

## SC AIS 5580 8 Channel Analog Input to Modbus Converter User Manual

### Overview

SC AIS 5580 converter is used for collecting analog data input. There are 8 channels analog data differential input, each channel has independent 8 adjustable span range. The analog input resolution can be as high as 24-bit. It supports RS-485 / MODBUS-RTU protocol. SCM controls the ADC conversion circuit, data processing, & the communication. The input ports and the output ports are Magnetic Isolated to avoid the impact of interference, greatly improving the reliability.

### Features

Input channel	: 8 channel differential input
Protocol	: MODBUS-RTU
Baudrate	: 1200/2400/4800/9600/19200/38400/57600/115200 bps
Data format	: 1, 8, N, 1
Physical address	: 1 to 247
Communication	: RS485
Sampling frequency	: 8Hz
Accuracy	: $\pm 5\%$
Zero drift	: $20\mu\text{V}/^\circ\text{C}$
Span drift	: $25\text{ppm}/^\circ\text{C}$
Resolution	: 24-bit AD sampling
Common-mode rejection	: 120dB
Span	: $\pm 10\text{V}/\pm 5\text{V}/\pm 20\text{mA} / \pm 1\text{V}/\pm 500\text{mV}/\pm 150\text{mV}$ it needs to connect with external $125\Omega \pm 1\%$ /1W resistance when testing the current
Input impedance	: Voltage $10\text{M}\Omega$ , current $125\Omega$
Isolated voltage	: 2500VDC
Over-voltage protection	: 240Vrms
Operating voltage	: 12-24V DC $\pm 20\%$
Operating current	: $\leq 110\text{mA}@12\text{V}$
Power consumption	: $\leq 1.3\text{W}$
Operating temperature	: -20 to $+75^\circ\text{C}$
Storage temperature	: -40 to $+85^\circ\text{C}$
Operating humidity	: 5 to 95%
Indicators	
PWR	: Red, Power indicator. ON when power on.
TXD	: Green, TXD indicator. ON when the converter is transmitting data.
RXD	: Yellow, RXD indicator. ON when the converter is receiving data.

### Pin information

Vin5+ 1	20 Vin0+
Vin5-	Vin0-
Vin6+	Vin1+
Vin6-	Vin1-
Vin7+	Vin2+
INIT*/Vin7-	Vin2-
DATA+	Vin3+
DATA-	Vin3-
+VCC	Vin4+
GND 10	11 Vin4-

### PIN assignment

PIN name	PIN type	Description	PIN name	PIN type	Description
+VCC	POWER	Positive	Vin3+	I	Channel 3+
GND	POWER	Negative	Vin3-	I	Channel 3-
DATA+	I/O	RS485- A	Vin4+	I	Channel 4+
DATA-	I/O	RS485- B	Vin4-	I	Channel 4-
Vin0+	I	Channel 0+	Vin5+	I	Channel 5+
Vin0-	I	Channel 0-	Vin5-	I	Channel 5-
Vin1+	I	Channel 1+	Vin6+	I	Channel 6+
Vin1-	I	Channel 1-	Vin6-	I	Channel 6-
Vin2+	I	Channel 2+	Vin7+	I	Channel 7+
Vin2-	I	Channel 2-	Vin7-	I	Channel 7-

### Code information

#### Baudrate setting

Code	Baudrate (bps)
0x00	1200 (None)
0x01	2400 (None)
0x02	4800 (None)
0x03	9600 (None)
0x04	19200 (None)
0x05	38400 (None)
0x06	57600 (None)
0x07	115200 (None)

