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0022-VM20
VIBRATION METER
OPERATION MANUAL

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VIDEO

V0

Caution

1. Read this manual carefully before using the instrument for the first time.
2. Other damage caused by improper operation is not covered by the warranty.

1. Overview

The instrument conforms to JJG 676-2019 "Verification Regulation of Vibration Meters" and it is suitable for factory inspection, condition monitoring and fault diagnosis of mechanical equipment such as pumps, fans, household appliances, compressors, smoke machines, generators and gearboxes.

2. Main Technical Properties

1) Frequency range: electrical signal

Sampling Frequencies	Acceleration	Velocity	Displacement
8 kHz	10 Hz~2.5 kHz	10 Hz~1.25 kHz	10 Hz~800 Hz
32 kHz	32 Hz~13 kHz	32 Hz~5.0 kHz	32 Hz~2.0 kHz

2) Measurement range: electrical signal

The measurement range varies with the sensitivity of the user's accelerometer;

The measurement range is based on a sensitivity of 3 mV/(m/s^{-2}) and a frequency of 80 Hz:

Sampling Frequencies	Acceleration peak value (RMS*$\sqrt{2}$, m/s^2)	Velocity RMS (mm/s)	Displacement p-p (RMS*$2\sqrt{2}$, mm)
8 kHz	0.03~1400	0.1~2000	0.03~12
32 kHz	0.03~1400	0.1~2000	0.002~12

3) Main measurement indicators: actual signal after connecting the sensor

Measuring parameter	acceleration (virtual/peak/peak-peak value) $a_{RMS,1}$, $a_{Peak,1}$, $a_{P-P,1}$, a_{Peak}', a_{P-P}'	velocity (virtual/peak/peak-peak value) $v_{RMS,1}$, $v_{Peak,1}$, $v_{P-P,1}$, v_{Peak}', v_{P-P}'	displacement (virtual/peak/peak-peak value) $d_{RMS,1}$, $d_{Peak,1}$, $d_{P-P,1}$, d_{Peak}', d_{P-P}'
Measuring range	0.01~200m/s² (peak value)	0.1~200mm/s (virtual value)	0.01~2mm (peak-peak value)
Frequency range	10Hz~5kHz	10Hz~1kHz	10Hz~500Hz
Amplitude frequency reponse	±5%		
Amplitude linearity	±5%		
Frequency accuracy	±0.5%		

4) Cut-off frequency

8 kHz sampling frequency:

Second-order high-pass filter: 3.16Hz, 10.00Hz, 31.60Hz and Off can be selected

32 kHz sampling frequency:

Second-order high-pass filter: 12.64Hz, 40.00Hz, 126.4Hz and Off can be selected

5) Display: 1.97 inch 128 x 64 dot matrix OLED screen.

6) Power consumption (basic function): <80mA/5V

7) Power supply:

4×AAA alkaline battery : 10h operating time

8) Mainframe Size: 172×69×26mm

9) Conditions of use:

--Temperature: -10 °C∽50 °C

--Relative humidity: 25 %∽90 %

--Atmospheric pressure: 65 kPa∽108 kPa

10) Hand-transmitted vibration measurement:

--Measuring range: 80~180dB (Note: $10^{-6}m/s^2$ as reference 0dB)

3. Terms and Definitions

"$a_{RMS,1}$"	RMS acceleration in 1 second
"$v_{RMS,1}$"	RMS velocity in 1 second
"$d_{RMS,1}$"	RMS displacement in 1 second
"a_{Peak1}"	Peak acceleration in 1 second
"v_{Peak1}"	Peak velocity in 1 second
"d_{Peak1}"	Peak displacement in 1 second
"a_{P-P1}"	Peak to peak acceleration in 1 second
"v_{P-P1}"	Peak to peak velocity in 1 second
"d_{P-P1}"	Peak to peak displacement in 1 second
"a_{Peak}' "	Peak acceleration of a sine wave, 1.414 times the rms
"v_{Peak}' "	Peak velocity of a sine wave, 1.414 times the rms
"d_{Peak}' "	Peak displacement of a sine wave, 1.414 times the rms
"a_{P-P}' "	Peak to peak acceleration of a sine wave, 2.828 times the rms
"v_{P-P}' "	Peak to peak velocity of a sine wave, 2.828 times the rms
"d_{P-P}' "	Peak to peak displacement of a sine wave, 2.828 times the rms
"Freq."	Frequency
"$V_{La,1}$"	Acceleration level in 1 second

