User manual

Version 1.0.0 May 2024

iSN-700 Series

Vibration signal converter and sensor

Table of Content

Important message

Product warranty

The warranty period for products manufactured by ICP DAS is one year from the date of delivery and applies to defective materials from the date of delivery.

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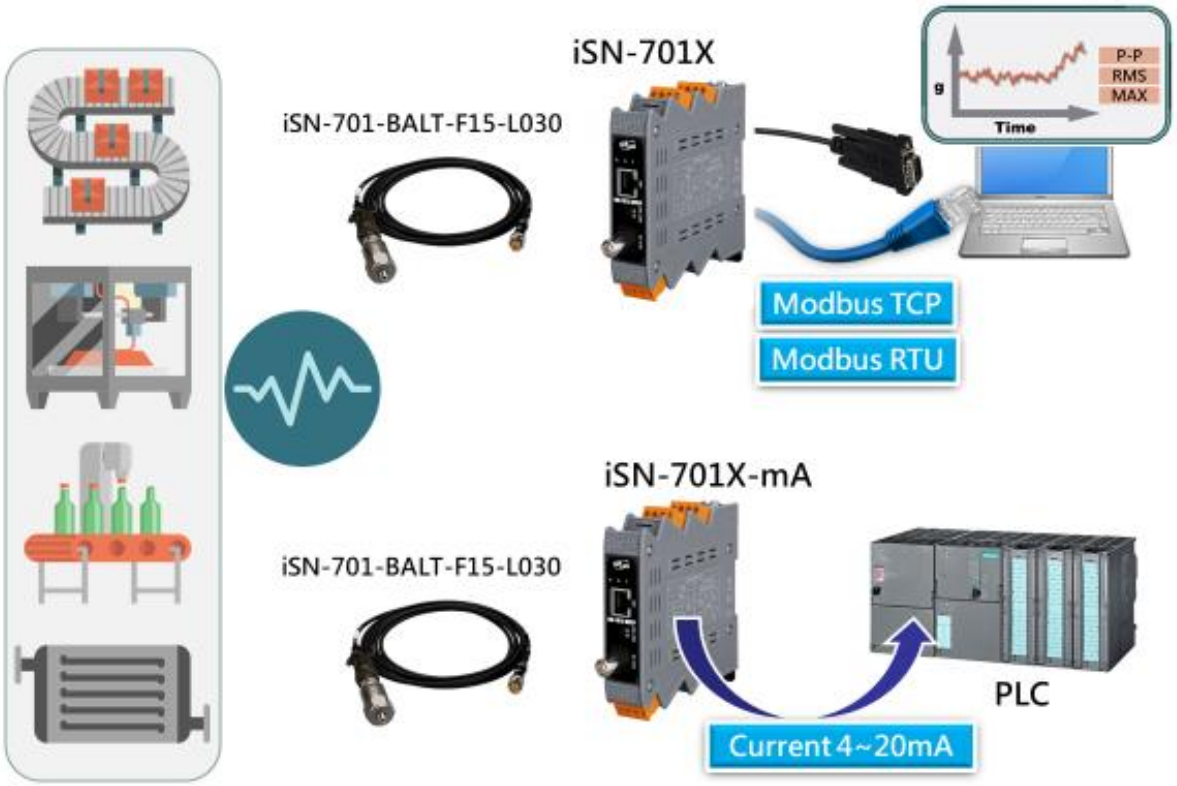
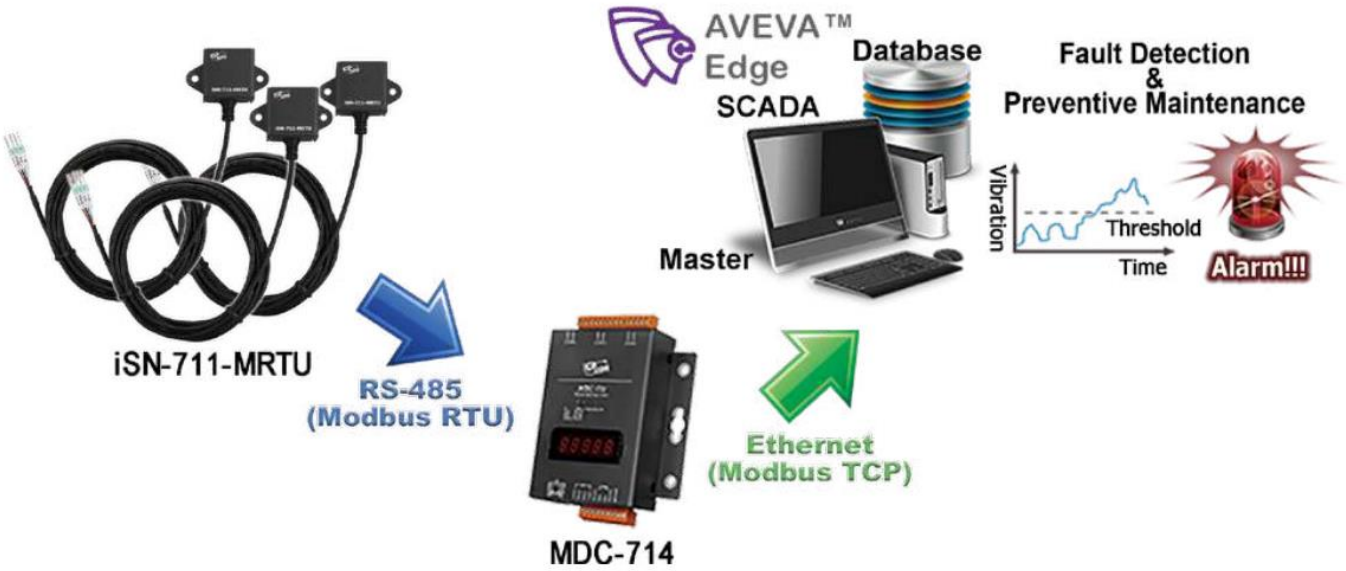
Email : service@icpdas.com

1. Introduce



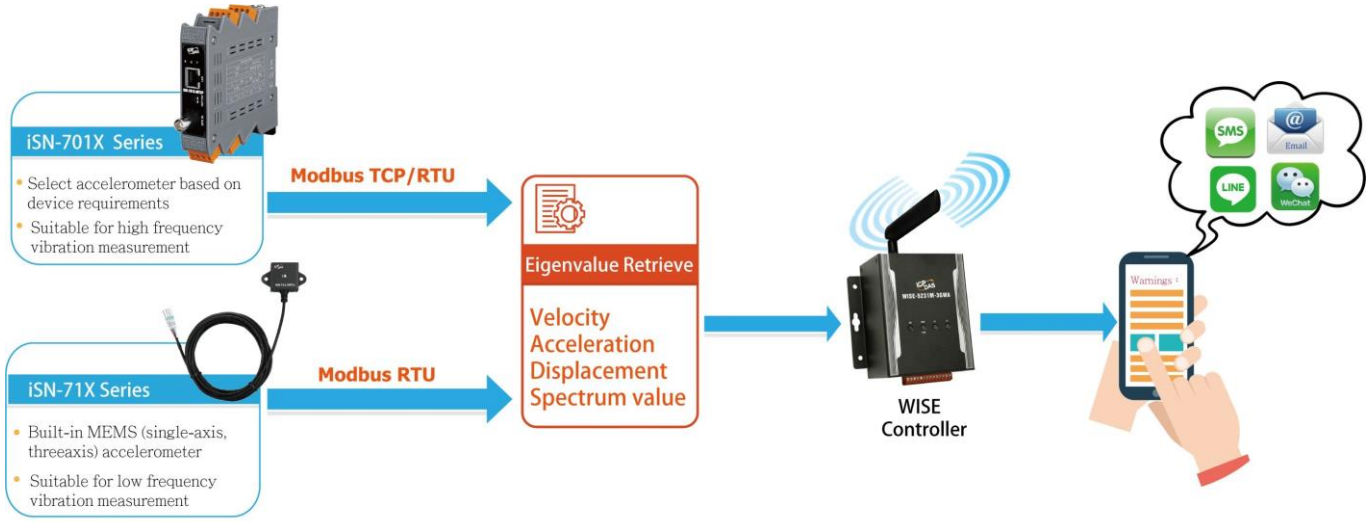


In recent years, predictive maintenance has gradually attracted attention, and its function can carry out real-time equipment diagnosis and maintenance, and effectively prevent unexpected damage to equipment and public accidents. Therefore, vibration data is collected through vibration measurement technology, the quality of core components such as equipment and bearings is actively analyzed, and maintenance is managed in advance to extend the service life of equipment and avoid unexpected downtime and damage. In view of this, ICP DAS has launched a series of vibration measurement products, which can be applied to the measurement and judgment of vibration signals of various field devices, and provide application functions for vibration eigenvalue in anomaly detection, fault diagnosis and data analysis.
The iSN-700 series module is a product in the vibration measurement series, which allows users to easily monitor the vibration status of the equipment by selecting an external IEPE accelerometer or a built-in MEMS accelerometer according to the application requirements. The module supports Modbus RTU or Modbus TCP communication protocol according to the model, and can read the vibration eigenvalue data measured by the sensor through Modbus commands and analyze the data.

- Feature -

Model	**iSN-701X series**	**iSN-71x series**
Measurement type	Velocity / Acceleration / Displacement / Spectrum	
Protocol	Modbus TCP / RTU	Modbus RTU
Bandwidth	6 Hz ~ 6.4 kHz	6 Hz ~ 1 kHz
Data format	■ Acceleration: RMS, Max, pk-pk ■ Velocity: Valid value ■ Displacement: pk-pk ■ Up to 20 spectral values (amplitude/frequency) ■ Peak factor	
Feature	❖ Signal Capture Range: Voltage：±10V Current：4mA ❖ Vibration signal eigenvalue conversion current signal function (iSN-701X-mA)	❖ Amplitude range：±8g ❖ 1-axis/3-axis MEMS

1.1 Application



The iSN-700 series is designed to accurately monitor the aging phenomenon of the machine and find out the production equipment that is on the verge of failure in time, so as to avoid heavy losses caused by equipment failure and shutdown. The iSN-700 sensor can be connected to the monitoring system and upload real-time data, and the engineering personnel can analyze the vibration data in the background and find out the production equipment with reduced production yield or even the possibility of downtime, bringing users more accurate and stable manufacturing operations. With the iSN-700 series module, users can monitor the real-time vibration of equipment in various industrial fields and grasp the long-term equipment vibration trend. And through the analysis of vibration data, it can effectively help users improve the stability and safety of production operations.

Select the model：

The iSN-701X series has two models: iSN-701X / iSN-701X-mA, the difference between the two is that the iSN-701X-mA has an additional current signal output, so if the field environment cannot use Modbus TCP/RTU to transmit data, but there is a device that can receive the current signal, in this case, you can consider choosing the iSN-701X-mA model.

2. Hardware

2.1 Specification

- iSN-701X series -

Model	iSN-701X	iSN-701X-mA
Product photo		
Analog Input		
Type	IEPE x 1	
Range	±10 V	
Resolution	24 bit	
Sampling Rate	32kHz / 64kHz	
Bandwidth	6Hz ~ 6.4kHz	
Excitation Current	4 mA	
Analog Output		
Type	Voltage x 1	Voltage x 1 Current x 1
Range	Voltage: ±10 V	Voltage: ±10 V Current: 0~20mA, 4~20mA
COM Ports		
Ports	1 x RS-485	
Baud Rate	115200 bps Max.	
Protocol	Modbus RTU slave	
Ethernet		
Ports	1 x RJ-45, 10/100Base-T(X)	
Protocol	Modbus TCP server	
LED Indicators		
Status	R x 1, G x 1, Y x 1	
Power		
Input Range	+10 ~ +30 VDC	
Consumption	2.5W	
Mechanical		
Installation	Din-Rail	
Dimensions (mm) (W x L x H)	25 x 120 x 117	
Environment		
Operating Temperature	-25 ~ 75 ℃	
Storage Temperature	-30 ~ 80 ℃	
Humidity	10 ~ 90% RH, non-condensing	

- iSN-70x series -

Model	iSN-701-F15-L030	iSN-701-F15-L060
Product photo		
Vibration Measurement		
Axes	1	
Sensor Type	IEPE	
Amplitude Range	±80g	
Frequency Range	0.5Hz~15kHz	
Sensitivity	100mV/g	
Bias Voltage	10~14VDC	
Power		
Input Range	18~30VDC, 2~10mA	
Mechanical		
Dimensions (mm)	Ø22.9 x 53.3	
Cable		
Length (m)	3	6
Accelerometer selection rules: Accelerometers that meet the following criteria may also be used		
Excitation Current	< 4mA	
Amplitude Range x Sensitivity	Amplitude Range (g) x Sensitivity (mV/g) ≦ ±10V	
Voltage Range	Amplitude Range (g) x Sensitivity (mV/g) + Bias Voltage (V) ≦ 20 V	
Response frequency	Maximum Frequency (Hz) x 5 < Sampling Rate (Hz)	

Example: Take our products: iSN-701-F15-L030 accelerometer and PET-AR400 data acquisition module as examples

Model	PET-AR400
Product photo	
Analog Input	
Excitation Current	4mA
Measuring range	±10 V
Bandwidth	12.8k Hz (-0.1 db) @ 1/2 channel 6.4k Hz (-0.1 db) @ 3/4 channel
Sampling Rate	32 kHz for 3/4 channel 64 kHz for 2 channel 128 kHz for 1 channel

1. Excitation Current：The excitation current of PET-AR400 is 4mA, which meets the power input range of 2~10mA of iSN-701-F15-L030, which means that the excitation current of PET-AR400 is enough to drive iSN-701-F15-L030, so it meets the conditions.

2. Amplitude Range x Sensitivity：±80g x 100mV/g = ±8V ≤ ±10V, which means that the signal range of the iSN-701-F15-L030 is within the measurement range of the PET-AR400, so it meets the conditions.

3. Voltage Range：80g x 100mV/g + 10~14VDC = 18~22V, which does not fully meet the conditions of ≦ 20 V, but this does not mean that this accelerometer cannot be used, but refers to the maximum measurement limit of the module is 20 V, and the module cannot measure the amplitude exceeded, that is, the measurement range of the module is ±60g.

4. Response frequency：15kHz x 5 = 75kHz, According to the sampling rate of PET-AR400：

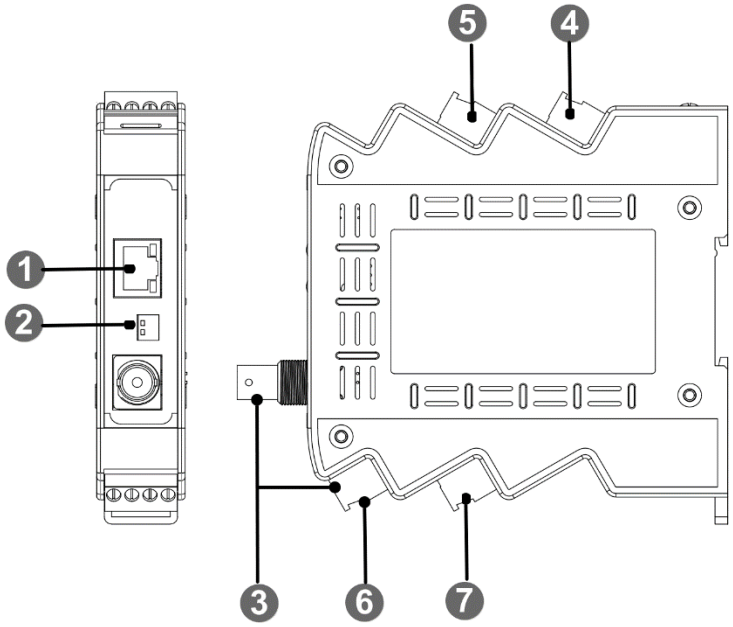
   - ❖ When using 1 channel,75kHz < 128kHz, so it meets the conditions.
   - ❖ When using 2 channel, 75kHz > 64kHz, but this does not mean that this accelerometer cannot be used, but the recommended frequency measurement range for this sample rate is up to 12.8kHz, and if the target frequency you want to measure is within this range, this accelerometer can also be used.
   - ❖ Similarly, in the case of using 3/4 channels, 75kHz > 32kHz does not mean that this accelerometer cannot be used, but the recommended frequency measurement range for this sample rate is up to 6.4kHz, and if the target frequency you want to measure is within this range, this accelerometer can also be used.

- iSN-71x series -

Model	iSN-711-MRTU	iSN-711-MRTU-IP68	iSN-713-MRTU	iSN-713-MRTU-IP68
Product photo				
Vibration Measurement				
Sensor Type	1 Axes MEMS		3 Axes MEMS	
Amplitude Range	±8 g			
Frequency Range	6 ~ 1000 Hz			
COM Ports				
Ports	1 x RS-485 (D+ / D-)			
Baud Rate	9600、19200、38400、57600、115200 bps，N81			
Protocol	Modbus RTU			
Power				
Input Range	+10 ~ +30 VDC			
Consumption	0.3 W			
Mechanical				
Dimensions (mm) (W x L x H)	51 x 30 x 19	65 x 44 x 21	51 x 30 x 19	65 x 44 x 21
enclosure rating	IP30	IP68	IP30	IP68
Installation	Wall-mount or magnet adsorption			
Environment				
Operating Temperature	-25℃ ~ +75℃			
Storage Temperature	-30℃ ~ +80℃			
Humidity	10 ~ 90% RH, Non-condensing			

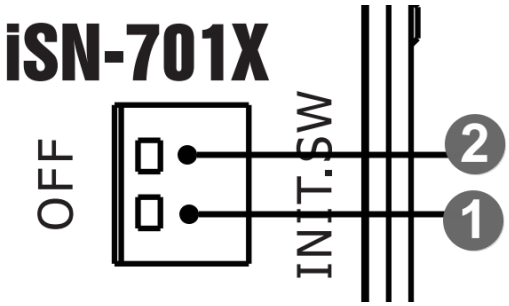
2.2 Appearance

iSN-701X series ：



Number	Description
1	Ethernet
2	Dip switch
3	IEPE
4	Power
5	RS-485
6	Voltage output
7	Current output (iSN-701X-mA)

- Dip switch -



OFF← →ON

Switch	Status	Description
1	OFF	User setting
	ON	Factory setting
2	OFF	Operating mode
	ON	FW update mode

The Switch-1 provides 2 functions

Function	Description	Step
1	Restore factory defaults	1. Turn the switch to [ON] 2. Power off and on again 3. The module will be restored to factory default values. 4. Turn the switch to [OFF]
2	Pause signal acquisition	If the switch is switched to ON while the module is running, the module will pause signal acquisition until the switch switches back to OFF.

- LED Indicators -

The iSN-701X series provides 3 LED indicators
Below is an overview of the purpose and function of each indicator, as well as an explanation.

