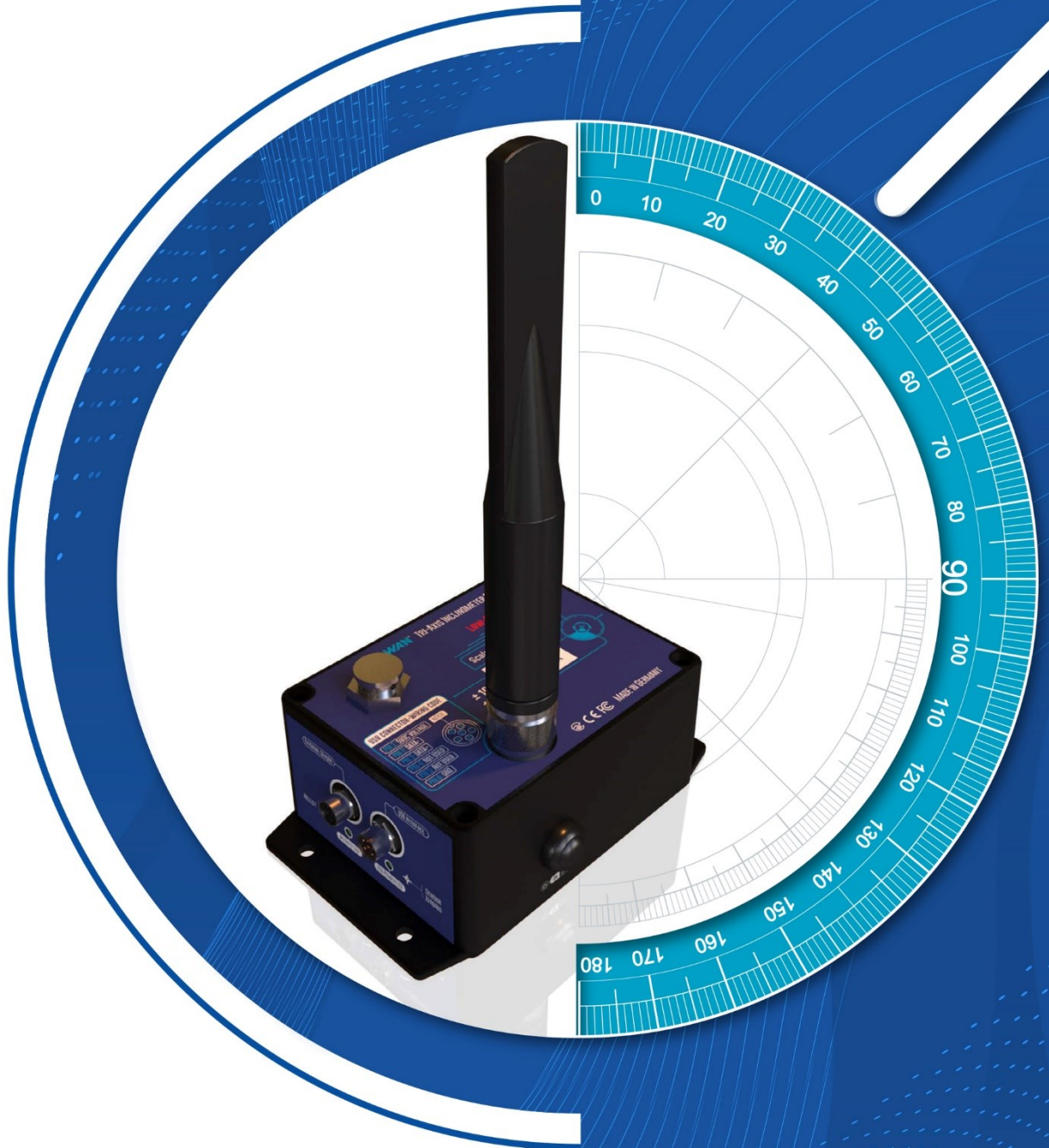


UG-ENG-SATEVIS-MESSAGES-LORA-NETWORK-SERVER



LoRaWAN™ 



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Contents

- 1 List of all messages Types..... 6
- 2 Satevis® Device Startup : Which messages are transmitted ? 10
- 3 Messages Transfer Method : GET and POST 11
- 4 Error message..... 12
- 5 How to extract the sensor profile ?..... 13
 - 5.1 Hello Message transmitted on-site..... 14
 - 5.2 Hello message requested Remotely 15
- 6 Sensor zeroing 16
 - 6.1 Sensor zeroing messages (when sensor zeroing is done on monitoring site) 16
 - 6.2 Sensor zeroing requested remotely..... 17
- 7 moniTOring mode 18
 - 7.1 slow monitoring mode..... 18
 - 7.2 Alarm mode..... 18
 - 7.3 All the Timing values in Alarm mode 19
 - 7.4 Alarm notification Rule 20
 - 7.4.1 OR Alarm notification Rule 21
 - 7.4.2 AND Alarm Notification Rule 22
 - 7.5 Alarms Thresholds..... 23
 - 7.5.1 High Threshold Alarms..... 23
 - 7.5.2 Low Threshold Alarms 24
 - 7.5.3 Mixed High-Low Thresholds alarms..... 24
- 8 Diagnostic Report 26
 - 8.1 Which Information are transmitted frequently ? 26

1 LIST OF ALL MESSAGES TYPES

Message Type ID	Value	Request Transfer Method (Satevis device to cloud)	Request Transfer Method (cloud to satevis device)	Default Lora Port ID	Short description
Device Main Profile	0x11	POST	GET	0x0F	Fisrt Message Tx at startup
Sensor Profile	0x12	POST	GET	0x0F	Second Message Tx at Startup
System Diag Report	0x21	POST	GET	0x10	Cyclic Diag Report - Refresh rate can be remotely configured (SDRR)
Slow Monitoring' Data Transmission message	0x22	POST	N.A.	0x12	Cyclic Data transmission , several samples can be encapsulated in the message
Alarm Event (part of 'Alarm Monitoring' mode) Transmission message	0x23	POST	N.A.	0x12	Alarm event transmitted in the case if an alarm threshold is reached
Data Logs 'Slow Monitoring' Transmission message	0x24	POST	GET	0x12	Download of Logs files related to Slow Monitoring mode

Data Logs 'Alarm Monitoirng' Transmission message	0x25	POST	GET	0x12	Download of Log files related to Alarm Monitoring
Hello Data Transmission message	0x26	POST	GET	0x12	Hello Message transmitted during startup or on user request
Keep Alive (part of 'Alarm Monitoring' mode) Data Transmission	0x27	POST	N.A.	0x12	Keep Alive data transmission transmitted frequently in Alarm Monitoring Mode
LORA Stack Info	0x30	POST	GET	0x13	Lora stack info (For security reasons Lora settings can be only changed from USB software)
Monitoring Full Config	0x31	POST	POST, GET	0x13	All the Timing parameters related to Monitoring mode
Sensor Channel config	0x32	POST	POST, GET	0x13	Sensor Channel configuration including alarm thresholds type, and values
Monitoring Mode config	0x33	POST	POST, GET	0x13	Monitoirng Mode configuration
System Diag Settings	0x34	POST	POST, GET	0x13	System diag refresh rate configuration
Hardware Reset Request	0x35	N.A.	POST	0x13	Remote request of Satevis device

