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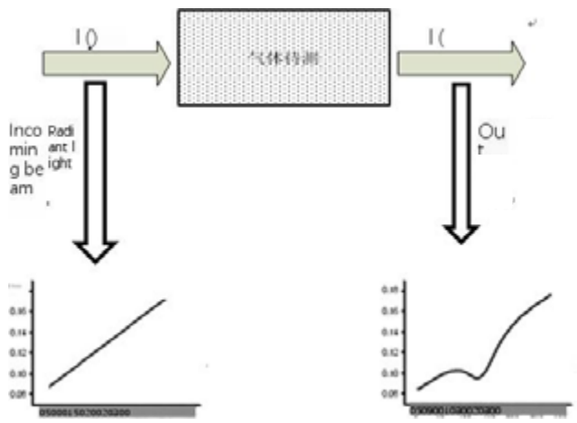
Operating Instructions for Laser NH3 Gas Analysis Module

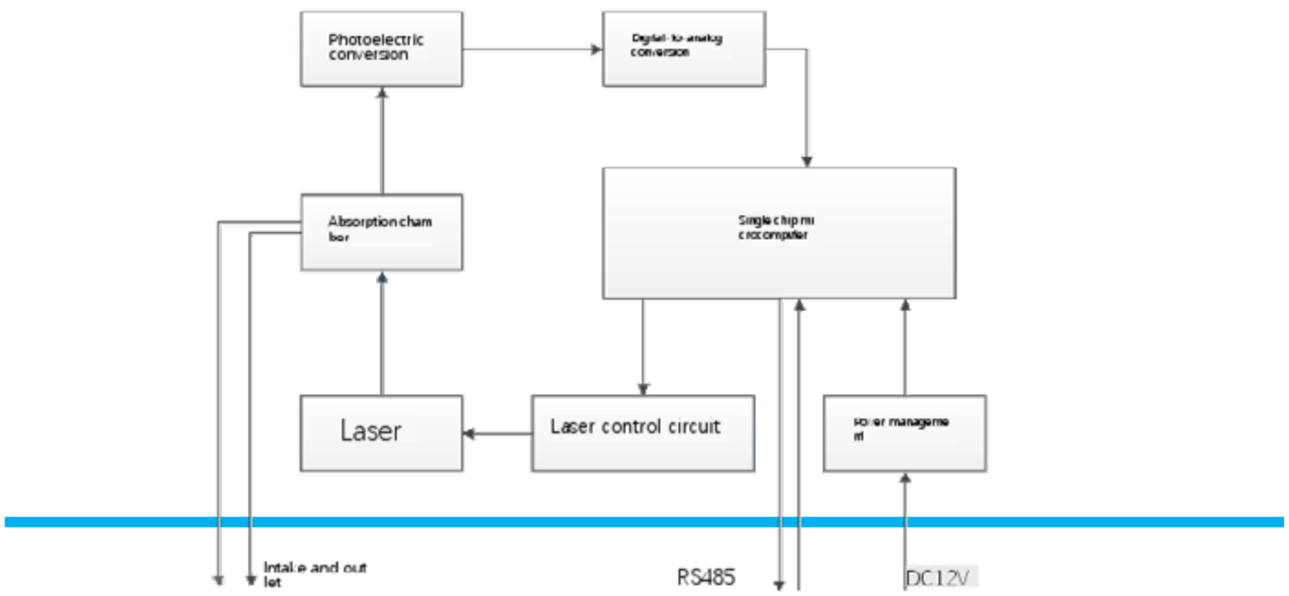
ProductIntroduction

Laser ammonia gas analysis module is a new generation of ultra-high precision NH3 gas detection product developed by our company, which is suitable for coal mine, chemical industry and other industries. Based on the principle of laser spectral absorption, the module has the characteristics of high measurement accuracy, wide range, short response time, internal temperature compensation, cross interference compensation, good stability and long service life.The continuous detection of the concentration of ammonia gas can be realized. The module has RS485 communication interface and adopts Modbus communication protocol.

