

# USER GUIDE FOR SIGFOX TILT SENSOR WSSFC-AG

**THIS IS OBSOLETE MANUAL**

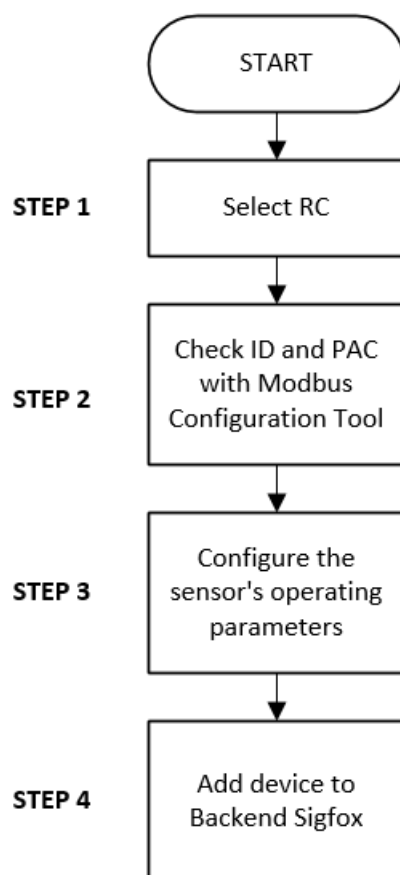
Please access <https://www.iot.daviteq.com/wireless-sensors> for updated manual

WSSFC-AG-MN-EN-01	FEB-2022
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*This document is applied for the following products*

SKU	WSSFC-AG	HW Ver.	1.0	FW Ver.	1.02
Item Code	WSSFC-AG-9-01	Sigfox XYZ Tilt sensor, Internal antenna, Type AA battery 1.5VDC, IP67, RC2-RC3-RC4-RC5 zones			
	WSSFC-AG-8-01	Sigfox XYZ Tilt sensor, Internal antenna, Type AA battery 1.5VDC, IP67, RC1-RC6-RC7 zones			

## 0. Configuration Check List



<b>STEP 1: Select RC</b>	
1. Select RC zone <a href="#">using Modbus Configuration Cable</a>	RC zones selection 1, 2, 4 is RCZ1, RCZ2, RCZ4 (refer to register address <b>270</b> )

2. Select RC zone using button	<a href="#">Refer to the button configuration</a>
<b>STEP 2: Check ID and PAC</b>	
Use Modbus Configuration Cable to read the ID and PAC values	Refer to register address 8 and 10 (DEC)
<b>STEP 3: Configure the sensor's operating parameters</b>	
Configure parameters like cycle send data, alarm, a, b,...	Refer to the configuration section <a href="#">using the Modbus Configuration Cable</a>
<b>STEP 4: Add device to Backend Sigfox</b>	
<a href="#">refer to section 5.4 for details</a>	

# 1. Functions Change Log

HW Ver.	FW Ver.	Release Date	Functions Change
1.0	1.02	DEC-2020	

# 2. Introduction

WSSFC-AG is a Sigfox Tilt Sensor, can be used to measure 3 tilt angles X, Y, Z of any object as Tower, Building, Tree, Electricity Tower, Telecom Tower, Bridges... The Tilt sensor utilises the combination of advanced Accelerometer and Gyro meter to deliver high accuracy and stable measurement of Tilt angle of 03 axis X,Y,Z. The Ultra-Low Power Power design and smart firmware allow the sensor to last up to 10 years with 02 x AA battery (depending on configuration). The sensor will transmit data in kilo-meters distance to Sigfox basestation. WSSFC-AG can support all regions of Sigfox network in over the World, RC1, RC2, RC3, RC4, RC5, RC6, RC7.