Lora RejoinFrequ config	0x36	POST	GET, POST	0x13	Cyclic Lora Rejoin cycle
Lorawan com PORT config	0x37	POST	GET, POST	0x13	Lorawan PORT configuration
Clock Source config	0x38	POST	GET, POST	0x13	Currently only clock source provided by LNS is available
N.A. - for future applications	0x39 to 0x4F	N.A.	N.A.	0x13	
DataLogger Config	0x50	POST	POST, GET	0x11	Datalogger settings
DataLogger Status	0x51	POST	GET	0x11	Provides datalogger status
Sensor Zeroing config	0x60	N.A.	POST, GET	0x13	Enable/Disable sensor zeroing
Sensor Zeroing Results	0x61	POST	GET	0x13	Transmits offsets values on Inclinomter sensor
Inclino sensor config	0x62	POST	POST, GET	0x13	Inclinometer sensor range config
Sensor calib. Date	0x63	POST	GET	0x13	Date of calibration for all the sensor channels
Error Status	0xFF	POST	N.A.	0x13	Error status transmitted by Satevis device if the GET/POST message is not well formed

Messages type transmitte by satevis devis durint the Init

Message Type related to data measurement and diag transmitted frequently (user configurable)

Message Type Posted during Init or on User Request(Push Button)

Message Transmitted during Init or frequently (user configurable)

Remote config related to Inclino sensor (Sensor Type 0x31)

Remote device config. Transmitted only on GET request from cloud software

Datalogger config & status

Error Message

2 SATEVIS® DEVICE STARTUP : WHICH MESSAGES ARE TRANSMITTED ?

At device startup , the following messages are transmitted automatically to the cloud software:

- **Main Profile:** which contains the Satevis® Device ID, all the versions ID (Hardware, Firmware, Lora Stack), Lorawan® Settings and all the timing parameters related to the different monitoring modes
- **Sensor Profile:** contains all the sensor channels profile connected to Satevis® Device, this will allow the user to create a database on the cloud software containing the Sensor Type, Conversion Method to the physical unit

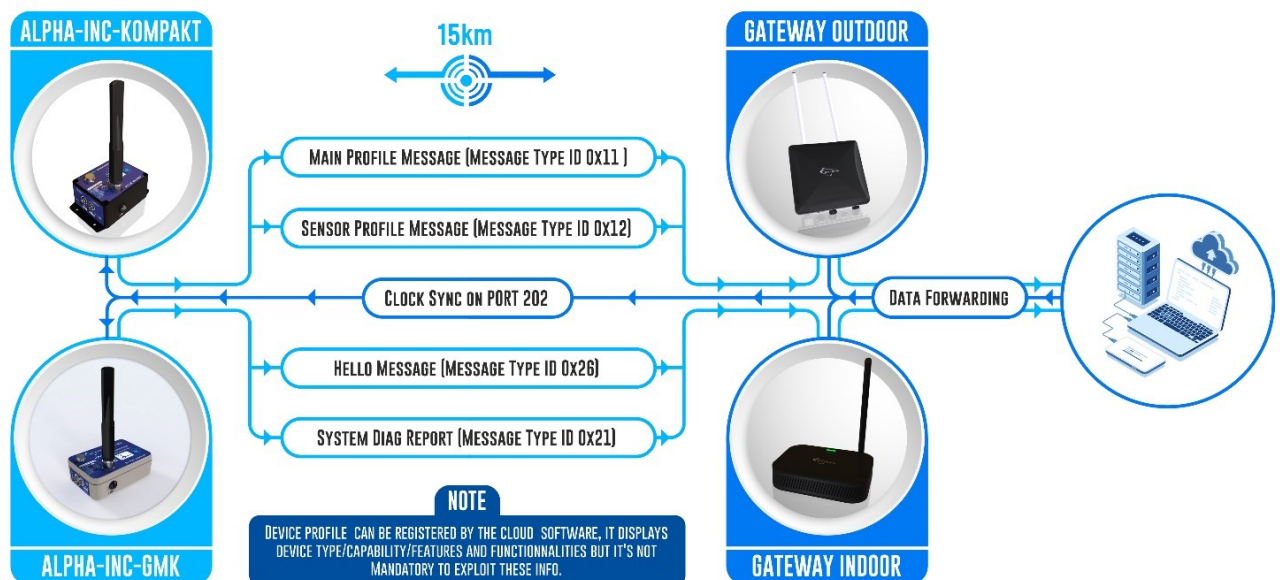
Satevis® device will receive a clock synchronization message from LNS on PORT 202.

When Profile Information is transmitted, Satevis® device starts to send Hello Message followed by System Diag Report, confirming the device is working properly.



Clock synchronization is a critical function used on data timestamping and alarm management. Make sure your LNS (Lora Network Server) integrates Clock synchronization on PORT 202, popular and recent LNS integrate this services. This service doesn't need specific development on your side.

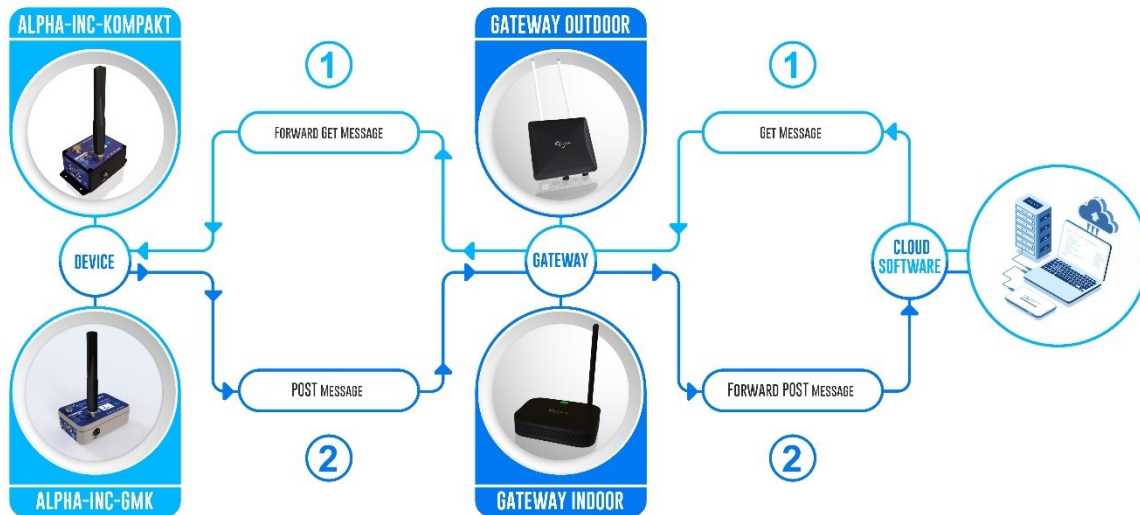
For more information about Clock synchronization, please read Lora Alliance Spec : [click here](#)



3 MESSAGES TRANSFER METHOD : GET AND POST

GET request

GET Request is transmitted by the cloud software to read the device status or current settings. If the GET request is well-formed, Satevis® device answers by a POST request containing all the status information related to the GET message.