The product uses a tunable diode laser as the detection light source. By modulating the injection current of the laser, the laser wavelength is periodically scanned to cover the characteristic absorption spectral line of ammonia gas. In the working state, the laser signal is absorbed by the ammonia gas, and the concentration value of the ammonia gas can be accurately inverted through the change of the intensity of the laser absorption spectrum. As shown in the following figure:



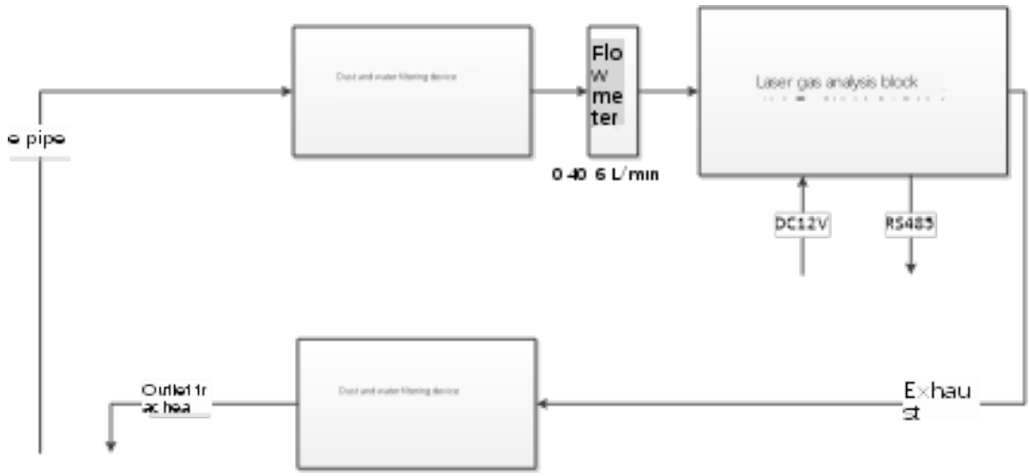
Principle block diagram



Main Technical Indexes

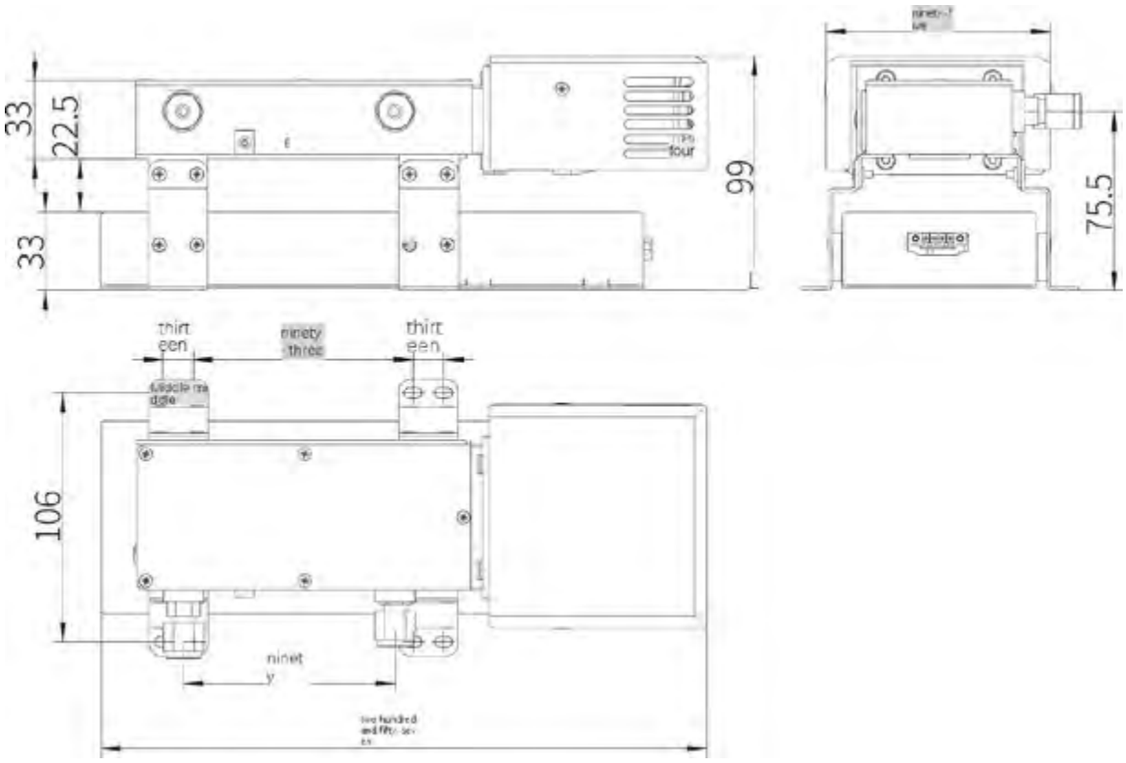
Technical indicators	
Detect gas	Ammonia (NH3)
Sampling mode	Pump suction type
Sensor type	Laser spectral absorption
Detection range	0-200PPM
Precision	≤±3%F.S
Detection limit	≤0.5ppm
Repeatability	≤±0.5%F.S
Range drift	＜ ± 1% F. S (within 8h)
Response Time (T90)	T90 ≤ 2.5 s (a gas flow of 10 L/min is expected to be feasible, but the need for a greater gas flow is not excluded Quantity)
Output signal	RS485 or 4-20mA
Ventilation flow	0.2~10L/min
Enclosure material	Sheet metal
Size of air pipe interface	Φ6mm
Supply voltage	24VDC

