



Industrial Vibration Sensor (RS485 Type) User Manual



ATO-SN-3001-N01

1.1 Product Overview

ATO-SN-3001-N01 is a high-performance MEMS chip, using embedded technology, temperature sensing technology, vibration sensing technology development and production of a high-performance, low-power, anti-interference and composite vibration sensor. The product is widely used in coal mining, chemical industry, metallurgy, power generation and other industries, motor, reducer fan, generator, air compressor, centrifuges, pumps and other rotating equipment temperature and vibration measurement online.

The whole shell is made of stainless steel, and it can be installed by threaded installation if there are conditions on site, and the standard threads on the metal shell can be connected with the installation parts quickly. You can also choose the magnetic suction mounting method, the site free from the trouble of drilling holes, the installation is more convenient.

1.2 Functional Features

- The product adopts high-performance MEMS chip, with high measurement accuracy and strong anti-interference ability.
- The product provides thread mounting and magnetic suction mounting.
- Measurement of single-axis vibration speed.
- Motor surface temperature can be measured.
- 10-30V DC wide voltage power supply.
- Protection class IP68.

1.3 Main Specifications

Power Supply	DC10-30V
Power Consumption	0.3W(DC24V)
Protection Class	IP68
Explosion-proof Marking	Ex ia IIC T4 Ga; Ex ia IIIC T200 130°C Da
Frequency Range	10-1600Hz/10-5000Hz
Vibration Measurement Direction	Single-axis or 3-axis
Transmitter Circuit Operating Temperature	-40°C~+80°C, 0%RH~80%RH
Vibration Velocity Measurement Range	0-50mm/s
Vibration Velocity Measurement Accuracy	< 1% (@160Hz, 10mm/s)
Vibration Speed Display Resolution	0.1 mm/s
Vibration Displacement Measurement Range μm	0-5000
Vibration Displacement Measurement Accuracy	< 1% (@40Hz, 400 μm)
Vibration Displacement Display Resolution	0.1 μm
Vibration Acceleration Measurement Range	$\pm 16\text{g}$ (Default g is taken as 9.8 m/s ²)
Vibration Acceleration Measurement Accuracy	< 1% (@160Hz, 10m/s ²)
Acceleration Display Resolution	0.1 m/s ²
Surface Temperature Measurement Range	-40°C~+80°C
Temperature Display Resolution	0.1°C
Signal Output	RS485
Detection Period	(in) real time



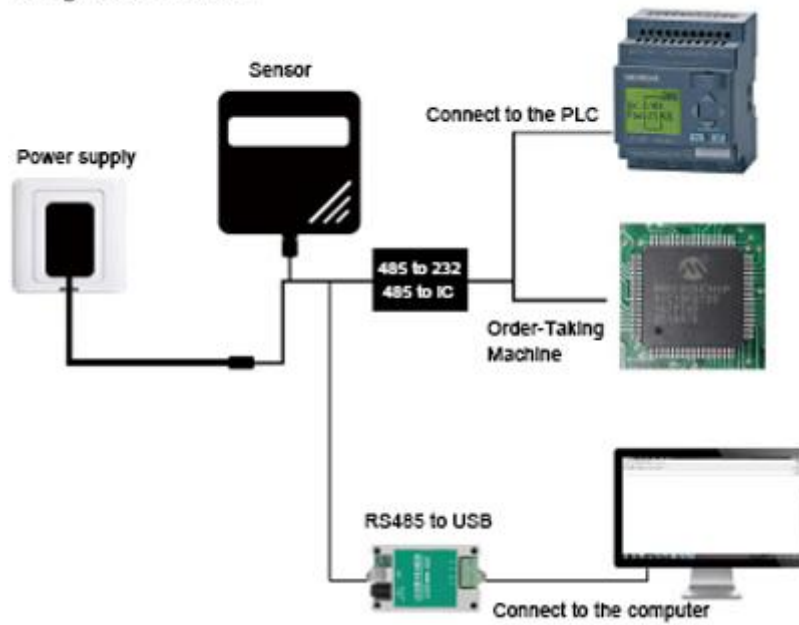
Note: This product is not suitable for use in explosive environments.

The performance data stated above are the statistics obtained from the data obtained from the prototype provided by our company under the test conditions of the test system and software operated by the testing organization in accordance with the corresponding calibration basis, if you have any questions about the relevant data and testing procedures, you can contact our staff to obtain the prototype of the relevant information for review. In order to continuously improve the product, we reserve the right to change the design features and specifications without prior notice.