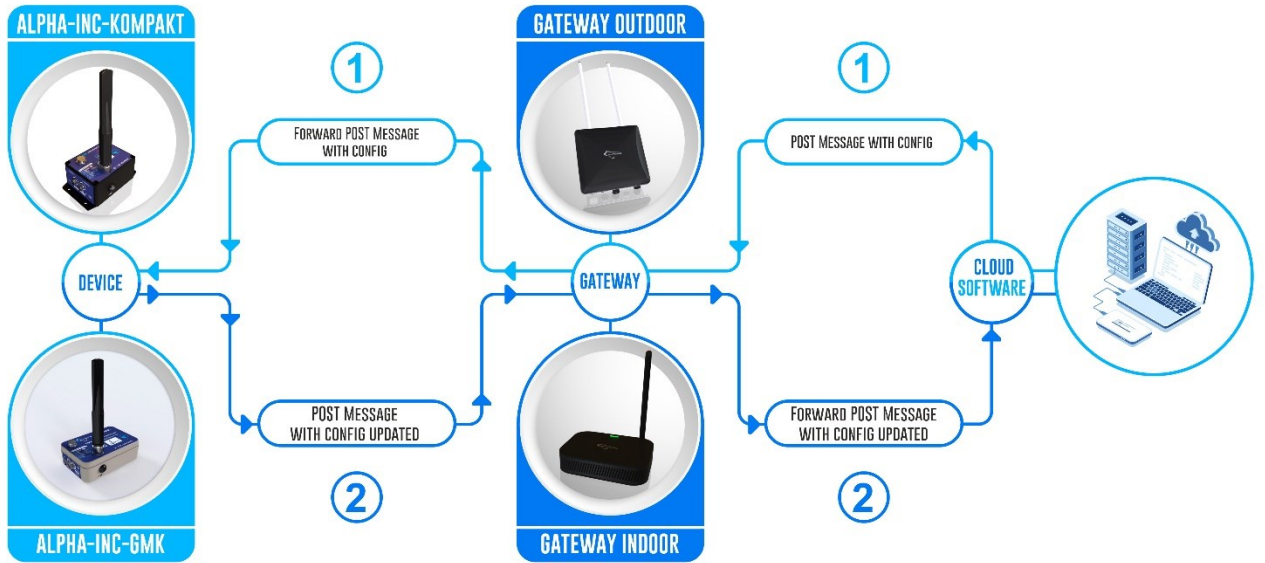
POST Request

POST request can be transmitted by Satevis® device to the cloud software, it contains :

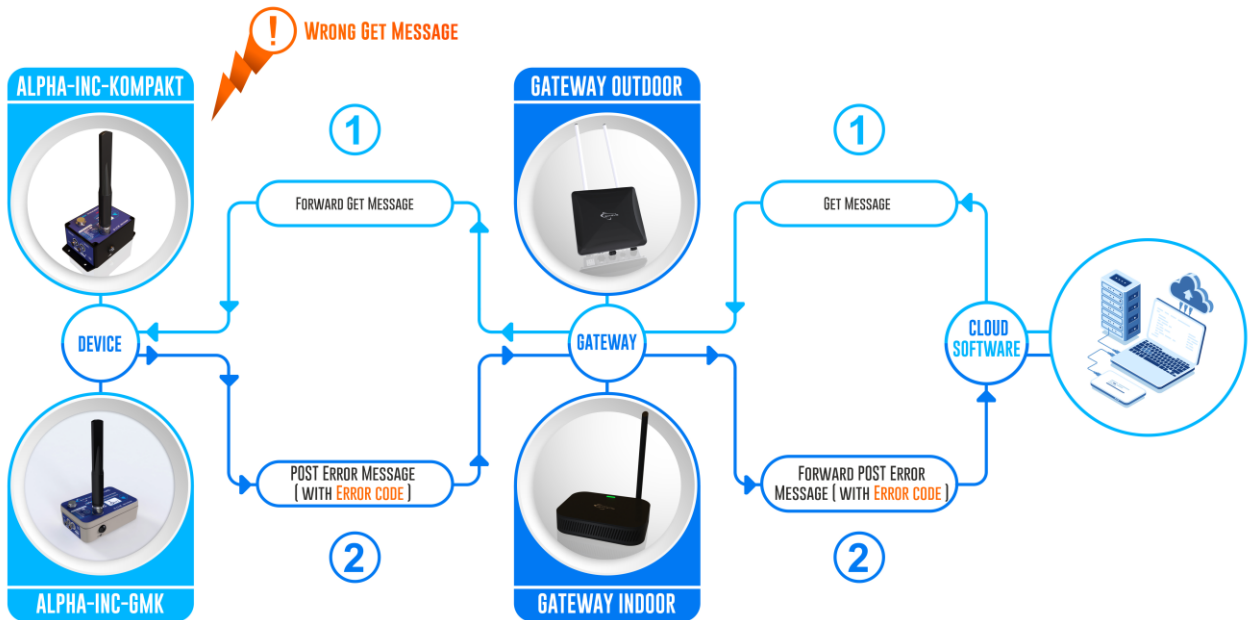
- Device profile at Startup,
- Device current configuration (as a response to a GET request)
- Diagnostic
- Data Measurement

