

ISO 4014 Series

Four-channel Analog Signal
Data Acquisition RS485/232 Output Modules

Features

- Four-channel analog signal acquisition,isolated RS-485/232 output
- Testing accuracy>0.05%
- Can be remotely reconfigured for modules accuracy
- Three-port isolation(input/output/assistant power supply): 3000VDC
- Power supply:24VDC/15VDC/12VDC/5VDC
- High reliability,easy programme,installation.
- Can programme setting module address,baud rate
- 0-5V voltage signal or 4-20mA current signal input

Applications

- Signal testing/ monitoring/ cintrol
- RS-232/485 industrial automation control system
- Industial field signal isolation
- Process Monitoring & Control
- Test sensors signal
- Laboratory Data Acquisition
- Medical machine monitoring
- 4-20mA/0-5V signal acquisition

Product Overview

ISO40xx series realizes sensor-to-host signal acquisition for testing analog signal or remote applications. Software-configurable for a wide variety of sensor types, including: analog input, analog output, and digital I/O,ISO40xx series are widely used in RS-232/485 automation control system,temperature signal testing,small signal testing, Monitoring & Control, remote data acquisition applications.

Including power supply isolation, signal isolation, linearization, A/d conversion and RS-232C/RS-485 serial communication. for up to 256 channels per serial port, ISO40xx Series modules,adopts ASCII format and MODBUS,its injunction fully encapsulated to ADAM modules,baud rate can be intercalated by code,can be used in the same RS-485 lines with other manufacturers modules,convenient for computer-programme.

ISO40xx series modules is SCM-based intelligent monitoring and control system, with all calibration,High and Low alarm, address,input ranges,baud rate,data format and linearizing parameters stored in EEPROM non-volatile memory. ISO 40xx series modules can test variety of sensor types,including thermocouple and RTD ,and other a wide variety of input ranges,different modules that need to be used in a given application and carried in inventory.

ISO40xx series modules are designed as industrial standard,three-port isolation (input/output/power supply),3000VDC isolated.Temperature range is - 45°C to +85°C.

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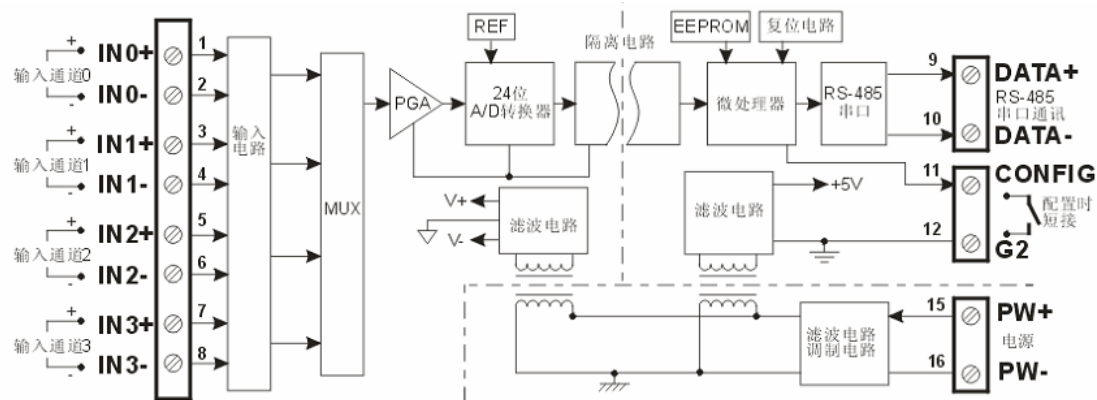


Figure 1 FUNCTIONAL BLOCK DIAGRAM

ISO 4011 Function Description

ISO 4011 is Four-channel isolated signal-conditioning modules. Accepts outputs from Thermocouple, millivolt, volt and current signals.