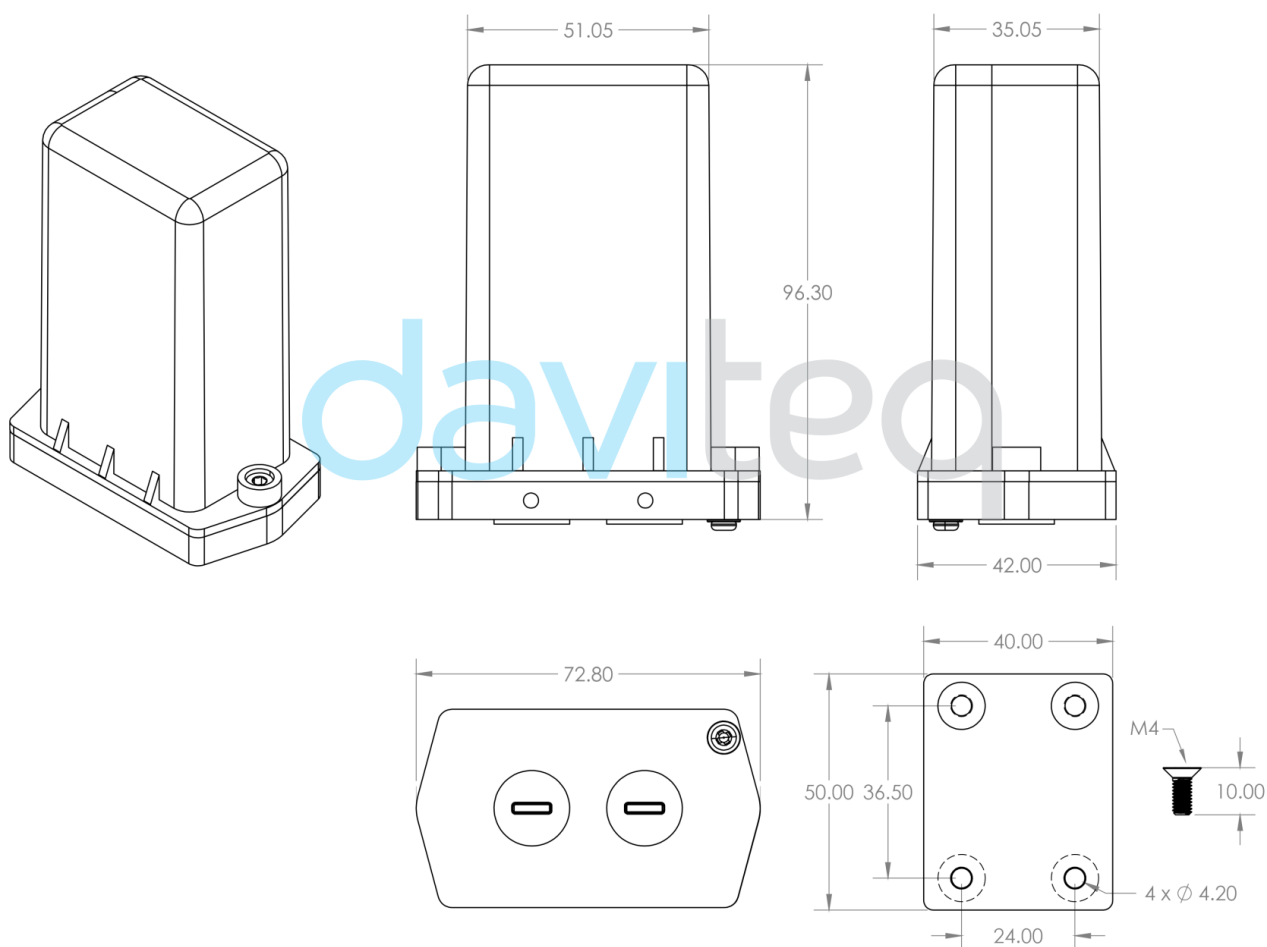
# 3. Specification

<b>SENSORS SPECIFICATION:</b>	
Tilt Sensor	Built-in advanced accelerometer and gyro meter to deliver tilt angle measurement of X, Y, Z

Measurement range	$\pm 90^\circ$ of XYZ
Repeatability	$\pm 0.25^\circ$
Sensor sampling rate	1Hz max
Alarm setting	setting the alarm threshold for each angle
<b>Sigfox SPECIFICATION:</b>	
Sigfox zones	select RC2-RC3-RC4-RC5 or RC1-RC6-RC7
Antenna	Internal Antenna 2dbi
Battery	02 x AA Type 1.5VDC, working time up to 10 years (depends on configuration)
RF Module complies to	CE, FCC, ARIB
Working temperature	-40°C..+60°C (using Energizer Lithium Ultimate AA battery)
Dimensions	H97xW73xD42
Net-weight	250 grams
Housing	Polycarbonate & POM plastic, IP67

## 4. Dimensions

### DIMENSION DRAWING OF WIRELESS SENSOR (Unit: mm)



## 5. Operation Principle

Upon power on, the Sigfox node has **60 seconds** to wait for **off-line** configuration (via **cable** with **ModbusRTU** protocol)

After 1 minute 30 seconds later the device will send the first data packet and at the same time wait for the downlink packet from the Base Station.

Then during the operation, there are 03 cases of sending data to base station:

**1.** When the sensor sampling time interval is reached, the Sigfox node will read the data from Input or sensor and performing the calculation. After that it will check calculated value with alarm thresholds. If the calculated was out off the threshold values (Lo or Hi), called alarm, and the number of times of alarm did not pass the limit of number of alarms, then it will send data to Base station immediately;

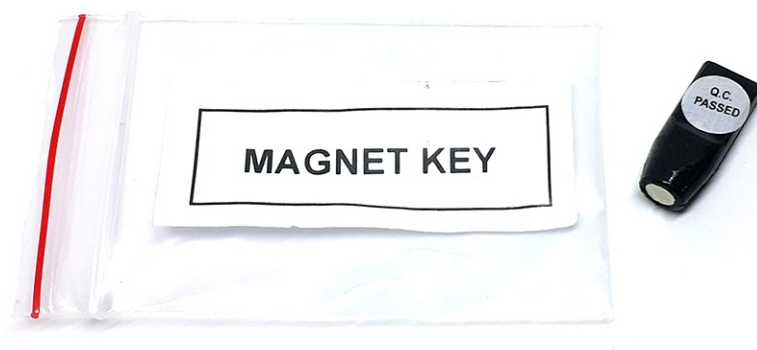
### **NOTE:**



Once sending the data to base station by this alarm event, the timer of sending time interval will be reset;

**2.** When the sending time interval is reached, it will send data to Base station immediately, regardless of value;

**3.** By using the magnet key, the Sigfox node can be triggered to send data to base station immediately. There will be a beep sound from the buzzer meaning the data has been sent.



### **REED SWITCHS FUNCTIONS (activated by magnet):**

EVENT	PRE-CONDITION	ACTION	LED STATUS	ACTIVITIES	POST-CONDITION
FORCE_DATA	Any state	Move Magnet Key to contact point of REED SWITCH. Led blink <b>SKY BLUE</b> , move Magnet Key away.	Blink <b>SKY BLUE</b>	See FW specs	Back to previous state
PARAMETERS_UPDATE	Any state	Move Magnet Key to contact point of REED SWITCH. Led blink <b>SKY BLUE</b> , hold Magnet Key <b>5s</b> . Led blink <b>PURPLE</b> , move Magnet Key away.	Blink <b>PURPLE</b>	See FW specs	Back to previous state

### **NOTE:**



Once sending the data to base station by the magnet key, the timer of sending time interval will be reset;

The shortest time interval between the two manual triggers is **5s**. if shorter than **5s**, there will be no data sending.



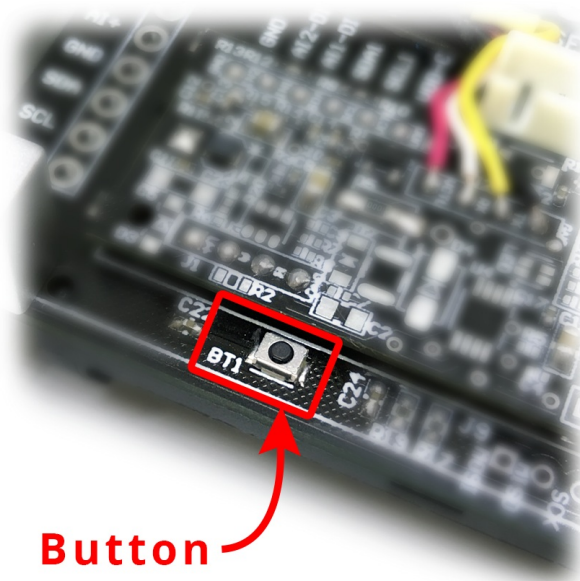
## 5.1 LED meaning

Whenever the data is sent to base station, the LED will lit with color codes as below:

- RC1: **RED** colour
- RC2: **GREEN** colour
- RC4: **BLUE** colour



## 5.2 Button Function



**i** the push button can only be used for the first **60 seconds** after powering up.

## 5.2.1 Menu configuration

There are 3 configuration menus: **tx\_repeat**, **downlink\_flag**, **radio configuration**.

