激光 H2S 气体分析模块使用手册 V3.0

Manual for TDLAS Gas Sensing Module (H2S)

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手册适用产品：激光 TDLAS 全系列产品

The manual is applicable for all products of TDLAS series

使用手册 Manual V3.0

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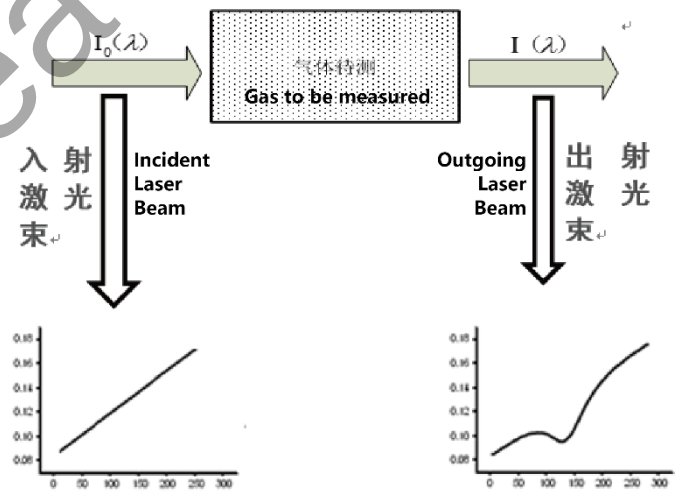
一、产品介绍 General Introduction

激光 H2S 气体分析模块是我公司研发的新一代超高精度 H2S 气体检测产品。该模块采用激光光谱吸收原理，具有测量精度高、应用范围广、响应时间短、内部有温度补偿、交叉干扰补偿、稳定性好、使用寿命长等特点，可实现 H2S 气体浓度的连续检测。该模块具有 RS485 通信接口，采用 Modbus 通信协议。

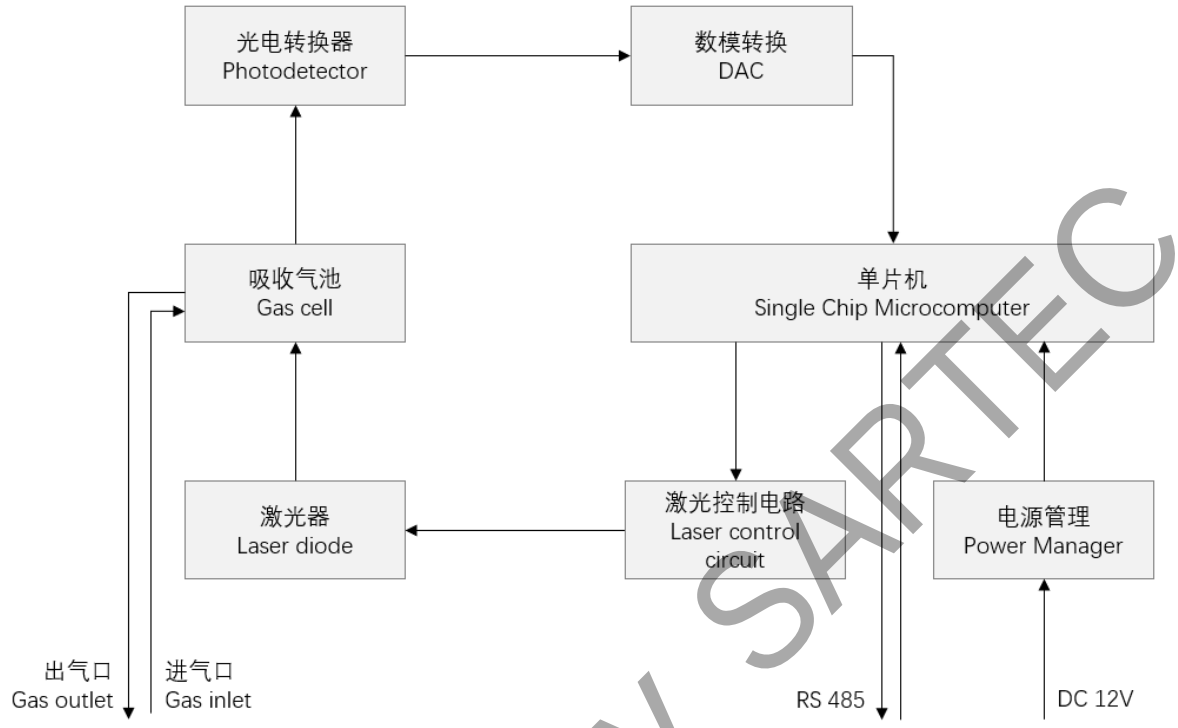
本产品采用可调谐二极管激光器作为检测光源，通过调制激光器注入电流，使激光波长周期性地扫描，覆盖 H2S 气体的特征吸收谱线。工作状态下，激光信号被 H2S 气体所吸收，通过激光吸收光谱的强弱变化即可准确反演出 H2S 气体的浓度值。如图下图：

