KANOMAX
The Ultimate Measurements

Laser Particle Sensor

MODEL 3720-06

User Manual

Component List

◆ Standard

ITEM	MODEL	QTY
Main Unit (3720-06) (Contained Analog Output terminal connector)	3720-06	1
AC Adaptor (DC24V)	SDI50-24-U-P5R	1
Zero Filter	–	1
Software CD	–	1
User's Manual	–	1

◆ Optional Extras

ITEM	MODEL	QTY
USB-RS485 Converter	3720-20	1
RS232C-RS485 Converter	3720-21	1
Isokinetic Suction Probe	3905-07	1
IP65 protective case	3720-23	1

For more information on optional extras, please contact your local KANOMAX.

Important Safety Information

In this manual, warning types and classifications are defined as follows:

[Classification]

WARNING: To Prevent Serious Injury or Death

Indicates a potentially hazardous situation which, if not avoided, may result in serious injury or death.

CAUTION: To Prevent Damage to the Product

Indicates a potentially hazardous situation which, if not avoided, may result in damage to the product that may void the product warranty.

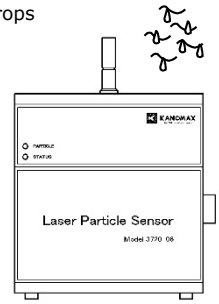
[Description of Symbols]

△ Indicates a condition (including danger) that requires caution. The subject of each caution is illustrated inside the triangle (e.g., the symbol shown to the left is the high temperature caution).

⃠ Indicates a prohibition. Do not take the prohibited action shown inside or near this symbol (e.g., The symbol shown to the left prohibits disassembly).

● Indicates a mandatory action. A specific action is described near the symbol.

WARNING	
 Do not modify/disassemble	◆ Do not disassemble, modify or repair the instrument. …… Misuse of the instrument may result in electric shock, fire, or damage to the instrument, etc. **……A level 3 B laser is used as a light source inside the device, which is extremely dangerous.**
 Handle Properly.	◆ Use this instrument properly by carefully following this User's Manual. …… Misuse of the instrument may result in electric shock, fire, or damage to the instrument. etc.
	◆ If any abnormal noises, unusual odors or smoke are observed, or any liquid enters the instrument, turn the power off immediately, remove the battery and disconnect the power cable. …… It may result in electric shock, fire or damage to the instrument. Contact your distributor or your KANOMAX service center for repair.

 Prohibition	◆ Do not install the instrument where it will be exposed to rain and/or water drops. …… It may result in electric shock, fire, serious injury or death.	Water drops 

Caution

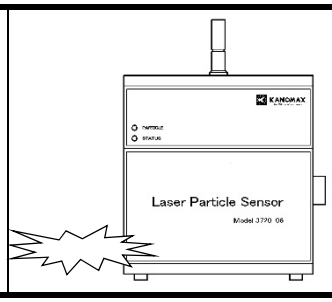
	◆ Unplug the power cord when the instrument is not in use. ……Failure to observe the above(It) may result in electrical shock, fire or damage to internal circuitry.
 Handle Properly	◆ When using a power cord or an AC adapter, make sure to use the one provided with this instrument. ……Other commercially available cords may have different voltage specifications and polarity, which could result in a short circuit, fire or damage to the instrument. ◆ The supplied power cord and AC adapter are for this product only. Do not use it for other equipment. ……Other devices have different polarities and standards, which may cause a short circuit or fire. ◆ Never block the suction port or exhaust port during operation. ……Closing the suction port or exhaust port during use may cause malfunction or damage.
 Prohibition	◆ Do not perform measurements in environments exceeding or falling below the specified temperatures and RH levels of the instrument. …… The instrument may not function properly outside the specified environment (10-30 ℃, 20～85%RH, with no condensation).
 Prohibition	◆ Do not subject the instrument to strong shock. Do not place heavy objects on the instrument or sensor. ……Failure to observe the above may cause damage to the instrument. 