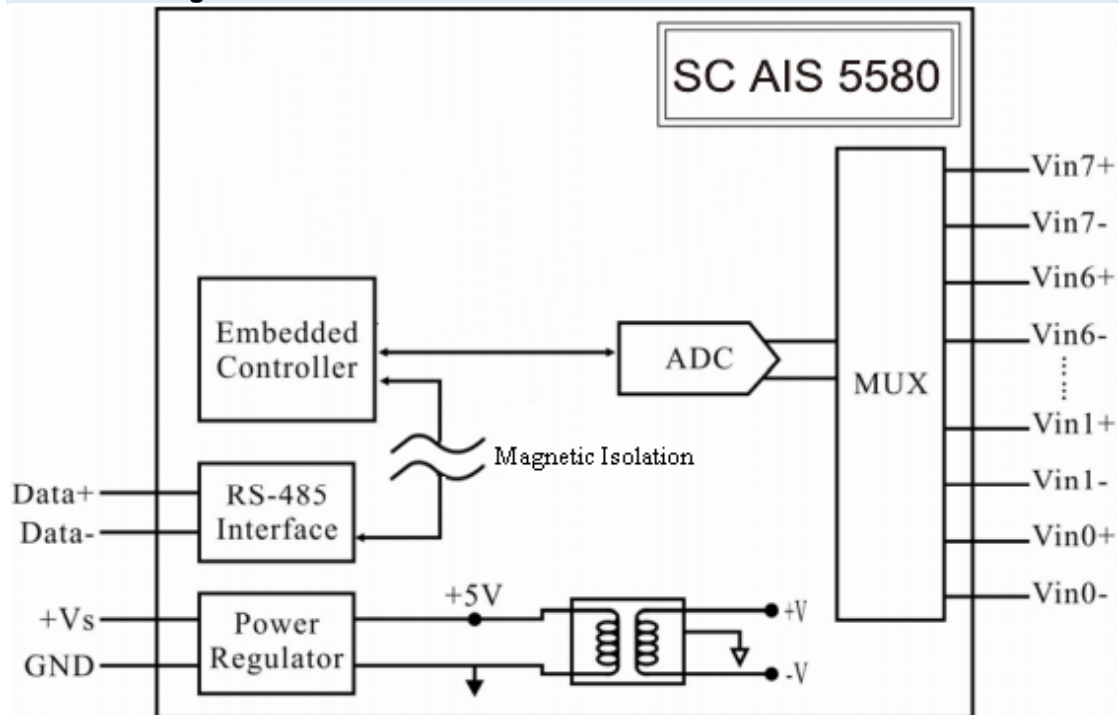
### Analog input type

Code type	Input type (range)
0x01	±10V
0x02	±5V
0x03	±20mA
0x04	±1V
0x05	±500mV
0x06	±150mV

### Feature

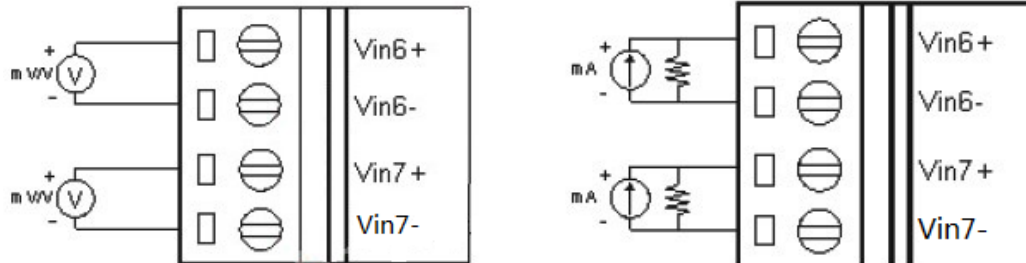
Physical address	01
Protocol	MODBUS
Data format	8, N, 1
Baudrate	9600 bps
Channel 0	differential input, ±10V
Channel 1	differential input, ±10V
Channel 2	differential input, ±10V
Channel 3	differential input, ±10V
Channel 4	differential input, ±10V
Channel 5	differential input, ±10V
Channel 6	differential input, ±10V
Channel 7	differential input, ±10V

### Schematic diagram



### Connection

#### Differential voltage/current input



### Communication protocol

Modbus is the protocol developed by MODICON in 1979. It is a standard, open-structure. It is widely used in industrial automation. This converter supports standard MODBUS-RTU command: 0x03, 0x04, 0x06, 0x10.

