HollySys

LM MICRO SERIES PLC

HARDWARE MANUAL

Revision 1.0 ©2008, MAN-PLC-LM-2008-08-10001
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Revision 1.0, Edition: September 2008

Preface

The LM Micro Series PLC is the new generation programmable logic controller (PLC) for the industrial automation application. It is designed and developed by HollySys with integration of the latest technology in PLCs for the control of discrete and analog devices. It is the result of combined technology from automation control, electronics, communications, and computers while absorbing our automation engineer's experience and knowledge over the years. It is modular in design and compact in size with great performance. Before development, we have carefully put into thought and consideration in terms of system, size, modular, communications, hardware, software, user habits, and user-friendly interface.

Features Highlights

- Modular Design
- Easy Installation and Wiring
- Powerful Instructions and Functions
- Advanced Programming Software – PowerPro for Windows
- Perfect Micro PLC Choices

Application Scope

The content of this manual is applicable to LM Micro Series PLC

How to Use

It is suggested to read the whole manual for any first time user with PLC. Experienced users can refer directly to the relevant module pages that you are interested with for more information.

Other References

- LM Micro PLC Overview
- LM Micro PLC Selection Guide
- LM Micro PLC Software Manual
- LM Micro PLC Instruction Sets Reference Manual

Table of Contents

Chapter 1

Overview of LM Micro Series PLC

LM Micro PLCs can fulfill powerful and complex control functions, no matter under the independent mode or the network mode. Main features of the LM Micro PLC products are as follows:

1. Compact size
2. Instruction set with powerful functions
3. Simple and easy installation
4. Unique power-loss protection
5. Variety of hardware modules
6. Off-line simulation
7. Powerful analog signal process
8. Standardized program languages

The LM Micro PLCs are applicable to many industries include machine tools, punch machinery, print machinery, textile machinery, building material machinery, packaging machinery, plastic machinery, motion control, transmission lines, environmental protection equipments, central air conditioners, lift control, latex industry and various production lines, etc.

1.1 HARDWARE SYSTEM ARCHITECTURE

LM Micro PLC series consists of a variety of CPU modules and expansion modules. CPU module can work independently; however, if the I/Os of the CPU module cannot meet the system requirements; the CPU module can also operate with expansion modules through expansion cables. If special networking communication is required, dedicated expansion communication modules can be added. The architectures of the LM Micro PLC hardware and operating system are shown in Figure 1.1 and Figure 1.2 respectively.