We use the button to enter the menus as follows:

### 5.2.1.1 tx\_repeat

Press and hold the button **2s** -> When the **Red LED** is on, it means entering the **tx\_repeat** configuration menu. Then release to configure it.

Press to configure. After pressing if the **Red LED** flashes **once**, **tx\_repeat = 0** (send 1 time). After pressing if the **Red LED** blinks **twice**, it is **tx\_repeat = 1** (send 3 times).

### 5.2.1.2 downlink\_flag

Press and hold the button **5s** -> When the **Green LED** is on, it means entering the **downlink\_flag** configuration menu. Then release to configure it.

Press to configure. After pressing if the **Green LED** flashes **once**, it is **downlink\_flag = 0** (downlink is not allowed). After pressing if the **Red LED** blinks **twice**, it is **downlink\_flag = 1** (downlink is allowed).

### 5.2.1.3 radio configuration

Press and hold the button **10s** -> **Blue LED** is on, it means entering the **Radio Configuration** menu. Then release to configure it.

Press to configure. After pressing if the **Blue LED** blinks **once**, it is **Radio Configuration = 1**. After pressing if the **Blue LED** flashes **twice**, it is **Radio Configuration = 2**. After pressing if the **Blue LED** flashes **4 times**, it is **Radio Configuration = 4**.

## 5.2.2 Exit the menu:

There are 3 ways to exit the menu:

- Press and hold for 3s, the LED turns off to exit the menu;
- Wait 30 seconds, then exit the menu;
- Take out the battery, it all starts over (outside the menu)).

## 5.3 RC technical details

The RF transmit power will be automatically set as the max value as allowed by the Zone.

Sigfox Radio Configuration (RC) defines the radio parameters in which the device shall operate: Sigfox operating frequencies, output power, spectrum access mechanism, throughput, coexistence with other radio technologies, etc.

Each radio configuration includes 4 uplink classes: 0u, 1u, 2u, and 3u.

The Sigfox network globally works within the ranges from 862 to 928 MHz. But not all RCs require such a wide range of operation.

	RC1	RC2	RC4
<b>Uplink center frequency (MHz)</b>	868.130	902.200	920.800
<b>Downlink center frequency (MHz)</b>	869.525	905.200	922.300
<b>Uplink data rate (bit/s)</b>	100	600	600
<b>Downlink data rate (bit/s)</b>	600	600	600
<b>Sigfox recommended EIRP (dBm)</b>	16	24	24
<b>Specifics</b>	Duty cycle 1% *	Frequency hopping **	Frequency hopping **

\* **Duty cycle** is 1% of the time per hour (36 seconds). For an 8 to 12 bytes payload, this means 6 messages per hour, 140 per day.

\*\* **Frequency hopping**: The device broadcasts each message 3 times on 3 different frequencies. Maximum On time 400 ms per channel. No new emission before 20 s.

\*\*\* **Listen Before Talk**: Devices must verify that the Sigfox-operated 200 kHz channel is free of any signal stronger than -80 dBm before transmitting.

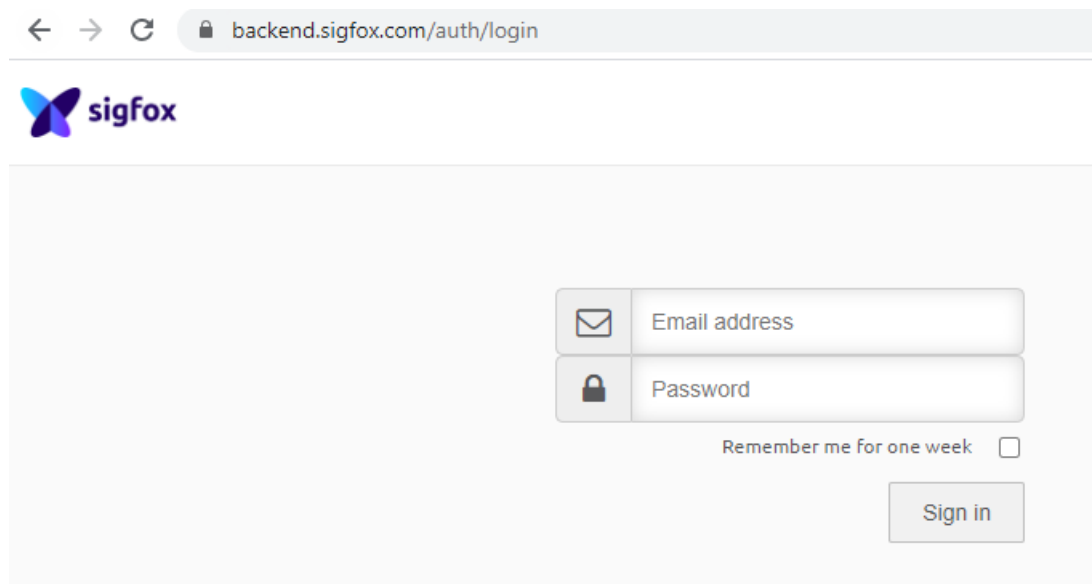
Sigfox's high limit EIRP recommendation is included in each column although regulations sometimes allow for more radiated power than the Sigfox recommendation.