This module is a TDLAS gas sensing module for H2S detection. It is a new generation of ultra precision H2S gas detection product developed by our company. The module adopts the principle of Tunable Diode Laser Absorption Spectroscopy (TDLAS), and meanwhile it has the characteristics of high measurement accuracy, wide range of application, short response time, high stability, long service life, integrated with internal temperature compensation and cross interference compensation, etc. Continuous detection of H2S gas concentration could be realized conclusively. The module is assembled with RS485 connector and adopts Modbus Protocol.

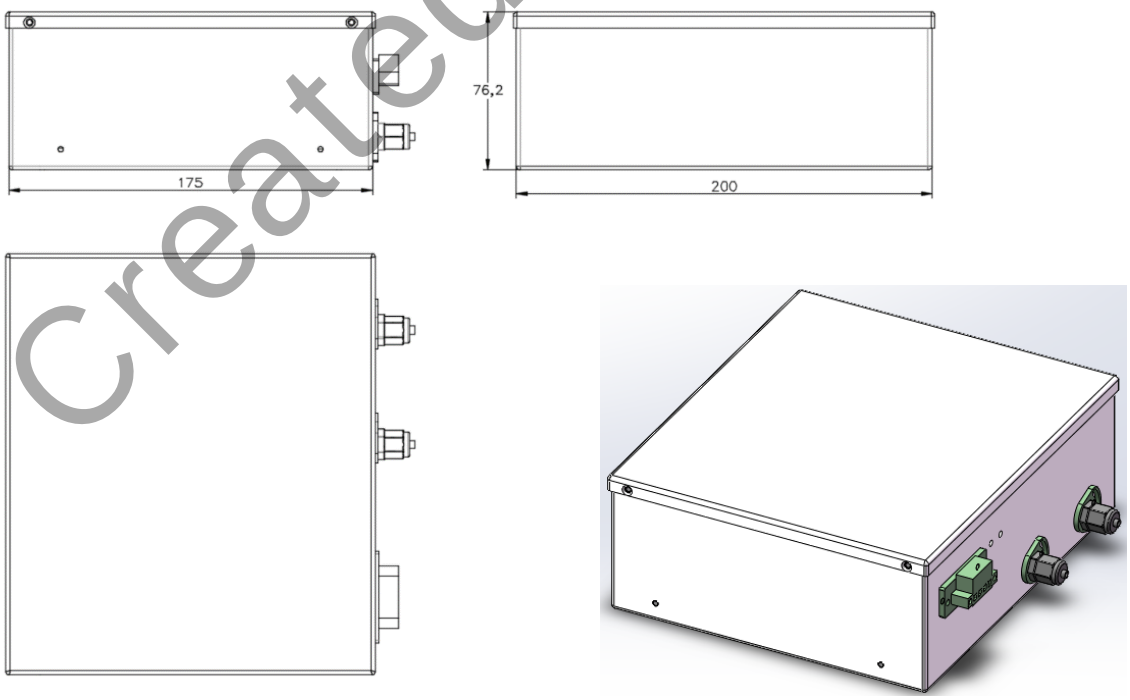
This product uses a tunable diode laser as the light source for H2S detection. By modulating the driving current, the laser scans periodically, and its wavelength covers the characteristic absorption spectrum of methane.. When working, the laser signal is absorbed by methane, and the concentration value of methane can be accurately inversed by the intensity change of the laser absorption spectrum. As shown in the figure below:



二、原理框图 Functional Block Diagram



三、结构尺寸 Dimensional drawing



SIZE：200mm X 175mm X 76mm （* Please prevail in kind）

四、主要技术指标 Main Specifications

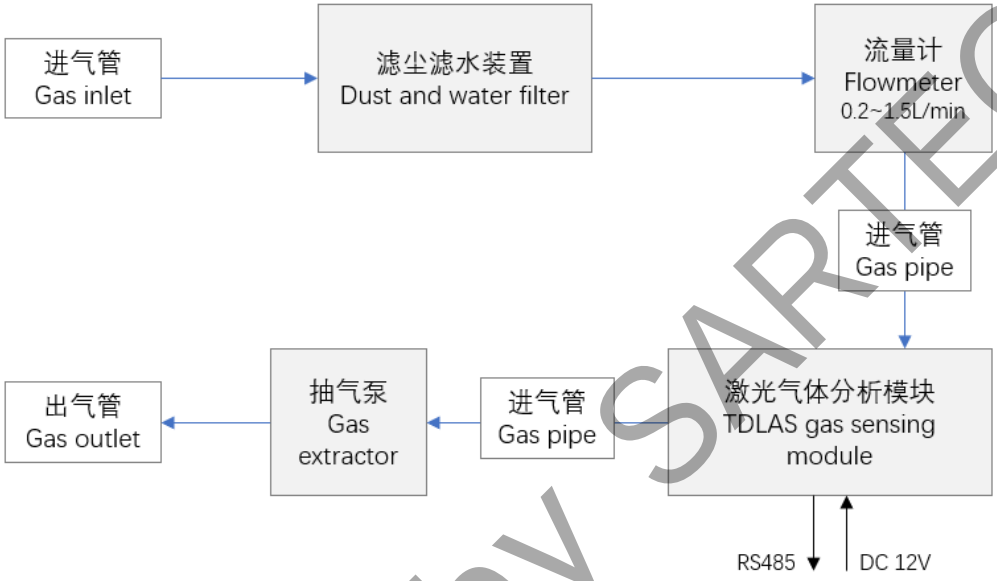
技术指标 Technical Specification	
检测气体 Target gas	硫化氢 Hydrothion（H2S）
采样方式 Gas supply	流动式 Flow
检测原理 Principle of measurement	激光光谱吸收 TDLAS
检测范围 Measuring range	0-200ppm （资料仅展示低量程指标，满量程≥200ppm 时均可提供） 0-200ppm（or F.S.≥200ppm）
线性度 Linearity:	≤±1%F.S.
重复性 Repeatability:	≤±1%F.S.
量程漂移 Span drift	≤±2%F.S./6 months
检测下限 Detection limit	2 ppm
响应时间 Response time (T_{90})	≤30s
通讯方式 Communication connection	RS485
通讯协议 Communication protocol	Modbus
通气流量 Suggested gas flow	1~5 L/min
样气 Sample gas	无油、无水汽、无颗粒物，干燥气体 dust/moisture/oil free
外壳材料 Housing material	钣金 Metal plate
气管接口尺寸 Gas pipe connector	4/6mm（PTFE ）
供电电压 Operating voltage	12v±1v
尺寸 Dimension[1]	200mm (L) x 175mm (W) x 76mm (H)

*1. Product in kind prevail, specifications maybe change without notice..

五、气路连接 Gas circuit connection

气体必须经过充分的处理，确保无水汽、无颗粒物，气体干燥。在使用过程中请按照进气口和出气口的标识通入气体，若按照相反方向通气将有可能对模块产生不可修复的损坏。请确保滤尘滤水装置处于正常使用状态。仪器放置在无明显震动的水平面上，模块预热 1min 后，按照通信协议，获取实时数据。

The gas must be adequately filtered to ensure that there is no water vapor, no particles and dry. Please follow the signs of the air inlet and the air outlet during use. If the gas is ventilated in the opposite direction, it may cause irreparable damage to the module. Please ensure that the dust and water filtering device is in normal operating condition. The module should be placed on a horizontal plane without obvious vibration. After the warming up for 1min, real-time data could be acquired operating according to the communication protocol.