LED	Status	Description
R(Red、Power status)	ON	Power supply is normal
	OFF	Power supply abnormality
Operating mode		
G(Green、IEPE status)	OFF	No IEPE sensor detected
	ON	IEPE sensor detected
	Flash	short circuit
Y(Yellow、Data acquisition status)	Flash (slow, 500ms)	Idle
	Flash (fast, 100ms)	Signal acquisition in progress
FW update mode		
G & Y	Flash (fast, 100ms)	Update firmware

iSN-70x series ：

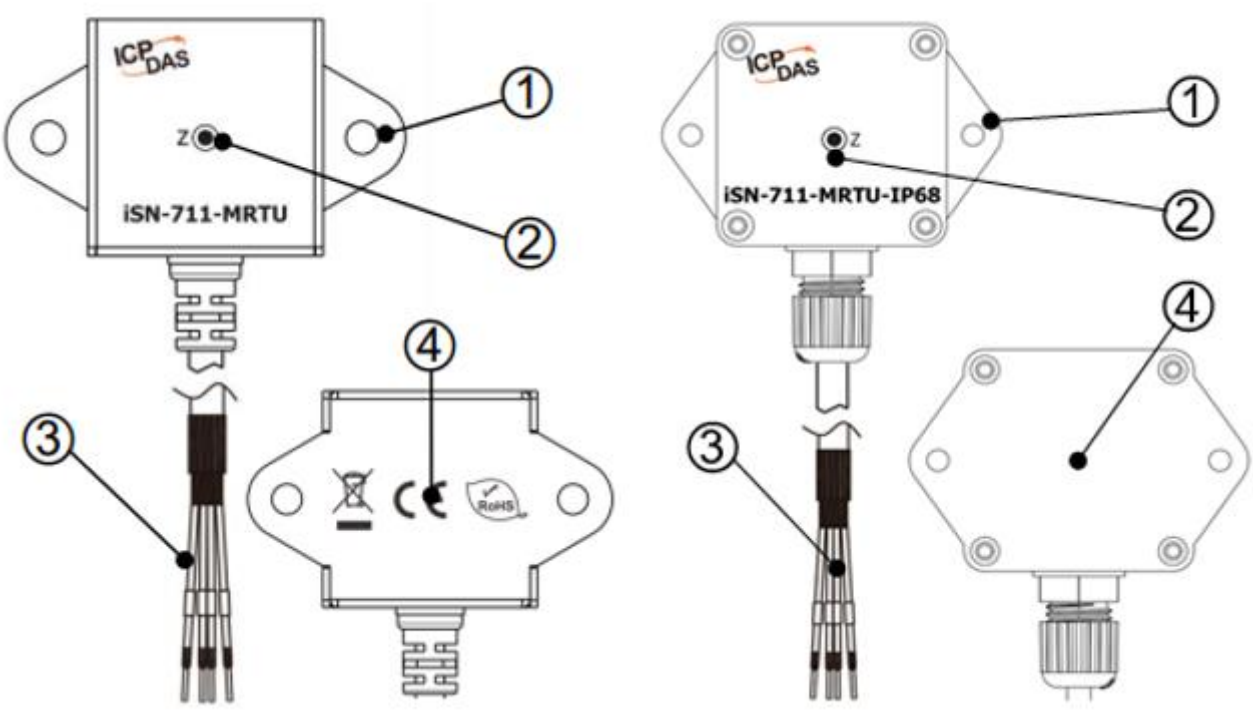
iSN-701-F15-L030 / L060:

Number	Description
1	Vibration sensor
2	Magnetic mount
3	Screw installation
4	Power and Signal Connector

iSN-703-F1-L015:

Number	Description
1	Vibration sensor
2	Power and Signal Connector
3	Magnetic mount

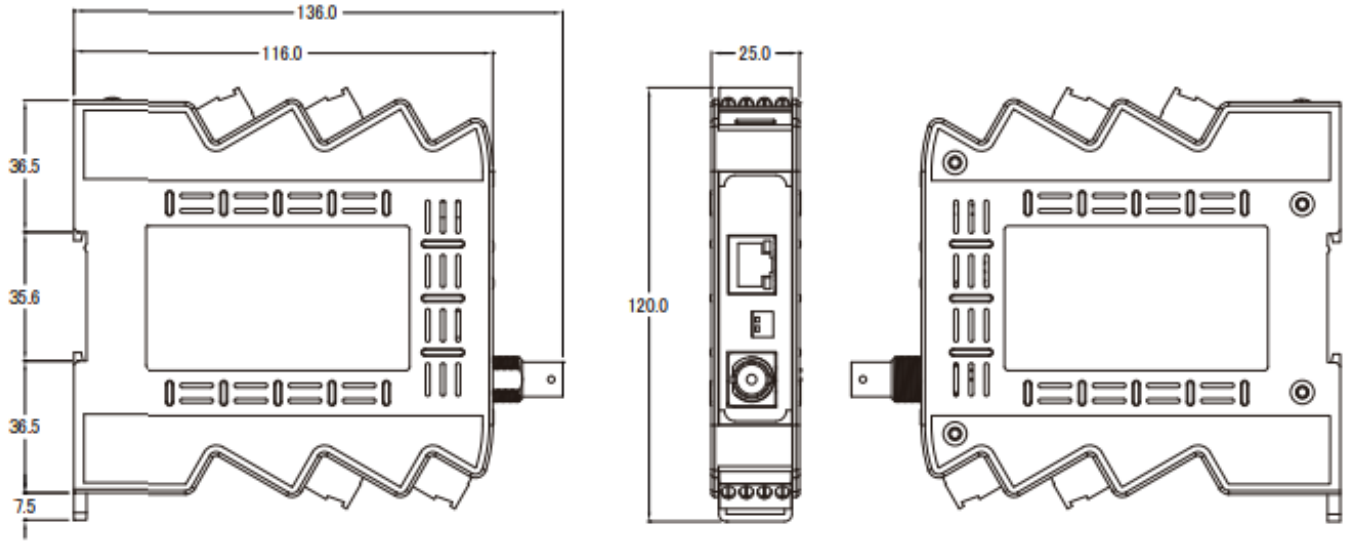
iSN-71x series ：



Number	Instructions
1	Wall mount
2	Vibration sensor
3	Power and RS-485 Connector
4	Magnetic mount

2.3 Dimensions

iSN-701X series ：Unit：mm

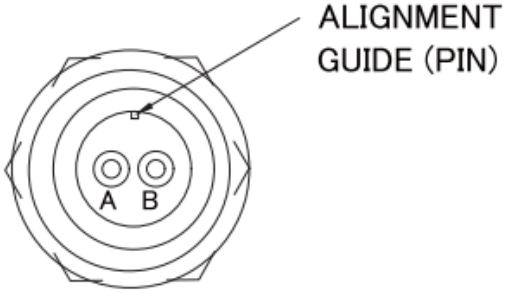


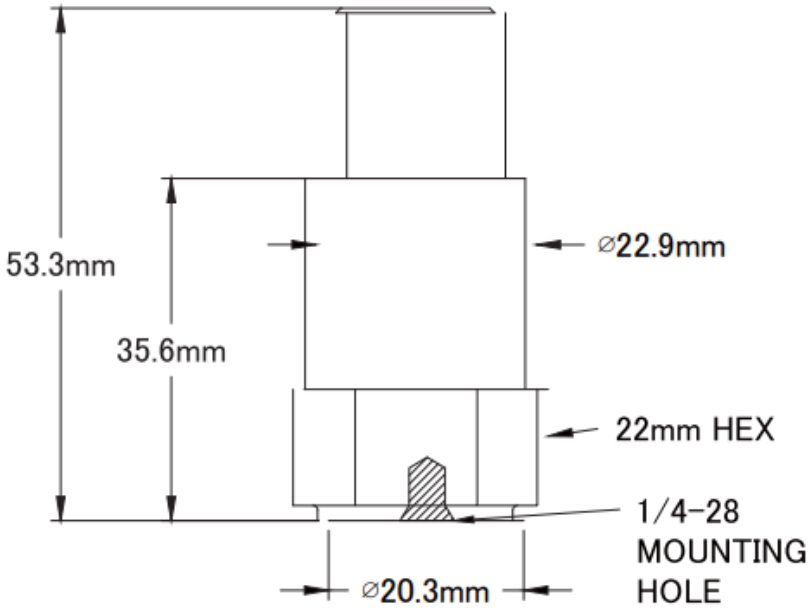
iSN-70x series：Unit：mm

iSN-701-F15-L030/ iSN-701-F15-L060

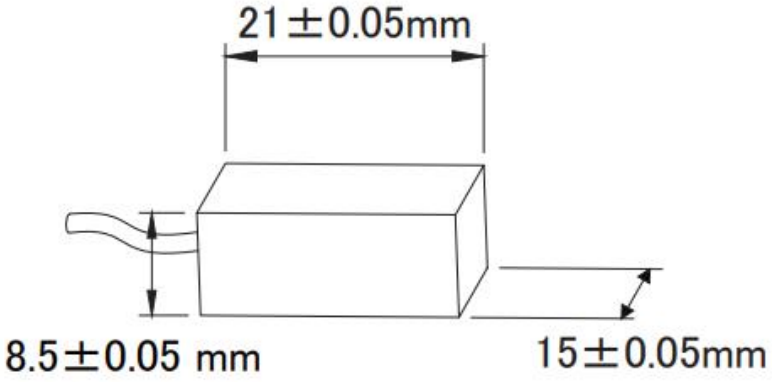
2 Pin Connector

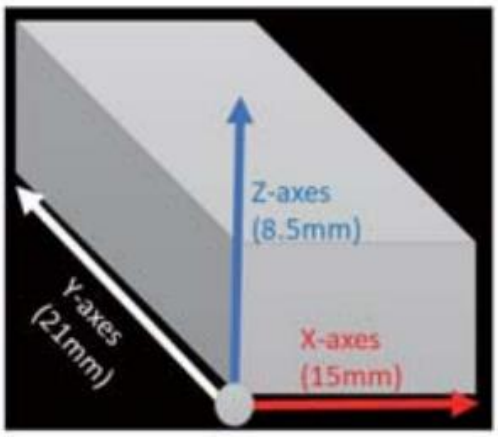
Connector Pin	Polarity
A	(＋)Signal/Power
B	(－)Common



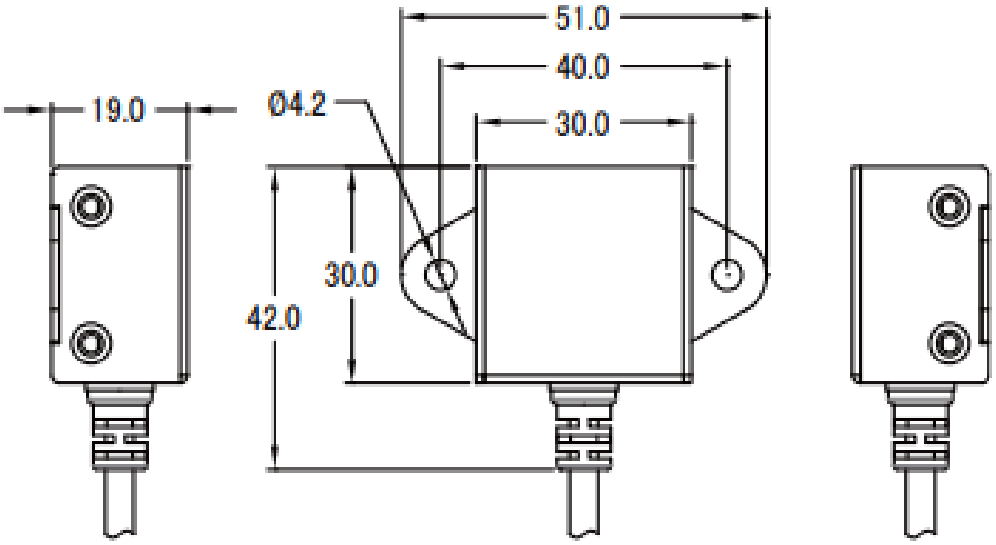


iSN-703-F1-L015

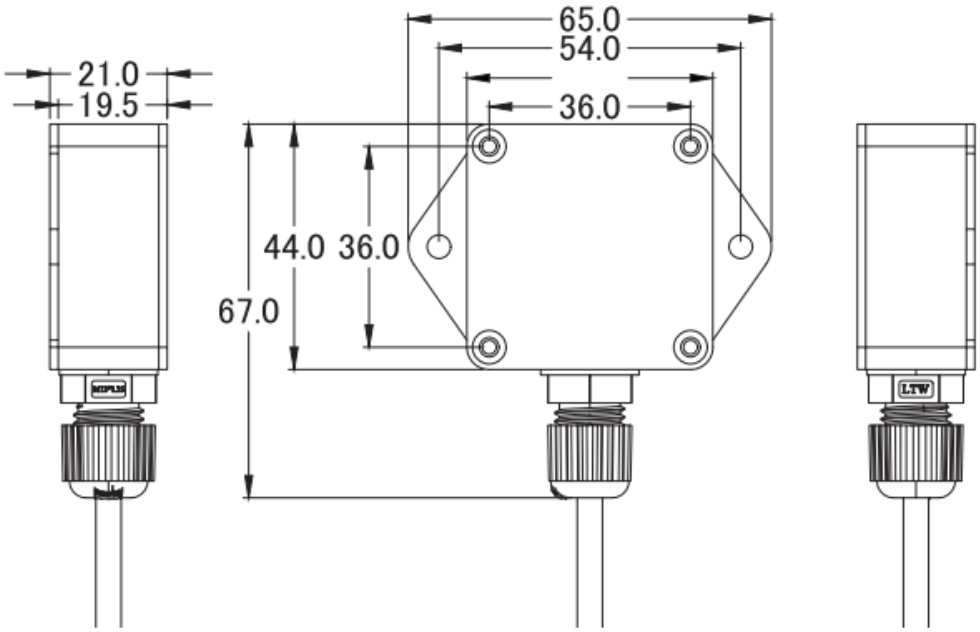




iSN-71x series ：Unit：mm

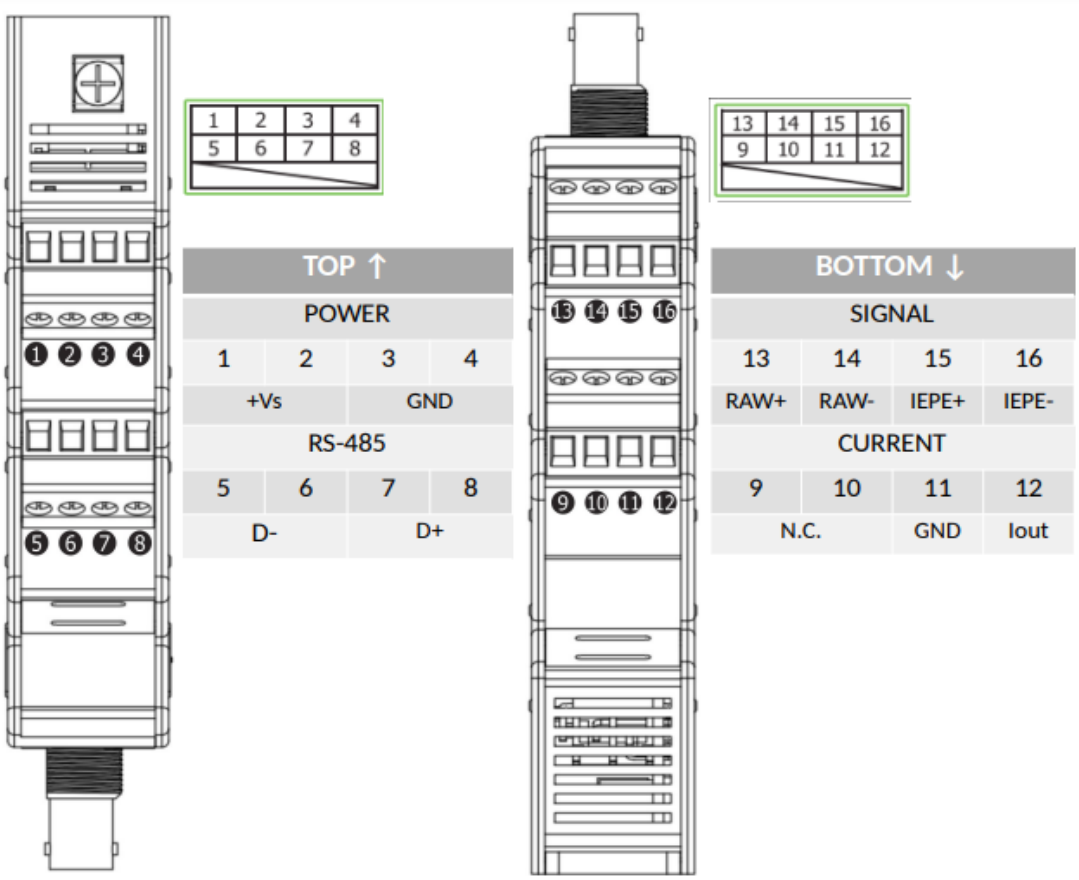


iSN-71x-IP68 series ：Unit：mm



2.4 Pin assignments

iSN-701X series ：



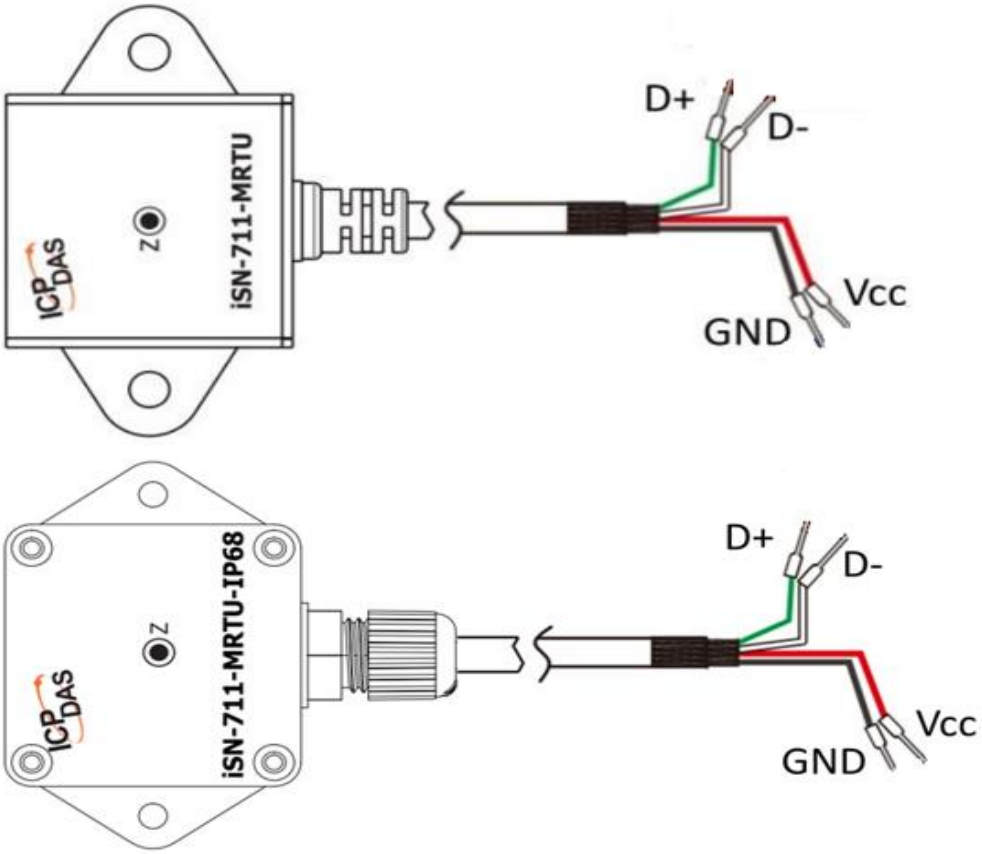
TOP ↑			
POWER			
1	2	3	4
+Vs		GND	
RS-485			
5	6	7	8
D-		D+	

BOTTOM ↓			
SIGNAL			
13	14	15	16
RAW+	RAW-	IEPE+	IEPE-
CURRENT			
9	10	11	12
N.C.		GND	Iout

iSN-703-F1-L015：

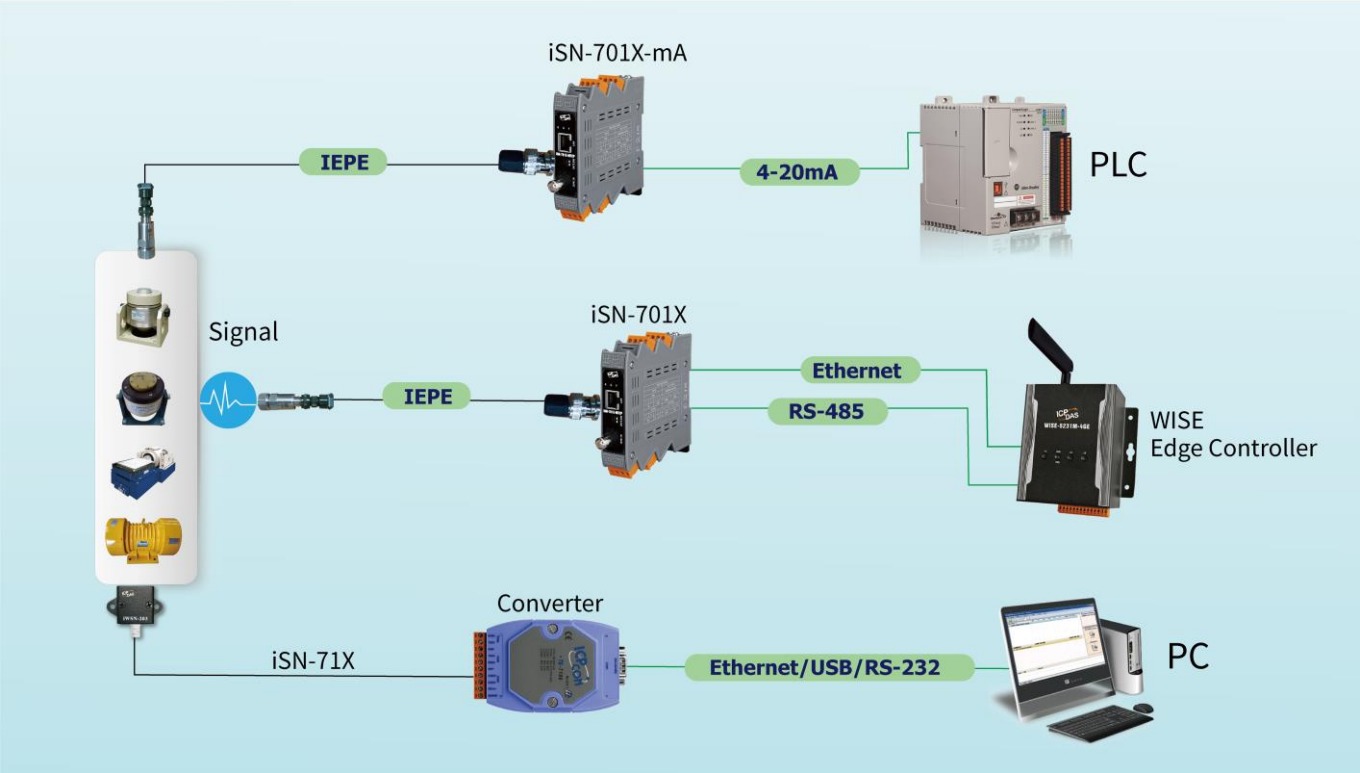
Color	Pin Assignment
Red	V+
White	X-axes
Blue	Y-axes
Yellow	Z-axes
Green	N/C
Black	GND

iSN-71x series ：



CONN.	Color	Pin Assignment
1	White	D-
2	Red	VCC
3	Black	GND
4	Green	D+

2.5 Wiring instructions



The iSN-701X series is capable of transmitting data via Modbus TCP/RTU, and the iSN-701X-mA also has an additional current signal output. The iSN-71x series can convert RS-485 signals into a transmission method that can be received by a master station (e.g., a PC) through various converters.