Table of Contents

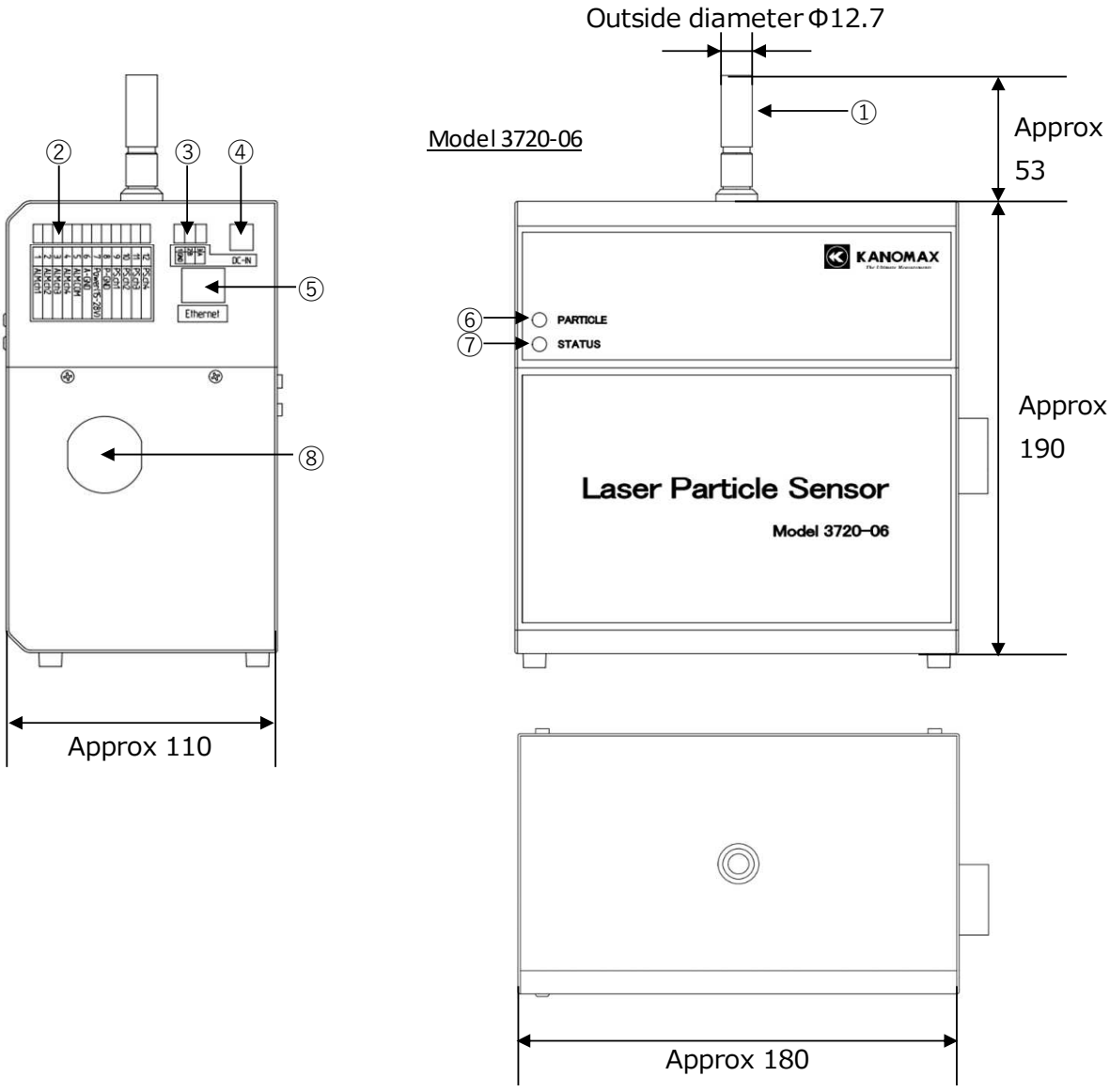
1. Part Names and Functions

1.1General Outline

- This instrument (Model 3720-06) is a light scattering laser particle sensor with a laser diode light source. Measurement data is output in 4~20mA current method.
- Status lamps indicate LD errors and flow rate errors.
- Outputs an alarm signal when a particle concentration above a set value is detected.

1.2 Part Names and Functions

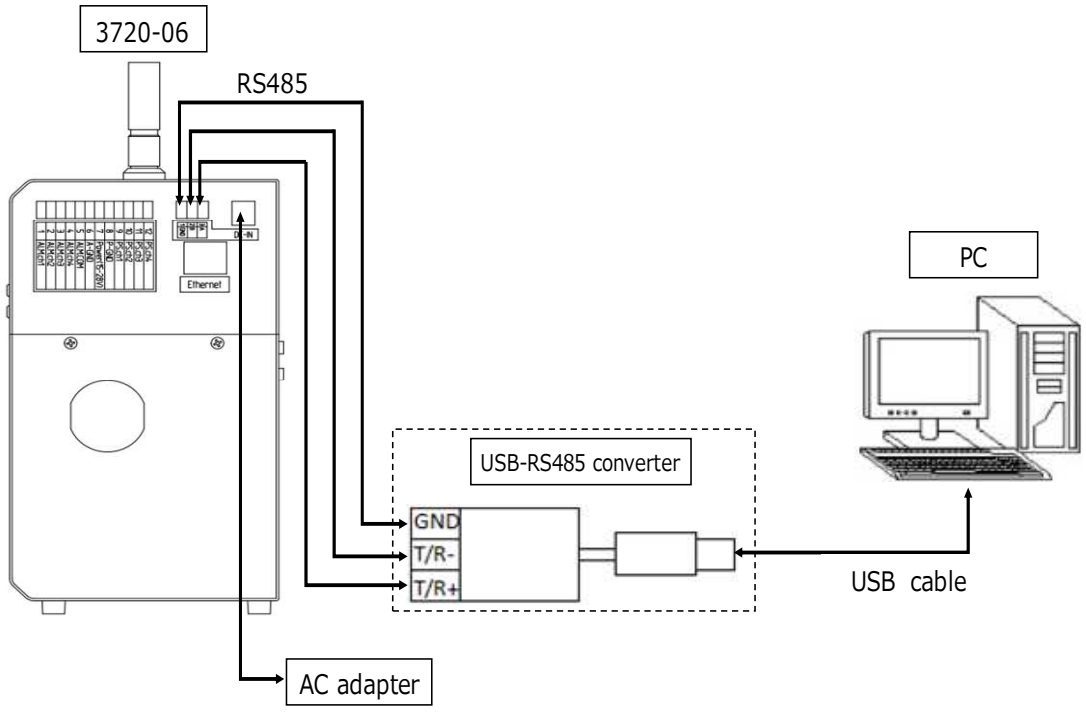
(Unit: mm)



