HCFA

HCQX-AD/DA04-D2 Hardware Instruction

AD04-D2
DA04-D2

ManualNo.	HPPP1540000EN
Version	1.2
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1 Introduction

Thank you for purchasing and using the Q series analog modules independently developed and produced by HCFA Corporation.

This manual will give the brief explanation for the following modules in the table:

Name	Module	Version	Power	Description
Analog input module	HCQX-AD04-D2	V1.00	1.2w	4 channel analog input. Connected to the local extension of main unit or the back of coupler, cannot be used alone. Support single-ended and differential input and wide range of current/ voltage input signal.16bit resolution.
Analog output module	HCQX-DA04-D2	V1.00	1.2w	4 channel analog output. Connected to the local extension of main unit or the back of coupler, cannot be used alone. Supporting various current/voltage output. 16bit resolution.

When the user selects modules according to the power, part of the power is reserved to avoid the loss during the signal transmission.

For the users of HCFA Q series analog modules, refer to this manual to perform the wiring, installation, diagnosis and maintenance and requires the users to have the certain knowledge of electrical and automation.

This manual gives the necessary information for the use of HCFA Q series analog modules, please read this manual carefully before use and make the correct operation with full attention to safety.

1.1 Safety Precautions

1.1.1 Safety symbols

DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury or significant property damage.
WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.
CAUTION	Indicates that incorrect handling may cause slight injury or property damage.
NOTE	Indicates that incorrect handling may cause damage to the environment / equipment or data loss.

Key points or explanations to help with better operation and understanding of product.

1.1.2 Safety precautions

STARTUP AND MAINTENANCE PRECAUTIONS — DANGER

- Do not touch any terminal while the PLC's power is on. Doing so may cause electric shock or malfunctions.
- Before cleaning or retightening terminals externally cut off all phases of the power supply. Failure to do so may cause electric shock.
- Before modifying or disrupting the program in operation or Forced output, RUN, STOP etc., carefully read through this manual and the associated manuals and ensure the safety of the operation. An operation error may damage the machinery or cause accidents.

STARTUP AND MAINTENANCE PRECAUTIONS — CAUTION

- Do not disassemble or modify the PLC. Doing so may cause fire, equipment failures, or malfunctions. * For module repair, contact our HCFA distributor.
- Turn off the power to the PLC before connecting or disconnecting any extension cable. Failure to do so may cause equipment failures or malfunctions.
- Turn off the power to the PLC before attaching or detaching the following devices. Failure to do so may cause equipment failures or malfunctions
  - —Display module, peripheral devices, expansion boards
  - —Extension blocks and special adapters
  - —Battery, terminal block and memory cassette

DISPOSAL PRECAUTIONS — CAUTION

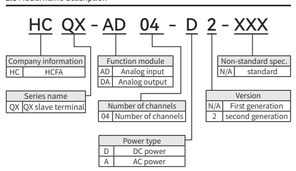
- Please contact a certified electronic waste disposal company for the environmentally safe recycling and disposal of your device.

TRANSPORT AND STORAGE PRECAUTIONS — CAUTION

- The PLC is a precision instrument. During transportation, avoid impacts larger than those specified in Section 3.1. Failure to do so may cause failures in the PLC. After transportation, verify the operations of the PLC.

2 Product Overview

2.1 Model name description



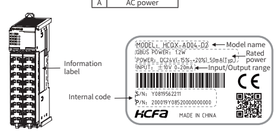


Figure1 Model name and nameplate description

Item	Description
Information label	Describes the basic information about the product, such as the model and power.
Model name	Describe the model's name.
Rated power	Describe the rated power QBUS POWER: Power Consumption POWER: Rated input voltage and current of QBUS
Input/Output range	Describe the Input/Output range (Current and voltage) INPUT: Range of input voltage and current OUTPUT: Range of output voltage and current
Internal code	Describe the Internal code P/N、S/N: Internal code

2.2 Part name description

2.2.1 HCQX-AD04-D2 Analog Input Module

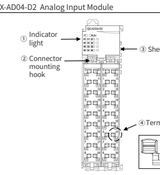
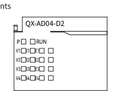


Figure 2 Interface diagram for HCQX-AD04-D2

Number	Name	Function
(1)	Indicator light	Used to display module and terminal status
(2)	Connector mounting hook	Fix the connector on the module
(3)	Sheetmetal	Transmit QBUS signal and control circuit current, does not support hot swap
(4)	Terminal block	Insert the cable, input/output signal

■ Indicator arrangements



■ Table 1 Indicator description for HCQX-AD04-D2

Symbol	Indicator color	Channel description
P	Green	The indicator show the current power supply status of the module
RUN	Red	AD module running state: Init: Off PreOP: Quick flashing SafeOP: Slow flashing Op: Steady light Boot: Irregular flashing
V1	Red	The voltage mode of channel 1 is enabled
V2	Red	The voltage mode of channel 2 is enabled
V3	Red	The voltage mode of channel 3 is enabled
V4	Red	The voltage mode of channel 4 is enabled
I1	Red	The current mode of channel 1 is enabled
I2	Red	The current mode of channel 2 is enabled
I3	Red	The current mode of channel 3 is enabled
I4	Red	The current mode of channel 4 is enabled
E1	Red	An error occurred in channel 1; For details 3.9 error description
E2	Red	An error occurred in channel 2; For details 3.9 error description
E3	Red	An error occurred in channel 3; For details 3.9 error description
E4	Red	An error occurred in channel 4; For details 3.9 error description

A global error occurred when all four E lights are on. For details 3.9 error description.