4. Structure & Function

4.1 Construction

The appearance of the instrument is shown in Figure 4-1, which consists of a vibration sensor and a mainframe. The instrument consists of an ABS plastic upper and lower case, powered by 4 AAA alkaline batteries in series and easily dismantled.

Fig.4-1 Appearance

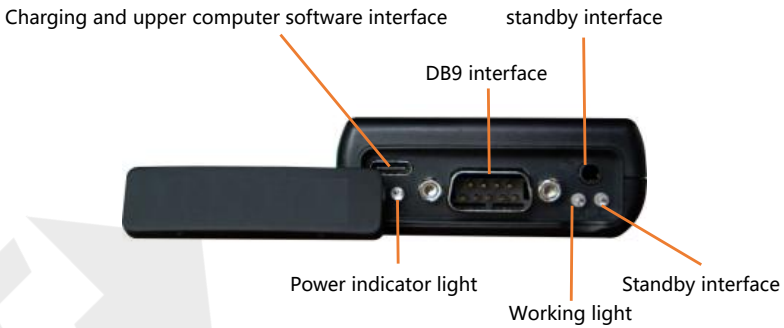


Fig.4-2 Bottom

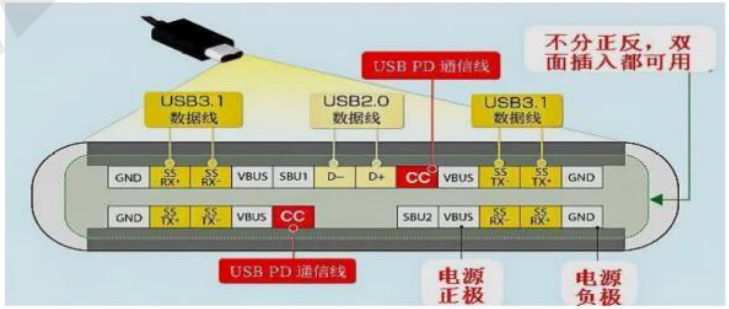


Fig.4-3 USB-Type-C_16 Sockets

On the bottom of the instrument are the USB-Type-C interface, the communication interface, and the operating indicator. The communication interface is a DB9 socket interface with the following pin definition:

Pin number	Function	Pin number	Function
1	Power supply:+4.5V∽8.0V	6	Instrument reset: should normally be suspended
2	RXD/A+	7	Save, should normally be suspended
3	TXD/B+	8	485
4	Overrun output	9	Save, should normally be suspended
5	Power ground	--	

4.2 Button Function

Enter button: to go to the next menu level or to confirm the operation

Exit button: to go back to the previous level or turn off the power

Cursor key: to move the cursor to the next position

Cursor key: to move the cursor to the previous position

Parameter key: parameter at cursor location minus

Parameter key: parameter at cursor location plus

Power on reset button, instrument power on setting, or reset

5. Method of Use

5.1 Before Use

1) Check if the vibration sensor is in place.

2) Check if the battery voltage is sufficient before switching on, the instrument will automatically switch off when the battery voltage is insufficient.

3) If necessary, the instrument should be calibrated using a vibration calibrator.

6. Operating Instructions

6.1 Switch On/Off

Press the "ON/RESET" button on the instrument panel, the instrument will switch on after 3s, press and hold the C button to switch off.