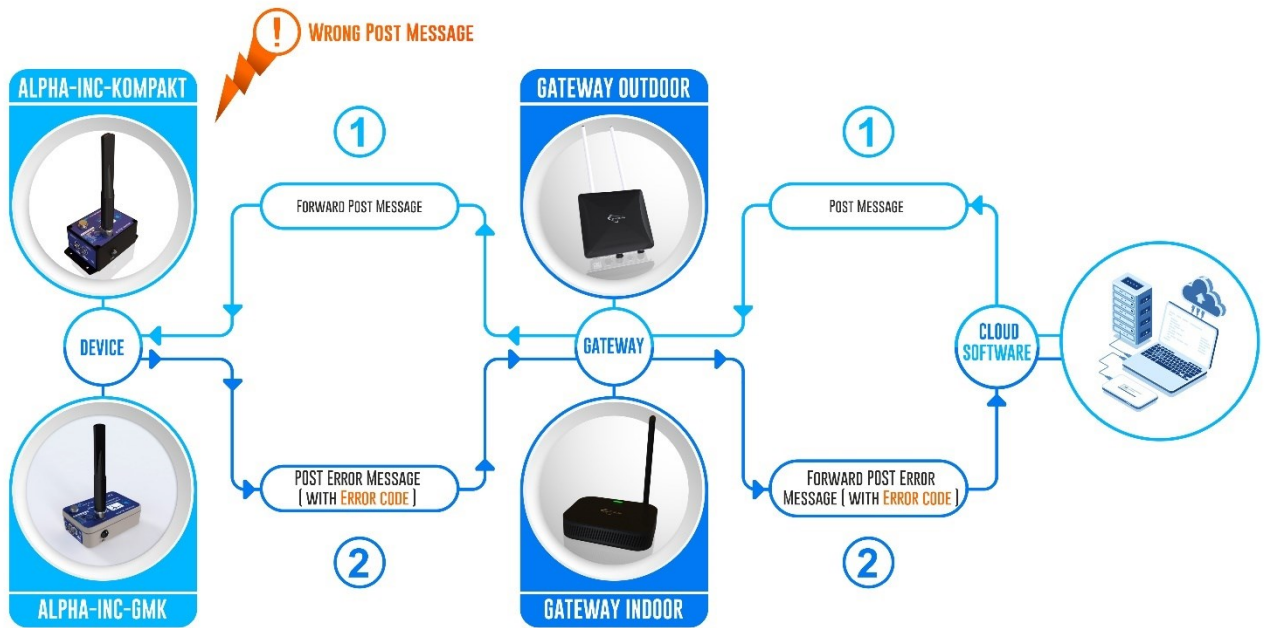
When POST request is transmitted by Cloud software it contains:

- New device settings (ex: alarms thresholds, new measurement mode.....)
- Initiate datalogger download



4 ERROR MESSAGE





5 HOW TO EXTRACT THE SENSOR PROFILE ?

Hello Message

5.1 HELLO MESSAGE TRANSMITTED ON-SITE



Caption 1: After installing the Alpha-Inc-Kompakt inclinometer, the field operator can check at any moment if the sensor is working properly



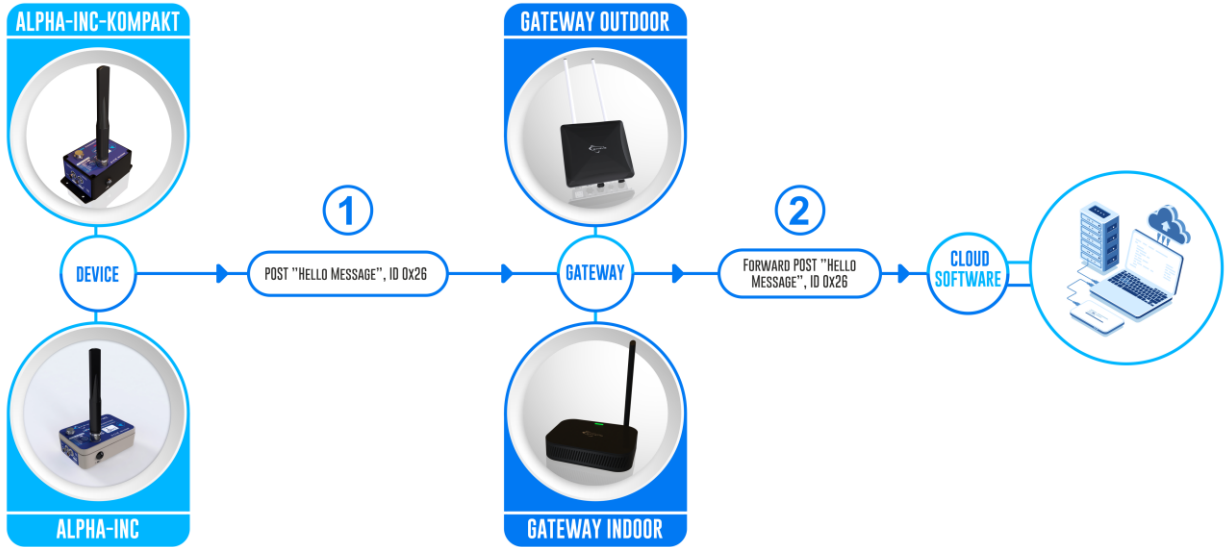
Caption 2: By Holding the magnet on the 'Hello!' label for more than 5s, the sensor wakes-up and transmits to the Lorawan network the data measurement followed by the system diagnostic (battery status and network quality)



Caption 3: The Activity Led blinks in green color, confirming that a data measurement is transmitted to the Lorawan network.

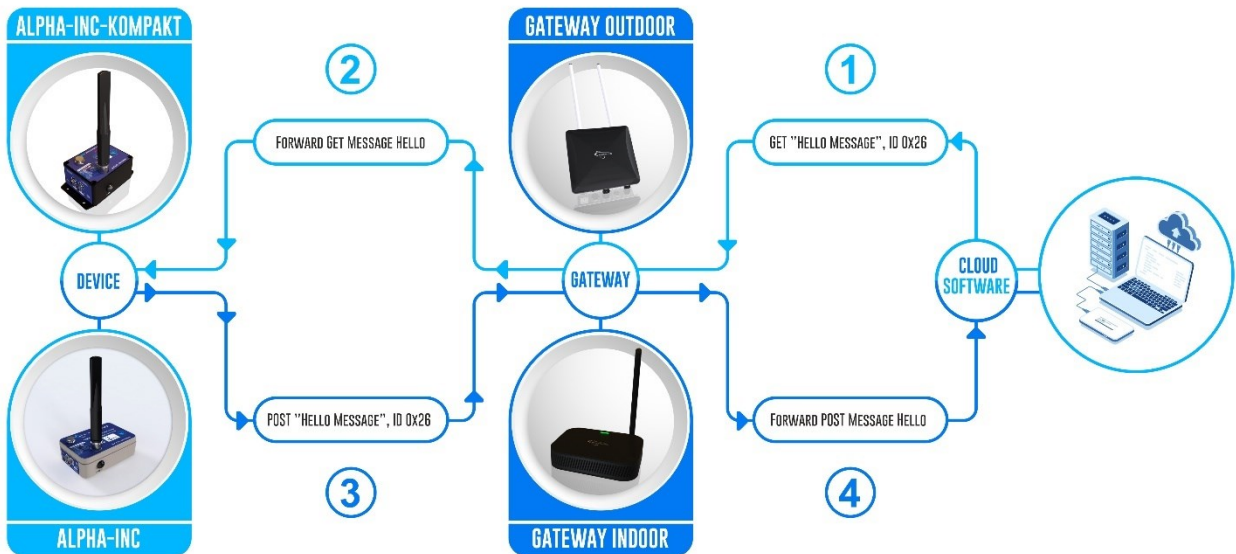


Caption 4: The field operator can check on Satevis® Cloud software (or a third-party cloud software) if his sensor is working properly.