3. Module data reading and output settings

In this section, we will use the Utility (Modbus Master Tool) provided by ICP DAS to implement the following three functions using the standard Modbus communication protocol：

1. Read the vibration data
2. iSN-70x series alarm setting
3. iSN-701X-mA current output setting

This chapter uses factory settings for demonstration. The hardware default parameters are explained as follows：

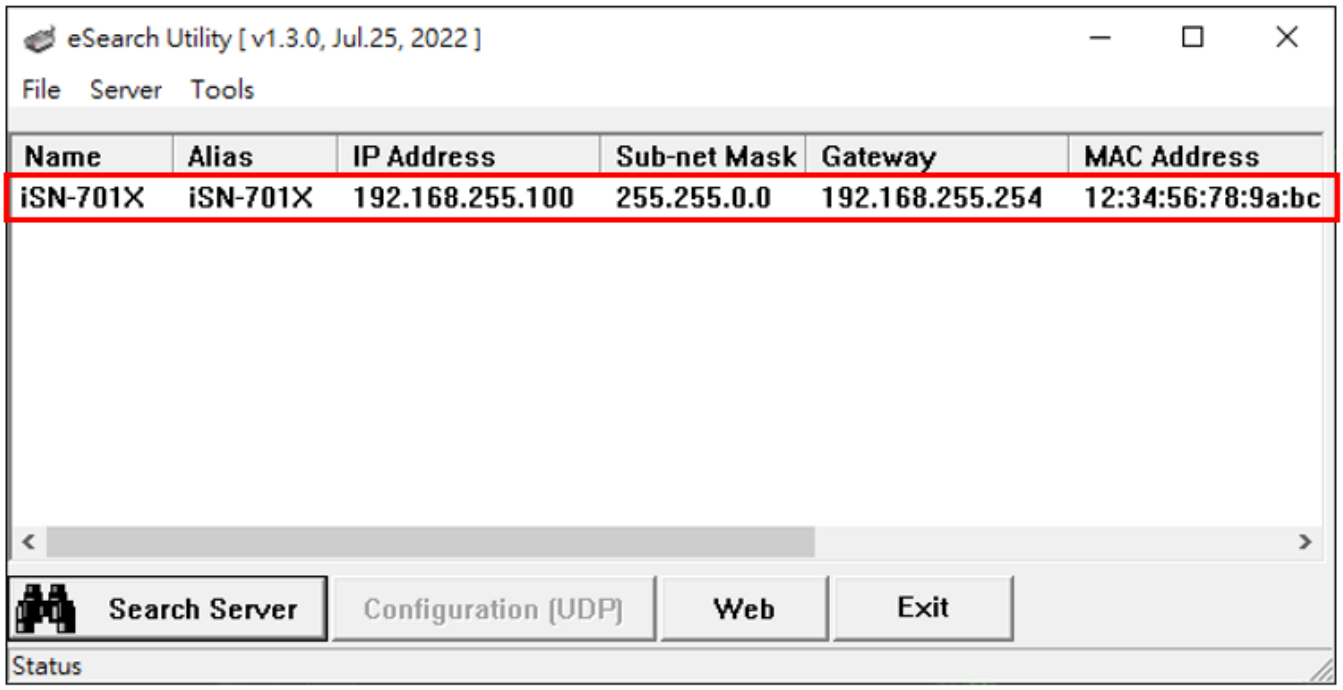
- RTU communication -

- Protocol：Modbus/RTU
- Net ID：1
- Baud rate：9600
- Parity：N,8,1

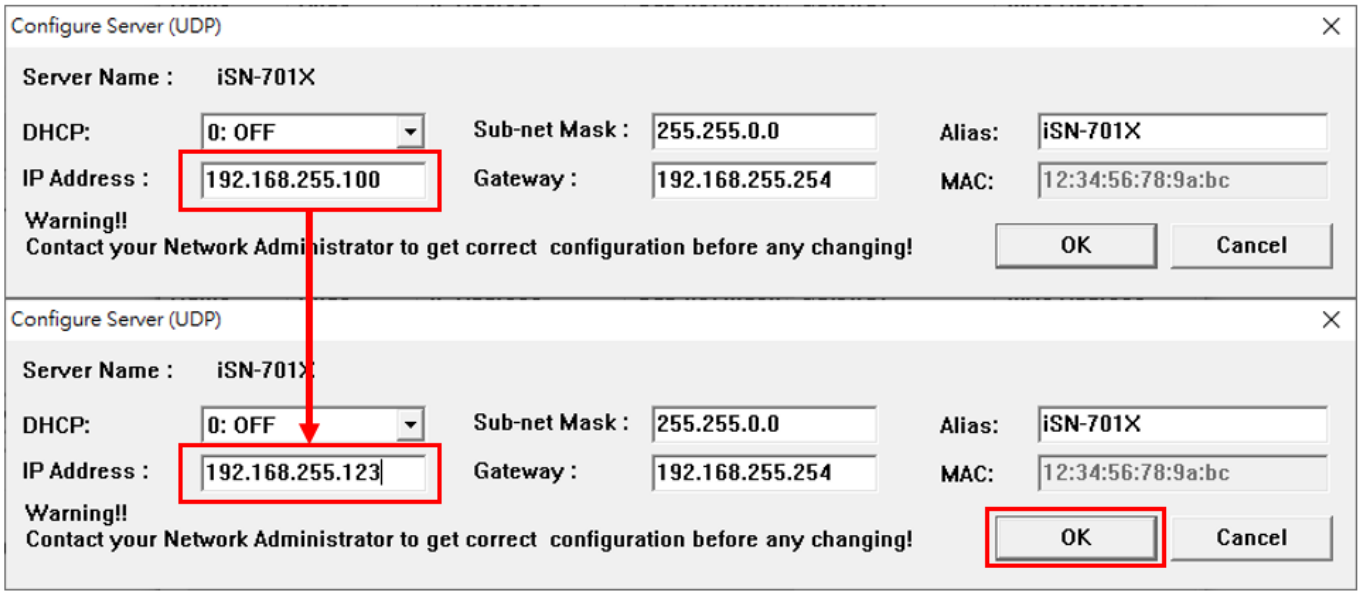
- TCP communication -

- IP: 192.168.255.100
- Mask: 255.255.0.0
- Gateway: 192.168.255.254
- Net ID：1

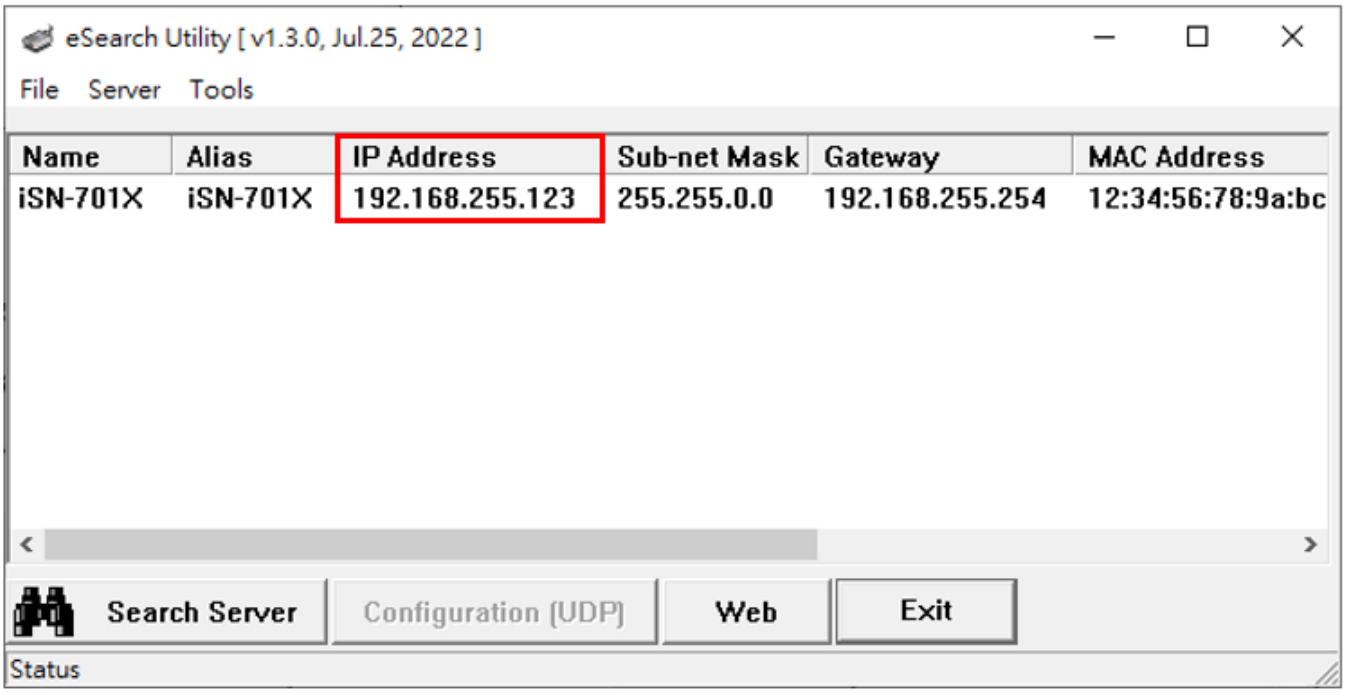
Use the eSearch Utility to set the IP address of the module, click the device, and then click [Configuration] to enter the settings.



Modify the IP address, and then click [OK] to save the settings.



Click [Search Server] to see if the edit is successful.



Modbus Master Tool download：

The Utility <Modbus Master tool> can be obtained from the following websites：

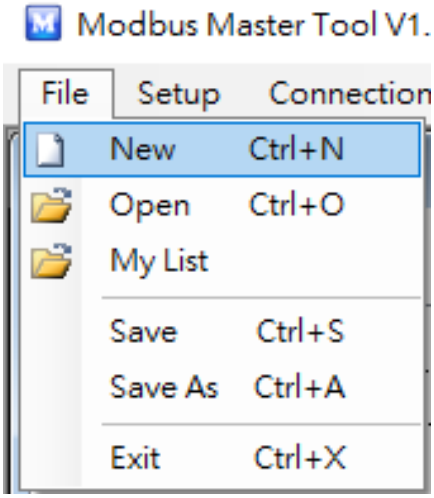
https://www.icpdas.com/en/download/show.php?num=1026&root=&model=&kw=Modbus%20Master%20Tool

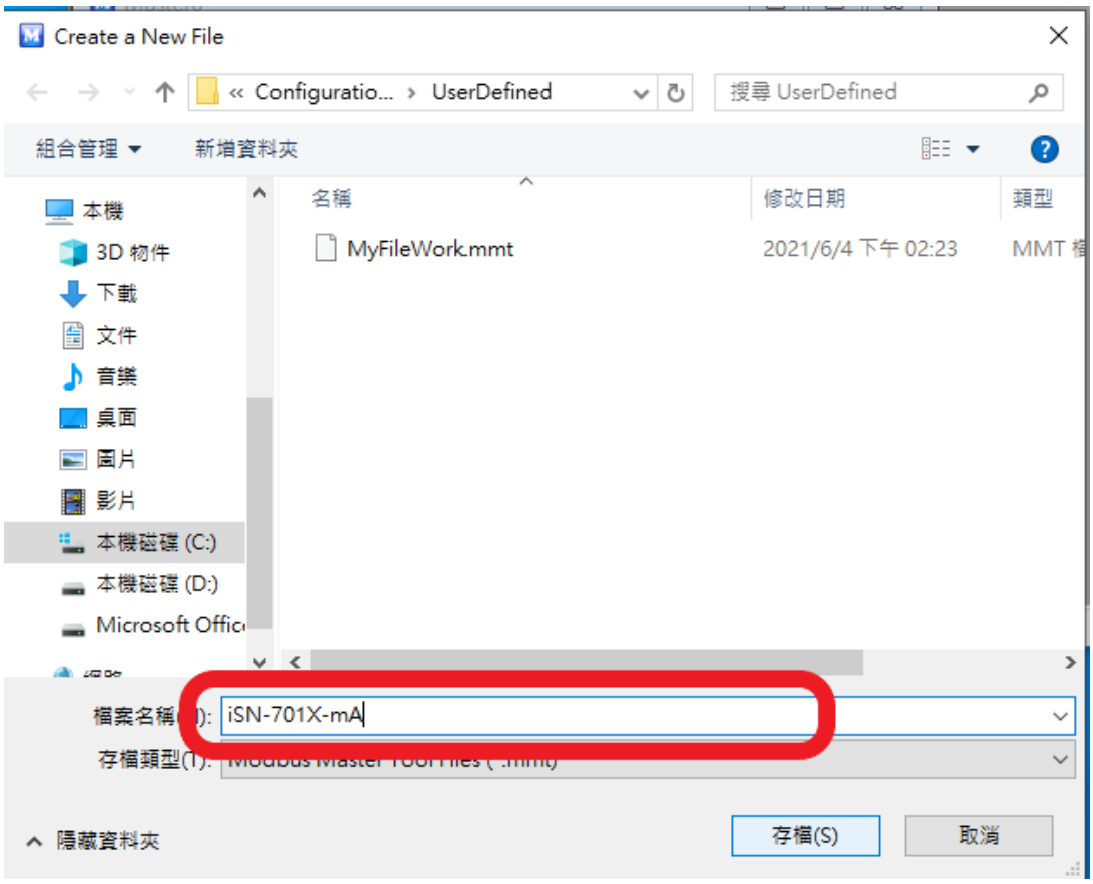
3.1 Read the vibration data

1. Open Modbus Master Tool

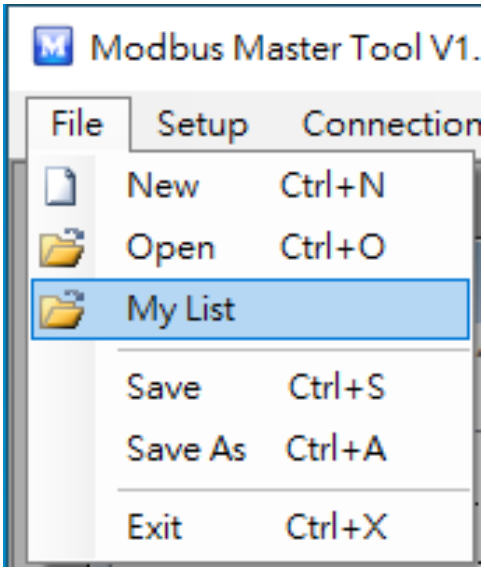
2. connection setting

- ❖ Click [New] in the [File] menu to create a new configuration file, enter the module model you want to create in the file name, and save the file after the input is completed.

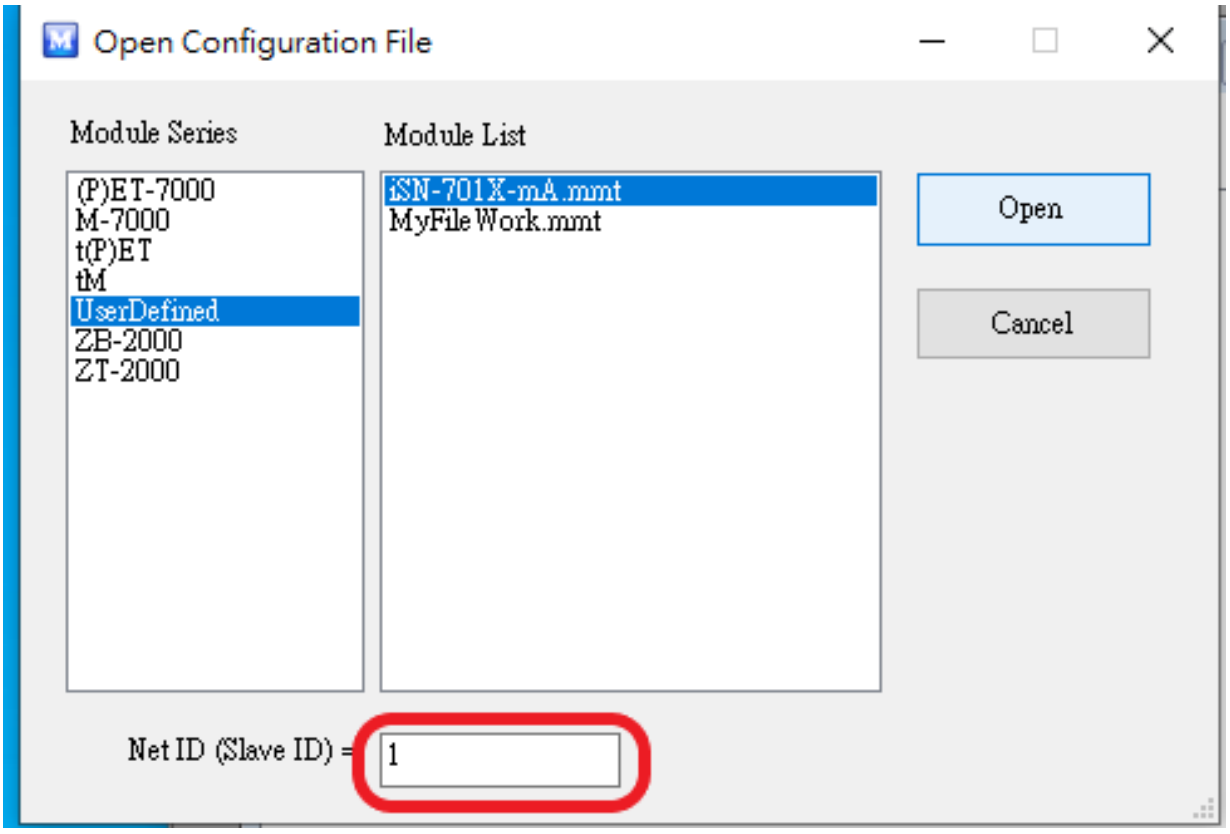




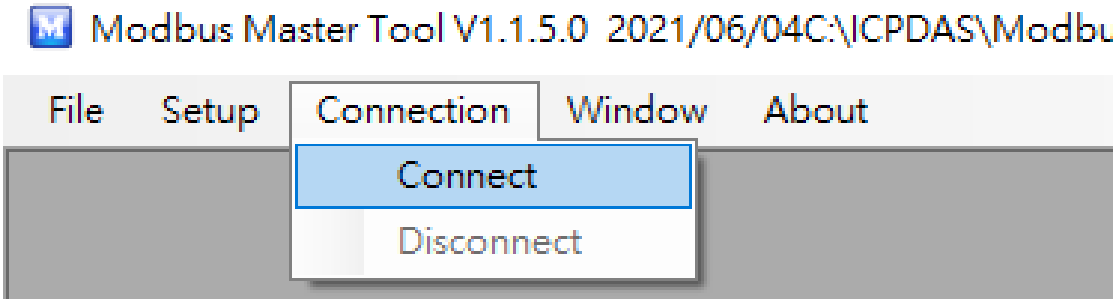
❖ After saving the file, click [My List] in the [File] menu to open the module list and load the configuration file.