■ Terminal board arrangements

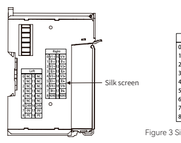


Figure 3 Silk screen for HCQX-AD04-D2

■ Table 2 Left terminal block description for HCQX-AD04-D2

Description	Name		NO		Name	Description
NC	NC	0		10	NC	NC
	NC	1		11	NC	
	NC	2		12	NC	
	NC	3		13	NC	
	NC	4		14	NC	
	NC	5		15	NC	
Power input DC24V	24V	6		16	24V	Power input DC24V
Power input 0V	0V	7		17	0V	Power input 0V
Ground	PE	8		18	PE	Ground

■ Table 3 Right terminal block description for HCQX-AD04-D2

Description	Name		NO		Name	Description
Voltage input (positive) of channel 1	V1+	0		10	V1-	Voltage input (negative) of channel 1
Current input (positive) of channel 1	I1+	1		11	I1-	Current input (negative) of channel 1
Voltage input (positive) of channel 2	V2+	2		12	V2-	Voltage input (negative) of channel 2
Current input (positive) of channel 2	I2+	3		13	I2-	Current input (negative) of channel 2
Voltage input (positive) of channel 3	V3+	4		14	V3-	Voltage input (negative) of channel 3
Current input (positive) of channel 3	I3+	5		15	I3-	Current input (negative) of channel 3
Voltage input (positive) of channel 4	V4+	6		16	V4-	Voltage input (negative) of channel 4
Current input (positive) of channel 4	I4+	7		17	I4-	Current input (negative) of channel 4
Analog ground	AGND	8		18	AGND	Analog ground

- Connected the AGND of AD module to the AGND of receive equipment can eliminate differential pressure when the input signal is a differential signal.
- AGND don't need wiring when the input signal is a single-ended.
- The analog signal cable adopts twisted-pair shielded wire.

2.2.2 HCQX-DA04-D2 Analog Output Module

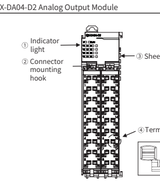
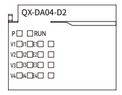


Figure 4 Interface diagram for HCQX-DA04-D2

Number	Name	Function
(1)	Indicator light	Used to display module and terminal status
(2)	Connector mounting hook	Fix the connector on the module
(3)	Sheetmetal	Transmit QBUS signal and control circuit current, does not support hot swap
(4)	Terminal block	Insert the cable, input/output signal

■ Indicator arrangements



■ Table 4 Indicator description for HCQX-DA04-D2

Symbol	Indicator color	Channel description
P	Green	The indicator show the current power supply status of the module
RUN	Red	DA module running state: Init:Off PreOP:Quick flashing SafeOP:Slow flashing Op: Steady light Boot:Irregular flashing
V1	Red	The voltage mode of channel 1 is enabled
V2	Red	The voltage mode of channel 2 is enabled
V3	Red	The voltage mode of channel 3 is enabled
V4	Red	The voltage mode of channel 4 is enabled
I1	Red	The current mode of channel 1 is enabled
I2	Red	The current mode of channel 2 is enabled
I3	Red	The current mode of channel 3 is enabled
I4	Red	The current mode of channel 4 is enabled
E1	Red	An error occurred in channel 1; For details 3.9 error description
E2	Red	An error occurred in channel 2; For details 3.9 error description
E3	Red	An error occurred in channel 3; For details 3.9 error description
E4	Red	An error occurred in channel 4; For details 3.9 error description

A global error occurred when all four E lights are on. For details 3.9 error description.

■ Terminal board arrangements

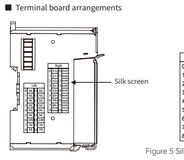


Figure 5 Silk screen for HCQX-DA04-D2

■ Table 5 Left terminal block description for HCQX-DA04-D2

Description	Name		NO		Name	Description
NC	NC	0		10	NC	NC
	NC	1		11	NC	
	NC	2		12	NC	
	NC	3		13	NC	
	NC	4		14	NC	
	NC	5		15	NC	
Power input DC24V	24V	6		16	24V	Power input DC24V
Power input 0V	0V	7		17	0V	Power input 0V
Ground	PE	8		18	PE	Ground

■ Table 6 Right terminal block description for HCQX-DA04-D2

Description	Name		NO		Name	Description
Voltage output of channel 1	V1+	0		10	AGND	Analog ground
Current output of channel 1	I1+	1		11	AGND	
Voltage output of channel 2	V2+	2		12	AGND	
Current output of channel 2	I2+	3		13	AGND	
Voltage output of channel 3	V3+	4		14	AGND	
Current output of channel 3	I3+	5		15	AGND	
Voltage output of channel 4	V4+	6		16	AGND	
Current output of channel 4	I4+	7		17	AGND	
Analog ground	AGND	8		18	AGND	

The analog signal cable adopts twisted-pair shielded wire.

2.2.3 Left view for analog modules

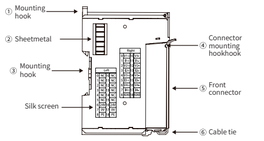


Figure 6 Left view for HCQX-AD/DA04-D2

■ Table 7 Part description on left view for analog modules

Number	Name	Function
(1) (3)	Mounting hook	Fix the module on the DIN rail
(2)	Sheetmetal	Transmit QBUS signal, transmit control circuit current, do not support hot swap
(4)	Connector mounting hook	Fix the front connector on the module, can install and remove the front connector by this structure
(5)	Front connector	Provide hot-swappable wiring device to make wiring and module replacement much easier
(6)	Cable tie	Fix the cables to make the wiring tidier and more beautiful, and convenient for later maintenance

2.3 Product Dimensions

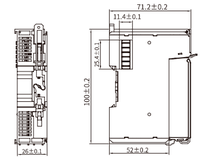


Figure 7 Installation dimension for HCQX-AD/DA04-D2 (Unit: mm)

3 Specifications and Parameters

3.1 Environment specifications

Items	Specifications		
Working temperature	0~55℃		
Storage temperature	-25~75℃		
Relative humidity	95%, No condensation		
Altitude	2km or less		
Atmosphere	108kPa~66kPa		
Noise resistance	±2kV 5~100kHz		
Sinusoidal vibration	9Hz≤f<100Hz, 1.0 acceleration, constant amplitude		
Drop down	1m, 10 times during packaging and transportation		
Terminal port	Power port	DC 24V (-15%~+20%)	
	Current Input/Output	4ch	
LED	Power LED: P Green (Power supply for the CPU)		
	Run LED: RUN Red (Module running)		
	Voltage enable: V Red (The voltage mode of channel is enabled)		
	Current enable: I Red (The current mode of channel is enabled)		
	Error LED: E Red (A global error occurred when all four E lights are on. For details 3.9 error description.)		