Analog Input Module:

24-bit accuracy, have been calibrated all signal input before ex-factor. Also, Users can programme himself when modules working. Thermocouple input break line testing, linearity compensation and cold port temperature compensation.

Communication software:

Communication Interface: Module has one standard RS-485 interface

Communication agreement: Standard ASCII, MODBUS, can make network communicate with PLC, RTU or watch software.

Data format: 10-bit, 1 start bit, 8 data bits, 1 stop bit, no parity. (N, 8, 1)

Communication address (0~255) and baud rate (300、600、1200、2400、4800、9600、19200、38400bps), Max. communication distance: 1200m, connect by both twists shielded cable. $\pm 15\text{KV}$ ESD protection, communication response time is less than 70mS.

(2-wire) Alarm signaling output:

When choose products with alarm function, output two channels switching alarm signal, they are used to high&low control and alarm.

Anti-jamming:

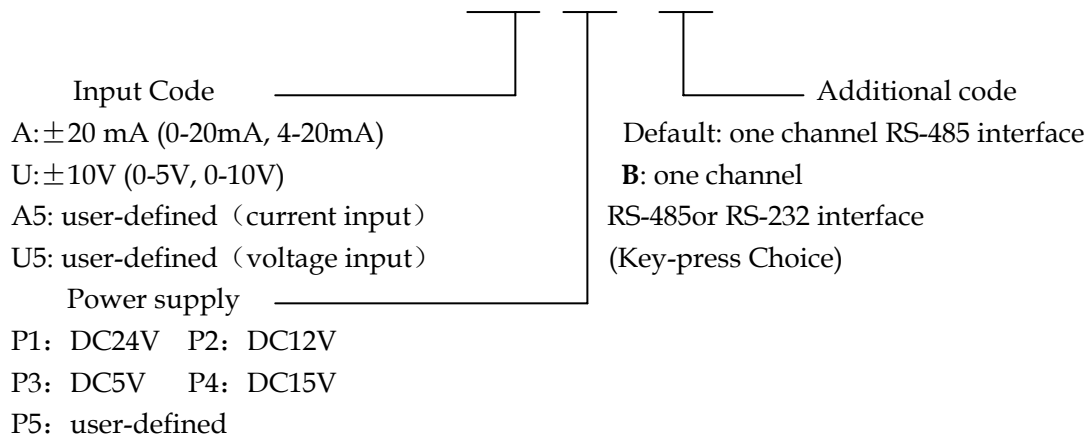
Set checksum according to need. Its inside contains MOMENTARY batediode, can Restrain surge impulse, protect modules.

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Products Choose

ISO 4014 - □ - P□ - □



ISO4014 General Parameters

(typical @ +25°C, Vs is rated value)

Inputs, Software Selectable

Input Type: current input ±20 mA,0-20mA,4-20mA

Volt Input ±10 V,0-5 V ,0-10V

Accuracy: @ +25°C refer to figure 1

Input Maladjustment: ±0.02 uV/°C

Temperature Drift: ±1 ppm/°C (±3 ppm/°C,max)

Input Resistance: current input 50 Ω

Volt Input 1 MΩ

Bandwidth: -3 dB 12.7 Hz

Conversion Speed: 15.0 Sps

Common-Mode Rejection(CMR): 120 dB (1kΩ Source Imbalance @ 50/60 Hz)

Normal Mode Rejection (NMR): 60 dB (1kΩ Source Imbalance @ 50/60 Hz)

Input port protection: ANSI/IEEE C37.90.1-1989 Momentary protection

Communications

Protocol RS-485 ASCII format、MODBUS

Baud Rates Software Selectable (300、600、1200、2400、4800、9600、19200、38400bps)

Address (0~255) Software Selectable

Synchronized Sampling Command: Yes

Response Time: 70 ms,max

Operation Power: DC5V/12V/ 15V/24V(±10%)

Power Lost: ≤1W

Operation Temperature: - 45 ~ +85°C

Operation Humidity: 10 ~ 90% (non-condensing)