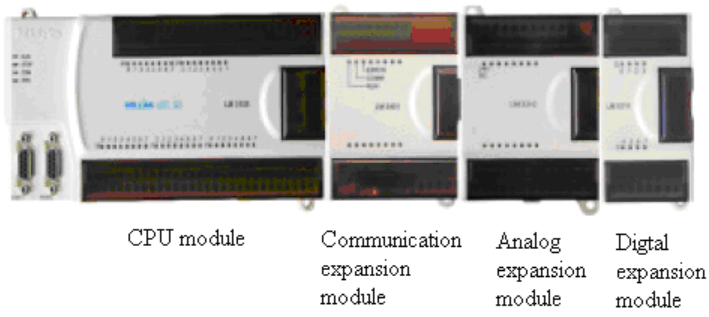


Figure 1.1 Hardware System Architecture

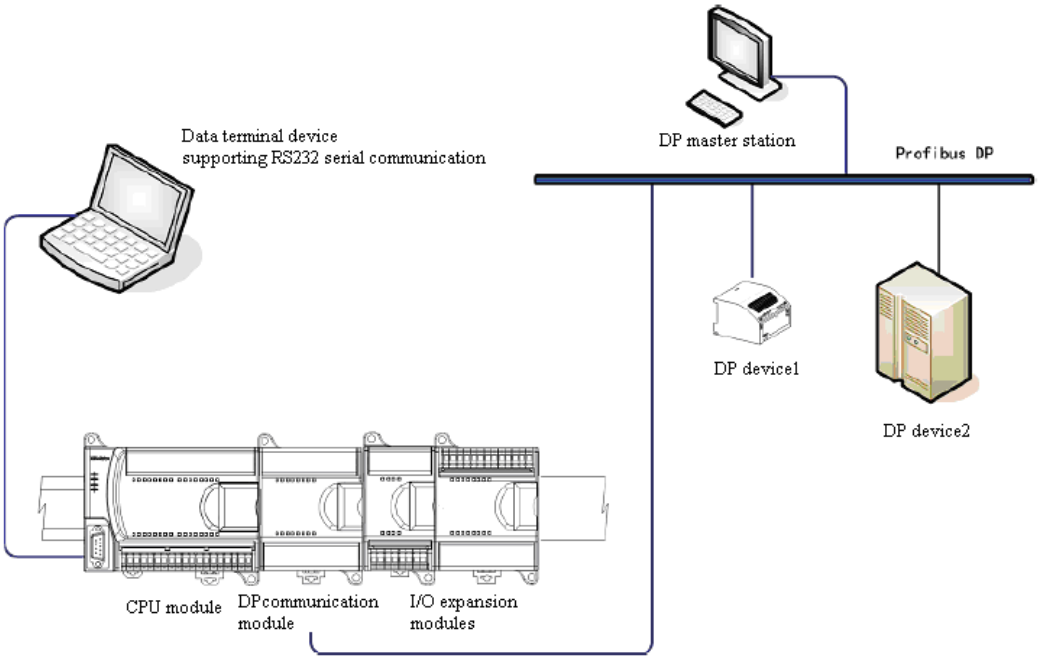


Figure 1.2 LM Micro PLC Work System Architecture

1.1.1 CPU Modules

CPU module executes the job cycle "Read input data → Execute Program → Process communication requirement → Self diagnosis → Write output data". LM Micro PLC CPU modules are available in 7 various types.

CPU model	CPU module	Specifications Description
LM3104-CDT		8×DI, 6×DO (transistor), connection with 2 expansion modules (shall not be connected with DP slave station interface module - LM3401 and Ethernet interface module - LM3403). Three 100KHz single-phase counters / two 100KHz two-phase counters, one 20KHz high-speed pulse output. One RS232 serial port that supports proprietary, MODBUS RTU slave and freeport protocols.
LM3105-CAR		8×DI, 6×DO (relay), connection with 2 expansion modules (shall not be connecte dwith DP slave station interface module - LM3401 and Ethernet interface module - LM3403). Three 100KHz single-phase counters / two 100KHz two-phase counters. One RS232 serial port that supports proprietary, MODBUS RTU slave and freeport protocols.
LM3106-CDT		14×DI, 10×DO (transistor), connection with 4 expansion modules. Three 100KHz single-phase counters / two 100KHz two-phase counters, two 20KHz pulse outputs. One RS232 serial port that support proprietary, MODBUS RTU slave and freeport protocols.
LM3107-CARE		12×DI, 4×DO (relay), 2×AI, 1×AO, connection with 4 expansion modules. Three 100KHz single-phase counters / two 100KHz two-phase counters. One RS232 serial port that supports proprietary, MODBUS RTU slave and freeport protocols.

LM3107-CAR		14×DI, 10×DO (relay), connection with 4 expansion modules. Three 100KHz single-phase counters / two 100KHz two-phase counters. One RS232 serial port that support proprietary, MODBUS RTU slave and freeport protocols.
LM3108-CDT		24×DI, 16×DO (transistor), connection with 7 expansion modules. Three 100KHz single-phase counters / two 100KHz two-phase counters, two 20KHz pulse outputs. One RS232 serial port and one RS485 serial port that support proprietary, MODBUS RTU slave and freeport protocols.
LM3109-CAR		24×DI, 16×DO (relay), connection with 7 expansion modules. Three 100KHz single-phase counters / two 100KHz two-phase counters. One RS232 serial port and one RS485 serial port that upport proprietary, MODBUS RTU slave and freeport protocols.

Table 1.1 LM Micro Series PLC - CPU Modules

1.1.2 Expansion Modules

Expansion modules include the I/O expansion modules and the communication expansion modules (Profibus-DP slave interface modules and Ethernet interface modules). Figure 1.3 shows the combination of LM Micro PLC CPU and expansion modules.