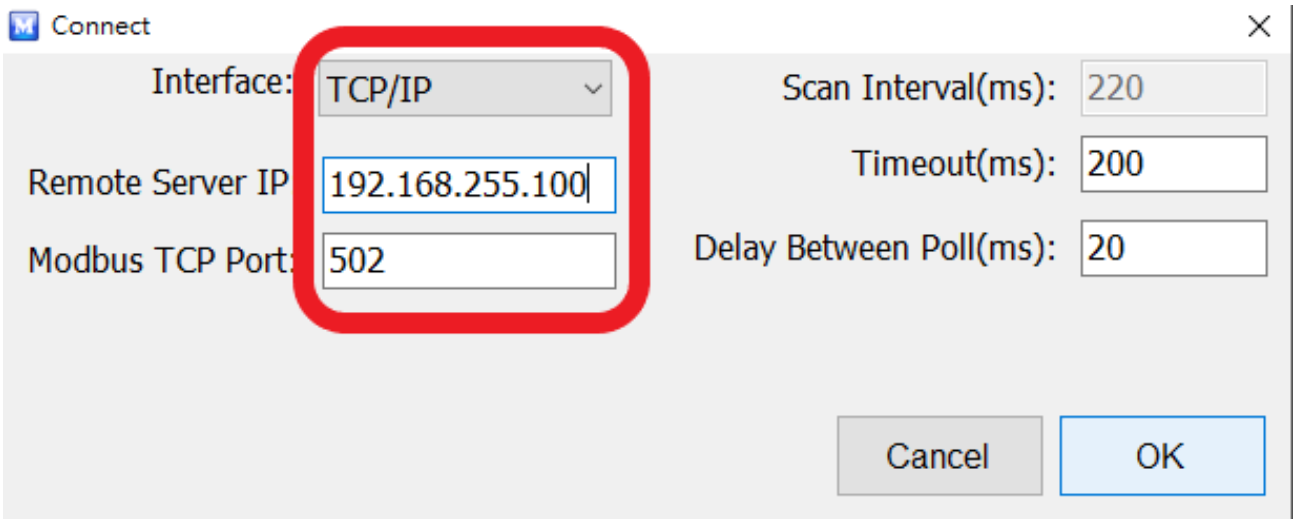


❖ Select the module you want to open, enter 1 (default) in the Net ID (Slave ID) field, and click [Open] to open the configuration file. The newly created configuration file is located in the UserDefined folder.



❖ TCP Communication: Establish a TCP connection.
Select [Connect] in the [Connection] menu, select [TCP/IP] in the [Interface] menu, set the connection parameters, and click [OK] to start capturing data online.



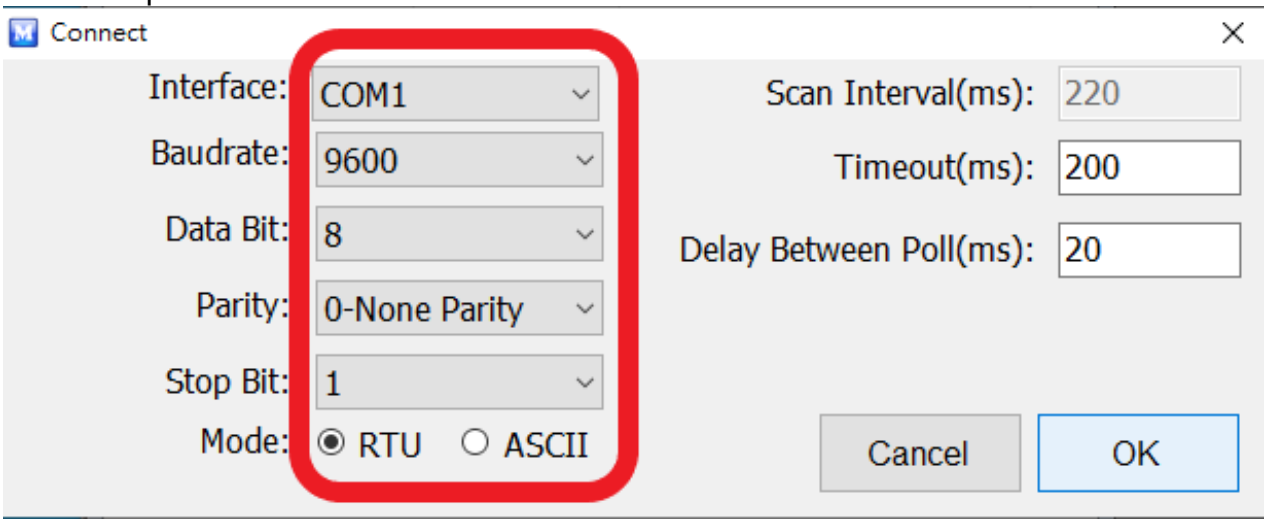


[Connect]：

- ➢ Remote Server IP：Enter the IP address of the module, the default IP address is 192.168.255.100
- ➢ Modbus TCP Port：Enter the TCP port of the module, the default TCP port is 502

❖ RTU Communication：Establish a RTU connection.

Select [Connect] in the [Connection] menu, select the port location of the module in the [Interface] menu, set the connection parameters, and click [OK] to start the connection and capture data.



[Connect] screen：

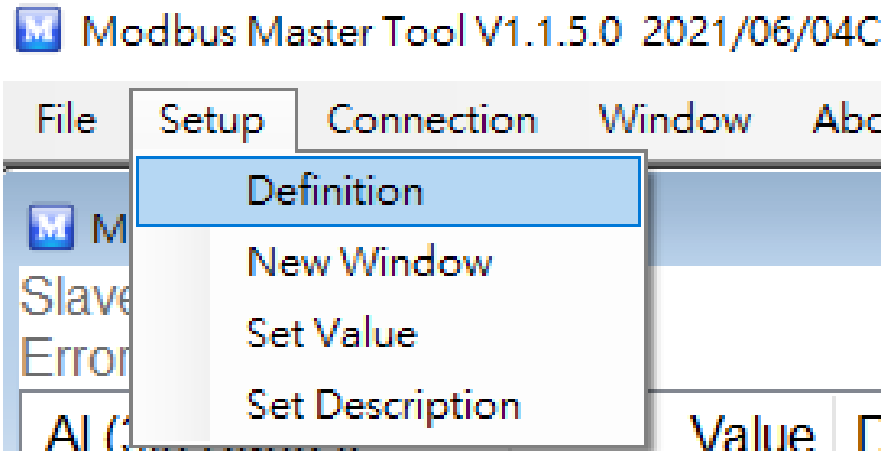
- ➢ Baudrate：Select the baud rate of the module, the default is 9600
- ➢ Data Bit：Select the communication bit length of the module, the default is 8
- ➢ Parity ：Select the module's parity, the default is N
- ➢ Stop Bit ：Select the stop bit of the module, the default is 1

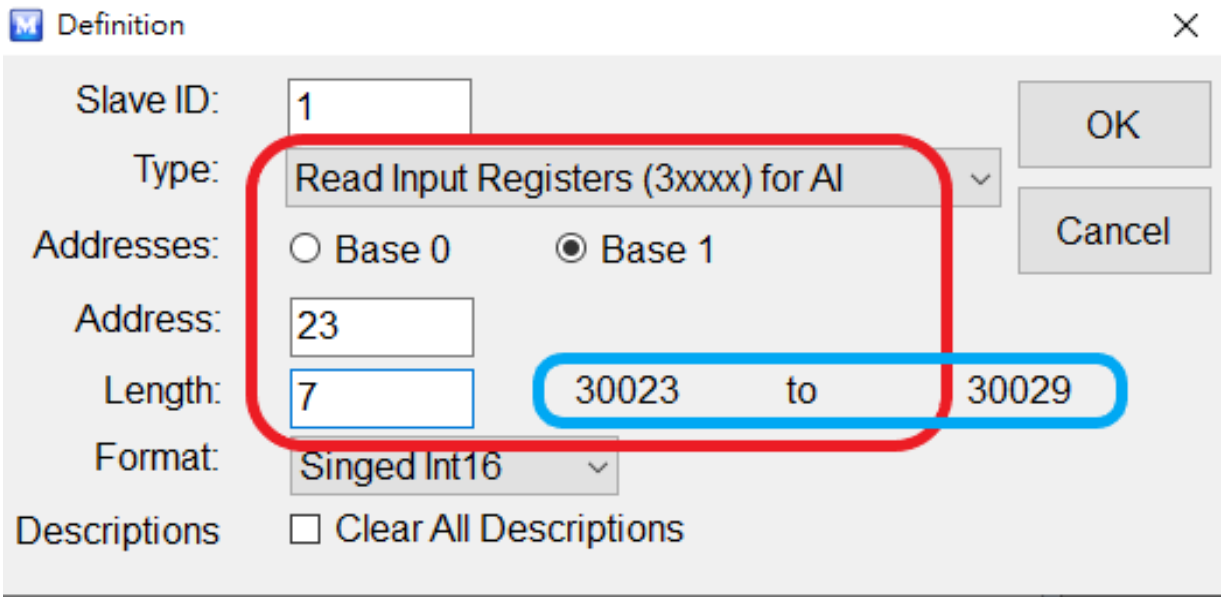
3. Query data

The module data address is as follows：

30023	22 (0x0016)	04	Acceleration (RMS)	Unit: mg
30024	23 (0x0017)	04	Acceleration (MAX)	Unit: mg
30025	24 (0x0018)	04	Acceleration (P-P)	Unit: mg
30026	25 (0x0019)	04	Acceleration (Crest Factor)	Unit: 0.01 CF
30027	26 (0x001A)	04	Velocity (RMS)	Unit: um/s
30028	27 (0x001B)	04	Displacement (P-P)	Unit: um
30029	28 (0x001C)	04	Characteristic current value	4000 ~ 20000 uA or 0 ~ 20000 uA For iSN-701X-mA

- ❖ Select [Definition] from the [Setup] menu, and set the connection parameters in the [Definition] screen.



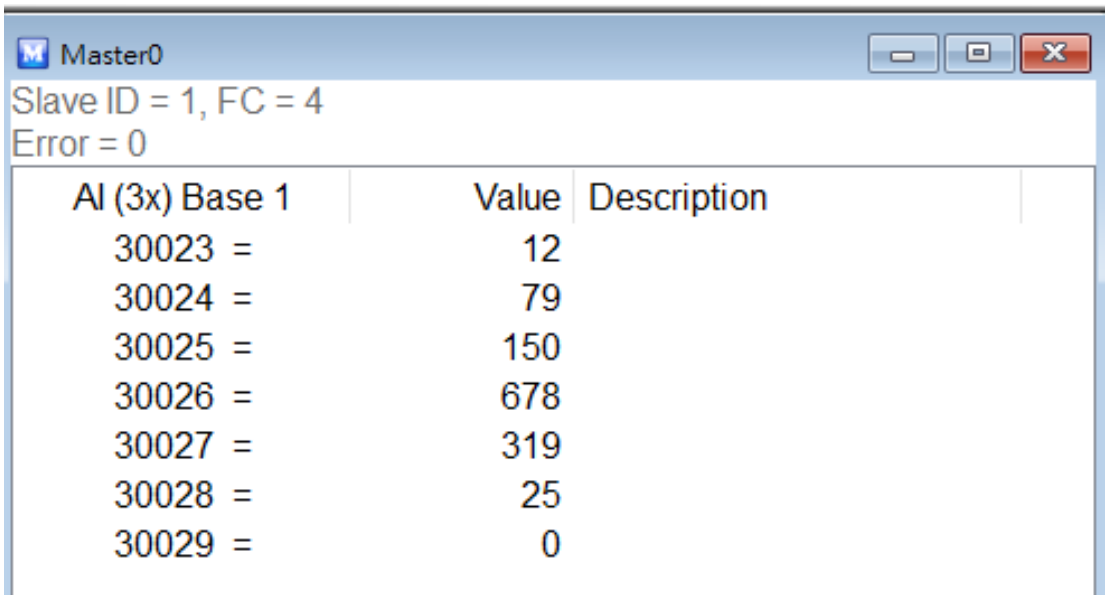


[Definition] screen：

- ➢ Slave ID：the ID of device
- ➢ Type：Select Read Input Registers (3xxxx) for AI
- ➢ Addresses：Select Base 1
- ➢ Address：Enter the address of the target data
- ➢ Length：Starting from [Address], enter the number of addresses to be read

Take reading module data as an example, set the read-only mode (3xxxx), Base 1, Address=23 means that we start reading from address 30023, Length=7 means that we read from address 30023 to 30029, which is shown in the blue box in the figure.

❖ Click [OK] to start the connection to capture the target data, the result is as follows, we can read the current measured data of the module.



3.2 Alarm setting - iSN-700 series

In this section, we will briefly explain the warning settings of the iSN-700 series.

First, we need to select the type of feature value to be used for early warning, that is, which feature value should be selected as the judgment for early warning. Then, set the threshold value of the eigenvalue as the basis for triggering the alarm. Then, set the number of judgment fault tolerances. When the number of consecutive faults exceeds the threshold, we will issue an alarm to avoid accidentally interfering with our alarms if the number exceeds once or twice. Finally, reset the device so that the set parameters are accurately written into the device.

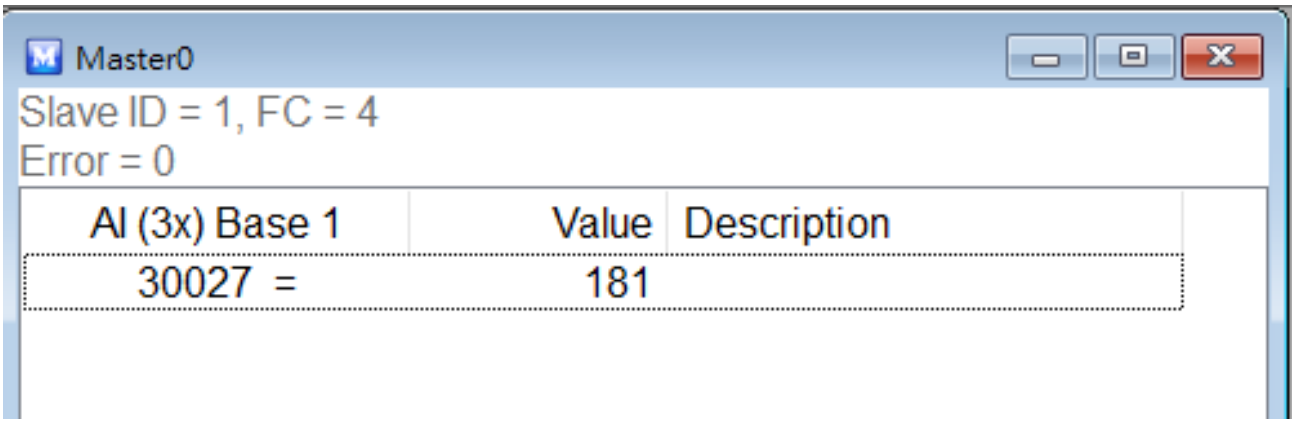
When an early warning is triggered, the system will continue to issue the alarm until the person in charge manually turns it off. This prevents the early warning from appearing only at the moment when the problem occurs, and the person in charge does not receive the alarm due to some reasons, resulting in missing the abnormal state and being unable to Deal with problems promptly.

Setup steps：

1. Set the eigenvalue type of the warning.
2. Set the threshold of the eigenvalue.
3. Set the number of judgment fault tolerances.
4. Device reset.
5. Disarm the alarm.

Example：

In this example, the eigenvalue - velocity is used as an example. The following figure shows the currently measured velocity value.



1. Set the eigenvalue type of the warning
Take velocity as an example, address 40029, set to 4.
2. Set the threshold value of the eigenvalue
Address 40030, set to 100.
3. Set the number of judgment fault tolerances
Address 40028, use default 3

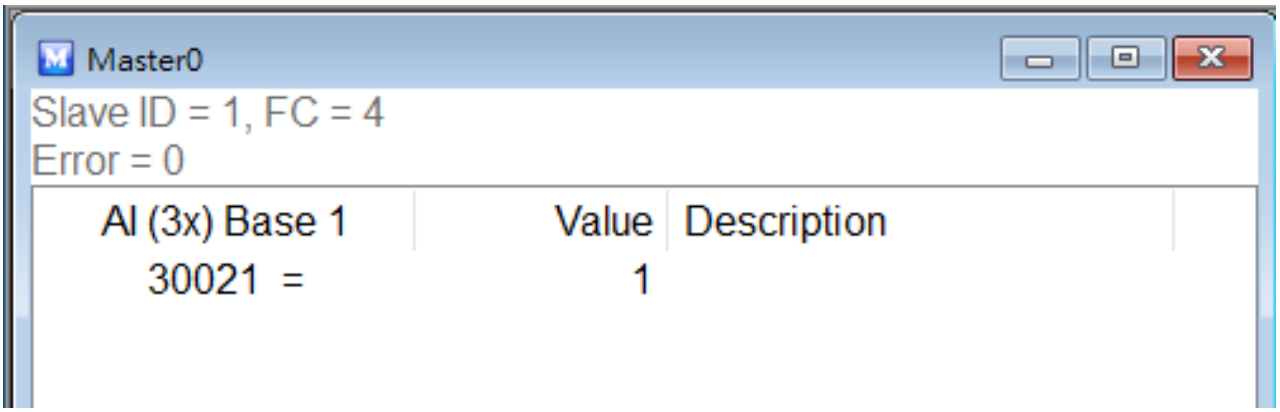
40028	27 (0x001B)	03 16	Feature judgment error tolerance times	Range:1~255, Default:3 (Abnormal alarms occur continuously N times)
40029	28 (0x001C)	03 16	Channel 1 (X-axis) Type of feature judgment	0: Disable (Default) 1: Acceleration (mg, RMS) 2: Acceleration (mg, MAX) 3: Acceleration (mg, P-P) 4: Velocity (μm/s, RMS) 5: Displacement(μm, P-P)
40030	29 (0x001D)	03 16	Channel 1 (X-axis) Threshold value of feature judgment	Threshold value: 1~32767 Default: 1

4. Device reset
After setting the above steps, you need to reset the device to write parameters and set address 40002 to 1.

40002	(0x0001)	03 16	Parameter settings (*1)	0: Idle 1: Setup

After setting, check the current alarm status at address 30021. Since the measured value (181) is higher than the warning threshold (100) we set, the alarm status needs to be displayed as abnormal.