3.2 Power specifications

Items	Specifications
MAX. current consumption of QBUS	100mA
Rated supply voltage	DC 24V
Input voltage range	DC 24V (-15%~+20%)
Current consumption	50mA/DC 24V

3.3 Input specifications (HCQX-AD04-D2)

Items	Specifications	
Number of input channels	4ch	
Input voltage (channels)	Input range	-10V~+10V
	Input impedance	1MΩ or more
	Input form	Differential input
Input current (channels)	Input range	0~20mA
	Input impedance	240Ω
	Input form	Differential input
Input filter limit frequency	5kHz	
Common-mode voltage UCM	35V	
Channel data refresh time	1ms/4ch	
Resolution	16bit	
Measurement accuracy	25℃: voltage: ±0.2% current:±0.2% (Gamut) 0-55℃: voltage: ±0.3% current:±0.3%(Gamut)	

3.4 Output specifications (HCQX-DA04-D2)

Items	Specifications		
Number of output channels	4ch		
Output voltage (channels)	Output range	-10V~+10V	
	Load	>1kΩ	
Output current (channels)	Output range	0~20mA	
	Load	<350Ω	
Channel data refresh time	1ms/4ch		
Resolution	16bit		
Measurement accuracy	25℃: voltage: ±0.2% current: ±0.2% (Gamut) 0-55℃: voltage: ±0.3% current: ±0.3%(Gamut)		

3.5 Protection specification

Items	Specifications	
	AD04	DA04
Under-voltage protection of power Input	18V	18V
Over-voltage protection of power Input	36V	36V
Reverse direction of power Input	60V	60V
Over-voltage protection of channel Input	-50V~+50V	—
Over- current protection of channel Input	-50mA~+50mA	—
Short-circuit protection of voltage output	—	Nonsupport
Open-circuit detection of voltage output	—	Nonsupport

3.6 Port specification

Items	Specifications
Communication port	QBUS_IN，QBUS_OUT
Communication port type	10/100BASE-TX (IEEE 802.3)

3.7 Bus specification

Items	Specifications
Addressing mode	Sequential addressing, setting addressing
COE	Support
FOE	Support
Refresh mode	Sync Manager

3.8 Function Specifications

Items	Specifications			
	AD04		DA04	
Number of Channels	4Ch		4Ch	
Voltage Input/ Output	0~10V, -10~+10V, -5V~+5V, 0~5V, 1~5V		0~10V, -10~+10V, -5V~+5V, 0~5V, 1~5V	
Current Input/ Output	0~20mA, 4~20mA		0~20mA, 4~20mA	
Overrun detection	Support		—	
Range detection	Support		—	
Mutation detection	Support		—	
Fault handling & Alarm	Power disconnected	Global error (manual recovery)	Power disconnected	Global error (manual recovery)
	Input overrun	Channel error (manual recovery)	Output overrun	Channel error (manual recovery)
	Out of range	Channel error (manual recovery)	—	—
	Mutation detection	Channel error (manual recovery)	—	—
filtering	Support average filtering		—	
User calibration	Support		Support	
Preset input/ output values	—		Support	
Program upgrade	FOE，DFU upgrade			
LED display	Power indicator: P (green)	Power on: On. Power off: Off		
	Running indicator: RUN (red)	Init: Off		
		SafeOP: Slow flashing		
		PreOP: Quick flashing		
		OP: Steady light		
		Bootstrap: Irregular flashing		
	Error light (red)	Error indication: E (indicating that there is an error in the channel, 4 "E" are all bright, indicating that there is a global error)		
	Current mode indicator (red)	Voltage enable: V (indicating channel voltage mode enable)		
		Current enable: I (indicating channel current mode enable)		

3.9 Error description

Module	Indicator light	COE description		Error name	Error description	Error handling
		View index	Recovery index			
AD	E1、E2、E3、E4	0x6000 bit3、bit5 0x6040 bit3、bit5 0x6080 bit3、bit5 0x60C0 bit3、bit5	0x8001 bit0、bit1 0x8011 bit0、bit1 0x8021 bit0、bit1 0x8031 bit0、bit1	Input overrun	If the input range exceeds the limit of the hardware, the error indicator of the corresponding channel will flash quickly (quick flashing at 5Hz).	Change the **Error clear** of the corresponding channel in the I/O mapping table to 1 or 2. (1: clear the under minimum range error; 2: clear over maximum range errors.) For details, see AD Object Dictionary 0X8001
		0x6000 bit1、bit2 0x6040 bit1、bit2 0x6080 bit1、bit2 0x60C0 bit1、bit2	0x8001 bit2、bit3 0x8011 bit2、bit3 0x8021 bit2、bit3 0x8031 bit2、bit3	Out of range	After the input range limit is enabled and set by the user, if the input exceeds the specified range, the corresponding channel error indicator will flash slowly (slow flashing at 2Hz).	Change the **Error clear** value of the corresponding channel in the I/O mapping table to 4 or 8. (4: clear under user's minimum limit error. 8: Clear over user's maximum limit error) For details ,see AD Object Dictionary x8001
		0x6000 bit8 0x6040 bit8 0x6080 bit8 0x60C0 bit8	0x8001 bit5 0x8011 bit5 0x8021 bit5 0x8031 bit5	Mutation detection	Only when the user enables and sets the limit range of the mutation detection, the corresponding flag position ON (no error indicator) when the change amplitude exceeds the amplitude set by the user.	Change the **Error clear** of the corresponding channel in the I/O mapping table to 32. For details, see AD Object Dictionary 0X8001
	Full lights bright	0x6000 bit7 0x6040 bit7 0x6080 bit7 0x60C0 bit7	0x8001 bit4 0x8011 bit4 0x8021 bit4 0x8031 bit4	Power disconnected	When the external power supply is not connected, the four channel error indicators are steady on	Connect DC24V power to the module and modify the **Error clear** of the corresponding channel in the I/O mapping table to 16. For details, see AD Object Dictionary 0X8001
DA	E1、E2、E3、E4	0x6000 bit0、bit1 0x6040 bit0、bit1 0x6080 bit0、bit1 0x60C0 bit0、bit1	0x8001 bit0、bit1 0x8011 bit0、bit1 0x8021 bit0、bit1 0x8031 bit0、bit1	Output overrun	When the output value set by the user exceeds the limit of the output range of the mode selected by the user, the error indicator of the corresponding channel will flash slowly (slow flashing at 2Hz).	Change the **Error clear** of the corresponding channel in the I/O mapping table to 1 or 2. (1: clear the under minimum range error; 2: clear over maximum range errors.) For details, see AD Object Dictionary 0X8001
	Full lights bright	0x6000 bit3 0x6040 bit3 0x6080 bit3 0x60C0 bit3	0x8001 bit2 0x8011 bit2 0x8021 bit2 0x8031 bit2	Power disconnected	When the external power supply is not connected, the four channel error indicators are steady on	Connect DC24V power to the module and modify the **Error clear** of the corresponding channel in the I/O mapping table to 4. For details, see AD Object Dictionary 0X8001

4 Installation instruction

4.1 Installation instruction

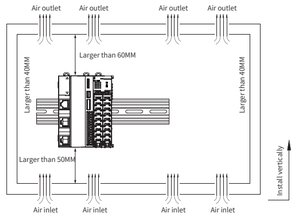
4.1.1 Control cabinet installation

When installing in the control cabinet, please pay attention to the following:

① Install the module in the vertical direction. Use natural air or fan cooling to the device. And install the module on the 35mm DIN rail by the mounting hooks.

