



# LX3V-2TC2DAI-BD

## User manual



Website: <http://www.we-con.com.cn/en>

Technical Support: [support@we-con.com.cn](mailto:support@we-con.com.cn)

Skype: fcwkkj

Phone: 86-591-87868869

QQ: 1043098682

Technical forum: <http://wecon.freeforums.net/>



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# 1. Installation Instructions

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Before installation, it is necessary to ensure that the associated equipment of the PLC host and the terminal of the BD module are reliably powered off.

This module comes with two standard terminals; please plug the terminals into the module terminals after wiring. Confirm the installation of host, module and wiring are correct and then power on.

## Caution:

- 1) When using current output, make sure that the external load resistance is  $\leq 500\Omega$ . If the external load resistance  $> 500\Omega$ , the output current will be lower than normal;
- 2) To install the function expansion board firmly and fix it on the PLC, poor contact may cause malfunction;
- 3) The fastening torque is 0.3-0.6N.m. Firmly screw down to prevent malfunctions;
- 4) The PLC main unit of the LX3V can only use one BD module. Don't try to use two or more BD modules (these BD modules will not work);
- 5) When mounting module to PLC, all the lights are blinking after power ON PLC, it means this PLC can't support it, please purchase new PLC.

## Warnings:

Cut off the electricity before installation/disassembly of the unit or connection of wires onto the unit, to prevent electric shock or product damage.

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# 2. Features of LX3V-2TC2DAI-BD

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- 1) It could use LX3V-2TC2DAI-BD to add 2 analog input points and 2 current output points. It is internally installed in the top of PLC, thus it is not necessary to change the PLC's installation area.
- 2) The analog digital conversion of LX3V-2TC2DAI-BD module is thermocouple input (K or J type), current output (4~20mA), and the data of all the channels after conversion are stored inside a special digital memory, but the converted characteristics of the analog data cannot be adjusted. The allocation of the relevant channel addresses is in the following table.

Table 2- 1

Address	Description	Address	Description
M8112	The flag of thermocouple type in CH1 OFF: K type	D8112	CH1's temperature at 0.1 °C units
M8113	The flag of thermocouple type in CH2 OFF: K type		
M8114	CH3: Flag of the input mode OFF: Current output mode	D8114	Digital value of CH3
M8115	CH4: flag of the input mode OFF: Current output mode	D8115	Digital value of CH4

### 3. Dimension

Table 2- 1

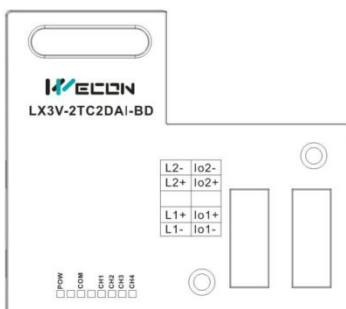


Figure 3- 1

IN-2TC part 2-wire thermocouple		IN-2DAI Part Input voltage ranges: 4~20mA	
L1+	CH1 thermocouple signal input (+)	io3+	CH3 current output (+)
L1-	CH1 thermocouple signal input (-)	io3-	CH3 current output (-)
▪	Disconnect	▪	Disconnect
L2+	CH2 thermocouple signal input (+)	io4+	CH4 current output (+)
L2-	CH2 thermocouple signal input (-)	io4-	CH4 current output (-)

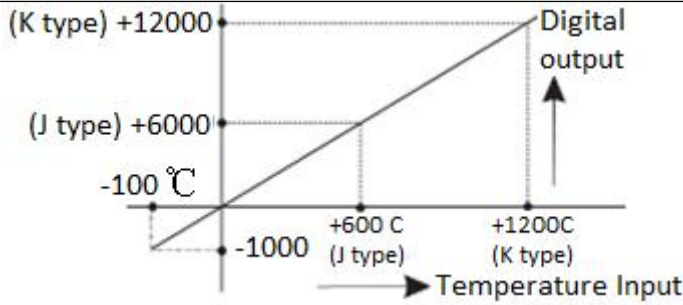
#### LED lights indicating:

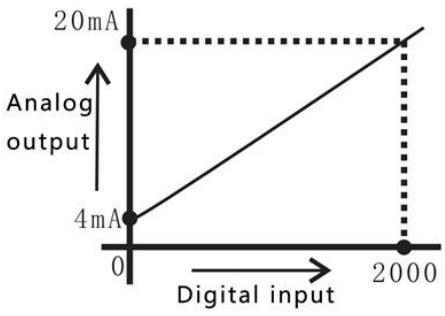
- POW LED: Constantly ON when PLC power ON;
- COM LED: Lit when communicating PLC, OFF when timeout;
- CH1 LED: LED for CH1, constantly ON when analog signal in range, lit when analog signal out of range (K type: -100~1200°C, J type: -100~600°C). M8112=OFF K type, M8112=ON J type.
- CH2 LED: LED for CH2, constantly ON when analog signal in range, lit when analog signal out of range (K type: -100~1200°C, J type: -100~600°C). M8112=OFF K type, M8112=ON J type.
- CH3 LED: LED for CH3, constantly ON when M8114 turns OFF, OFF when M8114 turns ON.

- CH4 LED: LED for CH4, constantly ON when M8115 turns OFF, OFF when M8115 turns ON.

## 4. Specifications

- 1) **General specification:** The same as the PLC main unit. (Please refer to the attached instructions supplied with the main unit of the PLC.)
- 2) **Power specification:** Powered from inside of the programmable controller.
- 3) **Performance specifications**

Item	Specification	
<b>Power supply</b>	24VDC $\pm$ 10%, 50mA; 5VDC $\pm$ 10%, 70mA (Powered by PLC host)	
<b>Temperature input (TC)</b>		
<b>Analog input signal</b>	Thermocouple: K or J type, 2 channels (CH1, CH2)	
<b>Range of rated temperature</b>	K: -100 $^{\circ}$ C - 1200 $^{\circ}$ C	J: -100 $^{\circ}$ C - 600 $^{\circ}$ C
<b>Digital output</b>	K: -1000 - 12000	J: -1000 - 6000
	12 bits total	
<b>Accuracy</b>	K: 0.4 $^{\circ}$ C	J: 0.3 $^{\circ}$ C
<b>Overall accuracy</b>	$\pm$ 0.5%	
<b>Conversion rate</b>	50ms	
<b>Conversion characteristics</b>	 <p>The graph illustrates the conversion characteristics for K and J type thermocouples. The x-axis represents Temperature Input in degrees Celsius, and the y-axis represents Digital output. A linear relationship is shown for both types. For the K type, the range is from -100<math>^{\circ}</math>C to +1200<math>^{\circ}</math>C, with digital outputs ranging from -1000 to +12000. For the J type, the range is from -100<math>^{\circ}</math>C to +600<math>^{\circ}</math>C, with digital outputs ranging from -1000 to +6000. The digital output is zero at 0<math>^{\circ}</math>C for both types.</p>	
<b>Analog output (DAI)</b>		
<b>Rated range</b>	4~20mA: 0~2000	
<b>Analog output</b>	DC 4~20mA (the external load resistance is no less than 500 $\Omega$ )	
<b>Digital output</b>	12 bit binary	
<b>Resolution</b>	8 $\mu$ A[4~20mA / 2000]	
<b>Precision</b>	$\pm$ 0.5% of full scale	
<b>AD conversion time</b>	One PLC scanning cycle	
<b>Input characteristics</b>	The external load is 250 $\Omega$ and 0-2000 is converted to 4-20mA	

	
<b>Insulation</b>	No insulation in each PLC channel
<b>Occupied points</b>	None

**Note:** This module does not support grounding thermocouples.

## 5. Wire Connection

### Warning:

Make sure cut off the electricity before installation/disassembly, to prevent electric shock or product damages.

### Caution:

- 1) Please keep the signal cable from the high-voltage cable at lease 100mm.
- 2) The shielding wire cable shall be grounded. But their grounding point can be the same with high-voltage lines.
- 3) Never connect cable with forbidden size.
- 4) Fix the cable, so that the stress does not act on the terminal board or the cable connection area.
- 5) The screwing torque of the terminal is from 0.5 to 0.6N.m. Fasten tight to prevent malfunction.
- 6) Keep the redundant terminals empty.