30021	20 (0x0014)	04	Characteristic alert status	Alert status 0: Normal 1: Abnormal

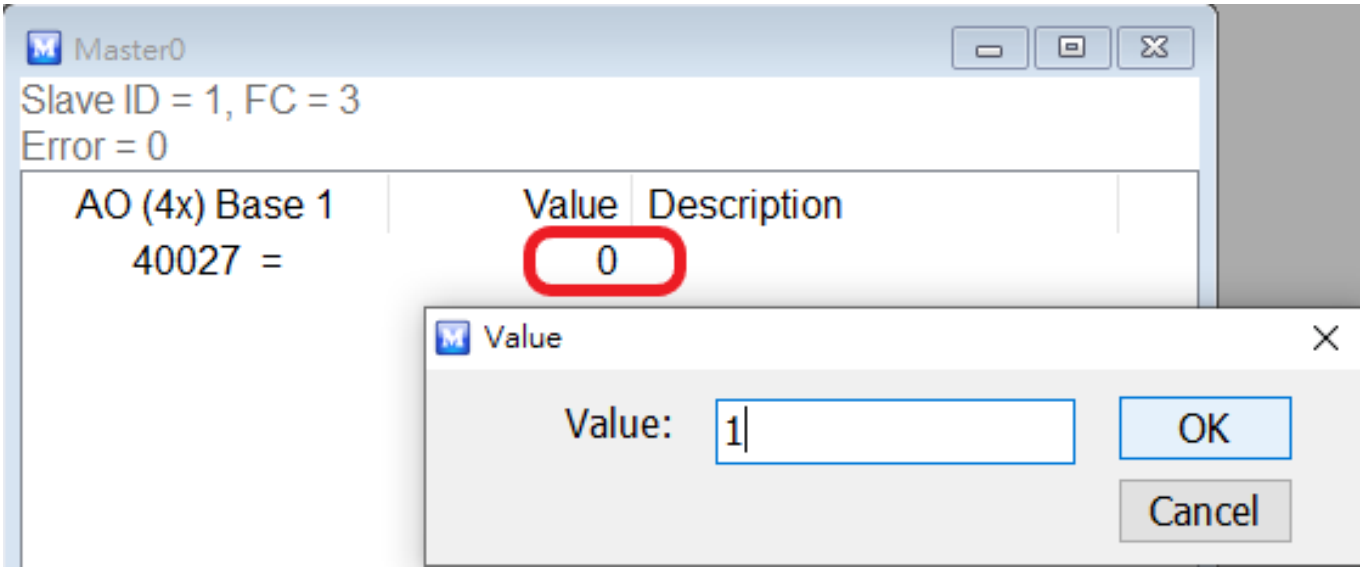


At address 30021, you can see that the value is 1, which represents an abnormality and indicates that the early warning system is operating normally.

5. Disarm alarm

When an alarm occurs, if you want to cancel it, set address 40027 to 1.

40027	26 (0x001A)	03 16	Clear feature judgment exception alarm (*2)	0: Idle 1: Clear



3.3 Current conversion- iSN-701X-mA

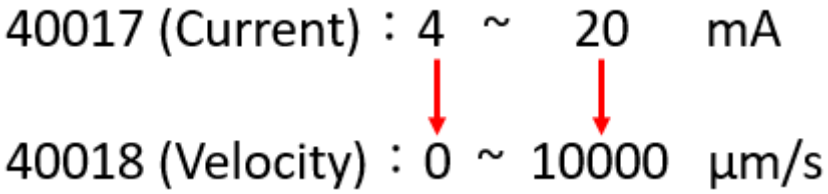
This section describes how to convert the vibration characteristics of the iSN-701X-mA to current values.

When encountering a field environment where Modbus TCP/RTU cannot be used to transmit data, we will need to utilize the conversion of current and eigenvalue to obtain the data.
First, you need to select the current output type of iSN-701X-mA. Then, select the type of eigenvalue to be converted and set the upper limit of the eigenvalue to match the current output so that there is a basis for conversion.

Setup steps：

- Taking eigenvalue-velocity as an example, obtain the conversion comparison of current value-velocity value
    1. Set the selected eigenvalue, here select eigenvalue <velocity>.
    2. Set the AO output type to 4~20mA.
    3. Set the upper limit of the eigenvalue. Here, it is assumed that the upper limit is 10,000, that is, the upper limit of the velocity is 10,000.
    4. Device reset.

    From this we can get a conversion comparison of current value- velocity value, as shown below.



    Assume that the actual measured velocity value is X and the current value is Y, then
    Current-velocity conversion equation: Y - 4 / 20 - 4 = X - 0 / 10000 - 0
    Putting the current value Y into the equation, we can get the velocity value X. On the contrary, if the velocity value is brought in, we can get the corresponding current value.

Operation example：

1. Set selected eigenvalue

Taking velocity as an example, address 40029 is set to 4.

40029	28 (0x001C)	03 16	Channel 1 (X-axis) Type of feature judgment	0: Disable (Default) 1: Acceleration (mg, RMS) 2: Acceleration (mg, MAX) 3: Acceleration (mg, P-P) 4: Velocity (μm/s, RMS) 5: Displacement(μm, P-P)

2. Set the AO output type

Address 40017, set to 9.

3. Set the upper limit of eigenvalue

Address 40018, set to 10000.

40017	16 (0x0010)	03 16	Channel 1 Current output type	0: Disable (Default) 1: Acceleration (mg, RMS), 0~20mA 2: Acceleration (mg, MAX), 0~20mA 3: Acceleration (mg, P-P), 0~20mA 4: Velocity (μm/s, RMS), 0~20mA 5: Displacement (μm, P-P), 0~20mA 6: Acceleration (mg, RMS), 4~20mA 7: Acceleration (mg, MAX), 4~20mA 8: Acceleration (mg, P-P), 4~20mA 9: Velocity (μm/s, RMS), 4~20mA 10: Displacement (μm, P-P), 4~20mA For iSN-701X-mA
40018	17 (0x0011)	03 16	Channel 1 Eigenvalue conversion Current upper limit	Range: 1~65535 Default: 65535 For iSN-701X-mA

4. Device reset

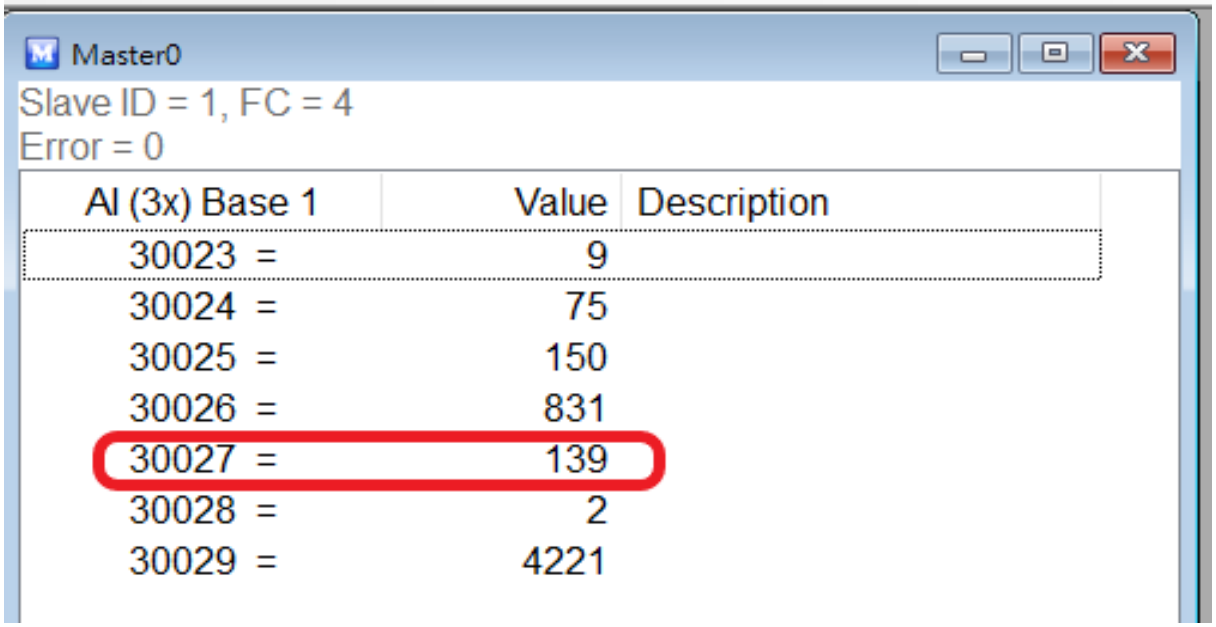
After setting the above steps, you need to reset the device to write parameters. The set address is 40002 and set to 1.

40002	(0x0001)	03 16	Parameter settings (*1)	0: Idle 1: Setup

- After the above settings, we can get
  Current-velocity conversion equation: Y - 4 / 20 - 4 = X - 0 / 10000 - 0.

In the actual measurement, we can obtain the eigenvalue from the address 30023~30028, and the current value from the address 30029.

30023	22 (0x0016)	04	Acceleration (RMS)	Unit: mg
30024	23 (0x0017)	04	Acceleration (MAX)	Unit: mg
30025	24 (0x0018)	04	Acceleration (P-P)	Unit: mg
30026	25 (0x0019)	04	Acceleration (Crest Factor)	Unit: 0.01 CF
30027	26 (0x001A)	04	Velocity (RMS)	Unit: um/s
30028	27 (0x001B)	04	Displacement (P-P)	Unit: um
30029	28 (0x001C)	04	Characteristic current value	4000 ~ 20000 uA or 0 ~ 20000 uA For iSN-701X-mA



Inserting the current value into the equation yields a speed value, which is then compared with the measured velocity value.
4.221 - 4 / 20 - 4 = x - 0 / 10000 - 0, the calculated value of velocity x = 138.125, which is approximate to the measured value of 139.

4. iSN-700-Series_Utility

This chapter will explain the various functions and usage settings of the tool software (iSN-700-Series_Utility) provided by ICP DAS.

1. Download iSN-700-Series_Utility

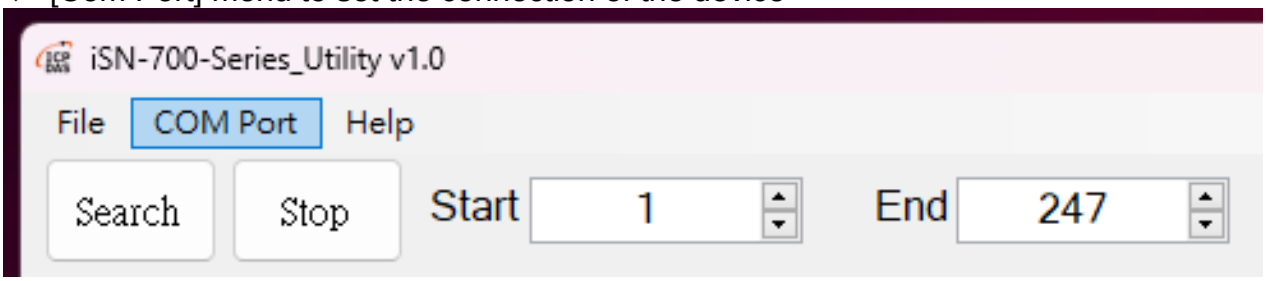
The Utility <iSN-700-Series_Utility> can be obtained from the following website：

https://www.icpdas.com/en/download/

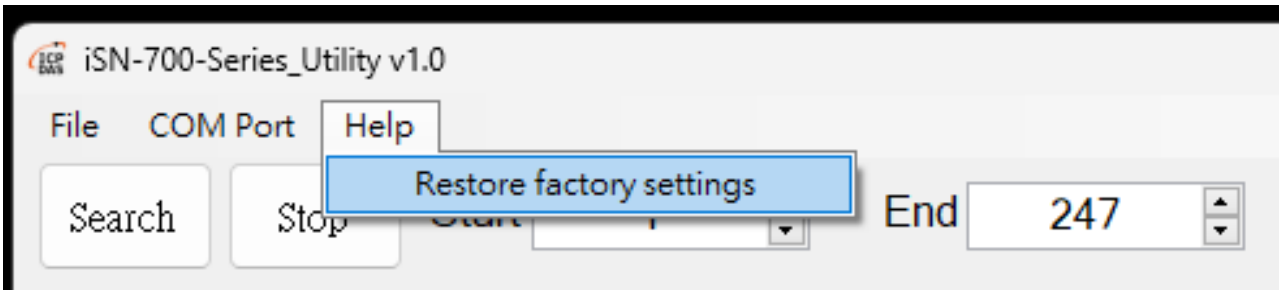
2. Start screen description

The function bar currently has three function menus：

- [Com Port] menu to set the connection of the device

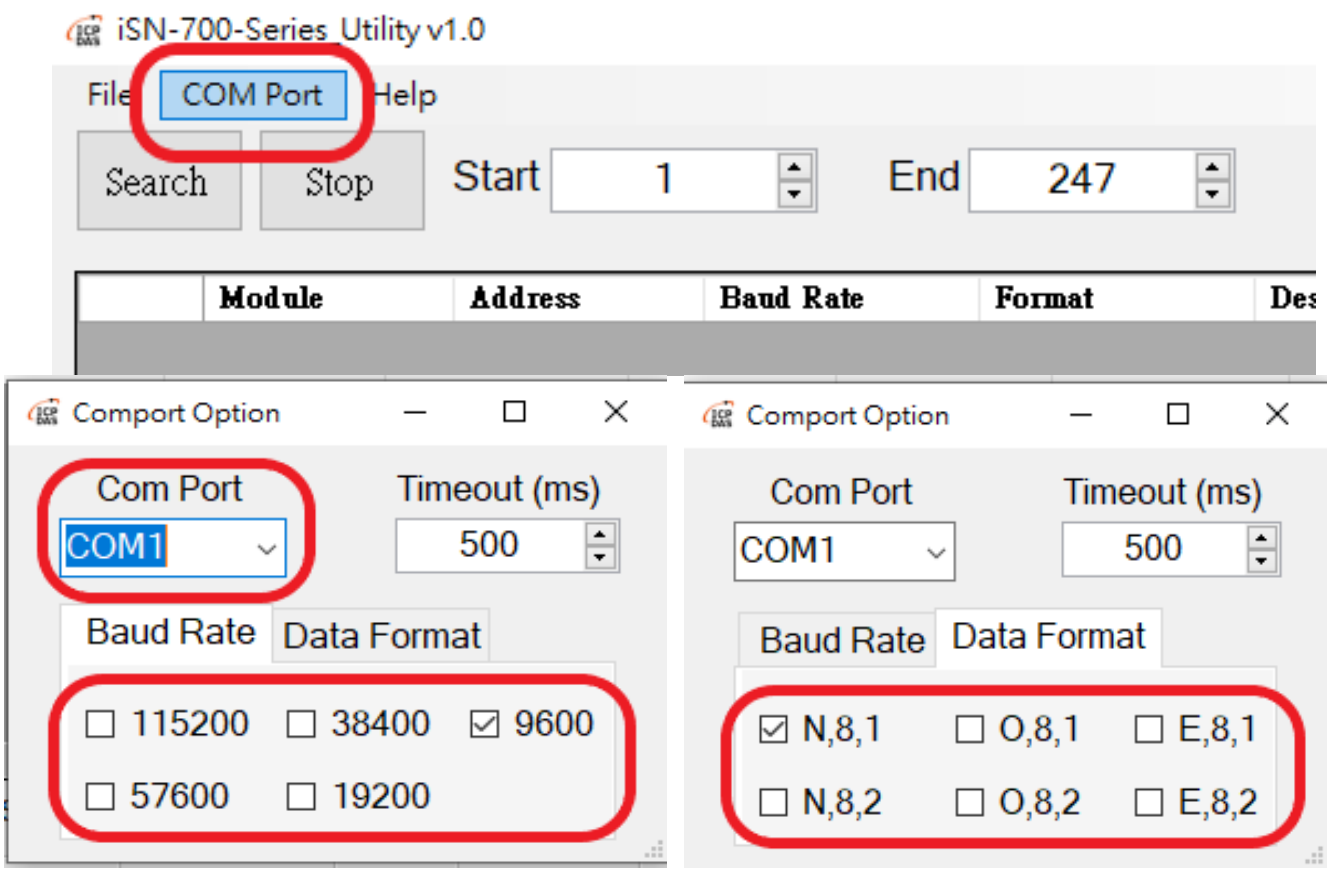


- [Help]menu，Restore factory settings , reset to factory default



3. Connection settings

❖ Click the [COM Port] menu to set the connection parameters.



[COM Port]：

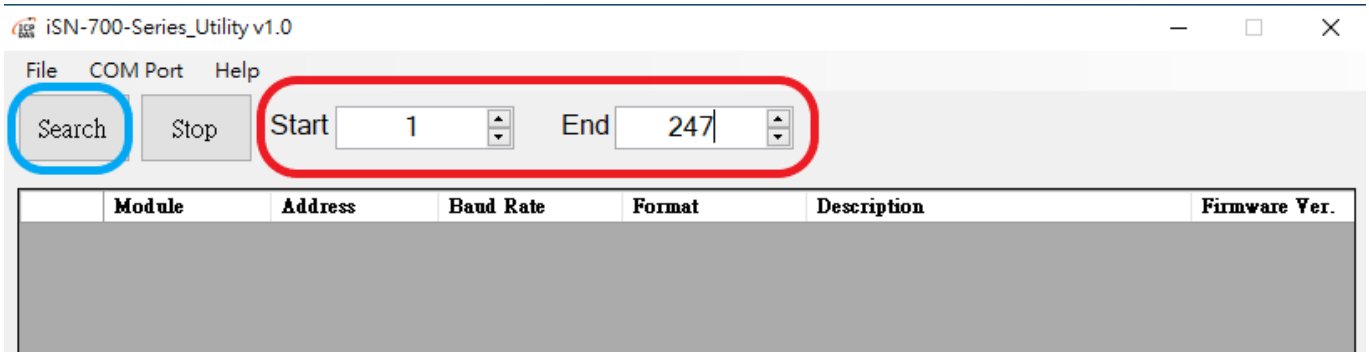
➢ Com Port：Select the module's port

➢ Baud Rate：Select the module's baud rate

➢ Data Format：Select module data format

❖ After the settings are completed, close this window.

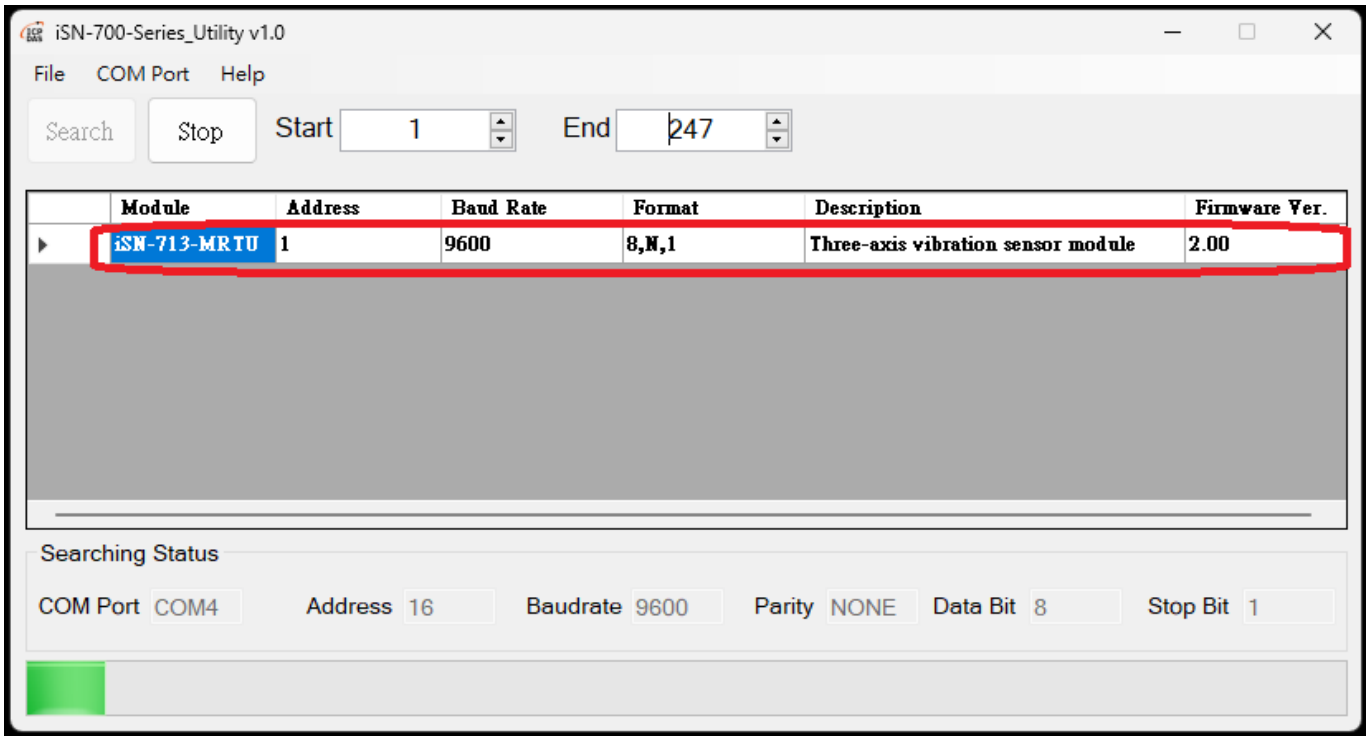
❖ Go back to the original window. You can first set the range of module ID positions in [Start]-[End], and then click [Search] to search for modules.