StorageTemperature: - 45 ~ +85°C

Storage Humidity: 10 ~ 95% (non-condensing)

Isolation: 3KVDC,1 minute,leak current:1mA

Endure Impact Voltage: 3KVAC,1.2/50us(peak value)

Mechanical Dimensions: 101 mm x 23 mm x 116.5 mm

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ISO 4014 Specifications: typical @+25°C Vs(rated value)

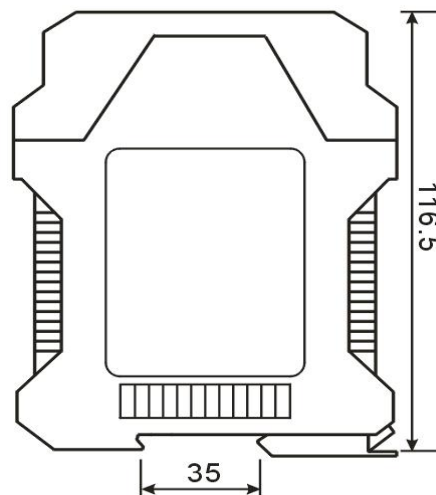
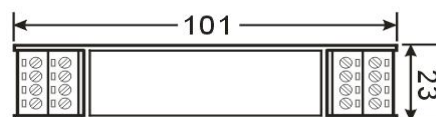
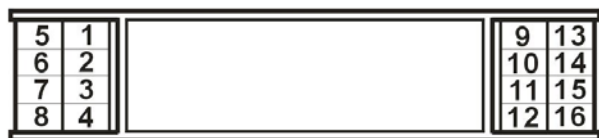
Input Range Description	Accuracy (Typical)	Accuracy (Maximum)	Noise (Peak-to-Peak)
±20 mA	±0.01 % FS	±0.03 % FS	±0.005 % FS
±10V	±0.01 % FS	±0.03 % FS	±0.005 % FS

Table 1

Footprint Function and Dimension:

Table 2

Footprint	Name	
1	Vin	+ voltage input
2	G1	Input port ground
3	Iin	+ current input
4	NC	NO Pin
5	NC	NO Pin
6	NC	NO Pin
7	NC	NO Pin
8	NC	NO Pin
9	DATA+	RS-485signal in series, + (note1)
10	DATA-	RS-485 signal in series,- (note 1)
11	CONFIG	Initializte state set
12	G2	Output port ground
13	Do0	Low alarm output (note 2)
14	Do1	High alarm output (note2)
15	PW+	Power +
16	PW-	Power -



Note 1:when output is RS-232, output connection refer to Figure 2

Wiring Diagram:

Module connecting refer to Figure 1. Broken line divides modt Into three isolated parts:Signal input,RS-485/RS-232 interface /assistant power supply.

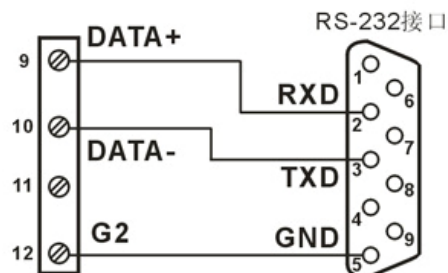


Figure 2 ISO 4014-□-P□-A and RS-232 Wiring Diagram

RS-232 Interface

When part No. is ISO 4014-P-B, user can choose RS-485 output or RS-232 output by internal keyswitch. Open product's coping, may see two button switching in the board, all aren't pressed is RS-485 output, two pressed is RS-232 output. When choose RS-232 output, please refer to Figure 9, 10, 12 separately connects to RS-232 interface RXD, TXD, GND.