Number	Name	Function
①	Inlet	This is where sample air is taken in. A clean pipe can be attached to this inlet. If the inlet is blocked during measurement, it will be damaged. Never block the inlet.
②	Analog Output Terminal	This consists of a DC power input, an analog output terminal, and an alarm output terminal. For detailed functions, refer to 2.4 Connecting the Analog Output Terminal.
③	RS485 Terminal	MODBUS/RTU communication connection terminal. USB-RS 485 converter (converter + cable) is used to connect to a PC to enable parameter setting and count reading of the unit. For more details, refer to 2.5 Connecting RS485 Terminal.
④	DC-IN	This is a power jack to supply DC power to the main unit. Connect the provided AC adapter to this inlet. Refer to 2.1.1 AC Adapter.
⑤	Ethernet connector	MODBUS/TCP communication connection terminal. 3720-06 can be connected to a PC via a router or PoE switch to set parameters and take count readings. For detailed functions, refer to 1.4 Connection with Ethernet.
⑥	PARTICLE Lamp	Blinks orange once each time one particle is detected. The light turns off while no particles are detected.
⑦	STATUS Lamp	Lights red when there is an abnormality in the flow rate or the laser diode. Lights green during normal operation.
⑧	Outlet	The air taken in is processed by the built-in filter and then discharged. If the outlet is blocked during measurement, it will be damaged. Never block the outlet.

1.3 Connection with RS485

- To set parameters and acquire measurements via MODBUS/RTU communication, the RS-485 terminal must be connected to a PC.
- An optional USB-RS 485 converter MODEL 3720-20 (sold separately) can be used for the connection. For details, contact your distributor or agent.
- If you are going to prepare your own USB-RS 485 converter, please read the following description before preparing it.
- Connect this product to the USB-RS 485 converter and PC as follows.



- Each signal of the RS485 terminal and the USB-RS485 converter should correspond as shown in the figure below.