② The cooling fan or natural air need to reduce the temperature as below to leave enough space around the equipment. To prevent the ambient temperature of the device from being too high, keep the temperature in the electric cabinet even.

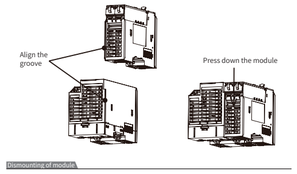
③ When installing side by side, it is recommended to leave space of more than 10mm on both sides of the horizontal direction (if the installation space is limited, you can choose not to leave space).



4.1.2 (Dis)mounting of Module

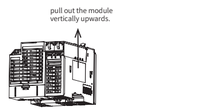
Mounting of Module

Align the groove of the module (the area shown by the dot) with the groove of the Q-series controller (the area shown by the dot), and press the module downward to ensure that the module is properly installed.Before installing the module, ensure that the installation direction is correct; otherwise, the device cannot run properly).



Dismounting of module

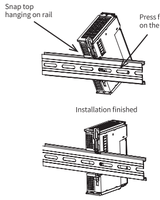
When you need to disassemble, you should press the module with both hands (shown in the direction of the arrow in the figure), and pull out the module vertically upwards.



4.1.3 (Un)Installation of guide rails

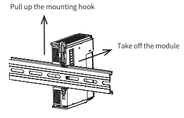
Rails installation

Align the bottom of HCQX-HC04-D with the 35MM international guide rail, and then press down hard, when you can hear a "click", it indicates that the bottom of the mounting hook has been connected to the international guide rail. Then the HCQX-HC04-D installation completed (Before installation, ensure that the mounting hook is in good state, otherwise it may cause installation failure).



Rails uninstallation

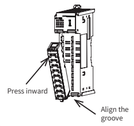
First remove the 35MM international guide rail dovetail groove fixing parts installed on the two sides of the machine, and then pull upwards at a distance of about 5.8 mm (when you pull upward, you can clearly hear the "click"), at this time you can directly take off the machine to complete the disassembly (you can use the accessories, such as screwdrivers, etc., when pulling).



4.1.4 (Un)installation of connector

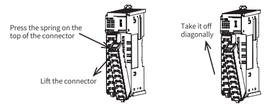
Installation of connector

Align the bottom of the connector with the bottom of the extension module. After aligning, press down on the top of the terminal in the direction shown in the figure below. When you hear a "click", the assembly of the connector is completed.



Connector uninstallation

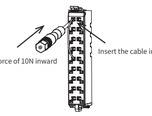
Use your index finger or your middle finger to firmly press the top spring of the connector down to separate the top of the connector from the extension module, and use your thumb to press the rear part of the connector. While pressing, lift the top of the connector upwards and take it away.



4.1.5 (Dis)connection of cables

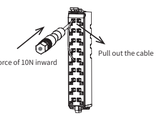
Cable connection

First insert a small screwdriver into the hole, apply a force of 10N inward, and then insert the cable into the hole. Pull out the small screwdriver after the cable is inserted.



Cable disconnection

After the installation is complete, gently pull out the cable, the installation is complete if the cable does not fall off.



4.2 Wiring Description

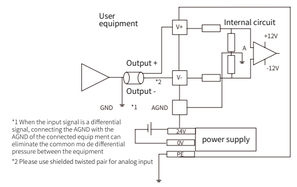
4.2.1 Cable selection

Items	Specification	
Installation method	Push-in	
Push force (per contact)	10N	
Cable type	Copper wire only (aluminum cable is not allowed)	
Cable length	7-9mm	
Cross section	Single-stranded	0.08-1.50mm²/28-16 AWG
	Multi-stranded	0.25-1.50mm²/24-16 AWG
	Sleeve	0.25-0.75mm²/24-20 AWG

4.2.2 Analog input module wiring description (HCQX-AD04-D2)

The analog input module, as the remote extension module of the Q series CPU unit, cannot work alone and needs to be connected to the EC coupler or the right side of the CPU unit. It supports both current and voltage input. HCFA offers varieties of input ranges and the working range can be modified online through SDO or COE, where voltage input supports single -ended and differential input.

■ External wiring diagram



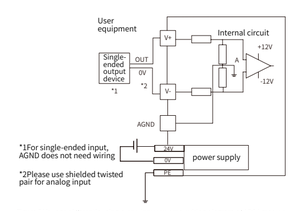
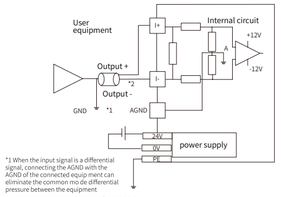


Figure 8 Voltage differential/single-end input external wiring diagram of AD04 module



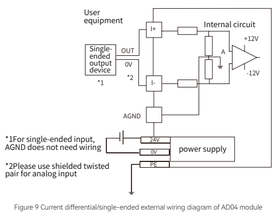


Figure 9 Current differential/single-ended external wiring diagram of AD04 module

■ Terminal wiring diagram

Voltage differential/single-end input

Current differential/single-ended input

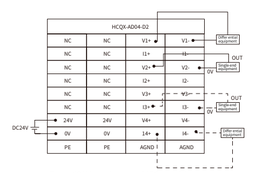


Figure 10 Wiring diagram of AD04 module

- 1. The analog signal cable adopts twisted-pair shielded wire.
- 2. When the input signal for the differential signal, connected the AGND to receive equipment AGND can eliminate the difference between the common mode voltage of devices.

4.2.3 Analog output module wiring description (HCQX-DA04-D2)

The analog output module, as the remote extension module of the Q series CPU unit, cannot work alone and needs to be connected to the EC coupler or the right side of the CPU unit. It supports both current and voltage output. HCFA offers varieties of output ranges and the working range can be modified online through SDO or COE, Both voltage and current support single-ended output.

