

IVC-EH-4AD Analog Input Module

User Manual

Thanks for choosing the programmable logic controllers (PLCs) developed and produced by INVT Auto-Control Technology (Shenzhen) Co., Ltd. Before using the IVC-EH-4AD series PLC products, read this manual carefully to understand the product features, so that you can install and use the products properly and make full use of its abundant functions.

Note:

Before using the product, read the operation instructions and precautions carefully to prevent accidents. Only trained personnel can install and operate the product, and when installing and operating the product, the operators must strictly follow the related industrial safety specifications and the precautions and special safety guide provided in this manual to perform operations properly.

1 Interface description

1.1 Interface introduction

Cover plates are provided for the extension cable interfaces and user terminals of the IVC-EH-4AD module, as shown in Figure 1-1. You can see the extension cable interfaces and user terminals after opening the cover plates, as shown in Figure 1-2.

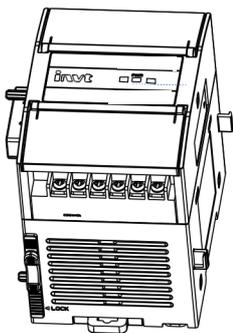


Figure 1-1 Module appearance diagram

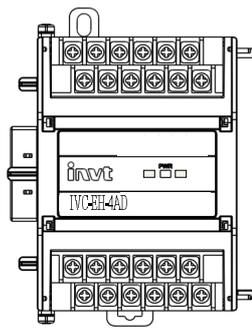


Figure 1-2 Module interface diagram

The IVC-EH-4AD module is connected to the main module through a patch board, and the extension modules are connected in cascade mode to implement hard connection. For the specific connection method, see the connection diagram in Figure 1-3.

Table 1-1 describes the definition of IVC-EH-4AD user terminals.

Table 1-1 Definition of IVC-EH-4AD user terminals

Label	Description
24V+	Positive pole of the 24 V analog power supply
24V-	Negative pole of the 24 V analog power supply
PG	Ground terminal
V1+, V2+, V3+, V4+	Voltage signal input terminals for channels 1, 2, 3, and 4
FG	Shielding ground
I1+, I2+, I3+, I4+	Current signal input terminals for channels 1, 2, 3, and 4
VI1-, VI2-, VI3-, VI4-	Common ground terminals for channels 1, 2, 3, and 4
.	Empty pin

Special statement: Voltage signals and current signals of a channel cannot be input simultaneously. To detect current signals, **short-circuit** the voltage signal input terminal of the channel to the current signal input terminal.

1.2 System connection

IVC-EH-4AD is applied to IVC3 series PLC systems. It can be connected to an IVC3 series system through hard connection, that is, inserting it into the extension interface of any extension module of the main module or system, as shown in Figure 1-3.

After the IVC-EH-4AD module is connected to the system, its extension interface can also be used to connect another extension module of the IVC3 series, such as the I/O extension module, VC-EH-4DA, IVC-EH-4TC, or another IVC-EH-4AD.

The main module of an IVC3 series PLC can be extended with multiple I/O extension modules and special function modules. The number of extension modules depends on the power that the module can supply. For details, see section 4.7 "Power supply specifications" in the *IVC3 Series PLC User Manual*.

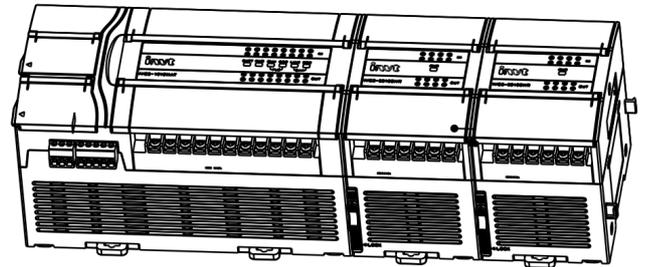


Figure 1-3 Diagram of the connection between IVC-EH-4AD analog input modules and the main module

1.3 Wiring description

Figure 1-4 shows the user terminal wiring requirements. Pay attention to the following seven aspects:

1. It is recommended that you connect the analog input by using a shielded twisted-pair cable, and keep the cable away from power cables or other cables that may cause electrical interference.
2. If fluctuation occurs in input signals, or external cables cause electrical interference, it is recommended that you configure a smoothing capacitor (0.1 μ F to 0.47 μ F/25V).
3. If current input is adopted for a channel, short-circuit the voltage input terminal of the channel to the current input terminal.
4. If too much electrical interference is caused, connect the shielding ground FG to the ground terminal PG of the module.
5. Ground the ground terminal PG of the module properly.
6. The auxiliary 24 V DC output power supply or any other power supply that meets requirements can be used as the analog power supply.
7. Do not use the empty pin of the user terminal.