Sigfox's recommendation is set to comply with the Sigfox technological approach of:

- Low current consumption
- Balanced link budget between uplink and downlink communication

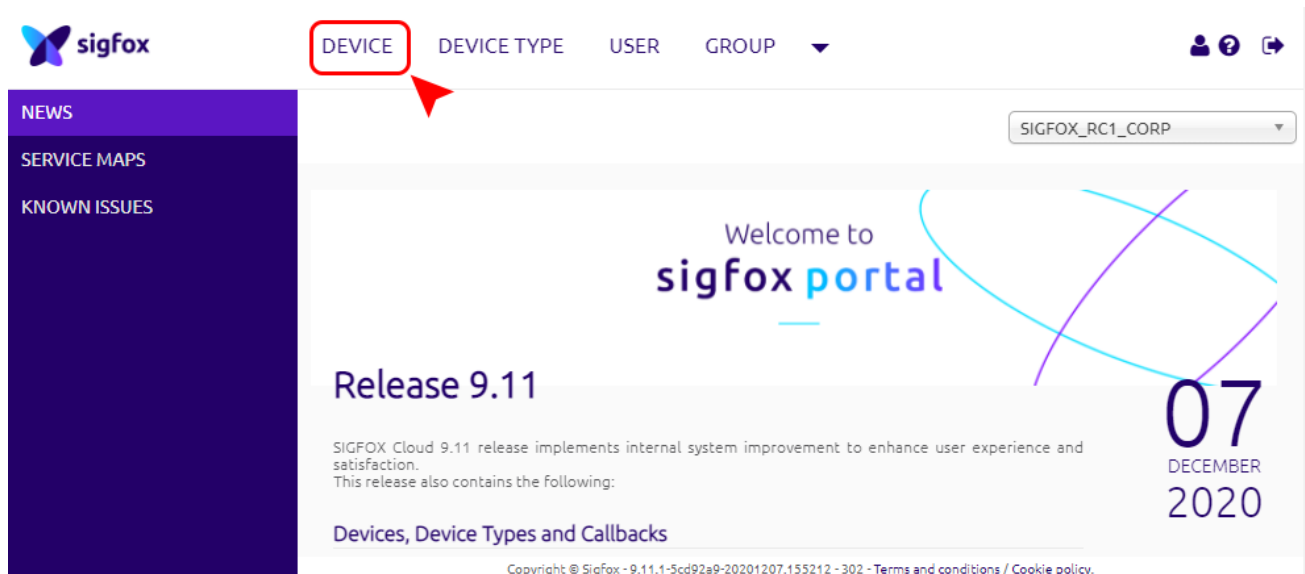
## 5.4 Add a device to the Backend Sigfox

**Step 1:** Log in to the sigfox backend website



The screenshot shows the login page of the Sigfox backend website. The browser address bar displays 'backend.sigfox.com/auth/login'. The page features the Sigfox logo at the top left. The login form consists of two input fields: 'Email address' with an envelope icon and 'Password' with a lock icon. Below these fields is a checkbox labeled 'Remember me for one week'. A 'Sign in' button is located at the bottom right of the form.

**Step 2:** Click on Device



The screenshot shows the Sigfox portal dashboard. The top navigation bar includes the Sigfox logo and several menu items: 'DEVICE' (highlighted with a red box and a red arrow), 'DEVICE TYPE', 'USER', and 'GROUP'. On the left side, there is a dark blue sidebar with links for 'NEWS', 'SERVICE MAPS', and 'KNOWN ISSUES'. The main content area displays a 'Welcome to sigfox portal' message, a 'Release 9.11' announcement, and a date '07 DECEMBER 2020'. A dropdown menu at the top right shows 'SIGFOX\_RC1\_CORP'. The footer contains copyright information: 'Copyright: © SigFox - 9.11.1-5cd92a9-20201207.155212 - 302 - Terms and conditions / Cookie policy.'

**Step 3:** Click New → Select a group

The screenshot shows the Sigfox web interface. The top navigation bar includes the Sigfox logo and tabs for 'DEVICE', 'DEVICE TYPE', 'USER', and 'GROUP'. The 'DEVICE' tab is selected. Below the navigation bar, there is a sidebar with 'DEVICES' and 'DELETED DEVICES'. The main content area shows a 'New' button highlighted with a red box and a red arrow. Other buttons include 'New series', 'Edit series', 'Transfer series', 'Replace series', and 'Delete series'. A dropdown menu shows 'SIGFOX\_RC1\_CORP'. Below these buttons are input fields for 'Id', 'State', 'Last seen from date', and 'Last seen to date'. There are also buttons for 'RESET' and 'FILTER'. At the bottom, there is a table with columns: 'Communication status', 'Device type', 'Group', 'Id', 'Last seen', 'Name', 'Token state', and 'PAC'. The footer contains copyright information: 'Copyright © Sigfox - 9.11.1-5cd92a9-20201207.155212 - 302 - Terms and conditions / Cookie policy.'

**Step 4:** Fill in the required information

The screenshot shows the 'Device - New' form in the Sigfox web interface. The form is titled 'Device - New' and contains several input fields and checkboxes. The 'Device information' section includes fields for 'Identifier (hexl)' (0000), 'Name', 'PAC', and 'End product certificate'. Below this is a link 'Where can I find the end product certificate?'. The 'Type' dropdown is set to 'ST\_Micro\_SEmaker\_DevKit\_1'. There are fields for 'Lat (-90° to +90°)' (0.0) and 'Lng (-180° to +180°)' (0.0). A 'Map' section has a 'Locate on map' button. The 'Subscription automatic renewal' checkbox is checked. The 'Activable' checkbox is also checked. At the bottom are 'Ok' and 'Cancel' buttons. The footer contains copyright information: 'Copyright © Sigfox - 9.11.1-5cd92a9-20201207.155212 - 302 - Terms and conditions / Cookie policy.'

**Note:** Some of our products may not have end product certification in time, to add the product to Backend Sigfox please follow the steps below.

**Click on the text as shown below**



## Device - New

Device information

Identifier (hex!)

Name

PAC

End product certificate  ⓘ

Where can I find the end product certificate?

Type  Available Tokens: 0

Lat (-90° to +90°)

Lng (-180° to +180°)

Map [Locate on map](#)

Subscription automatic renewal ☒

Activable ☒ ⓘ

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Check the box as shown below to register as a prototype

## Device - New

Device information

Identifier (hex!)

Name

PAC

End product certificate  ⓘ

Where can I find the end product certificate?

The device vendor should provide the end product certificate number. If not, please use the search bar below:

Otherwise you can contact your Sigfox distributor service desk.  
If the device has not obtained an end product certificate yet, then you can register as a prototype.

