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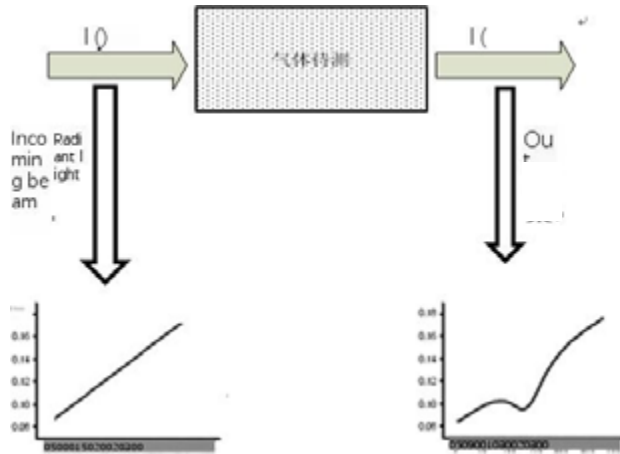
Operating Instructions for Laser Methane Gas Analysis Module

I. Product Introduction

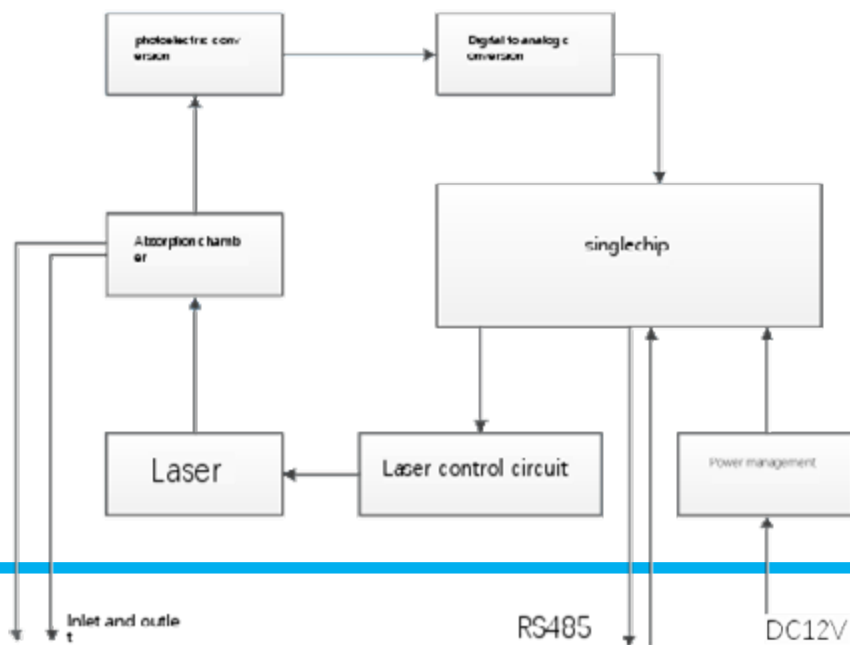
Laser methane gas analysis module is a new generation of ultra-high precision methane gas detection product developed by our company, which is suitable for coal mine, chemical industry and other industries. Based on the principle of laser spectral absorption, the module has the characteristics of high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