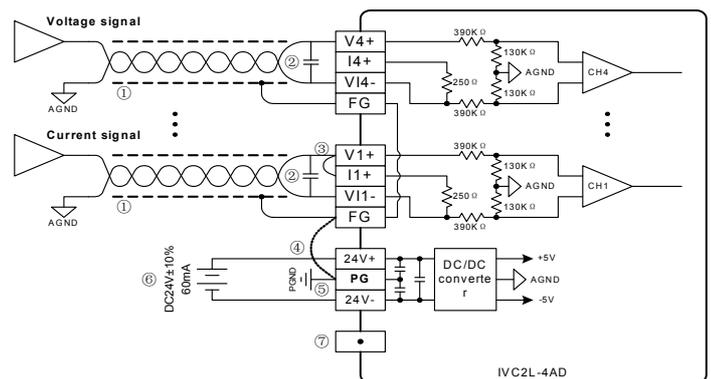


Figure 1-4 IVC-EH-4AD user terminal wiring diagram

2 Instructions

2.1 Power supply specifications

Table 2-1 Power supply specifications

Item	Description
Analog circuit	24 V DC (-15%~+20%); Max. allowable ripple voltage: 5%; 50 mA (supplied by the main module or external power supply)
Digital circuit	5 V DC, 72 mA (supplied by the main module)

2.2 Performance specifications

Table 2-2 Performance specifications

Item		Specification	
Converting speed		4 ms/channel	
Analog input range	Voltage input	-10 V—+10 V, with an input impedance of 1 MΩ	You can use 4 channels simultaneously, and select the input range by setting the buffer memory (BFM) (for details, see the description in Table 2-4).
	Current input	-20 mA—+20 mA or -5 V—+5 V, with an input impedance of 250 Ω	
Digital output		Default setting: -10000—+10000 Max. allowable user setting range: -10000—+10000	
Resolution	Voltage input	Depending on the input range	
	Current input	10μA	
Precision		±1% of the full range	
Isolation		Analog circuits are isolated from digital circuits by using photoelectric couplers. Analog circuits are isolated from the internal 24 V DC power supply of the module. Analog channels are not isolated from each other.	

2.3 BFM

The IVC-EH-4AD module can exchange information with the main module through the buffer memory (BFM) in either of the following operation modes:

Mode 1

The channels and converting results are set quickly in the configuration interfaces. This is also a common mode in which special extension modules are set.

Mode 2

1. The main module writes information to the BFM of IVC-EH-4AD through TO instructions to set IVC-EH-4AD.

2. The main module reads the AD converting results of IVC-EH-4AD and other information in the BFM through FROM instructions.

Table 2-3 describes the information in the BFM of IVC-EH-4AD.

Table 2-3 Information in the BFM of IVC-EH-4AD

BFM	Information	Default value
*#100	Average value of channel 1	0
*#101	Average value of channel 2	0
*#102	Average value of channel 3	0
*#103	Average value of channel 4	0
#200	Current value of channel 1	0
#201	Current value of channel 2	0
#202	Current value of channel 3	0
#203	Current value of channel 4	0
#300	Module fault state word	0X0000
#400	Initialization instruction	Default value: 0
#500	Setting modification allowing instruction	Default value: 1 (modification allowed)
#700	Channel 1 mode word	0x0000
#701	Channel 2 mode word	0x0000
#702	Channel 3 mode word	0x0000
#703	Channel 4 mode word	0x0000
#800	Number of points of channel 1 average value	8 (1-4096)
#801	Number of points of channel 2 average value	8 (1-4096)
#802	Number of points of channel 3 average value	8 (1-4096)
#803	Number of points of channel 4 average value	8 (1-4096)
*#900	CH1-D0	0 (input mode 0)
#901	CH1-A0	0 (input mode 0)
*#902	CH1-D1	10000 (input mode 0)