3720-06 RS485

No.	Signal name
1	GND
2	B
3	A

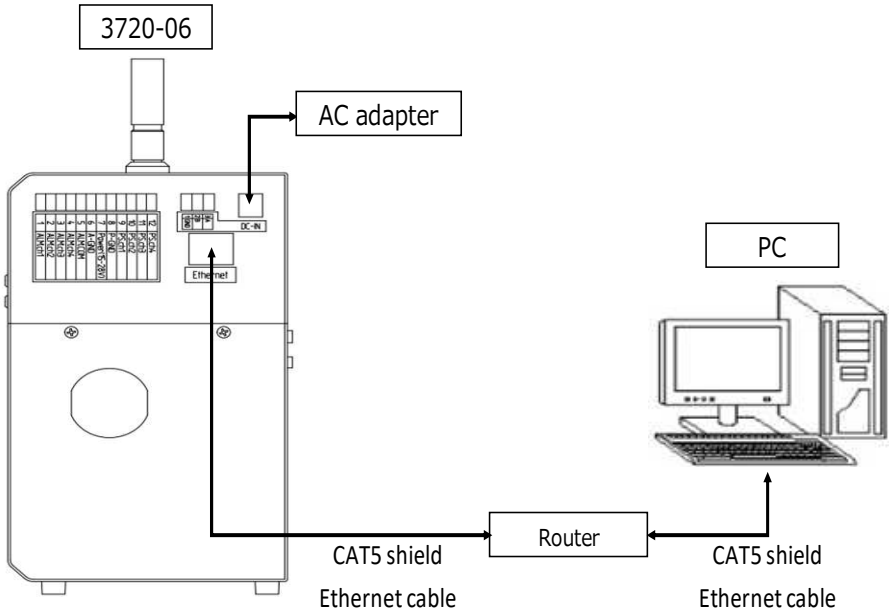
USB-RS485 converter

No.	Signal name
1	GND
2	T/R -
3	T/R +

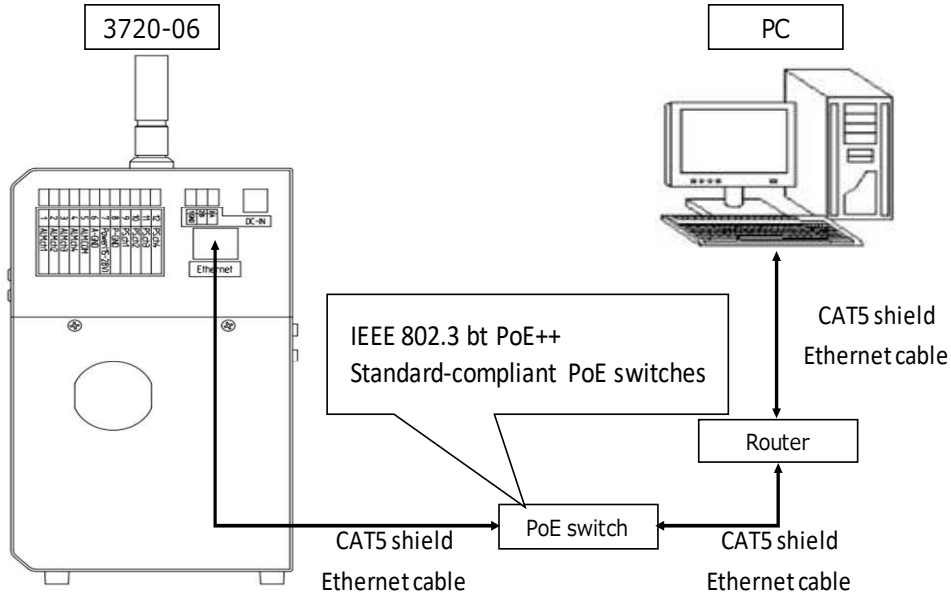
Unused terminals of the USB-RS485 converter should be insulated.

1.4 Connection with Ethernet

◆ Connect this instrument to the router and PC as shown in the figure below.

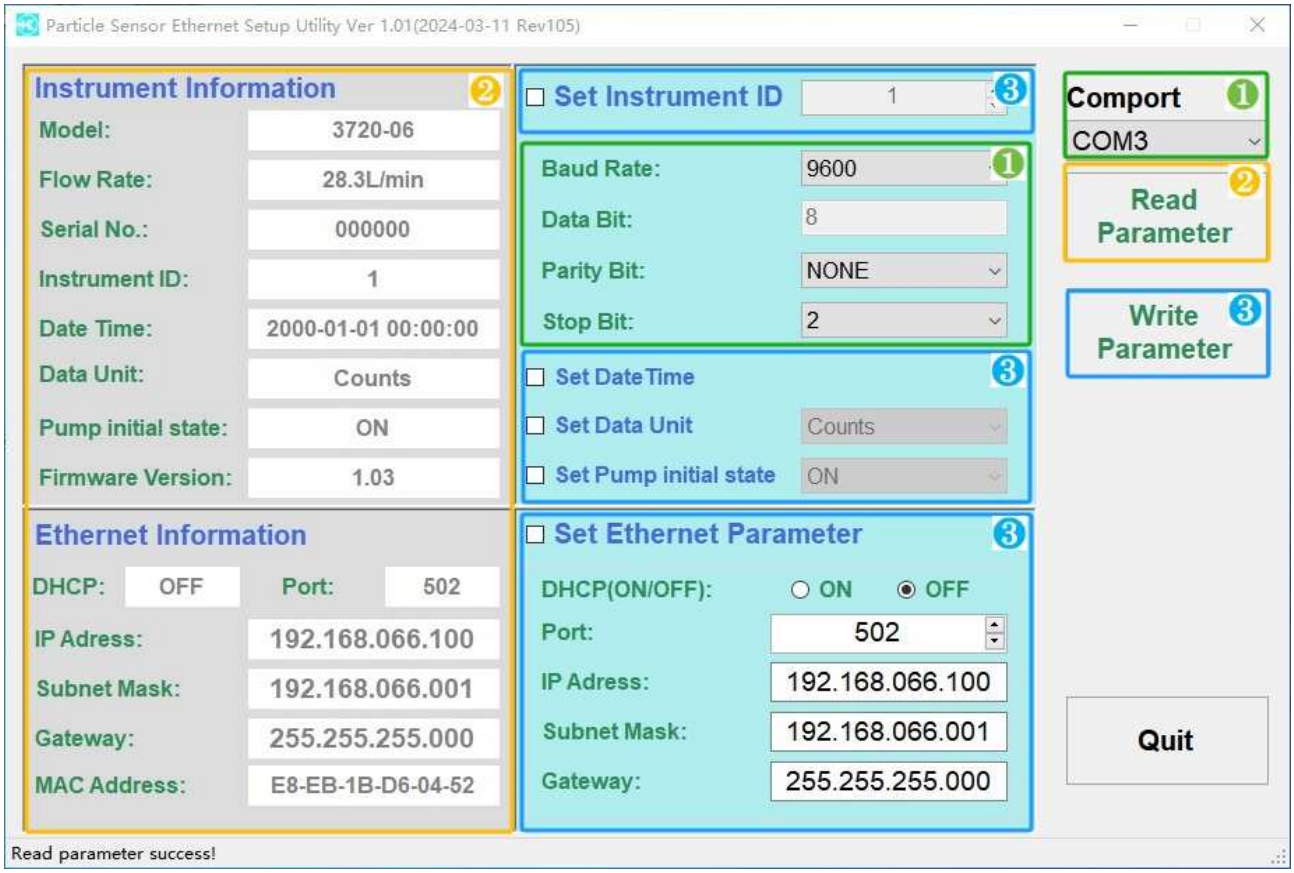


◆ When using a PoE switch, connect as shown below.