Initialization ISO 40xx Module

All ISO 40xx modules use RS-485 network, must distribute a only one address, between 00 and FF (hexadecimal), but, all new ISO 40xx modules use a factory initialization set. As follows:

Address: 00 (hexadecimal)

Baud rate: 9600 bps

Checksum: disabled

Because address codes of new module are the same, their address will conflict to other modules, you must reconfigured every analog input address when you configure system. You can amend ISO40xx address by set command, after connecting ISO40xx power line and RS485.

Baud rate, checksum state also need been adjusted according to users' need. You must

install leap line before you amend baud rate, checksum state. All ISO40xx modules have a Pin mark with CONFIG. connect CONFIG Pin to ground (G2 pin), then connect power supply, this time they are in listening mode. Its set is as follows:

Address :00

Baud rate 9600 bps

Checksum: disabled

Command

Every command is used of a series characters, such as leading code, address ID, command, checksum, carriage return cr. Host computer is with "*" synchronous command, only command a ISO40xx module once.

Command format: **(delimiter character)(Addr)(Command)[data][checksum](cr)**

(delimiter character) is the first letter of command. All commands need a leading code. such as: %, \$, #, @, ...

1-Character

(Addr) is module address code, if the following does not appoint, value range is 00~FF (hexadecimal) **2-Character**

(Command) represents command code or variable value **Variable**

Length

[data] some output command need data **Variable**

Length

[checksum] represents optional parameters, only need it when checksum is enabled.

2-

Character

(cr) a control code as identify, is a terminating character, value is 0x0D **1-character**

When checksum is enabled, need [Checksum]. The delimiter character is followed by a two-character address (hexadecimal) that specifies the target module. Command and response must append checksum characteristic. Checksum is used to check all input command, to help you find the errors between host computer and module command. Checksum characters are followed by command or response character, but ahead carriage return character.

Method: two-character (hexadecimal), is the sum of all sending characters ASCII, then AND 0xFF.

Example: Disable checksum

command: **\$002(cr)**

response: **!00020600 (cr)**

Enable checksum

command: **\$002B6 (cr)**

response: **!00020600 A9 (cr)**

'\$' = 0x24 '0' = 0x30 '2' = 0x32

$B6 = (0x24 + 0x30 + 0x30 + 0x32) \text{ AND } 0xFF$

'!' = 0x21 '0' = 0x30 '2' = 0x32 '6' = 0x36

$A9 = (0x21 + 0x30 + 0x30 + 0x30 + 0x32 + 0x30 + 0x36 + 0x30 + 0x30) \text{ AND } 0xFF$

Generally analog input module command table:

- 1、Read Analog Input Module Data
- 2、Read Channels N Analog Input Module Data
- 3、Set Module
- 4、Read Set State
- 5、Offset Calibration
- 6、Span Calibration
- 7、Read Module Name

Response :

Response depends on all kinds of command. It is formed some characters, such as delimiter character, variable and carriage return sign. Its leading codes has '!' or '>', represents command is valid, '?' is invalid. So that can watch command whether is valid by testing response information.

Note: 1、ALL COMMANDS SHOULD BE ISSUED IN UPPERCASE CHARACTERS!

1、 Read Analog Input Data command

Describe: Returns the input value from a specified analog input module in the currently configured data format

Syntax: #AA(cr)

delimiter character

AA is (range 00-FF) represents the 2-character hexadecimal address of the module.

(cr) is the terminating character, carriage return (0Dh)

Response : >(data)(cr) command is valid.

?AA(cr) invalid command or nonlicet operation

> delimiter character

(data) Returns data.The data format is in Engineering Units, Percent of FSR, Two's complement hexadecimal,or ohms. Refer to Chapter 4 Command Set.

(cr) terminating character, carriage return (0Dh)

There is no response if the module detects a syntax error or communication error or if the specified address does not exists.

Example: command #23(cr)

Response >+04.765+04.756 +04.632 +04.836 (cr)

The analog input module channel 0 is +04.765V , channel 1: +04.756V ,channel 2: +04.632V,channel 3: +04.836V at adress 23H (Data formats is engineer units)

2、 Read Channels N Analog Input Module Data

Describe: Returns the channels N input value from a specified analog input module in the currently configured data format

Syntax: #AAN(cr)

delimiter character

AA is (range 00-FF) represents the 2-character hexadecimal address of the module.