6.2 Interface

Switch on the power, the instrument displays "Self-Test" and if there are no errors, it enters the main menu interface, which displays as follows.

Fig.6-1 Main menu interface

In the main menu interface, if no key is pressed within 6s, the instrument will automatically enter the sub-menu interface. When the "Exit" key is pressed, it returns to the previous menu level.

6.3 Main Menu

"1.Measure": Sub-menu for measurements, which is required for normal measurements.

"2.Calibrate": Calibrate sub-menu to perform vibration calibration of the instrument, set the calibration parameters and consult the calibration records.

"3.Setup":Setup menu for clock, serial port and other functions(Sample, Display, Language，ect.).

6.4 Measure Interface

In the main menu, use the "cursor left/right" key to move the cursor to "1. Measure" and press the "Enter" key to enter the measurement sub-menu. In the measure sub-menu there are various display interfaces, such as big font display, list display, status information interface.

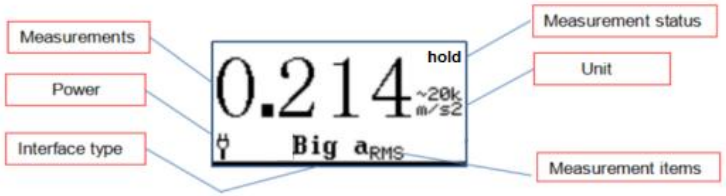


Fig.6-2 Big font display interface

The big font displayed in the screen allows only one measurement result to be

displayed at once. The last line of the display shows the basic operating status of the instrument, the cursor can be moved at "Big", "a_{RMS}" in this interface. press "Enter" to hold, press "Exit" to return to the main menu.

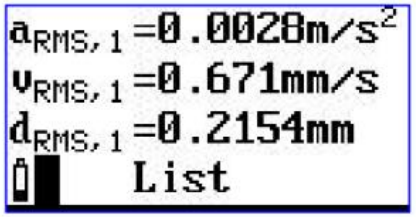


Fig.6-3 List display

Press the "Enter" key from the main menu or place the cursor on "Big" in the big font interface and press the " Parameter plus/minus" key to enter the list display, as shown in Figure 6-3. Top 3 lines of the screen show 3 different measurement indicators and the bottom 1 line shows the operating status of the instrument. Press the left and right keys to switch the cursor position to the first three lines, and use the up and down keys to switch the type of measurement data. Press "Exit" to return to the main menu.

In the measurement interface, move the cursor to the display mode and press the "parameter plus/minus" key to enter the instrument status interface, as shown in Figure 6-4.

Fig.6-4 Battery voltage and temperature of device

6.5 Calibrate Interface

In the main menu, use the "Cursor" key to move the light to "2.calibrate" and press "Enter" to enter the calibration sub-menu, which displays as follows:

Fig.6-5 Calibration sub-menu

Line 1 is vibration calibration, where the sensitivity of the instrument is calibrated using a vibration level calibrator.

Line 2 is for calibration setup, which sets the vibration level of the vibration calibrator and also sets the sensitivity of the sensor

Line 3 is calibration record, to view the instrument's calibration record.

6.5.1 Vibration Calibration

Using the "Cursor" key, move the cursor to line 1 and press "Enter" to bring the

instrument into the vibration calibration interface, which displays the following:

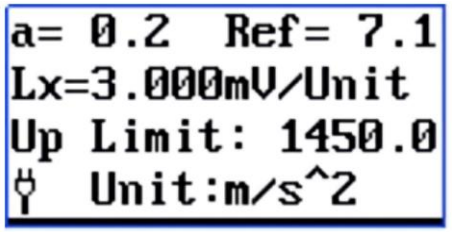


Fig.6-6 Vibration Calibration

“a=xx.xx” : The display shows the acceleration value of the current instrument measurement

“Ref=10.0” : is the acceleration value to which the instrument will be calibrated

“Lx=xx.xx mV/Unit” : is the sensitivity of the current calibration

“Up Limit: xx.xx” : is the upper measurement limit at the current sensitivity

6.5.2 Sensor Setup

In the Calibration sub-menu, move the cursor to line 2 and press the “Enter” key to enter the sensor setup interface, which displays as follows:

Fig.6-7 Sensor Setup

"Serial number:" shows the serial number of the sensor, which is set by the manufacturer before leaving the factory and cannot be changed by the user.