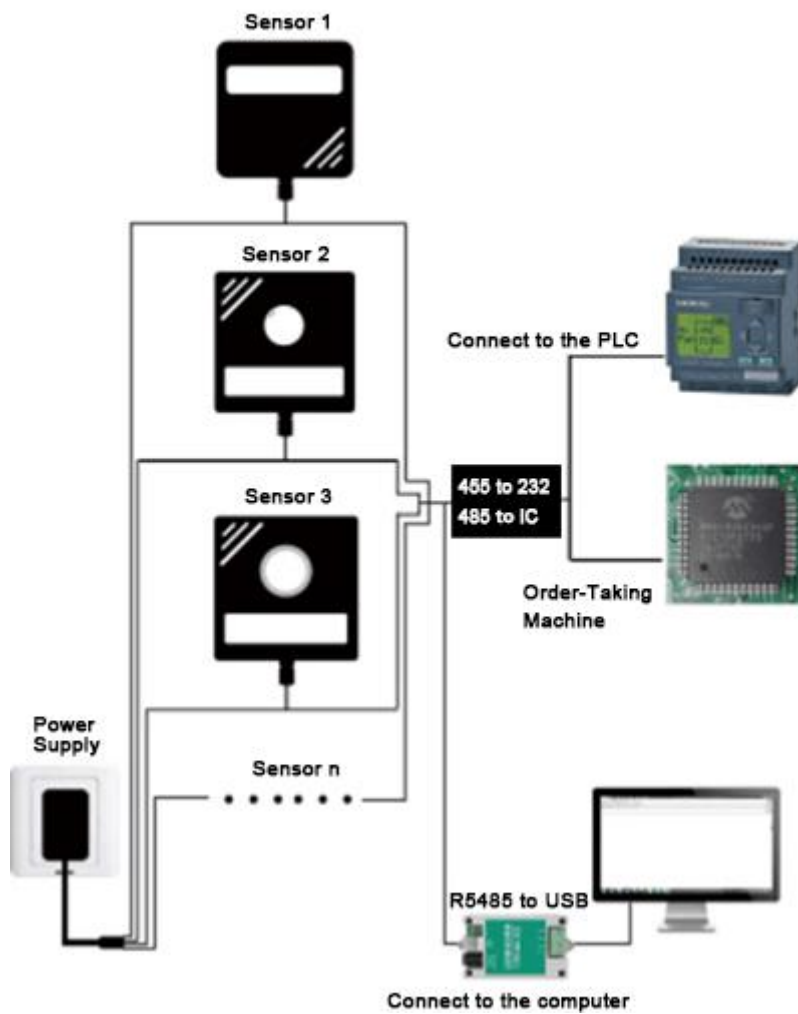
1.4 System Framework Diagram

This product can also be a combination of multiple sensors in a 485 bus to use, theoretically a bus can be 254 485 sensors, the other end of the access with a 485 interface PLC, through the 485 interface chip connected to the microcontroller, or the use of USB to 485 can be connected to the computer, the use of my company to provide the sensor configuration tool to configure and test (in the use of the configuration software can only be connected to) (Only one device can be connected when using the configuration software).

Single Connection



Multiple connection



1.5 Product Appearance



2. Hardware Connections

2.1 Pre-installation Inspection of Equipment

Equipment list:

- 1 set of main equipment
- Certificate of conformity, warranty card, etc.

2.2 Interface Description

Wide voltage 10~30V DC power input. When wiring the 485 signal line, pay attention to the A\B two lines can not be reversed, the address of multiple devices on the bus can not conflict.

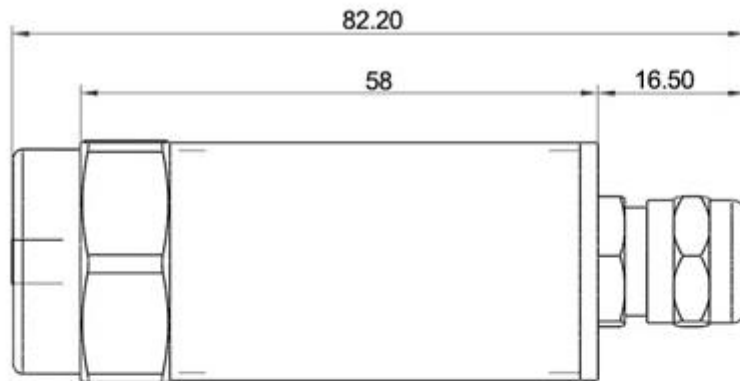
2.2.1 Sensor Wiring

	Thread Color	Description
Power	Brown	Power positive (10~30V DC)
	Black	Power Supply Negative
Communication	Yellow (Green)	485-A
	Blue	485-B

