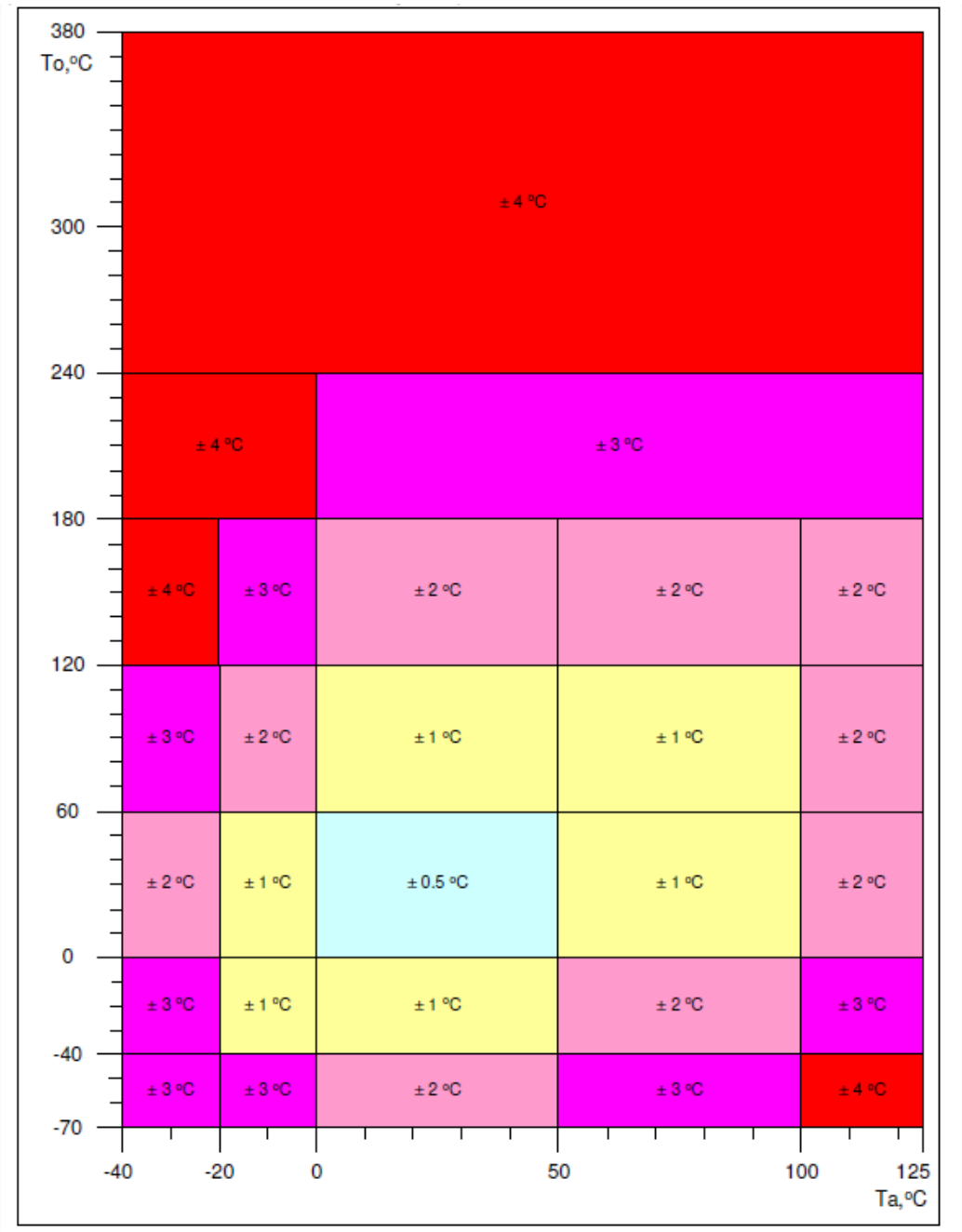


Figure 3: ONE-TIR sensor accuracy

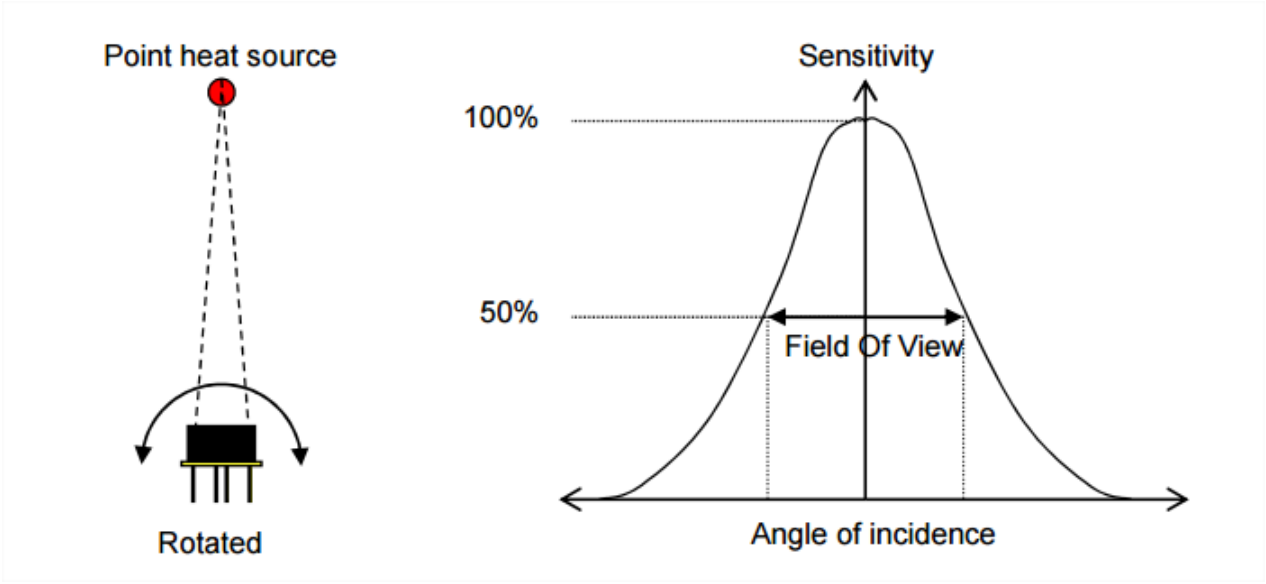


Figure 4: Field of view measurement

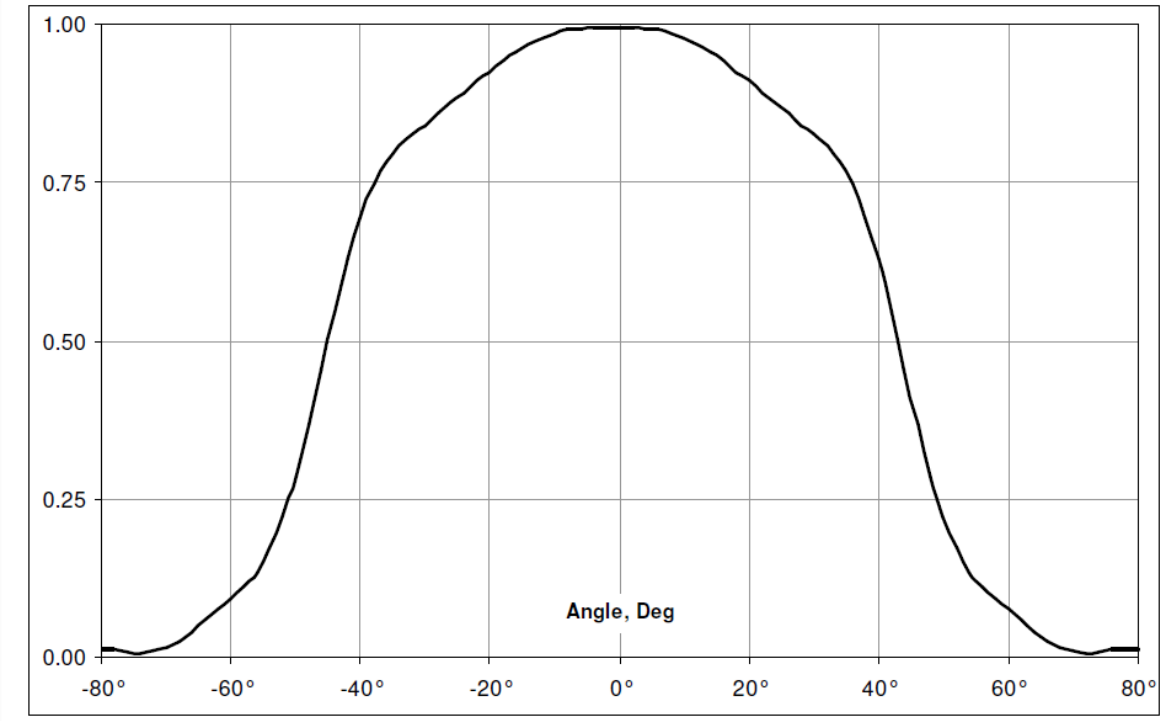


Figure 5 : Typical FOV curve

2.4 BEANDEVICE® ONE-TH

Figure 6: BeanDevice® ONE-TH

2.4.1 Applications

- ✓ HVAC (heating, ventilation, and air conditioning)
- ✓ Cold chain traceability
- ✓ Medical lab & clean room
- ✓ Agriculture & Greenhouse
- ✓ Environment

2.4.2 Product reference

Product Reference
BND-ONE-TH

2.4.3 Temperature/Humidity sensors specifications

Sensor filter cap mechanical specifications		
Filter cap	Glass grommet and sinter filter	
Pressure Resistant	Up to 16 bars	
Dew formation resistant	Yes	

Temperature sensor specifications	
Temperature Sensor technology	Thermistor
Measurement range	- 40°C to +85 °C
Measurement accuracy	±0.2 °C (0 ... 60 °C)
Sensor resolution	0.015 °C
Long term drift	< 0.05 K / year
Response time	< 10s with sensor cap

Humidity sensor specifications	
Humidity Sensor technology	Capacitive polymer humidity sensor
Measurement range	0 to 100% RH
Sensor accuracy (at 23°C)	±1.8% RH (10 ... 80% RH)
Sensor resolution	0.02% RH
Hysteresis (50% rH)	< ±1% RH
Linearity error	< ±1% RH
Response time	<10s with sensor cap
Long term drift	< 0.5 % RH / year

2.4.4 Usage recommendations

2.4.4.1 Hysteresis

The hysteresis value is the difference between an RH measurement in a rising and falling RH environment, at a specific RH point

2.4.4.2 Long-term drift

Drift due to aging effects at typical conditions (30°C and 20% to 50% RH). This value may be impacted by dust, vaporized solvents, outgassing tapes, adhesives, packaging materials, etc.

2.4.4.3 High temperature and Humidity

Recommended humidity operating range is 10% to 70% RH. Prolonged operation outside this range may result in a measurement offset. The measurement offset will decrease after operating the sensor in this recommended operating range.

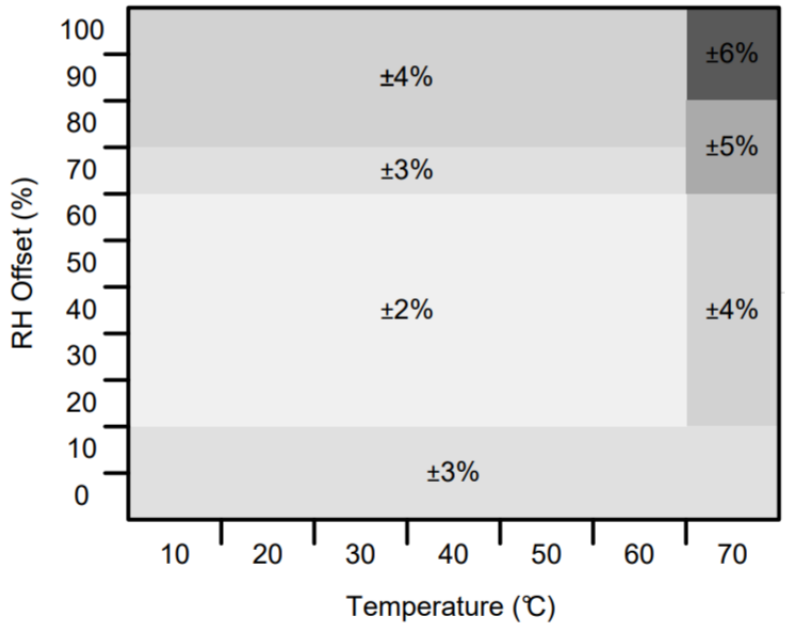


Figure 7: Relative Humidity Accuracy vs Temperature

The following table shows the RH offset values that can be expected for exposure to 85 °C and 85 % RH for durations between 12 and 500 hours (continuous).

85°C/85% RH Duration (hours)	**12**	**24**	**168**	**500**
RH Offset (%)	3	6	12	15

2.5 PRODUCTS FOCUS

2.5.1 BeanDevice® ONE-TIR

Figure 8: BeanDevice® ONE-TIR -Product description

Number	Function	Description
1	IR Sensor	Waterproof (IP67) infrared Sensor
2	ON/OFF	ON/OFF Reed Switch. Activated using a magnet. (waiting time: 2 seconds) If the "***Network LED***" illuminates in **GREEN** color, the BeanDevice® is powered on. If the "***Network LED***" illuminates in **RED** color, the BeanDevice® is powered off.
3	Sensor/Activity LED	Bi-color led light, either displays in **GREEN** or **RED** color depending up on the status of the device ***See Led Description table***
4	Network LED	Bi-color led light for network status, **GREEN** or **RED** depending upon the status of the network. ***See Led Description table***
5	Antenna	2.2 dBi omnidirectional antenna ***See antenna description section***

6	Network	"**Network**" non-contact button restores the factory settings on the BeanDevice®. Point the pole of the Neodymium magnet that was provided with your BeanDevice® towards the "Network" label circle. Hold the magnet for approximately ***2s*** ***Please read the following section for more information*** "click here"
7	Eyelet	Eyelet for screw mounting

2.5.2 BeanDevice® ONE-T

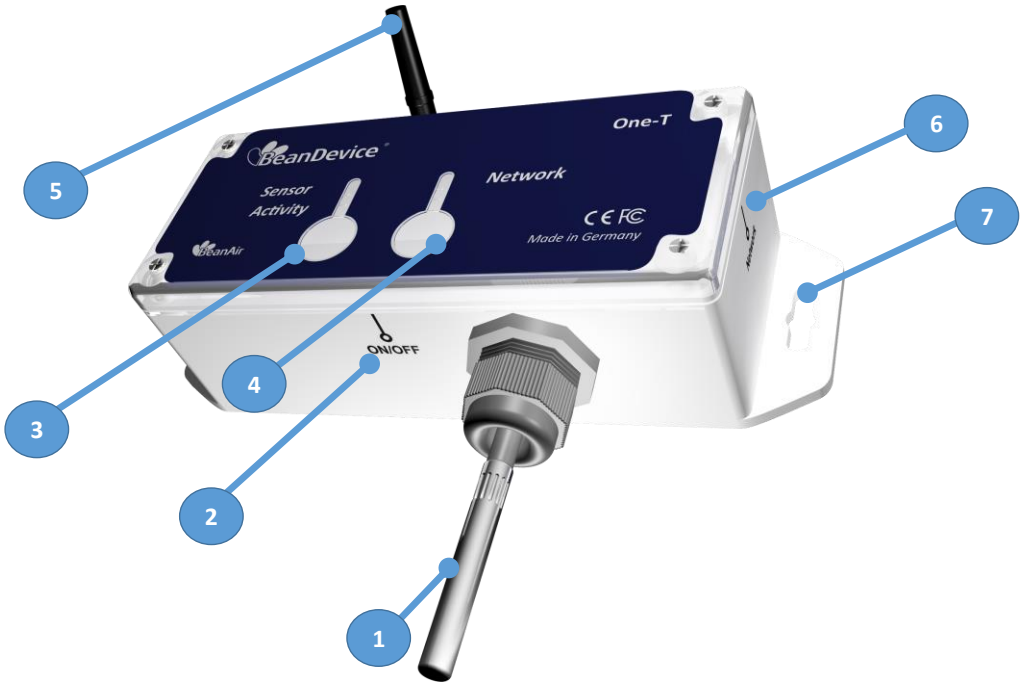


Figure 9: BeanDevice® ONE-T - Product description

Number	Function	Description
1	Silicon Temperature Sensor	Silicon temperature sensor Up to 1.5 meters of cable length
2	ON/OFF	ON/OFF Reed Switch. Activated using a magnet. (waiting time : 2 seconds) If the "***Network LED***" illuminates in **GREEN** color, the BeanDevice® is powered on. If the "***Network LED***" illuminates in **RED** color, the BeanDevice® is powered off.

3	Sensor/Activity LED	Bi-color led light, either displays in **GREEN** or **RED** color depending up on the status of the device ***See Led Description table***
4	Network LED	Bi-color led light for network status, **GREEN** or **RED** depending upon the status of the network. ***See Led Description table***
5	Antenna	2.2 dBi omnidirectional antenna ***See antenna description section***
6	Network	"**Network**" non-contact button restores the factory settings on the BeanDevice®. Point the pole of the Neodymium magnet that was provided with your BeanDevice® towards the "Network" label circle. Hold the magnet for approximately ***2s*** ***Please read the following section for more information*** "click here"
7	Eyelet	Eyelet for screw mounting

2.5.3 BeanDevice® ONE-TH

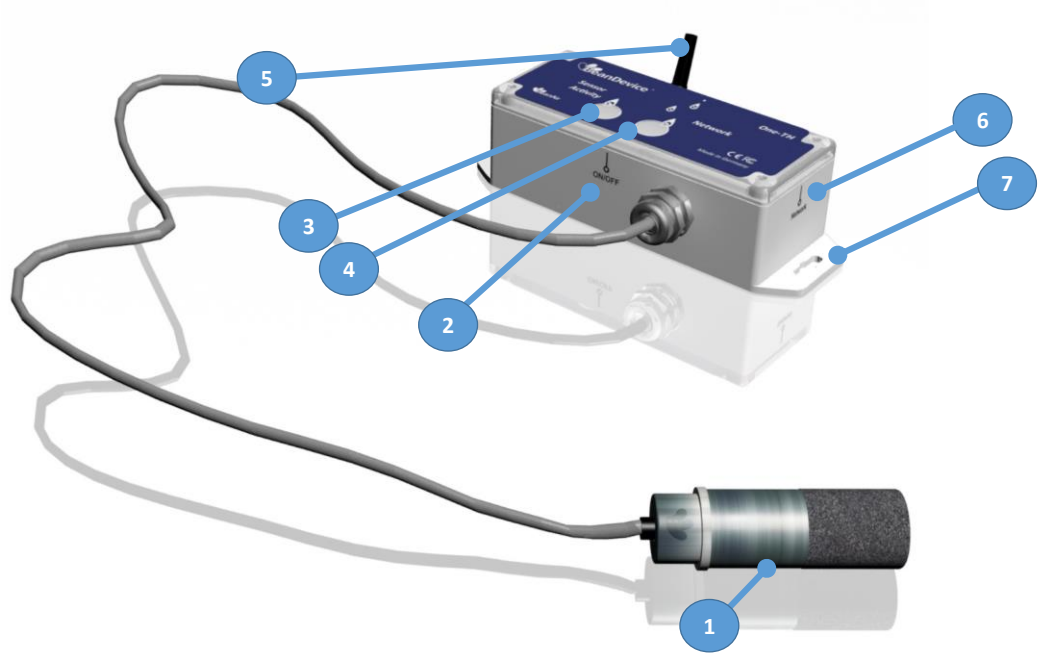


Figure 10: BeanDevice® ONE-TH - Product description

Number	Function	Description
1	Temperature/Humidity/Dew Point sensor probe	Temperature/Humidity sensor coming with IP67 sensor filter with 1.5 meters of cable maximum
2	ON/OFF	ON/OFF Reed Switch. Activated using a magnet. (waiting time: 2 seconds) If the "***Network LED***" illuminates in **GREEN** color, the BeanDevice® is powered on. If the "***Network LED***" illuminates in **RED** color, the BeanDevice® is powered off.
3	Sensor/Activity LED	Bi-color led light, either displays in **GREEN** or **RED** color depending up on the status of the device ***See Led Description table***
4	Network LED	Bi-color led light for network status, **GREEN** or **RED** depending upon the status of the network. ***See Led Description table***
5	Antenna	2.2 dBi omnidirectional antenna

		See antenna description section
6	Network	"**Network**" non-contact button restores the factory settings on the BeanDevice®. Point the pole of the Neodymium magnet that was provided with your BeanDevice® towards the "Network" label circle. Hold the magnet for approximately ***2s*** ***Please read the following section for more information*** "click here"
7	Eyelet	Eyelet for screw mounting

2.5.4 Led description

This table shows the led description depending on the BeanDevice® status:

BeanDevice® status	*Leds Description*
The ***BeanDevice®*** is power on	***Network Led*** flashes one time in **GREEN**
The ***BeanDevice®*** is power off	***Network Led*** flashes one time in **RED**
The ***BeanDevice®*** starts successfully a Network association	***Network Led*** flashes slowly in **GREEN**
The ***BeanDevice®*** transmits a data to the BeanGateway®	***Network Led*** flashes quickly in **GREEN**
The ***BeanDevice®*** fails to start a Network association	***Network Led*** flashes one time in **RED** and then restart flashing in **GREEN** for a new Network association
The ***BeanDevice®*** fails to transmit a data to the ***BeanGateway®***	***Network Led*** flashes quickly in **RED**
Data acquisition and/or data logging are correctly performed on the ***BeanDevice®***	***Sensor activity Led*** flashes one time in **GREEN**
Data acquisition and/or data logging fails	***Sensor activity Led*** flashes one time in **RED**

2.5.5 Enclosure mechanical drawing

Material type	PUR (Polycarbonate)
Enclosure size (w/o external sensor & antenna) in mm LxlxH	110 x 30 x 34
Impact EN 50 102	IK 08
Protection	IP67