Gas Circuit Connection

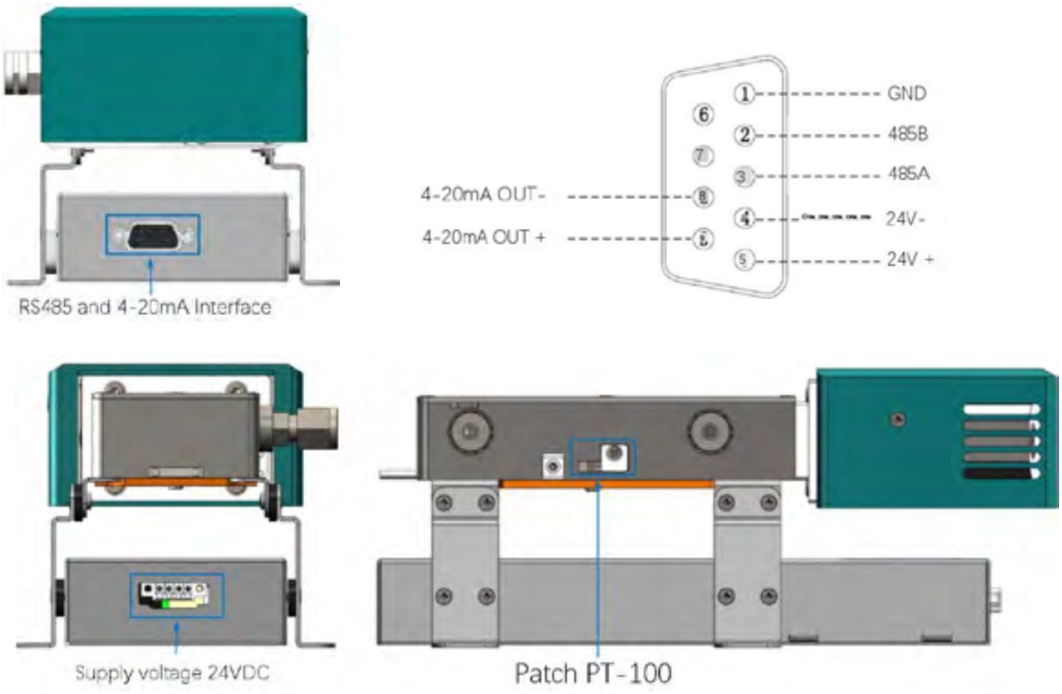


The gas must be adequately treated to ensure that there is no moisture, no particles, and the gas is dry. In the process of use, please fill in the gas according to the identification of the gas inlet and outlet. If the gas is filled in the opposite direction, it may cause irreparable damage to the module. Please ensure that the dust filter and water filter are in normal use. The instrument is placed on a horizontal plane without obvious vibration,After the module is preheated for 1min, the real-time data is obtained according to the communication protocol.

