Bus signal to analog display control isolation transmitter

RS232/485 isolated conversion 4-20mA display control module: ISO DA (LED1)

Features

- Low-cost, small-volume modular design, can be paired with ISO 4021
- RS485 or RS232 digital quantity is isolated and converted into standard analog signal output
- Data output results are displayed by LED digital tube in two modes
- The output accuracy of analog signal is better than 0.2%
- The output accuracy of the calibration module can be programmed
- Isolation between signal output and communication interface withstand voltage 3000VDC
- Wide power supply range: 8 ~ 50VDC
- High reliability, convenient programming, easy installation and wiring
- User programmable setting of module address, baud rate, etc.
- It can be set as a host to read ISO 4021 product data to realize remote collection
- Support Modbus RTU communication protocol

Typical application

- Digital quantity isolation is converted to standard analog quantity output
- Intelligent building control, security engineering and other application systems
- RS232/RS485 bus industrial automation control system
- Industrial field control signal isolation and long-term transmission
- Equipment operation debugging and control
- Remote transmission of sensor signal and signal restoration
- Industrial field actuator data given
- Development of electrical equipment, medical equipment, industrial control products
- PLC, DCS signal remote measurement, monitoring and control

Summarize：

ISO DA (LED1) series products can realize host RS485 or RS232 interface signal isolation and conversion into standard analog signals to control remote equipment. And can display the output analog signal value in real time. The product can be applied to the RS232/RS485 bus industrial automation control system to convert the computer serial communication signal into 4-20mA (0-10V) and other standard analog signal output, which is used to control the executive equipment, instrumentation, PLC/DCS/ FCS/PCC etc.

Products include power isolation, signal isolation, linearization, D/A conversion, display and RS485 serial communication. Each serial port can connect up to 256 ISODA series modules. The communication method adopts ASCII code communication protocol or Modbus RTU communication protocol. Its instruction set is compatible with ADAM modules. The baud rate can be set by code and can be linked to the control modules of other manufacturers. On the RS485 bus, it is convenient for computer programming.

ISO DA (LED1) is an intelligent monitoring and control system based on a single-chip microcomputer. All configuration information such as the calibration value, address, baud rate, data format, and checksum status set by the user are stored in the non-volatile memory EEPROM . The product is designed and manufactured according to industrial standards, and can withstand 3000VDC isolation voltage between the signal output and the communication interface, with strong anti-interference ability and high reliability. Operating temperature range-25℃～+70℃.

Principle block diagram
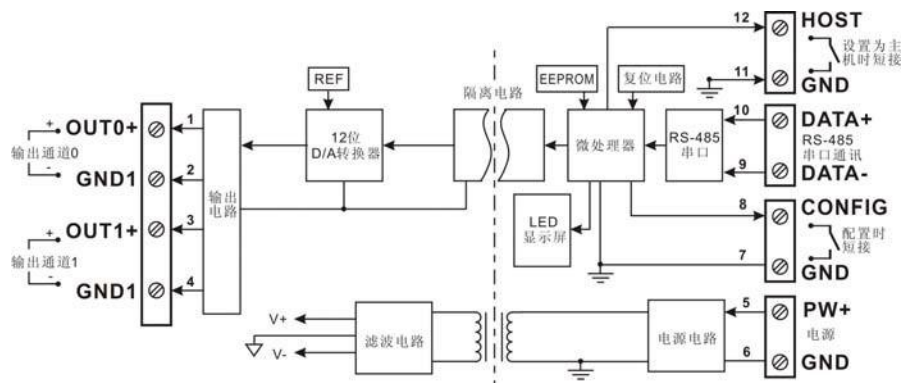
Introduction to ISO DA (LED1) function

The ISO DA (LED1) signal isolation D/A conversion module can be used to output one voltage or current signal, and can also be used to output two current or voltage signals that can share the ground, and can display the output analog signal value in real time.

Analog signal output

12-bit output accuracy, all signal output ranges have been calibrated before the product leaves the factory. When in use, users can also easily program and calibrate by themselves. Please refer to the product selection for the specific current or voltage output range. When outputting two signals, the two output selections must be the same.

Protocol

Communication interface: 1 standard RS485 communication interface or 1 standard RS232 communication interface. Please indicate the communication method when ordering and selecting.
Communication protocol: supports two protocols, the character protocol defined by the command set and the Modbus RTU communication protocol. Which communication protocol can be used by programming

It can realize network communication with various brands of PLC, RTU or computer monitoring system.

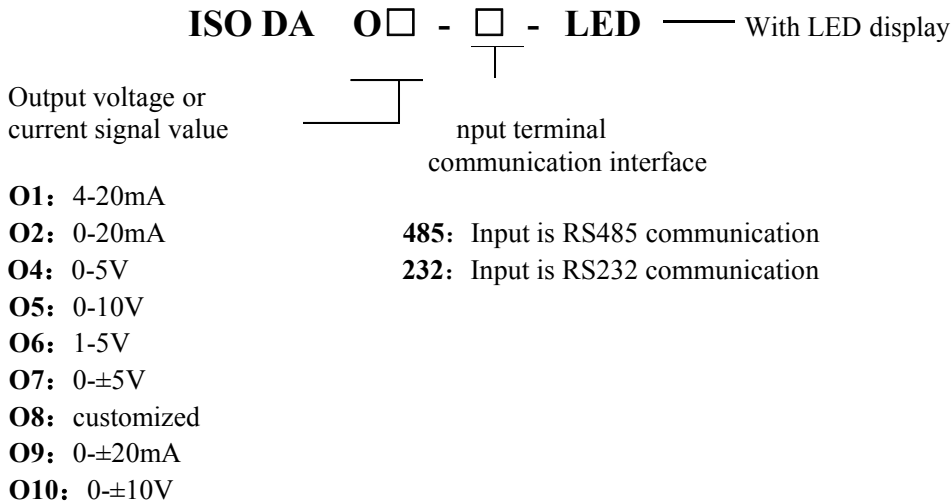Data format: 10 bits. 1 start bit, 8 data bits, 1 stop bit.