"Sensitivity": Sensitivity of the sensor. With the cursor here, press the "parameter" key to adjust the sensitivity of the sensor.

"Calibration value": The acceleration value of the vibration calibrator, when the acceleration value of the vibration calibrator used by the user is not 10m/s2 , move the cursor to "Calibration value", press the "Parameter" key to adjust to the output value of the vibration calibrator, press the confirmation key, "OK" will be displayed.

6.5.3 Calibration Records

In the Calibration sub-menu interface, move the cursor to line 3 and press the "Enter" key to enter the calibration record list interface, which displays as the following:

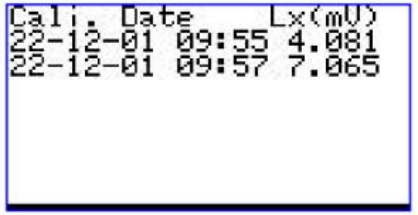


Fig.6-8 Calibration Records.

One line is a calibration record and one calibration record includes the date of the record and the sensor sensitivity level. If there are more calibration records, you can press the "Parameters" key to turn the page.

6.6 Instrument Setup

In the main menu, use the "Cursor" key to move the cursor to "3. Instrument Setup" and press "Enter" to enter the Instrument Setup sub-menu, which displays as follows:

Fig.6-9 Instrument Setup sub-menu

6.6.1 Clock setup

On page 1 of the Instrument Setup, move the cursor to line 1 and press "Enter" to enter the RTC adjustment interface with the following display:

Fig.6-10 RTC Setup

The cursor can move to the date such as Year, Month, Day and time such as Hour, Minute, Second and use “Parameter plus/minus” key to adjust corresponding date and time. When the adjustment is complete press the "Enter" or "Exit" key to return to page 1 of the Instrument Setup.

6.6.2 Other Setup

Move the cursor to "2. Other Setup" and press the "Enter" key to enter the other setup interface as shown below:

Fig.6-11 Other Setup

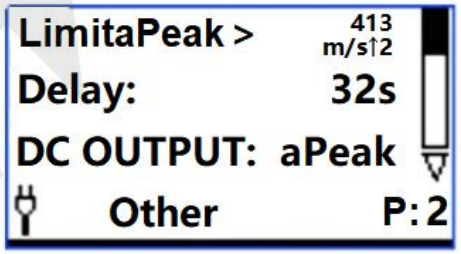


Fig.6-12 Other Setup

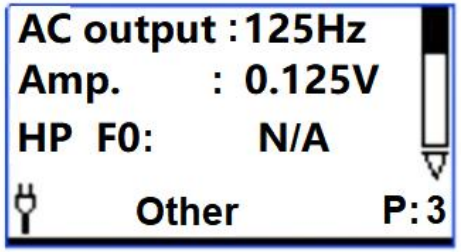


Fig.6-13 Other Setup

"Sample(Hz)": Two sampling frequencies are available: "8kHz" and "32kHz".

"Display": Display protection. Can be selected between Normally Open, Delayed 10 s, 20 s, 30 s, 40 s, 50 s, 60 s, 70 s, 80 s, 90 s. 10 s to 90 s means that the display is automatically switched off if no key is operated within the specified time, Normally Open means that the display is always on.

"Lang." : Move the cursor to "Lang." and press "cursor left/right" key to switch the language between "Chinese", " English" and "Português".

"limit" : Move the cursor to "limit" and press "Parameter plus/minus" keys to change the value. When the measured value is greater than the set value, the over limit prompt light will turn red.