Figure 1.3 Combination of LM Micro PLC CPU and Expansion Modules

1.1.3 Maximum I/O Configuration

Maximum I/O Configuration				
CPU Modules	Digital Input	Digital Output	Analog Input	Analog Output
LM3104-CDT / LM3105-CAR - Maximum number of expansion = 2				
CPU Based Module I/O	**8**	**6**	-	-
Maximum Module Expansion (If connects 2 expansion module)	16 x 2 =**32**	16 x 2 = **32**	8x2= **16**	2x2= **4**
Maximum total I/O	8+32 = **40**	6+32 = **38**	**16**	**4**
LM3106-CDT / LM3107-CAR - Maximum number of expansion = 4				
CPU Based Module I/O	**14**	**10**	-	-
Maximum Module Expansion (If connects 4 expansion module)	16x4= **64**	16x4= **64**	8x4= **32**	2x4= **8**
Maximum total I/O	14+64 = **78**	10+64 = **74**	**32**	**8**
LM3108-CDT / LM3109-CAR - Maximum number of expansion = 7				
CPU Based Module I/O	**24**	**16**	-	-
Maximum Module Expansion (If connects 7 expansion module)	16x7 = **112**	16x7 = **112**	8x7 = **56**	2x7 = **14**
Maximum total I/O	24+112 = **136**	16+112 = **128**	**56**	**14**
LM3107E-CAR - Maximum number of expansion = 4				
CPU Based Module I/O	**12**	**8**	**2**	**1**
Maximum Module Expansion (If connects 4 expansion module)	16x4 = **64**	16x4 = **64**	8x4 = **32**	2x4 = **8**
Maximum total I/O	12+64= **76**	8+64 = **72**	2+32 = **34**	1+8 = **9**

Table 1.2 Maximum I/O configuration of One CPU Module

1.2 COMMUNICATION FUNCTION

1.2.1 Serial Communication

RS232 and RS485 serial communication ports are integrated on CPU modules. They support proprietary, standard Modbus RTU Slave and freeport protocols.

1.2.2 Field Bus

The communication expansion module LM3401 is the Profibus-DP slave interface module. LM series PLC can be connected to Profibus-DP field bus network through LM3401, which provides an up to 12Mbps communication speed and 64bytes input/output area.

1.2.3 Industrial Ethernet Network

The communication expansion module LM3403 is Ethernet interface module and supports standard Modbus TCP protocol. LM Micro PLC can be connected to the Ethernet network through LM3403, which provides a 10 Mbps communication speed and 200bytes input/output area.