BFM	Information	Default value
#903	CH1-A1	10000 (input mode 0)
*#904	CH2-D0	0 (input mode 0)
#905	CH2-A0	0 (input mode 0)
*#906	CH2-D1	10000 (input mode 0)
#907	CH2-A1	10000 (input mode 0)
*#908	CH3-D0	0 (input mode 0)
#909	CH3-A0	0 (input mode 0)
*#910	CH3-D1	10000 (input mode 0)
#911	CH3-A1	10000 (input mode 0)
*#912	CH4-D0	0 (input mode 0)
#913	CH4-A0	0 (input mode 0)
*#914	CH4-D1	10000 (input mode 0)
#915	CH4-A1	10000 (input mode 0)
#4094	Module software version information	0X1000
#4095	Module identification code	0X1042

Description:

1. Only for buffers with the asterisk (*), the main module can write information to the BFM of IVC-EH-4AD through TO instructions and read information of any unit in the BFM through FROM instructions. If the main module reads information from a reserved unit, the value 0 is obtained.
2. The input mode depends on the value of BFM#700. #700 determines control channel 1, #701 determines control channel 2, #702 determines control channel 3, and #703 determines control channel 4. Table 2-4 describes the meaning of the values of the characters.

Table 2-4 BFM#700 information table

BFM#700	State information	Corresponding digital value
0	Channel disabled	
1	Input range: -10 V—+10 V	-10000—+10000
2	Input range: -5 V—+5 V or -20 mA—+20 mA	-10000—+10000
3	Input range: 1 V—5 V or 4 mA—20 mA	0—10000

For example, if "0x0001" is written into the #700 unit, the following information is set:

Input range of channel 1: -10 V—+10 V

3. The units BFM#800 to BFM#803 are the setting buffer memory for the average number of channel sampling times. The value ranges from 1 to 4096, and the default value 8 indicates that the average number of channel sampling times is 8.
4. The units BFM#900 to BFM#915 are buffers for channel characteristic settings, and channel characteristics are set in two-point mode. D0 and D1 indicate the digital output of the channel, A0 and A1 indicate the actual input (in the unit of mV) of the channel, and each channel uses 4 words. To simplify the setting of users without affecting the implementation of functions, the values of A0 and A1 are fixed to 0 and the maximum value of the analog in the applied mode. The values change with the modification of channel mode words (such as BFM#700). Users cannot modify these two items.
Note: If current signals (-20 mA—+20 mA) of a channel is input, you need to set the mode of the channel to 2. The internal measurement of channels is based on voltage signals, therefore, the current signals are converted into voltage signals (-5 V—+5 V) by the 250 Ω resistor on the current input terminal of the channel (see Figure 1-4). The value of A1 in characteristic setting area corresponding to the channel is still in mV, that is, 5000 mV (20 mA × 250 Ω = 5000 mV). For how the channel characteristics change with the modification of D0, A0, D1, and A1, see chapter 3 "Characteristic setting".

5. For state information of BFM#300, see Table 2-5.

Table 2-5 State information of BFM#300

Bit state of BFM#300	ON	OFF
b0: Error	If any of the bit states b1 to b2 is on, AD conversion of all channels is stopped.	No error
b1: Channel characteristic setting error	Exceptions occur in the channel characteristic data in the BFM or adjustment errors occur.	The channel characteristic data is normal.
b2: Power supply fault	24 V DC power supply fault	The power supply works properly.

- When BFM#400 is set to 1, that is, when it is activated, all the settings of the module are reset to the default values.
- BFM#500 is used to disable the modification of the I/O characteristic. After BFM#500 is set to 0, you cannot modify the I/O characteristic until BFM#500 is set to 1. The setting is saved at power outage.
- BFM#4094 contains the module software version information. You can use the FROM instruction to read the information.
- BFM#4095 contains the module identification code. The identification code of IVC-EH-4AD is 0X1042. User programs on the PLC can use this code to identify the special module IVC-EH-4AD before transmitting or receiving data.

3 Characteristic setting

The input channel characteristic of IVC-EH-4AD is the linear relationship between the analog input A and digital output D of the channel. You can set the characteristic. Each channel can be understood as the model shown in Figure 3-1. Since it is linear, the characteristic of a channel can be determined by identifying two points, P0 (A0, D0) and P1 (A1, D1). D0 indicates the channel digital output when the analog input is A0, and D1 indicates the channel digital output when the analog input is A1.