"Delay" : Within the set delay, the alarm is triggered only when the instantaneous vibration value at all times exceeds the limit value, and the 4th pin of DB9 outputs a level of +3.1V.

"DC output": Outputs a DC signal proportional to the value of the specified indicator, which is available with the relevant authorisation in "aRMS", "aPeak", "VLa,1", "dP-P", "dRMS", "dPeak", "vP-P", "vRMS", "vPeak", "aP-P", up to +3.1V DC output.

"AC output": "Close", "Dis.", "Vel", "Acc" and "125Hz" are available. 125Hz means that a fixed signal of 125Hz is output; "Dis", "Vel", " Acc" represent the displacement, velocity and acceleration values respectively.

"Amp.": When the AC output is "Dis", "Vel" or "Acc", the signal amplitude can be selected from 1x, 2x, 4x, 8x, 16x, 32x, 64x, 128x, 256x. When the AC output is "125Hz", the output amplitude can be selected from "3.9mV", "7.8mV", "15.6mV ", "31.3mV. "31.3mV", "62.5mV", "0.125V", "0.25V" 0.25V", "0.5V", "1V" .

"HP F0": 8kHz sampling frequencies:

Second order high-pass filter: 3.16Hz, 10.00Hz, 31.60Hz and N/A optional.

32kHz sampling frequencies:

Second order high-pass filter: 12.64Hz, 40.00Hz, 126.4Hz and N/A optional.

6.6.3 Serial Port Setup

Move the cursor to "6. Serial port setting" and press "Enter", the instrument enters the serial port setting interface as shown below:

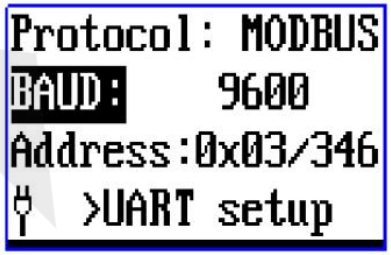


Fig.6-14 Serial Port Setup

"Protocol": "MODBUS"

"BAUD": Available in "9600" and "115200".

"Device address": used for MODBUS communication, selectable between 0 and 255, "346" indicates the function code "03" for reading the parameter setup, "04" for reading the measurement results, "06" for writing the device address, baud rate, etc.

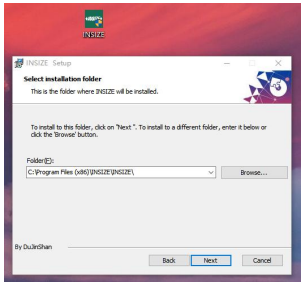
6.7 Connect to USB port

Connect the instrument to the PC with the USB cable and switch on the instrument. then the USB indicator will light up, indicating that the instrument is connected and the measurement results can be obtained using the PC software.

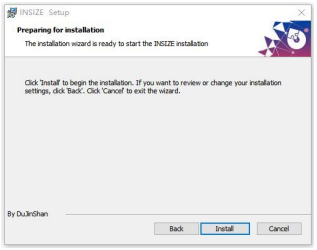
7 Software

7.1 Software installation (do not install on C drive)

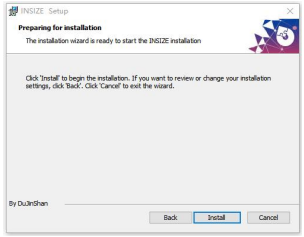
Open the software installation in the standard USB drive, and the steps are as follows:



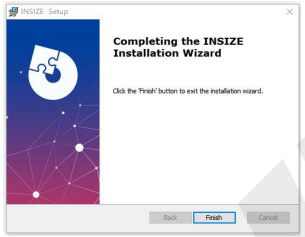
I



II



III



IV

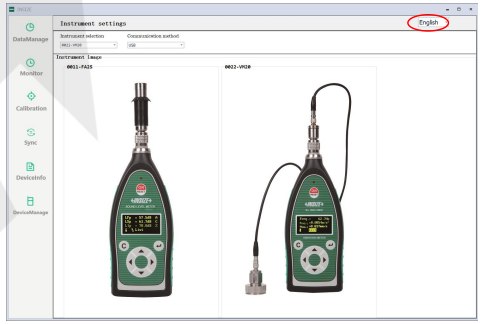
7.2 Connection with PC

Connect the standard TYPE C data cable to the computer software, and the computer can power the device through the TYPE C cable.