Dimension (unit: mm)

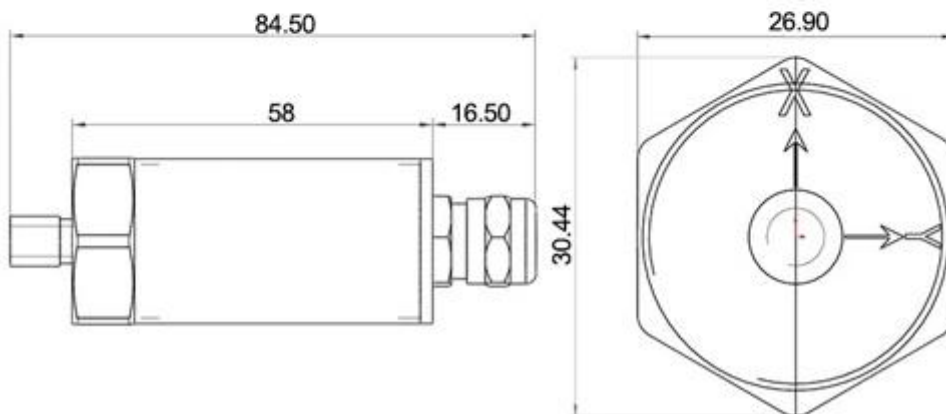
Magnetic mounting dimensions:

(Unit: mm)



Threaded mounting dimensions:

(Unit: mm)



The sensor threaded mounting m8*1.25*10, m5*7 external thread two specifications, in addition to magnetic mounting.

If you need to detect X,Y axis data with special needs, you need to pay attention to the bottom of the sensor silk screen logo, if only monitoring single-axis data, it is recommended to use the Z-axis, i.e., the direction perpendicular to the bottom of the equipment after installation.

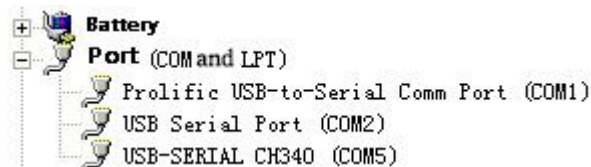
3. Configuration Software Installation and Use

We provide matching "485 parameter configuration software" , you can easily use the computer to read the parameters of the sensor, and at the same time, flexible modification of the sensor's device ID and address.

Note that when using the software to obtain automatically, you need to ensure that there is only one sensor on the 485 bus.

3.1 Sensor to PC

When the sensor is properly connected to the computer via USB to 485 and powered, the correct COM port can be seen on the computer ("My Computer - Properties - Device Manager - Ports" for COM ports).).



Open the package, select "Debugging Software" --- "485 Parameter Configuration Software" , find "485 Configuration Software" and open it.

If you can't find COM port in the device manager, it means you haven't installed USB to 485 driver (in the package) or you haven't installed the driver correctly, please contact the technician for help.

3.2 Use of Sensor Monitoring Software

- First of all, according to the method in chapter 3.1, get the serial port number and select the correct serial port.
- Click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s and the default address is 0x01.
- Modify the address and baud rate according to your needs, and check the current functional status of the device.
- If the test is unsuccessful, please recheck the device wiring and 485 driver installation.

4. Communication Protocols

4.1 Basic Parameters of Communication

Code	8-bit binary
Data Bits	8-bit
Parity Bit	None
Stop Bit	1 bit
Error Check	CRC (redundant cyclic code)
Baud Rate	2400~115200 can be set

4.2 Data Frame Format Definition

The Modbus-RTU communication protocol is used in the following format:

Initial structure \geq 4 bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16 bit CRC code

End structure \geq 4 bytes of time

Address code: address of the sensor, unique in the communication network (factor default 0x01).

Function code: Functional indication of the command issued by the host.

Data area: data area is the specific communication data, note that 16bits data high byte i front!

CRC code: two-byte checksum code.