☒ Register as a prototype (remaining prototypes which can be registered in your group: 1000)

Type  Available Tokens: 0

Lat (-90° to +90°)

Lng (-180° to +180°)

Map [Locate on map](#)

Subscription automatic renewal ☒

Activable ☒ ⓘ

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## 5.5 Measurement principle of Sigfox Sensor

When the sensor sampling time interval is reached, for example 2 minutes, the Sigfox node will wake up and switch ON

the power supply to supply the energy to external sensor to start the measurement. Depends on the type and characteristic of external sensor, the sensor will take a certain time to finish the measurement.

Once reading the value, it can be scaled to any engineering value by the following formula:

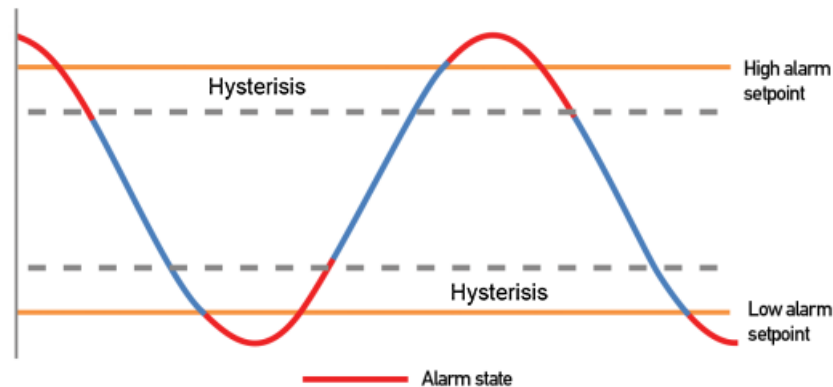
$$Y = aX + b$$

**Where:**

- X: the raw value from sensor
- Y: the calculated value will be sent to Sigfox base station in the payload data.
- a: constant (default value is 1)
- b: constant (default value is 0)

So, if there is no user setting for **a** and **b** ==> **Y = X**

The **Y** value will be compared with Lo and Hi threshold. Please refer below the graph of alarm processing.



## 5.6 Configuration Parameters

Parameter	Description	Possible values	Default value	Length (in bits)
<b>LED_BUZZER_ENABLE</b>	Enable/Disable LEDs and Buzzers interactions for action not triggered by the reed switch	0b0 = LEDs and Buzzers are OFF 0b1 = LEDs and Buzzers are ON	0b1 = LEDs and Buzzers are ON	<b>1</b>
<b>HEARTBEAT_PERIOD</b>	Period of time to send HEARTBEAT event	0b000 = every 1h 0b001 = every 6h 0b010 = every 12h 0b011 = every 24h (1 day) 0b100 = every 48h (2 days) 0b101 = every 72h (3 days) 0b110 = every 120h (5 days) 0b111 = every 240h (10 days)	0b011 = every 24h (1 day)	<b>3</b>
<b>MEASURE_PERIOD</b>	Period of time to measure sensor	0b0000 = every 1s 0b0001 = every 2s 0b0010 = every 5s 0b0011 = every 10s 0b0100 = every 20s 0b0101 = every 30s 0b0110 = every 1min 0b0111 = every 2min 0b1000 = every 5min 0b1001 = every 10min 0b1010 = every 20min 0b1011 = every 30min 0b1100 = every 1h 0b1101 = every 2h 0b1110 = every 3h 0b1111 = every 6h	0b1001 = every 10min	<b>4</b>
<b>TX_REPEAT</b>	Sigfox TX repeat	0b0 = Send RF 1 time 0b1 = Send RF 3 time	0b1 = Send RF 3 time	<b>1</b>
<b>CYCLIC_DATA_PERIOD</b>	Period of time to send CYCLIC_DATA event	0b000 = every 10min 0b001 = every 30min 0b010 = every 1h 0b011 = every 2h 0b100 = every 3h 0b101 = every 6h 0b110 = every 12h 0b111 = every 24h	0b000 = every 10min	<b>3</b>

<b>DEVICE_RESET</b>	Once this parameter is set, the device shall restart once after having received the Downlink.	0b1010 = 0xA = force device reset others = do nothing	0b0000 = do nothing	<b>4</b>
<b>DOWNLINK_TYPE</b>	Downlink type	4-bit unsigned integer See Sigfox Downlink tab	0b0000	<b>4</b>

## 5.7 Payload Data

The following is the format of payload data that will be sent to the Sigfox server.

### 5.7.1 Payload Fields

Data name	Description	Encoding or Possible values	Length (in bits)
<b>EVENT_ID</b>	Unique ID identifying the device event	4-bit unsigned integer 0 = START_UP 1 = HEARTBEAT 2 = PARAMETERS_UPDATE 3 = FORCE_DATA 4 = CYCLIC_DATA 5 = ALARM	<b>4</b>
<b>HW_VERSION</b>	Indicate HW version	4-bit unsigned integer 1..15	<b>4</b>
<b>FW_VERSION</b>	Indicate FW version	8-bit unsigned integer 1..255	<b>8</b>
<b>LATEST_SIGFOX_DOWNLINK</b>	Latest received and valid sigfox downlink frame = Current configuration	64-bit encoded field See Sigfox Downlink tab	<b>64</b>
<b>HW_ERROR</b>	HW error	0b0 = no error 0b1 = error	<b>1</b>
<b>BATTERY_LEVEL</b>	Battery level	2-bit unsigned integer 0..3	<b>2</b>
<b>X_TILT_VALUE_X10</b>	X Tilt value	16-bit signed integer X_TILT_VALUE = X_TILT_VALUE_X10 / 10 Range: -90.0 to 90.0	<b>16</b>
<b>Y_TILT_VALUE_X10</b>	Y Tilt value	16-bit signed integer Y_TILT_VALUE = Y_TILT_VALUE_X10 / 10 Range: -90.0 to 90.0	<b>16</b>
<b>Z_TILT_VALUE_X10</b>	Z Tilt value	16-bit signed integer Z_TILT_VALUE = Z_TILT_VALUE_X10 / 10 Range: -90.0 to 90.0	<b>16</b>