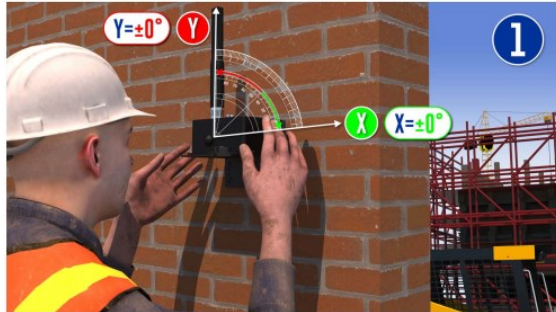
5.2 HELLO MESSAGE REQUESTED REMOTELY

User can also send a GET request to receive Hello Message:



6 SENSOR ZEROING

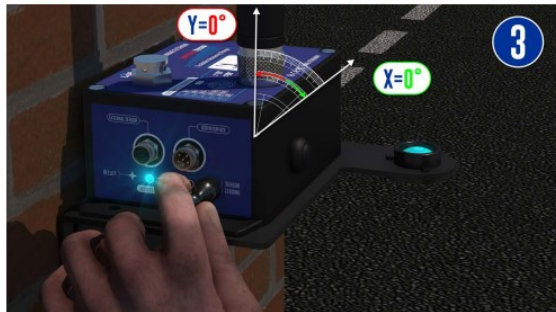
6.1 SENSOR ZEROING MESSAGES (WHEN SENSOR ZEROING IS DONE ON MONITORING SITE)



Caption 1: Even if an angle bracket is used, it's sometimes difficult to bring a zero-offset on both X and Y axis (in the case if Z axis is on the same direction than Earth Gravity). In some cases, the field operator can not spend too much time on this task.



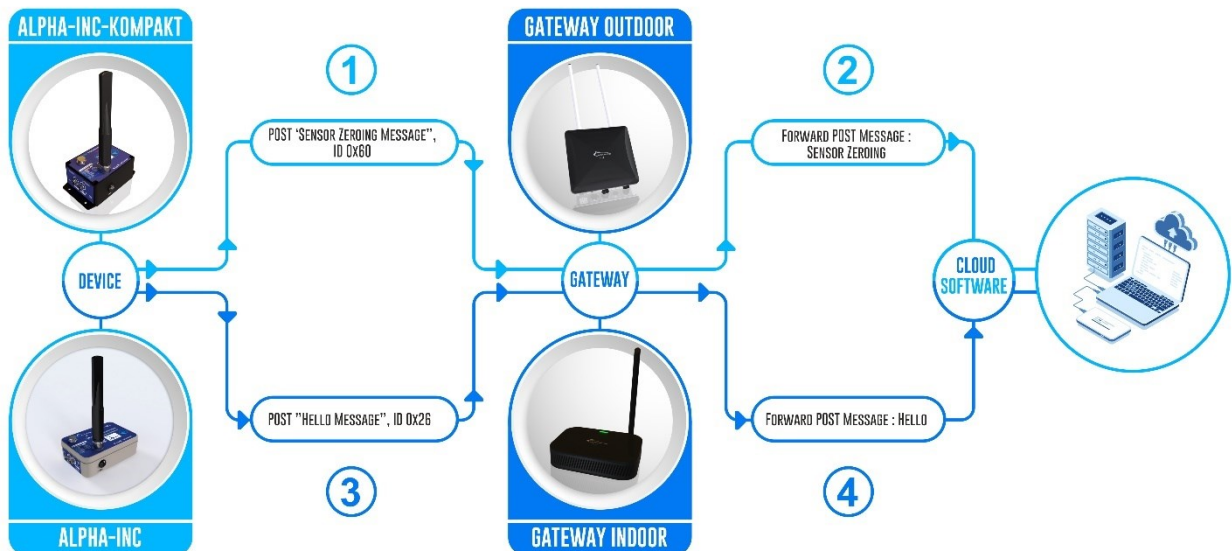
Caption 2: To enable the sensor zeroing function, hold the magnet on "Sensor Zeroing" Label for more than 20s.



Caption 3: The Activity LED blinks in blue, the sensor zeroing starts on both X and Y axis. When this process is done, the Activity led will blink again in blue color and transmits a data measurement to the Lorawan® network. If the sensor zeroing process is not done correctly (the device is moving) the Activity Led will blink in Red color.

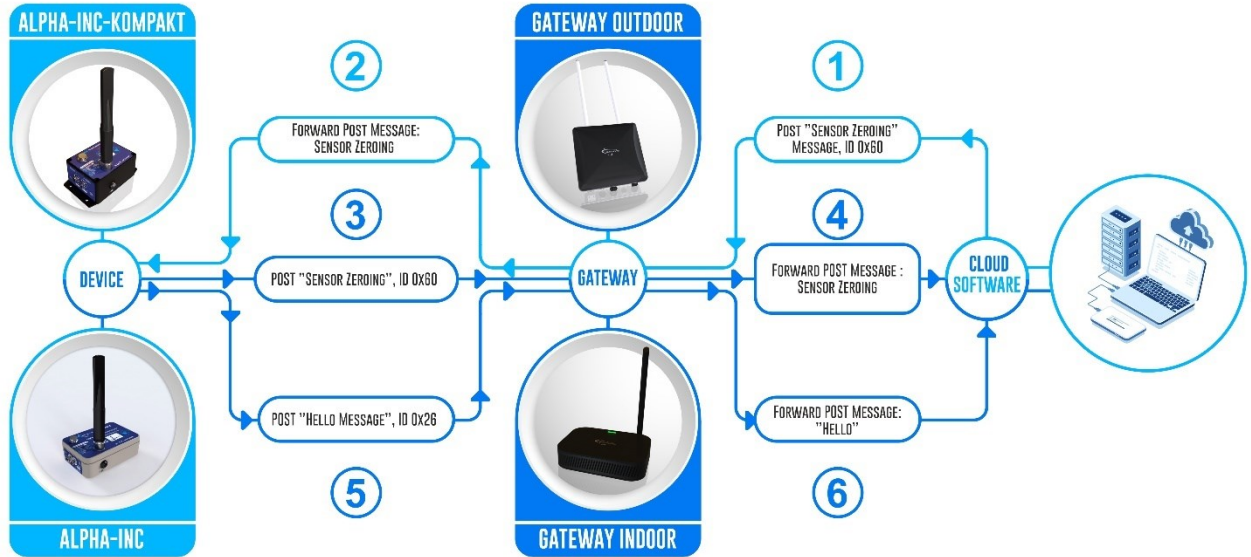


Caption 4: The Sensor-zeroing process can be also done remotely from the cloud software.



6.2 SENSOR ZEROING REQUESTED REMOTELY

Sensor zeroing can also be done remotely from cloud software, there is no need to send a technician on the monitoring to do this operation.