六、电路连接 Electric circuit connection

模块自带四芯电缆，配置有四种颜色，应按照下表进行连接：

Four-core cable with cable cores in four different colors is provided, which should be connected according to the following table:

端口 Color	红 Red	棕 Brown	蓝 Blue	黄 Yellow
说明 Function	V_{DC}	GND	RS485-A	RS485-B

七、通讯协议 Communication protocol

1、异步串行通讯设置 / Asynchronous serial communication settings：

☐ 波特率 / Baud Rate：9600

☐ 数据位 / Date Bit：8

☐ 校验位 / Parity：无

☐ 停止位 / Stop Bit：1

2、获取实时数据 / Get real-time data

①实时数据请求命令 / Real time data request command：

请求指令 / Request instruction	ID	功能码 / Function code	寄存器起始地址 / Register start address		寄存器单元长度 / Register unit length		CRC	
	id	03	00	01	00	04	crcl	crch

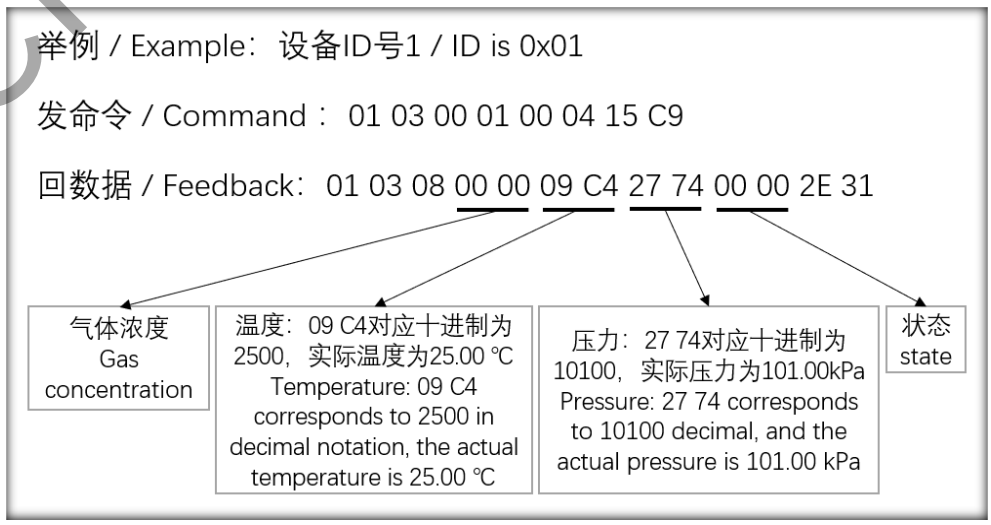
②实时数据应答命令 / Real time data response command：

应答			
ID	1 bit	0x01	
功能码 / Function code	1 bit	0x03	
数据数量 / Number of data	1bit	0x08	
浓度 / Concentration	2 bits	High 8 bits Low 8 bits	Data/100
温度 / Temperature	2 bits	High 8 bits Low 8 bits	Data /100
压力 / Pressure	2 bits	High 8 bits Low 8 bits	Data /100
状态 / State	2 bits	High 8 bits Low 8 bits	0: OK Else：Fault
CRC	2 bits	High 8 bits Low 8 bits	

