NB-IoT Vibrating Wire Datalogger
VWdot

USER MENU

Model: VD-1002

sanlien

Contents

I. Introduction

Utilizing the latest NB-IoT wireless transmission technology, **VWdot** is a datalogger that can measure frequency and thermistor temperature signals of vibration wire sensors.

The hosing is designed with a robust and waterproof enclosure that complies with IP65 standard. **VWdot** is able to sustain long-term measurement and instant data upload because of its low-power consumption which is merely using a 18650 Li-ion rechargeable battery. It is able to back-up and store more than 1 million of recorded data with its built-in 16 GB SD card.

Therefore, **VWdot** is not only a wireless datalogger but also a stand-alone system where there is no NB-IoT service.

VWdot is a reliable, cost-effective datalogger developed for all kinds of vibrating wire sensor and civil engineering applications.

Service Including：

- Water level : VW water level gauge and VW piezometer measurement
- Stress : VW Rebar Strain gauge measurement
- Strain : VW Strain gauge measurement
- Anchor load : VW load cell measurement
- Structural cracks : VW crackmeter measurement
- Landslide : VW displacement gauge measurement

II、Specification

Sensor Type	Vibrating Wire sensor
Number of Instrument	1 channel
Measuring Range	450~6000Hz
Accuracy	±0.01%
Resolution	0.01Hz
Storage	32GB Micro SD card
Network Module	NB-IoT
Output	MQTT
Temperature Type	Thermistor Resolution 0.1℃
Power Supply	18650 Li-Lon Battery x2
Dimensions (WxHxD)	100x100x60mm (not included antenna)

III、Accessory

VWdot Standard package includes：

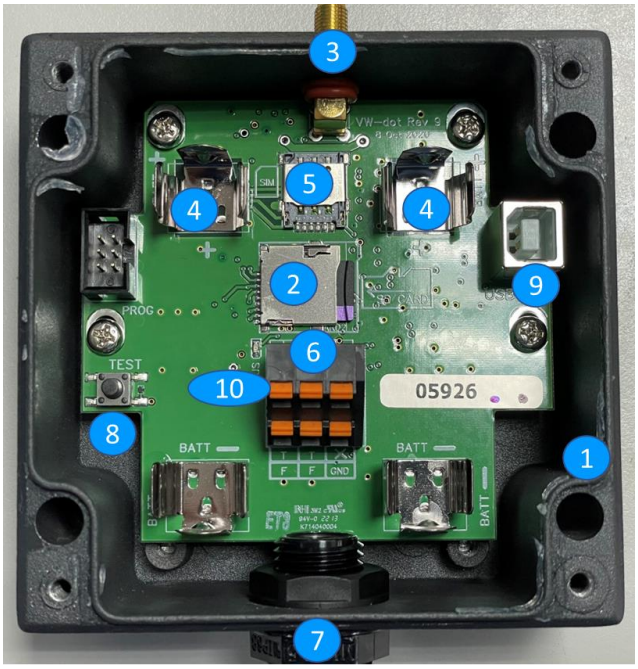
(1) **VWdot** Datalogger x1

(2) Antenna x1

(3) 32GB Micro SD card x1

(4) 18650 Rechargeable Li-Lon Battery x2(unincluded)

(5) NB-IoT SIM card x1(unincluded)



1	VWdot Enclosure
2	SD Card Slot
3	Antenna Port
4	Battery Holder
5	SIM Card Slot
6	Terminal Socket
7	Cable Gland
8	Test Button
9	COM Port

IV、SD Card setup

Included 32GB data capacity SD card.

Formatting the SD card by Windows operating system as FAT32 and allocating unit size 64KB is always advised.

There will be total of 3 files on SD card that are needed for normal operation. There are:

1. VW_setup.txt: The only file to be created by user.
   After the first Power-on of the VWdot datalogger, there will be two more files that will be automatically created by the VWdot.
   <refer chapter 5 for detail setup information>

2. VW_DATA.txt:
   - It is automatically created by the VWdot at the first power-on.
   - It containing all the sensor data the same as the data transmitted to the MQTT server.
   - In NOT NORMAL operation if the wireless connection fails, this file is a backup to prevent data loss.
   - It can be deleted at any time and the file will be re-created as an empty file after power is switched on.

   <refer chapter 6 for detail description>

3. VW_ERROR.txt:
   - This file is automatically created by the VWdot after the Battery is inserted for the first Power ON.
   - This file contains all the error messages generated by the datalogger while it is operating.
   - This information can be used to identify problems with installation and operation of the datalogger.
   - The user can delete this file at any time and the file will be re-created as an empty file after power is switched on.

   <refer chapter 7 for detail description>

Name	Data modified	Type	Size
VW_DATA	2020/4/10 上午 08:52	Text Document	188 KB
VW_ERROR	2020/4/10 上午 08:52	Text Document	132 KB
VW_setup	2020/4/1 下午 02:06	Text Document	1 KB

V、VW_setup Configure Descriptions

VW_setup.txt: Activating VWdot will go over the four required settings, there is “sweep” “interval_hour”, “interval_min” and “date_time”.
Put a pound and a dollar sign at the end of each setting line.

sweep=C#$ A 450-1500, B 800-2000, C 1400-3500, D 2300-6000 (Hz)
Remark: This is sweeping frequency setting, select「A」or「B」or「C」or「D」as above.
interval_hr=0#$ Units hours. Minimum must be 1. Maximum is 1000.
Remark: Frequency of measurement calculate method in hours, minimum 1 hour maximum 1000 hours, if value below to 1, then interval hour set as 0.
If Sleep Interval is large than one hour, the “interval min” value will be ignored.
(e.g. 2 hours and 20 minutes will be regarded as 2 hours)
interval_min=5#$ Units minutes. The valid range of value is 0,5, 10…55.
Remark: Frequency of measurement calculate method in minutes, If the input value is not multiple of five, it will be rounded down to the nearest multiple of five. (e.g. Value 9 will be rounded down to 5).
date_time=network#$ Must enter "manual" or "network"
Remark: Recommend always stay with network selection, if you choose network, please enter the time zone based on your location in the “GMT_offset”.
If you enter ”manual” then you must connect to the VWdot with a computer and using a Serial Terminal application as “putty.exe” to set up the date-time.
When you choose to enter ”manual” at this row, you don’t need enter anything at the “GMT_offset” row.
GMT_offset = +480#$ Local Offset +/- in minutes from GMT
Remark: Time zone correction. Using minute as unit. For example, if you are in GMT+8, please type +480.
For example, the time zone for Taiwan is “+480”,so this is what we enter here.
disable_NBIOT=no#$ Must enter "yes" or "no"
If you wish to turn your VWdot into a standalone datalogger, please enter yes at ”disable_NBIoT”.
In addition, you have to enter “manual” at “date-time” selection.
nbiot_band=28#$ NB-IoT band for Wireless service
Remark: The wireless bandwidth of NB-IoT. Please check with local telecom company.
For example, we enter 28 here for Band 28, this is the frequency band for NB-IoT from Far Eas Tone Telecom Taiwan.
APN=nbiot#$ Access Point Name for Wireless service。
Remark: NB-IoT wireless service access point name, Please check with local telecom

company。

server_IP=SANLIEN#$ MQTT Server Name or IP address

Remark: The IP address of the MQTT server for data upload. If you select “dot” the SANLIEN web service, please set as”SANLIEN”。

If you do not want to use Sanlien’s cloud service, it is possible to connect VWdot to your private registered MQTT broker。

Please add additional four- row information after server_IP。

server_port=??????#$ MQTT Server port

user_name=??????#$ User name for MQTT Server

password=??????#$ MQTT server password。

data_path=?????? #$ MQTT publish path

Example : data_path=VWdot/test#$。

Wakeup_LED=yes#$ Must enter "yes" or "no"

Remark: When you enter "yes" the LED indicator function will be turned on while measuring ,yet the LED will light up when detecting the frequency.