Size information



Electrical connection



Communication and electrification

Before starting the machine, please ensure that the air supply, power supply and grounding resistance comply with the relevant provisions in the technical agreement. After power-on, the instrument will perform self-test, and output the measured value after passing the self-test. Generally, the self-check time is within 2min. If the instrument still does not output the measured value for more than 2min, troubleshooting is required.

Through RS485 mode, the analysis module can be read, zeroed and calibrated.

The module provides two communication transmission protocols: 1. ASCII code transmission protocol; 2.Modbus RTU transmission protocol.

Serial communication settings:

Baud rate: 57600
Data bits: 8
Check bit: No
stop bit: 1

The ASCII code transmission protocol is shown in the following table:

Commands (ASCII)	Commands (HE X)	Command description	Answer	
[ZT001]	5B 5A 54 30 30 31 5D	Concentration reading	[ZT001: Concentration] (the unit is the measuring range unit, and 3 digits are reserved after the decimal point)	
[ZT002]	5B 5A 54 30 30 32 5D	Read calibration concentration	[ZT002: calibration concentration] (unit:%, 3 decimal places reserved)	
[ZT003]	5B 5A 54 30 30 33 5D	Read the alarm code	[ZT003: Alarm Code 1, Alarm Code 2, … , alarm code n]	
[ZT102: Calibration Concentration] Example: [ZT102: 22.3]	5B 5A 54 30 32 3A 32 32 2E 33 5D	Set the calibration concentration	Success	[ZT102 : SUC]
			Failure	[ZT102 : ERR]
[ZT201]	5B 5A 54 32 30 31 5D	Zero	Success	[ZT301 : SUC]
			Failure	[ZT301 : ERR]
[ZT202]	5B 5A 54 32 30 32 5D	Calibration	Success	[ZT302 : SUC]
			Failure	[ZT302 : ERR]

The address list of Modbus RTU transmission protocol register is shown in the following table

Parameter	Register address	Number of registers	Data type	Explain
Gas concentration	0x1000	2	float	
Calibration concentration	0x1050	2	float	
Zeroing/Calibration	0x1101	1	unit16	Write 1 for zeroing, write 2 for calibration, and reply 0xAA55 to indicate success. Return 0xBB66 to indicate failure
Number of alarm codes	0x1200	1	unit16	
Current alarm code 1	0x1201	1	unit16	Read the number of current alarms before reading the corresponding alarm code

Modbus RTU transmission protocol communication example (protocol transmission data format is little-endian format, namely float DCBA format):

(1) Read the gas concentration

Send: 01 03 10 00 00 02 C0 CB

Device address	Function code (read)	Register address	Number of registers	CRC check code
01	03	10 00	00 02	C0 CB

Re: 01 03 04 00 FA 33

Device address	Function code (read)	Data length	Concentration data (Hex format, converted to float type for 0, in range units)	CRC check code
01	03	04	00 00 00 00	FA 33

(2) Set the calibration concentration

Send: 01 10 10 50 00 02 04 00 00 A8 41 84 A3

Device address	Function code (write)	Register address	Data length	Calibration concentration data (21%, modifiable)	CRC check code
01	10	10 50	04	00 00 A8 41	84 A3

Reply: 01 10 10 50 00 02 45 19

Device address	Function code (write)	Register address	Number of registers	CRC check code
01	10	10 50	00 02	45 19

(3) Zero

Send: 01 10 11 01 00 01 02 01 00 57 10

Device address	Function code (write)	Register address	Number of registers	Data length	Data: 1	CRC check code
01	10	11 01	00 01	02	01 00	57 10

Re: AA 55 for success, BB 66 for failure

Maintenance

The laser gas analysis module has been calibrated at zero point and range before delivery, and no calibration is required for the first use. However, with the aging of electronic devices, the system parameters will drift, which will affect the accuracy of instrument measurement. Therefore, the product needs to be calibrated periodically, and it is recommended to calibrate once every 3 to 6 months.

Zero setting: Fill in the zero gas, and execute the zero setting command after the measured value is stable.

During calibration: set the calibration concentration as the standard gas concentration, introduce the standard gas, and execute the calibration command after the measured value is stable. During the normal use of the instrument, the maintenance work mainly includes:

It is necessary to regularly check whether the sample gas flow meets the use requirements; Check whether the system temperature has abnormal alarm information.