The communication address (0～255) and baud rate (300, 600, 1200, 2400, 4800, 9600, 19200, 38400bps) can be set; the longest distance of the communication network can reach 1200 meters, connected by twisted pair shielded cable.

The communication interface has a high anti-interference design, ±15KV ESD protection, and the communication response time is less than 100mS.

Anti-interference

The checksum can be set as required. There are transient suppression diodes inside the module, which can effectively suppress various surge pulses, protect the module, and the internal digital filter can also suppress the power frequency interference from the power grid.

Product model number:

ISO DA O□ - □ - LED ——— With LED display

Output voltage or
current signal value

nput terminal
communication interface

O1：4-20mA

O2：0-20mA   **485**：Input is RS485 communication

O4：0-5V   **232**：Input is RS232 communication

O5：0-10V

O6：1-5V

O7：0-±5V

O8：customized

O9：0-±20mA

O10：0-±10V

Selection example 1. Model: ISO DA O1 -485 LED; indicates 4-20mA signal output, input is RS485 communication, with LED display.
Selection example 2. Model: ISO DA O4 -232 LED; means 0-5V signal output, input is RS232 communication, with LED display.
Selection example 3. Model: ISO DA O7 -232 LED; indicates 0-±5V signal output, input is RS232 communication, with LED display.

General parameters

(typical @ +25℃，Vs为24VDC)

Output type: current output / voltage output

accuracy: 0.2%

Output offset: current output ±0.5 uA/℃, voltage output ±0.1 mV/℃

temperature drift: ±20 ppm/℃ (±30 ppm/℃, maximum)

Output load capacity: current output 350Ω (4-20mA/0-20mA/0-±20mA current output)

Voltage output 10mA (0-5V/0-10V/0-±5V voltage output)

Communication: Protocol RS-485 or RS-232 standard character protocol and MODBUS RTU communication protocol

Baud rate (300, 600, 1200, 2400, 4800, 9600, 19200, 38400bps) can be selected by software,

address (0～255) can be selected by software

Communication response time: 100 ms max
Working power supply: +8 ~ 50 VDC wide power supply range, internal anti-reverse connection and overvoltage protection circuit Power consumption: less than 1.5W
Working temperature:-45 ~ +80℃
Working humidity: 10 ~ 90% (non-condensing)
Storage temperature:-45 ~ +80℃
Storage humidity: 10 ~ 95% (no condensation)
Isolation withstand voltage: between communication interface / output: 3KVDC, 1 minute, leakage current 1mA
The communication interface and the power supply share the same ground. Impulse withstand voltage: 3KVAC, 1.2/50us (peak value)
Dimensions: 83 mm x 37 mm x 51mm

Dimensions and pin description

Pin	Name	Description
1	OUT0+	Output channel 0 positive terminal
2	GND1	Output channel 0 negative terminal
3	OUT1+	Output channel 1 positive terminal
4	GND1	Output channel 1 negative terminal
5	PW+	Power positive terminal
6	GND	Power negative terminal
7	GND	Power negative terminal
8	CONFIG	Initial state setting
9	DATA-	RS-485 signal negative terminal
10	DATA+	RS-485 signal positive terminal
11	GND	Power negative terminal
12	HOST	Set as host

Typical application diagram

ISODA -U(A) -(LED1)

顶视图

ISODA -U(A) -(LED1)