If you want to turn off the LED indicator, enter "no". So LED indicator will not light up when VWdot is measuring the frequency. By this mode enable extending batterie's lifetime but does not affect LED indicator light up for the first time use or while you use TEST key function。

encryption=yes#$ Must enter "yes" or "no"

If you select “dot” the SANLIEN web service, please set as” yes”。

new_key=no#$ Must enter "yes" or "no"

If you select “dot” the SANLIEN web service, please set as” no”。

sub_path=sanLienmq/VWdot/01234#$

If you select “dot” the SANLIEN web service, please set the sub_path to sanLienmq/VWdot/01234, where 01234 is the serial number of VWdot, and you need to confirm that the serial number is correct.

conf_path=sanLienconf/VWdot/01234#$

If you select “dot” the SANLIEN web service, please set the sub_path to sanLienmq/VWdot/01234, where 01234 is the serial number of VWdot, and you need to confirm that the serial number is correct.

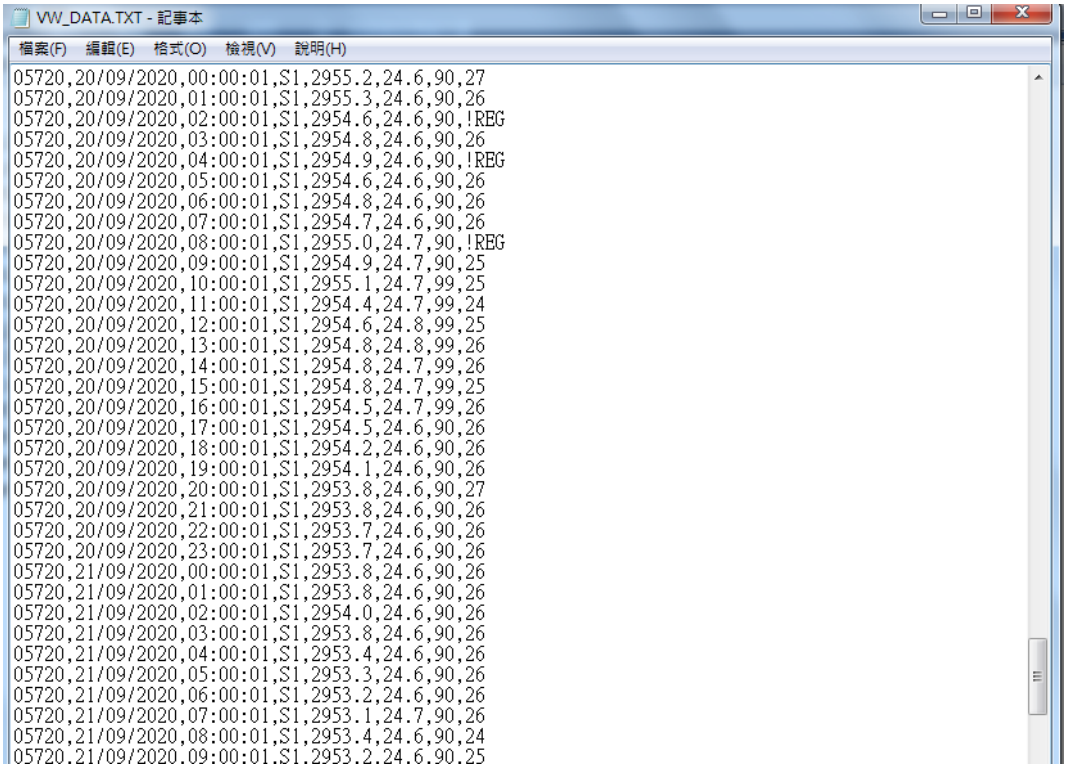
VI、VW_DATA Content Descriptions

VWdot data format is divided by comma. For example:

05720,20/09/2020, 00:00:01, S1, 2955.2, 24.6, 90, 27, !REG, each value means:

VWdot series number, Date & time, Raw data (Hz), temperature(℃), capacity of battery percentage ,RSSI strength, and error code.

<refer chapter 7 for detail error code definition >



VII、VW_ERROR Content Descriptions

Recorded except in the VW_DATA file, a VW_ERROR event is also generated.

These errors usually occur when installing VWdot and performing operations in the field.

Error code as "! Xxx" will be transmitted to the MQTT server as part of the data set. The following is a description of the error code:

(a) !PWRx : Powering problem of the NB-IoT SIM7020 module

(b) !CPIN : Problem with NB-IoT SIM card

(c) !REG : Problem with registering on Network (RSSI is Low on Wireless Network down)

(d) !RSSI : Signal strength (RSSI) too low or failure

(e) !RST : Problem with resetting the NB-IoT module

(f) !QNEW : MQTT server not available. No response when pinged

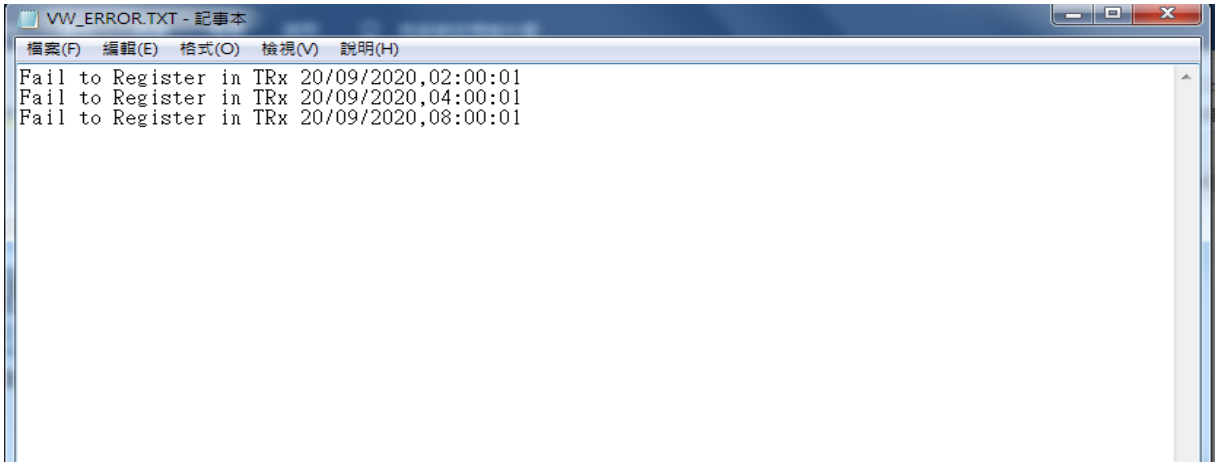
(g) !QCON : MQTT server is available but cannot connect (Account does not exist or password is incorrect)

(h) !QPUB : MQTT server connected successfully but data transmission failed.