### 5.7.2 Sigfox Uplink Frame Format

Size					
	<b>START_UP</b>	<i>(led blink <b>WHITE</b>)</i>			
	<b>Payload</b>	<b>EVENT_ID</b>	<b>HW_VERSION</b>	<b>FW_VERSION</b>	<b>LATEST_SIGFOX_DOWNLINK</b>
10.0	<b>bits</b>	<b>4</b>	<b>4</b>	<b>8</b>	<b>64</b>
	<i>Value</i>	<i>0b0000 = 0</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
	<b>HEARTBEAT</b>	<i>(led blink <b>GREEN</b>)</i>			
	<b>Payload</b>	<b>EVENT_ID</b>	<b>HW_VERSION</b>	<b>FW_VERSION</b>	<b>LATEST_SIGFOX_DOWNLINK</b>

10.0	bits	4	4	8	64
	Value	0b0001 = 1	yes	yes	yes
	PARAMETERS_UPDATE (led blink <b>PURPLE</b> )				
	Payload	EVENT_ID	HW_VERSION	FW_VERSION	LATEST_SIGFOX_DOWNLINK
10.0	bits	4	4	8	64
	Value	0b0010 = 2	yes	yes	yes

	FORCE_DATA (led blink <b>SKY BLUE</b> )								
	Payload	EVENT_ID	HW_ERROR	reserved	BATTERY_LEVEL	reserved	X_TILT_VALUE	Y_TILT_VALUE	Z_TILT_VALUE
8.0	bits	4	1	5	2	4	16	16	16
	Value	0b0011 = 3	yes	zeros	yes	zeros	yes	yes	yes
	CYCLIC_DATA (led blink <b>SKY BLUE</b> )								
	Payload	EVENT_ID	HW_ERROR	reserved	BATTERY_LEVEL	reserved	X_TILT_VALUE	Y_TILT_VALUE	Z_TILT_VALUE
8.0	bits	4	1	5	2	4	16	16	16
	Value	0b0100 = 4	yes	zeros	yes	zeros	yes	yes	yes

### 5.7.3 Payload for Downlink, length is 8 bytes.

⚠ The Sigfox node is only able to receive max 04 downlinks a day, each downlink will be waiting in every 06 hours.

User can set the down link data in Sigfox back-end system in advance, whenever the Sigfox node connected to base stations and with downlink waiting is enable at that time (one time in 6 hours), the downlink data will be loaded to Sigfox node.

The downlink data can be any configuration parameter.

⚠ **Please pay attention when send downlink data.** If there was a mistake in sending wrong data, it would cause the Sigfox node not working properly and user need to configure it by **offline cable!!!**

Size									
	DOWNLINK_ID = 0								
	Payload	reserved	LED_BUZZER	HEARTBEAT	MEASURE_PERIOD	TX_REPEAT	CYCLIC_DATA	DEVICE_RESERVED	DOWNLINK_ID
8.0	bits	44	1	3	4	1	3	4	4

	Value	zeros	yes	yes	yes	yes	yes	yes	0b0000 = 0
--	-------	-------	-----	-----	-----	-----	-----	-----	------------

	<b>DOWNLINK_TYPE = 5</b>					
	<b>Payload</b>	<b>PRM_ADDRESS</b>	<b>PRM_LENGTH</b>	<b>PRM_VALUE</b>	<b>reserved</b>	<b>DOWNLINK_TYPE</b>
8.0	<b>bits</b>	<b>8</b>	<b>8</b>	<b>16</b>	<b>28</b>	<b>4</b>
	Value	yes	0x02 = 2	yes	zeros	0b0101 = 5
	<b>Payload</b>	<b>PRM_ADDRESS</b>	<b>PRM_LENGTH</b>	<b>PRM_VALUE</b>	<b>reserved</b>	<b>DOWNLINK_TYPE</b>
8.0	<b>bits</b>	<b>8</b>	<b>8</b>	<b>32</b>	<b>12</b>	<b>4</b>
	Value	yes	0x04 = 4	yes	zeros	0b0101 = 5

## 6. Offline configuration

Using the configuration cable to connect to the sensor as below picture.



Serial port configuration on computer: **9600** baud, **None** parity, **1** stop bit.

⚠ Reading data by **Function 3**.

Writing data by **Function 16**.

During connection with Modbus configuration tool, the Sigfox node will send all data in realtime: Battery, Battery level, Vref, Button status, reed switch status, PCB temperature, Measured value, alarm status.

**Step to configure & check data:**

### NOTE:

⚠ The Modbus configuration can be done in the first **60s** after power up the Sigfox node. After 60s, if user can not finish the configuration, user need to reset the power of Sigfox node again, by removing battery in at least 15s.

**Step 1:** Install the Modbus Configurator Software in the link below

<https://filerun.daviteq.com/wl/?id=qK0PGNbY1g1fuxTqbFW9SXtEvCw7bpc6>

**How to use the Modbus configuration software**

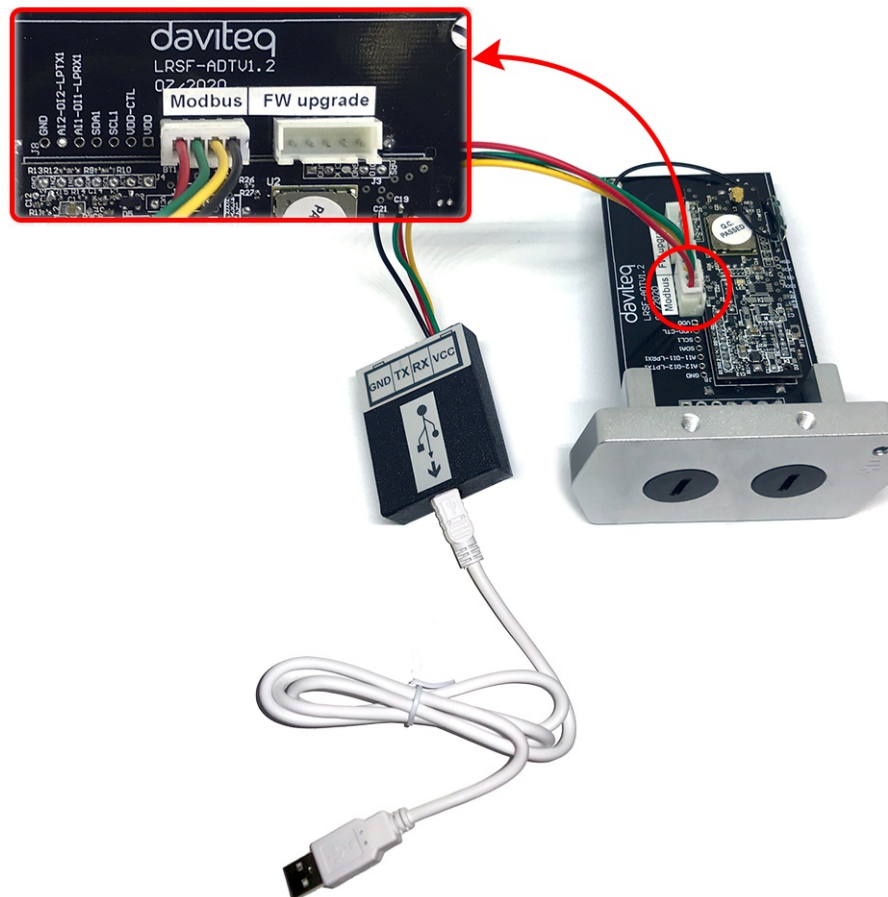
**Step 2:** Plug the configuration cable to Computer via **USB** port;