2.5.5.1 BeanDevice® ONE-T

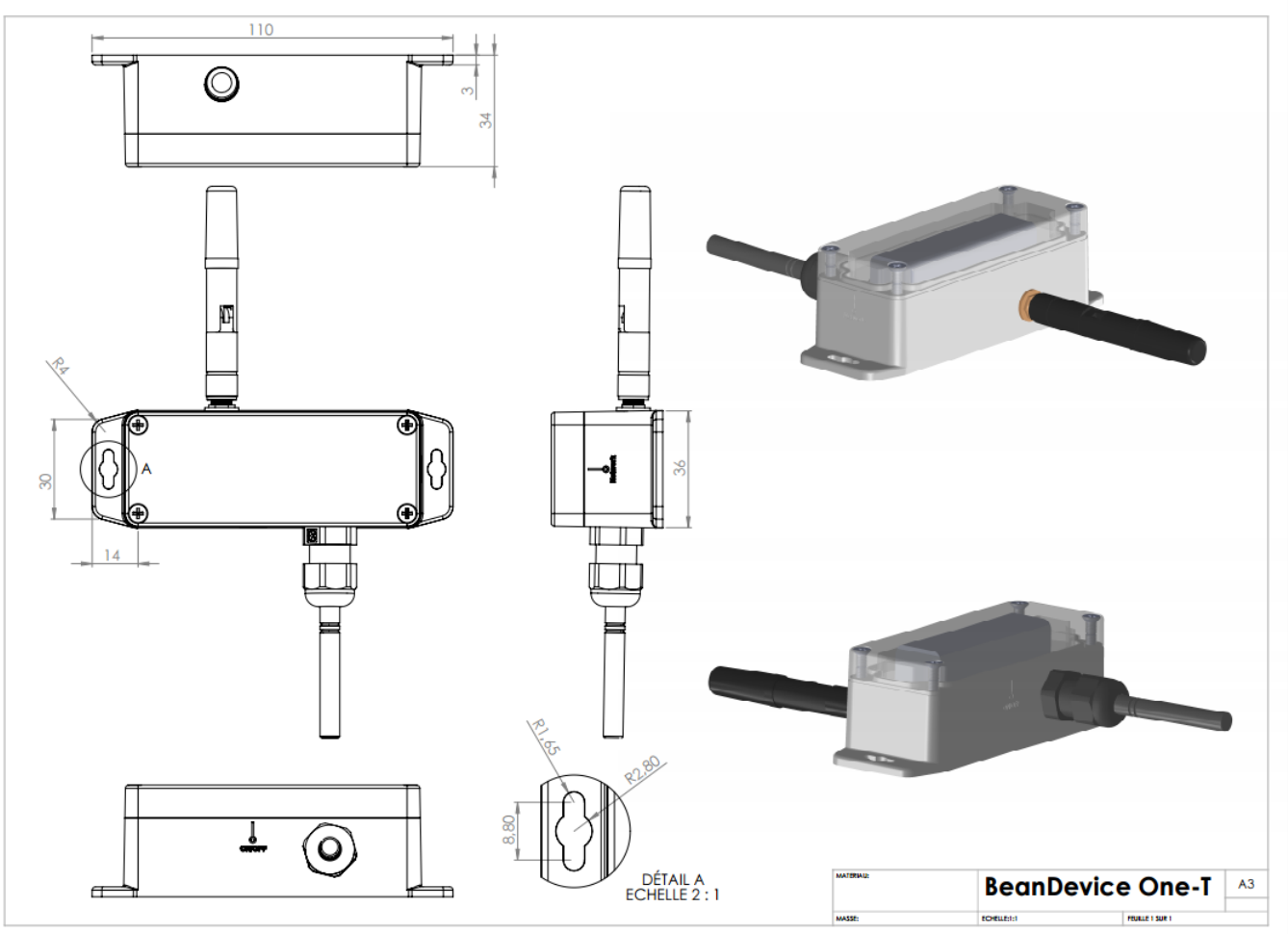


Figure 11: BeanDevice® ONE-T Mechanical drawing

2.5.5.2 BeanDevice® ONE-TIR

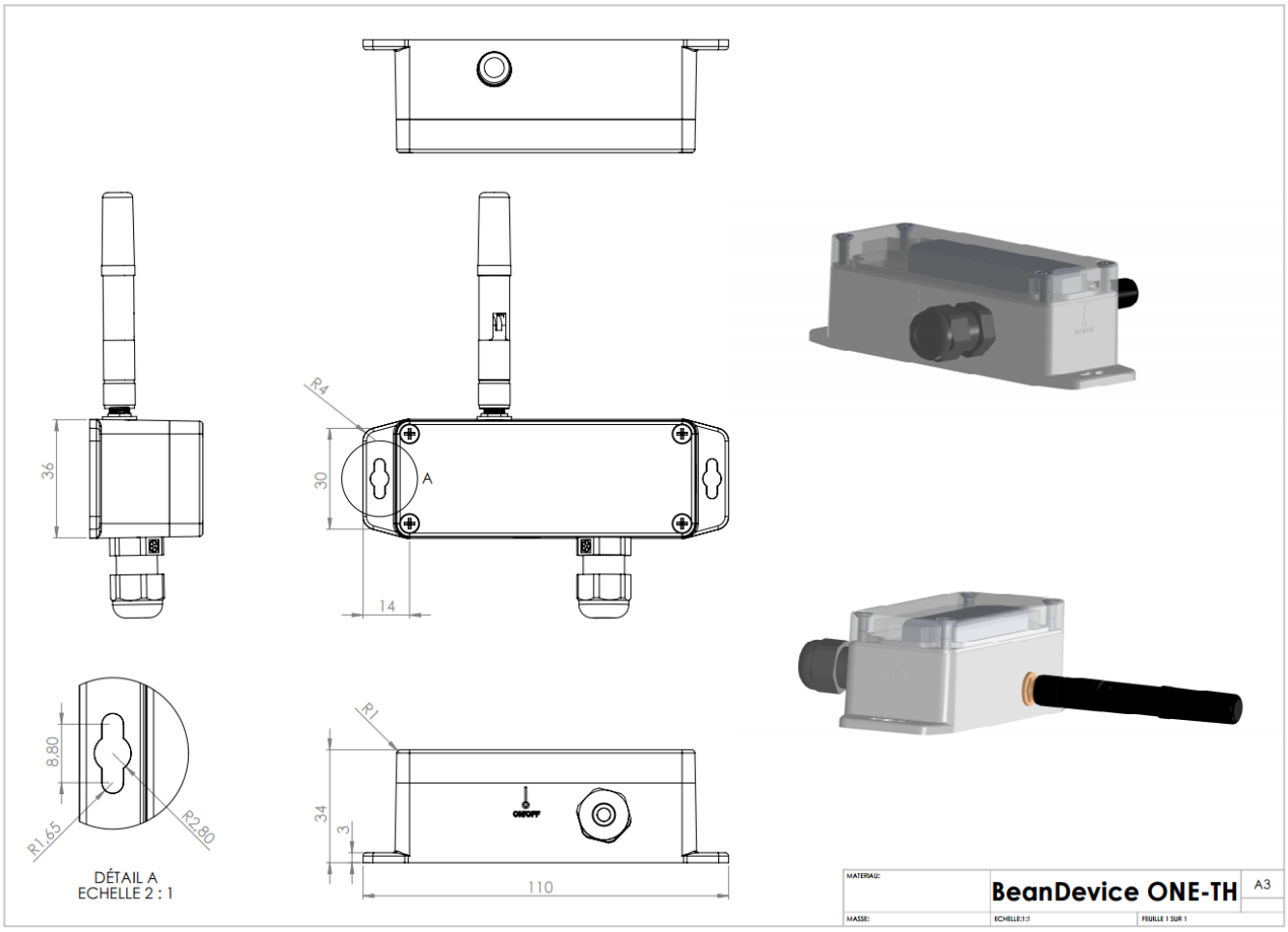
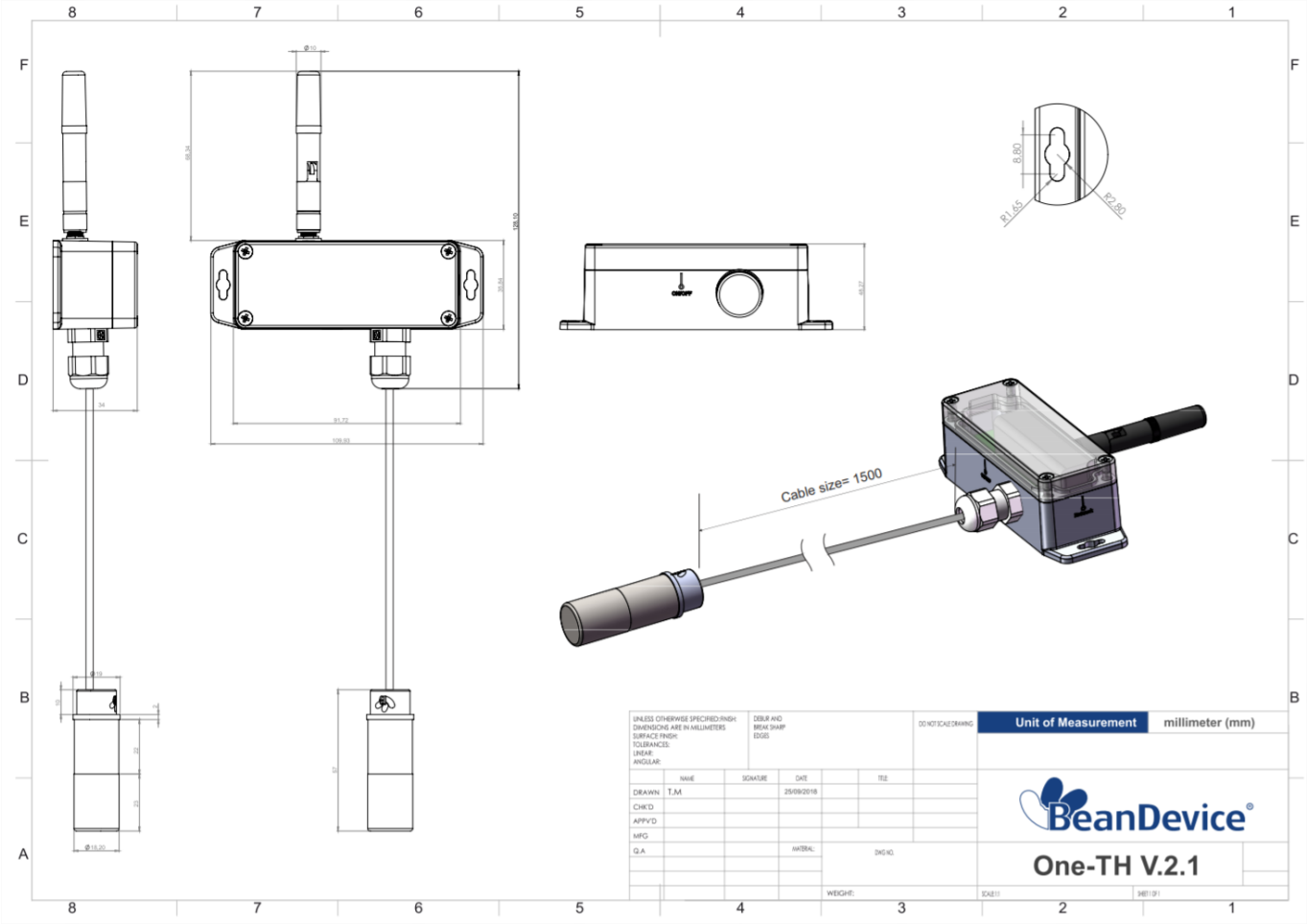


Figure 12 : BeanDevice® ONE-TIR Mechanical drawing

2.5.5.3 BeanDevice® ONE-TH



2.5.6 Antenna specifications

The BeanDevice® Ecosensor range comes with an external omnidirectional antenna.

Figure 13 : Omnidirectional 2.2dBi Antenna

RF Properties	Value	Unit	Tol.
Frequency range	2400 … 2500	MHz	
VSWR	1.5		max
Impedance	50	Ω	
Peak Gain	2.8	dBi	Typ.
Average Gain	2.2	dBi	Typ.

Table 1 : Antenna Specifications table

During BeanDevice® installation, test several orientations of the antenna in order to get best wireless link quality.

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"

2.6 BEANDEVICE® POWER SUPPLY

The BeanDevice® ONE-TH/ONE-T/ONE-TIR is power supplied by a Lithium-thionyl chloride primary cell with a very low leakage current (less than 2%/year)

A primary cell is not a rechargeable battery, don't try to recharge it. You will damage your primary cell and your BeanDevice®.

Primary cell technology	LiSOCl2 (Lithium -thionyl chloride)
Nominal Voltage	3,6V
Nominal capacity	1800 mAh
Size	14.5*33.5mm (AA)
Maximum continuous current	500mA
Maximum pulse current	1A
Type	ER14505M

Table 2 : Primary cell specifications table

List of LiSOCl2 primary cell manufacturer:

Manufacturer	Product Reference
EEMB	***ER14505M***
BIPOWER CORP	
EVE	
Ultralife	

Important Precautions to follow:

- ✓ ***Lithium-thionyl chloride primary cell with a size of AA must be used. Don't try to use another primary cell technology, you will damage your BeanDevice®;***
- ✓ ***Use only the ER14505M battery type with the "M" extension for high power management;***
- ✓ ***Primary cell is not a rechargeable battery. Don't try to recharge a primary cell; you will damage your BeanDevice®.***

3. BEANDEVICE® INSTALLATION GUIDELINE

3.1 POWERING ON YOUR BEANDEVICE®

The BeanDevice® ONE includes a reed switch that allows switching ON or OFF the wireless sensor. The device could be powered ON by hovering the magnet on the ON-OFF label.

This technology allows you to power on your BeanDevice® instantly and without any physical contact between the magnet and the BeanDevice® enclosure.

Powering ON your BeanDevice® ONE is very simple:

1. Please make sure that your ***BeanDevice® ONE-T/ONE-TIR/ONE-TH*** is provided with a magnet (the magnet is provided in another box separated from the BeanDevice®)

Figure 14: Powering ON/OFF the BeanDevice®

2. As shown in the picture below, hover your magnet slowly above the ON-OFF label for about 2 seconds, your BeanDevice® turns on automatically. The LED light illuminates *GREEN*. You can hold your magnet position diagonally or in parallel to your device label.

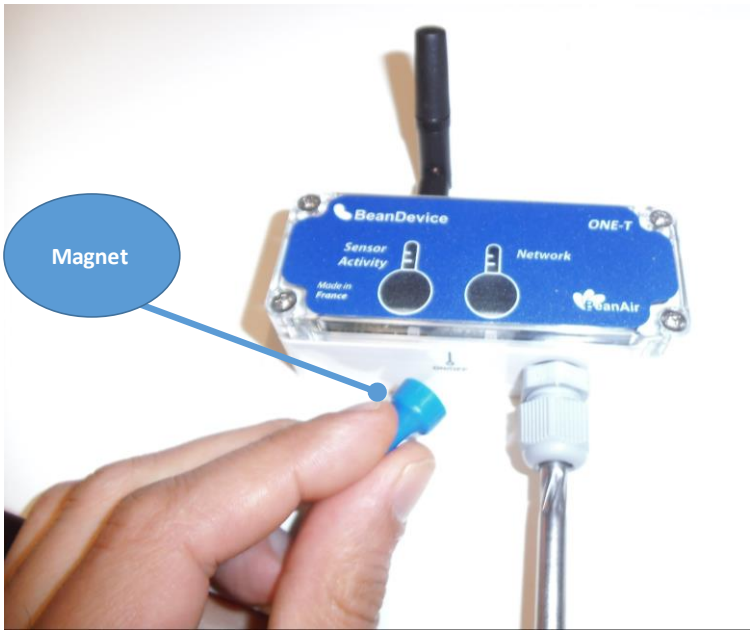


Figure 15: Using Magnet to Power ON/OFF

3. Repeat the same process to Power OFF your BeanDevice®. The LED illuminates in RED. Your BeanScape will specify that the device is no longer active.

3.2 PRIMARY CELL REPLACEMENT

Located inside the BeanDevice® enclosure, the primary cell provides the BeanDevice® power supply. The self-discharge rate is very low on a primary cell (2% / year).

The BeanScape® displays the battery charge level, if it is in low state you will need to change the battery as follows.

Step n°1: Open the BeanDevice® casing

- Power down your BeanDevice®
- Use a Philips screwdriver with the right size
- Unscrew the cover

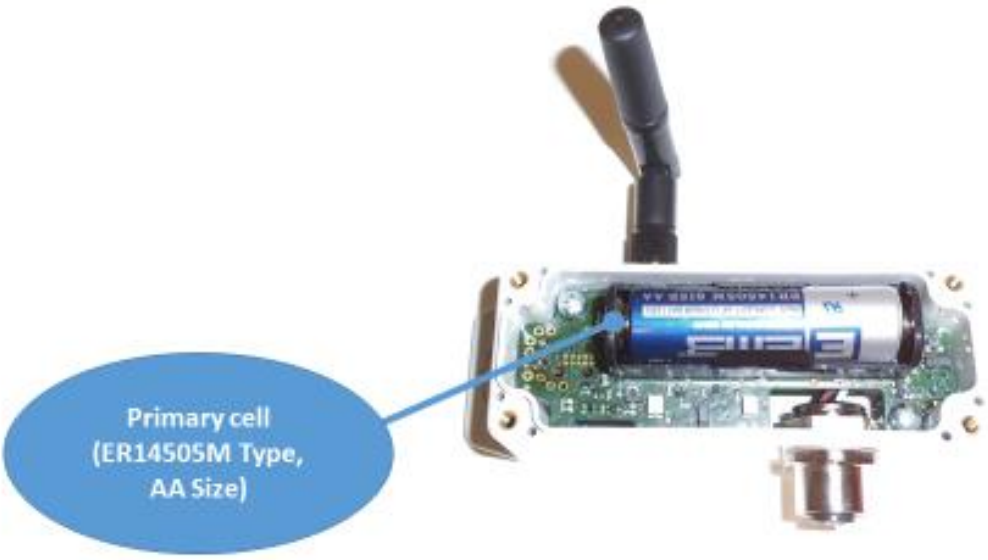


Figure 16: AA size Primary Cell

Step n°2: Primary cell replacement

- Remove the primary cell from the battery holder
- Replace the primary cell. Follow the electrical polarity on the battery holder(see picture)
- Close the cover

3.3 BEANDEVICE® NETWORK ASSOCIATION

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

3.4 DATALOGGER FUNCTION

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

3.5 OTAC (OVER-THE-AIR-CONFIGURATION) PROCESS

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

3.6 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"

3.7 OPERATING TEMPERATURE

The table below shows the BeanDevice® operating temperature:

Operating temperature
-40°C to +75 ° C

BeanDevice® 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), ...

3.8 MECHANICAL MOUNTING

The BeanDevice® ONE-XX enclosure can be easily mounted to the wall through 2 mounting holes provided on the back of the box.

The diameters of these holes are 4.2mm respectively.

3.9 FACTORY SETTINGS

If desired, the user can perform a Network context deletion. It allows to restore default parameters on the BeanDevice®:

Parameter	
Power Mode	*Sleep*
Data Acquisition duty cycle	*2 minutes*
Data Acquisition mode	*LowDutyCycle*

To restore these defaults parameters, you must perform a *Network context deletion*. The “Network” non-contact button is outside the product. Hold the magnet on the button network ("Network") for more than 2 seconds.

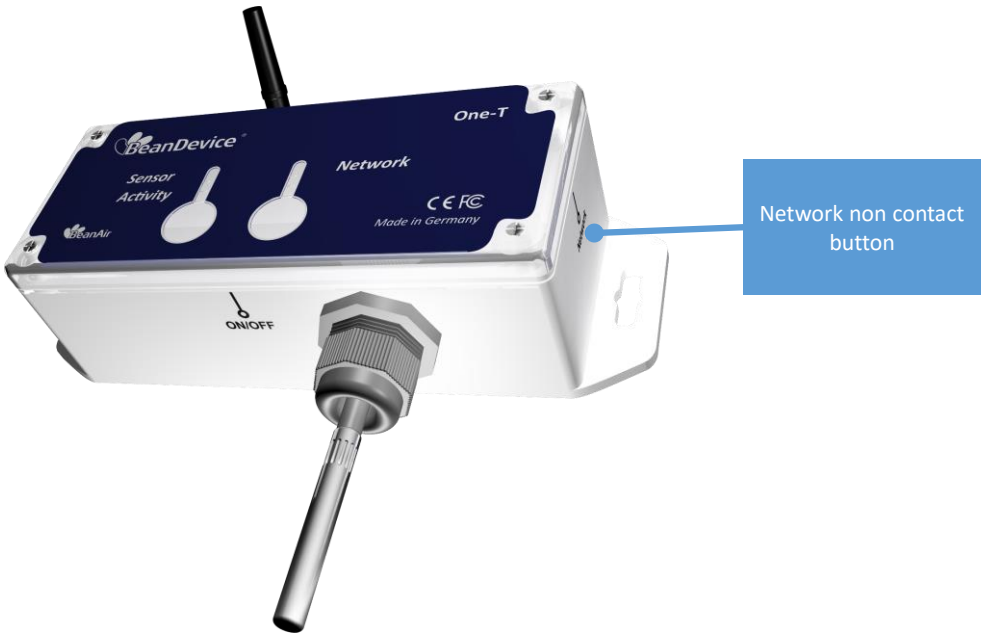


Figure 17: Network Reset button

4. BEANDEVICE® SUPERVISION FROM THE BEANSCAPE

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

4.1 STARTING THE BEANSCAPE®

The 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.*

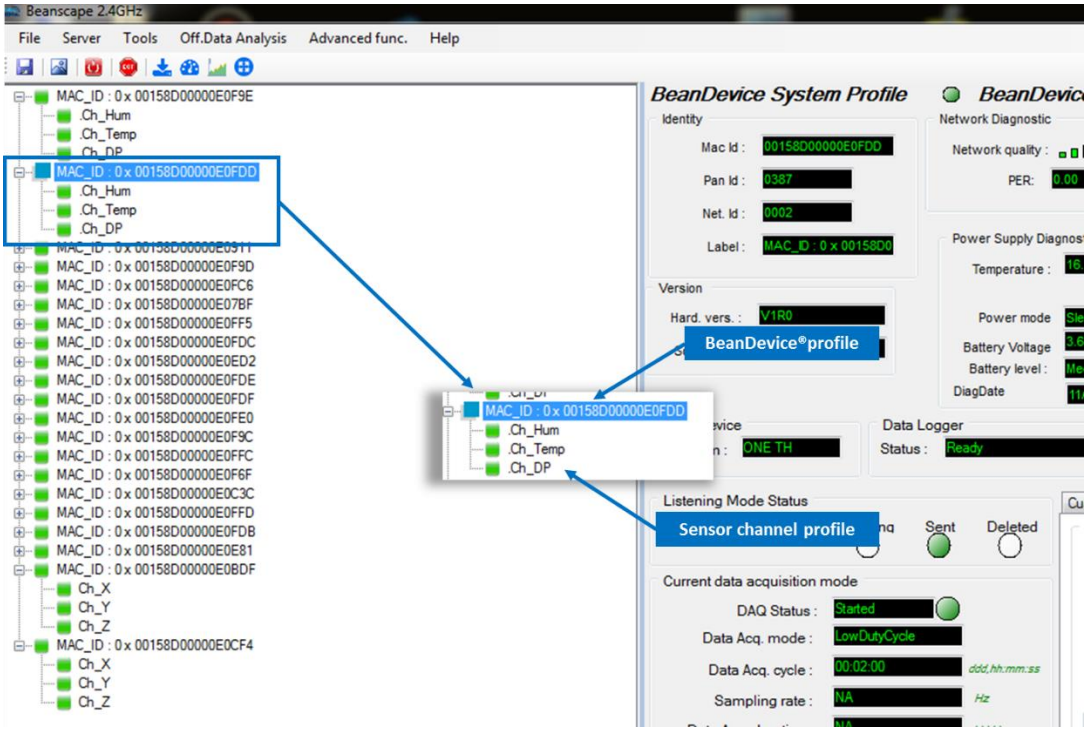
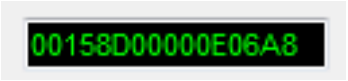