(i) !SDx : problem with SD card

(j) !LOWB : Indicates Low Battery state

(k) !OFFB : Indicates that the VWdot is Shut Down and will stop transmitting data until battery is rechanging.



VIII、VWdot Installation

(1) Connect the Antenna. DO NOT USE TOO MUCH FORCE WHEN SCREWING THE ANTENNA.

(2) Insert the SIM card and make sure it has registered and active.

(3) Insert SD card and verifies it has the parameter setting on “vw_setup.txt” file in properly.

NOTE: There is no error checking function while enters the parameter path in “vw_setup.txt”. Incorrect information can cause unpredictable behavior of the VWdot.

(4) Screw each cable connect to VWdot terminal socket properly.

F lower terminal socket	F lower terminal socket	GND lower terminal socket	T upper terminal socket	T upper terminal socket
Frequency	Frequency	Ground	Temperature	Temperature

(5) When inserting the Li-Lon battery note the plus “+” and minus “-“ signs on the PCB Battery Terminals with the correct polarity. If the Battery is Inserted incorrect polarity, please remove and wait for at least 3 seconds before re-inserts the Battery.

(6) After the Battery is inserted, a Green LED will turn ON and can stay ON for maximum 2-3 minutes depending on the Registration status with the Wireless Network and the Data transfer to MQTT server. Normally for the very first time, the SIM card takes a long time to do the registration process.

(7) If the Green LED Light stays steady on with NO BLINKING all the time and then turns off after maximum 3 minutes this indicates that the VWdot operation is OK, otherwise please refer chapter 8 for the status description.

(8) While VWdot setup completed, it will automatically upload 1 data and published on the MQTT server, then turn to sleep mode immediately after transmission as well as execute data upload again by interval setting.

(9) Go on SANLIEN web station to make sure MQTT Lan upload completed, if so, which indicated parameter setup ok.

(10) Most of the time VWdot will be in Sleep Mode to conserve power.

If the user intends to check the test function, the user can press the “TEST” button on the PCB.

VWdot will upload 1 data then turns to sleep mode immediately after Transmission.

If errors been detected, LED green light will start blinking in many ways. please refer to chapter 9 for “Error types and Error logging” description.

IX、LED Light Indicator

There are indicate several error types of VWdot which general as

(1) Transmitted as “!xxx” as comment info in VW_DATA, as well as upload to the MQTT server.

(2) Recorded in the VW_ERROR file.

(3) Indicate by LED; After inserted battery, if the GREEN LED starts blinking for 15 seconds, it indicates that the operation fails. The system will shut down automatically.

Below are described the different types of Error Blink Codes:

a) After the battery inserted, the Green LED light will steady ON 2-3 minutes at least until it turns off, which indicated operation success, and the data was transmitted to the MQTT server as well; the user cloud connect to the MQTT server to verify this point.

b) The Green LED light blinks 1 time per 0.5 seconds continuously (……). This indicates problem with SD card or “vw_setup.txt” file. Verify SD card is properly formatted and installed and the setup file is not corrupted.

c) The Green LED light blinks 2 times and follows by 2 seconds off. (.._____.._____.._____..) This indicates that SD card is okay but there is problem with the SIM card or with the power to NBIOT module. Verify the SIM card is correctly inserted.

d) The Green LED light blinks 3 times and follows by 2 seconds off. (…_____..._____..._____...) This indicates SIM card and SD card are OK but there is problem with registering on the wireless network. Verify that you have signal strength higher than “0” and that your SIM card account is active.e)

e) The Green LED light blinks 4 times ON followed by 2 seconds OFF (….____....____....____....). This indicates SD, SIM card are OK and the VWdot can connect to the Wireless Network but there is a problem either connecting MQTT server or publishing data to MQTT server. Verify that address, port, user name, password, path whether all correct.

X、Battery Power

VWdot required power: A single 18650 Li-Lon battery, configure voltages between 3.5V-4.2V, with capacities up to 3200 mAh.

<recommend battery comply with NCR18650B specification>

Battery level in voltages and % and error codes as below table

bat_volt > 4.149 bat_%=99

bat_volt <=4.15 bat_%=90

bat_volt<= 4.03 bat_%=80

bat_volt<= 3.88 bat_%=70

bat_volt<= 3.75 bat_%=60

bat_volt<= 3.70 bat_%=50

bat_volt<= 3.68 bat_%=40

bat_volt<= 3.65 bat_%=30

bat_volt<= 3.60 bat_%=20

bat_volt<= 3.56 bat_%=10

bat_volt<= 3.48 bat_%=5 // generated “!LOWB” message

bat_volt<= 3.35 bat_%=2 // generated “!OFFB” message and shut down systems automatically.

XI、SANLIEN “**dot**” Web Service

The following instructions are for the user who selects to use SANLIEN MQTT Web service station.

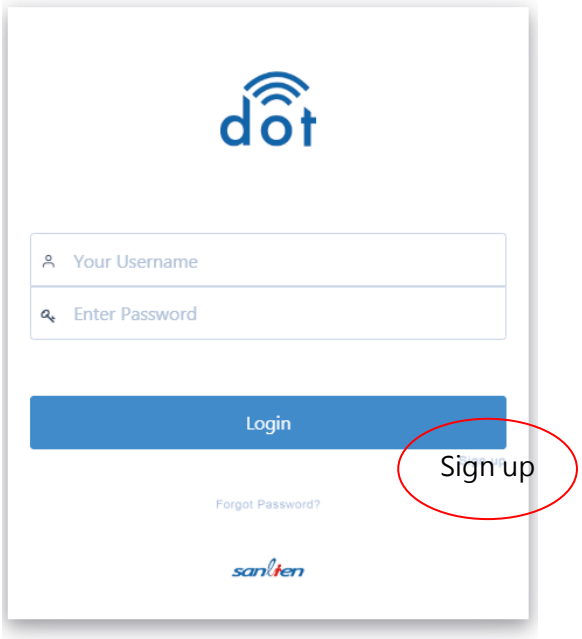
If the user intends to build their own MQTT server platform, please contact SANLIEN Technology's technical support team.