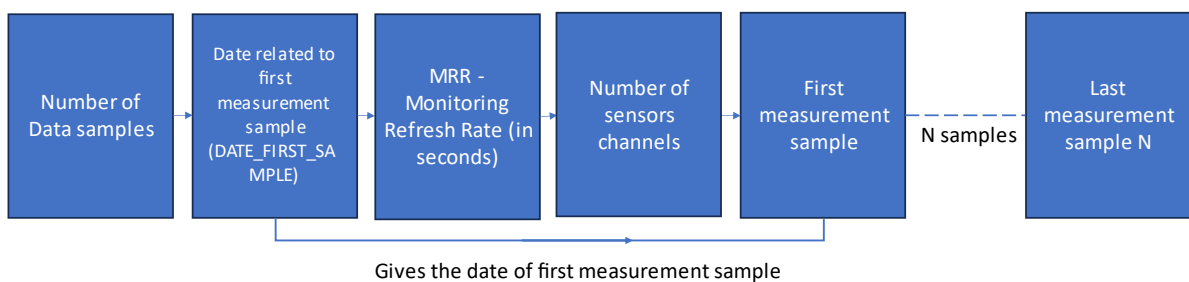


7 MONITORING MODE

7.1 SLOW MONITORING MODE

User-configurable settings related to Slow Monitoring Mode:

- MRR – Monitoring Refresh Rate
- Max Number of data samples per sensor channel in a transmission message (NB_MON_DATA_SAMPLES)



How to get the date of Last Measurement sample:

Date_Sample_N = DATE_FIRST_SAMPLE + MRR (seconds)

7.2 ALARM MODE

Three level of Alarm notifications can be transmitted to cloud software Alert /Action/Alarm .

Several settings are available for an accurate alarm configuration:

- Low or High Alarms Thresholds can be configured;
- For a real-time alarm tracking, the Monitoring refresh cycle can be accelerated when a threshold is reached,
- Alarms can be independently enabled/disabled on the measurement channels;

User can create 'OR' or 'AND' alarm notification rule between each measurement channel .

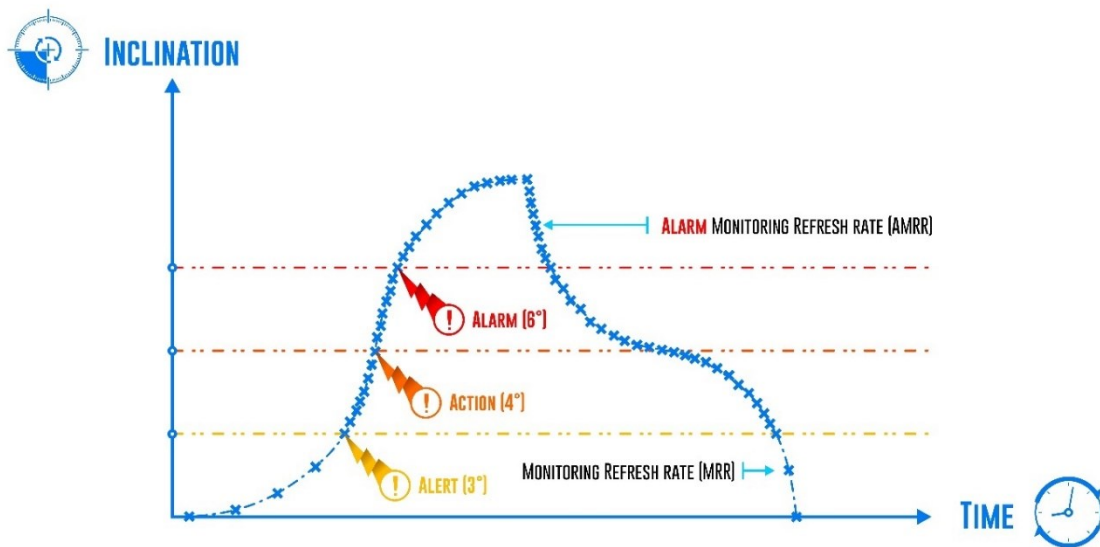
If the Alarm threshold is not reached:

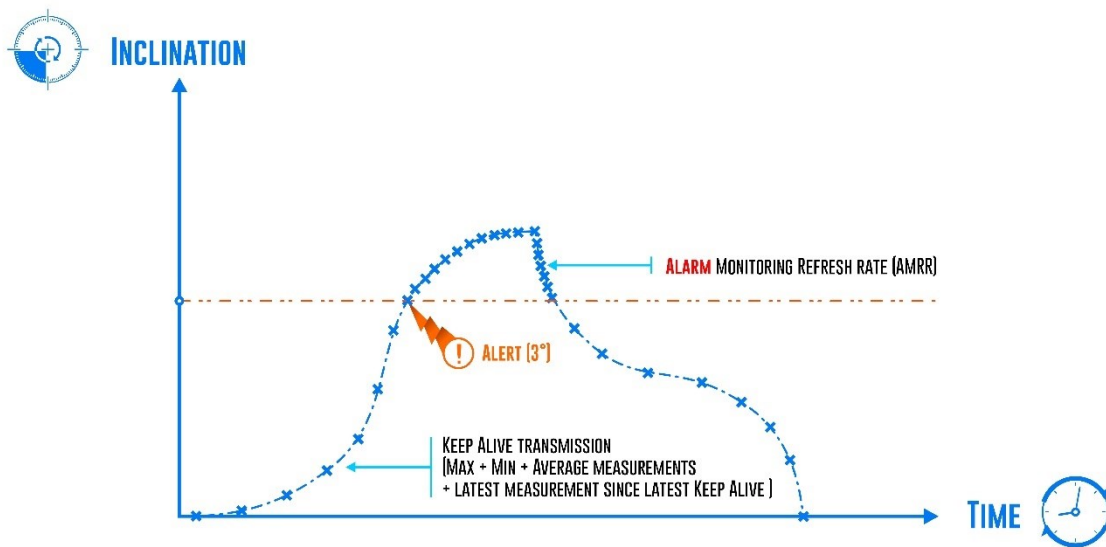
- Satevis® device transmits frequently a Keep Alive Message to keep informed the user about the device operation;

- For each measurement channel, Max/Min/Average values and Latest measurement are encapsulated in the Keep Alive Message;

7.3 ALL THE TIMING VALUES IN ALARM MODE

- **AMRR (Alarm Monitoring Refresh Rate)** : In the case of AAA threshold is reached , the monitoring rate is accelerated to track closely the alarm evolution;
- **MRR (Monitoring Refresh rate)** : In the case if AAA threshold is not reached, the device monitors an alarm at a slower rate