[Start] - [End] Setup description：

The lower limit of [Start] is 1 and the upper limit of [End] is 247. This is to set the range of module ID to search.
The larger the range, the longer it takes to search the whole range, so you can set a closer range to avoid spending more time.

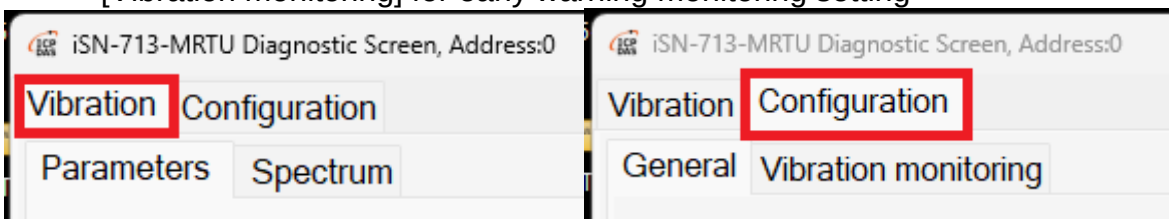
❖ If the connection is successful, the module will appear in the window below. Click on the module to enter the data monitoring page.



4. Data monitoring page description

Function bar：[Vibration] and [Configuration]

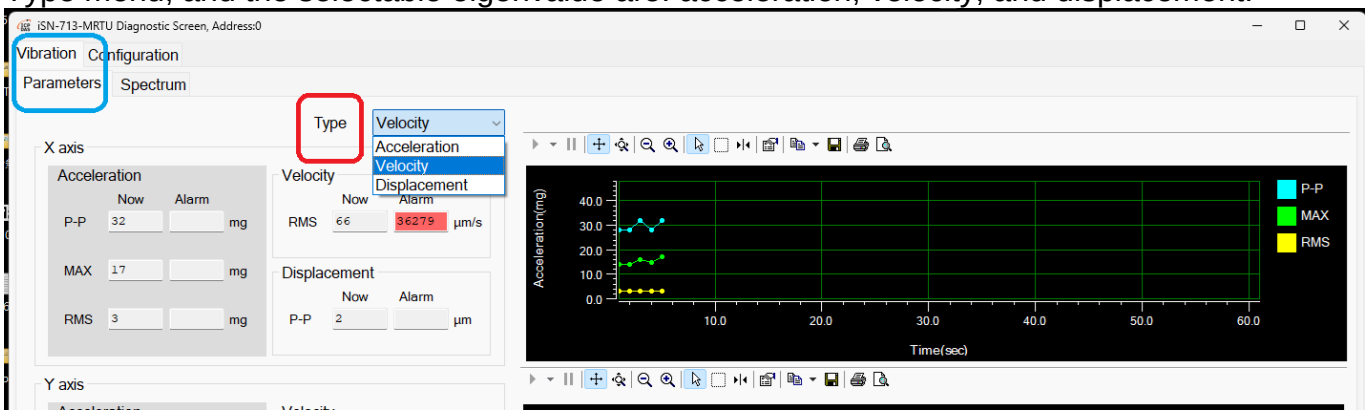
- ❖ Vibration：How to display the data chart, [Parameters] shows the trend chart, and [Spectrum] shows the spectrum.
- ❖ Configuration：For parameter configuration, [General] for module parameter setting, and [Vibration monitoring] for early warning monitoring setting



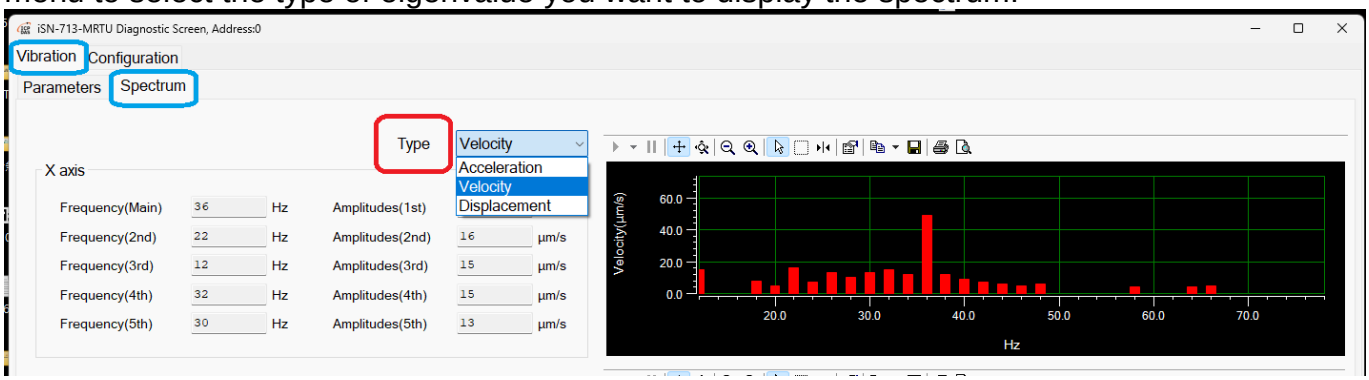
- Vibration screen -

After clicking on the module, you will enter the [Parameters] page in the [Vibration] function, and you will see three chart blocks, corresponding to the measurement results of the three axes (X, Y, Z), if there is only a single axis measurement, only one chart block (X-axis) will have a numerical value.

The [Parameters] page in the [Vibration] function is used to display the trend chart of the eigenvalue, and you can select the type of eigenvalue you want to display the trend chart in the Type menu, and the selectable eigenvalue are: acceleration, velocity, and displacement.



The [Spectrum] page is used to display the spectrum of eigenvalue, and there is also a Type menu to select the type of eigenvalue you want to display the spectrum.



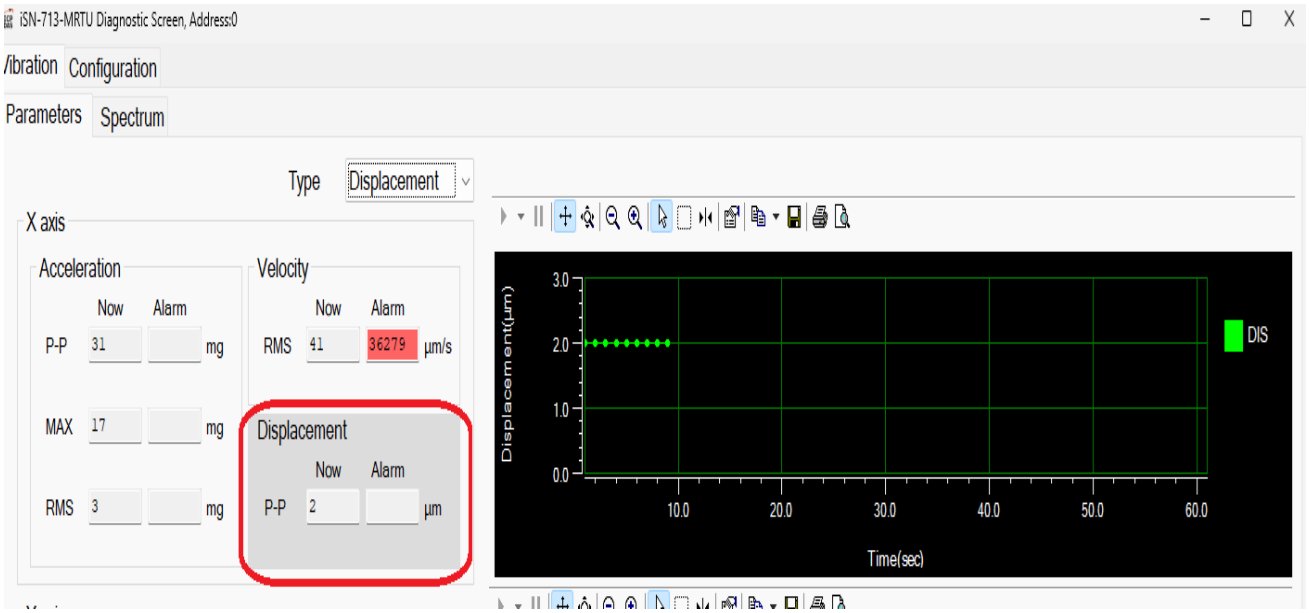
I. Parameters screen

- ❖ The Type menu allows you to select the type of eigenvalue you want to display the trend chart.
- ❖ The left area displays the current value of the selected eigenvalue [Now] and the maximum value of the alert that exceeds the warning standard when an alert occurs [Alarm], and when you select the eigenvalue in the Type menu, the corresponding eigenvalue block is displayed with a dark background.
- ❖ The chart on the right will show the trend chart of the selected feature value.
- ❖ If an alert standard is set, the chart on the right will be marked with a red dotted line, and when an alert is triggered, the [Alarm] value in the left area will be displayed with a red background.

- Select [Acceleration] and the values displayed on the left from top to bottom are: peak-to-peak, maximum, and average

- Select [Velocity], and the value displayed on the left is the valid value for velocity. Since the tool software will preset the warning value of the speed, you can see that there is a red dotted line in the chart on the right, and because the initial warning value is set low, the [Alarm] value has a red prompt when the warning is triggered. How to set up alerts will be explained later.

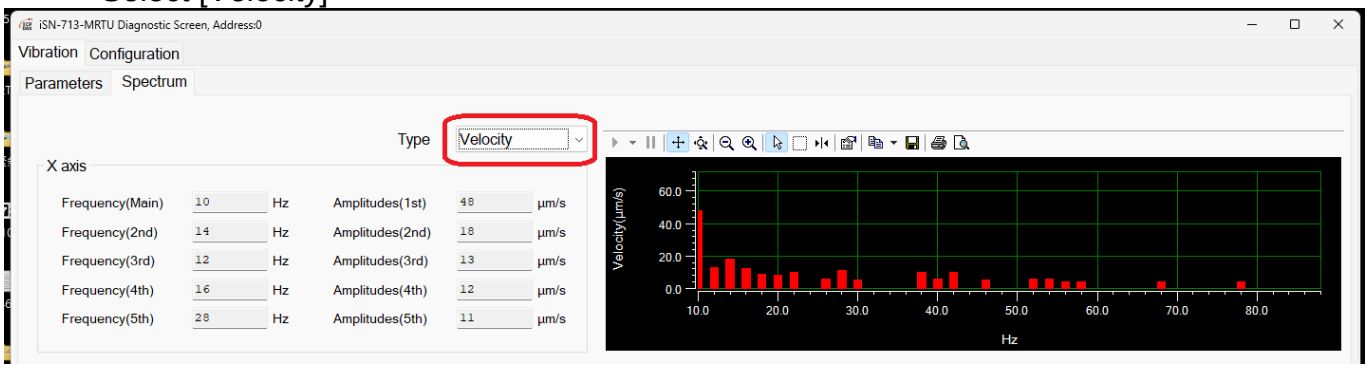
- Select [Displacement], and the peak-to-peak value of the displacement is displayed on the left.



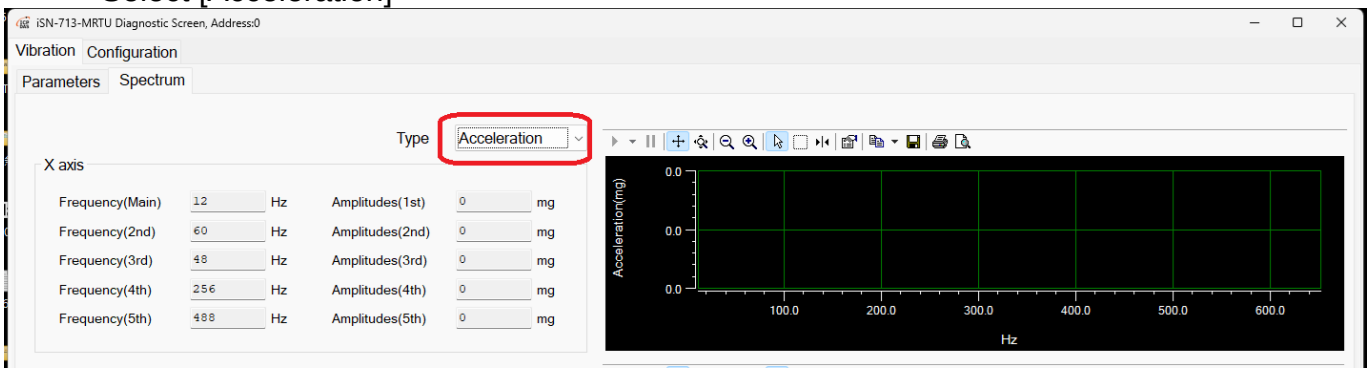
II. Spectrum screen

- ❖ Type menu allows you to select the eigenvalue of the spectrum to be displayed
- ❖ The left area displays the frequency and amplitude (intensity) measured by the selected eigenvalue, and the top five items with the highest values are displayed in order from top to bottom.
- ❖ The chart on the right will present the spectrum of the selected eigenvalue.

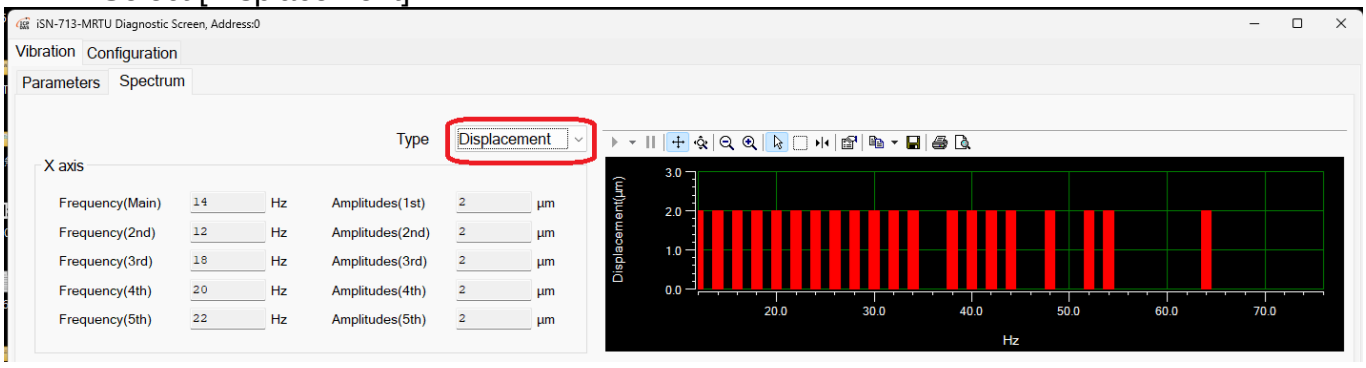
- Select [Velocity]



- Select [Acceleration]

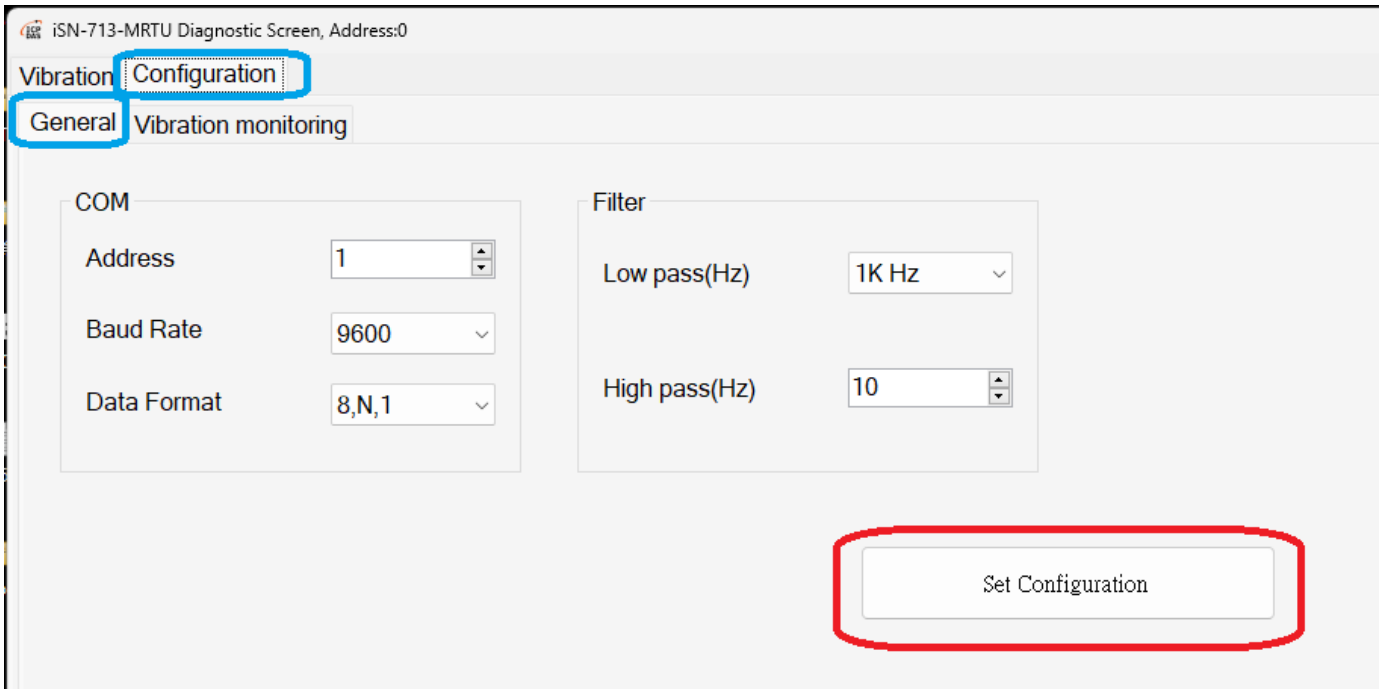


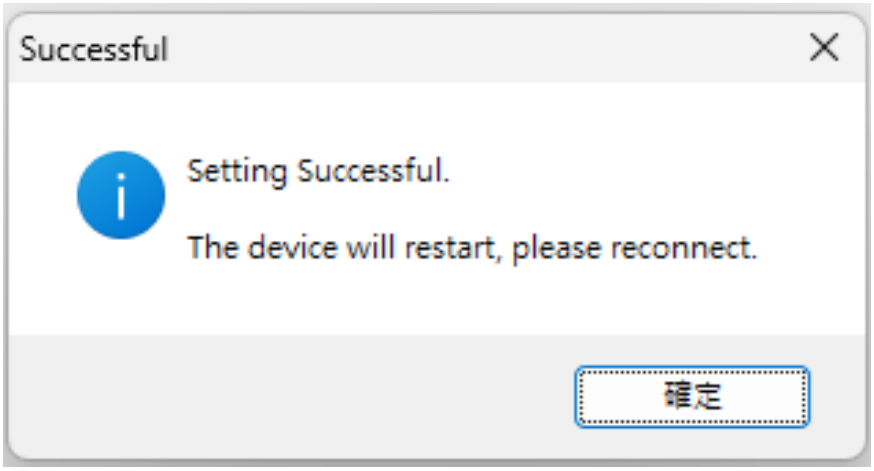
- Select [Displacement]



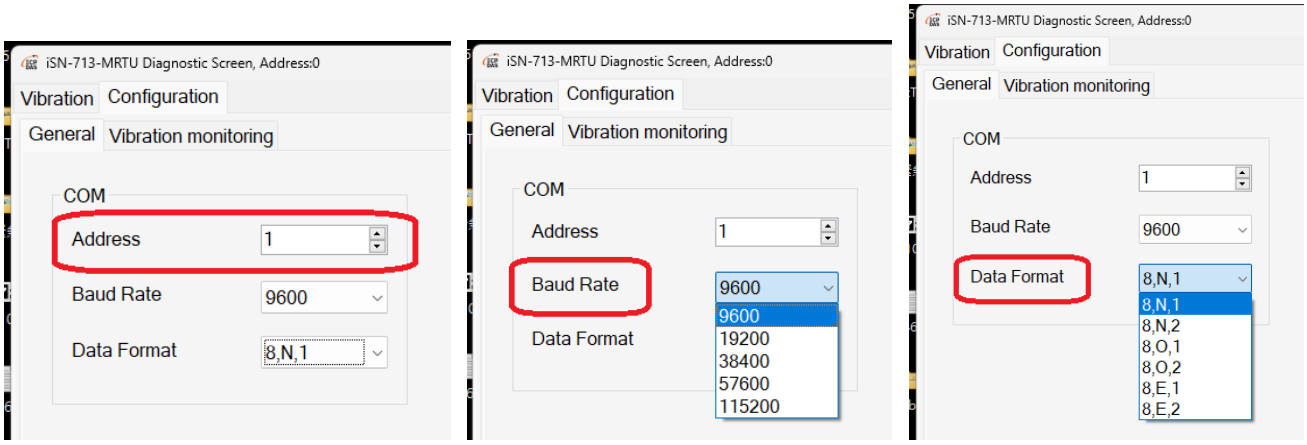
III. General screen

In the [General] page of [Configuration], you can configure the parameters of the currently connected module. The [COM] area allows you to change the parameters of the connected module, including: address, baud rate, and data format. The [Filter] area allows you to adjust the Low Pass Filter and High Pass Filter to eliminate the out-of-range frequency signal interference. After setting, click [Set Configuration] at the bottom, if the setting is successful, a [Successful] window will appear. Tap [OK] and go back to the connection page to re-select the module to connect, and enter the data monitoring page to finish the module setting.