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



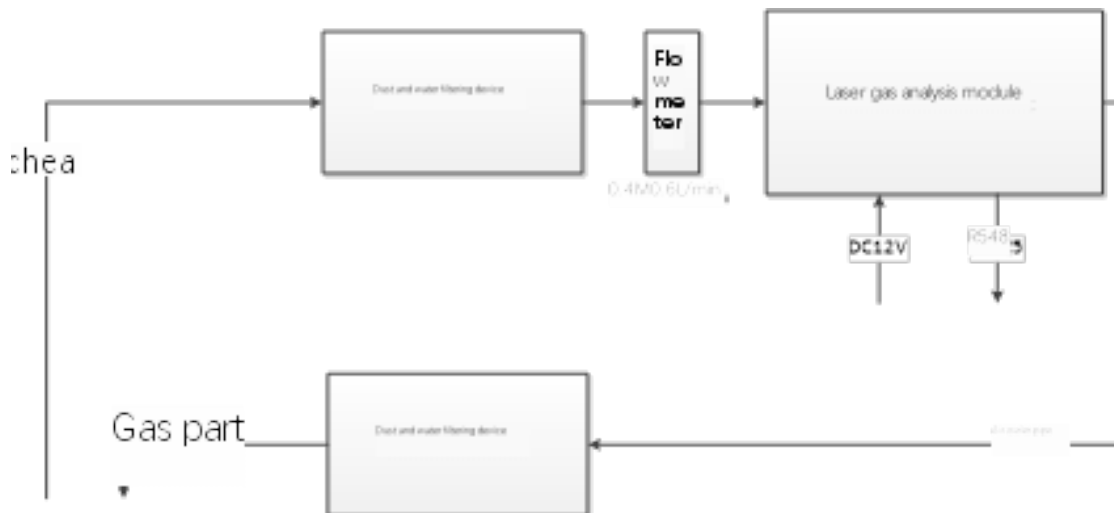
II. Principle block diagram



III. Main Technical Indexes

Technical indicators	
Detect gas	Methane (CH ₄)
Sampling mode	Pump suction type
Sensor type	Laser spectral absorption
Detection range	0-100PPM
Measurement error	±2%F.S
Resolution	0.1PPM
Response Time (T ₉₀)	≤1s
Output signal	RS485
Ventilation flow	0.4~0.6L/min
Enclosure material	Sheet metal
Size of air pipe interface	4/6mm (PTFE)
Supply voltage	12V ± 1V, current > 500mA
Operating current	Normal operation: not more than 200mA
	Impact current: not more than 300mA
Weight of complete machine	2kg
Size	230mm X 170mm X 75mm (L X W X H)

IV. 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.

V. Circuit connection

The module has its own four-core cable, which is configured with four colors and shall be connected according to the following table:

Port	Red	Brown	Blue	Yellow
Explain	V _{DC}	GND	RS485-A	RS485-B

VI. Communication protocol

1. Asynchronous serial communication setting:

Baud rate:
9600 Data
bits: 8
Check bit:
No stop
bit: 1

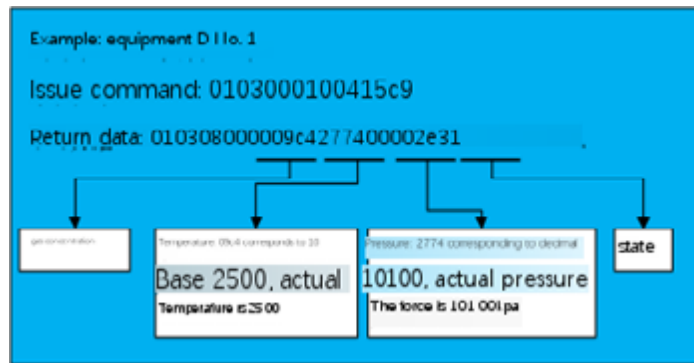
2. Obtain real-time data

① Real-time data request command:

Request	Device ID	Function Code	Register start address		Register unit length		CRC check	
	id	03	00	01	00	04	crcl	crch

② Real-time data response command

Answer			
ID number	1 byte	Device ID	
Function Code	1 byte	0x03	
Number of data	1 byte	0x08	
Concentration	2 bytes	High 8 bits	Data/100
		Lower 8 bits	
Temperature	2 bytes	High 8 bits	Data/100
		Lower 8 bits	
Pressure	2 bytes	High 8 bits	Data/100
		Lower 8 bits	
Status	2 bytes	High 8 bits	0: Normal Other: Malfunction
		Lower 8 bits	
CRC	2 bytes	Lower 8 bits	
		High 8 bits	



3. CRC verification method

```

/*****
*Pchmsg data header address to be verified
*Wdatalen number of data to be verified
*****/
u16 CRC_16( u8 pchMsg, u16 wDataLen)
{
    u16 wCRCTalbeAbs[]={ 0x0000, 0xCC01, 0xD801, 0x1400, 0xF001, 0x3C00,
                        0x2800, 0xE401, 0xA001, 0x6C00, 0x7800, 0xB401, 0x5000, 0x9C01, 0x8801,
                        0x4400
                    };

    u16 wCRC=0xFFFF;
    u16i;
    u8 chChar;
    for(i=0; i< wDataLen; i++)
    {
        chChar= pchMsg[i];
        wCRC=(u16)(wCRCTalbeAbs[(chChar ^wCRC)& 15]^(wCRC4);
        wCRC=(u16)(wCRCTalbeAbs[(chChar>4)wCRC]& 15]^());
    }
    return wCRC;
}

```

VII. Maintenance

- a) The laser methane gas analysis module does not need to be calibrated in normal use.
- b) In case of abnormal working state, please contact the manufacturer, and do not disassemble and repair without authorization.
- c) When not in use, the air inlet and outlet can be connected together by a pipe to prevent dust from entering.
- d) The instrument should be placed in a place where there is no obvious vibration, so as not to damage the internal components.