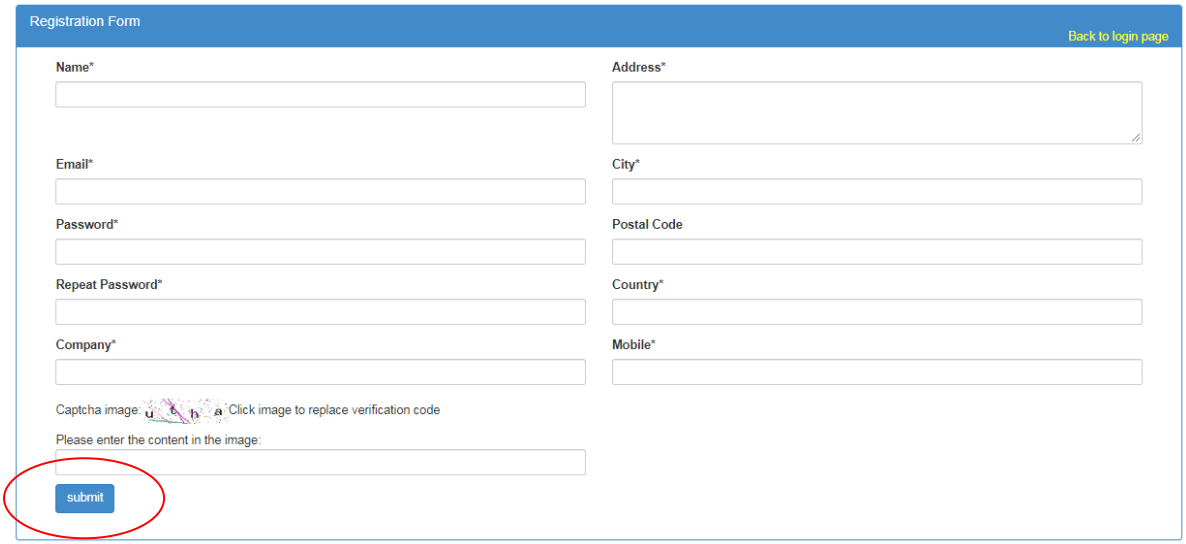
Login VWdot website：http://wms.sanlien.com.tw/dot

1. Click Sign up button link to complete registration initially

After submitting the information, a message has been sent to your mailbox, please login to your email address and activate your account.

simply click on the link then account successfully activated display on your screen.





2. After creating an account, you can log in to the VWdot web service platform.

The main functions are described as follows:

(a) Latest Record function : the newest data.

(b) Record Que function : data search & download service.

(c) Chart Query function : curve format and download service.

(d) Map function : display location on Map function.

(e) Company Setting function : setup VWdot initially data, such us company name & project name.

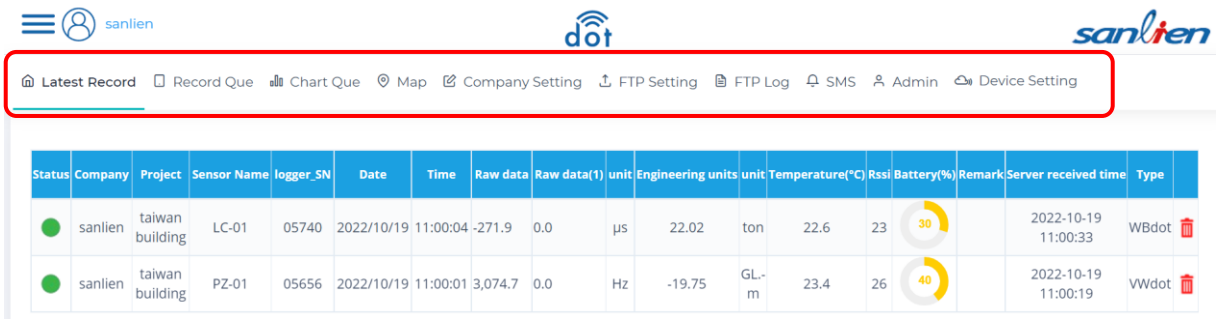
(f) FTP Setting function: FTP automatic transmission service of data.

(g) FTP Log function : Provided FTP error transmission record.

(h) SMS Setting function : SMS message notification.

(i) Admin function: Configure VWdot device information.

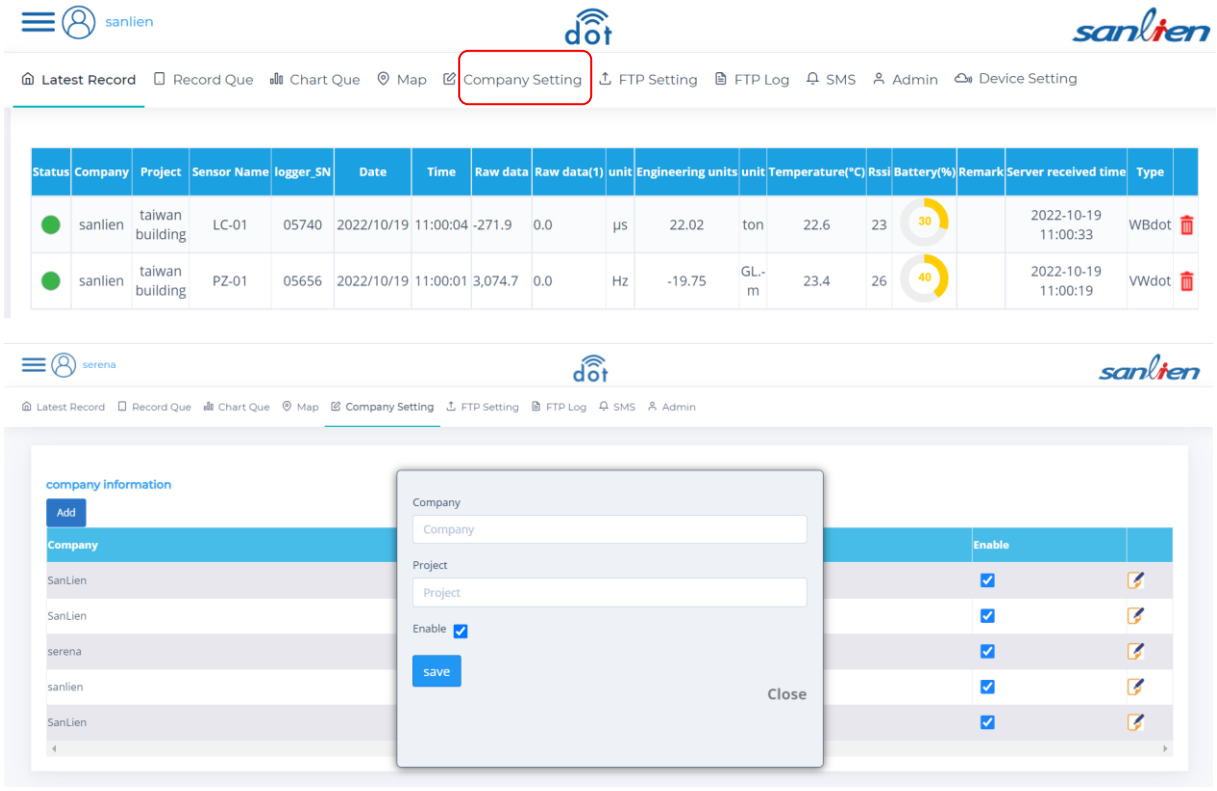
(j) Device Setting function: Change measurement interval.



3. Company Setting

For the first time login to the VWdot web station, you have to select “company setting” and press “Add” icon

Then type in your company and project information, then click “save” button to finish the setting.



4. Admin setting

Once you are on the “Admin” page, please click “Add” to enter your VWdot info.

You will see “Type”, “S/N”, “License Key”, “Company”, “Project” and “Sensor Name” at this setting.

For “Type”, “Company”, “Project” and “Sensor Name” are fairly self-explanatory.

Please enter your VWdot serial number at “S/N” and license key at “License Key”.