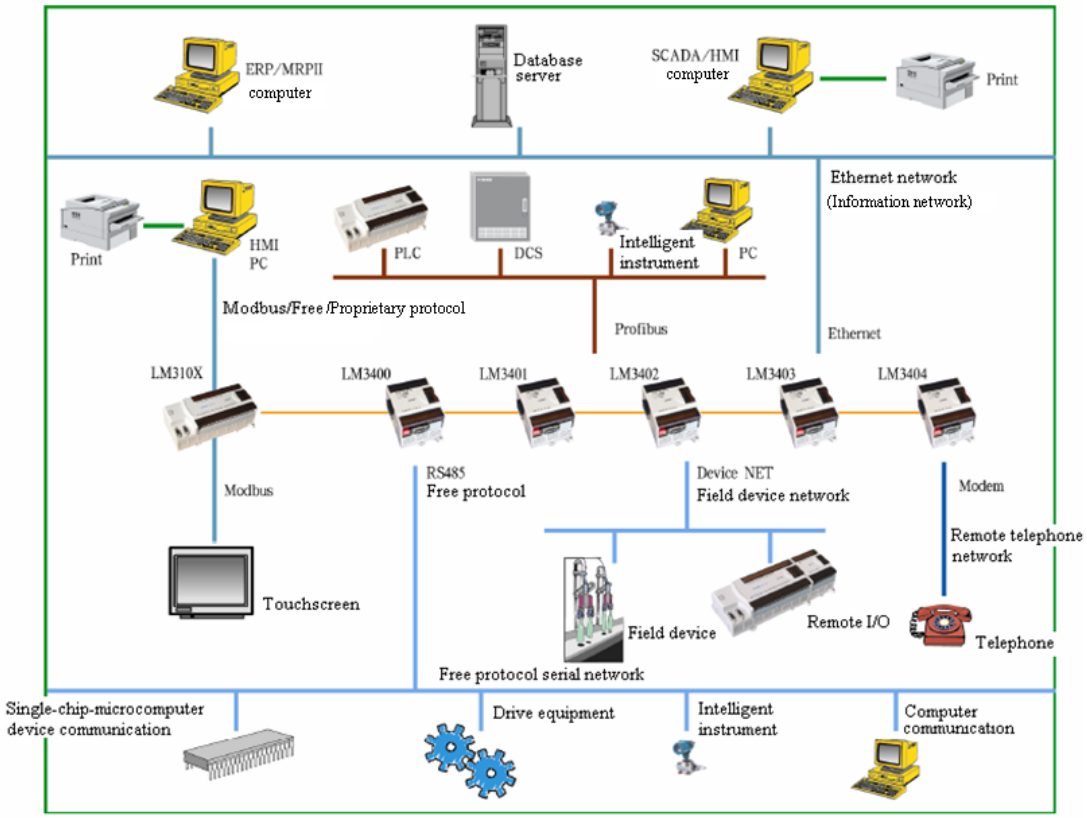


Figure 1.4 Communication Network Architecture

1.3 QUICK USAGE GUIDE

For users who have some experiences of PLC usage, the following guide will give instructions to quickly create a simple LM Micro PLC control system.

1.3.1 PLC Products Check

Confirm that the PLC products received are as same as the purchase order. Check the integrity of packaging integrity, if there is any damage to the packaging or the PLC products, please contact the supplier as soon as possible.

1.3.2 Power Supply Wiring

Power supply wiring is shown in Figure 1.5. Please see the details in Chapter 4

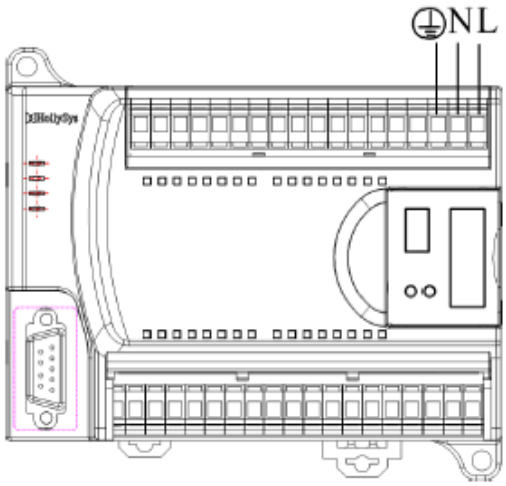


Figure 1.5 Power Supply Wiring

After the power supply wiring is done, do not turn on the PLC immediately. Please check the wiring and be sure that all wirings are correct before turn on the power supply. The RUN indicator light will be ON.

NOTE:
After completing the wiring of power supply, please cover the terminal lid to avoid unnecessary human injury and equipment damage. Please do not connect any other modules to the CPU module when power is ON. This will cause damages to the modules.

1.3.3 Setting up the PC Communication

The RS-232 communication port integrated on the CPU module is a non-isolated port. Hence, the CPU module shall be connected to the PC by the LM PLC programming cable before the power-on of the PLC.

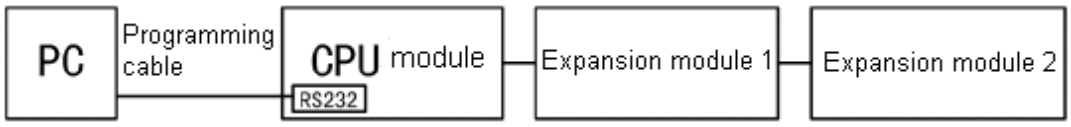


Figure 1.6 Programming Cable Connection

1.3.4 Programming the PLC

Install the PowerPro programming software on the PC. Create the communication between PC and CPU module and set the relative hardware parameters. According to the engineering requirements, design and develop the PLC control program to meet the application demands.

1.3.5 Running the PLC

Insure that all the procedures above are correctly done. Download the control program into PLC. Complete the field debugging before running the PLC.

Chapter 2

CPU Modules

2.1 OVERVIEW

2.1.1 Design of CPU Modules

The design of a CPU module is shown in Figure 2.1, which includes the PLC status indicator, I/O channel status indicator, input/output wiring terminals, communication port, run/stop operation switch, interface for the connection to expansion modules, analog potentiometer presets, heat radiator, holes for backplane or wall mounting, and DIN rail snap-on clip, etc.