■ External wiring diagram

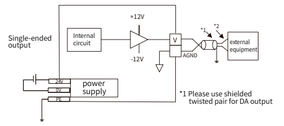


Figure 11 Voltage single-ended output external wiring diagram of DA04 module

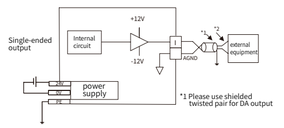


Figure 12 Current single-ended output external wiring diagram of DA04 module

■ Terminal wiring diagram

Voltage single-end Output

Current single-end Output

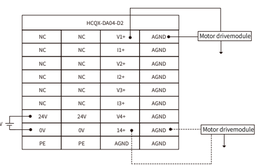


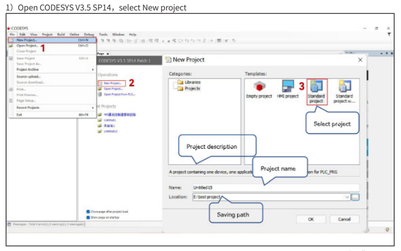
Figure 13 Wiring diagram of DA04 module

- The analog signal cable adopts twisted-pair shielded wire.

5 Module programming examples

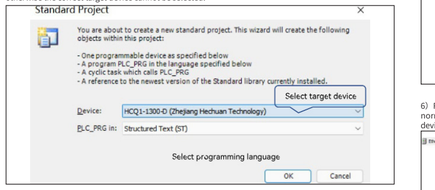
This example uses the CPU unit HCQ1-1300-D + coupler module HCQX-EC + high-speed counter module HCQX-HC04-D as an example to illustrate: (Q1 connection has been described briefly here. For more details, refer to Q1 Software Manual.)

1) Open CODESYS V3.5 SP14，select New project

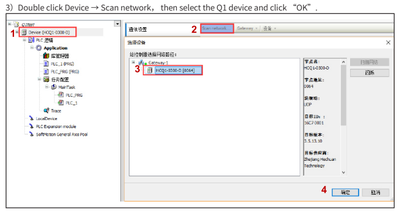


The user can select the project type they want, enter the name and save path, and then click "OK".

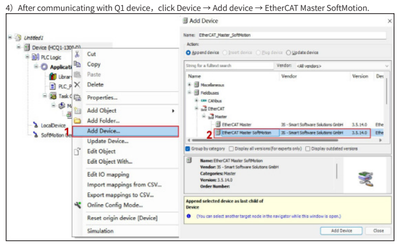
2) Follow the CODESYS guide, select the target device and main program PLC_PRG programming language. Q1 device is not installed by default, so you need to install the device description file first, otherwise the correct target device cannot be selected.



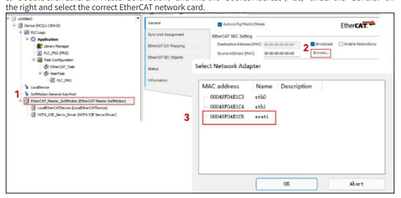
3) Double click Device → Scan network，then select the Q1 device and click "OK".



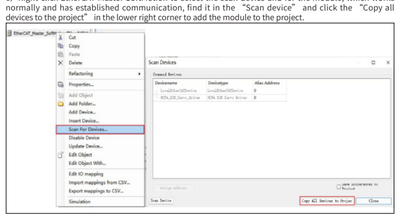
4) After communicating with Q1 device，click Device → Add device → EtherCAT Master SoftMotion.



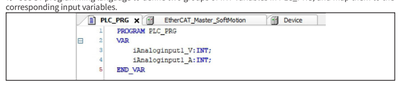
5) Double click EtherCAT Master SoftMotion，and find the "Source Address (Mac)" under the "General" on the right and select the correct EtherCAT network card.



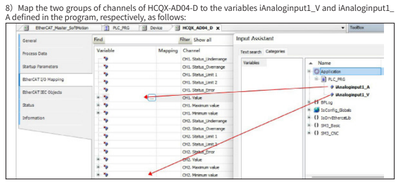
6) Right-click EtherCAT Master SoftMotion to select the scan device and for the module, which works normally and has established communication, find it in the "Scan device" and click the "Copy all devices to the project" in the lower right corner to add the module to the project.



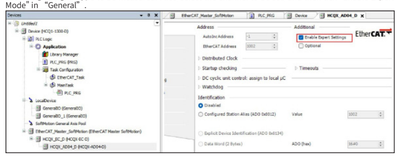
7) Use ST programming language to define two groups of INT variables in PLC_PRG, and map them to the corresponding input variables.



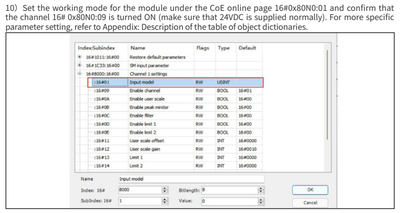
8) Map the two groups of channels of HCQX-AD04-D to the variables iAnalogInput1_V and iAnalogInput1_A defined in the program, respectively, as follows:



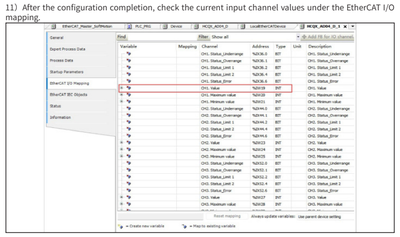
9) After no error for compiling, log in and run the program, and set the current channel operating mode according to signal type to be measured. First, select the channel to be set, and then tick "Enable Expert Mode" in "General".



10) Set the working mode for the module under the CoE online page 16#0x80N0:01 and confirm that the channel 16# 0x80ND:09 is turned ON (make sure that 24VDC is supplied normally). For more specific parameter setting, refer to Appendix: Description of the table of object dictionaries.



11) After the configuration completion, check the current input channel values under the EtherCAT I/O mapping.