### Data register

Register address	Description
40001	Channel 0 high 16-bit
40002	Channel 0 low 16-bit
40003	Channel 1 high 16-bit
40004	Channel 1 low 16-bit
40005	Channel 2 high 16-bit
40006	Channel 2 low 16-bit
40007	Channel 3 high 16-bit
40008	Channel 3 low 16-bit
40009	Channel 4 high 16-bit
40010	Channel 4 low 16-bit
40011	Channel 5 high 16-bit
40012	Channel 5 low 16-bit
40013	Channel 6 high 16-bit
40014	Channel 6 low 16-bit
40015	Channel 7 high 16-bit
40016	Channel 7 low 16-bit

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**Register setting**

Register address	Description
30001	Channel 0 range span
30002	Channel 1 range span
30003	Channel 2 range span
30004	Channel 3 range span
30005	Channel 4 range span
30006	Channel 5 range span
30007	Channel 6 range span
30008	Channel 7 range span

**Note : Span description: 1 : ±10V, 2 : ±5V, 3 : ±20mA, 4 : ±1V, 5 : ±500mV, 6 : ±150mV**

Register address	Description
35001	Device address
35002	Baudrate

**Remarks:**

Device address range 0 to 247

Baudrate

- 0: 1200
- 1: 2400
- 2: 4800
- 3: 9600
- 4: 19200
- 5: 38400
- 6: 57600
- 7: 115200

**Modify baud rate and the device address:**

1. Please send 01 46 46 54 4D 30 30 2D 04, so as to switch to communication mode
2. Send 01(fixed) 46 46 54 4F XX XX 3Y 30 32 30 32 LRC 04 set device address and band rate.  
**XX XX:** device address 01(30 31); 02(30 32)..09(30 39); 0A(30 41)..A0(41 30)...F7(46 37)  
**Y:** Baud rate 30(1200); 31(2400); 32(4800; 33(9600); 34(19200); 35(38400); 36(57600); 37(115200)

LRC checking algorithm is as below:

```
uint8_t LRC(uint8_t *str,uint16_t len)
{
    uint8_t uchLRC = 0x00;
    uint16_t index;

    for (index = 0; index < len; index++)
    {
        uchLRC += str[index];
    }

    if ((uchLRC & 0x7F) <= 0x20)
    {
        uchLRC += 0x20;
    }
    uchLRC &= 0x7F;

    return uchLRC;
}
```

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}  
Checking content: 46 46 54 4F XX XX 3Y 30 32 30 32

3. Send 01 46 46 54 4D 30 31 2E 04, switch to MODBUS communication mode.

#### **Modify each channel range**

Use modbus 0x10 function code, write the range into 0x0000-0x0007 register.

#### **EXAMPLES for above changes**

Setup:

Open Docklight with 9600 baud rate 8, N, 1  
Send below frames to SC AIS 5580.

#### **To Enter into Communication mode**

Send 01 46 46 54 4D 30 30 2D 04

#### **Change device ID from 1 to 2 :**

Send 01 46 46 54 4F 30 32 33 30 32 30 32 LRC 04

LRC calculation

$46+46+54+4F+30+32+33+30+32+30+32 = 288H$

$288 H \& 0x7F = 0x8$

As  $(288 \& 7f) \leq 0x20$

So  $LRC = LRC+0x20 = 0x8+0x20 = 0x28$

$LRC = LRC+0x7F$

$LRC = 0x28 \& 0x7F = 0x28$

So send 01 46 46 54 4F 30 32 33 30 32 30 32 28 04 to change device ID from 1 to 2

#### **Change baud rate to 115200 for Device ID 2:**

Send 01 46 46 54 4F 30 32 37 30 32 30 32 LRC 04

LRC calculation

$46+46+54+4F+30+32+37+30+32+30+32 = 28CH$

$28C H \& 0x7F = 0xC$

As  $(28C \& 7f) \leq 0x20$

So  $LRC = LRC+0x20 = 0xC+0x20 = 0x2C$

$LRC = LRC+0x7F$

$LRC = 0x2C \& 0x7F = 0x2C$

So send 01 46 46 54 4F 30 32 37 30 32 30 32 2C 04 to change baud rate to 115200

#### **Change Channel 1 code type to 0x03**

Use function code 0x10 .

Send Query-02 10 00 00 00 01 02 00 03 F2 A1

Response- 02 10 00 00 00 01 01 FA

Code type of channel 1 is changed to 0x03

#### **Switch to MODBUS communication mode**

Send 01 46 46 54 4D 30 31 2E 04