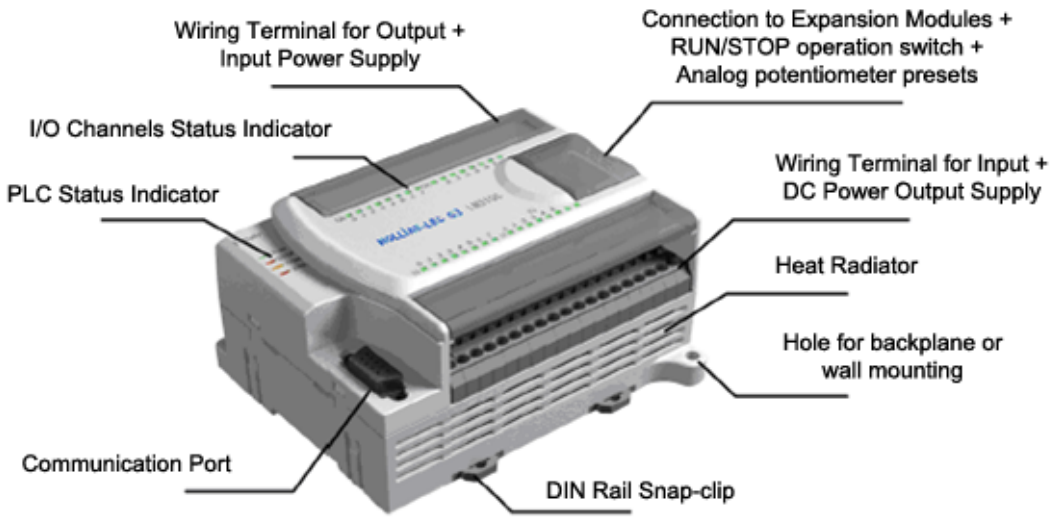


Figure 2.1 CPU Module Connection & Interfaces Diagram

- "RUN/STOP operation switch" is used to select the mode in which the CPU runs.
- Analog potentiometer is used to Set-point Value during customize testing.
- Interface for the connection to expansion modules provides high-speed data transmission between the CPU module and other expansion modules.

2.1.2 Features of CPU Modules

LM Micro PLC provides various types of CPU modules to meet different application requirements. CPU modules are integrated with certain amount of Digital Input (DI) and Digital Output (DO) points, among which DIs are the transistor inputs that receive source/sink input signals and DOs are the transistor/relay outputs. Differed from models, the power supply of the CPU modules can be either the 24V DC power or the AC power. Table 2.1 shows a chart of all the different CPU modules and their general specifications.

CPU Modules							
Specifications	LM3104-CDT	LM3105-CAR	LM3106-CDT	LM3107-CAR	LM3108-CDT	LM3109-CAR	LM3107E-CAR
Digital input	8	8	14	14	24	24	12
Digital output	6 x transistor	6 x relay	10 x transistor	10 x relay	16 x transistor	16 x relay	8 x relay
Analog input	--	--	--	--	--	--	2
Analog output	--	--	--	--	--	--	1
Maximum number of expansion modules	2	2	4	4	7	7	4
Current limit +24VDC (for expansion Bus)	300mA	260mA	300mA	260mA	400mA	320mA	260mA
Current limit +5VDC (for expansion Bus)	800mA	800mA	800mA	800mA	1500mA	1300mA	800mA
Communication interface	1x RS-232 (non-isolation)				1x RS-232 and 1x RS-485 (non-isolation)		1x RS-232 (non-isolation)
Communication protocol	MODBUS RTU, G3 proprietary, or FreePort protocol						
High speed input counter	3 points 100KHz mono-phase input counters or 2 points 100KHz bi-phase input counters						
Pulse output	1 point, 20kHz	None	2 points, 20kHz	None	2 points, 20kHz	None	None
Timer	Unlimited number of timers, 1ms to 49 days						
Counter	Unlimited number of counters, 15 bits counting range						
Boolean execution speed	0.37μs per instruction						
Power Supply	21~27VDC	187 ~ 242VAC @ 47 ~ 63Hz	21~27VDC	187 ~ 242VAC @ 47 ~ 63Hz	21~27VDC	187 ~ 242VAC @ 47 ~ 63Hz	85 ~ 242VAC @ 47 ~ 63Hz
Dimension	125mm(L) x 90mm (W) x 70mm(H)				200mm(L) x 90mm (W) x 70mm(H)		125mm(L) x 90mm (W) x 70mm(H)