举例 / Example：设备ID号1 / ID is 0x01

发命令 / Command： 01 03 00 01 00 04 15 C9

回数据 / Feedback：01 03 08 00 00 09 C4 27 74 00 00 2E 31

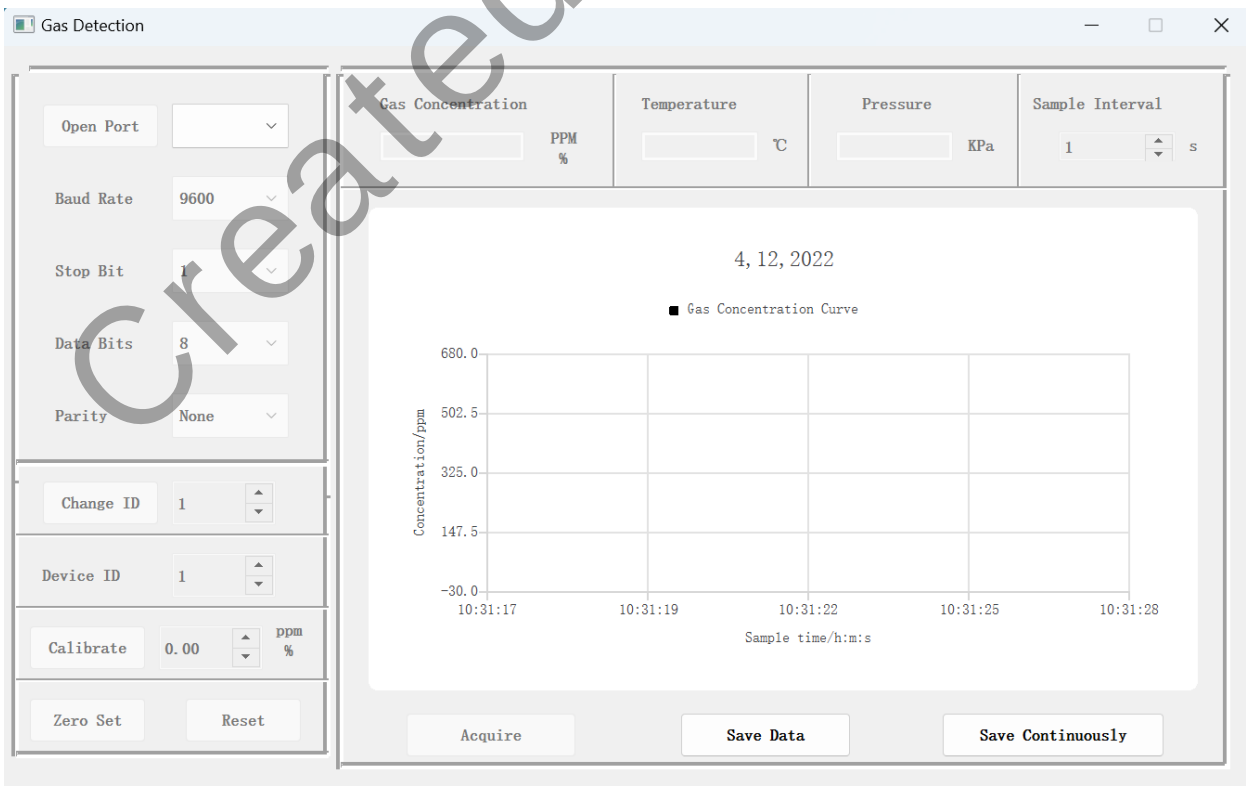


3、CRC 校验方法 / CRC calibration method

```
/*********************************************************************************
* pchMsg：需要校验的数据首地址
* wDataLen：需要校验的数据数量
*********************************************************************************/
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;
            u16 i;
            u8 chChar;
            for (i = 0; i < wDataLen; i++)
            {
               chChar = pchMsg[i];
               wCRC = (u16)(wCRCTalbeAbs[(chChar ^ wCRC) & 15] ^ (wCRC >> 4));
               wCRC = (u16)(wCRCTalbeAbs[((chChar >> 4) ^ wCRC) & 15] ^ (wCRC >> 4));
            }
            return wCRC;
}
```

八、软件界面 Software interface



九、保养及维护 General maintenance

a) 激光 H2S 气体分析模块正常使用状态下，无需标校。

b) 出现工作状态异常时，请联系厂家，不可擅自拆卸维修。

c) 未使用状态下，可将进气口与出气口通过一条管路连接在一起，以免进入灰尘。

d) 仪器应放置在无明显震动的地方适用，以免损坏内部器件。

a) Calibration is not required when the TDLAS gas sensing module is in normal operating condition.

b) In case of abnormal working conditions, please contact the manufacturer and do not disassemble and repair without the technical guidance.

c) When not in use, the gas inlet and outlet can be connected together through a pipeline to avoid dust.

d) The module shall be placed in a place without obvious vibration to avoid damage to internal components.

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