1.5 Communication Setup

◆ The included PC software "Particle Sensor Ethernet Setup Utility" reads the product information and configures the product ID and Ethernet settings.



Operation Description:

(1) PC and this product are connected via RS485. Refer to "1.3 RS485 Connection" for the connection method.

(2) Select communication parameters. ❶(*Factory default: 9600bps, 8bit, None, 2bit)

(3) Click "Read Parameter" button to read information on this product. ❷

(4) To set the ID, check "Set Instrument ID" and enter a value in "Instrument ID".

(5) To set Ethernet settings, check the "Set Ethernet Parameter" checkbox and enter the Ethernet settings.

(6) Click the "Write Parameter" button to write the device ID and network parameters. ❸

(7) Click the "Quit" button to exit this software.

2. Preparation before measurement

2.1 Power Supply

- The instrument can be powered by three different routes: AC adapter, analog terminal, and PoE.
- When power is supplied from multiple paths simultaneously, power is supplied from the power source with the highest voltage.

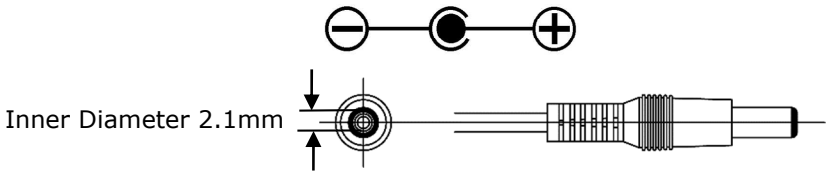
2.1.1 AC Adapter

- Plug the AC adapter into the DC-IN. Below are the AC adapter specifications included with the product.

Input/Output Specification : Input AC 100-240V (50-60Hz) ,

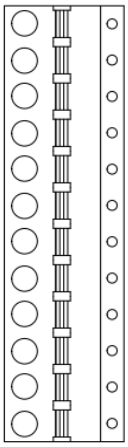
Output DC 24V 2.1A

Plug Specification :



2.1.2 DC Power Supply

- By using No.7 Pin Power (15-28V) and No.8 Pin P-GND of the analog terminal, DC power can be supplied. (Note: Pay careful attention to the connecting order.)
- Use a DC power supply with overload protection.



12	PS. ch4
11	PS. ch3
10	PS. ch2
9	PS. ch1
8	P-GND
7	Power (15-28V)
6	A-GND
5	ALM. COM
4	ALM. ch4
3	ALM. ch3
2	ALM. ch2
1	ALM. ch1

3720-06 Analog Output Terminal

2.1.3 Using the PoE switch

- Connecting a PoE switch to the Ethernet connector allows power to be supplied from the PoE switch.
- For details, see the connection diagram with PoE switch in 1.4 Connection with Ethernet.
- When using a PoE switch to supply power, select a switch that conforms to the IEEE 802.3 bt PoE++ standard. Use of equipment that does not meet the standard may result in malfunction.

2.2 Parameter Settings

- Parameters must be set before measurement. Use "3720-06 MODBUS Communication Protocol" for setting.
- Connect 3720-06, 3720-06 power supply, USB-RS485 converter (converter, cable), PoE switch, router, and PC before setting parameters.
- Sampling time setting: 1 second step in the range of 1-60 seconds
  - All data within the sampling time is totaled and output via analog output (4-20 mA).
  - This sampling time is common to all channels.

  *The factory default setting is 60 seconds.
- Output range setting: Sets the particle count range and concentration range.
  - The 4-20 mA analog output is generated within the set range.
  - The setting range is shown below. This output range setting can be set for each channel.

  *The factory default setting is 02 (0-100CNT).

Setting Code	Output Range	Count / Concentration
01	0—10CNT	Count
02	0—100CNT	
03	0—1,000CNT	
04	0—10,000CNT	
11	0—10CNT/cf	Concentration
12	0—100CNT/cf	
13	0—1,000CNT/cf	
14	0—1,000,000CNT/cf	
21	0—353CNT/m^3	
22	0—3,530CNT/m^3	
23	0—35,300CNT/m^3	
24	0—35,300,000CNT/m^3	

◆ Alarm Settings: Set the measurement range (0-100%) in 1% increments.

- An alarm setting can be configured for each channel.
- Particle counts exceed the configured alarm level of concentration, the alarm signal will be sent.
- For more details on the alarm settings, refer to 2.4 Connecting the Analog Output Terminal.

*The factory setting is 100% (all channels).