### 5.1 Applicable Cables

Use AWG25-16 to connect the output equipment

The maximal screwing torque is from 0.5 to 0.6N.m

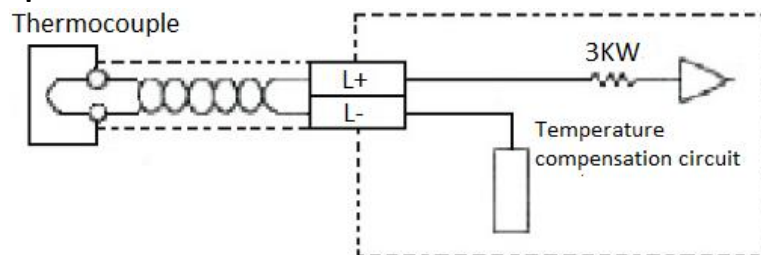
The use of different types of cables might cause poor contact between the terminals. It is better to use pressed terminals.

Table 4- 1

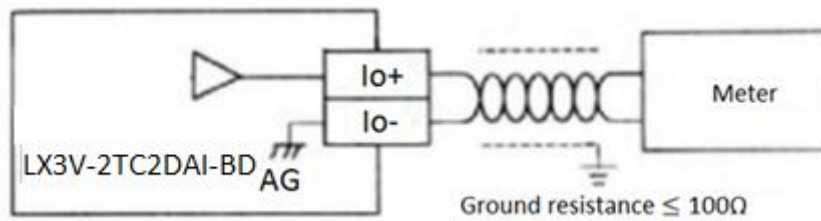
Line type	Cross sectional area(mm <sup>2</sup> )	End-of-pipe treatment	
AWG26	0.1288	Stranded cable: stripped jacket, rub Conductor, then connect the cable.	
AWG16	1.309	Single-core cable: stripped jacket, Then connect the cable.	

## 5.2 Input and output mode

### 1) Thermocouple input mode



### 2) Current Output Mode



## 6. Example

The analog values of each channel are transfer to digital values and stored in D8112&D8113.

On the contrary process, digital value in each channel will be converted into analog value and output in system address (D8114, D8115).

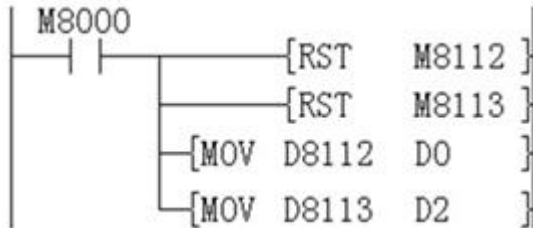
### 6.1 Basic Program Examples

**Caution:**

- M8112 and M8113 are used to analog to digital conversion for CH1 and CH2;
- The TC part only supports K or J type thermocouple;
- The DA part only supports current output;
- When M8112-M8115 is ON, the channels will not work, all show "0";
- Don't try to change the value in D8112 or D8113, when finished the A/D conversion;

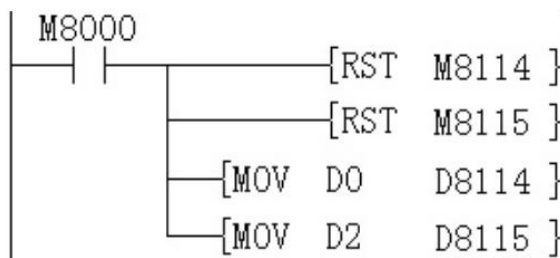
### 1) Thermocouple input

Set CH1 and CH2 as thermocouple input mode, and stored value in D0 and D2.