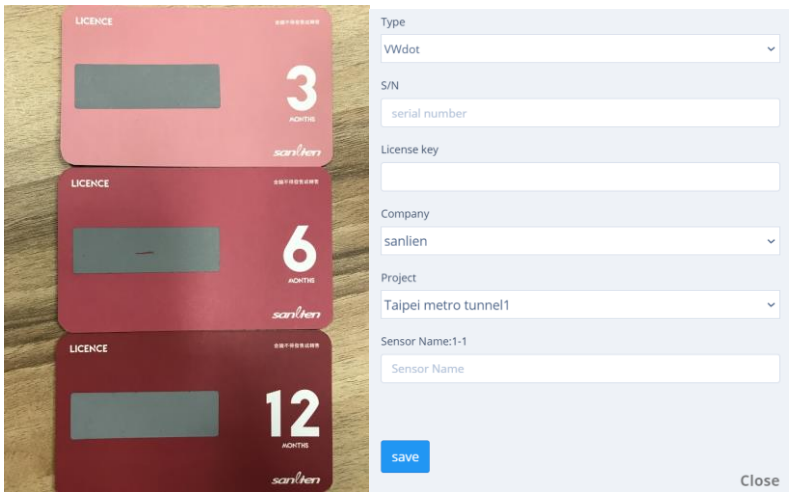
This is an important step to link your VWdot to our dot service.

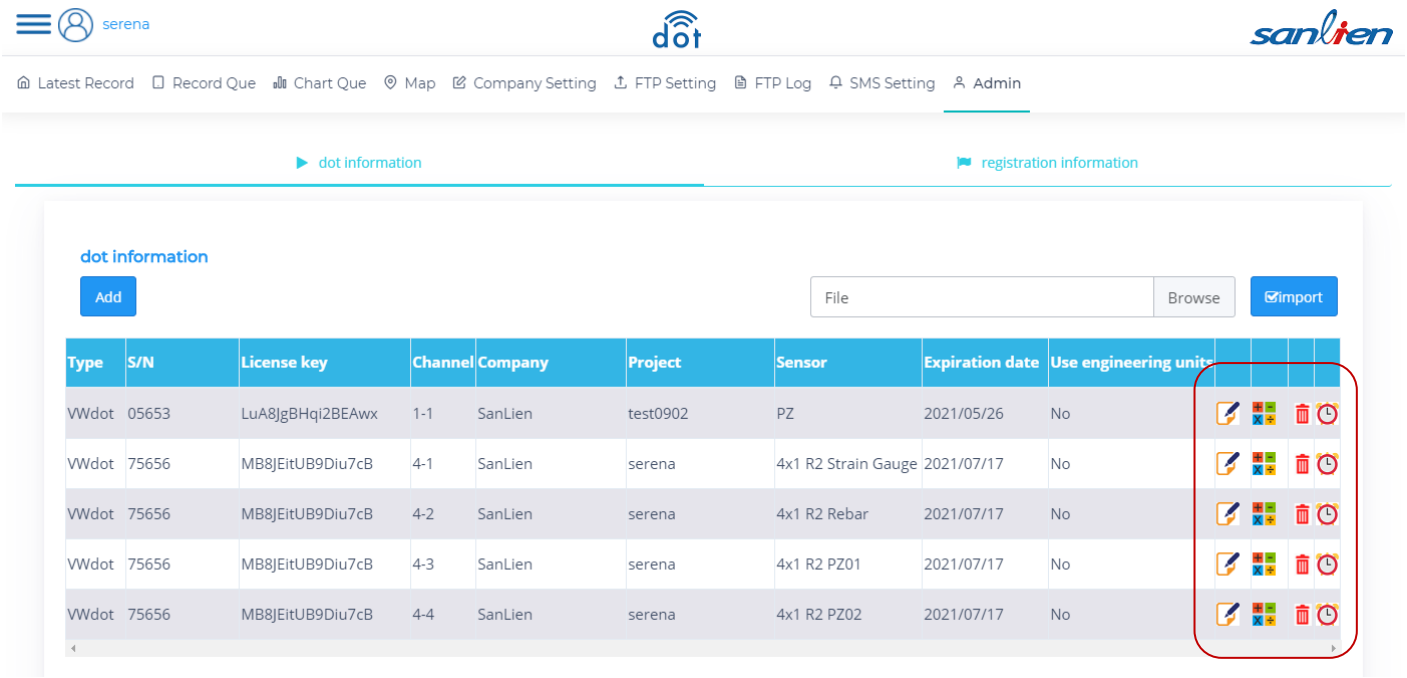
If you purchase our VWdot, we provide a one-year complimentary service for using “dot”

After the first year, you can renew it on our website under the Purchase information page.

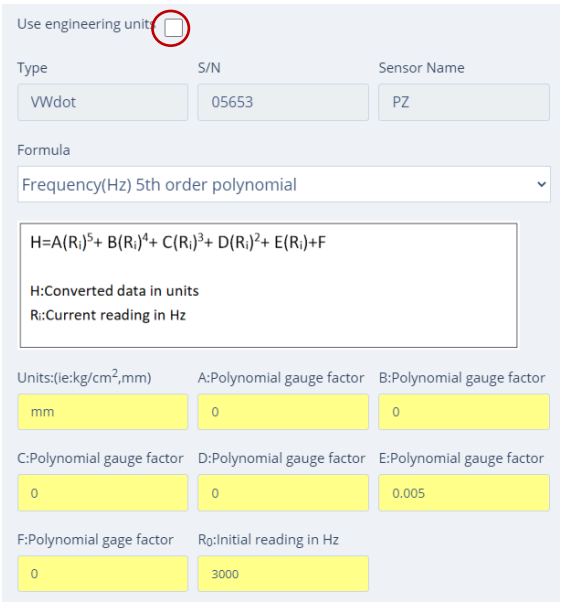
Click the “clock” icon and enter the new license to extend the expiration date.

You can also remove the device and change the category by the other two icon.





4.1 (Edit Formula) button. 

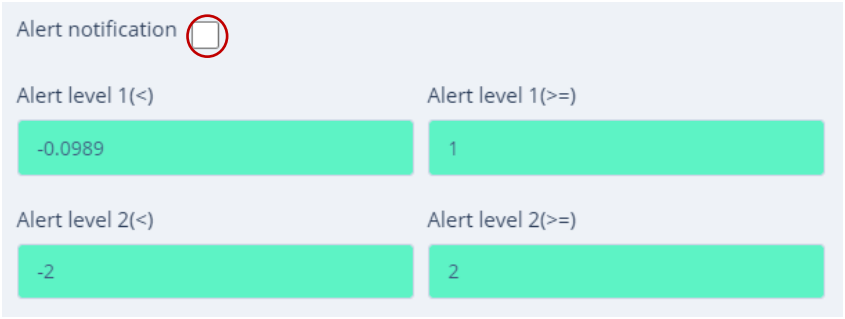


If you want to use this option, you have to fill in relevant instrument's parameter on the yellow frame for formula calculating then tick the box next to Use engineering units.

4.2 Alert notification

Next to " Use engineering units" is green frame for alert messages receiving and the setting of the critical value range.