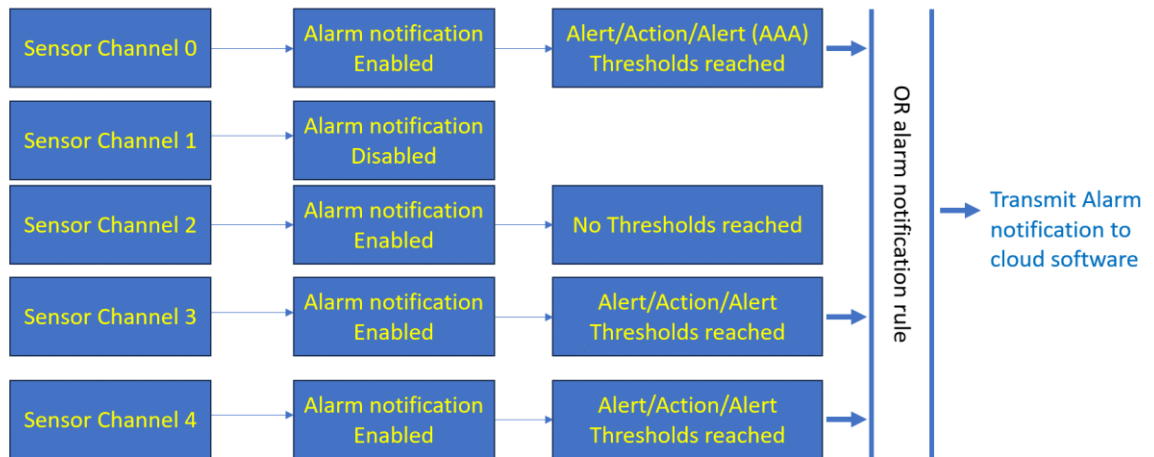


7.4 ALARM NOTIFICATION RULE

Two alarm notification rules are present:

- **Logical 'OR' Alarm Notification** : Alarm notification is transmitted to cloud software if a AAA Threshold is reached on one of the sensor channel (Alarm Notification should be enabled on the sensor channel)
- **Logical 'AND' Alarm Notification** : Alarm notification is transmitted to cloud software if a AAA Threshold is reached **on all the sensor channels at the same time** (Alarm Notification should be enabled on the sensor channel)

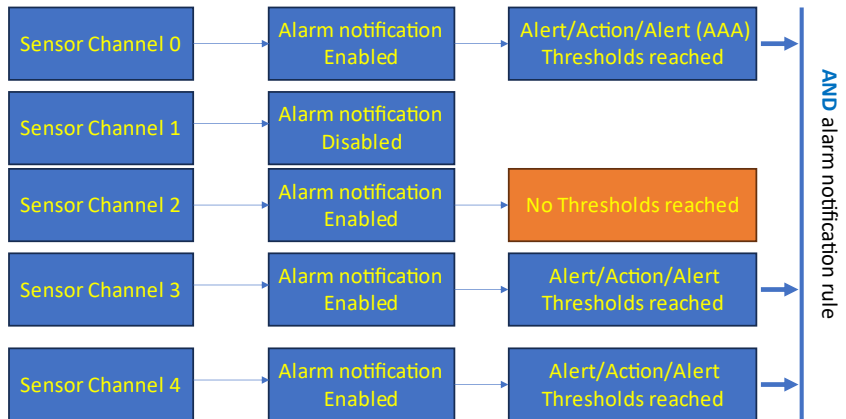
7.4.1 OR Alarm notification Rule



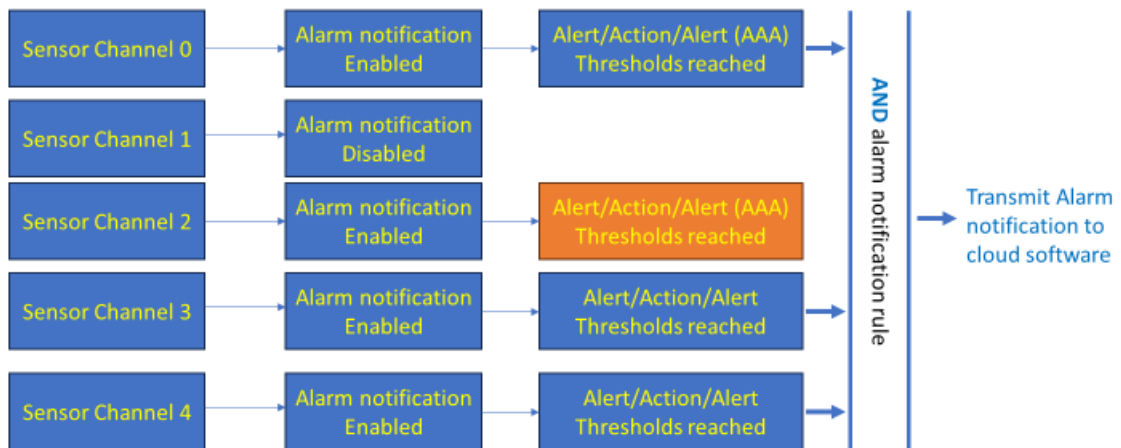
7.4.2 AND Alarm Notification Rule

Logical 'AND' alarm notification rule can be enabled if a correlation is present between the sensor channels. Example of an Inclinator sensor combined with structure/equipment temperature , a temperature raise on the structure can lead to its deformation.

Example 1: No Alarm notification is transmitted to cloud software as on Sensor Channel 2 , no AAA Thresholds was reached.



Example 2 : An alarm notification is transmitted to cloud software as all the sensor channels reached a AAA Thresholds.



7.5 ALARMS THRESHOLDS

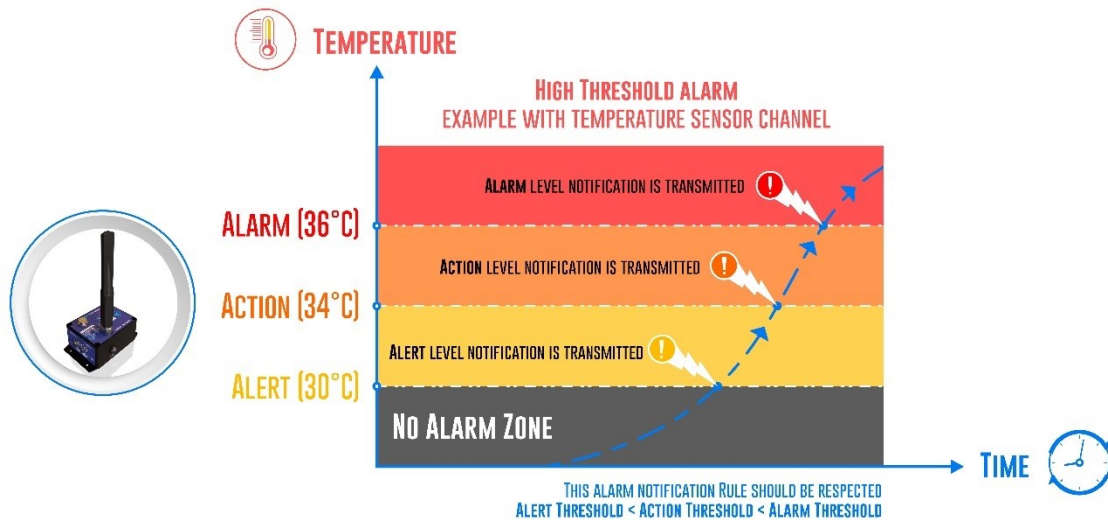
Three levels of alarms notifications are available allowing users to redirect the alarm notification to different emails or to activate a relay:

- **Alert level:** lowest level of alarm,
- **Action level:** medium level of alarm notification
- **Alarm level:** critical level , field intervention is requested

User can configure High/Level Thresholds alarms, explained hereafter.