顶视图

RS-232接口
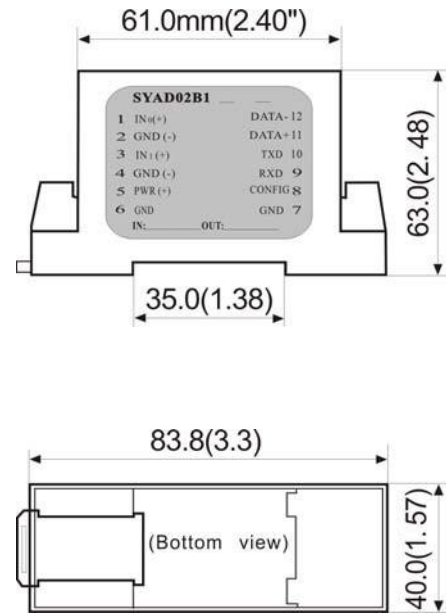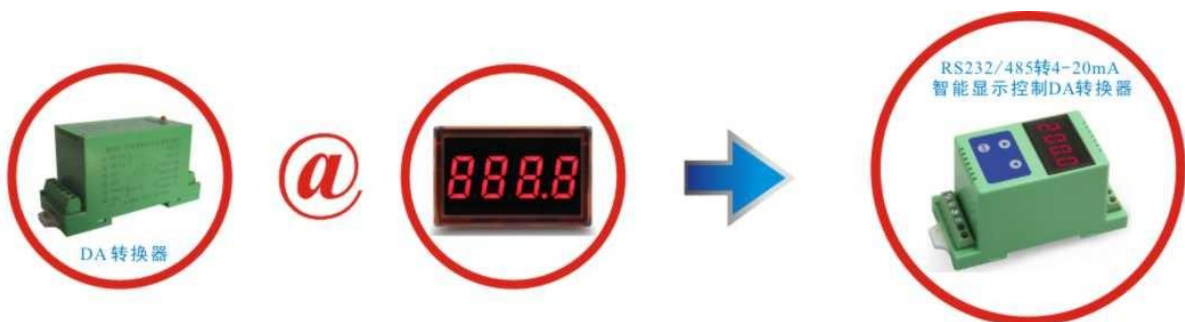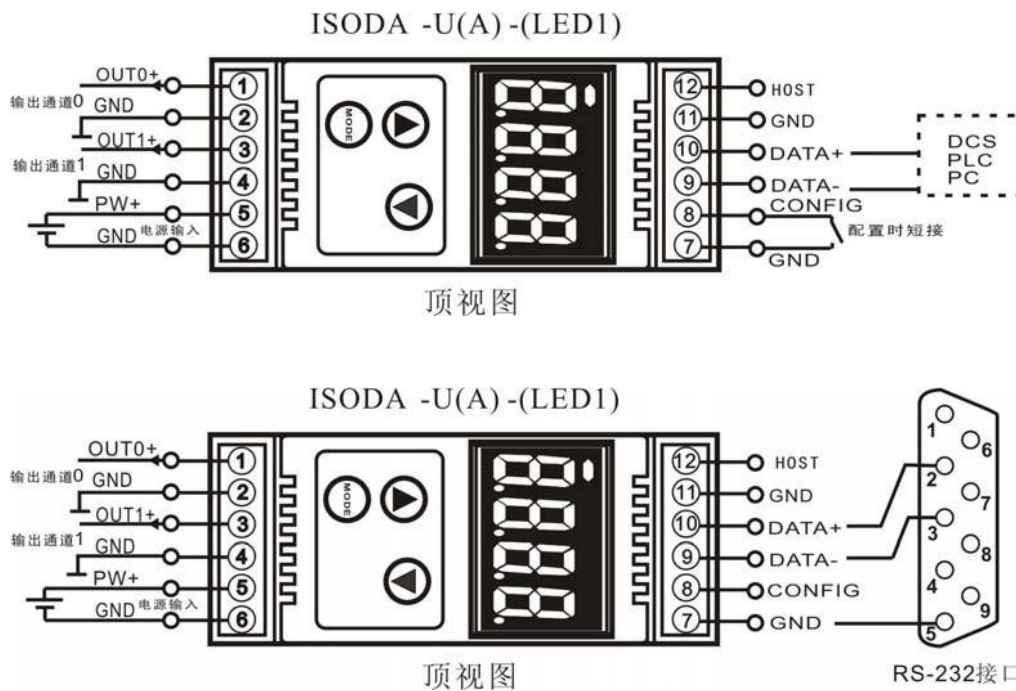
RS232转4-20MA
数字转模拟DA转换器 ＋ 智能化数显表 ＝ RS232/485转4-20mA
显示控制智能转换器

Initialize the ISO DA module

All ISO DA modules, if using RS485 network, must be assigned a unique address code, the address code value is hexadecimal number 00 And FF. However, all brand new ISO DA modules use a factory's initial settings, as shown below: The address code is 01

Baud rate 9600 bps

Prohibit checksum

Since the address codes of the new modules are the same, their addresses will conflict with other modules, so when you build the system, you must reconfigure the address of each analog output module. After connecting the ISODA module power line and RS485 communication line, you can modify the ISODA module address through configuration commands. The baud rate, checksum status, and communication protocol also need to be adjusted according to user requirements. Before modifying the baud rate, checksum status, and communication protocol, the module must first enter the default state, otherwise it cannot be modified.

How to make the module enter the default state

The ISO DA module has a special pin labeled CONFIG. Short-circuit the CONFIG pin to the ground wire (GND pin), and then turn on the power. At this time, the module enters the default state. In this state, the configuration of the module is as follows:

Address code is 00

Baud rate 9600 bps

Prohibit checksum

At this time, you can modify the ISODA module's baud rate, checksum status and other parameters through the configuration command, and select the communication protocol by setting the module's communication protocol command. When you are not sure about the specific configuration of a certain module, you can also install the configuration jumper to make the module enter the default state, and then reconfigure the module. If the user needs to set the module to the MODBUS RTU communication protocol, please refer to the relevant instructions in the MODBUS communication protocol chapter.

Instructions on the use of LED digital tube display

ISO DA-LED is a digital to analog output module with display, which displays the output analog voltage or current value through four LED digital tubes, which is convenient for users to view the current output value. If the display is not needed, the user can turn off the display by pressing the MODE key. After the display is turned on, two display modes are used, namely single-channel display and multi-channel circular display.

The display data format is: channel number, symbol mark, 3 data bits; data bits are divided into integer and decimal parts, separated by decimal points. The first digit from the left is the channel number (1-2). The channel number is followed by a decimal point as a sign bit. The decimal point lights up to indicate that the current data is positive, and if the decimal point is off, it means that the current data is negative. The last 3 digits are the decimal value of the output data.