**Step 3:** Open the housing;



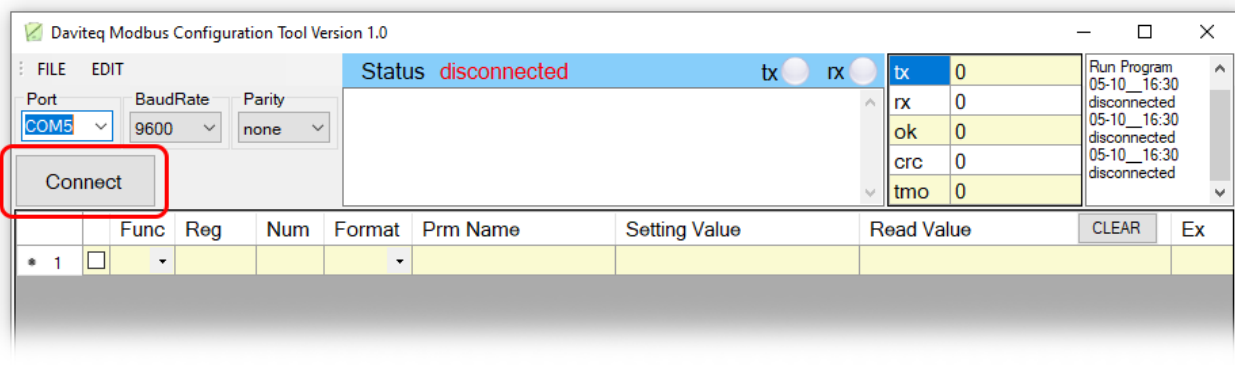
**Step 4:** Plug the connector to the configuration port;



**Step 5:** Import the configuration file by importing the csv file: Go to MENU:FILE / **Import New** / => select the file with name CONFIGURATION TEMPLATE FILE FOR SIGFOX.csv (in the link below). Then click **Connect**;



**CONFIGURATION TEMPLATE FILE FOR SIGFOX WSSFC-AG.csv**



**Here is the table of Data will be read by Modbus tool**

Modbus Register (Dec)	Modbus Register (Hex)	Function Code (Read)	Function Code (Write)	# of Registers	Description	Range	Default	Format	Property	Comment
2	2	3		4	FW_VERSION			string	Read	
6	6	3		2	HW_VERSION			string	Read	
8	8	3		2	DEVICE_ID			hex	Read	Product ID
10	A	3		4	DEVICE_PAC			hex	Read	Product PAC

14	E	3		1	SENSOR_TYP	1-255		uint16	Read	Sensor or Input Type
----	---	---	--	---	------------	-------	--	--------	------	----------------------

## Here is the table for Configuration:

Modbus Register (Dec)	Modbus Register (Hex)	Function Code (Read)	Function Code (Write)	# of Registers	Description	Range	Default	Format	Property	Comment
270	10E	3	16	4	CURRENT_C			hex	Read / Write	
274	112	3	16	1	SERVER_CO			uint16	Read / Write	0: Send to Sigfox Network 1: Send to Dongle
276	114	3	16	1	RADIO_CON	1, 2, 4	4	uint16	Read / Write	RC zones selection 1, 2, 4 is RCZ1, RCZ2, RCZ4
277	115	3	16	1	TX_POWER		20	int16	Read / Write	RF Tx power
286	11E	3	16	2	SENSOR_BO		200	uint32	Read / Write	Boot time of sensor/input in ms

## 7. Installation

### 7.1 Locate the good place for Radio signal

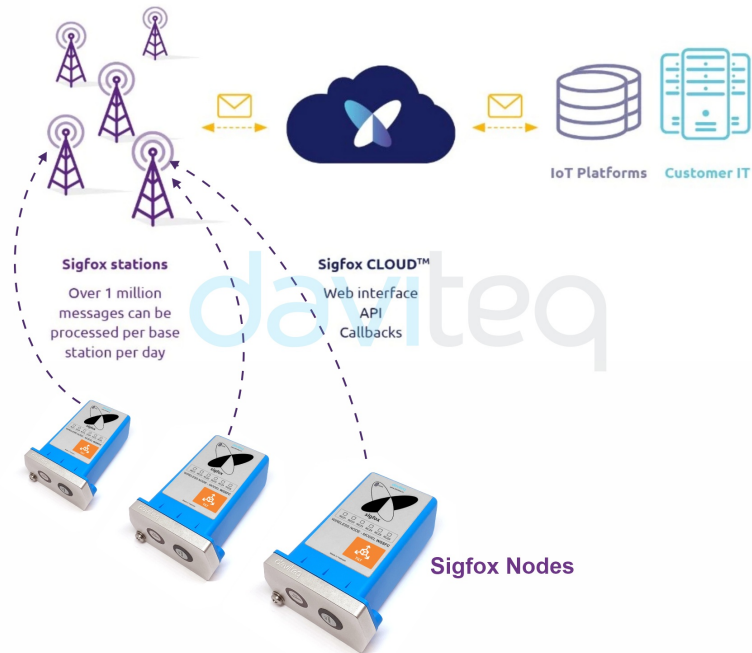
To maximize the distance of transmission, the ideal condition is Line-of-sight (LOS) between the Sigfox sensor and Base station. In real life, there may be no LOS condition. However, the Sigfox sensor still communicate with Base station, but the distance will be reduced significantly.

