



# Stox Smart Gas Sensor Device RS485 Modbus-RTU

—— User Communication Protocol ——

This document details the RS485 Modbus-RTU Communication Mode of the Stox Smart Gas Sensor Device and the user requirements for the operation of this product.

Please refer to the Technical Specifications for the detailed electrical parameters of the product.

Before using the Communication Protocol, please read the product’s instruction manual carefully to better understand and use the product.

## » Summary

The Stox Smart Sensor Device has a RS485 Modbus-RTU output and the power supply range is 12~24V DC., which is mainly used for continuous monitoring of the gas concentration. Through the instructions of the protocol of the Stox Smart Gas Sensor Device and the PC, PLC or other devices, the system can achieve effective data transmission. Asynchronous semi-duplex response communication via the serial port is adopted, i.e. the lower computer does not actively send the data to the upper computer, instead it sends it only after receiving the command sent by the upper computer.

## » Configuration Parameters

Baud rate	Data bit	Stop bit	Check bit
9600	8 bit	1 bit	Modbus-CRC16

### The device adopts the RS485 Communication Mode

Communication protocol: Modbus-RTU

Factory default address: 01

Data reading and writing time interval requirements: >=1s

The master-slave data transmission mode is adopted. Each data transmission is sent by the host command and the slave transmits the corresponding data according to the instructions.

## » Modifying the Modbus Address

If the product address number needs to be modified, the address of a single product must be modified one by one. Multiple product addresses cannot be modified at the same time. Modify the Modbus address using a series of (two) special instructions. Two instructions must be sent in sequence, with an intermediate interval of > = 1s

Range: 01 (0x01) <= addr <= 247 (0xF7), out of the range value, the default is 01 (0x01).

Example:

TX:

Data										Address
0x80	0x72	0x65	0x70	0x6F	0x6C	0x65	0x76	0x65	0x44	0x01

RX:

Data										Address
0xFF	0x72	0x65	0x70	0x6F	0x6C	0x65	0x76	0x65	0x44	0x01

## » Gas Concentration Unit Code Table

The concentration unit type of the product can be identified by reading the measured gas concentration unit value in the Holding Register.

Schedule 1:

Value (HEX)	0x02	0x04	0x08
Unit	ppm	ppb	%vol.

## » Device Type Code Table

The device types configured on the current product can be identified by reading the gas type values in the Holding Register. Device type value table:

Schedule 2:

Sensor type	HCHO	VOC	CO	Cl <sub>2</sub>	H <sub>2</sub>	H <sub>2</sub> S	HCl	HCN	HF	NH <sub>3</sub>	NO <sub>2</sub>	O <sub>2</sub>	O <sub>3</sub>	SO <sub>2</sub>
Value (HEX)	0x17	0x18	0x19	0x1A	0x1B	0x1C	0x1D	0x1E	0x1F	0x20	0x21	0x22	0x23	0x24
Sensor type	HBr	Br <sub>2</sub>	F <sub>2</sub>	PH <sub>3</sub>	AsH <sub>3</sub>	SiH <sub>4</sub>	GeH <sub>4</sub>	B <sub>2</sub> H <sub>6</sub>	BF <sub>3</sub>	WF <sub>6</sub>	SiF <sub>4</sub>	XeF <sub>2</sub>	TiF <sub>4</sub>	
Value (HEX)	0x25	0x26	0x27	0x28	0x29	0x2A	0x2B	0x2C	0x2D	0x2E	0x2F	0x30	0x31	

## » Obtaining the Device Measurement Parameters

This group address is used for the output gas concentration, temperature, humidity, range, unit and sensor type. The following information cannot be obtained when the device address is not set correctly.

Holding Register			
Address	Data definition	Data type (Big Endian)	R/W
0x2000	Gas concentration value	float	R
0x2001			
0x2002	Temperature (including 2 decimal places)	int16	R
0x2003	Humidity (including 2 decimal places)	uint16	R
0x2004	Range	uint16	R
0x2005	Unit (see attached Schedule 1 for specific mapping)	uint8	R
	Sensor type (see Schedule 2 for specific mapping)	uint8	R
0x2006	Unit (see attached Schedule 1 for specific mapping)	uint16	R
0x2007	Sensor type (see Schedule 2 for specific mapping)	uint16	R
0x2008	0: The sensor is functioning normal 2: Replacement of the sensor is recommended 1: The sensor must be replaced	uint16	R

Note: R (Read) /W (Write)