Display mode

Switch the display mode through the mode switch button (MODE button). After pressing the mode button, the LED briefly displays C1 to indicate that the current mode is single-channel display mode, and briefly displays C2 to indicate that the current mode is multi-channel cyclic display mode.

C1: Single channel display. In this mode, the LED only displays the output value of one channel at a time (the channel number indicates which channel data is displayed). The two channel switching buttons below the mode key switch the display channel, and the left button is pressed , The displayed channel number is increased by one; after the right button is pressed, the displayed channel number is decreased by one.

C2: Multi-channel cyclic display. In this mode, the LED displays the output value of each channel in a fixed time interval. If you need to switch the display mode or turn off the display, just press the MODE button.

ISO DA command set

The command consists of a series of characters, such as the first code, address ID, variables, optional checksum byte and a terminator (cr) to display the command. The host only commands one ISODA module at a time, except for the synchronization command with the wildcard address "**".

Command format: (Leading Code)(Addr)(Command)[data][checksum](cr)

(Leading code) The first code is the first letter in the command. All commands need a command prefix, such as %,$,#,@,... etc. **1-character (Addr)**

The address code of the module, if not specified below, the value range is 00～FF (hexadecimal). **2- Character**

(Command) shows the command code or variable value. **Variable length**

[data] Some data needed for output commands. **Variable length**

[checksum] Checksum (checksum) in parentheses shows optional parameters. This option is only required when checksum is enabled. **2- characters**

(cr) A control code character used for identification, (cr) is used as a carriage return terminator, and its value is 0x0D. **1- character**

When checksum (checksum) is enabled, [Checksum] is required. It occupies 2-characters. Both commands and responses must be accompanied by a checksum feature. Checksum is used to check all input commands to help you find host-to-module command errors and module-to-host response errors. The checksum character is placed after the command or response character and before the carriage return character.

Calculation method: Two characters, hexadecimal number, are the sum of the ASCII code values of all the characters sent before, and then the hexadecimal number 0xFF is ANDed.

Application example: disable checksum (checksum)
user command $002(cr)
Module response   !00020600 (cr)
Enable checksum (checksum)
user command $002B6 (cr)
Module response   !00020600 A9 (cr)
 '$' = 0x24 '0' = 0x30 '2' = 0x32 B6=(0x24+0x30+0x30+0x32) AND 0xFF

 '!' = 0x21 '0' = 0x30 '2' = 0x32 '6' = 0x36 A9=(0x21+0x30+0x30+0x30+0x32+0x30+0x36+0x30+0x30) AND 0xFF

Commonly used commands:

1. Set the analog output value command of channel N
2. Set the analog output value command after power-on or reset of channel N
3. Configure the analog output module command
4. Read configuration status
5. Offset calibration
6. Full scale calibration
7. Read module name
8. The analog output value readback command of channel N
9. Set the communication protocol command

Command response:
The response information depends on various commands. The response also consists of several characters, including the first code, variables, and end identifier. There are two first codes of response signal, '!' or '>' means valid command and '?' means invalid. By checking the response information, you can monitor whether the command is valid

Note: 1. In some cases, many commands use the same command syntax. Make sure that the address you use is correct in a command. If you use the wrong address, and this address represents another module, the command will take effect in the other module, and an error will occur.
2. The command must be entered in uppercase letters.

1、Set the analog output value command of channel N

Explanation: Set the analog output value of channel N of the analog output module in the currently configured data format.
Command syntax: #AAN(data)(cr)
Parameter description: # delimiter.
                        AA   Module address, the value range is 00～FF (hexadecimal).
                        N   channel code 0 or 1
                        (data) Represents the analog output data of channel N to be set. The data format can be engineering units, percentage of FSR, hexadecimal complement. For details, see Article 3 of the Command Set.
                        (cr) Terminator, host computer enter key (0DH).

Response syntax: >(cr)   command is valid.
                    ?AA(cr)   command is invalid or illegal operation.
Parameter description: > Delimiter.
                        (cr) Terminator, host computer enter key (0DH).
Other instructions: If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command #230+04.632(cr)
                     Module response >(cr)
Explanation: Set the output value of channel 0 on the module with address 23H to +04.632mA (data format is engineering unit).

2、Set the analog output value command after power-on or reset of channel N

Explanation: Use the currently configured data format to set the analog output value of channel N of the analog output module when it is powered on.
Command syntax: #AASN(data)(cr)
Parameter description: # delimiter.
                        AA Module address, the value range is 00～FF (hexadecimal). S means to set the analog output value after power-on or reset.
                        N channel code 0 or 1
                        (data) represents the analog data output after the channel N to be set is powered on. The data format can be engineering units, percentage of FSR, hexadecimal complement. For details, see Article 3 of the Command Set.

(cr) Terminator, host computer enter key (0DH).

Response syntax: **＞(cr)** command is valid.

?AA(cr) command is invalid or illegal operation.

Parameter description:＞ Delimiter.

(cr) Terminator, host computer enter key (0DH).

Other instructions: If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command **#23S0+04.000(cr)**

Module response >**(cr)**

Explanation: Set the power-on output value of channel 0 on the module with address 23H to +04.000mA (the data format is in engineering units).

3、Configure analog output module commands

Explanation: Set the address, output range, baud rate, data format, checksum status for an analog output module. The configuration information is stored in the non-volatile memory EEPROM.