Appendix 1: Table of AD04 objects dictionary

objects diction ary	Sub-index	Name	R/W	Type	Default	Range	Notes
0x1000	00	Device type	RO	UDINT	501	-	
0x1001	00	Error register	RO	USINT	0	-	Reserved
0x1008	00	Device name	RO	STRING(20)		-	HCQX_AD04-D2
0x1009	00	Hardware version	RO	STRING(5)	---	-	
0x100A	00	Software version	RO	STRING(5)	---	-	
0x100A	00	Number of Sub-index	RO	USINT	1	-	Recover 0x80n0 default parameter
0x1011	01	Recover default parameter	RW	BOOL	0	-	
0x1018	00	Identification					
	01	Supplier ID	RO	UDINT			
	02	Product code	RO	UDINT			
	03	Revision number	RO	UDINT			
	04	Serial number	RO	UDINT			
0x1600	00	Channel error clearing				0-0xFFFFFFFF	
	01	ch1	RO	UDINT			ch1 error clearing
	02	ch2	RO	UDINT			ch2 error clearing
	03	ch3	RO	UDINT			ch3 error clearing
	04	ch4	RO	UDINT			ch4 error clearing
Ch1							
0x1A00	00	Number of Sub-index	RO			-	
	01~0C	Mapping object of channel state	RO	UDINT	/	0-0xFFFFFFFF	Channel 1 TXPDO mapping object
0x1A01	00	Number of Sub-index	RO			-	
	01	Mapping object of detect value	RO	UDINT	/	0-0xFFFFFFFF	Detect Channel 1 TXPDO mapping object
0x1A02	00	Number of Sub-index	RO			-	
	01	Channel maximum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 1 maximum value mapping
0x1A03	00	Number of Sub-index	RO			-	
	01	Channel minimum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 1 minimum value mapping
Ch2							
0x1A04	00	Number of Sub-index	RO			-	
	01~0C	Mapping object of channel state	RO	UDINT	/	0-0xFFFFFFFF	Channel 2 TXPDO mapping object
0x1A05	00	Number of Sub-index	RO			-	
	01	Mapping object of detect value	RO	UDINT	/	0-0xFFFFFFFF	Detect Channel 2 TXPDO mapping object
0x1A06	00	Number of Sub-index	RO			-	
	01	Channel maximum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 2 maximum value mapping
0x1A07	00	Number of Sub-index	RO			-	
	01	Channel minimum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 2 minimum value mapping
Ch3							
0x1A08	00	Number of Sub-index	RO			-	
	01~0C	Mapping object of channel state	RO	UDINT	/	0-0xFFFFFFFF	Channel 3 TXPDO mapping object
0x1A09	00	Number of Sub-index	RO			-	
	01	Mapping object of detect value	RO	UDINT	/	0-0xFFFFFFFF	Detect Channel 3 TXPDO mapping object
0x1A0A	00	Number of Sub-index	RO			-	
	01	Channel maximum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 3 maximum value mapping
0x1A0B	00	Number of Sub-index	RO			-	
	01	Channel minimum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 3 minimum value mapping
CH4							
0x1A0C	00	Number of Sub-index	RO			-	
	01~0C	Mapping object of channel state	RO	UDINT	/	0-0xFFFFFFFF	Channel 4 TXPDO mapping object
0x1A0D	00	Number of Sub-index	RO			-	
	01	Mapping object of detect value	RO	UDINT	/	0-0xFFFFFFFF	Detect Channel 4 TXPDO mapping object
0x1A0E	00	Number of Sub-index	RO			-	
	01	Channel maximum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 4 maximum value mapping
0x1A0F	00	Number of Sub-index	RO			-	
	01	Channel minimum value mapping	RO	UDINT	/	0-0xFFFFFFFF	Channel 4 minimum value mapping
0x1C00	00	Synchronization manager type				-	
	01	SDO output type	RO	USINT	1		
	02	SDO input type	RO	USINT	2		
	03	PDO output type	RO	USINT	3		
	04	PDO input type	RO	USINT	4		
0x1C12	00	RxPDO allocation				-	
	01	sub-index 1	RO	UINT	1600		
	02	sub-index 2	RO	UINT	1601		
	03	sub-index 3	RO	UINT	1602		
	04	sub-index 4	RO	UINT	1603		
	05	sub-index 5	RO	UINT	1604		
0x1C13	00	TxPDO allocation				-	
	01	sub-index 1		UINT	1A00		
	02	sub-index 2		UINT	1A01		
	03	sub-index 3		UINT	1A02		
	04	sub-index 4		UINT	1A03		
0x1C00	00	SM output parameter				-	
	01	synchronous mode	RW	UINT	1		
	02	Cycle time	RW	UDINT	71220000(DEC)		
	03	Offset time	RO	UDINT	0		
0x1C32	04	Supported synchronization mode	RO	UINT	3		
	05	Minimum cycle time	RO	UDINT	100000		
	06	Calculate and copy time	RO	UDINT	0		
	07	NA					
	08	Acquire cycle time	RW	UINT	0		
	09	Delay time	RO	UDINT	0		
	0A	SYNC0 time	RW	UDINT	0		
	0B	The count of SM event loss	RO	UDINT	0		
	0C	The count of over-loop	RO	UDINT	0		
0x1C33	05	The count of too short offset	RO	UDINT	0		
	20	Synchronization error	RO	BOOL	FALSE		
	00	SM input parameter					
	01	synchronous mode	RW	UINT	1		
	02	Cycle time	RW	UINT	71220000(DEC)		
	04	Offset time	RO	UINT	0		
	05	Supported synchronization mode	RO	UINT	3		
0x1C33	06	Minimum cycle time	RO	UDINT	100000		
	08	Acquire cycle time	RW	UINT	0		
	09	Delay time		UDINT			
	0A	SYNC0 time	RW	UDINT	0		
	0B	The count of SM event loss	RO	UINT	0		
	0C	The count of over-loop	RO	UINT	0		
	20	The count of too short offset	RO	UINT	0		
	00	SM input parameter					
	01	synchronous mode	RW	UINT	1		
	02	Cycle time	RW	UINT	71220000(DEC)		
	04	Offset time	RO	UINT	0		
	05	Supported synchronization mode	RO	UINT	3		
0x1C32	06	Minimum cycle time	RO	UDINT	100000		
	08	Acquire cycle time	RW	UINT	0		
	09	Delay time		UDINT			
	0A	SYNC0 time	RW	UINT	0		
	0B	The count of SM event loss	RO	UINT	0		
	0C	The count of over-loop	RO	UINT	0		
	20	The count of too short offset	RO	UINT	0		