N channels code 0~3

(cr) is the terminating character, carriage return (0Dh)

Response : >(data)(cr) command is valid.

?AA(cr) invalid command or nonlicet operation

> delimiter character

(data) Returns channel N data.The data format is in Engineering Units, Percent of FSR, Two's complement hexadecimal,or ohms. Refer to Chapter 3 Command Set.

(cr) terminating character, carriage return (0Dh)

There is no response if the module detects a syntax error or communication error or if the specified address does not exists.

Example: command #232(cr)

Response >+04.632 (cr)

Channel 2 input signal is +04.632V at 23H (Data formats is engineer units)

3、 Set Analog Input Module Command

Description: Set address, input ranges, baud rate, data formats, checksum and state for a analog input module, counter data are stored in a EEPROM.

Syntax: %AANNTTCCFF(cr)

% delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

NN indicates new module hexadecimal address, value NN range is 00~FF

TT hexadecimal indicates type code. ISO4014 must set 00

CC Baud Rate code (hexadecimal)

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

Table 3 Baud rate code

FF (8-bit parameter) hexadecimal represents data formats, checksum.

Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
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Table 4 Data format, checksum

Bit7: Not used (set to 0)

Bit6: checksum states, if 0: Disabled, if 1: Enabled

Bit5-bit2: Not used (set to 0)

Bit1-bit0: Data Format Bit

00: Engineering Units

01: % of FSR

10: Twos complement hexadecimal

11: ohms

(cr) terminating character, carriage return (0Dh)

Response: !AA(cr) command is valid

?AA(cr) command is invalid or nonlicet operation, or do not set up line before changing baud rate or checksum

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(cr) terminating character, carriage return (0Dh)

If you configure module for the first time, AA=00、 NN equals to new address. If reconfigure module changing address, input range, data formats, AA equals to present or new address. If reconfigure module changing baud rate or checksum state, must install

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command string,make them in listening mode,module address is 00H,also AA=00H,NN=present or new address.

There is no response if the module detects a syntax error or communication error or if the specified address does not exists.

Example: command %0011050600(cr)
 Response !11(cr)

Description: % delimiter character
 00indicates analog input module initial address that you want to set is 00H
 11 indicates new module hexadecimal address is 11H
 05 indicates input range:±2.5 V
 06 indicates baud rate:9600 baud
 00 indicates data format is Engineering Units, checksum is disabled

4、Read Set State Command

Description: Read set for the specified a analog input module.

Syntax: \$AA2(cr)
 \$ delimiter character
 AA module address, (range 00-FF) represents the 2-character hexadecimal
 2 indicates read set state command
 (cr) terminating character, carriage return (0Dh)

Response: !AATCCFF(cr) command is valid
 ?AA(cr) command is invalid or nonlicet operation
 ! delimiter character
 AA represents input module address
 TT Type Code,Table 5
 CC Baud rate code,Table 3
 FF Table 4
 (cr) terminating character, carriage return (0Dh)

There is no response if the module detects a syntax error or communication error or if the specified address does not exists.

Example: command \$302(cr)
 Response !300F0600(cr)
 ! delimiter character
 30 indicates analog input module address is 30H
 0F indicates that input is K,testing range is 0℃~1000℃
 06 represents that baud rate is 9600 baud
 00 represents that data format is Engineering Units,disable checksum

5、Offset Calibration Command

Description: Calibrates an analog input module to correct for offset errors

Syntax: \$AA1N(cr)
 \$ delimiter character
 AA module address, (range 00-FF) represents the 2-character hexadecimal
 1 represents offset calibration command

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N channels code 0~3
 (cr) terminating character, carriage return (0Dh)

Response: !AA (cr) command is valid
?AA(cr) command is invalid or nonlicet operation
 ! delimiter character which indicates a valid command.
 ? delimiter character which indicates a invalid command.
AA represents input module address
 (cr) terminating character, carriage return (0Dh)

Products have been calibrated,user can use them directly.After calibrating offset command,then calibrate gain errors.