- Set CH1 as K-type thermocouple input mode
- Set CH2 as K-type thermocouple input mode
- Set the digital value of D0 into analog value
- Set the digital value of D2 into analog value

### 2) DA conversion:



- Set channel 1 as current output (4~20mA)
- Set channel 2 as current output (4~20mA)
- Save the value of D0 to channel 1
- Save the value of D2 to channel 2

- If the data are not stored into D0 or D2, then D8112, D8113 and D8114, D8115 can be simultaneously used on setting values and other orders, such as timer/counter.

## 6.2 Application example

Since the LX3V-2TC2DAI-BD does not have offset and gain functions, if it needs for the values out of the standard specifications, Additional programming orders will be needed to multiply or divide the converted value.

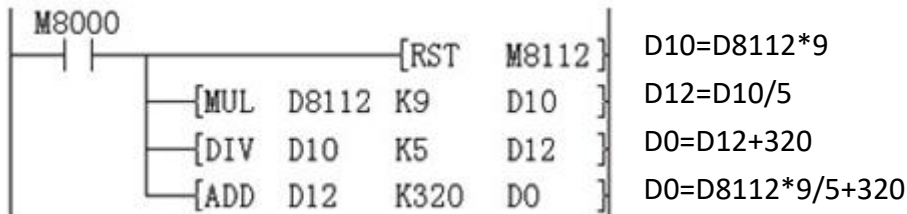
### Caution

- Since the use of additional programming orders, the converted precision and resolution of the analog value are different with the specifications.
- The original range of the analog output does not change.

### 1) Thermocouple input mode

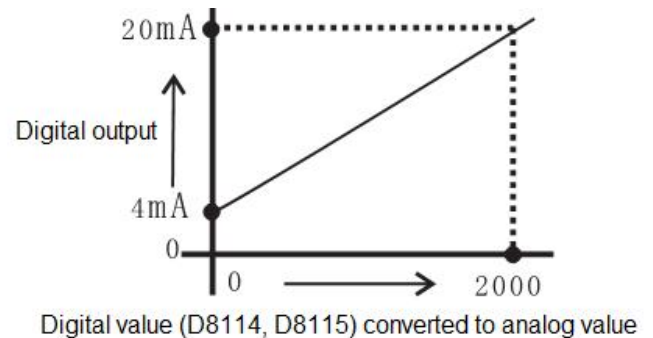
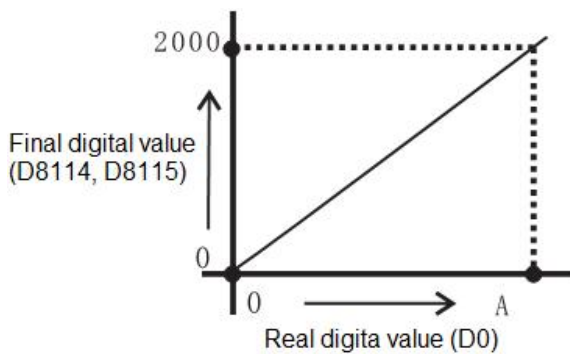
In Thermocouple input mode, LX3V-2TC2DAI-BD convert an analog value to a digital value in degrees Celsius. If in the program is Fahrenheit as a unit it needs to be converted to Celsius value.

Fahrenheit and Celsius conversion formula, Fahrenheit = Celsius \* 9/5 + 32, the unit is 0.1 °C.



## 2) Current output mode

In current output mode, it changes the digital value (0-2000) to analog value (4-20mA). If the real digital range is 0-A (A means any value), it must be converted to 0-2000, as the following program shows, the final digital need to be saved in D8114.

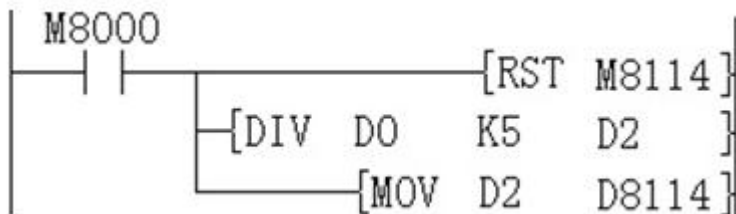


Suppose user needs 0-A digital range.

$$D8114=2000*D0/A$$

$$=2000*D0/10000 (A=10000)$$

$$=D0/5$$



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