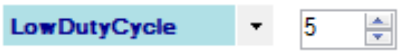
Figure 18: BeanDevice® display on BeanScape®

The user interface is organized as follow:

- Green on black background are displaying information



- Black on white background and Dark blue on light blue 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

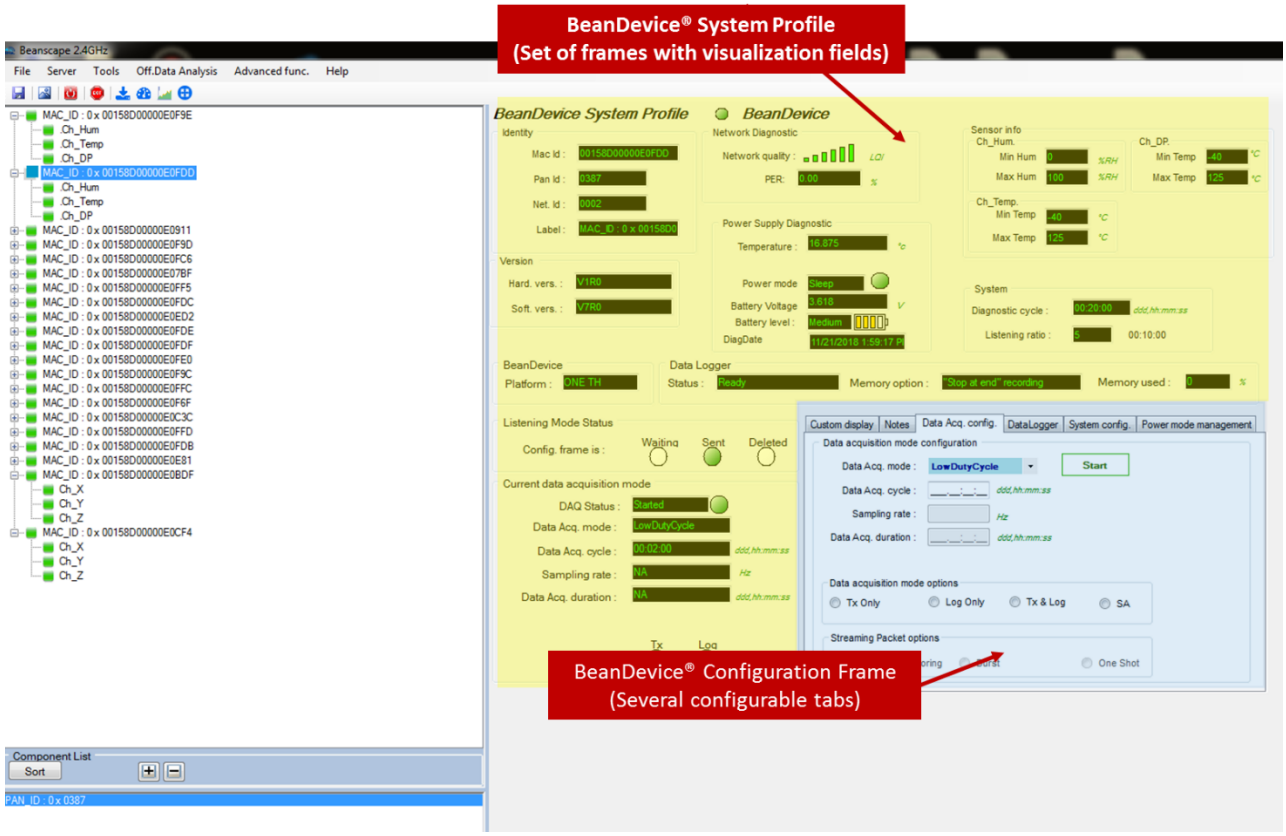


Figure 19: Overview: BeanDevice® System Profile on BeanScape®

4.2 BEANDEVICE® STATUS INFORMATION

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

4.2.1 Frame: Identity

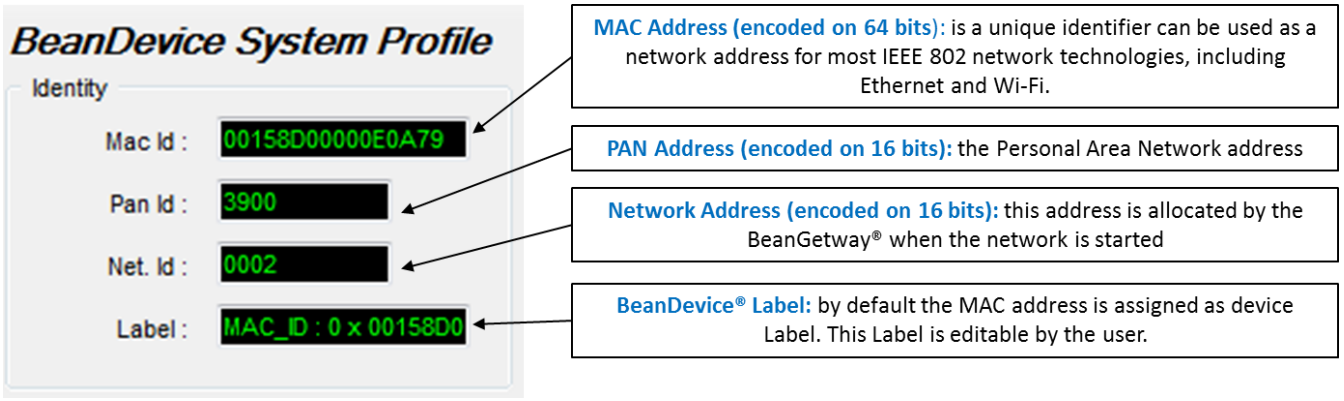


Figure 20: BeanDevice® Identity

How the 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®.

4.2.2 Frame : Wireless Network Diagnostic

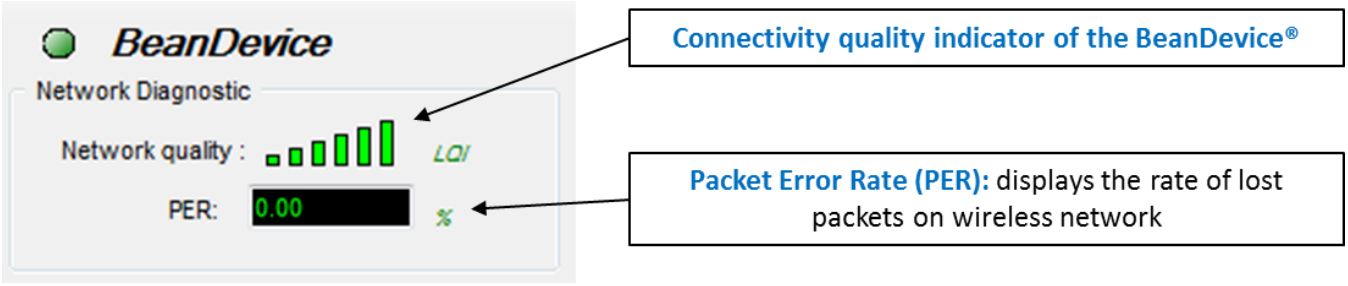


Figure 21: BeanDevice® network-link status

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	Red	medium
to 2 bars	Red	bad

4.2.3 Frame: Power supply diagnostic

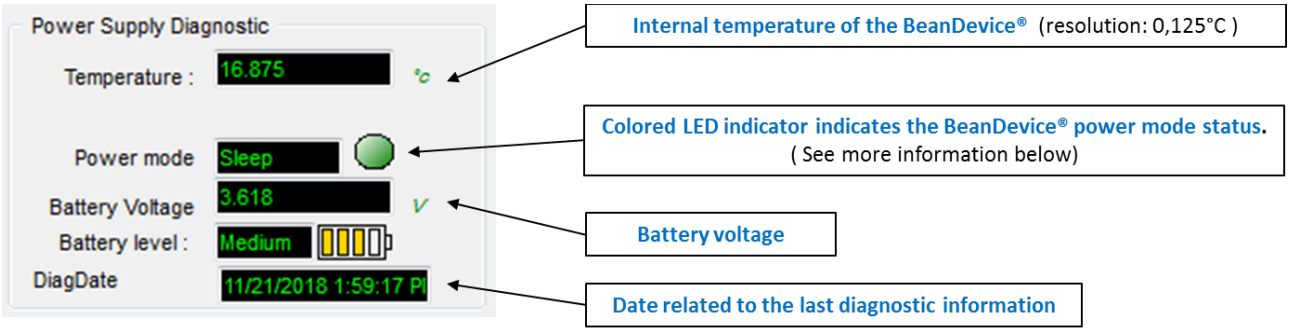


Figure 22: BeanDevice® Power Supply information

The BeanDevice® incorporates an internal temperature sensor:

- ✓ ***Battery temperature monitoring during charging ;***
- ✓ ***Temperature compensation of the analog conditioning chain ;***
- ✓ ***An alarm notification is send to the BeanGaeway® if the internal temperature is anormally high ;***

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

If your primary cell charge level is low, it is highly recommended to recharge your battery. Your BeanDevice® from SmartSensor product lines integrates a battery charger.

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

When using the Streaming mode or the S.E.T mode, BeanScape® stops to display the full Battery health status information on the Power Supply Diagnostic frame until stopping the acquisition.

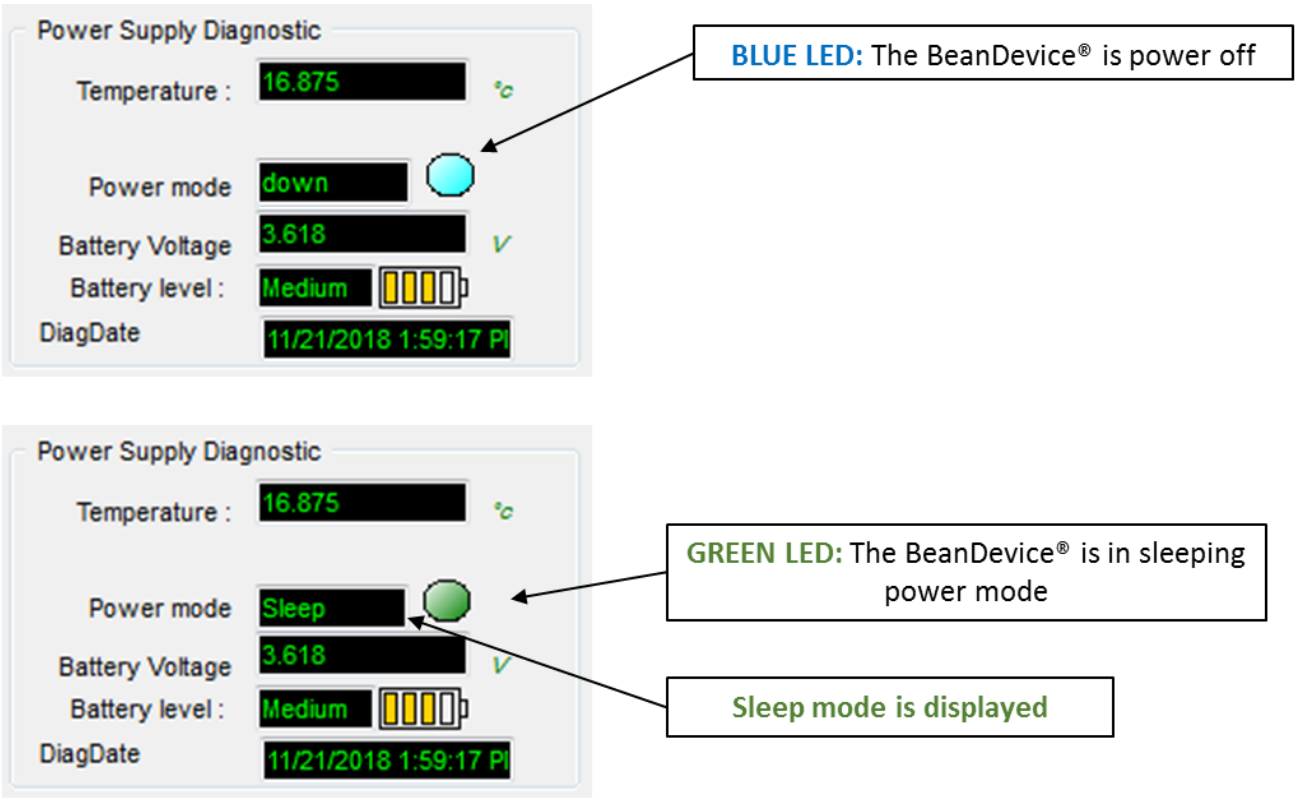


Figure 23:BeanDevice® Power modes

4.2.4 Frame : System

Figure 24: BeanDevice® Diagnostic cycle information

* The diagnostic cycle is a regular period during which the system collects information about the BeanDevice® (battery charge status, internal temperature, LQI, PER ..).

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.

4.3 FRAME : BEANDEVICE®

According to the BeanDevice® version, the information displayed in the frame will not be the same. For example (BeanDevice® ONE-TH):

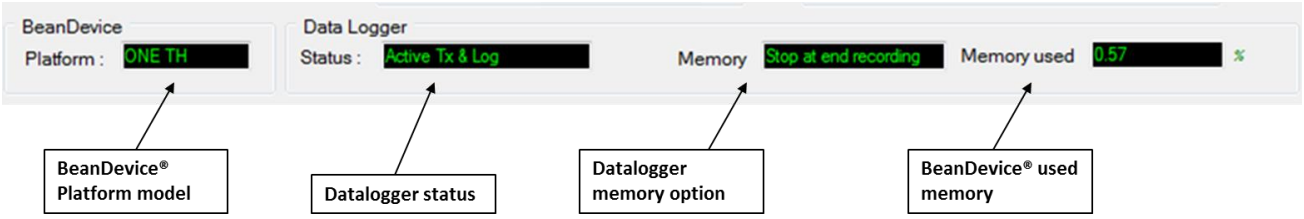


Figure 25: Frame BeanDevice® on BeanScape®

4.3.1 Frame: Product Version

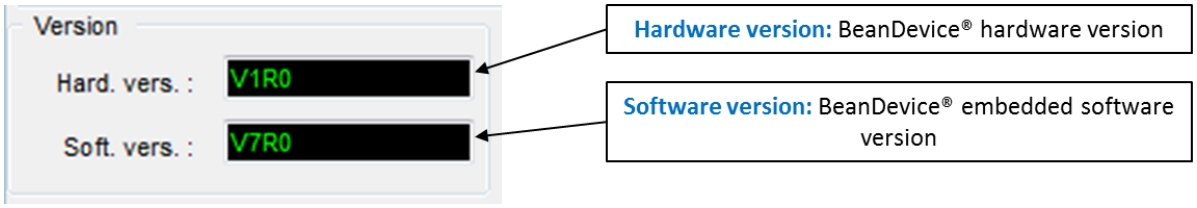


Figure 26: BeanDevice® Product version frame

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 having material or software dysfunction.

4.3.2 Frame: current data acquisition mode

This frame displays the current data acquisition mode :

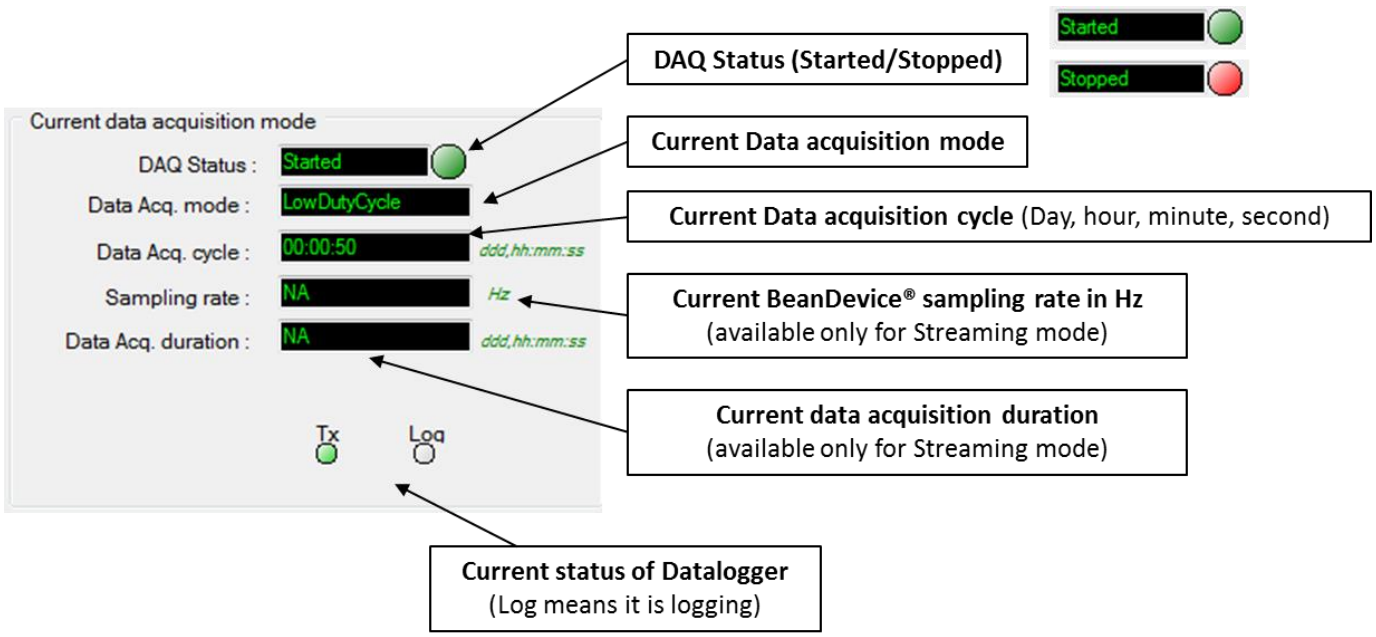


Figure 27: Frame: Current data acquisition mode

4.4 MAIN SETTINGS

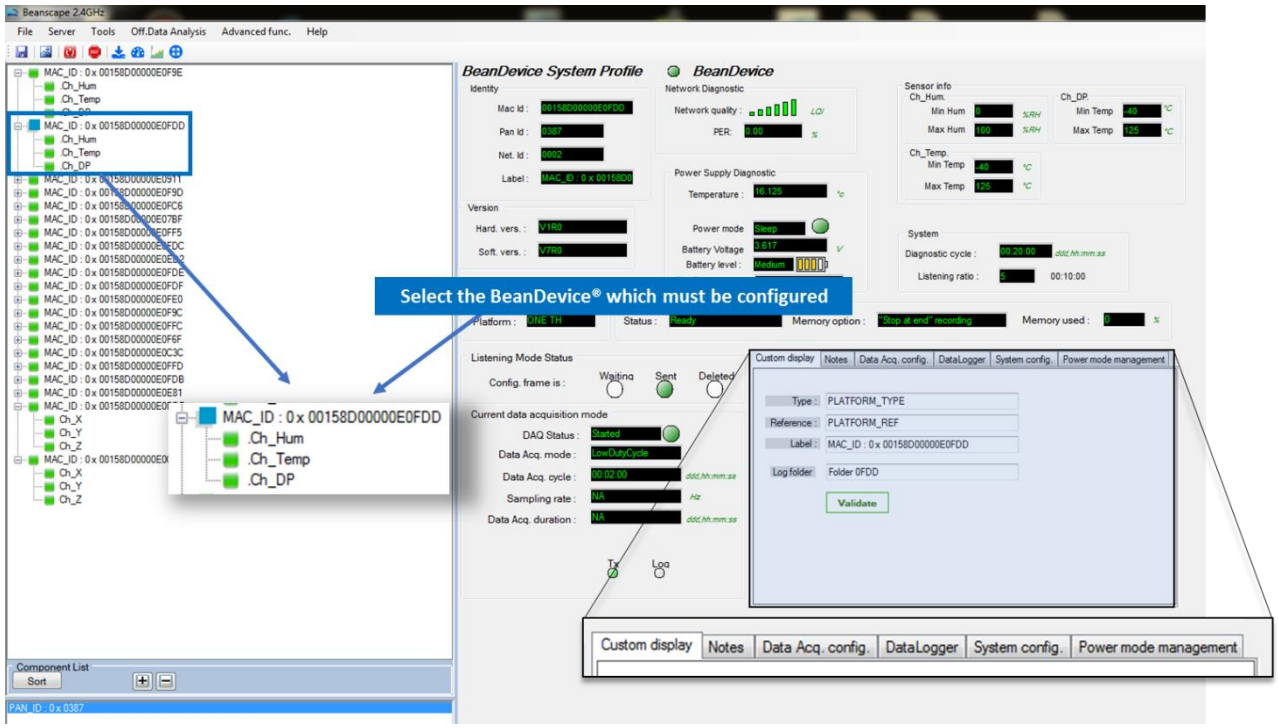


Figure 28: BeanDevice® configuration frame

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 mode configuration	Configure the data acquisition mode, set the acquisition cycle, enable/disable the data logger function.
Data logger	Data logger function on the BeanDevice®
System configuration	Diagnostic cycle and the TX Power
Power Mode Management	Configure the Power Mode (Sleep)

4.4.1 Tab: Custom Display

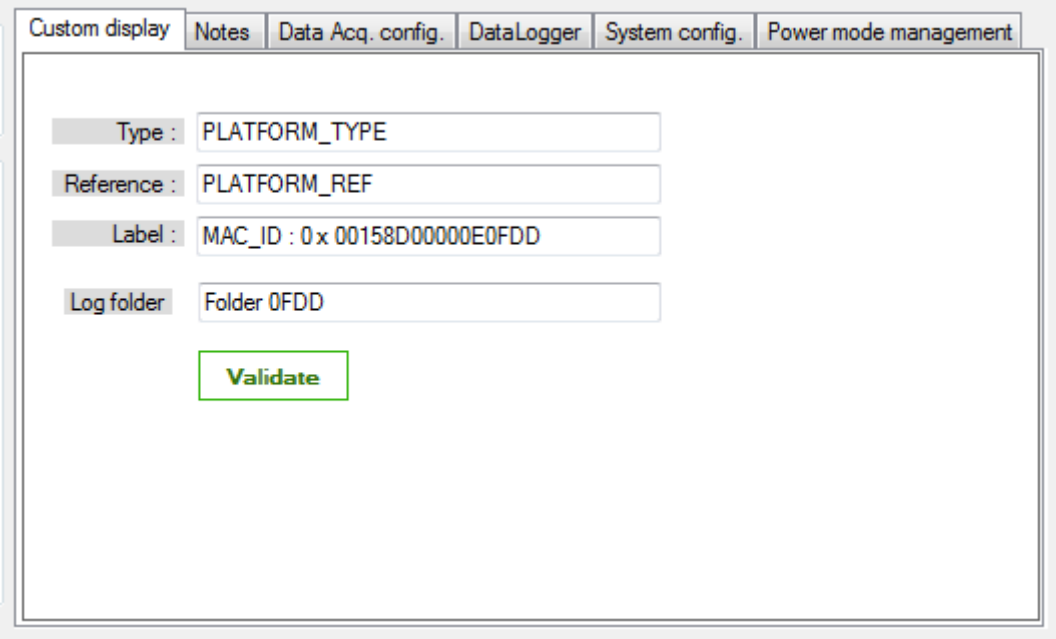


Figure 29: BeanDevice® custom display tab

Parameter	Description
Type	Enter here the type of BeanDevice® you want to use
Reference	Assign an internal reference to the BeanDevice®
Label	Assign any sort of Label to your BeanDevice®. Therefore, the user can easily associate the BeanDevice® with its equipment (example: Room_N521_Second_Floor)

Then click on "***Validate***" to confirm these new settings.