In order to successfully calibrate an analog input module's input range, a proper calibration input signal should be connected to the analog input module before and during the calibration. (See following Calibration information)

There is no response if the module detects a syntax error or communication error or if the specified address does not exist.

Example: command \$2310(cr)
Response !23 (cr)

Calibrate offset channel 0 at address 23H module.

6、Span Calibration Command

Description: Calibrates an analog input module to correct for gain errors

Syntax: \$AA0N(cr)
 \$ delimiter character
 AA module address, (range 00-FF) represents the 2-character hexadecimal
 0 represents gain calibration commandre
 N channels code 0~3
 (cr) terminating character, carriage return (0Dh)

Response: !AA(cr) command is valid
?AA(cr) command is invalid or nonlicet operation
 ! delimiter character which indicates a valid command.
 ? delimiter character which indicates a invalid command.
AA represents input module address
 (cr) terminating character, carriage return (0Dh)

Products have been calibrated,user can use them directly.After calibrating offset command,then calibrate gain errors.

In order to successfully calibrate an analog input module's input range, a proper calibration input signal should be connected to the analog input module before and during the calibration. (See following Calibration information)

There is no response if the module detects a syntax error or communication error or if the specified address does not exists.

Example: command \$2303(cr)
Response !23 (cr)

Calibrate gain errors channel 3 at address 23H module.

7、 Read Module Name Command

Description: Return the module name from the specified analog input module

Syntax: \$AAM(cr)

\$ delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

M represents Read module name command

(cr) terminating character, carriage return (0Dh)

Response: !AA(ModuleName)(cr) command is valid

?AA(cr) command is invalid or nonlicet operation

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(ModuleName) is ISO4011or ISO4012and so on, represents your module type

(cr) terminating character, carriage return (0Dh)

There is no response if the module detects a syntax error or communication error or if the specified address does not exists.

Example: command \$08M(cr)

Response !08ISO4014 (cr)

Counter Module is ISO4014 at adress 08H

Input Ranges& Data Formats

Analog Input four data formats: 00: Engineering Units
 01: % of FSR
 10: Twos complement hexadecimal
 11: ohms

Input Range	Data Formats	+F.S.	ZERO	-F.S	Displayed Resolution
±20mA	Engineering Units	+20.000	±00.000	-20.000	1uA
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement hexadecimal	7FFFFFFF	000000	800000	1LSB
±10V	Engineering Units	+10.000	±00.000	-10.000	1mV
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement hexadecimal	7FFFFFFF	000000	800000	1LSB

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Example:

1、 Input Range:±20mA,Output:4 -20mA

	command	#01(cr)
Engineering Units	Response	>+04.000(cr)
Percent of FSR	Response	>+020.00(cr)
Twos complement hexadecimal	Response	>199999(cr)

2、 Input Range: ±10V,Output:2.5V

	command	#01(cr)
Engineering Units	Response	>+02.500(cr)
Percent of FSR	Response	>+025.00(cr)
Twos complement hexadecimal	Response	>1FFFFFF(cr)

Module Calibration

In order to improve calibration precision,suggest to do as the following meters:

- 1、 Stable output,low noise DC voltage/current signal source
- 2、 High precision meter

Calibration Process:

1. Choose right input range,different input ranges need different calibration voltage
2. Input a right ZERO signal to analog input module channel of needing calibration
3. Send out offset calibration \$AA1N command to analog input module,after signal stable
4. Input a right SPAN signal to analog input module channel of needing calibration
5. Send out offset calibration \$AA0N commandto analog input module,after signal stable
6. Finished