◆ Address Settings: Set the address of this instrument.

- The settable range is 1-247.
- The addresses are used to identify each instrument when using multiple instruments.

*The factory setting is 1.

◆ Sensor Communication Settings: Configure the communication settings between the device and the PC.

- Baud rate: Select from 9600, 19200, and 38400bps.
- Data bit: 8 bits.
- Parity: Select from Even, Odd or None.
- Stop bit: Select from 1 bit or 2bit.

*The factory setting is 9600bps, 8bit, None, 2bit.

◆ Error Output Settings: Set the current output ON/OFF if flow rate errors or LD errors are detected.

- ON: Current output varies according to error contents.
- OFF: Measurement data will be output even if an error is detected.

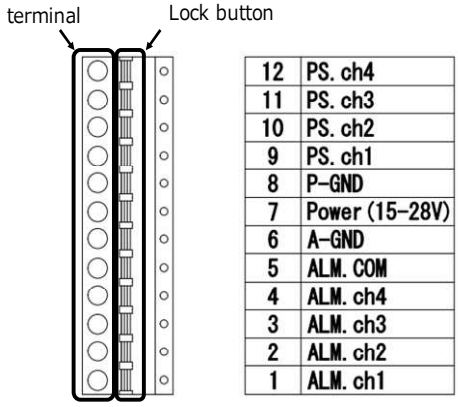
*Configure the appropriate error output settings based on the system to connect.

2.3 The Status of Flow rate

◆ The status of flow rate can be checked by the STATUS lamp on the main unit or by the output current from the analog output pins 9-12.
If the output current of pins 9-12 is outside the range of 1-1.8mA or 3-3.8mA, it is normal. *This output is enabled when the error output setting in 2.2 Parameter Setting is ON.

2.4 Connecting the Analog Output Terminal

- The connector of the analog output terminal of this instrument has an automatic lock function. When inserting and removing the lead, push the lock button (the orange-colored part) on the connector to unlock it. When you release the lock button, it becomes locked.
- Use AWG16-24 lead wires and remove the coating from the tip before insertion.
- The connector of the analog terminal is removable. However, we recommend that you leave it on, so you don't lose it.



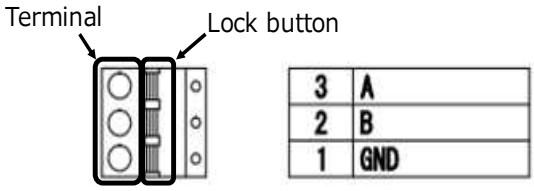
3720-06 Analog terminal

- The following Figures show the details of the Analog Output terminal.

Terminal Number	Signal Name (3720-06)	Functions
1	ALM.ch1	Alarm contact output terminals for each channel. This terminal turns ON when the number of measured particles or concentration exceeds the alarm set value. The contact specification for this terminal is 60 V/0.4 A or less. Use within this range.
2	ALM.ch2	
3	ALM.ch3	
4	ALM.ch4	
5	ALM.COM	Common terminal (-) of the alarm output terminal.
6	A-GND	Common terminal (-) of current output.
7	Power(15-28V)	Connecting terminal of DC power supply (+).
8	P-GND	Connecting terminal of DC power supply (GND).
9	PS.ch1	Current output terminal for particle count or concentration for each channel. The output range is 4-20 mA. This output terminal is also used when an abnormal flow rate or abnormal LD is detected. The current output range for flow error is 1-1.8 mA, and for LD error is 2-2.8 mA. If flow rate and LD error occur simultaneously, the current output range is 3-3.8 mA. *However, this output is enabled when the error output setting in 2.2 Parameter Setting is ON.
10	PS.ch2	
11	PS.ch3	
12	PS.ch4	

2.5 Connecting RS485 Terminal

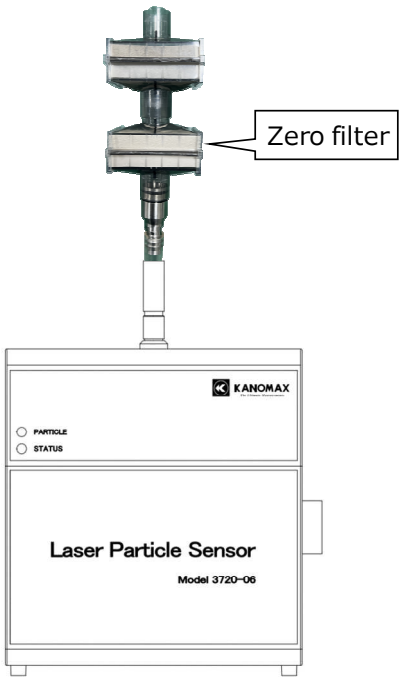
- The connector of the RS485 terminal of this instrument has an automatic lock function. When inserting and removing the lead, push the lock button (the orange-colored part) on the connector to unlock it. When you release the lock button, it becomes locked.
- Use AWG16-24 lead wires and remove the coating from the tip before insertion.
- The connector of the analog terminal is removable. However, we recommend that you leave it on, so you don't lose it.