4.4.2 Tab: Notes

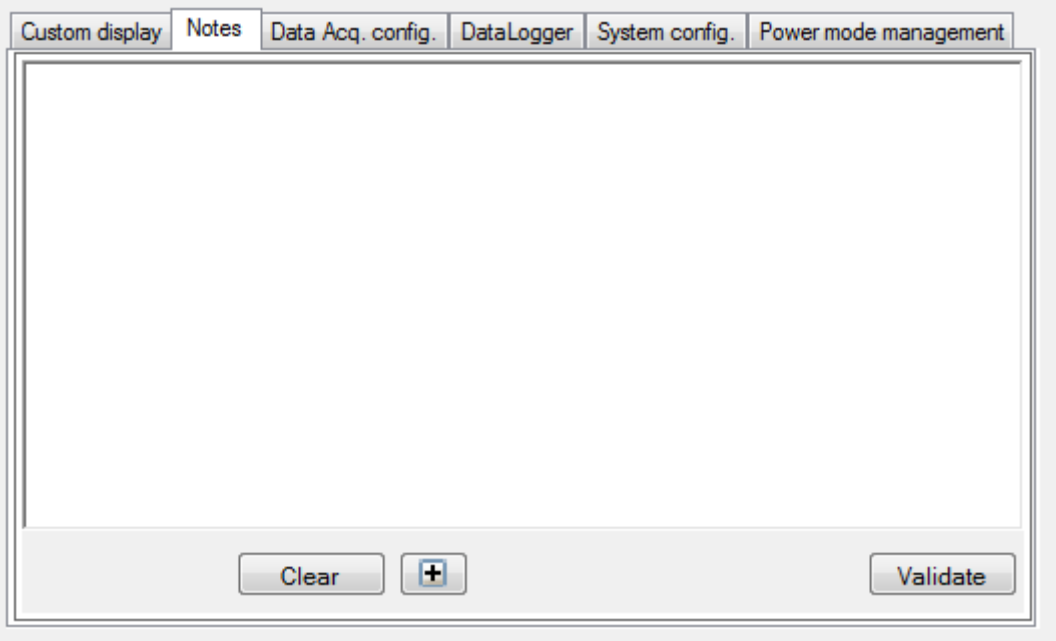


Figure 30: Tab : Notes

This field contains the user notes related to 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.

4.4.3 Tab: Data Acquisition configuration

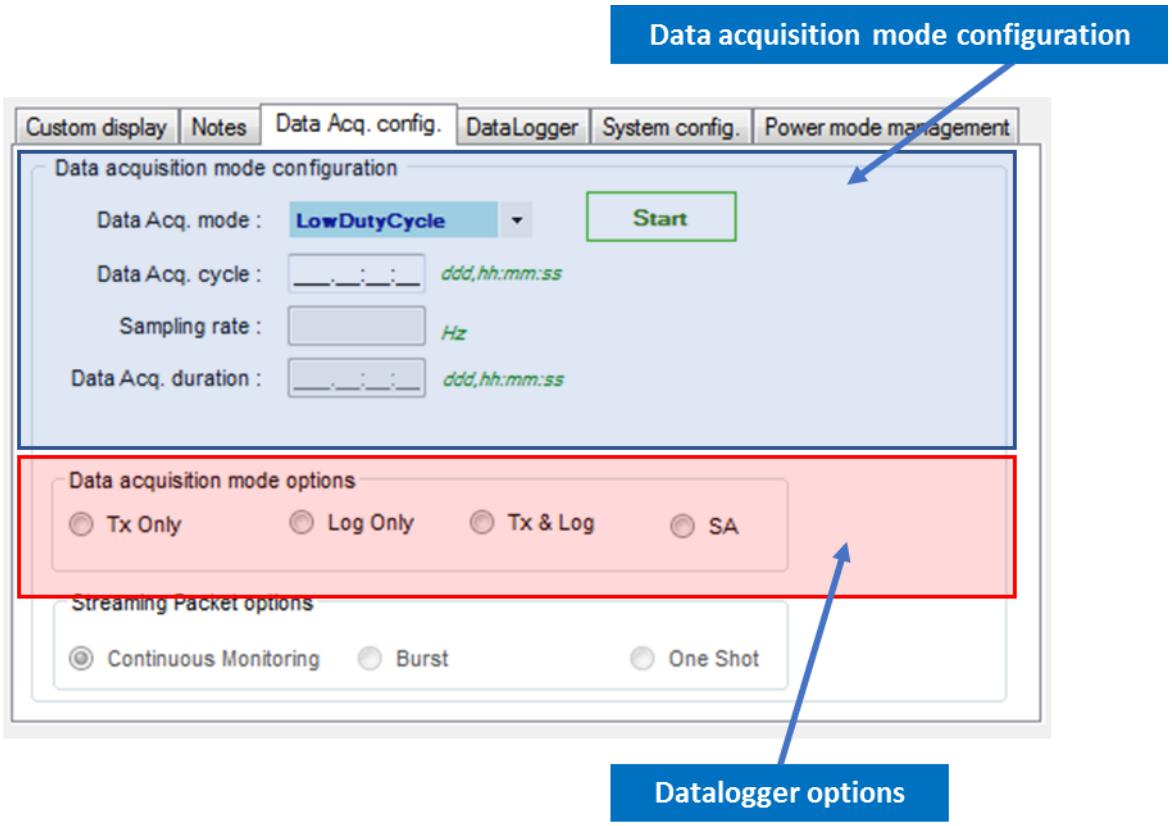


Figure 31: Tab: Data acquisition configuration

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 ▪ Whenever an alarm threshold (fixed by the user) is reached (4 alarm threshold levels High/Low). ▪ A transmission cycle is reached, the transmission cycle is configurable through the BeanScape® 1s to 24h ;

Data acquisition Cycle	Select the Data acquisition cycle between 1s and 24hours. The format is: Day: Hour : Minute :Second
Sampling rate	Not available on Ecosensor product lines
Data acquisition duration	Not available on Ecosensor product lines
Options	***TX only:*** The BeanDevice® transmits the data acquisition without DataLogging ***Log only:*** The BeanDevice® logs the data acquisition without wireless transmission ***TX & Log:*** The BeanDevice® transmits and logs the data acquisition; ***SA: Standalone:*** The BeanDevice® logs the data acquisition without wireless transmission. The BeanDevice stores all the measurements on its embedded datalogger. 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 the new modifications are displayed on "***Current data acquisition mode***" frame:

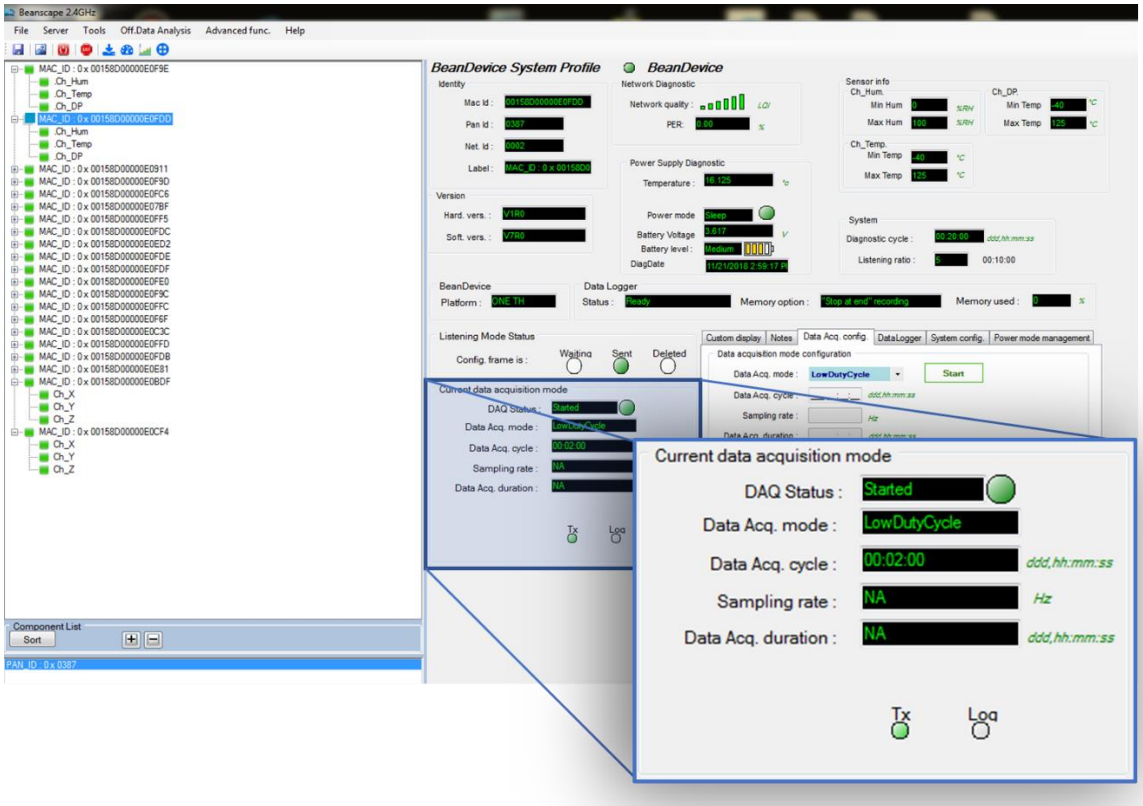


Figure 32: Current data acquisition mode display

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

4.4.4 Tab: DataLogger

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

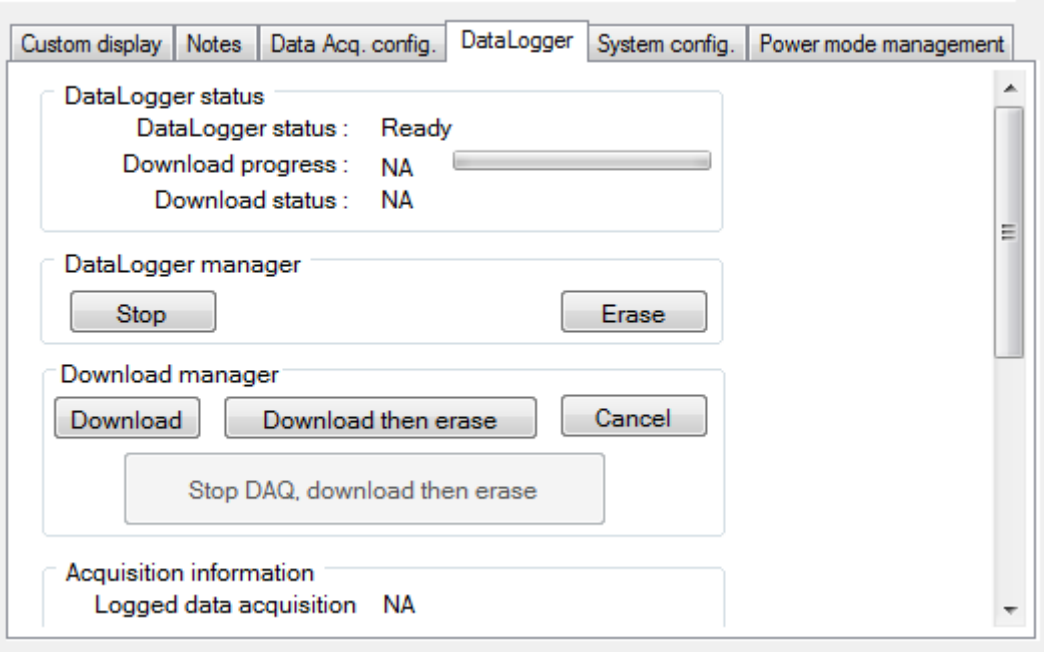
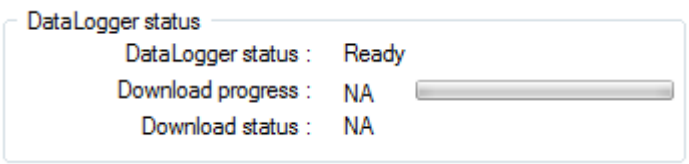


Figure 33: Datalogger Tab

Data logger tab is composed of five different fields:

- ***Datalogger Status***
- ***Datalogger manager***
- ***Download manager***
- ***Acquisition information***
- ***Datalogger memory configuration***

4.4.4.1 Datalogger status



- ***Datalogger status***: Displays loggers status, four status are available:
  - ***Ready***: the Datalogger is ready to register data
  - ***NotInit***: the Datalogger is not initialized;
  - ***Active logs only***: Data acquisition is logged only;

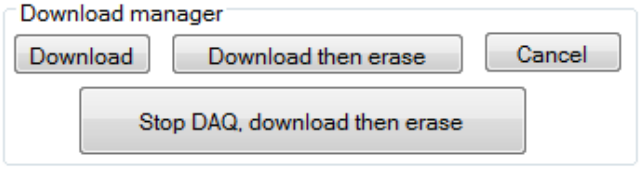
- ***Active TX and Log***: Data acquisition is logged & transmitted by Radio;
- ***Stopped***: Datalogger is stopped;

- ***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;

4.4.4.2 Datalogger manager

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

4.4.4.3 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***.

4.4.5 Tab : System config.

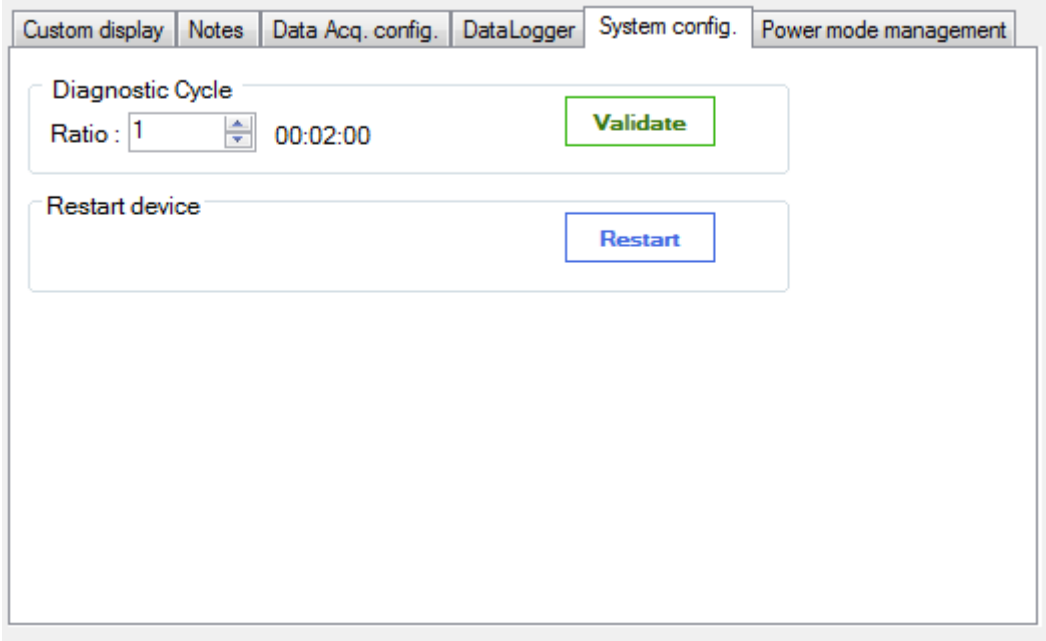


Figure 34: System Configuration Tab

Parameter	*Description*
Diagnostic cycle	You can set the BeanDevice® diagnostic cycle (Battery status, LQI, PER ...). The Diagnostic cycle is modulo the data acquisition cycle. ***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

4.4.6 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 frames:

- ✓ ***Sleep mode configuration:*** Configure the Power mode on your BeanDevice®
- ✓ ***Listening Mode Status:*** Describes the status of an OTAC (Over-the-air-Configuration)
- ✓ ***Sleep power mode:*** Configuration settings for Sleep mode.

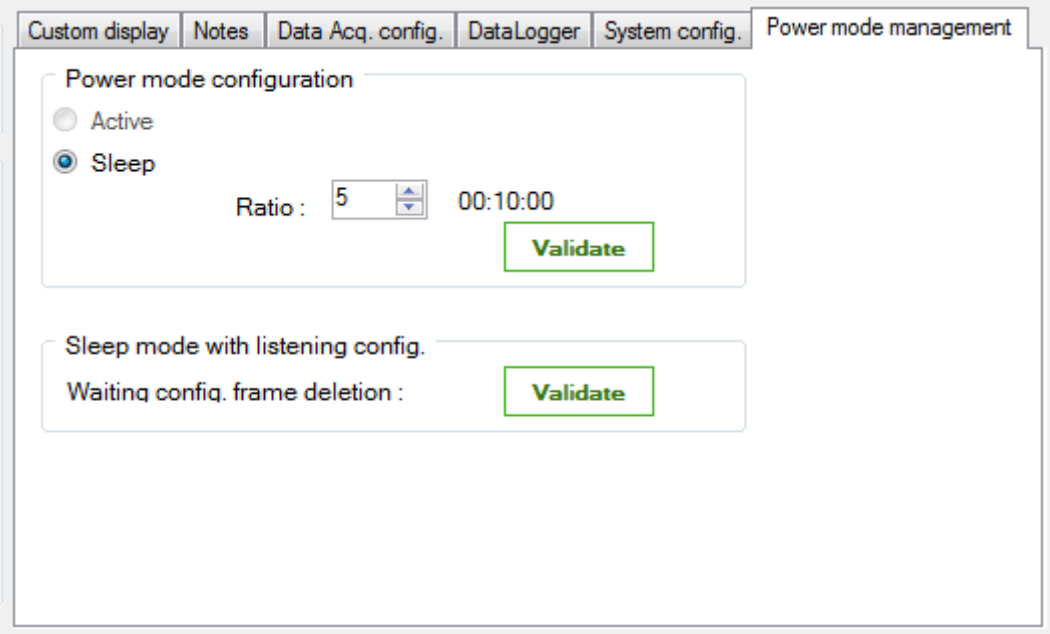


Figure 35: Power Mode Management Tab

Parameter	Description
Power mode configuration	***Active:*** Sleeping mode is disabled. The BeanDevice® operates in Active power mode. ***Sleep:*** Sleep power mode is enabled. ***Ratio***: Fix the Ratio of the listening cycle depending on the data acquisition low duty cycle. *Example*: If the data acquisition is 30 seconds and the ratio is set to 5, the Listening cycle will be 150 seconds (5*30).
Sleep mode with listening Config	By clicking on “validate”, the pending OTAC frame is deleted

4.5 SENSOR CHANNEL PROFILE

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;***

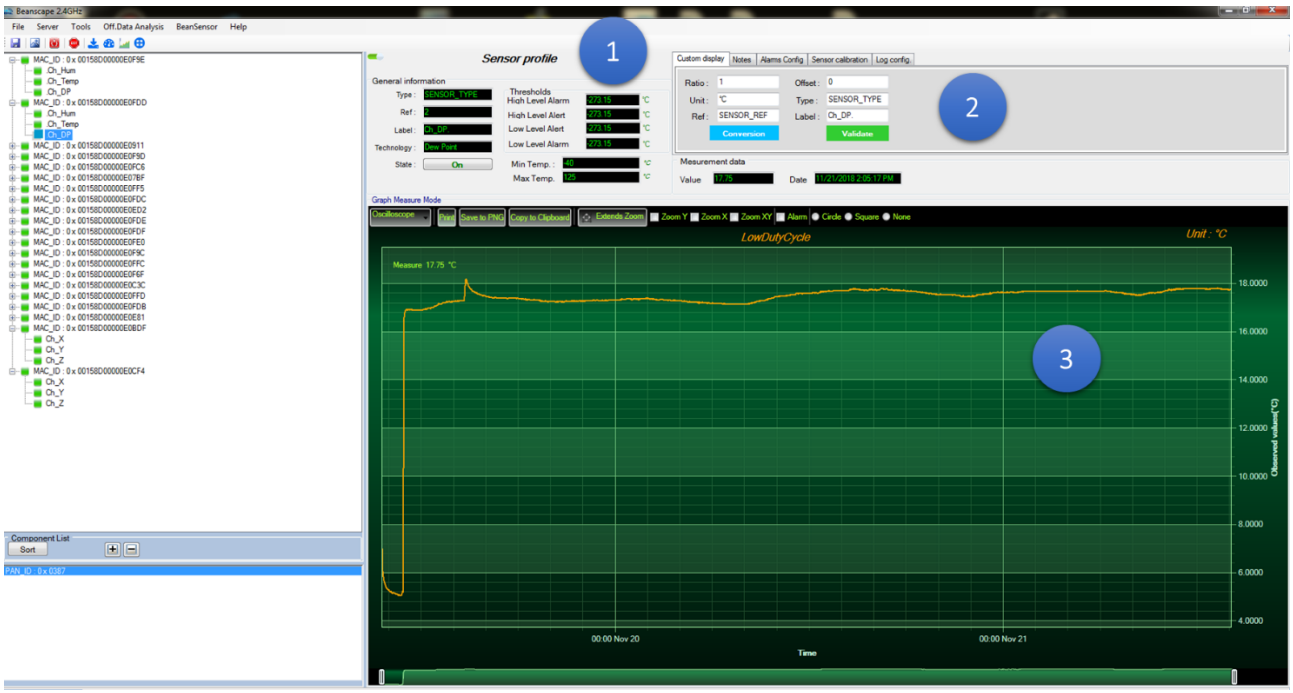


Figure 36: Overview: Sensor channel profile

4.5.1 Sensor channel status

4.5.1.1 General information on Temperature sensor

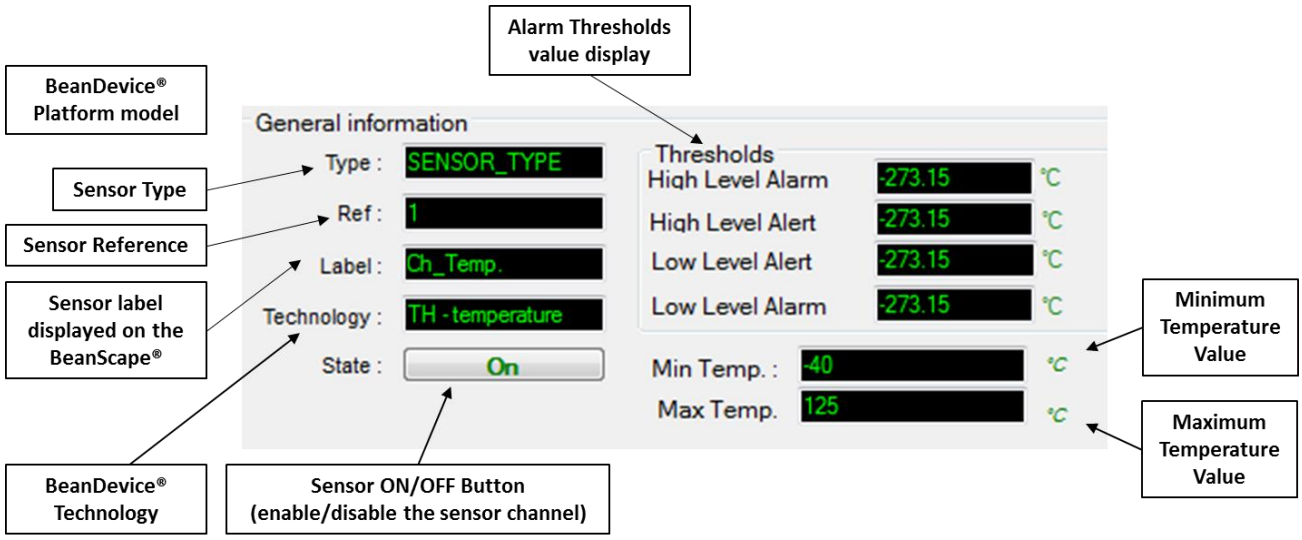


Figure 37: Sensor channel General information frame(BeanDevice® ONE-T)