#### **ATTENTION:**

**DO NOT** install the Sigfox sensor or its antenna inside a completed **metallic** box or housing, because RF signal can not pass through metallic wall. The housing is made from Non-metallic materials like plastic, glass, wood, leather, concrete, cement...is acceptable.



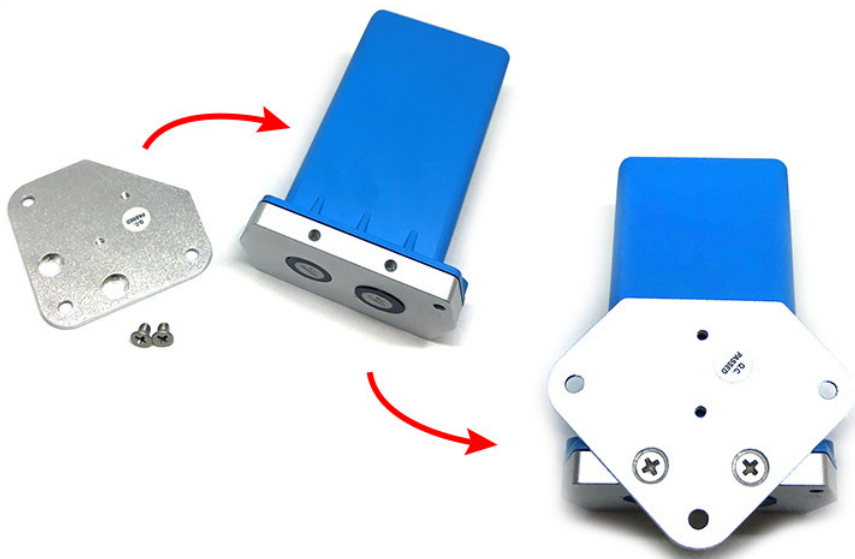
## SYSTEM ARCHITECTURE



WSSFC-AG-H5.PNG

## 7.2 Process mounting

### 7.2.1 Bracket installation



### 7.2.2 Site Installation

#### ⚠ WARNING:

- ⚠ The sensor must be securely fixed on the tilt angle measurement area.
- ⚠ The sensor only measures 3 axes from -90 degrees to 90 degrees
- ⚠ It is recommended to make a standard angle of 90 degrees for the sensor to achieve the best measurement results

#### TILT SENSOR FOR CRANE MONITORING



WSSFC-AG-H4.PNG

#### TILT SENSOR INSTALLED ON THE TREE



WSSFC-AG-H3.PNG

## 7.3 Battery installation

#### RECOMMENDED BATTERIES FOR SIGFOX SENSOR

##### E91 AA Alkaline battery



-18 .. + 60 oC working temperature

10-year shelf life

3000 mAH Capacity

Price: 1X

##### L91 AA Lithium battery



-40 .. + 60 oC working temperature

20-year shelf life

3500 mAH Capacity

Price: 3.5X

WSSFC-ULC-H7.PNG

*Steps for battery installation:*

**Step 1:** Using L hex key to unscrew M4 screws at the side of the housing and carefully pull out the top plastic housing in the vertical direction



**Step 2:** Insert 02 x AA 1.5VDC battery, please take note the poles of the battery

**ATTENTION:**



REVERSED POLARITY OF BATTERIES IN 10 SECONDS CAN DAMAGE THE SENSOR CIRCUIT!!!



**Step 3:** Insert the top plastic housing and locking by L hex key

**ATTENTION:**



When reinstalling the cover, pay attention to put the PCB edge into the middle slot of the box inside as shown below)



## 8. Troubleshooting

No.	Phenomena	Reason	Solutions
1	Node does not send RF to base station periodically, LED does not blink	<ul style="list-style-type: none"> <li>No power supply or battery ran out</li> <li>Configuration sending cycle is incorrect</li> </ul>	<ul style="list-style-type: none"> <li>Check that the battery is empty or not installed correctly</li> <li>Check the power supply</li> <li>Check the send cycle configuration</li> </ul>
2	Node does not send RF to base station according to the alarm, LED does not blink	<ul style="list-style-type: none"> <li>The alarm configuration is incorrect</li> <li>Running out of the number of alarms set for the day</li> </ul>	<ul style="list-style-type: none"> <li>Check alarm configuration</li> <li>Check the configuration for the maximum number of alarms per day</li> </ul>
3	Node does not send RF to base station when activated by the magnetic switch, LED does not blink	<ul style="list-style-type: none"> <li>Magnetic switch has malfunctioned</li> <li>Or place the Magnet key not right position</li> </ul>	<ul style="list-style-type: none"> <li>Locate the correct position for magnet key</li> <li>Read the status of the magnetic switch via modbus (when powering or attaching the battery) to see if the magnetic switch is working.</li> </ul>
4	Node has blinked LED when sending RF but the base station cannot received	<ul style="list-style-type: none"> <li>Out of the number of RF packages of uplink per day (140 packages / day)</li> </ul>	<ul style="list-style-type: none"> <li>Check on the base station whether the event message exceeds the number of RF packets</li> </ul>
5	Node has sent RF but the LED does not blink	<ul style="list-style-type: none"> <li>LED malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Contact manufacturer</li> </ul>

6	The measurement values from sensor do not change, keep constant values for long time	<ul style="list-style-type: none"> <li>• Sensor got failure</li> <li>• Sensor cable broken</li> <li>• Sensor connector is not connected firmly</li> </ul>	<ul style="list-style-type: none"> <li>• Check sensor cable and connector</li> <li>• If the issue is still exist, please contact manufacturer for warranty or replace new sensor</li> </ul>
7	The node does not send RF and the RF module is hot	<ul style="list-style-type: none"> <li>• Insert the battery in the wrong direction</li> <li>• Electronics got problem</li> </ul>	<ul style="list-style-type: none"> <li>• Check battery polarity</li> </ul>
8	RSSI is weak and often loses data	<ul style="list-style-type: none"> <li>• Distance between Node and Base station is far or there are many obstructions</li> <li>• Connection to Antenna problem</li> </ul>	<ul style="list-style-type: none"> <li>• Check location of Sigfox node and distance to base station</li> <li>• Check the antenna connector in the PCB</li> </ul>

## 9. Support contacts

Manufacturer



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