7.3 Software Settings

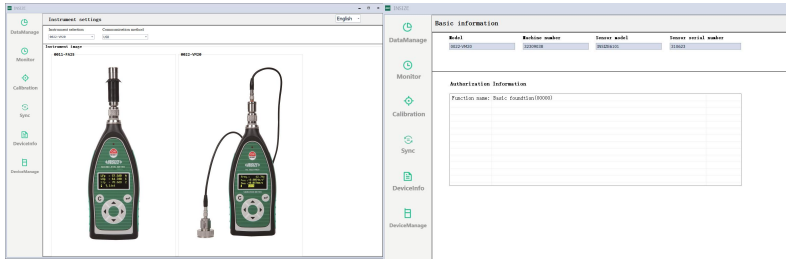
7.3.1 Language settings

After successfully installing the software, open the software and display the English interface. If you need to change it to Chinese, you can click on the position in the following image to switch languages.



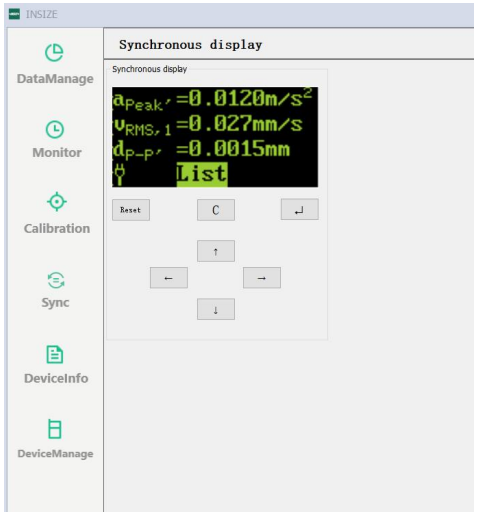
7.3.2 Instrument management and equipment information

Select the corresponding equipment model for the instrument to establish a connection, select 0022-VM20 for the vibration meter, and 0011-FA25 for the sound level meter. After selecting the correct device model and clicking on Basic Information, the interface will display the model and body number of the host, as well as the model and body number of the sensor.



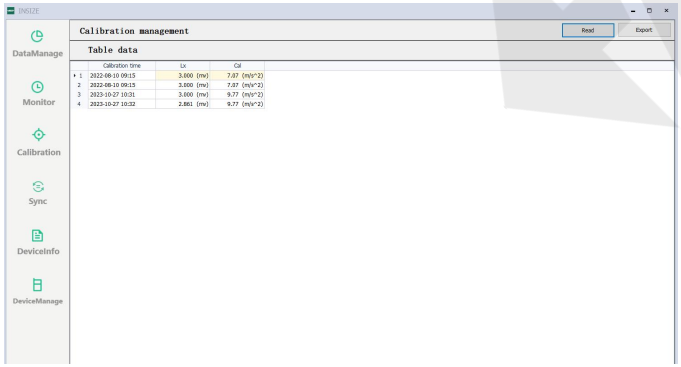
7.3.3 Synchronous display

The synchronous display interface synchronizes the device display screen and has the same buttons on the device.