4.5.1.2 Frame: Measurement data

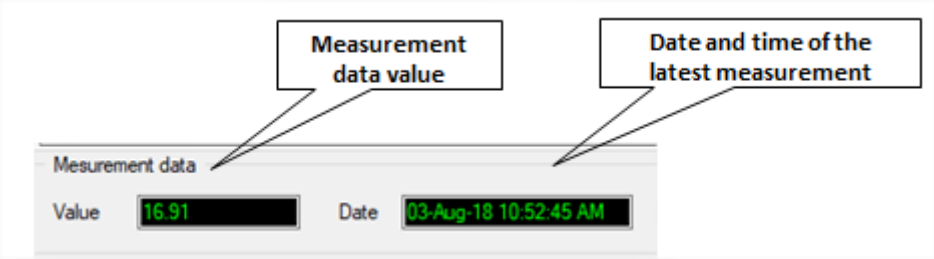


Figure 38: Measurement data frame

By default, sensor unit format is

- ***BeanDevice® ONE-T*** : °C for the temperature sensor
- ***BeanDevice® ONE-TIR*** : °C for IR & ambient temperature sensors
- ***BeanDevice® ONE-TH***: °C for the temperature sensor, %RH for humidity sensor

4.5.1.3 Frame : Alarm threshold

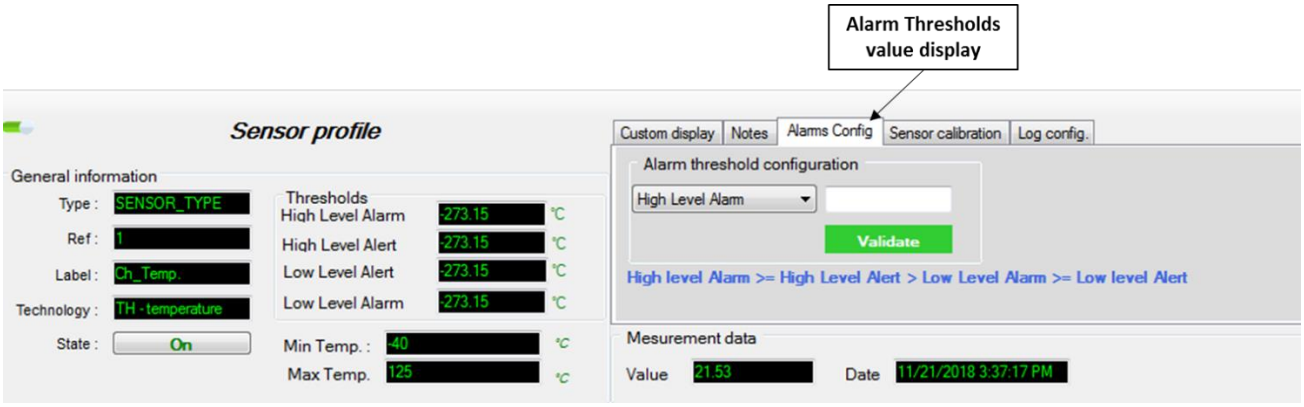


Figure 39: Frame Threshold

Alarm threshold are displayed in this frame:

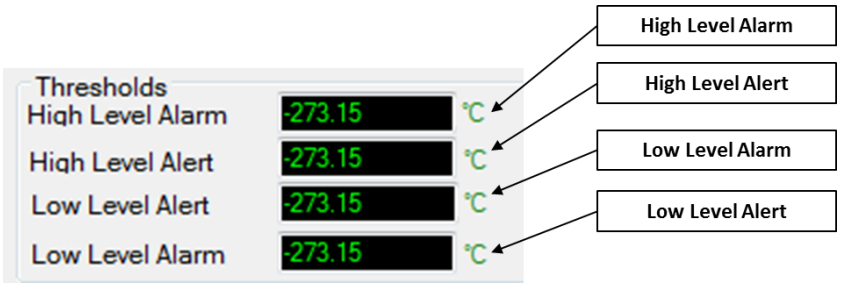


Figure 40: Alarm threshold

Depending on your sensor resolution, the displayed threshold value can differ from the reference value.

4.5.2 Sensor configuration & calibration frame

This frame contains a set of 5 tabs:

Custom Display	• Allows the end user to customzie the sensor
Notes	• Contains notes relating to the BeanDevice® sensor
Configuration	• Sensor configuration interface. The user can configure the alarm thresholds related to the sensor • Depending on the BeanDevice® version which is used, other configuration parameters are available
Measurement conditionning & calibration	• Sensor or measurement channel calibration
Log configuration	• Logs configuration on the BeanScape®

4.5.2.1 Tab: Custom display

These parameters allow the user to customize his sensor:

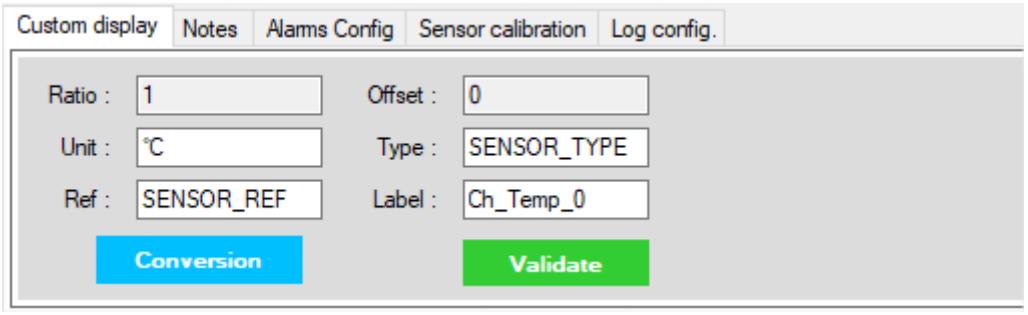


Figure 41: Sensor channel custom display tab

- ***Type***: Describe the sensor type (ex: load cell, pressure, Strain gage +/- 2 Mv/v, LVDT,….)
- ***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.

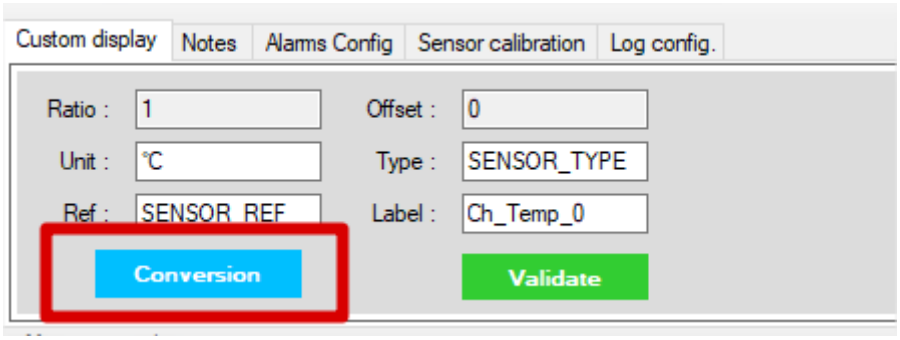
Converted Measurement[°F] = Measurement[°C] x RAT + OFF

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.

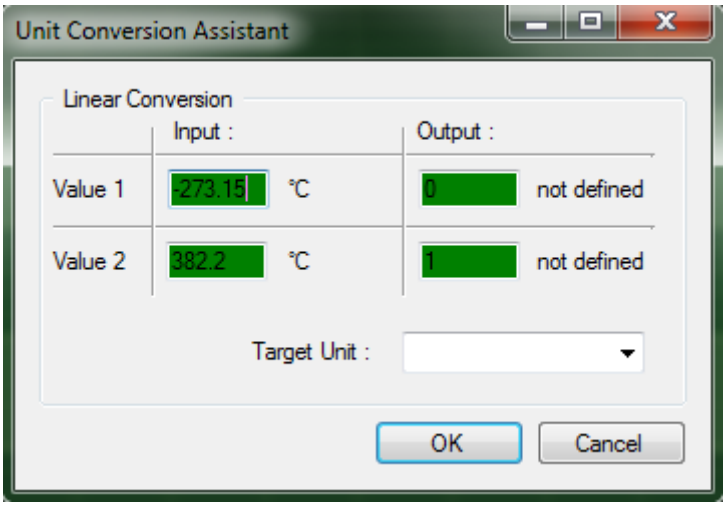


Figure 42: Unit Conversion Assistant

4.5.2.2 Tab : Notes

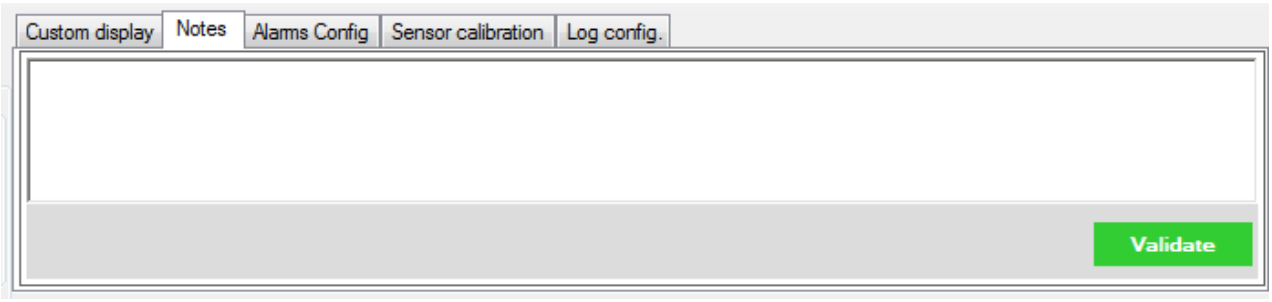
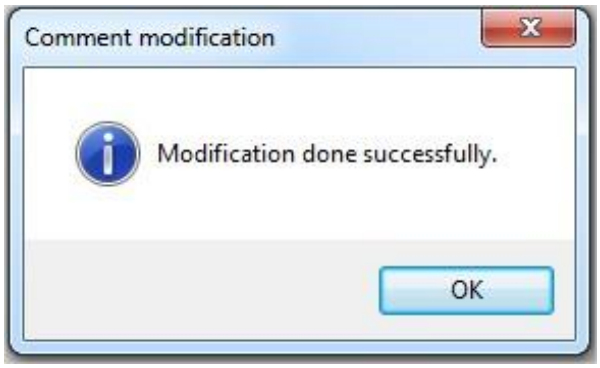


Figure 43: Sensor channel notes tab

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 backup your text click on the icon "Backup your Database" 

4.5.2.3 Tab: Alarm Configuration

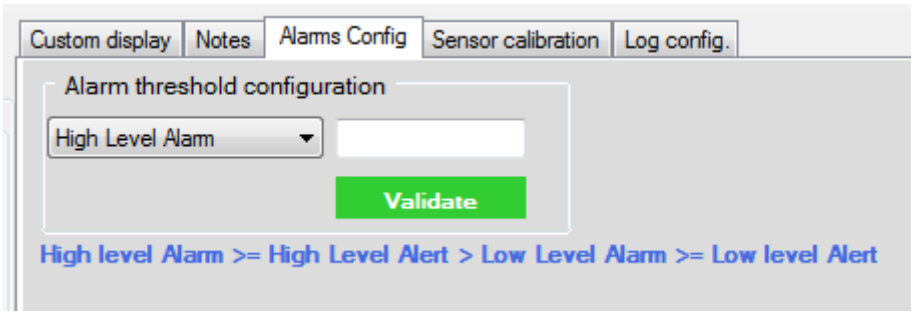


Figure 44: Alarm configuration tab

Parameter	Description
Alarm threshold	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 ; ✓ If the sensor value is higher than High level alarm/High level alert, notification is send to the BeanGateway/BeanScape; ✓ If the sensor value is lower than Low level alarm/Low level alert, notification is send to the BeanGateway/BeanScape. Threshold values must be organized in this manner: High level alarm >=High level alert > Low level alarm >= Low level alert

For further information about the alarms threshold configuration, please read the technical note ponse[TN_RF_008 – "Data acquisition modes available on the BeanDevice®"]

4.5.2.4 Tab : Sensor & Analog conditioning calibration

These coefficients are used to calibrate the ***external sensors (temperature, IR Temperature, Humidity….)*** sensor.

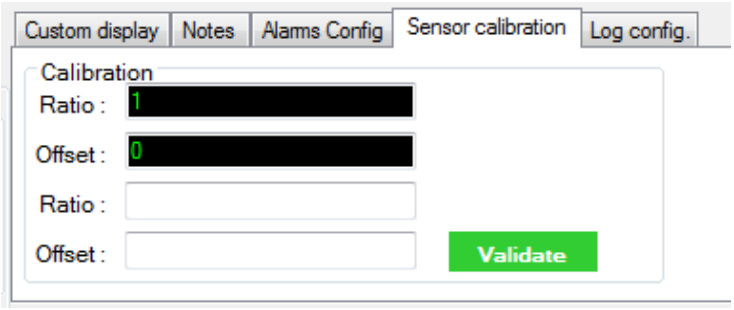


Figure 45: Sensor calibration tab

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

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

$$Calibrated\_value = (Ratio \times Non\_Calibrated\_Value) + Offset$$

Enter the calibration coefficients and then click on Validate.

The calibrations coefficients are backed up 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.

4.5.2.5 Tab: Log configuration

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

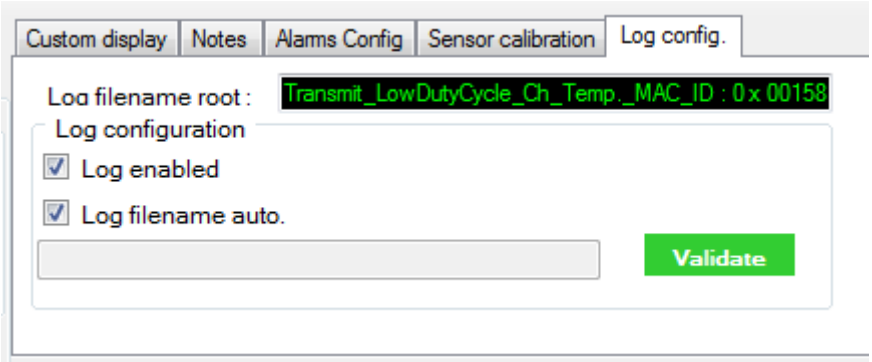


Figure 46: Log configuration tab

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

4.5.3 Graphical display

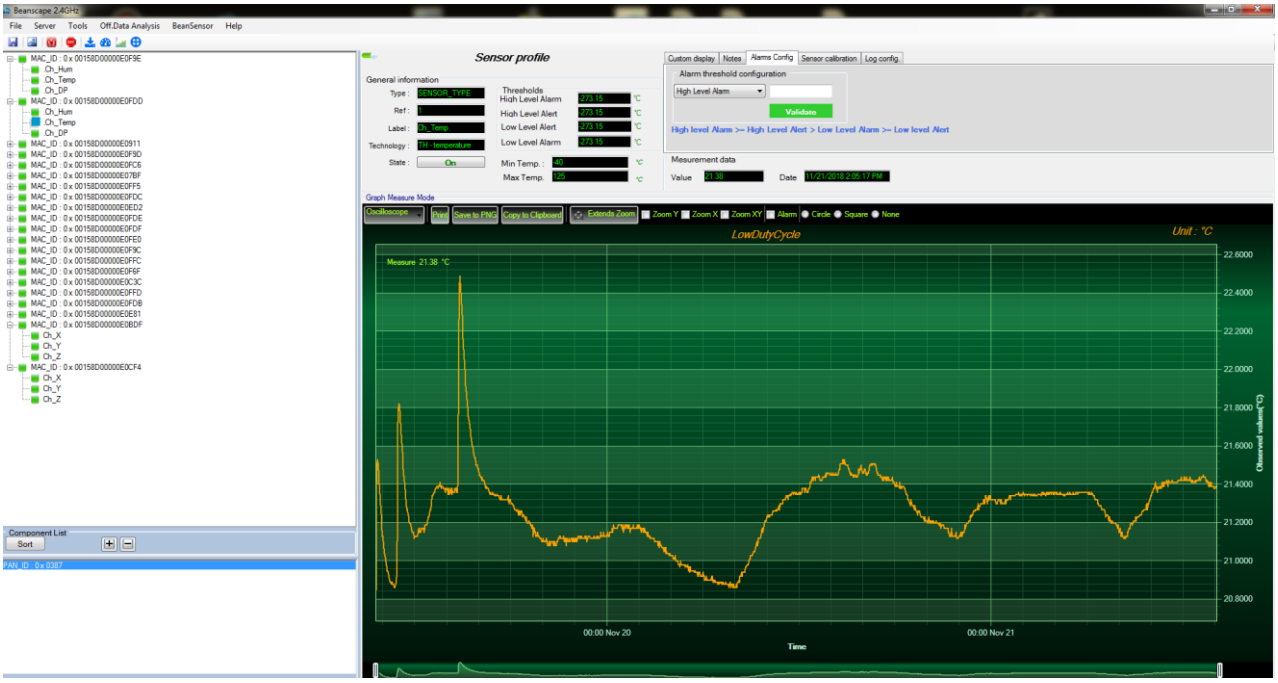
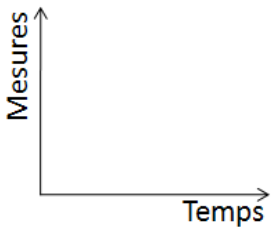


Figure 47: Channel acquisition graph visualization

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.