The host asks for the frame structure:

Address Code	Function Code	Register Starting Address	Register Length	Check Digit Low Bit	Check Digit High Bit
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave answer frame structure:

Address Code	Function Code	Effective Bytes	Data Area 1	Data Area 2	Data Area N	Check Digit
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

4.3 Register Address

Single Axis Temperature Vibration Sensor Register Description

Register Address	PLC or Configuration Address	Elements	Function Code Support	Description
0000 H	40001	Temperature	0x03/0x04	Temperature measurement values (10 times larger)
0001 H	40002	Velocity	0x03/0x04	Velocity measurement (10 times larger)
0002 H	40003	Displacement	0x03/0x04	Displacement measurement value (10x expansion)
0003 H	40004	Acceleration	0x03/0x04	Acceleration measurement value (10 times larger)
0021H	40034	Vibration frequency	0x03/0x04	Vibration frequency (float)
0022 H	40035			
0050 H	40081	Temperature calibration value	0x03/0x04/0x06	Integer (expanded by a factor of 10)
005C H	40093	Temperature	0x03/0x04/0x1	Temperature

005D H	40094	calibration coefficient A	0	coefficient A (float)
005E H	40095	Temperature calibration coefficient B	0x03/0x04/0x1 0	Temperature coefficient B (float)
005F H	40096			
0068 H	40105	Velocity calibration value A	0x03/0x04/0x1 0	Speed factor A (floating point type)
0069 H	40106			
006A H	40107	Velocity calibration value B	0x03/0x04/0x1 0	Velocity coefficient B (floating point)
006B H	40108			
0074 H	40117	Displacement calibration value A	0x03/0x04/0x1 0	Displacement factor A (floating point)
0075 H	40118			
0076 H	40119	Displacement calibration value B	0x03/0x04/0x1 0	Displacement coefficient B (floating-point)
0077 H	40120			
0080 H	40129	Acceleration calibration value A	0x03/0x04/0x1 0	Acceleration factor A (float)
0081 H	40130			
0082 H	40131	Acceleration calibration value B	0x03/0x04/0x1 0	Acceleration coefficient B (float)
0083 H	40132			

07D0 H	42001	Device address	0x03/0x04/0x06	1~254 (factory default 1)
07D1 H	42002	Baud rate	0x03/0x04/0x06	0 for 2400
0FA0 H	44001	Temperature value	0x03/0x04	Temperature measurements (expanded by a factor of 10)

3-axis Temperature Vibration Sensor Register Description

Register Address	PLC or Configuration Address	Elements	Function Code Support	Description
0000 H	40001	Temperature	0x03/0x04	Temperature measurement value (10 times enlargement)
0001 H	40002	X-axis speed	0x03/0x04	X-axis speed measurement (10x expansion)
0002 H	40003	Y-axis speed	0x03/0x04	Y-axis speed measurement (10x expansion)
0003 H	40004	Z-axis speed	0x03/0x04	Z-axis speed measurement value (10 times larger)
0004 H	40005	X-axis displacement	0x03/0x04	X-axis displacement measurement

				t (10 times larger)
0005 H	40006	Y-axis displacement	0x03/0x04	Y-axis displacement measurement (10 times larger)
0006 H	40007	Z-axis displacement	0x03/0x04	Z-axis displacement measurement (10 times larger)
0009 H	40010	Version number	0x03/0x04	Version number
000A H	40011	X-axis acceleration	0x03/0x04	X-axis acceleration measurement value (10 times larger)
000B H	40012	Y-axis acceleration	0x03/0x04	Y-axis acceleration measurement (10 times larger)
000C H	40013	Z-axis acceleration	0x03/0x04	Z-axis acceleration measurement value (10 times larger)
0021 H	40034	X-axis vibration frequency	0x03/0x04	X-axis vibration frequency (float)
0022 H	40035			
0023 H	40036	Y-axis	0x03/0x04	Y-axis

0024 H	40037	vibration frequency		vibration frequency (float)
0025 H	40038	Z-axis vibration frequency	0x03/0x04	Z-axis vibration frequency (float)
0026 H	40039			
0050 H	40081	Temperature calibration values	0x03/0x04/0x06	Integer (expanded by a factor of 10)
005C H	40093	Temperature coefficient A	0x03/0x04/0x10	Temperature coefficient A (float)
005D H	40094			
005E H	40095	Temperature coefficient B	0x03/0x04/0x10	Temperature coefficient B (float)
005F H	40096			
0060 H	40097	X-axis speed calibration value A	0x03/0x04/0x10	X-axis speed coefficient A (float)
0061 H	40098			
0062 H	40099	X-axis speed calibration value B	0x03/0x04/0x10	
0063 H	40100			
0064 H	40101	Y-axis speed calibration value A	0x03/0x04/0x10	Y-axis speed factor A (float)
0065 H	40102			
0066 H	40103	Y-axis speed	0x03/0x04/0x10	Y-axis speed