3720-06 RS485 terminal

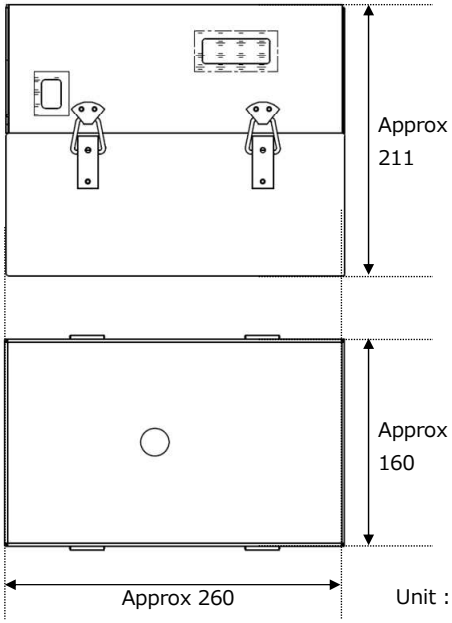
2.6 Connecting the Zero Filter

- To confirm the cleanness of the optical system, conduct a zero check before each measurement.
- Connect the tube side of the zero filter to the inlet of this instrument.
- The filters must be handled with care.
- If air leaks or other problems occur between the filter and the main unit, it will not be possible to check zero correctly.



3. Measurements

- Make sure that all procedures stated in 2. **Preparation before measurement** in this manual have been completed.
- Inhale sample air directly from the inlet of the 3720-06 or connect a clean pipe to the inlet to sample air to be inhaled. The outside diameter of the inlet is Φ12.7 mm.
- When the power supply to 3720-06 is started, the measurement starts with the parameters that have been set.
- If you have a problem with your instrument, such as the condition of the STATUS lamp, the output current value of the analog output terminal and alarm output status, please refer to 5. Troubleshooting in this manual first to find possible cause(s) and solution(s). If that does not solve the problem, please contact your distributor or your KANOMAX service center for repair.
- If you need protection level IP65, use the optional IP65 protection case (MODEL 3720-23).



- Sampling pumps that have been in operation for more than their service life (20,000 hr) need to be replaced. Please contact the place of purchase or KANOMAX.
- This instrument can store 5000 measurement data. Stored data includes measurement date and time, product status, and particle count values. Data is saved every sampling time after the product is turned on. When 5000 pieces of data have been saved, no more data will be saved. In this case, read and erase the stored data. Reading and erasing of stored data is executed via MODBUS communication. For details, refer to 3720-06 MODBUS Communication Protocol.

4. Main Specifications

Product name	Laser Particle Sensor
Model	3720-06
The outside diameter of the inlet	Φ12.7mm
Exhaust filter	Built in
Particle Size Distribution	Standard:0.5μm, 5.0μm Customize: Selectable 2-4CH from 0.3μm, 0.5μm, 0.7μm, 1.0μm, 3.0μm, 5.0μm, 10.0 μm (Please contact us)
Rated Flow	28.3L/min(1CFM)
Optical Source	Laser Diode
Counting Efficiency	ISO21501-4, JIS B 9921
Max Detectable Concentration	1,000,000CNT/ft^3
Data Storage	5,000
Setting Parameter	Sampling Time : 1 to 60 seconds
	Output Range Setting (Set for each particle size) Count: 0-10CNT, 0-100CNT, 0-1,000CNT, 0-10,000CNT Concentration: 0-10CNT/cf, 0-100CNT/cf, 0-1,000CNT/cf, 0-1,000,000CNT/cf 0-353CNT/ m^3, 0-3,530CNT/m^3, 0-35,300CNT/m^3, 0-35,300,000CNT/m^3
	Alarm Setting: 0%-100%
	Address Setting:1-247
	Error Output Setting: ON/OFF
Sampling Pump	Built-in small pump (brushless) *Lifespan of >20,000 hours
Interface	Ethernet, RS485, Analog Output（4-20mA）
Communication	Modbus(TCP/IP), Modbus(RTU)
Power Supply	①AC Adapter AC 100-240V (50-60Hz) , DC 24V/2.1A ②DC Power Supply DC 15V-28V/20A(with load protection function) ③PoE Switch Power Supply 802.3bt (PoE++)
Operating Environment	10～30℃ 20～85%RH (Non Condensing)

Storing Environment	Temperature: -10 to 50℃ Humidity: 95%RH or less (No condensation)
Dimension	180（W）× 110（D）× 190（H）mm
Weight	3.4 kg
Standard Accessories	User's Manual (1), AC adapter (1), Zero filter (1)
Optional Extras	USB-RS485 Converter 3720-20, RS232C-RS485Converter 3720-21, Isokinetic Probe 3905-07, IP65 protective case 3720-23