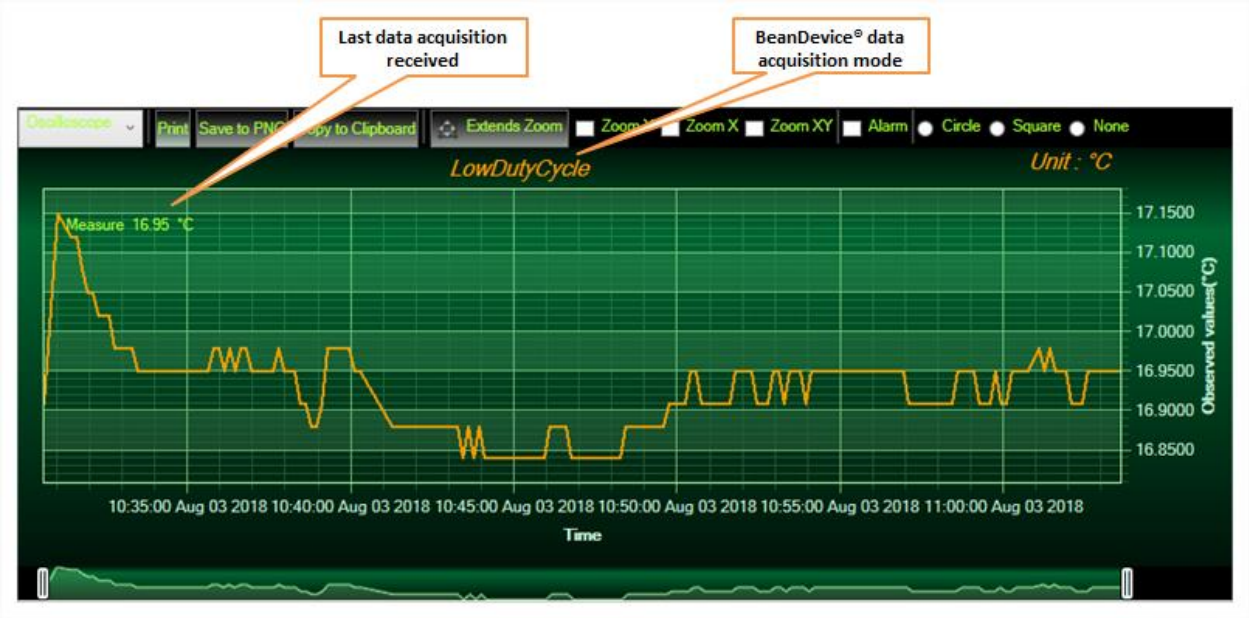


Figure 48: Example: Graph visualization

4.5.3.1 Frame: Display

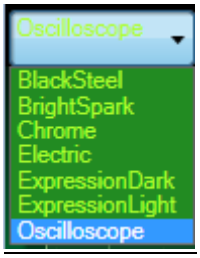
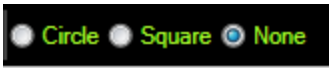


Figure 49: Graph measure mode: Frame Display

4.5.3.2 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

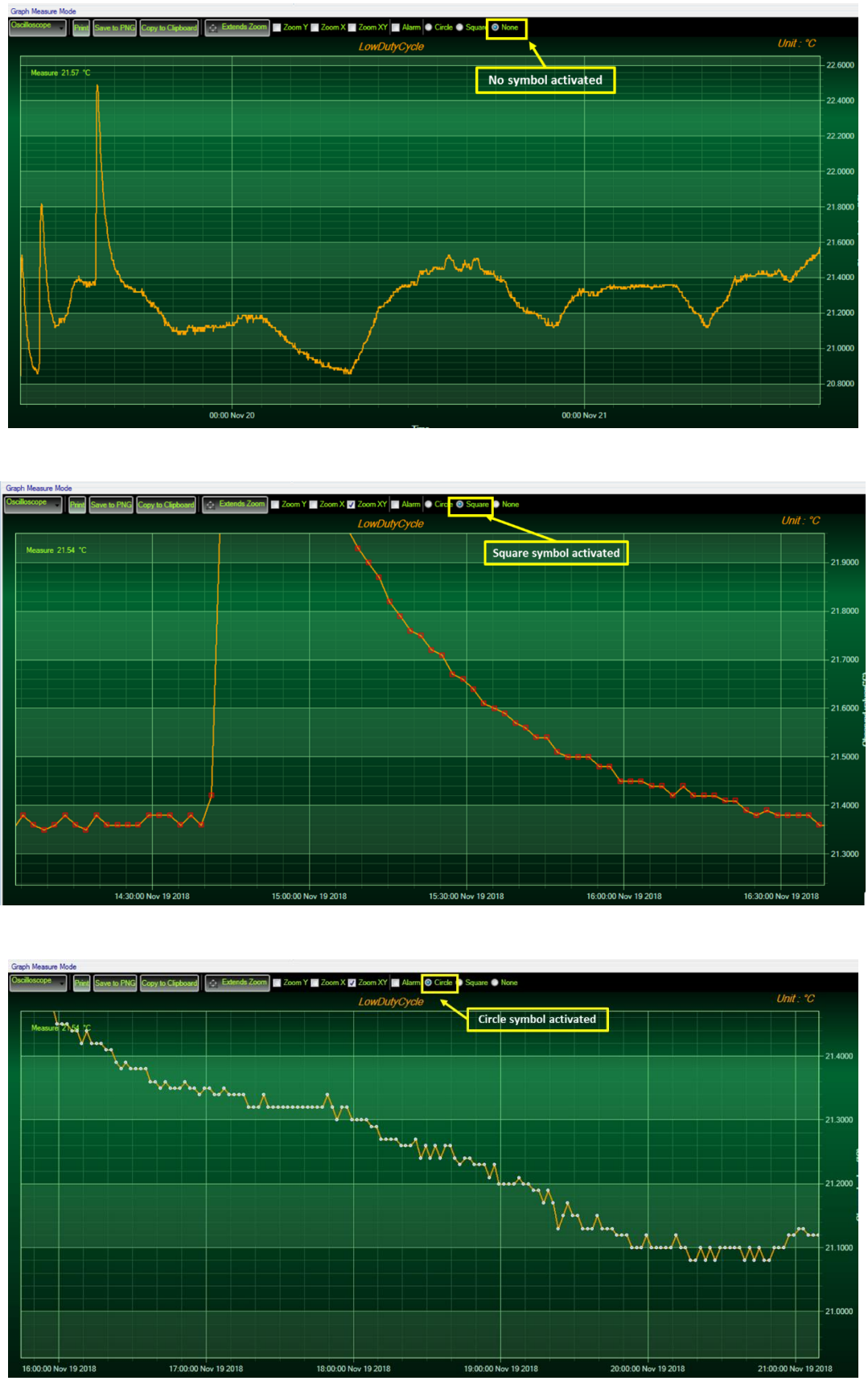


Figure 50: Graph measure mode: Frame Marks

4.5.3.3 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.

4.6 DATALOGGER CONFIGURATION

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

See "Exporting a log file to Excel" Youtube video

5. ALARM MANAGEMENT

5.1 DAQ ALARM

User can receive alarms notification by email. This function is only available with "**Survey**" data acquisition mode.

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

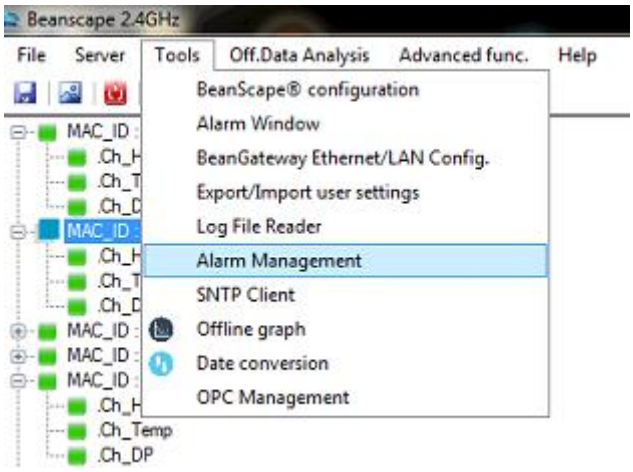
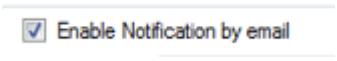


Figure 51: Alarm management menu

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

Check on **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 address for alarm notification*
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*

following fields:

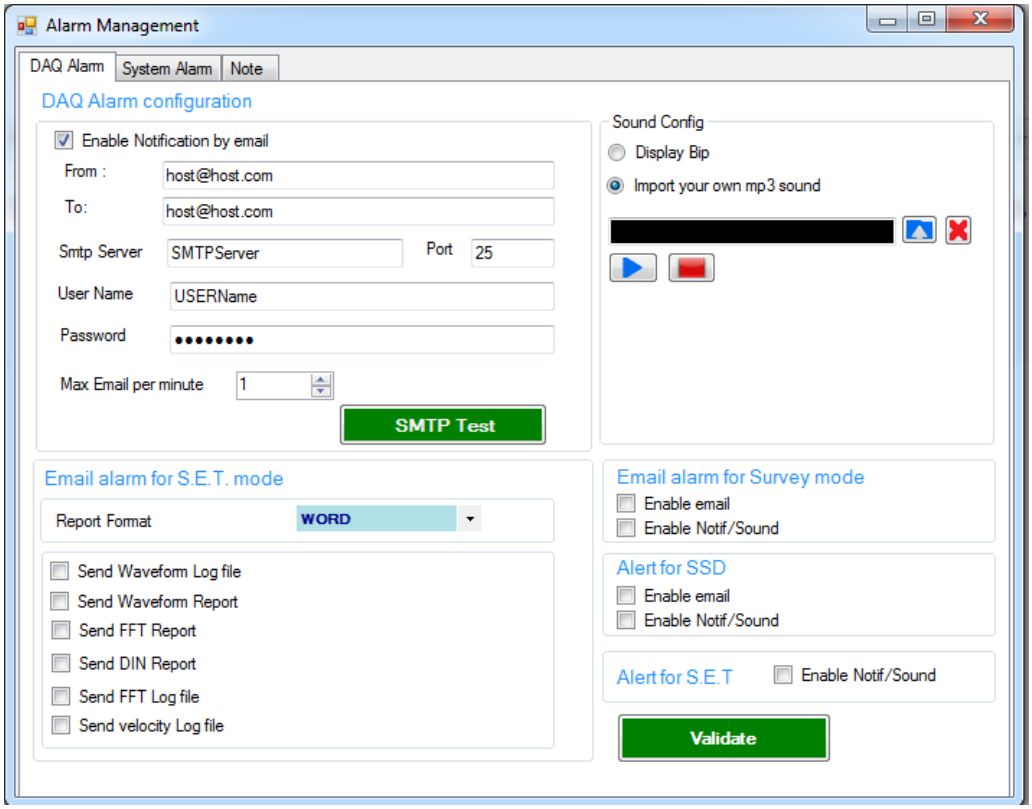


Figure 52: Alarm management window

In the panel below the Report format to be sent via email is selected between Word file, PDF or PNG

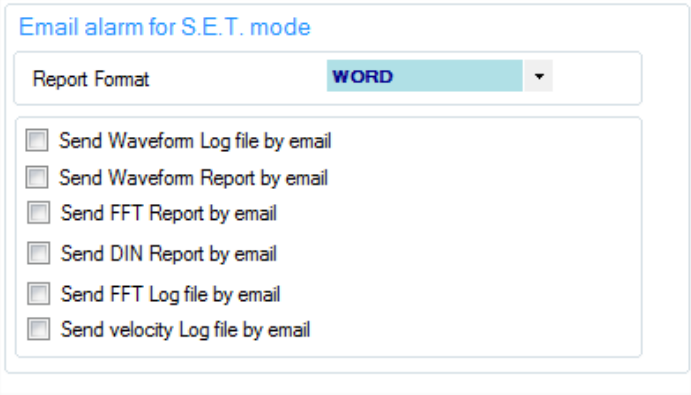


Figure 53: Frame: Email alarm for S.E.T mode

Also the user will chose which report and which log file to receive, more details can be found on the Data acquisition modes available on the BeanDevice Technical note

See « Alarm by email » Youtube video

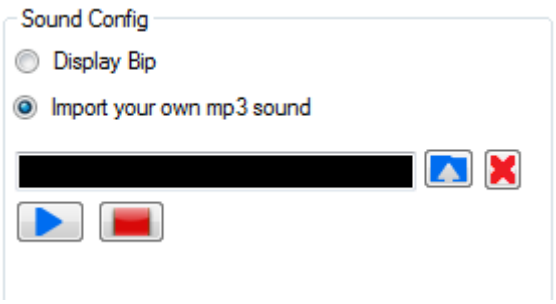


Figure 54: Frame: Soud config

To enable email notification for survey mode and Smart Shock Detection, check Enable email, for Audio notification on PC check Enable Notif/Sound

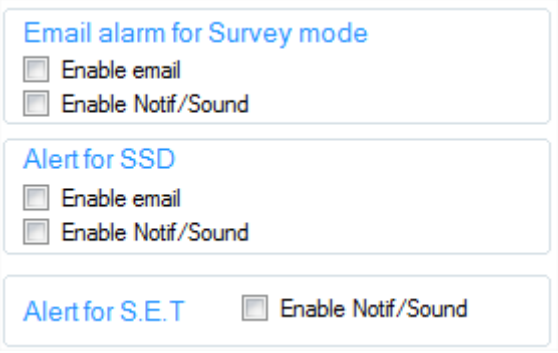


Figure 55: Email alarm for Survey mode and Alert for Shock detection

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

5.2 SYSTEM ALARM

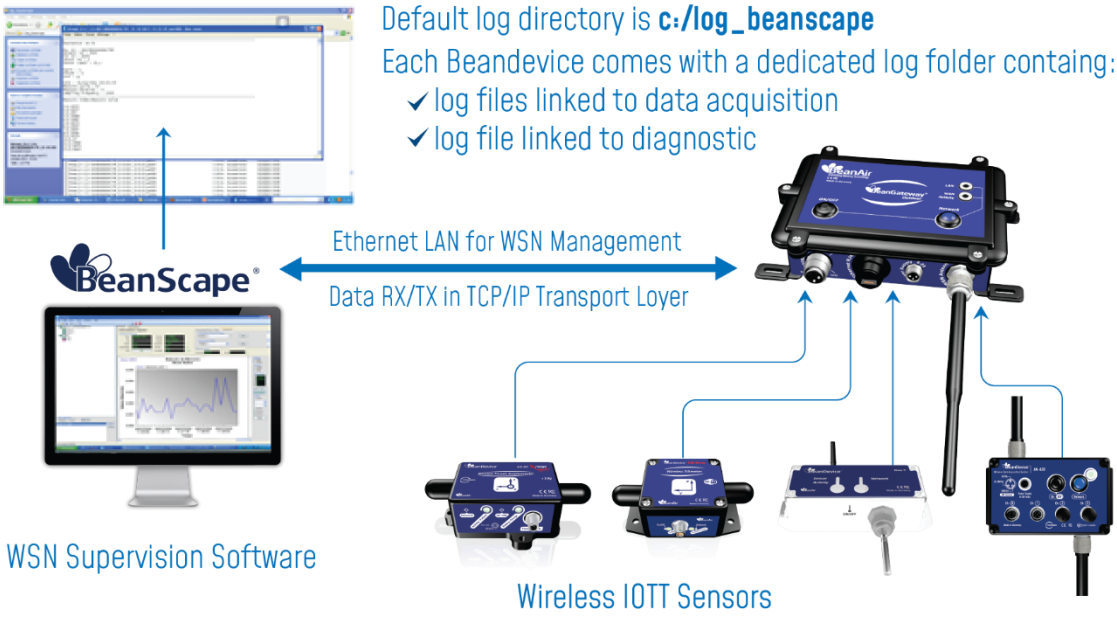
Same as the DAQ Alarm tab, the System Alarm tab contains SMTP configuration in order to receive notification on system status:

- 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: email notification if the PER reaches the pre-defined levels
- Link quality indicator: email notification when the LQI reaches the pre-defined levels

6. APPENDICES

6.1 APPENDICE 1: LOG FILE & FOLDER ORGANIZATION

6.1.1 Log file system overview



6.1.2 Log file directory

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

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

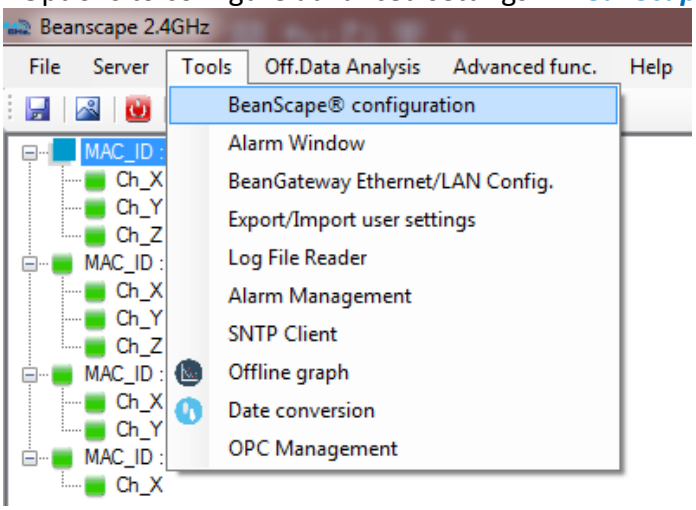


Figure 56: BeanScape® configuration menu

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

✓ A second window is displayed:

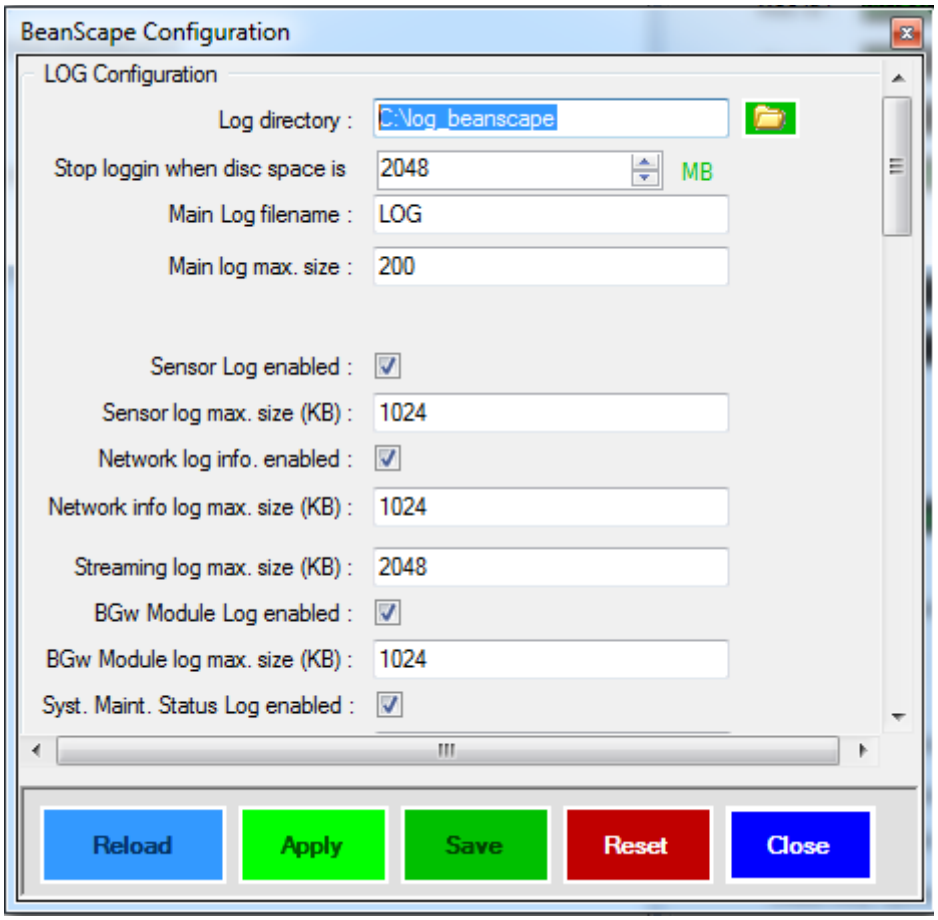


Figure 57: BeanScape® configuration window

✓ Clicking the button 

reverts back to its original configuration.

6.1.3 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:

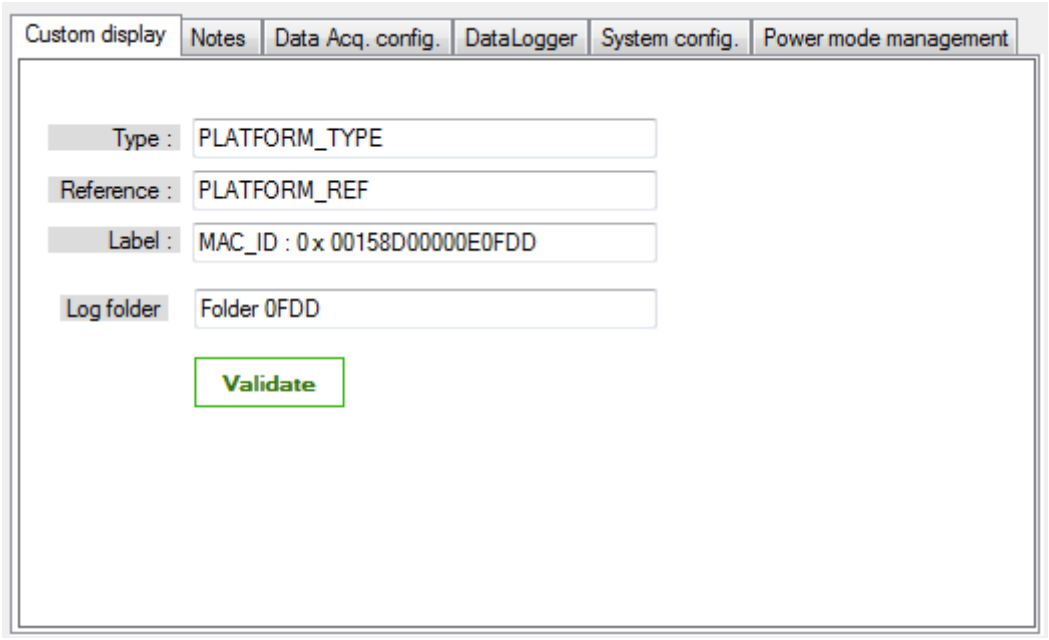
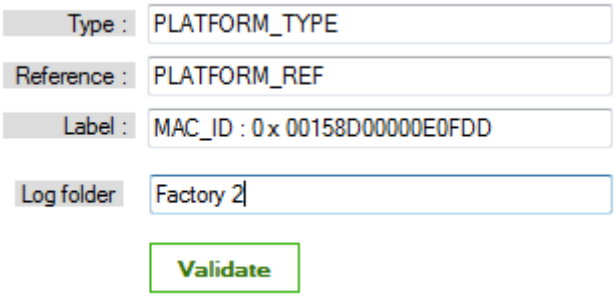


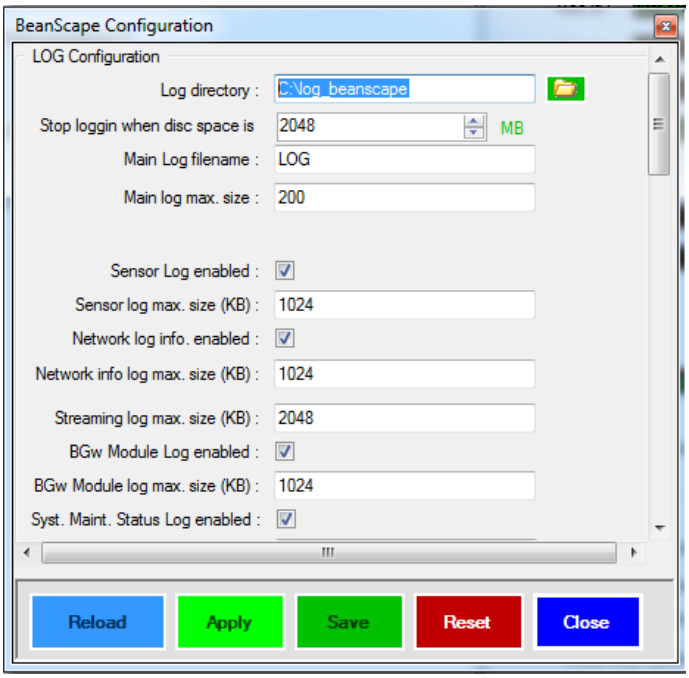
Figure 58: BeanDevice® Custom Display tab

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

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



6.1.4 Log file size configuration



- ✓ ***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)

6.1.5 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®.