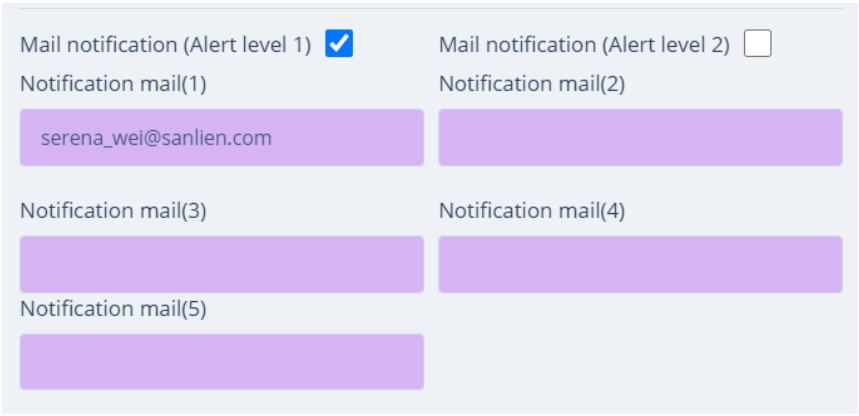
After configuration tick the box next to "Alert notification" to turn it on.



4.3 Mail notification

The purple frame is features of "Mail notification"

It is receiving notifications as forms of emails, two options enable to select.



5. SMS setting

The pink frame is features of SMS notification service.

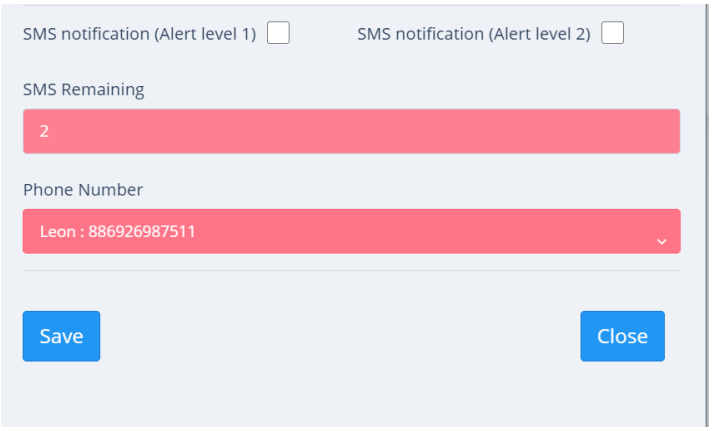
There are two options for you to select (Alert level 1 or 2) tick the box you select and choose receiving phone number on "phone number "then click save button to finish the setting.

SMS service (Short Message Service) is a service that sends SMS message concerning the "point card" use and other information to mobile phones in real-time.

"dot" designed Alert notification not only sent by mail but also messages to your cell-phone.

You need to recharge point of SMS card in advance before selection this feature.

If you are interested in how to purchase "points of SMS card" please contact our sales representative.

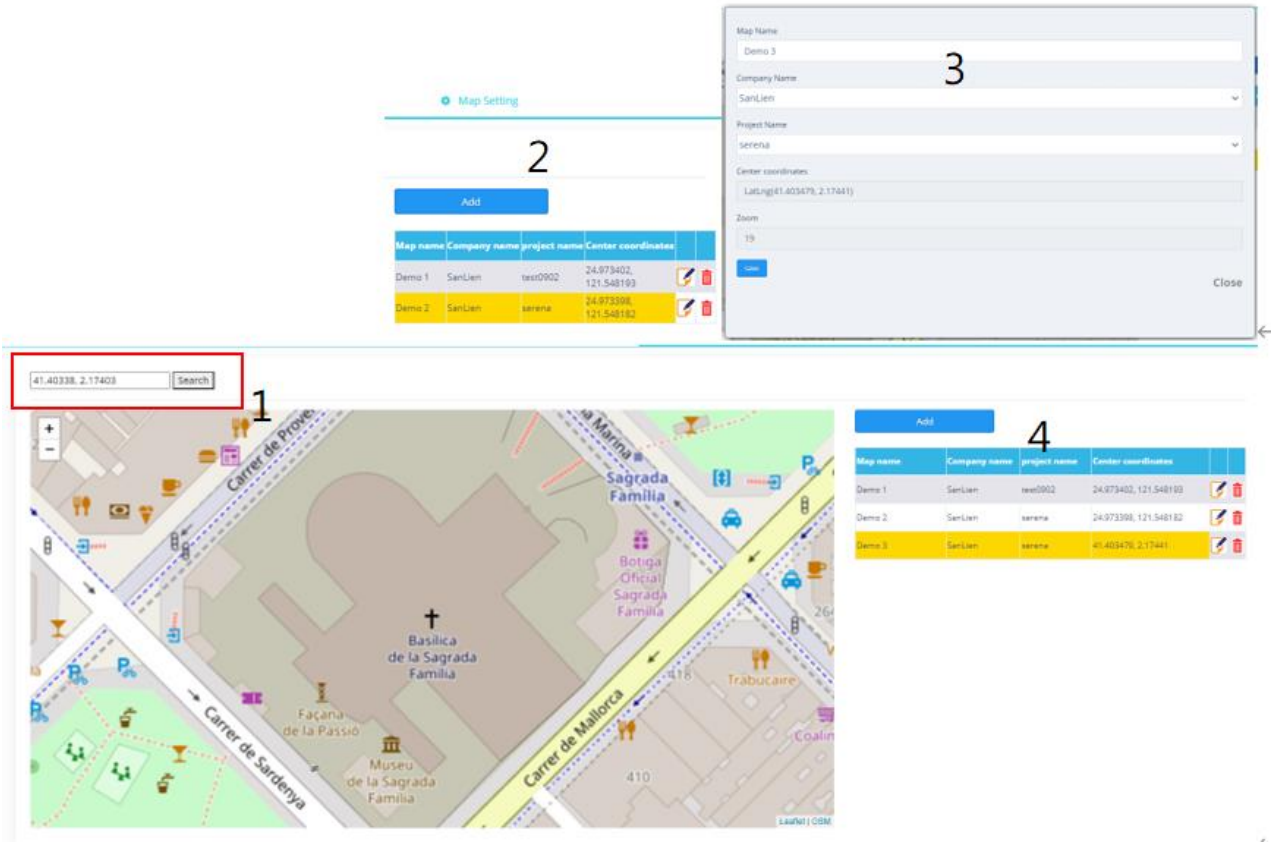


6. Map Setting

(1) Enter the coordinate of your project's location then click the search button refer to (graph-1)。

(2) Click "Add" to create new project information (graph-2)。

(3) Enter Map name, company name, and project name then click save to complete the setting (graph-3 & graph-4)。



7. FTP transmission: click FTP Setting option

(a) Company: Namely the project to be transmitted.

(b) FTP Server: Enter FTP login IP.

(c) FTP Port: Enter FTP login port.