Table 2.1 CPU Modules General Features

2.1.3 Operation Mode

Switch State	Description
RUN	CPU module under run mode, execute the PLC application program.
STOP	CPU module does not execute the PLC application program but allows the downloading of PLC application program from the PC into the CPU module.

Table 2.2 RUN/STOP Operation Switch Description

Note:
Downloading the PLC application program into the CPU module is possible only under STOP mode.

2.1.4 Status Indicators

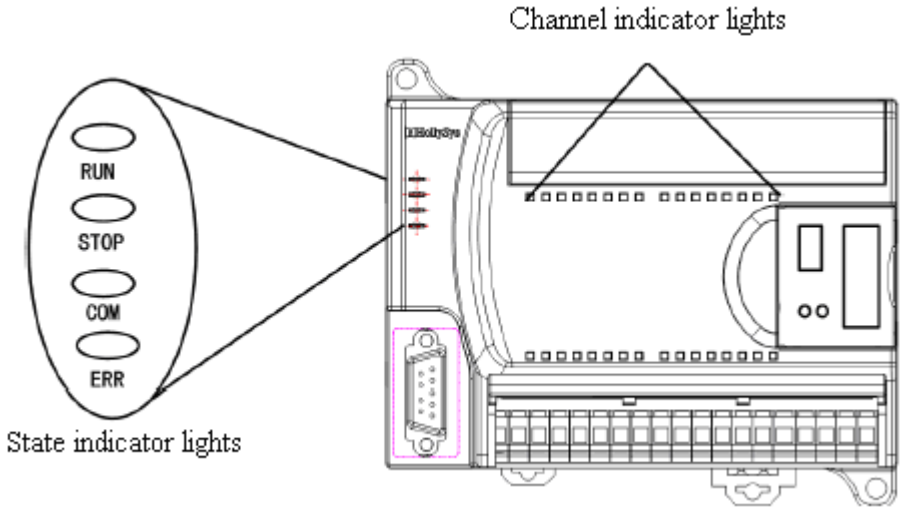


Figure 2.2 PLC Status and I/O Channels Indicators

- **I/O channel indicators:** display the operating status of each I/O channel of the CPU module
- **PLC operation status indicator (RUN/STOP):** display the operating status of the PLC; module run state (run/stop);
- **Communication indicator (COM)**: display the PLC system communication status, which includes the receiving and sending of the data frame
- **Error indicator (ERR):** display the self-diagnosed errors in the PLC system.

		State	Meaning
Channel indicator lights (green)		ON	Input or Output Signals are detected.
		OFF	No input or output signals are detected.
Working state indicator lights	RUN (green) STOP (yellow)	The RUN light is on The STOP light is on	CPU module works normally, PLC application program is running.
		The RUN light is off The STOP light is on	CPU module works normally; PLC application program is not running or no PLC application program is found in CPU module.
		The RUN and STOP lights are both off	CPU module is power off or CPU module failure.
		The RUN and STOP light are both on	CPU module failure.
Communication indicator light COM (green)		Flashing	CPU module is in communication.
Error indicator light ERR (red)		ON	Self-diagnosed errors in the system are detected.

Table 2.3 The Definition of PLC Status Indicator

If the software configuration does not match with the hardware configuration or version, ERR indicator light will be ON.

2.1.5 Communication Interface

Located on the bottom-left side of the CPU module, this port is a 9-pin D-type standard RS-232 serial communication interface. On the LM3108-CDT/LM3109-CAR CPU module, there is an additional 9-pin D-type standard interface for RS485 serial communication. Connection between the PLC and the PC can be established by connecting the RS-232 serial communication port to the PC's COM port with the RS-232 programming cable. This allows the programming, downloading, and on-line debugging with PowerPro, the PLC software. The RS-485 communication interface is used for communication between PLC and other field devices such as HMI display.