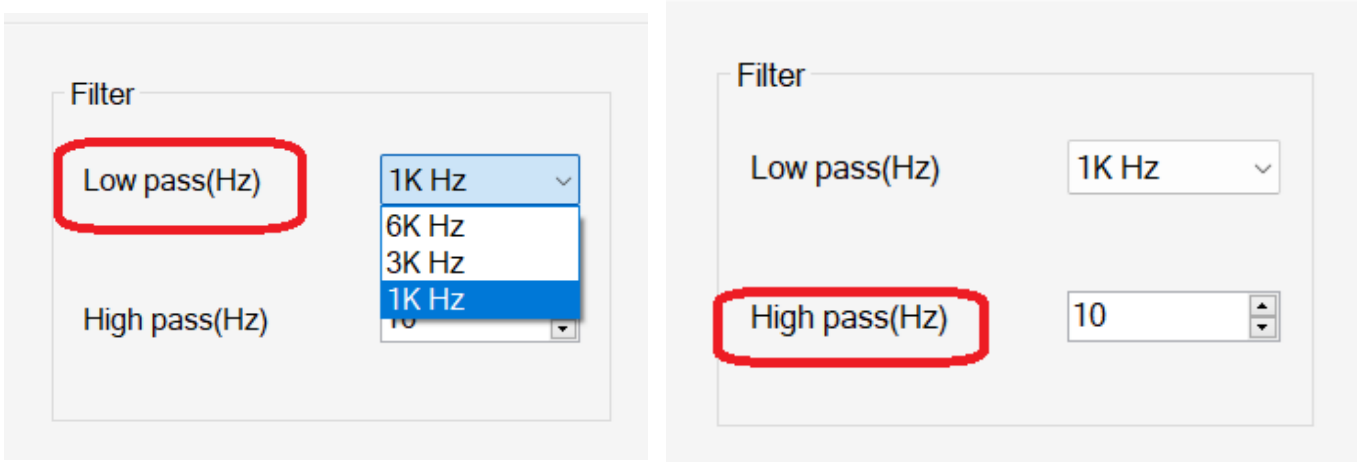




- Setup description -



- ❖ [COM]：
  - ➢ Address：Set the ID of the connection module
  - ➢ Baud Rate：Select the module's baud rate
  - ➢ Data Format：Select the module's data format

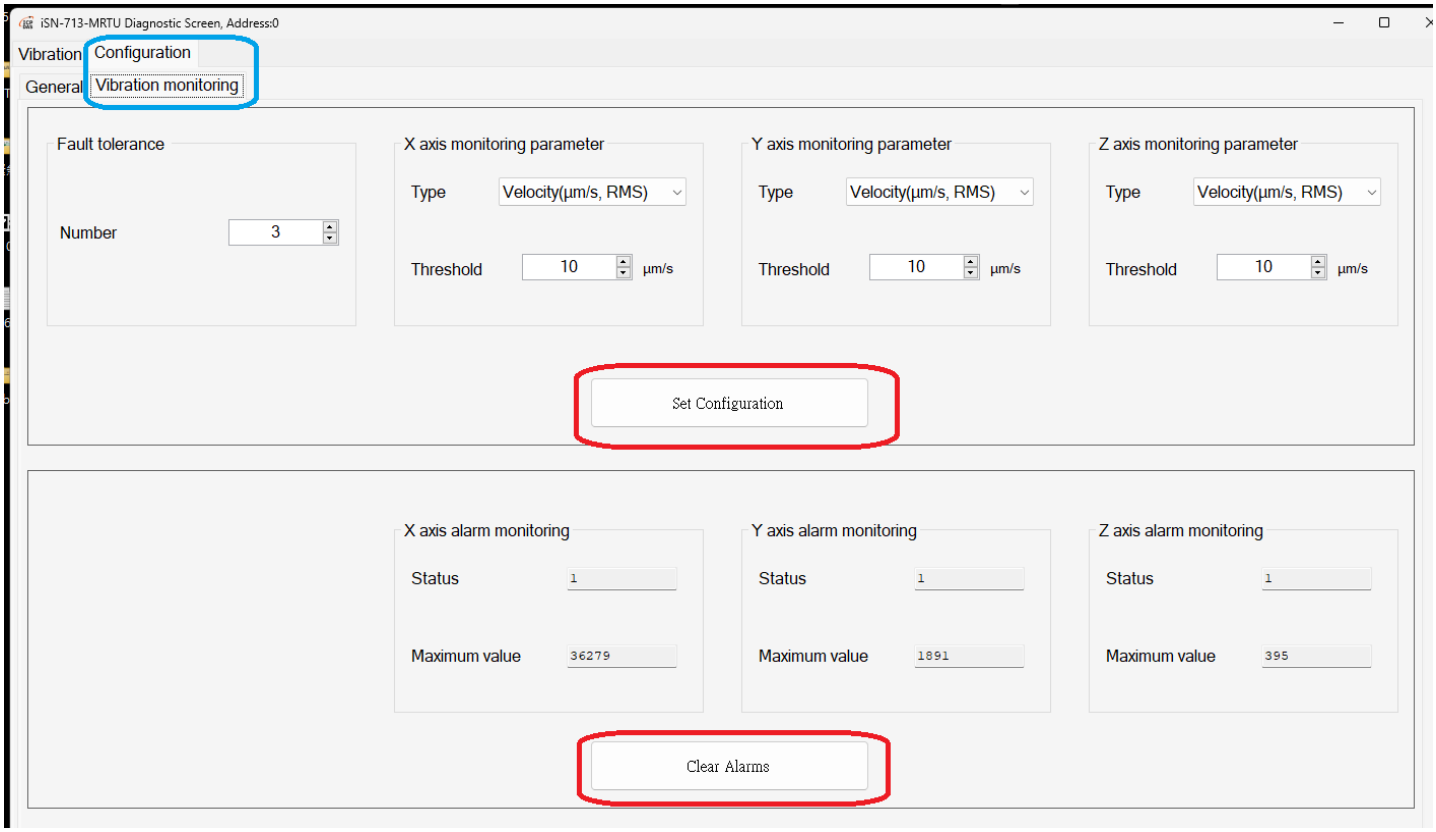


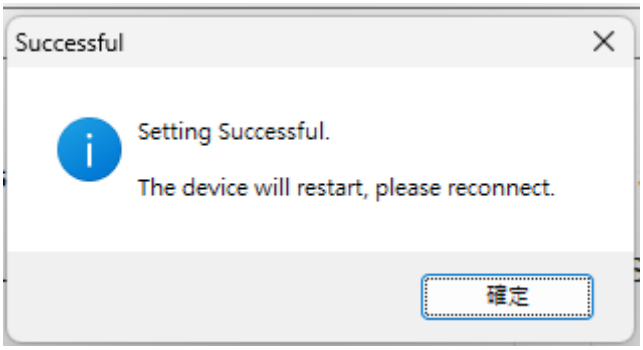
- ❖ [Filter]：
  - ➢ Low pass：Select the module's low-pass filtering, which defaults to 1K Hz
  - ➢ High pass：Set the module's high-pass filtering, which defaults to 10 Hz

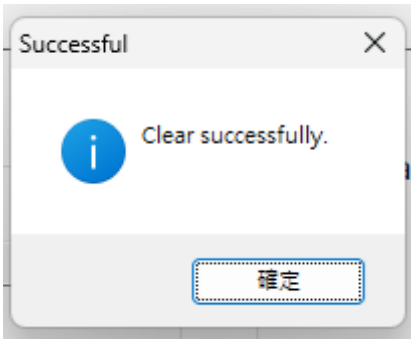
IV. Vibration monitoring screen

The [Vibration monitoring] page in [Configuration]：

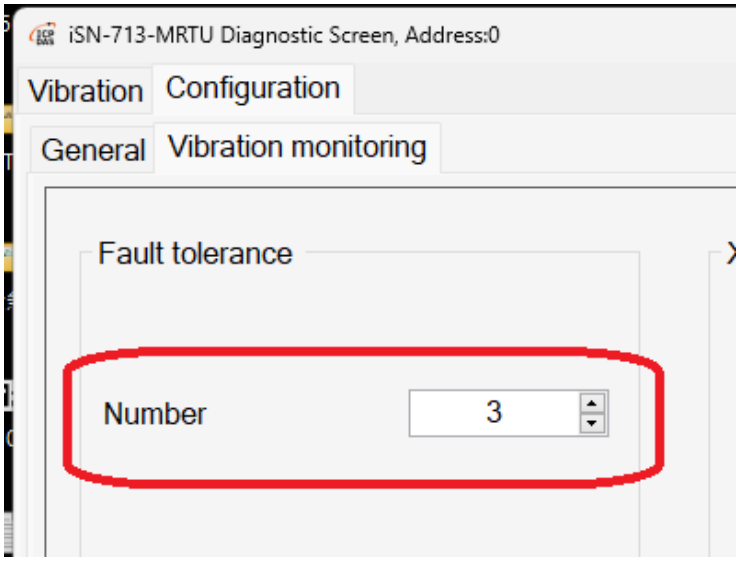
- ❖ The upper area can be used to configure the early warning of the module currently connected, including: the number of fault tolerance of the early warning judgment, the eigenvalue type of the three axes that each wants to monitor the early warning and the threshold value of triggering the early warning, click [Set Configuration] after the setting is completed, if the setting is successful, the [Successful] window will appear, click [OK] and then return to the connection surface to re-select this module to connect, and complete the setting of the module early warning after entering the data monitoring page.
- ❖ The lower area will record the status of the alert and exceed the maximum value of the alert, click [Clear Alarms] to clear the recorded status and maximum value, and the [Successful] window will appear when the record is successfully cleared.



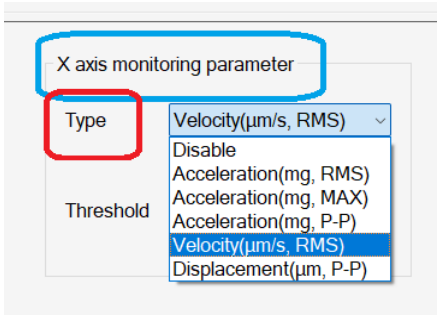


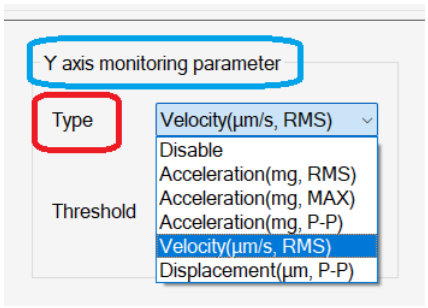


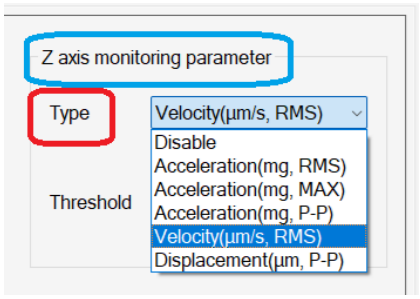
- Setup description -



❖ Fault tolerance：The number of fault tolerances for early warning judgment, the default is 3

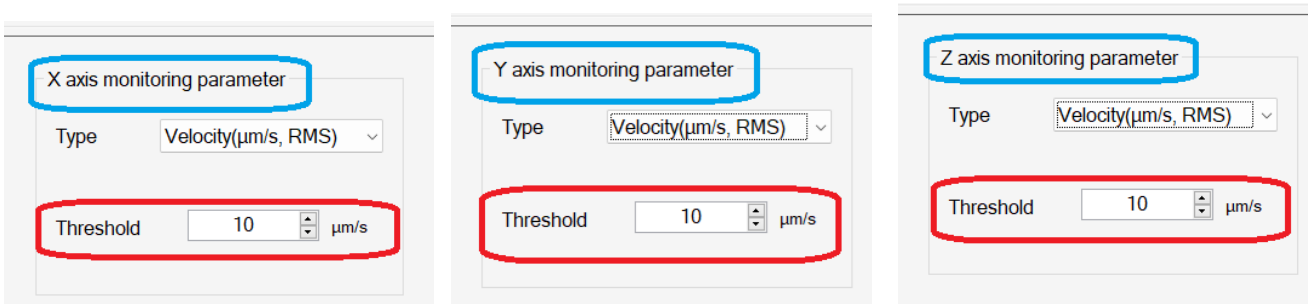




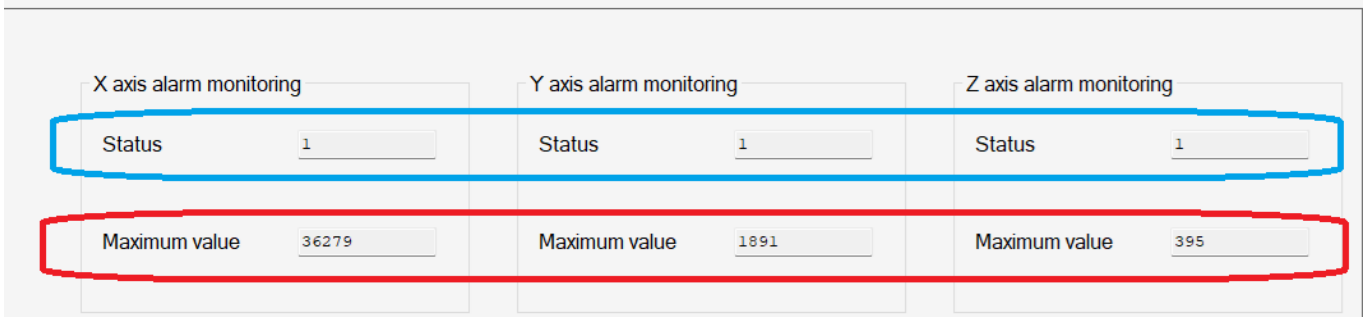


❖ Monitoring parameter：The three axes can be set separately. If there is only one axis, the X axis will be used for setting.

➢ [Type]：eigenvalue type, default is Velocity



➢ [Threshold]：The threshold value for triggering the warning, default is 10



❖ Alarm records of three axes：

➢ [Status]：The status of the warning, 0 means normal, 1 means triggered warning.

➢ [Maximum value] ：Maximum warning value exceeded.

5. Modbus Register table

This chapter provides the Modbus table of the vibration module.

Address (Base 1)	Description
40001 ~ 40038 (0x0000 ~ 0x0025)	Equipment parameters
30001 ~ 30020 (0x0000 ~ 0x0013)	Equipment status
30021 ~ 30160 (0x0014 ~ 0x009F)	Eigenvalue & Spectrum - Channel 1 (X-axis)
30161 ~ 30300 (0x00A0 ~ 0x012B)	Eigenvalue & Spectrum - Channel 2 (Y-axis)
30301 ~ 30440 (0x012C ~ 0x01B7)	Eigenvalue & Spectrum - Channel 3 (Z-axis)

R: Read / W: Write

Equipment parameter (R/W)

PLC Address (Base 1)	Protocol address (Base0, Hex)	command code	Description	Remark
40001	(0x0000)	03 16	Reboot or Restore factory defaults	0: Idle 1: Reboot 2: Restore factory defaults
40002	(0x0001)	03 16	Parameter settings (*1)	0: Idle 1: Setup
40003	(0x0002)	03 16	Modbus ID	1~247 Default: 1
40004	(0x0003)	03 16	Baud Rate	0: 9600 (Default) 1: 19200 2: 38400 3: 57600 4: 115200
40005	(0x0004)	03 16	Parity	0: NONE (Default) 1: ODD 2: EVEN

40006	(0x0005)	03 16	Stop Bits	0: 1 (Default) 1: 2
40008	(0x0007)	03 16	Sampling rate	32/64 kHz Default: 32 For iSN-701X series
40009	(0x0008)	03 16	High pass filter	Filter frequencies lower a set value iSN-701X series Range: 5~6400 Hz Default: 5 iSN-71x series Range:5~100 Hz Default: 5
40010	(0x0009)	03 16	Low pass filter	Filter frequencies higher a set value iSN-701X series Range:5~6400 Hz Default: 6400 iSN-71x series Range:0~2 0: 6 kHz 1: 3 kHz 2: 1 kHz Default: 2
40011	(0x000A)	03 16	Channel 1 Accelerometer sensitivity	Range: 1~10000 mV/g Default:100 For iSN-701X series

40017	16 (0x0010)	03 16	Channel 1 Current output type	0: Disable (Default) 1: Acceleration (mg, RMS), 0~20mA 2: Acceleration (mg, MAX), 0~20mA 3: Acceleration (mg, P-P), 0~20mA 4: Velocity (μm/s, RMS), 0~20mA 5: Displacement (μm, P-P), 0~20mA 6: Acceleration (mg, RMS), 4~20mA 7: Acceleration (mg, MAX), 4~20mA 8: Acceleration (mg, P-P), 4~20mA 9: Velocity (μm/s, RMS), 4~20mA 10: Displacement (μm, P-P), 4~20mA For iSN-701X-mA
40018	17 (0x0011)	03 16	Channel 1 Eigenvalue conversion Current upper limit	Range: 1~65535 Default: 65535 For iSN-701X-mA
40027	26 (0x001A)	03 16	Clear feature judgment exception alarm (*2)	0: Idle 1: Clear
40028	27 (0x001B)	03 16	Feature judgment error tolerance times	Range:1~255, Default:3 (Abnormal alarms occur continuously N times)
40029	28 (0x001C)	03 16	Channel 1 (X-axis) Type of feature judgment	0: Disable (Default) 1: Acceleration (mg, RMS) 2: Acceleration (mg, MAX) 3: Acceleration (mg, P-P) 4: Velocity (μm/s, RMS) 5: Displacement(μm, P-P)
40030	29 (0x001D)	03 16	Channel 1 (X-axis) Threshold value of feature judgment	Threshold value: 1~32767 Default: 1
40031	30 (0x001E)	03 16	Channel 2 (Y-axis) Type of feature judgment	0: Disable (Default) 1: Acceleration (mg, RMS) 2: Acceleration (mg, MAX) 3: Acceleration (mg, P-P) 4: Velocity (μm/s, RMS) 5:Displacement(μm, P-P)