## » Obtaining All Data Samples

### TX:

0x01, 0x03, 0x20, 0x00, 0x00, 0x09, 0x8E, 0x0C

Read the values of the Holding Register 0x2000 to 0x2008

### RX:

byte[0], byte[1], byte[2], byte[3], byte[4], byte[5], byte[6], byte[7], byte[8], byte[9], byte[10], byte[11], byte[12], byte[13], byte[14],  
byte[15], byte[16], byte[17], byte[18], byte[19], byte[20], byte[21], byte[22]

### Received Data Resolution:

byte [0]: Address

byte [1]: Function code

byte [2]: Valid data bytes

byte [3], byte [4], byte [5], byte [6]: Concentration values, float type

Calculating the concentration values during the test can refer to:

[http://www.binaryconvert.com/convert\\_float.html](http://www.binaryconvert.com/convert_float.html)

The language is available for language conversionC:

```
typedef union {  
    float data;  
    uint32_t uint32_data;  
    uint8_t uint8_data[4];  
}FLOAT_DATA_U;
```

byte [7], byte [8]: Temperature, 16-bit signed shaping

byte[7]<<8|byte[8], Contains 2-bit decimal

byte [9], byte [10]: Humidity, a 16-bit unsigned integer shape

byte[9]<<8|byte[10], Contains 2-bit decimal

byte [11], byte [12]: Maximum range, with a 16-bit unsigned integer shape

byte[11]<<8|byte[12]

byte [13]: Unit, 8-digit unsigned plastic surgery, Schedule 1

byte [14]: Sensor Type, 8-bit Unsigned Plastic, Schedule 2

byte [15], byte [16]: Unit (as byte [13], for convenient register resolution only)

byte [17], byte [18]: Sensor type (as byte [14], for convenient register resolution only)

byte [19], byte [20]: Sensor status

byte [21], byte [22]: modbus-crc check code

## » User Instruction Function Overview

### Device Calibration

Note: R (Read) /W (Write)

Holding Register			
Address	Data definition	Data type (Big Endian)	R/W
0x3000	Write to the calibration concentration value	float	W
0x3001			
0x3010	Restore the factory calibration settings 1: Restore the factory settings Others: do no operation	uint16	W

Note: If the customer has no calibration environment or the calibration information is different, the factory setting can be restored and our standard calibration data can be used. (User calibration data will be erased after factory reset)

### Reading of the Device Software Version Number and the Sensor Serial Number

Holding Register			
Address	Data definition	Data type (Big Endian)	R/W
0x3020	Device Software Version No.	HEX	R
0x3021			
0x3022			
0x3030	Sensor serial number In a total of 6 bytes, The high byte of the address 0x2030 is 0x00	HEX	R
0x3031			
0x3032			

### Current Calibration

Holding Register			
Address	Data definition	Data type (Big Endian)	R/W
0x3040	Force output current 0: Turn off the forced output current 1: Forced output of 4mA current 2: Forced output of 20mA current Others: do no operation	uint16	W
0x3041	Write the current current value with the forced output of 4mA current. (The writing is invalid if the forced output current is turned off)	float	W
0x3042			
0x3043	The current value with forced 20mA current is written. (The writing is invalid if the forced output current is turned off)	float	W
0x3044			
0x3045	4 ~ 20mA output restores factory settings	uint16	W

Parameters of the Reading Device

Read sensor real-time data (provide non-inhibitory concentration values for desired customers)			
Address	Data definition	Data type (Big Endian)	R/W
0x3060	Concentration value (no inhibitory concentration value)	float	R
0x3061			
0x3062	Temperature (including 2 decimal places)	int16	R
0x3063	Humidity (including 2 decimal places)	uint16	R
0x3064	Range	uint16	R
0x3065	Unit	uint8	R
	Sensor type	uint8	R
0x3066	Unit	uint16	R
0x3067	Sensor type	uint16	R
0x3068	Sensor fault code	uint16	R

Note: The concentration value (no inhibitory concentration value) will be negative because the zero point change causes a negative concentration value. Our upper computer software has suppressed the concentration value so that the upper computer will display a non-negative concentration value.

**For example:**

Multiple register writes:

Write to a calibration concentration value of 50

0x01 0x10 0x30 0x00 0x00 0x02 0x04 0x42 0x48 0x00 0x00 CRC\_L CRC\_H

Single register writes:

Write to restore the factory settings

0x01 0x06 0x30 0x10 0x00 0x01 CRC\_L CRC\_H



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