Item	Parameters
Interface quantity	1 or 2 interface port
Physical interface	RS232 (non-isolation) / RS485 (non-isolation)
Communication speed	38400bps
Communication Protocol	LM Mirco Proprietary Protocol / MOBUS RTU / FreePort protocol

Table 2.4 CPU Module Communication Parameters

2.2 LM3104-CDT, CPU MODULE

24V DC POWERED, 8-POINTS DI, 6-POINTS TRANSISTOR DO

2.2.1 LM3104-CDT, Technical Specifications

LM3104-CDT		
Local I/Os		DI 8 × 24V DC ; DO 6 × Transistor output
Maximum expansion modules		2 expansion modules (no DP slave interface module and Ethernet interface module)
High-speed counters		3 monoplane counters, 100KHz / 2 biphase counters, 100KHz
High-speed output		1 point, 20KHz
Pulse catch		2 points
Interruption inputs		2 points
Analog potentiometers		2, setting value range: 0~255
Customer program memory		120K bytes
Retain area		6K bytes
Password		Yes
Real-time clock		Yes
Timers		Unlimited (minimum unit is 1ms)
Counters		Unlimited (maximum count range: 15bits)
Basic instructions		340
Expansion instructions		47
Calculation speed		0.37μs (Single Boolean instruction)
Power supply specifications		
Power supply	Power supply voltage	24V DC
	Allowed range	21~27V DC
	Current consumption (Max.)	1300mA
Output power supply	Output voltage	24V DC
	Allowed range	22.8~25.2V DC
Output current	+24V DC (to expansion bus)	300mA
	+24V DC (Output power supply)	300mA
	+5V DC (to expansion bus)	800mA
Short circuit protection		400mA, 24V DC output
Communication features		
Communication interface		1 RS232 port (non-isolation)
Communication protocol		Proprietary/Modbus protocol/Free protocol
Input features		
Input type		Sink/Source
Input rated voltage		24V DC
Allowed range		0~30V DC
Logic 1 signal		15～30V DC, allowed minimum current 3mA
Logic 0 signal		0～5V DC, allowed maximum current 1mA
Input delay time		<0.6ms (Rated input voltage)
Isolation mode		Optical-coupler isolation
Isolation group		1 group
Isolation endurance voltage		500V AC
Output features		
Output type		Transistor
Output voltage		24V DC

Allowed range	20.4～28.8V DC
Transistor conduction voltage drop	< 0.5V (when current is 1A, output logic “1”)
Contact impedance	< 0.2Ω
Logic “1” single point maximum output current	1A
Logic “0” maximum sink current	1mA
Common end total output current	< 4A
Isolation	Optical-coupler isolation
Isolation group	2 groups
Isolation endurance voltage	500V AC
Response time (state from “0” to “1”n or from “1” to “0”)	Normal output < 1ms, High-speed pulse output < 10μs
Short circuit protection	Externally provided
Physical features	
Dimensions	125mm(L) × 90mm(W) × 70mm(H)
Weight	310g
Working temperature	0~55°C
Storage temperature	-40~+70°C
Relative humidity	5%~95% (no condensation)