Command syntax: %AANNTTCCFF(cr)

Parameter description:% delimiter.

AA   Module address, the value range is 00～FF (hexadecimal).

NN   represents the hexadecimal address of the new module, and the value NN ranges from 00 to FF.

TT   uses hexadecimal to represent the type code. ISODA products must be set to 00.

CC   represents the baud rate code in hexadecimal.

Table 2. Baud rate codes

Baud rate code	Baud rate
01	300 baud
02	600 baud
03	1200 baud
04	2400 baud
05	4800 baud
06	9600 baud
07	19200 baud
08	38400 baud

FF   Use 8 hexadecimal digits to represent the data format and checksum. Note that bits2 to bits5 do not have to be set to zero.

Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0

3. Data format, checksum code

Bit7: reserved bit, must be set to zero

Bit6: Checksum status, if 0: prohibit; if 1: allow

Bit5-bit2: Not used, it must be set to zero.

Bit1-bit0: Data format bits.

00: Engineering Units 01: Percentage of full scale (% of FSR) 10: Twos complement

11: Ohm (ohms) (only thermal resistance products can be set)

(cr)   Terminator, host computer enter key (0DH).

Response syntax: !AA(cr)   command is valid.

?AA(cr)   command is invalid or illegal operation, or the configuration jumper is not installed before changing the baud rate or checksum.

Parameter description: !   Delimiter, which means the command is valid.

?   Delimiter, indicating that the command is invalid.

AA   stands for module address

(cr)   Terminator, host computer enter key (0DH).

Other instructions: If you configure the module for the first time, AA=00 and NN is equal to the new address. If the reconfiguration module changes the address, output range, and data format, AA is equal to the currently configured address, and NN is equal to the current or new address. If you want to reconfigure the module to change the baud rate or checksum status, you must install a configuration jumper to make the module enter the default state. At this time, the module address is 00H, that is, AA=00H, and NN is equal to the current or new address.

If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command   **%0011000600(cr)**

                              Module response   **!11(cr)**

Explanation: % delimiter.

                  00 means that the original address of the analog output module you want to configure is 00H.

                  11 means that the hexadecimal address of the new module is 11H.

                  00 type code, ISODA product must be set to 00.

                  06 means the baud rate is 9600 baud.

                  00 indicates that the data format is engineering units, and checksums are prohibited.

4、Read configuration status command

Explanation: Read the configuration of a specified analog output module.

Command syntax: **$AA2(cr)**

Parameter description: **$**   delimiter.

                     AA   Module address, the value range is 00～FF (hexadecimal).

                     2   Indicates read configuration status command

                    (cr)   Terminator, host computer enter key (0DH).

Response syntax: **!AATTCCFF(cr)**   command is valid.

                 ?AA(cr)   command is invalid or illegal operation. Parameter description:! Delimiter.

               AA   stands for the module address.

               TT   stands for type code.

               CC   stands for baud rate coding. See table 3

               FF   see Table 4

               (cr)   Terminator, host computer enter key (0DH).

Other instructions: If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command   **$302(cr)**

                          Module response   **!300F0600(cr)**

Explanation: !   Delimiter.

                  30   means that the address of the analog output module is 30H.

                  00   represents the output type code.

                  06   means the baud rate is 9600 baud.

                  00   indicates that the data format is engineering units, and checksums are prohibited.

5、Offset calibration command

Explanation: The zero offset of the output value of channel N of the calibration module.

Command syntax: **$AA1N(cr)**

Parameter description: **$**   delimiter.

                     AA   Module address, the value range is 00～FF (hexadecimal).

                     1   indicates the offset calibration command.

                     N   channel code 0～1

                    (cr)   Terminator, host computer enter key (0DH).

Response syntax: **! AA (cr)**   command is valid.

                 ?AA(cr)   command is invalid or illegal operation.

Parameter description: **!**   Delimiter, which means the command is valid.

                    ?   Delimiter, indicating that the command is invalid.

                  AA   stands for module address

                  (cr)   Terminator, host computer enter key (0DH).

Other instructions: The product has been calibrated when it leaves the factory, and the user can use it without calibration directly .

                    When calibrating an analog output module, calibrate the offset command first, and then calibrate the gain.

                    During calibration, the analog output module needs to be connected to the channel to be calibrated to monitor the output signal of a multimeter, set the analog output through the first command of the command set, adjust to the zero point value of the output signal displayed in the multimeter, and then enter the calibration For the offset command, please refer to the calibration module chapter for the specific calibration method.

                    If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command   **$2310(cr)**

Module response   **!23(cr)**

Explanation: Perform offset calibration on channel 0 of module address 23H.

6、Gain calibration command

Description: Calibrate the full-scale gain of the output value of channel N of the module.

Command syntax: **$AA0N(cr)**

Parameter description: **$**   delimiter.

AA Module address, the value range is 00～FF (hexadecimal).

0   means gain calibration command.

N   channel code 0～1

(cr) Terminator, host computer enter key (0DH).

Response syntax: **!AA(cr)**   command is valid.

?AA(cr) command is invalid or illegal operation.

Parameter description: **!** Delimiter, which means the command is valid.

? Delimiter, indicating that the command is invalid.

AA   stands for module address

(cr) Terminator, host computer enter key (0DH).

Other instructions: The product has been calibrated when it leaves the factory, and the user can use it directly without calibration.

When calibrating an analog output module, calibrate the offset first, and then calibrate the gain.