Ch1

0x6000	00	Channel 1 state					
	01	The mark bit when the measurement is below the minimum measurement range	RO	BOOL	0	0~1	The range of Mode0: -32640~32640 The range of Mode1: -640~32640 The range of Mode2: -16320~16320 The range of Mode3: -320~16320 The range of Mode4: -800~16800 The range of Mode5: -640~32640 The range of Mode6: -800~32767
	02	The mark bit when the measurement is above the maximum measurement range	RO	BOOL	0	0~1	
	03	The mark bit when the measurement value is lower than the user set minimum limit	RO	BOOL	0	0~1	The range of Mode0: -32640~32640 The range of Mode1: -640~32640 The range of Mode2: -16320~16320 The range of Mode3: -320~16320 The range of Mode4: -800~16800 The range of Mode5: -640~32640 The range of Mode6: -800~32767
	05	The mark bit when the measurement value is higher than the user set maximum limit	RO	BOOL	0	0~1	
	07	The mark bit of internal error	RO	BOOL	0	0~1	24V power supply is not connected or internal error
	08	The mark bit of mutation detection	RO	BOOL	0	0~1	Measured value lower than set value in 0x80020E
0x6090	00	Channel detection value of the channel	RO	INT	0	-32767~+32767	Ch 3 current detection value
0x60A0	00	Minimum detection value of the channel	RO	INT	0	-32767~+32767	Ch 3 minimum detection value
0x60B0	00	Minimum detection value of the channel	RO	INT	0	-32767~+32767	Ch 3 minimum detection value

Ch4

0x6010	00	Channel 4 state					
	01	The mark bit when the measurement is below the minimum measurement range	RO	BOOL	0		The range of Mode0: -32640~32640 The range of Mode1: -640~32640 The range of Mode2: -16320~16320 The range of Mode3: -320~16320 The range of Mode4: -800~16800 The range of Mode5: -640~32640 The range of Mode6: -800~32767
0x60C0	02	The mark bit when the measurement is above the maximum measurement range	RO	BOOL	0		
	03	The mark bit when the measurement value is lower than the user set minimum limit	RO	BOOL	0		Measured value lower than set value in 0x80030E
	05	The mark bit when the measurement value is higher than the user set maximum limit	RO	BOOL	0		Measured value higher than set value in 0x80030E
	07	The mark bit of internal error	RO	BOOL	0		24V power supply is not connected or internal error
	08	The mark bit of mutation detection	RO	BOOL	0		Measured value lower than set value in 0x80030E
0x6020	00	Current detection value of the channel	RO	INT	0	-32767~+32767	Ch 1 current detection value
0x6030	00	Maximum detection value of the channel	RO	INT	0	-32767~+32767	Ch 1 maximum detection value
0x6040	00	Minimum detection value of the channel	RO	INT	0	-32767~+32767	Ch 1 minimum detection value

Ch2

0x6040	00	Channel 2 state					
	01	The mark bit when the measurement is below the minimum measurement range	RO	BOOL	0		The range of Mode0: -32640~32640 The range of Mode1: -640~32640 The range of Mode2: -16320~16320 The range of Mode3: -320~16320 The range of Mode4: -800~16800 The range of Mode5: -640~32640 The range of Mode6: -800~32767
	02	The mark bit when the measurement is above the maximum measurement range	RO	BOOL	0		
	03	The mark bit when the measurement value is lower than the user set minimum limit	RO	BOOL	0		Measured value lower than set value in 0x80010D
	05	The mark bit when the measurement value is higher than the user set maximum limit	RO	BOOL	0		Measured value higher than set value in 0x80010E
	07	The mark bit of internal error	RO	BOOL	0		24V power supply is not connected or internal error
	08	The mark bit of mutation detection	RO	BOOL	0		Measured value lower than set value in 0x80010E
0x6080	00	Channel 3 state					
	01	The mark bit when the measurement is below the minimum measurement range	RO	BOOL	0		The range of Mode0: -32640~32640 The range of Mode1: -640~32640 The range of Mode2: -16320~16320 The range of Mode3: -320~16320 The range of Mode4: -800~16800 The range of Mode5: -640~32640 The range of Mode6: -800~32767

Ch3

0x6080	00	Ch3 output setting					
	01	Channel mode selection	RW	UINT16	0		Mode 0: -10~10V Mode 1: 0~10V Mode 2: -5~5V Mode 3: 0~5V Mode 4: 1~5V Mode 5: 0~20mA Mode 6: 4~20mA
	02	Channel enable	RW	BOOL	TRUE		Enable the channel detection function
	03	User calibration function enable	RW	BOOL	FALSE		
	04	Ratio adjustment enable	RW	BOOL	FALSE		Not supported
	05	Reserve					
	06	watchdog	RW	UINT	0		Not supported
	07	ERROR/STOP output mode	RW	UINT	0		0: Retain the current value 1: Output the value set by the user: 0x8nc8 2: Output a value of 0
	08	Default output value	RW	INT	0		
	09	User ratio offset	RW	INT	0		Not supported
	0A	User ratio gain	RW	DINT	0		Not supported
	0B	Offset value for user calibration	RW	INT	0		Output value = (detect value - offset) * gain Unit: mV/uA (determined by output mode selection)
	0C	User calibrated gain	RW	INT	10000		(Gain expands by multiple, output value = (detection value - offset) * gain) Unit: mV/uA (determined by output mode selection)
0x8021	00	Ch3 Error clear	RW	UINT	0		0: No error clear 1: Clear over minimum range error 2: Clear over maximum range error 4: Clear the error that analog power is not powered on 7: Clear all errors (Change CH1.Error clear in the I/O mapping table.)

Ch4

0x8030	00	Ch4 output setting					
	01	Channel mode selection	RW	UINT16	0		Mode 0: -10~10V Mode 1: 0~10V Mode 2: -5~5V Mode 3: 0~5V Mode 4: 1~5V Mode 5: 0~20mA Mode 6: 4~20mA
	02	Channel enable	RW	BOOL	TRUE		Enable the channel detection function
	03	User calibration function enable	RW	BOOL	FALSE		
	04	Ratio adjustment enable	RW	BOOL	FALSE		Not supported
	05	Reserve					
	06	watchdog	RW	UINT	0		Not supported
	07	ERROR/STOP output mode	RW	UINT	0		0: Retain the current value 1: Output the value set by the user: 0x8nc8 2: Output a value of 0
	08	Default output value	RW	INT	0		
	09	User ratio offset	RW	INT	0		Not supported
	0A	User ratio gain	RW	DINT	0		Not supported
	0B	Offset value for user calibration	RW	INT	0		Output value = (detect value - offset) * gain Unit: mV/uA (determined by output mode selection)
	0C	User calibrated gain	RW	INT	10000		(Gain expands by multiple, output value = (detection value - offset) * gain) Unit: mV/uA (determined by output mode selection)
0x8031	00	Ch4 Error clear	RW	UINT	0		0: No error clear 1: Clear over minimum range error 2: Clear over maximum range error 4: Clear the error that analog power is not powered on 7: Clear all errors (Change CH1.Error clear in the I/O mapping table.)