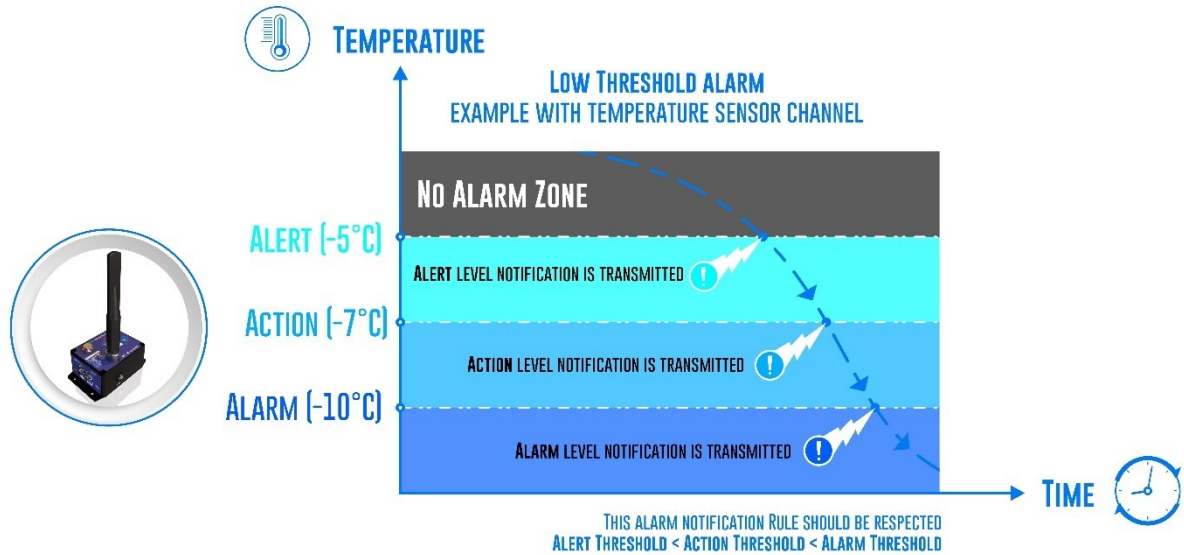
7.5.1 High Threshold Alarms

High thresholds alarms can be used to trigger an alarm when a data measurement is rising. Example of temperature sensor:



7.5.2 Low Threshold Alarms

Low thresholds alarms can be used to trigger an alarm when a data measurement is falling. Example of Temperature sensor :



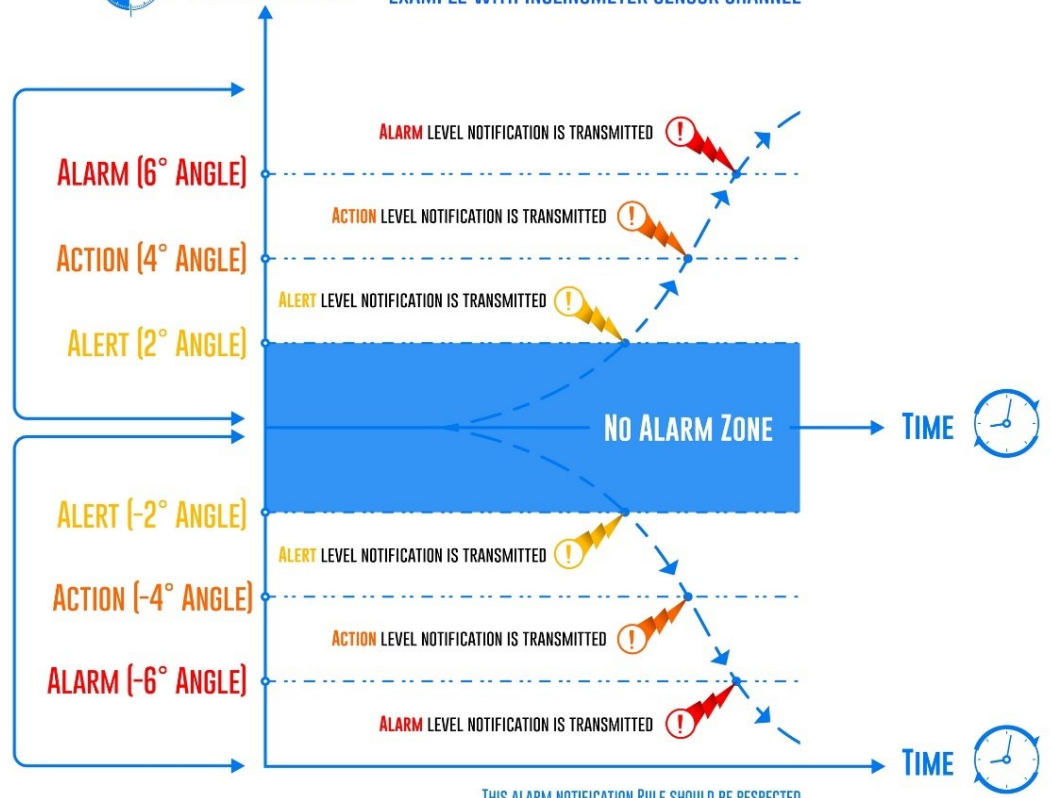
7.5.3 Mixed High-Low Thresholds alarms

Mixed High-Low can be used for sensors used to track a structure/equipment moving to one direction and the opposite.



INCLINOMETER

MIXED (HIGH-LOW) THRESHOLD ALARM
EXAMPLE WITH INCLINOMETER SENSOR CHANNEL



THIS ALARM NOTIFICATION RULE SHOULD BE RESPECTED
|ALERT THRESHOLD| < |ACTION THRESHOLD| < |ALARM THRESHOLD| (ABSOLUTE VALUES)

8 DIAGNOSTIC REPORT

8.1 WHICH INFORMATION ARE TRANSMITTED FREQUENTLY ?

Internal
Temperature
for Battery
Monitoring and
internal sensor
drift

Battery Diag :
Status, Voltage,
Level

Data Logger
Status &
Memory used

Power source
update (USB
Power/Battery
or other mains
power if
available)