0067 H	40104	calibration value B	0	factor B (float)
0068 H	40105	Z-axis speed calibration value A	0x03/0x04/0x1 0	Z-axis speed factor A (float)
0069 H	40106			
006A H	40107	Z-axis speed calibration value B	0x03/0x04/0x1 0	Z-axis velocity coefficient B (float)
006B H	40108			
006C H	40109	X-axis displacement calibration value A	0x03/0x04/0x1 0	X-axis displacement coefficient A (float)
006D H	40110			
006E H	40111	X-axis displacement calibration value B	0x03/0x04/0x1 0	
006F H	40112			
0070 H	40113	Y-axis displacement calibration value A	0x03/0x04/0x1 0	X-axis displacement coefficient B (float)
0071 H	40114			
0072 H	40115	Y-axis displacement calibration value B	0x03/0x04/0x1 0	
0073 H	40116			
0074 H	40117	Z-axis displacement	0x03/0x04/0x1 0	Z-axis displacement
0075 H	40118			

		t calibration value A		factor A (float)
0076 H	40119	Z-axis displacement calibration value B	0x03/0x04/0x10	Z-axis displacement coefficient B (float)
0077 H	40120			
0078 H	40121	X-axis acceleration calibration value A	0x03/0x04/0x10	X-axis acceleration factor A (float)
0079 H	40122			
007A H	40123	X-axis acceleration calibration value B	0x03/0x04/0x10	X-axis acceleration factor B (float)
007B H	40124			
007C H	40125	Y-axis acceleration calibration value A	0x03/0x04/0x10	Y-axis acceleration factor A (float)
007D H	40126			
007E H	40127	Y-axis acceleration calibration value B	0x03/0x04/0x10	Y-axis acceleration coefficient B (float)
007F H	40128			
0080 H	40129	Z-axis acceleration calibration value A	0x03/0x04/0x10	
0081 H	40130			
0082 H	40131	Z-axis	0x03/0x04/0x10	Z-axis

0083 H	40132	acceleration calibration value B	0	acceleration factor B (float)
07D0 H	42001	Device address	0x03/0x04/0x06	1~254 (factory default 1)
07D1 H	42002	Baud rate	0x03/0x04/0x06	0 means 2400 1 for 4800 2 represents 9600 3 represents 19200 4 represents 38400 5 for 57600 6 for 115200 7 for 1200
0FA0 H	44001	Temperature value	0x03/0x04	Temperature measurement value (expanded by a factor of 10)

4.4 Communication Protocol Examples and Explanations

Example 1: Reading the temperature value of device 1

Ask frame:

Address Code	Function Code	Start Address	Data Length	Check Digit Low Bit	Check Digit High Bit
0x01	0x03	0x00 0x00	0x00 0x01	0x84	0x0A

Answer frame: (e.g. device 1 is temperature with a real-time value of 8.0°C)

Address Code	Function Code	Return Number of Valid Bytes	Device 1 Real-time Data	Check Digit Low Bit	Check Digit High Bit
0x01	0x03	0x02	0x00 0x50	0xB8	0x78

Temperature calculation:

Temperature: 0050H (hexadecimal) = 80 (decimal) => temperature = 8.0°C (our transmitter upload value for the actual value of ten times)

5. FAQs and Solutions

The device cannot connect to the computer

Possible reasons:

1. The computer has more than one COM port, and the port selected is incorrect
2. Wrong device address, or there is a duplicate address of the device (factory default all 1).
3. baud rate, parity mode, data bit, stop bit error.
4. 485 bus is disconnected, or A and B lines are reversed.
5. The number of devices is too many or the wiring is too long, you should supply power nearby, add 485 enhancer, and increase 120 Ω termination resistor at the same time.
6. USB to 485 driver is not installed or damaged
7. The device is damaged.

Appendix 1

ISO2372 equipment vibration standard, applicable to all kinds of motors, fans, pumps, machine tools and equipment.

This product can detect triaxial vibration velocity in the range of 0-50mm/s and triaxial vibration displacement in the range of 0-5000μm, suitable for vibration testing and fault abatement.

Vibration Range	ISO2372 Equipment Vibration Standard			
	Equipment Category			
Unit (mm/s)	Class I	Class II	Class III	Class IV
0.71	A	A	A	A
1.12	B	A	A	A
1.8	B	B	A	A
2.8	C	B	B	A
4.5	C	C	B	B
7.1	D	C	C	B
11.2	D	D	C	C
18	D	D	D	C
28	D	D	D	D

Class I	Small equipment under 15KW	A:	Good
Class II	Medium-sized equipment 15-75KW	B:	Acceptable
Class III	Large equipment mounted on a hard foundation	C:	Attention
Class IV	High-speed machines with speeds higher than the natural frequency	D:	Not allowed