During calibration, the analog output module needs to be connected to the channel to be calibrated to monitor the output signal of a multimeter, set the analog output through the first command of the command set, adjust to the full scale value of the output signal displayed in the multimeter, and then input For the calibration gain command, please refer to the calibration module chapter for the specific calibration method.

If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command   **$2300(cr)**

Module response   **!23(cr)**

Explanation: Carry out gain calibration on channel 0 of module address 23H.

7、Read module name command

Description: Read the module name for a specified analog output module.

Command syntax: **$AAM(cr)**

Parameter description: **$** delimiter.

AA   Module address, the value range is 00～FF (hexadecimal).

M   means read module name command

(cr) Terminator, host computer enter key (0DH).

Response syntax: **!AA(ModuleName)(cr)**   command is valid.

?AA(cr) Invalid command or illegal operation Parameter description:! Delimiter, which means the command is valid.

?   Delimiter, indicating that the command is invalid.

AA   stands for the address of the output module.

(ModuleName)   The name of the module can be ISOADA08, ISODA or ISO4021, etc., which represents the model of the module you are using

(cr)   Terminator, host computer enter key (0DH).

Other instructions: If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command   **$08M(cr)**

Module response! **08ISODA (cr)**

Note: The module at address 08H is ISODA.

8、Channel N's analog output value readback command

Explanation: The analog output value of channel N of the analog output module is read back, and the output value is read back after power-on.

Command syntax: **$AADN(cr)**

Parameter description: **$**   delimiter.

AA Module address, the value range is 00～FF (hexadecimal).

D   represents the analog output value readback command.

N   channel code 0 or 1

(cr) Terminator, host computer enter key (0DH). Response syntax: !AA(data)(cr) command is valid.

Response syntax: !AA(data)(cr) command is valid.

?AA(cr) command is invalid or illegal operation.

Parameter description: ! Delimiter.

AA Module address, the value range is 00～FF (hexadecimal).

(data) Represents the analog output data of channel N read back. The data format can be engineering units, percentage of FSR, hexadecimal complement. For details, see Article 3 of the Command Set.

(cr) Terminator, host computer enter key (0DH).

Other instructions: If the syntax error or communication error or address does not exist, the module does not respond.

Application example: User command **$23D0 (cr)**

Module response **!23+04.632 (cr)**

Explanation: The current output value of channel 0 on module address 23H is +04.632mA (data format is engineering unit).

8、Set communication protocol command

9、

Note: Set the communication protocol of the module to the character protocol defined by the command set or the Modbus RTU protocol.

Command syntax: **$AAPV(cr)**

Parameter description: **$**   delimiter.

AA Module address, the value range is 00～FF (hexadecimal).

P   means to set the communication protocol command

V   protocol code, can be 0 or 1

0:   Character protocol defined by the command set 1: Modbus RTU protocol

(cr) Terminator, host computer enter key (0DH).

Response syntax: **!AA(cr)** command is valid.

?AA(cr) Invalid command or illegal operation Parameter description:! Delimiter, which means the command is valid.

?   Delimiter, indicating that the command is invalid.

AA   stands for the address of the output module.

(cr) Terminator, host computer enter key (0DH).

Other instructions: If the syntax error or communication error or address does not exist, the module does not respond. The command to set the communication protocol must be valid in the default state

Application example 1:   User command **$00P1(cr)**

Module response **!00 (cr)**

Explanation: Set the communication protocol to Modbus RTU protocol.

Application example 2: User command   *$00P0(cr)*

Module response **!00 (cr)**

Explanation: Set the communication protocol to the character protocol defined by the command set.

Output range and data format

：The analog output module uses 3 data formats:

00: Engineering Units

01: Percentage of full scale (% of FSR) 10:

Twos complement

Application examples

1、The output range is O1: 4~20mA, set the output to 4 mA, the command is as follows:

Engineering unit	User command	**#010+04.000(cr)**
Percentage of full scale	User command	**#010+020.00(cr)**
Hexadecimal complement	User command	**#010333(cr)**

2、The output range is O4: 0~5V, set the output to 3V, the command is as follows:

Engineering unit	User command	**#010+3.0000(cr)**
Percentage of full scale	User command	**#010+060.00(cr)**
Hexadecimal complement	User command	**#010999(cr)**

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Output range and data format

Output range	Data Format	Max	Min
O1：4-20mA	Engineering unit	+20.000	+04.000
	Percentage of full scale	+100.00	+020.00
	Hexadecimal complement	FFF	333
O2：0-20mA	Engineering unit	+20.000	±00.000
	Percentage of full scale	+100.00	±000.00
	Hexadecimal complement	FFF	000
O4：0-5V	Engineering unit	+5.0000	±0.0000
	Percentage of full scale	+100.00	±000.00
	Hexadecimal complement	FFF	000
O5：0-10V	Engineering unit	+10.000	±00.000
	Percentage of full scale	+100.00	±000.00
	Hexadecimal complement	FFF	000
O6：1-5V	Engineering unit	+5.0000	±1.0000
	Percentage of full scale	+100.00	±020.00
	Hexadecimal complement	FFF	333
O7：0-±5V	Engineering unit	+5.0000	-5.0000
	Percentage of full scale	+100.00	-100.00
	Hexadecimal complement	FFF	000
O8：user customized	Engineering unit	+100.00	±000.00
	Percentage of full scale	+100.00	±000.00
	Hexadecimal complement	FFF	000
O9：0-±20mA	Engineering unit	+20.000	-20.000
	Percentage of full scale	+100.00	-100.00
	Hexadecimal complement	FFF	000
O10：0-±10V	Engineering unit	+10.000	-10.000
	Percentage of full scale	+100.00	-100.00
	Hexadecimal complement	FFF	000

Calibration module

The product has been calibrated before leaving the factory, and the user can use it directly without calibration.