0x8040

0x8040	00	Ch1 voltage calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8041

0x8041	00	Ch2 voltage factory calibration parameters					Occupied, user can not adjust
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8042

0x8042	00	Ch3 voltage calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8043

0x8043	00	Ch4 voltage calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8044

0x8044	00	Ch1current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8045

0x8045	00	Ch2current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8046

0x8046	00	Ch3current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8047

0x8047	00	Ch4current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

Appendix 2: Table of DA04 objects dictionary

Index	Sub-index	Name	R/W	Type	Default	Note
0x1000	00	Device type	RO	UDINT	5001	
0x1001	00	Error register	RO	USINT	0	
0x1008	00	Device name	RO	STRING(20)		HCQX-DA04-D2
0x1009	00	Hardware version	RO	STRING(5)	---	
0x100A	00	Software version	RO	STRING(5)	---	
0x1011	00	Number of Sub-index	RO	USINT	1	Recover 0x80n0 default parameter
	01	Recover default parameter	RW	BOOL	0	
0x1018	00	Identification				
	01	Supplier ID	RO	UDINT		
	02	Product code	RO	UDINT		
	03	Revision number	RO	UDINT		
	04	Serial number	RO	UDINT		
0x1600	00	Ch n state				
	01	The mark bit when user output value is below the minimum range	RO	BOOL	0	
0x1601	00	Mapping object 001	RO	UDINT	7010 0110	
	01	Mapping object 001	RO	UDINT	7010 0210	
0x1602	00	DA ch3 parameter	RO			
	01	Mapping object 001	RO	UDINT	7010 0310	
0x1603	00	DA ch4 parameter	RO			
	01	Mapping object 001	RO	UDINT	7010 0410	
0x1604	00	DA channel output value				
	1	Ch 1		INT	0 RW	32000 indicates the maximum value of the output range. If this value is exceeded, it remains the maximum value of the range.
	2	Ch 2		INT	0 RW	32000 indicates the maximum value of the output range. If this value is exceeded, it remains the maximum value of the range.
	3	Ch 3		INT	0 RW	32000 indicates the maximum value of the output range. If this value is exceeded, it remains the maximum value of the range.
	4	Ch 4		INT	0 RW	32000 indicates the maximum value of the output range. If this value is exceeded, it remains the maximum value of the range.

0x7010

Ch1

0x8000	00	Ch1 output setting					
	01	Channel mode selection	RW	UINT16	0		Mode 0: -10~10V Mode 1: 0~10V Mode 2: -5~5V Mode 3: 0~5V Mode 4: 1~5V Mode 5: 0~20mA Mode 6: 4~20mA
	02	Channel enable	RW	BOOL	TRUE		Enable the channel detection function
	03	User calibration function enable	RW	BOOL	FALSE		
	04	Ratio adjustment enable	RW	BOOL	FALSE		Not supported
	05	Reserve					
	06	watchdog	RW	UINT	0		Not supported
0x8020	07	ERROR/STOP output mode	RW	UINT	0		0: Retain the current value 1: Output the value set by the user: 0x8nc8 2: Output a value of 0
	08	Default output value	RW	INT	0		
	09	User ratio offset	RW	INT	0		Not supported
	0A	User ratio gain	RW	DINT	0		Not supported
	0B	Offset value for user calibration	RW	INT	0		Output value = (detect value - offset) * gain Unit: mV/uA (determined by output mode selection)
	0C	User calibrated gain	RW	INT	10000		(Gain expands by multiple, output value = (detection value - offset) * gain) Unit: mV/uA (determined by output mode selection)
0x8021	00	Ch3 Error clear	RW	UINT	0		0: No error clear 1: Clear over minimum range error 2: Clear over maximum range error 4: Clear the error that analog power is not powered on 7: Clear all errors (Change CH1.Error clear in the I/O mapping table.)

Ch4

0x8030	00	Ch4 output setting					
	01	Channel mode selection	RW	UINT16	0		Mode 0: -10~10V Mode 1: 0~10V Mode 2: -5~5V Mode 3: 0~5V Mode 4: 1~5V Mode 5: 0~20mA Mode 6: 4~20mA
	02	Channel enable	RW	BOOL	TRUE		Enable the channel detection function
	03	User calibration function enable	RW	BOOL	FALSE		
	04	Ratio adjustment enable	RW	BOOL	FALSE		Not supported
	05	Reserve					
	06	watchdog	RW	UINT	0		Not supported
0x8031	00	Ch4 Error clear	RW	UINT	0		0: No error clear 1: Clear over minimum range error 2: Clear over maximum range error 4: Clear the error that analog power is not powered on 7: Clear all errors (Change CH1.Error clear in the I/O mapping table.)

0x8040

0x8040	00	Ch1 voltage factory calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8041

0x8041	00	Ch2 voltage factory calibration parameters					Occupied, user can not adjust
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8042

0x8042	00	Ch3 voltage calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8043

0x8043	00	Ch4 voltage calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8044

0x8044	00	Ch1current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8045

0x8045	00	Ch2current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8046

0x8046	00	Ch3current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

0x8047

0x8047	00	Ch4current calibration parameters					
	01	Factory calibration offset	RO	INT	0		Occupied, user can not adjust
	02	Factory calibration gain	RO	INT	10000		Occupied, user can not adjust

Appendix 3: Module value conversion and display table

The user display configuration is determined by index 0x80n0:01 (n from 0 to 3). Under this index, users can choose to modify the working mode of the channel to display values in different measurement ranges. The analog module has a 16-bit resolution and the maximum display range is -32768_dec to +32767_dec. Measured values and displayed values in different modes correspond to the following:

Input/Output Signal								Value	
HCQX-AD04-D2				HCQX-DA04-D2				Decimal	Hexadecimal
10V		20mA		10V		20mA		32000	0x7D00
5V				5V				16000	0x3E80
									0x0001
0V	1V	0mA	4mA	0V	1V	0mA	4mA	0	0x0000
									0xFFFF
-5V				-5V				-16000	0xC180
-10V				-10V				-32000	0x8300