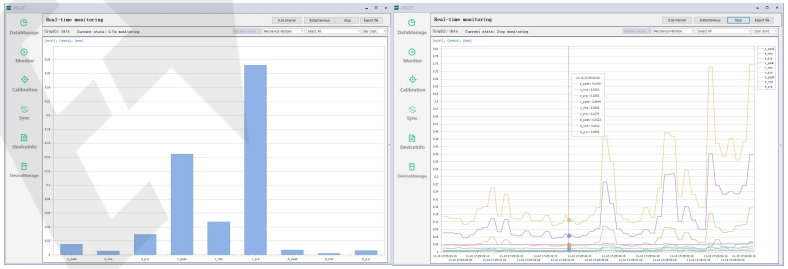
7.3.4 Calibration Management

The calibration management interface allows for querying and exporting calibration records.



7.3.5 Real time monitoring

The real-time monitoring interface can enable or disable real-time monitoring, set monitoring items such as acceleration, velocity, and displacement, set monitoring modes such as bar charts and line charts, and export monitoring data after real-time monitoring stops.



	A	B	C	D	E	F	G	H	I	J
1	Time	a peak (m/s²)	a rms (m/s²)	a p-p (m/s²)	v peak (mm/s)	v rms (mm/s)	v p-p (mm/s)	d peak (mm)	d rms (mm)	d p-p (mm)
2	11-13 09:00:06.00	0.0123	0.0046	0.0241	0.0824	0.0292	0.1407	0.0076	0.0021	0.0178
3	11-13 09:00:06.50	0.0131	0.0046	0.0268	0.0921	0.0236	0.1549	0.0033	0.0013	0.0043
4	11-13 09:00:07.00	0.0131	0.0046	0.0268	0.0921	0.0236	0.1549	0.0033	0.0013	0.0043
5	11-13 09:00:07.50	0.0121	0.0046	0.0237	0.1307	0.0608	0.2456	0.008	0.0036	0.0143
6	11-13 09:00:08.00	0.0121	0.0046	0.0237	0.1307	0.0608	0.2456	0.008	0.0036	0.0143
7	11-13 09:00:08.50	0.0127	0.0046	0.0262	0.0716	0.0238	0.1342	0.0029	0.0014	0.0037
8	11-13 09:00:09.00	0.0127	0.0046	0.0264	0.066	0.0261	0.1215	0.0031	0.0015	0.0068
9	11-13 09:00:09.50	0.0127	0.0046	0.0264	0.066	0.0261	0.1215	0.0031	0.0015	0.0068
10	11-13 09:00:10.00	0.0131	0.0046	0.0268	0.0828	0.0265	0.1351	0.0038	0.0014	0.0037
11	11-13 09:00:10.50	0.0131	0.0046	0.0268	0.0828	0.0265	0.1351	0.0038	0.0014	0.0037
12	11-13 09:00:11.00	0.0121	0.0045	0.0239	0.0694	0.023	0.1306	0.0053	0.0018	0.0077
13	11-13 09:00:11.50	0.0121	0.0045	0.0239	0.0694	0.023	0.1306	0.0053	0.0018	0.0077
14	11-13 09:00:12.00	0.0134	0.0046	0.0265	0.0632	0.0266	0.1245	0.0036	0.0017	0.0066
15	11-13 09:00:12.50	0.0134	0.0046	0.0265	0.0632	0.0266	0.1245	0.0036	0.0017	0.0066
16	11-13 09:00:13.00	0.0127	0.0046	0.0239	0.0805	0.0242	0.133	0.0031	0.0014	0.0057
17	11-13 09:00:13.50	0.0127	0.0046	0.0239	0.0805	0.0242	0.133	0.0031	0.0014	0.0057
18	11-13 09:00:14.00	0.0138	0.0045	0.0276	0.064	0.0231	0.1182	0.0027	0.0012	0.0046
19	11-13 09:00:14.50	0.0138	0.0045	0.0276	0.064	0.0231	0.1182	0.0027	0.0012	0.0046
20	11-13 09:00:15.00	0.0124	0.0046	0.0245	0.0784	0.0268	0.1312	0.0036	0.0019	0.0061

7.3.6 Data management

Due to the lack of internal storage in the vibration meter, the data management interface is not yet available, and currently only our company's sound level meter 0011-FA25 is supported.