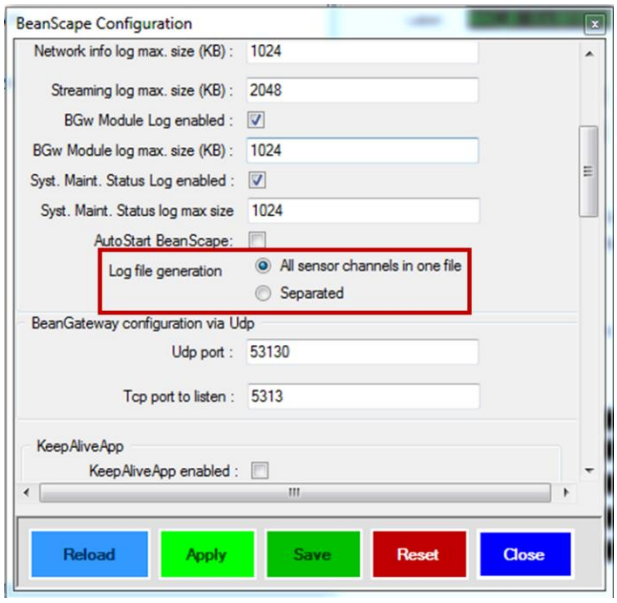


Figure 59: Log file generation options

6.1.6 Cache Data configuration (for Graph)

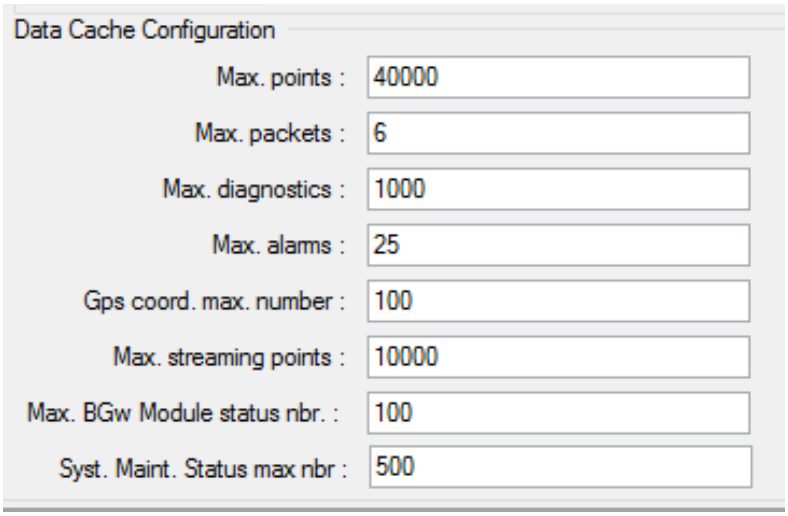


Figure 60: Data cache configuration options

- ✓ ***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 number of GPS coordinates***: Set here the maximum number of GPS information;
- ✓ ***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.

6.1.7 Log file related to data acquisition

6.1.7.1 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:

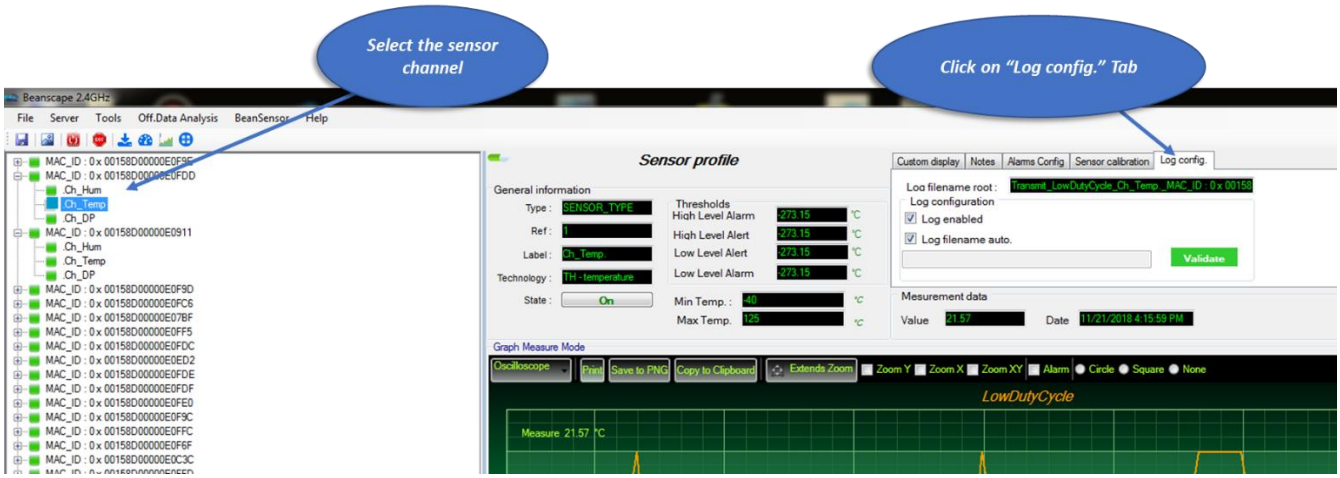


Figure 61: Overview: Log Config tab on BeanScape®

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

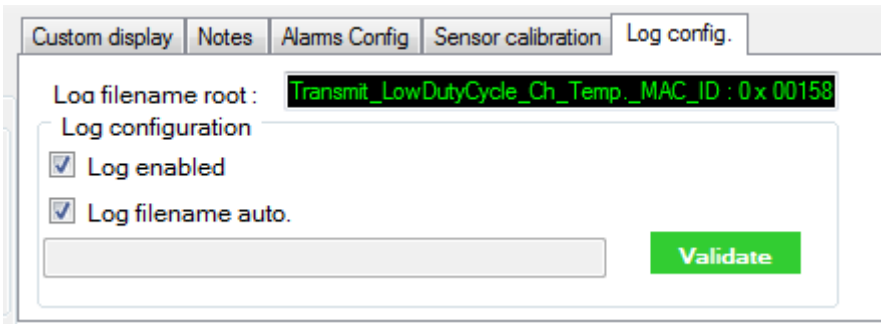


Figure 62: Log config tab

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

6.1.8 Log file related to Wireless Network diagnostic

6.1.8.1 Log filename organization

Wireless Diagnostic log filename is built as follow:

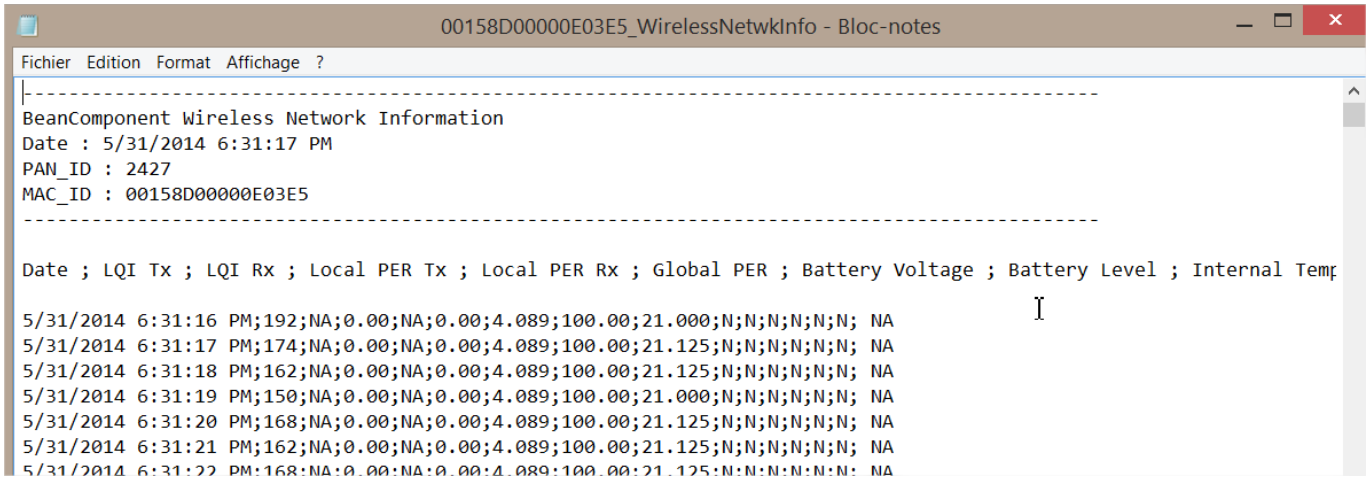
MAC_ID_WirelessNetwkInfo

- ✓ ***MAC_ID: BeanDevice® MAC ID***
- ✓ ***DATE: date when the streaming mode starts***

6.1.8.2 Log file analysis

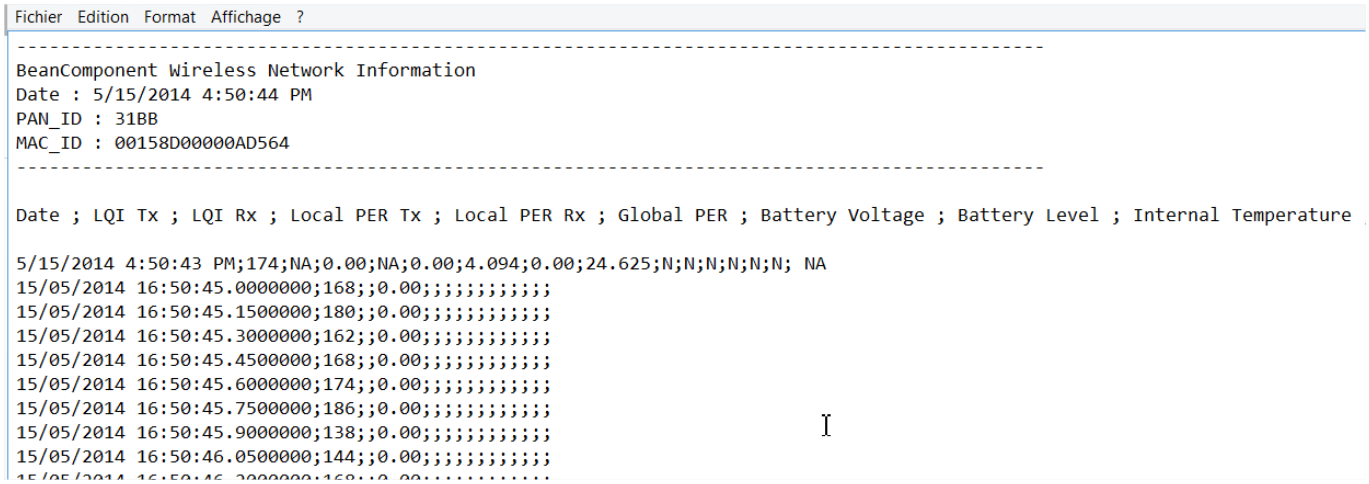
Log file related to wireless network diagnostic provides the following information:

- ***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®



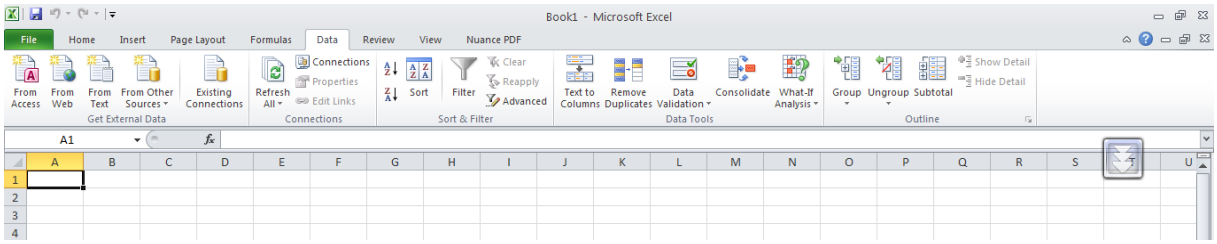
If the BeanDevice® is configured with the streaming data acquisition mode, the following diagnostic information are not refreshed:

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

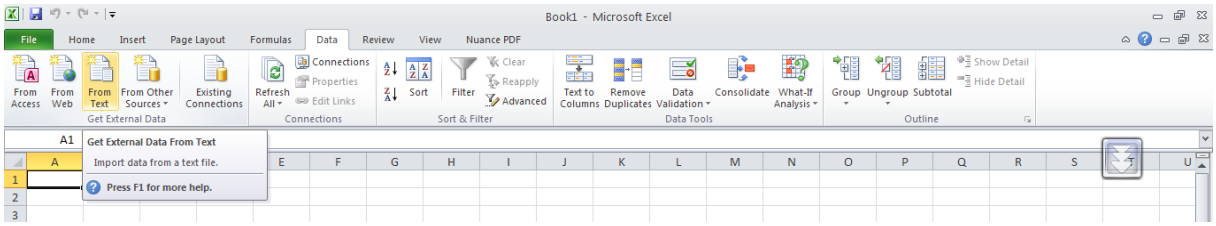


6.1.8.3 How to open a measurement file with excel

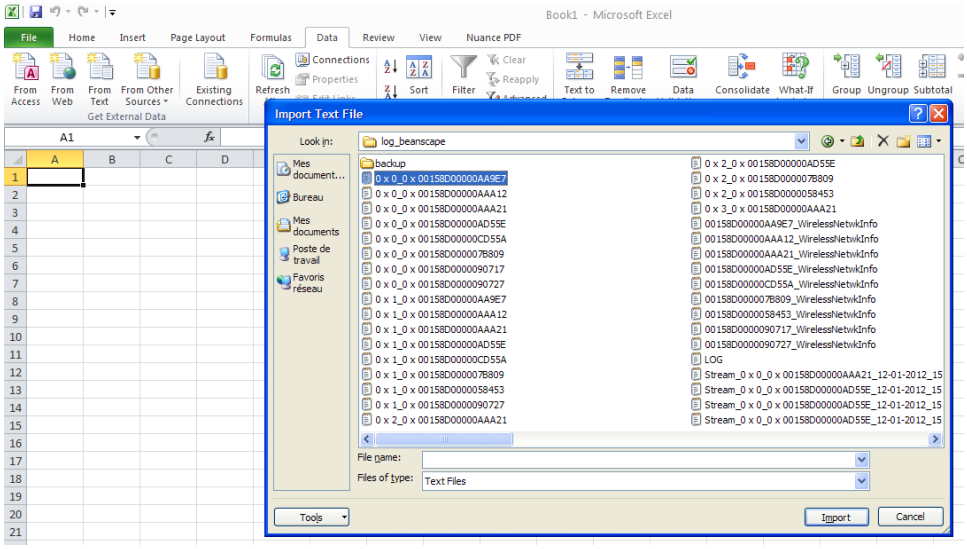
Step 1 : Open Excel



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

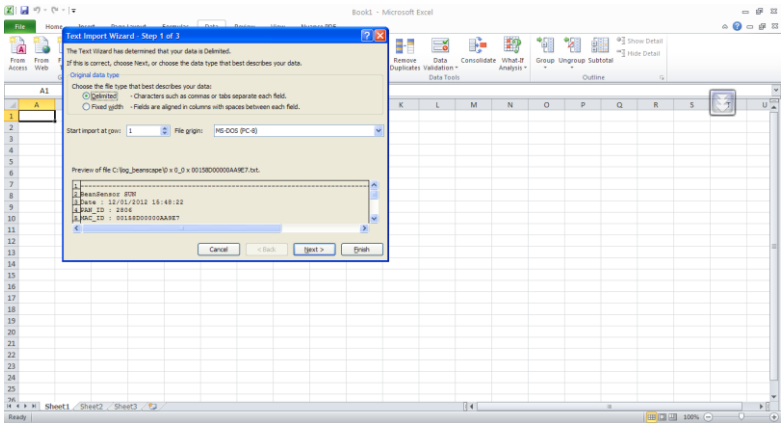


Step 3 : Choose your log file

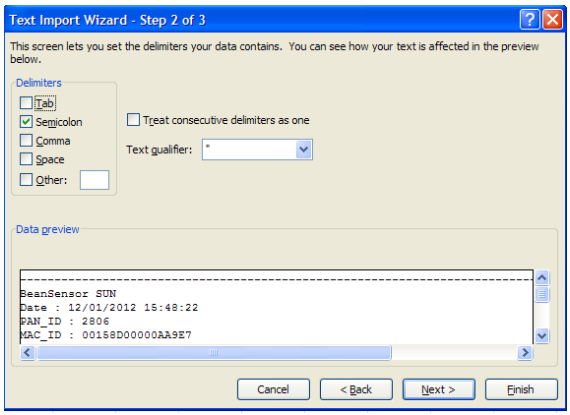


Step 4 : Text import wizard will open, select « Delimited » for Characters such as commas or tabs separate each field.

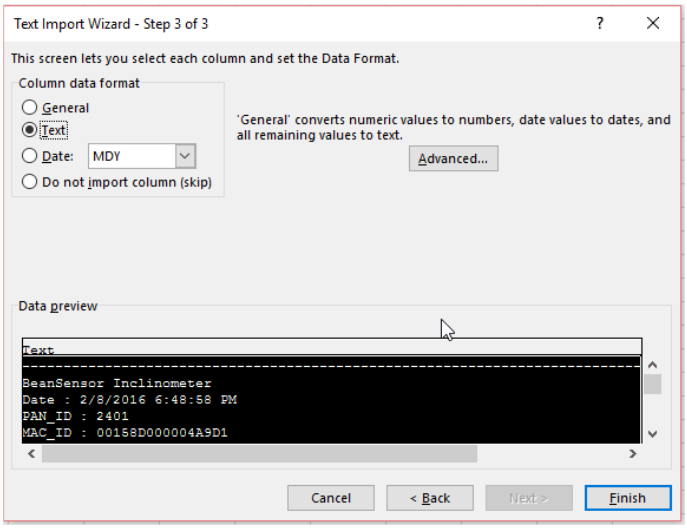
On "***Start import at row***" field: Select the number of lines that you want to suppress from the header:



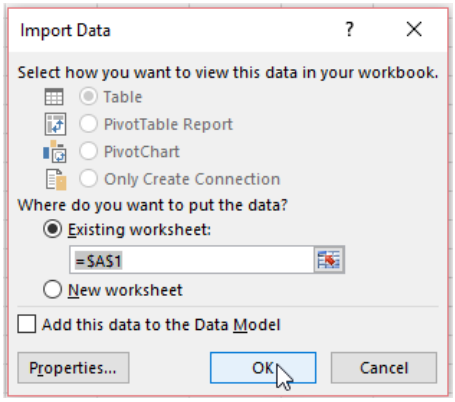
Select semicolon



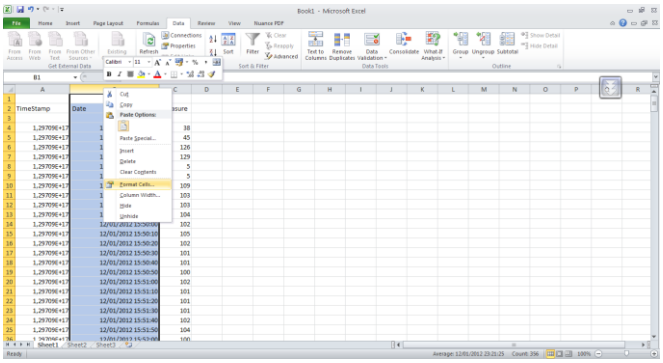
Select Text



Click on OK



Click on format cells:



[See “Exporting a log file to Excel” YouTube video]

6.2 APPENDICE 2: BEANDEVICE® MAINTENANCE & SUPERVISION

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

6.2.1 Extending the battery life

The battery life depends on several parameters:

- ✓ Operating temperature
- ✓ Data acquisition cycle & mode

For further information about the current consumption on a BeanDevice® during sleeping & active power mode, 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
Data acquisition cycle		
TX Power	Power consumption will grow with the TX Power	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).

6.2.2 Over-the-air Configuration (OTAC) parameters

The BeanDevice® integrates an internal flash memory used for backing up OTAC (Over-the-air configuration) parameters.

This memory is organized into several levels:

Level 1	• End-user parameters
Level 2	• Sensor calibration coefficients
Level 3	• Network maintenance (only fo experts)
Level 4	• Battery/Primary cell calibration

6.2.3 Level 1: End-user OTAC parameters

The following table presents all the defaults configuration parameters:

Parameter	*BeanDevice® version*		
	ONE-T	ONE-TH	ONE-TIR
Power Mode	*Sleeping*		
Data Acquisition duty cycle	*1 minute*		
Data Acquisition mode	*LowDutyCycle*		
TX Power	*+15dBm*		
Alarms Threshold	*H1 :2 ou10* *H2 :2 ou 10* *L2 :-2 ou -10* *L1 :-2 ou -10*	*H1 :20* *H2 :20* *L2 :0* *L1 :0*	*H1 :20* *H2 :20* *L2 :0* *L1 :0*

To restore these defaults parameters, you must perform a Network context deletion. The user should press the button network ("Network") network for more than 2 seconds.

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

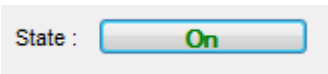
6.2.4 Network diagnostic from your BeanScape® software

This chapter describes the network diagnostic tool available on the BeanScape®.

6.2.5 Sensor operating status

Two states of the sensor operating status exist:

- ***On*** : the sensor is enabled
- ***Off*** : the sensor is disabled



The BeanDevice® checks the sensor connection and it status. It decides to disable the sensor when:

- ✓ The sensor is disconnected;
- ✓ A short-circuit is present on the sensor;
- ✓ The sensor doesn't respond;

6.2.6 Displaying BeanDevice® health status information

From your BeanScape® interface, click on a BeanDevice® profile displayed on the left window, a tab "Advanced Func." will appear on the top of the window. Click on this tab, and then click "BeanDevice® health status (History)".