During use, you can also use the calibration function of the product to recalibrate the module. During calibration, the module needs to use a high-precision multimeter to monitor the output of the module.

In order to improve the calibration accuracy, it is recommended to use the following equipment to calibrate:

1. A 5 and a half or more high-precision voltage/current measuring instrument monitors the accuracy of the output signal

1. Calibration process
2. Select the output channel to be calibrated, and connect the corresponding voltage or current measuring instrument according to the output range of the module.
3. Set the analog output module to output the zero signal of the channel that needs to be calibrated, usually 0mA, 4mA or 0V. Set the analog output through the first command of the command set, and adjust it to the zero point value of the output signal displayed in the measuring instrument.
4. After the signal is stable, send the offset calibration $AA1N command to the analog output module (N represents the channel code currently being calibrated, 0 or 1).
5. Set the analog output module to output the full-scale signal of the channel to be calibrated. Set the analog output through the first command of the command set, and adjust it to the full-scale value of the output signal displayed in the measuring instrument.
6. After the signal is stable, send the gain calibration $AA0N command to the analog output module (N represents the channel code currently being calibrated, 0 or 1).
7. Calibration is complete

Modbus RTU communication protocol

The factory default protocol of the module is the character communication protocol. If you need to set the module to the Modbus RTU communication protocol, please follow the steps below:

1. Short-circuit the CONFIG pin (pin 8) and GND pin (pin 7).
2. Correctly connect the power cord and communication interface line.
3. Turn on the power, the module automatically enters the default state, the communication address is 00, and the baud rate is 9600.
4. Wait for 1 minute for the module to initialize.
5. Send the command **$00P1(cr)**, check the response, if it is **!00 (cr)**, the setting is successful.
6. Turn off the power and disconnect the connection between the CONFIG pin and the GND pin.
7. The module has been successfully set to Modbus RTU communication protocol mode.

Modbus function codes supported by the module are 03 and 06. Please refer to Table 4 for the corresponding relationship between Modbus data content and output, which is the same as when the data format of the character protocol is hexadecimal complement.

Register description:

| Address 4X	Data content	characteristic	the data shows
40001	Out0(0x0000-0x0FFF)	Read/write	Analog output value of channel 0
40002	Out1(0x0000-0x0FFF)	Read/write	Analog output value of channel 1
40003	Sout0 (0x0000-0x0FFF)	Read/write	Analog output value of channel 0 power-on
40004	Sout1 (0x0000-0x0FFF)	Read/write	Analog output value of channel 1 power-on

Table 5. Modbus RTU register description

Host mode

The ISO DA module can be set to host mode by shorting the HOST end to the GND end (ie 11 pins and 12 pins are shorted), connect to the communication interface of the ISO 4021 module, and set the ISO 4021 module to Modbus communication mode. Realize that the two-channel input signal of ISO 4021 corresponds to the output of the two output channels of the ISODA module. This mode is mainly used for digital remote transmission and restoration of analog signals, and is widely used in signal fiber transmission, GSM, CDMA wireless transmission, Ethernet transmission and other fields.

Host mode setting method:

1. When the module is not powered on, short-circuit the HOST terminal to the GND terminal (that is, short-circuit pins 11 and 12).
2. Turn on the power supply and power on the module, and the module will enter the host mode, and will continuously issue read register data commands according to the Modbus protocol.
3. Note that to enter the host mode, the CONFIG pin should not be shorted to the ground (GND pin), otherwise it will enter the default mode.
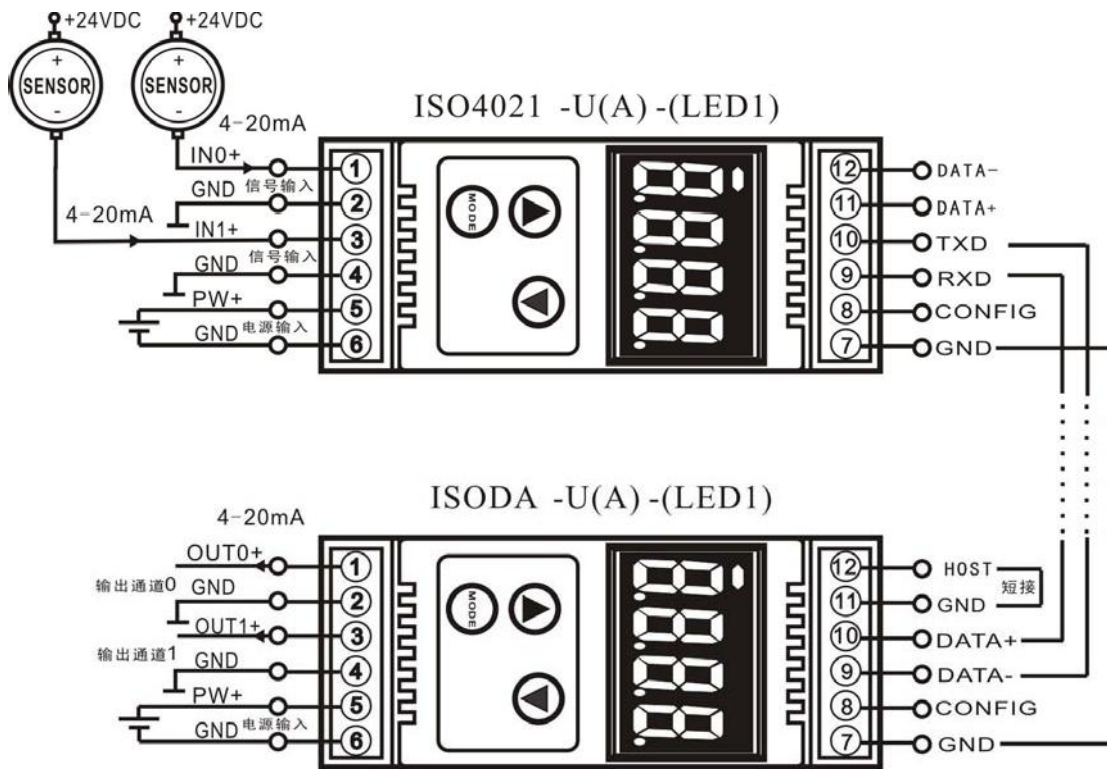
ISO 4021 (AD conversion) and ISO DA (DA conversion) connection typical application diagram
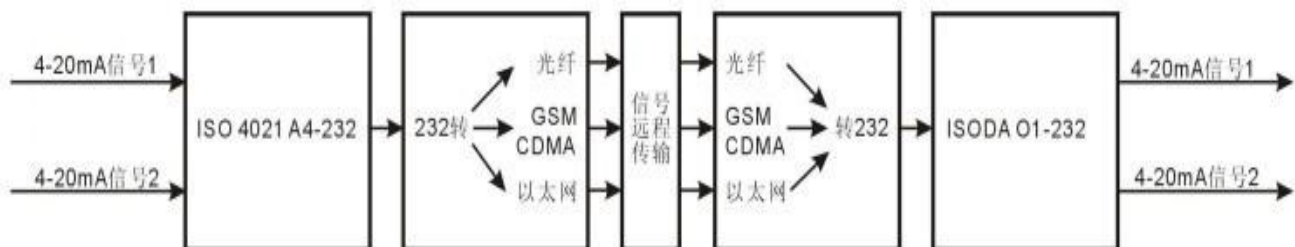
Signal remote transmission application examples
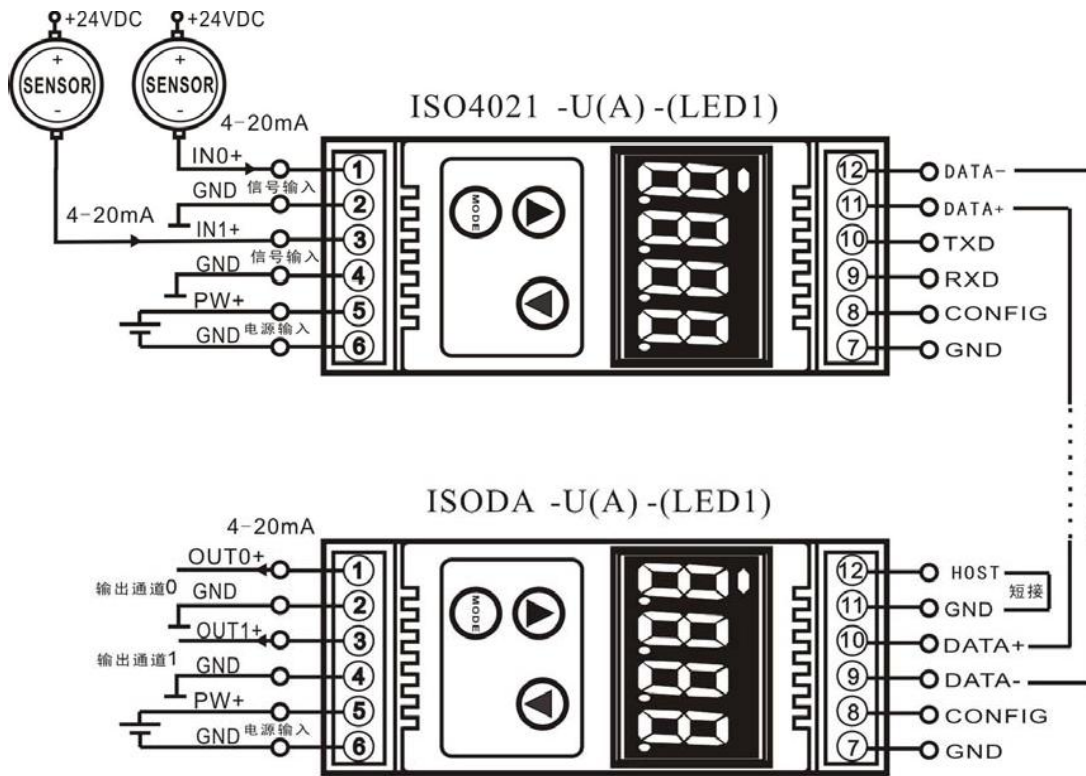
The wiring diagram of the RS485 communication mode of ISO DA and ISO 4021

The wiring diagram of the RS232 communication mode of ISO DA and ISO 4021