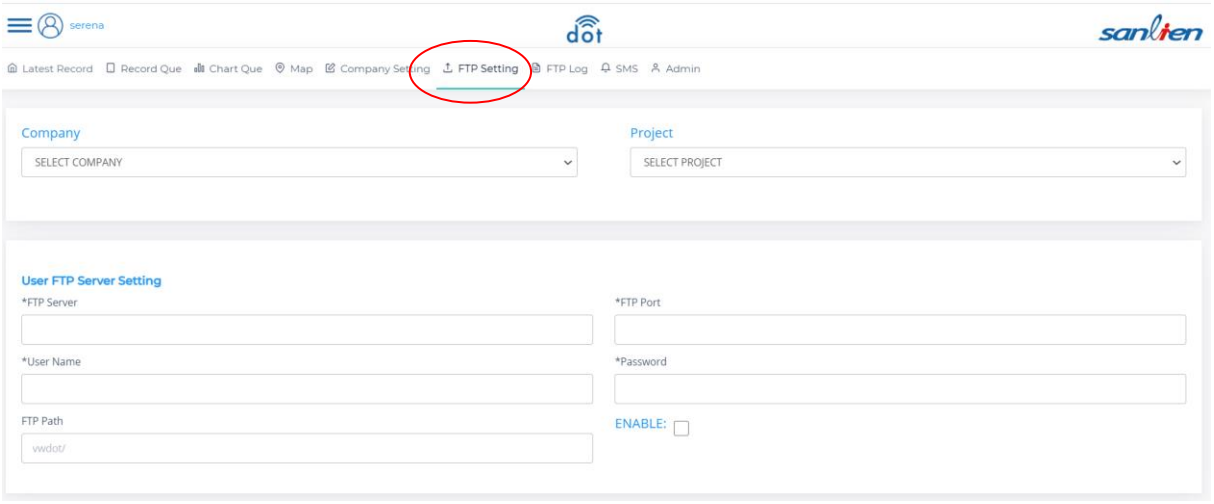
(d) User Name: Enter the FTP login account.

(e) Password: Enter the FTP login password.

(f) FTP Path: Enter the data path. If there is no subfolder, leave for blank. If the settings are stored in the subfolder, enter the subfolder name by backslash symbol.
Example: To store in the VWdot subfolder, please enter " **VWdot/** "

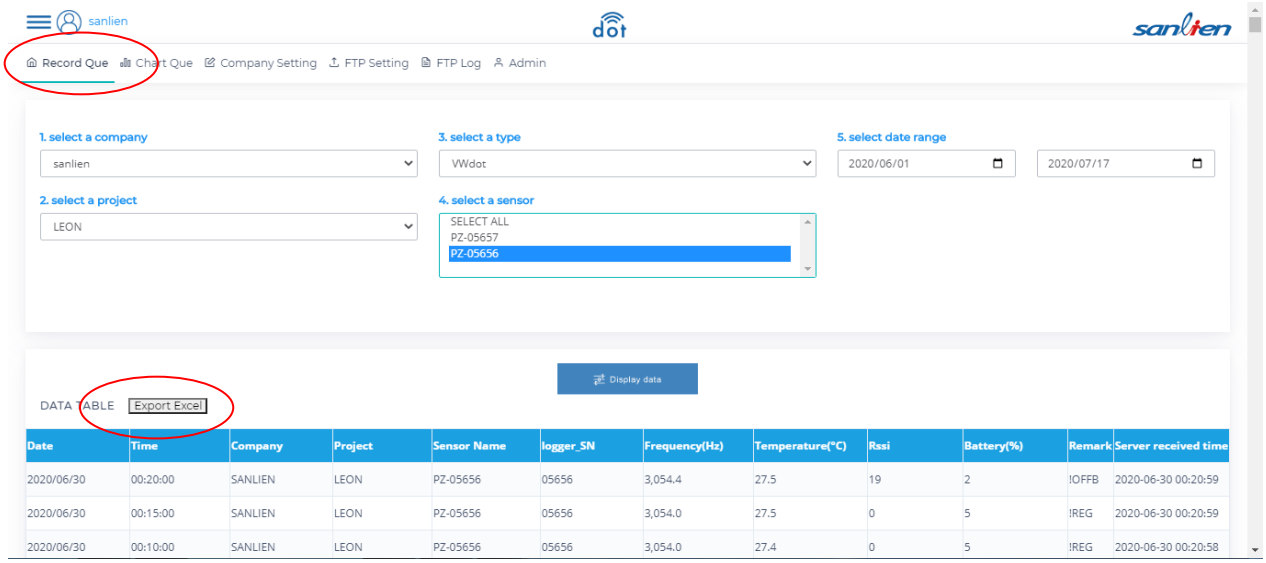
(g) ENABLE: Tick enable square icon to complete the configuration process, otherwise, it would not process.

(h) Overall input completed, press the save option to complete the FTP transfer settings.



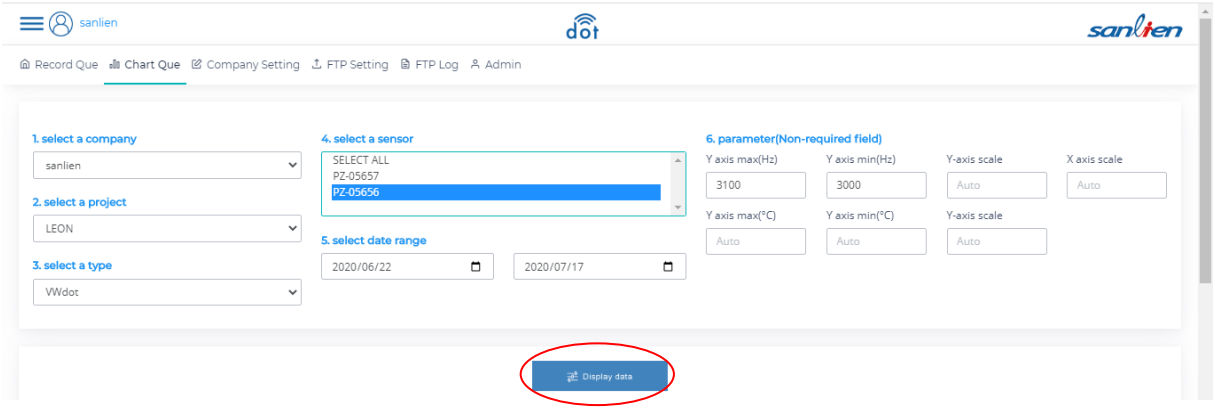
8. Record Query: For data query and download

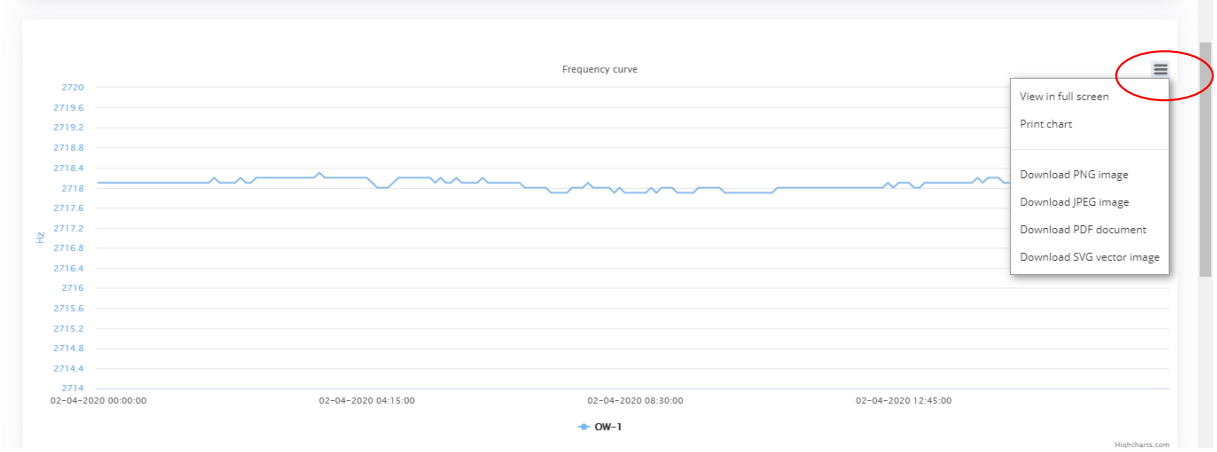
Click the Record Query icon select the company name, project name, instrument name and query date, press the Display data button, the query data will appear below, and the data can be exported through by “Excel file”.