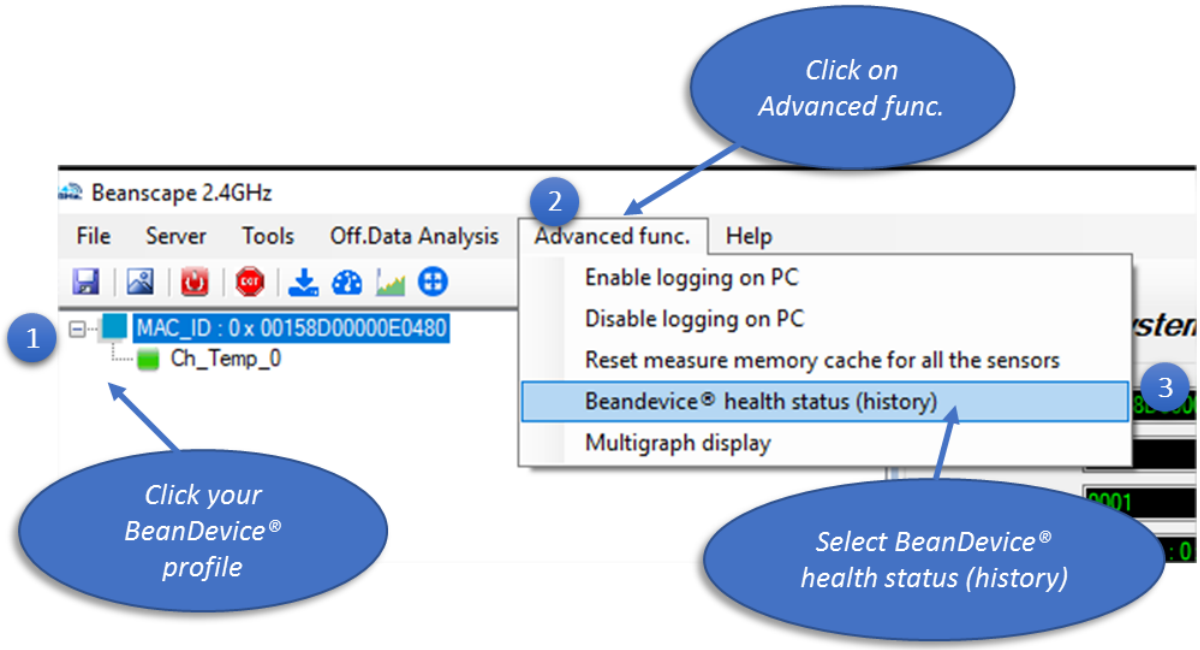


Figure 63: BeanDevice® health status option

A new window will appear:

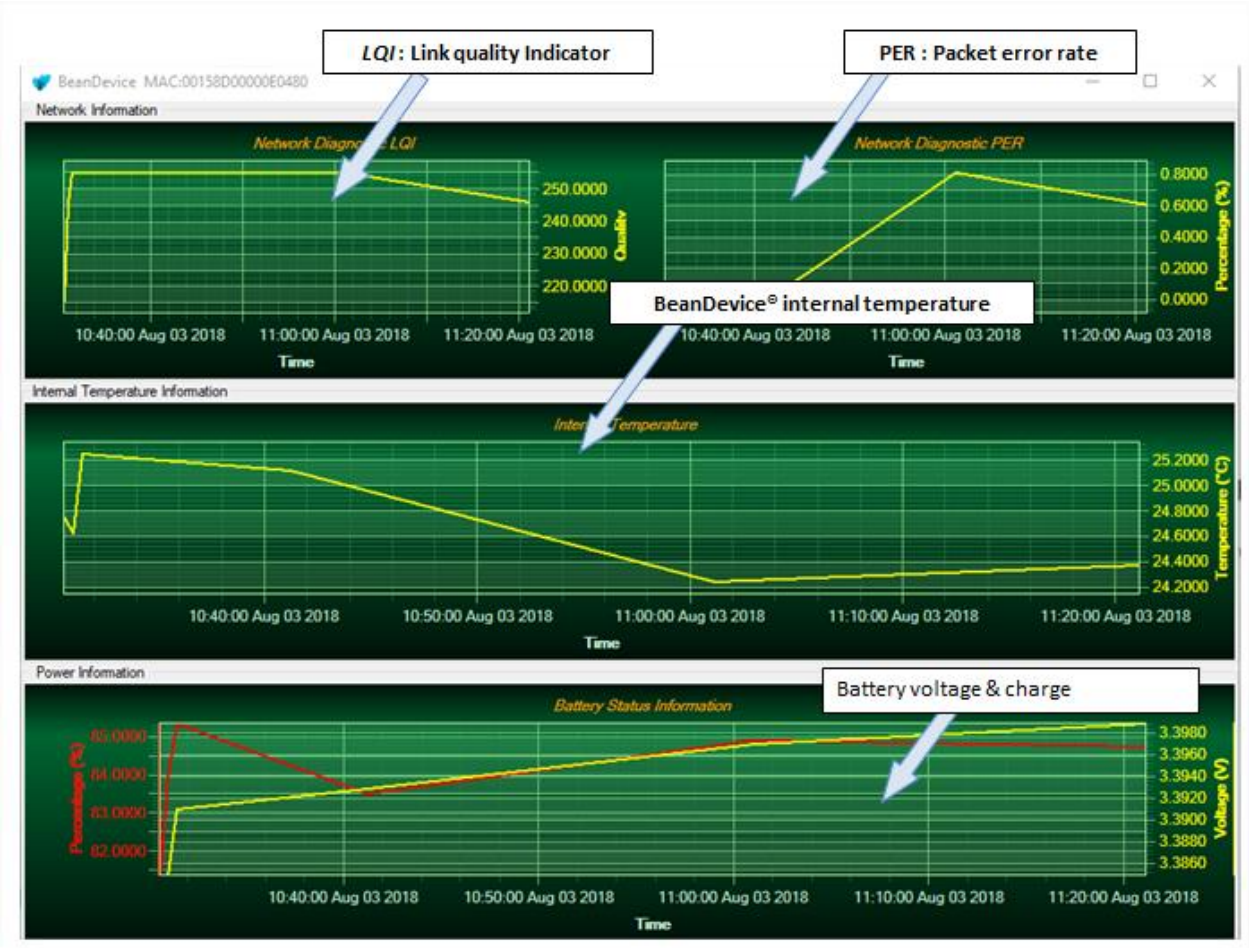


Figure 64: BeanDevice® health status window

✓ **PER (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®.

✓ ***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:

- ✓ Use the Maximum TX Power on your BeanDevice. The maximum TX Power authorized in Europe for indoor application is 12 dBm. For Outdoor application, you are authorized to extend the TX Power to 18 dBm. You can easily configure the TX Power on your BeanDevice from your BeanScape WSN software supervision.
- ✓ 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?"

- ***Internal temperature monitoring***

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

- ***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.

6.2.7 Scrolling menu « BeanSensor »

The BeanSensor® scrolling menu provides access to additional features: 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 this scrolling menu, click on the sensor attached to your BeanDevice®. You will then see the BeanSensor® scrolling menu appearing.

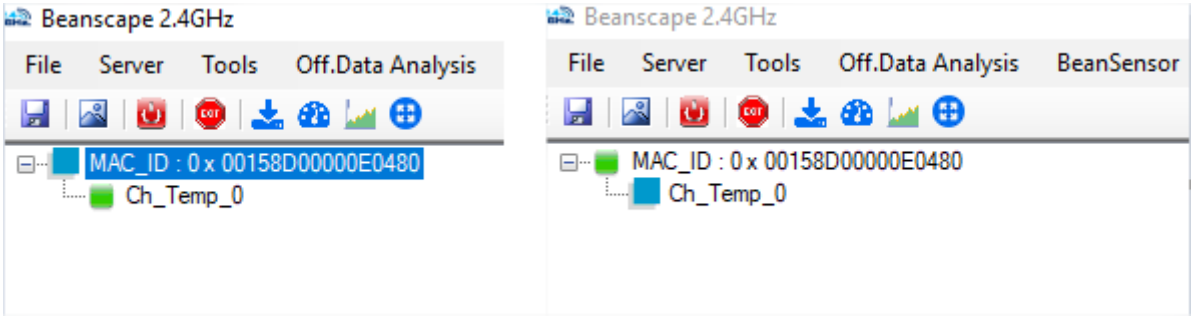


Figure 65: BeanDevice® Scrolling menu

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

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.

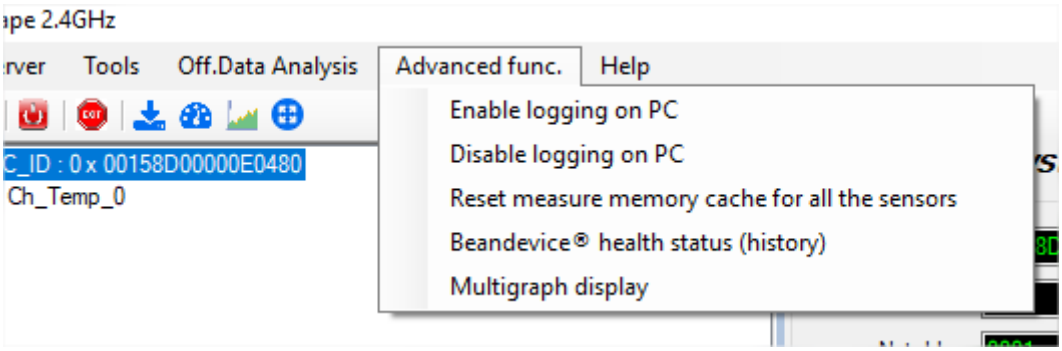


Figure 66: BeanSensor: Enable/Disable Log

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

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;

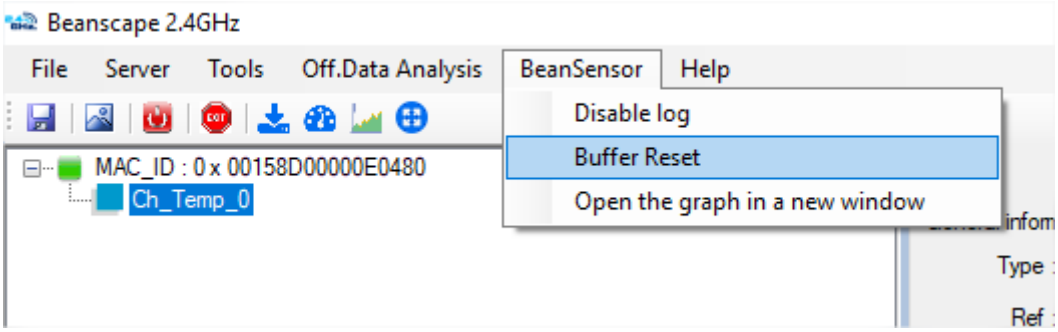


Figure 67: BeanSensor: Buffer Reset option

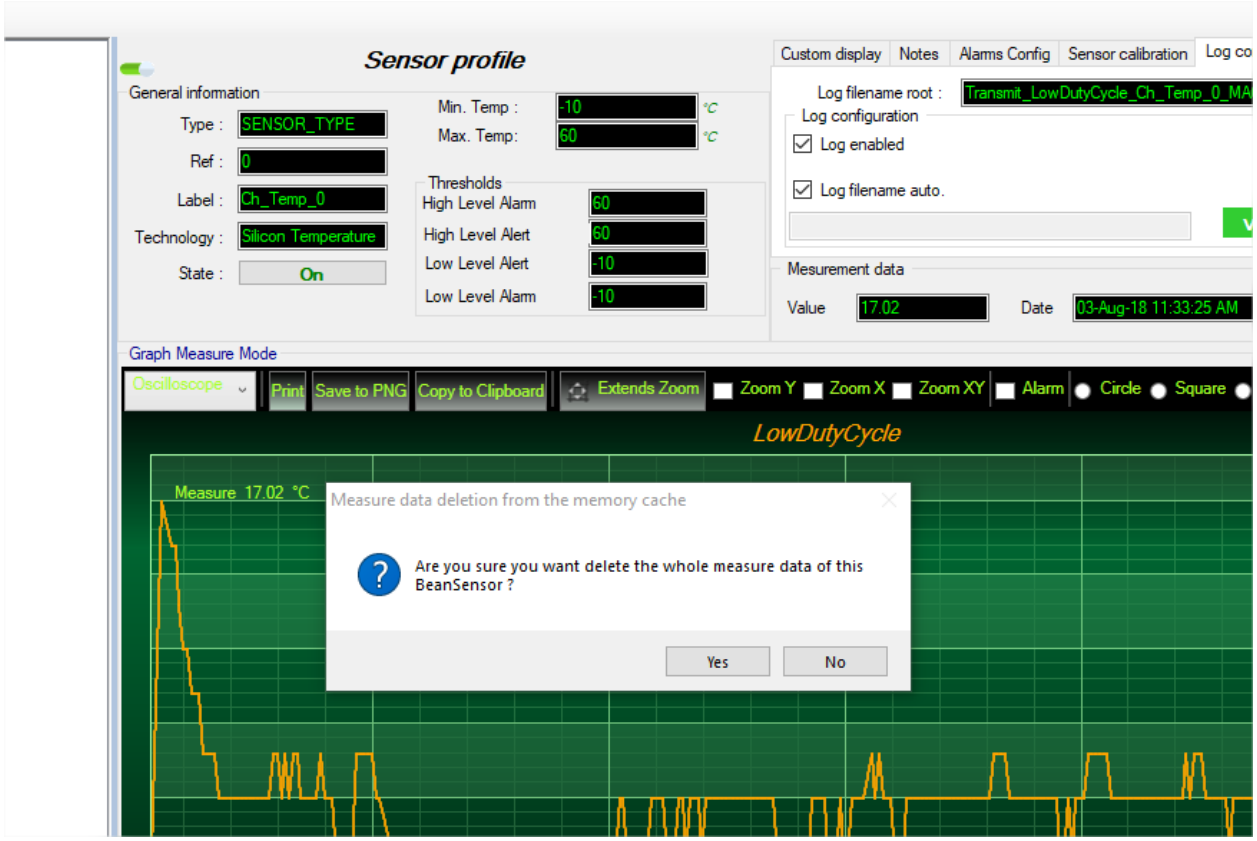


Figure 68: Buffer Reset

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.

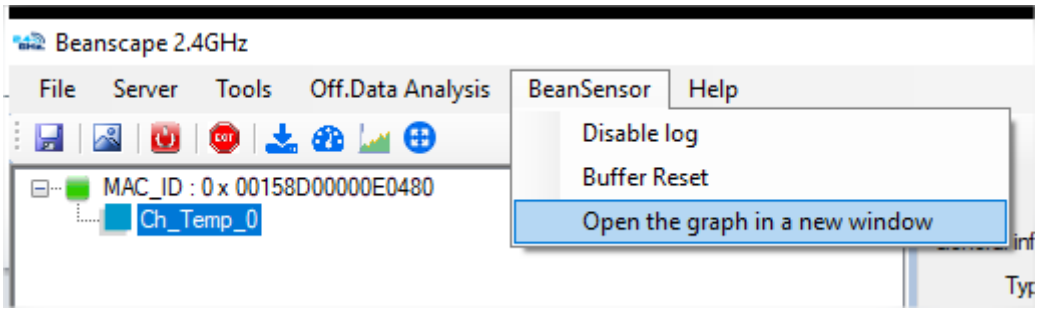


Figure 69: BeanSensor: Open the graph in a new window

You can easily open several graphs in a window.

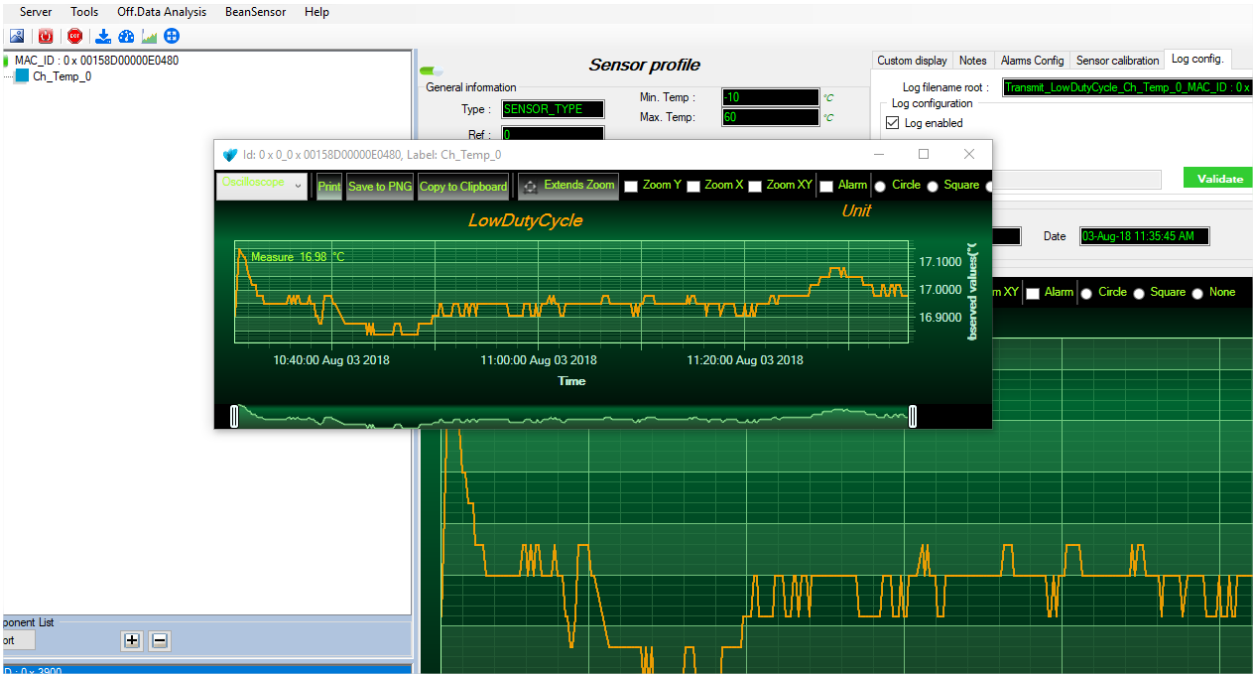


Figure 70: Graph displayed in separated windows

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

6.3 FIREWALL EXCEPTION FOR BEANSCAPE®

By default, firewall blocks all unknown network traffic coming in to 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"

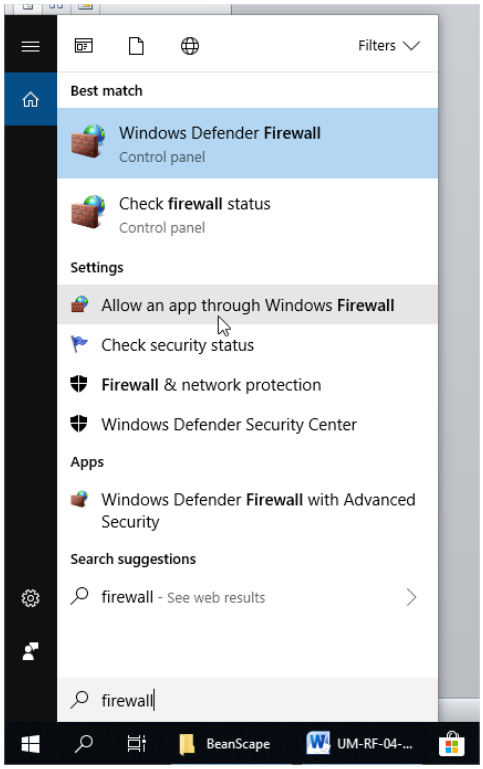


Figure 71 :Windows search for firewall screenshot

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.

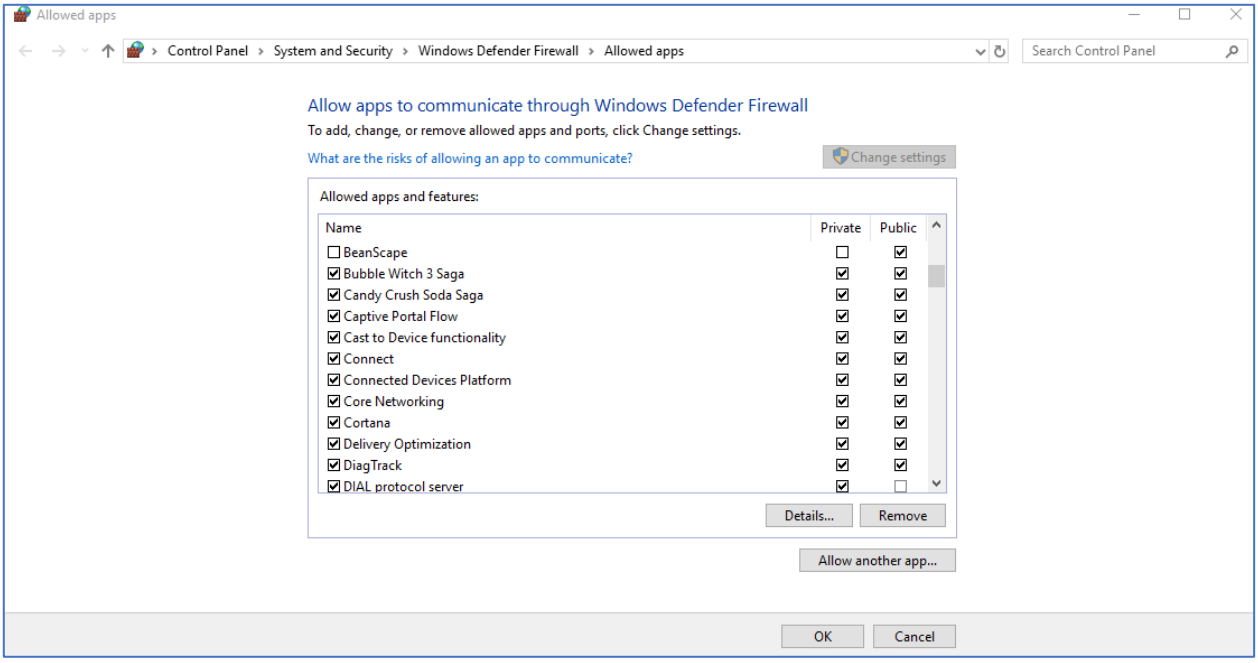


Figure 72: allowed apps window

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.

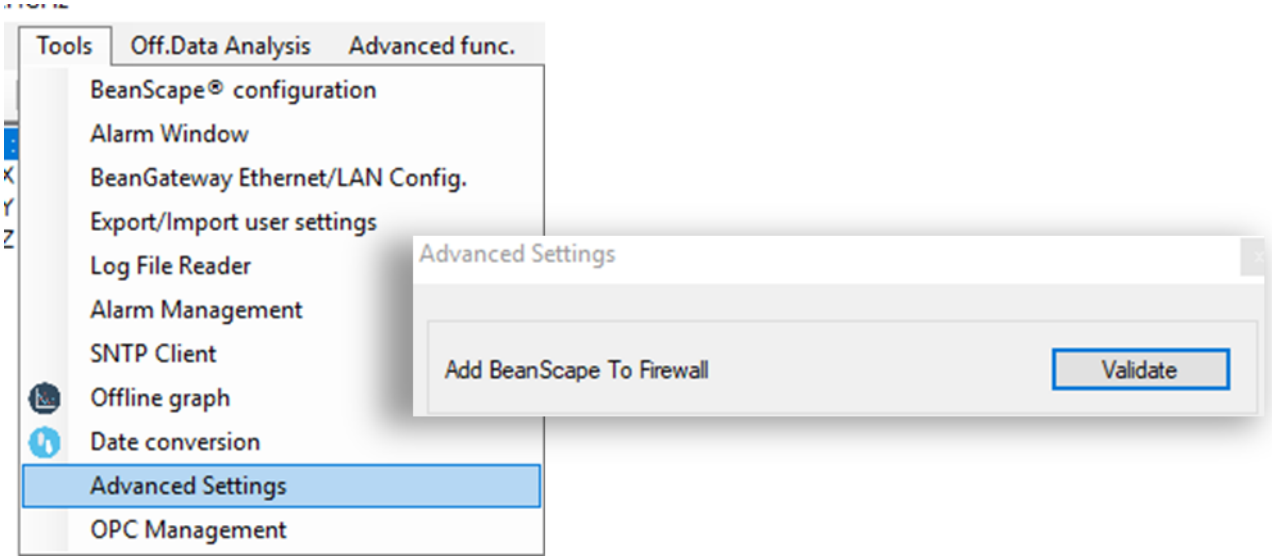


Figure 73: Firewall auto exception

7. 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.