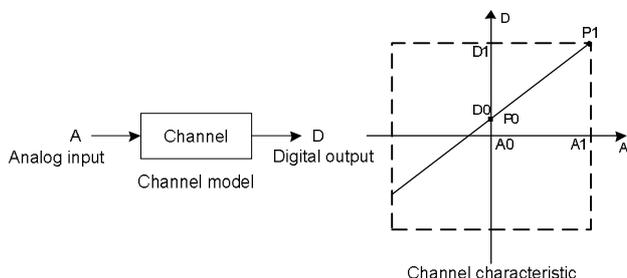
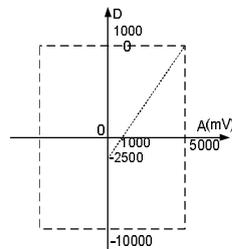
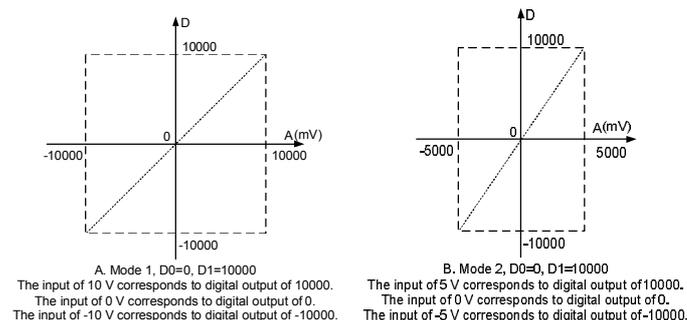


Figure 3-1 Channel characteristic of IVC-EH-4AD

To simplify the setting of users without affecting the implementation of functions, the values of A0 and A1 are fixed to 0 and the maximum value of the analog in the applied mode, that is, in Figure 3-1, A0 is 0 and A1 is the maximum analog input in the applied mode. The values change with the modification of channel mode words (such as BFM#700). Users cannot modify these two items.

If you do not modify D0 and D1 of each channel and only set the channel mode (BFM#700), the characteristic of each mode is the default one, as shown in Figure 3-2. The characteristics A, B, and C in Figure 3-2 are factory settings.



C. Mode 3, D0=0, D1=10000
The input of 1 V corresponds to digital output of 0.
The input of 5 V corresponds to digital output of -10000.

Figure 3-2 Default channel characteristic of each mode when D0 and D1 are not modified

If D0 and D1 of a channel are modified, the characteristic of the channel is changed. D0 and D1 can be set to any value ranging from -10000 to +1000. If the setting exceeds the range, IVC-EH-4AD does not receive the setting and keep the original valid setting.

4 Application instance

4.1 Configuring the extension module through the configuration interface

Example: The address of the IVC-EH-4AD module is 1 (for the addressing method of special function modules, see the *IVC-EH-4AD Series PLC User Manual*). Channel 1 is disabled, channel 2 and 3 are set to input voltage signals (-10 V~+10 V), channel 4 is set to input current signals (4~20 mA), the number of points of the average values is set to 8 by default, and data registers D2, D3, and D4 are used to receive the conversion results of the average values.

You can configure registers directly in the provided extension module configuration interface instead of using FROM and TO instructions. The configuration steps are as follows:

- Double-click the extension module configuration tab in the **System block** category on **Project Manager**.
- Double-click the module to be configured on the right instruction tree to add it to the configuration.
- After configuring all the parameters, click **OK** to complete the configuration.

After the configuration is complete, the user program needs only to use the configured D element to communicate with the special function module instead of using FROM and TO instructions. After the compiling is verified, the system block is downloaded to the main module with the user program. Figure 4-1 shows the configuration interface.

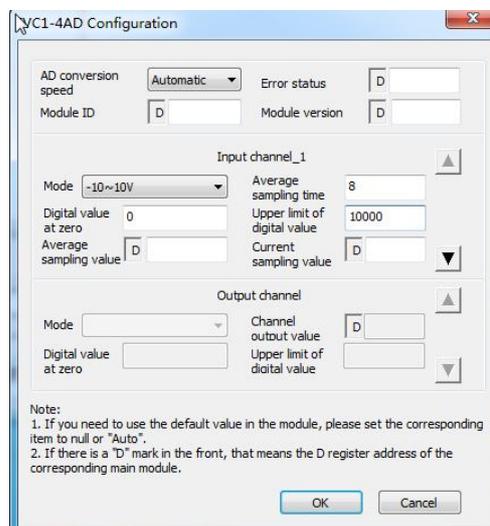


Figure 4-1 IVC-EH-4AD configuration interface