40032	31 (0x001F)	03 16	Channel 2 (Y-axis) Threshold value of feature judgment	Threshold value: 1~32767 Default: 1
40033	32 (0x0020)	03 16	Channel 3 (Z-axis) Type of feature judgment	0: Disable (Default) 1: Acceleration (mg, RMS) 2: Acceleration (mg, MAX) 3: Acceleration (mg, P-P) 4: Velocity (μm/s, RMS) 5:Displacement(μm, P-P)
40034	33 (0x0021)	03 16	Channel 3 (Z-axis) Threshold value of feature judgment	Threshold value: 1~32767 Default: 1

Equipment status (Read Only)

PLC Address (Base 1)	Protocol address (Base0, Hex)	command code	Description	Remark
30001	0 (0x0000)	04	Accelerator connection status	Use 2 bits per channel b7 b6 | b5 b4 | b3 b2 | b1 b0 CH 4 | CH 3 | CH 2 | CH 1 0: Not connected 1: Connected 2: short circuit For iSN-701X series
30002	1 (0x0001)	04	FW version	e.g. 100/101/102
30003	2 (0x0002)	04	Device code	iSN-701X: 0x02BD iSN-701X-mA: 0x02BE iSN-711-MRTU(IP68): 0x02C7 iSN-713-MRTU(IP68): 0x02C9
Channel 1 (X-axis) eigenvalue				
30021	20 (0x0014)	04	Characteristic alert status	Alert status 0: Normal 1: Abnormal

30022	21 (0x0015)	04	Characteristic alert values	Eigenvalue when alarm occurs 1~65535
30023	22 (0x0016)	04	Acceleration (RMS)	Unit: mg
30024	23 (0x0017)	04	Acceleration (MAX)	Unit: mg
30025	24 (0x0018)	04	Acceleration (P-P)	Unit: mg
30026	25 (0x0019)	04	Acceleration (Crest Factor)	Unit: 0.01 CF
30027	26 (0x001A)	04	Velocity (RMS)	Unit: um/s
30028	27 (0x001B)	04	Displacement (P-P)	Unit: um
30029	28 (0x001C)	04	Characteristic current value	4000 ~ 20000 μA or 0 ~ 20000 μA For iSN-701X-mA
Channel 1 (X-axis) spectrum				
30031 ~ 30050	30 (0x001E) ~ 49 (0x0031)	04	Acceleration spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30051 ~ 30070	50 (0x0032) ~ 69 (0x0045)	04	Acceleration spectrum amplitude	Unit: mg, RMS (Maximum 20 groups, sorted from largest to smallest)
30071 ~ 30090	70 (0x0046) ~ 89 (0x0059)	04	Velocity spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30091 ~ 30110	90 (0x005A) ~ 109 (0x006D)	04	Velocity spectrum amplitude	Unit: um/s, RMS (Maximum 20 groups, sorted from largest to smallest)

30111 ~ 30130	110 (0x006E) ~ 129 (0x0081)	04	Displacement spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30131 ~ 30150	130 (0x0082) ~ 149 (0x0095)	04	Displacement spectrum amplitude	Unit: um, P-P (Maximum 20 groups, sorted from largest to smallest)
Channel 2 (Y-axis) eigenvalue				
30161	160 (0x00A0)	04	Characteristic alert status	Alert status 0: Normal 1: Abnormal
30162	161 (0x00A1)	04	Characteristic alert values	Eigenvalue when alarm occurs 1~65535
30163	162 (0x00A2)	04	Acceleration (RMS)	Unit: mg
30164	163 (0x00A3)	04	Acceleration (MAX)	Unit: mg
30165	164 (0x00A4)	04	Acceleration (P-P)	Unit: mg
30166	165 (0x00A5)	04	Acceleration (Crest Factor)	Unit: 0.01 CF
30167	166 (0x00A6)	04	Velocity (RMS)	Unit: um/s
30168	167 (0x00A7)	04	Displacement (P-P)	Unit: um
30169	168 (0x00A8)	04	Characteristic current value	4000 ~ 20000 μA or 0 ~ 20000 μA For iSN-701X-mA
Channel 2 (Y-axis) spectrum				

30171 ~ 30190	170 (0x00AA) ~ 189 (0x00BD)	04	Acceleration spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30191 ~ 30210	190 (0x00BE) ~ 209 (0x00D1)	04	Acceleration spectrum amplitude	Unit: mg, RMS (Maximum 20 groups, sorted from largest to smallest)
30211 ~ 30230	210 (0x00D2) ~ 229 (0x00E5)	04	Velocity spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30231 ~ 30250	230 (0x00E6) ~ 249 (0x00F9)	04	Velocity spectrum amplitude	Unit: um/s, RMS (Maximum 20 groups, sorted from largest to smallest)
30251 ~ 30270	250 (0x00FA) ~ 269 (0x010D)	04	Displacement spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30271 ~ 30290	270 (0x010E) ~ 289 (0x0121)	04	Displacement spectrum amplitude	Unit: um, P-P (Maximum 20 groups, sorted from largest to smallest)
Channel 3 (Z-axis) eigenvalue				
30301	300 (0x012C)	04	Characteristic alert status	Alert status 0: Normal 1: Abnormal
30302	301 (0x012D)	04	Characteristic alert values	Eigenvalue when alarm occurs 1~65535
30303	302 (0x012E)	04	Acceleration (RMS)	Unit: mg
30304	303 (0x012F)	04	Acceleration (MAX)	Unit: mg
30305	304 (0x0130)	04	Acceleration (P-P)	Unit: mg

30306	305 (0x0131)	04	Acceleration (Crest Factor)	Unit: 0.01 CF
30307	306 (0x0132)	04	Velocity (RMS)	Unit: um/s
30308	307 (0x0133)	04	Displacement (P-P)	Unit: um
30309	308 (0x0134)	04	Characteristic current value	4000 ~ 20000 μA or 0 ~ 20000 μA For iSN-701X-mA
Channel 3 (Z-axis) spectrum				
30311 ~ 30330	310 (0x0136) ~ 329 (0x0149)	04	Acceleration spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30331 ~ 30350	330 (0x014A) ~ 349 (0x015D)	04	Acceleration spectrum amplitude	Unit: mg, RMS (Maximum 20 groups, sorted from largest to smallest)
30351 ~ 30370	350 (0x015E) ~ 369 (0x0171)	04	Velocity spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)
30371 ~ 30390	370 (0x0172) ~ 389 (0x0185)	04	Velocity spectrum amplitude	Unit: um/s, RMS (Maximum 20 groups, sorted from largest to smallest)
30391 ~ 30410	390 (0x0186) ~ 409 (0x0199)	04	Displacement spectrum frequency	Unit: 0.1Hz (Maximum 20 groups, sorted from largest to smallest)

30411 ~ 30430	410 (0x019A) ~ 429 (0x01AD)	04	Displacement spectrum amplitude	Unit: um, P-P (Maximum 20 groups, sorted from largest to smallest)

*1: After the configuration is completed, [40002 Parameter Setting] needs to be set to 1. The module will write all parameters except [40027 Clear Feature Judgment Abnormal Alarm] and restart.

*2: Setting [40027 Clear Feature Judgment Abnormal Alarm] to 1 will take effect immediately.

6. Firmware update

This section explains how to update the firmware of the iSN-700 series to the latest version.

1. iSN-701X series firmware update
2. iSN-71X series firmware update

6.1 iSN-701X series firmware update

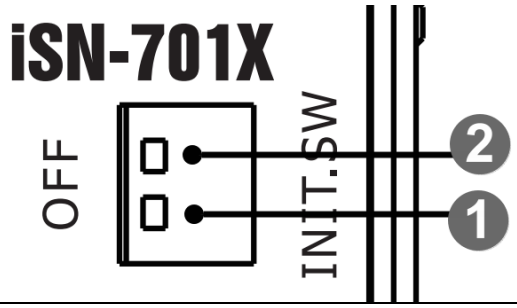
Step 1: Get update tool

The Firmware Update Tool software can be obtained from the following web site：

iSN-701X SUPPORT - ICP DAS

Step 2: Dip switch：Set initial

Set the Dip Switch-2 to "ON".

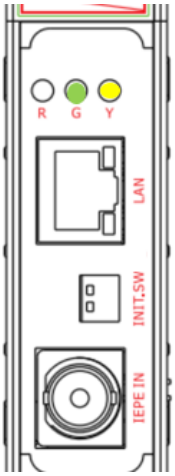


OFF← →ON

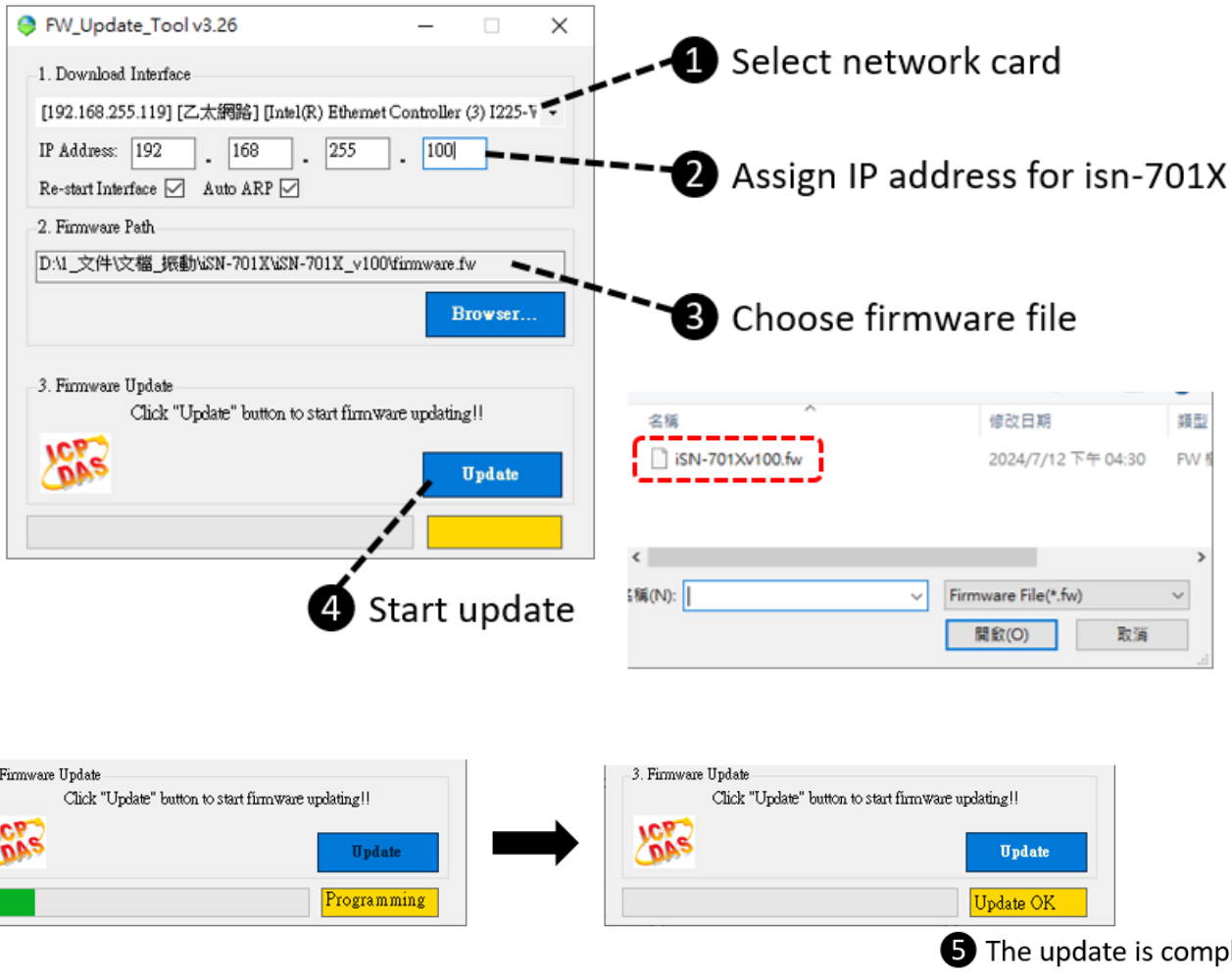
Switch	Status	description
1	OFF	User setting
	ON	Factory setting
2	OFF	Operating mode
	ON	FW update mode

Step 3: Enter boot mode

Power on again and confirm that the green and yellow lights flash quickly.



Step 4: Start updating



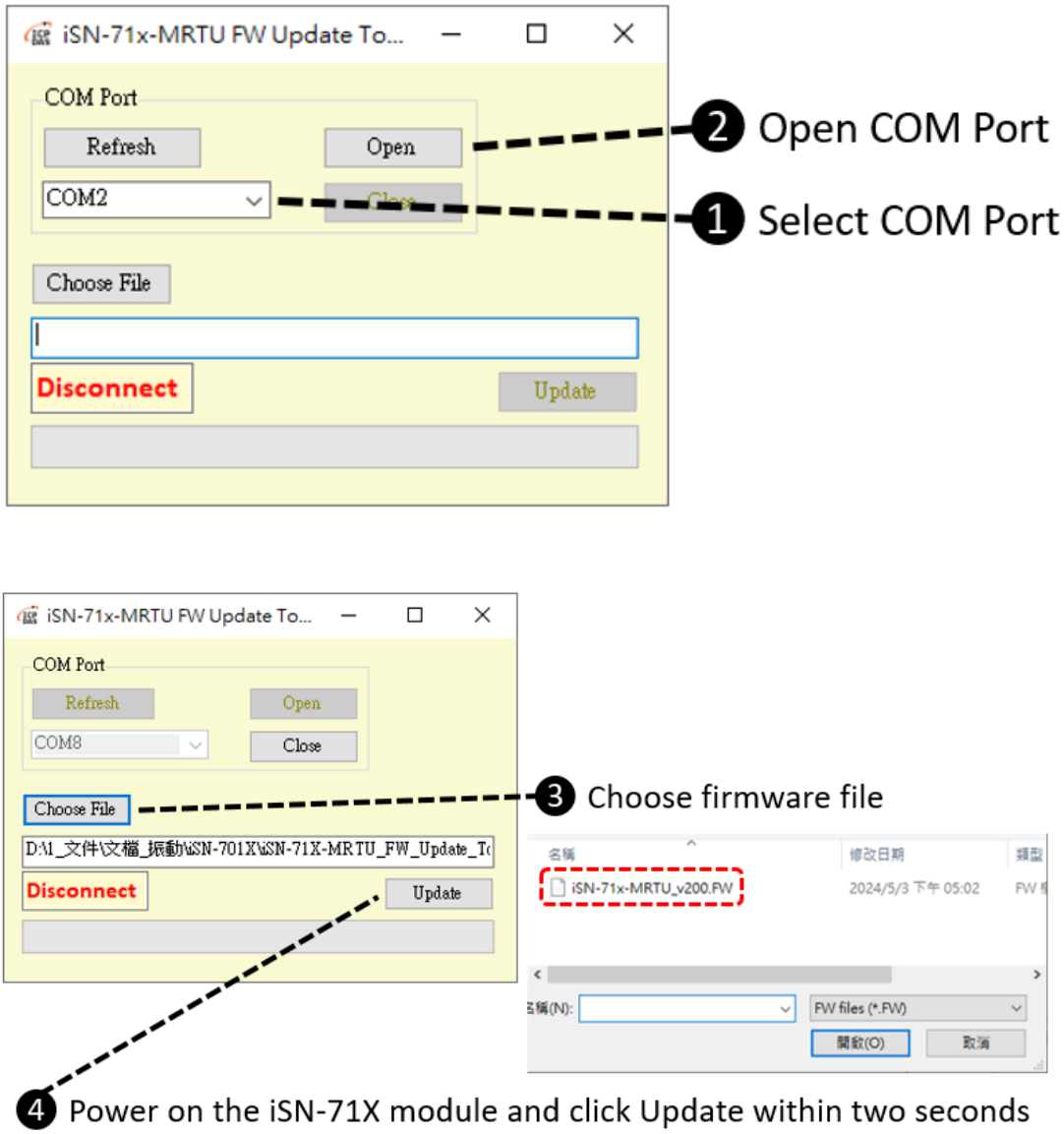
6.2 iSN-71X series firmware update

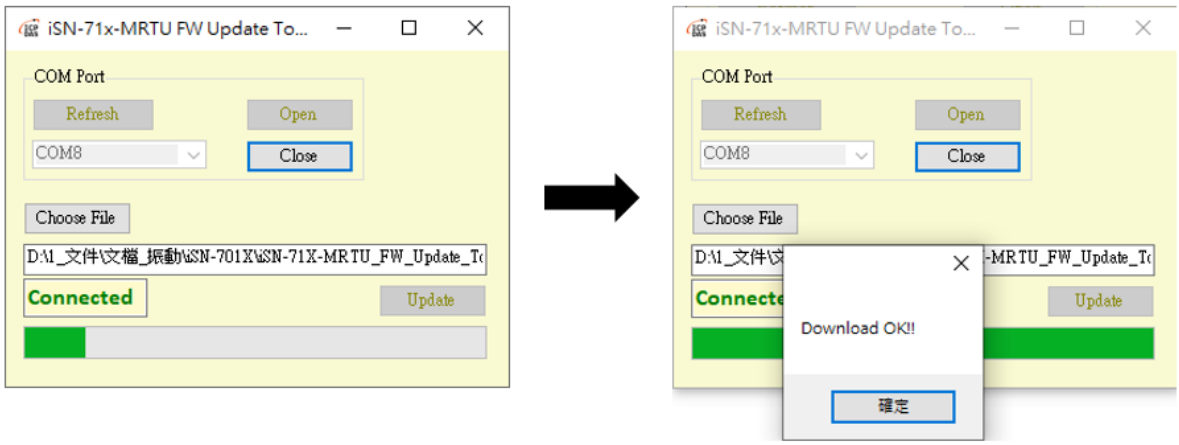
Step 1: Get update tool

The Firmware Update Tool software can be obtained from the following web site：

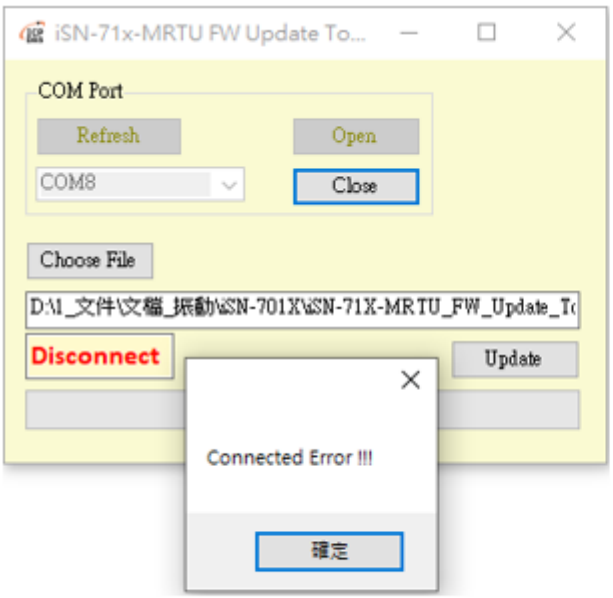
iSN-711-MRTU SUPPORT - ICP DAS

Step 2: Start updating





❺ The update is complete



If there is a connection error, please do ❸ 、❹ again

Appendix A. Manual Update History

This section provides the update history of this document, which is presented in a table below.

Version	Date	Description
1.0.0	May 2024	1st