9. Chart query: click the Chart Query function

Select the company name, project name, instrument name and query date, press the Display data button, the query data will appear at the bottom, then generate transmitted through the function in the upper right corner of the graph into various types of picture files.

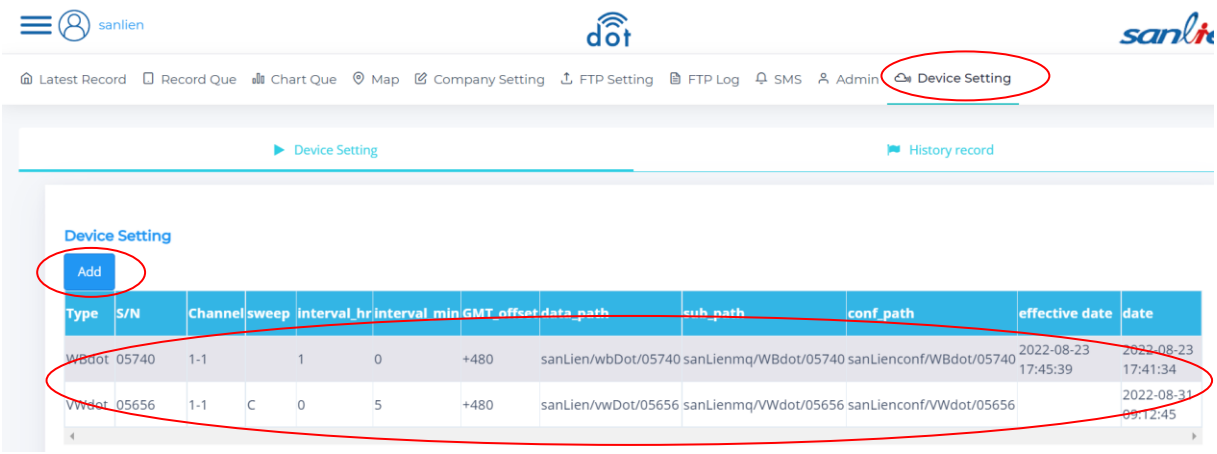


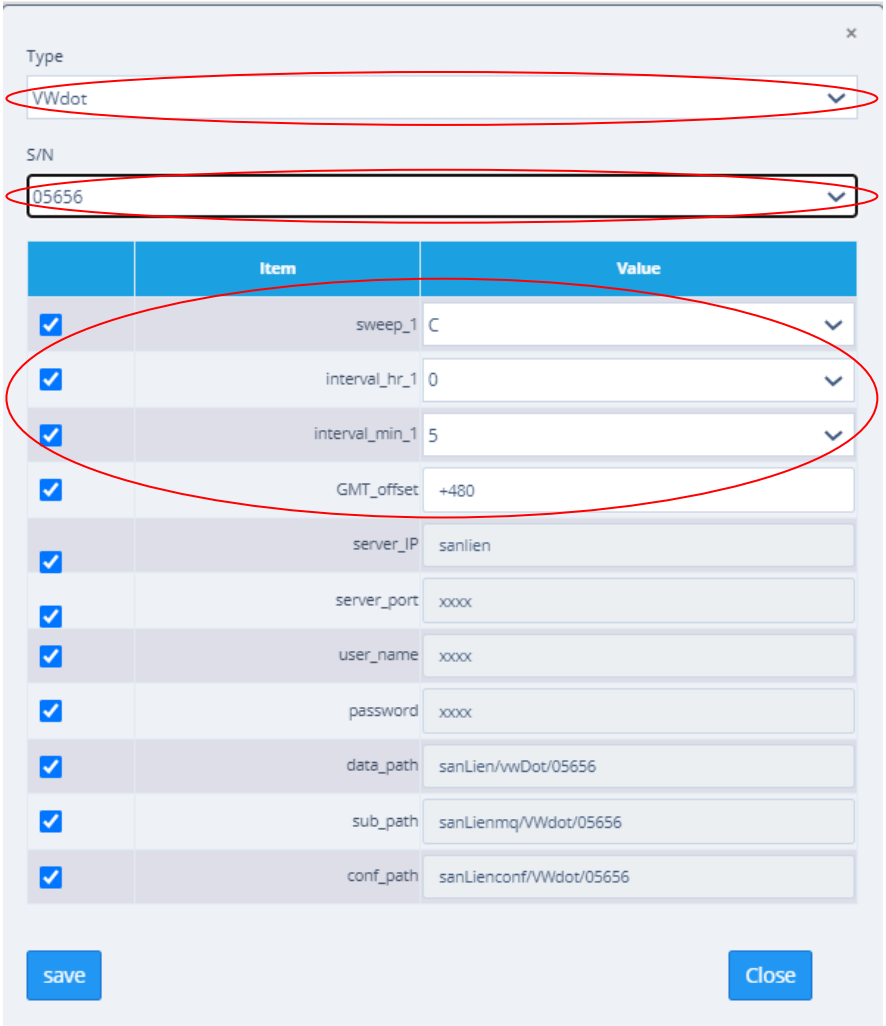


10. Device Setting : Change measurement interval

After clicking Add, select the serial number of the instrument to be modified, and then set items such as sweep, interval, and GMT_offset. After the input is complete, press save to complete and you can see the setting information and the effective time of the modification on the Device Setting screen.

Remarks: All modified settings will take effect after the next measurement by VWdot.


sanlien
Latest Record
Record Que
Chart Que
Map
Company Setting
FTP Setting
FTP Log
SMS
Admin
Device Setting
Device Setting
History record
Device Setting
Add
Type S/N Channel sweep interval_hr interval_min GMT_offset data_path sub_path conf_path effective date date
WBdot 05740 1-1 1 0 +480 sanLien/wbDot/05740 sanLienmq/WBdot/05740 sanLienconf/WBdot/05740 2022-08-23 17:45:39 2022-08-23 17:41:34
VWdot 05656 1-1 C 0 5 +480 sanLien/vwDot/05656 sanLienmq/VWdot/05656 sanLienconf/VWdot/05656 2022-08-31 09:12:45


Type
VWdot
S/N
05656
Item
Value
sweep_1 C
interval_hr_1 0
interval_min_1 5
GMT_offset +480
server_IP sanlien
server_port xxxx
user_name xxxx
password xxxx
data_path sanLien/vwDot/05656
sub_path sanLienmq/VWdot/05656
conf_path sanLienconf/VWdot/05656
save
Close