5. Troubleshooting

Problems	Possible Cause(s) / Solution(s)	Page
Power is not turned on.	Defective adapter → Replace the adapter.	6
	The lead of the DC power supply is not connected correctly. → Connect to the lead correctly.	6
	Bad connection with PoE switch → Reconnect to the PoE switch	7
STATUS lamp is not lit.	No connection to the power supply → Connect to the power supply.	6,7
	The lamp is damaged. → Return the instrument for repair.	15
STATUS lamp lights up in red.	The vacuum pump is not operating. → See 3720-06 MODBUS Communication Protocol.	11
	The vacuum source has piping leakage or a clogged pipe. → Inspect the vacuum source for leaks or clogs. Clear any clogs of the pipe.	—
	The internal piping is clogged. → Return the instrument for repair.	15
	An internal part is damaged. → Return the instrument for repair.	15
PARTICLE lamp is not lit when detecting particles	Internal part failure → Return the instrument for repair.	15
Analog output (4~20mA) has an output error.	Wiring error of the analog output → Rewire the analog output correctly.	9
	When the error output setting is ON, current output will be 4mA or less according to the error contents.	9
	Internal circuit failure → Return the instrument or repair.	15
Output error of the alarm terminal	Wiring error of the analog output → Rewire correctly.	9
	Internal circuit failure → Return the instrument for repair.	15

6. Warranty and After-sales Service

KANOMAX Limited Warranty

The limited warranty set below is given by KANOMAX with respect to the KANOMAX brand Airborne Particle Counter, its attachment parts including Probe and other accessories (hereafter referred to as "PRODUCT") that you have purchased. PRODUCT you have purchased shall be the only one that the limited warranty stated herein applies to.

Your PRODUCT, when delivered to you in new condition in its original container, is warranted against defects in materials or workmanship as follows: for a period of three (3) years from the date of original purchase, defective parts or a defective PRODUCT returned to your sales representative, as applicable, and proven to be defective upon inspection, will be exchanged for a new or comparable rebuilt parts, or a refurbished PRODUCT as determined by your sales representative. Warranty for such replacements shall not extend the original warranty period of the defective PRODUCT.

This limited warranty covers all defects encountered in normal use of the PRODUCT, and does not apply to the following cases:

(1) Use of parts or supplies other than the PRODUCT sold by your sales representative, which cause damage to the PRODUCT or cause abnormally frequent service calls or service problems.
(2) If any PRODUCT has its serial number or date altered or removed.
(3) Loss of damage to the PRODUCT due to abuse, mishandling, improper packaging by the owner, alteration, accident, electrical current fluctuations, failure to follow operating, maintenance or environmental instructions prescribed in the PRODUCT's instruction manual provided by KANOMAX, or service performed by a party other than KANOMAX.

NO IMPLIED WARRANTY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, APPLIES TO THE PRODUCT AFTER THE APPLICABLE PERIOD OF THE EXPRESS LIMITED WARRANTY STATED ABOVE, AND NO OTHER EXPRESS WARRANTY OR GUARANTY, EXCEPT AS MENTIONED ABOVE, GIVEN BY ANY PERSON OR ENTITY WITH RESPECT TO THE PRODUCT SHALL BIND KANOMAX. KANOMAX SHALL NOT BE LIABLE FOR LOSS OF STORAGE CHARGES, LOSS OR CORRUPTION OF DATA, OR ANY OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES CAUSED BY THE USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT, REGARDLESS OF THE LEGAL THEORY ON WHICH THE CLAIM IS BASED, AND EVEN IF KANOMAX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL RECOVERY OF ANY KIND AGAINST KANOMAX BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE PRODUCT SOLD BY KANOMAX AND CAUSING THE ALLEGED DAMAGE. WITHOUT LIMITING THE FOREGOING, THE OWNER ASSUMES ALL RISK AND LIABILITY FOR LOSS, DAMAGE OF, OR INJURY TO THE OWNER AND THE OWNER'S PROPERTY AND TO OTHERS AND THEIR PROPERTY ARISING OUT OF USE OR MISUSE OF, OR INABILITY TO USE, THE PRODUCT NOT CAUSED DIRECTLY BY THE NEGLIGENCE OF KANOMAX. THIS LIMITED WARRANTY SHALL NOT EXTEND TO ANYONE OTHER THAN THE ORIGINAL PURCHASER OF THE PRODUCT, OR THE PERSON FOR WHOM IT WAS PURCHASED AS A GIFT, AND STATES THE PURCHASER'S EXCLUSIVE REMEDY.

After-sales Service

If the PRODUCT is malfunctioning, please see "Troubleshooting" page 13 to find possible causes first.

As a general rule, parts supply and maintenance is scheduled for five (5) years after the end of sales. Although we estimate and secure the necessary quantity of parts, due to unforeseen circumstances, we may discontinue parts supply and maintenance before five (5) years have passed from the date of discontinuation of sales. Please contact our Service Center for details.

For more information, please contact your sales representative. When you call, please have the following information at hand:

(1) PRODUCT name;
(2) Model number;
(3) Serial number;
(4) Probe number;
(5) Description of Symptom, and;
(6) Date of purchase

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USA & Europe

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