Table 2.5 LM3104-CDT Technical Specification

2.2.2 LM3104-CDT, WIRING TERMINAL

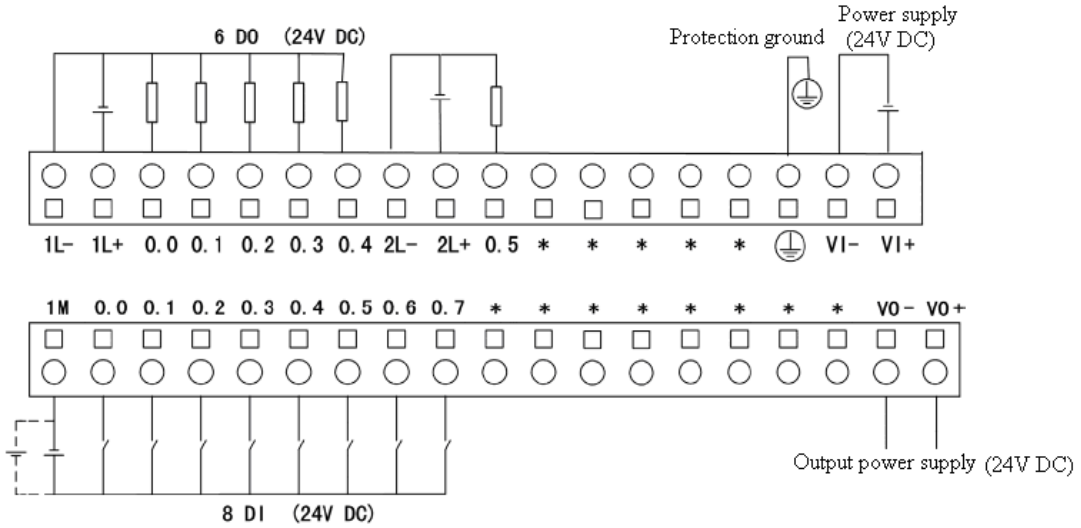


Figure 2.3 LM3104-CDT Wiring Terminals

- IM is a common terminal of DI that may be connected to 24VDC +/- terminal according to source/sink DI.
- DO 1L+/2L+ and 1L-/2L- connect to load drive power supply 24VDC + and – terminals.
- * means that no physical wiring.

LM3104-CDT, Wiring terminal label and definition

Upper Terminals	Description	Lower Terminals	Description
1L-	Load drive power supply GND	1M	DI common terminal
1L+	Load drive power supply +24VDC	I0.0	Normal input/High-speed counting input terminal
Q0.0	Normal output terminal	I0.1	Normal input/High-speed counting input control terminal
Q0.1	Normal output terminal	I0.2	Normal input/High-speed counting input terminal
Q0.2	Normal output terminal	I0.3	Normal input/High-speed counting input control terminal
Q0.3	Normal output/High-speed pulse output terminal	I0.4	Normal input/Normal counting input terminal
Q0.4	Normal output terminal	I0.5	Normal input/Normal counting input control terminal
2L-	Load drive power supply -24VDC	I0.6	Normal input/High-speed counting input/External interruption input/Pulse catch input terminal
2L+	Load drive power supply +24VDC	I0.7	Normal input/External interruption input/Pulse catch input terminal
Q0.5	Normal output terminal	*	-
*		*	-
*		*	-
*		*	-
*		*	-
*		*	-
⏚	Protection ground	*	-
VI-	Power supply -24VDC terminal	*	-
VI+	Power supply +24VDC terminal	VO-	Output power supply -24VDC terminal
		VO+	Output power supply +24VDC terminal

Table 2.6 LM3104-CDT Technical Specification

2.2.3 LM3104-CDT, RS-232 Communication Interface

The standard RS232 serial communication interface, integrated on the CPU module, is used to connect the PC to the PLC through programming cable for the program download and on-line debugging.

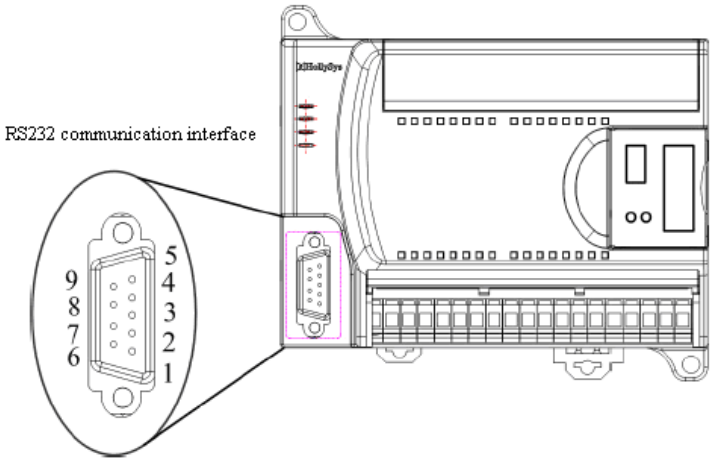


Figure 2.4 LM3104-CDT Communication Interface

Pin Number	Definition	Pin Number	Definition
1	-	6	-
2	RXD	7	-
3	TXD	8	-
4	-	9	-
5	GND		

Table 2.7 RS-232 Port Pins Definition

2.2.4 LM3104-CDT, Input and Output Equivalent Circuit

- Input channel (DI) equivalent circuit is shown below in Figure 2.5

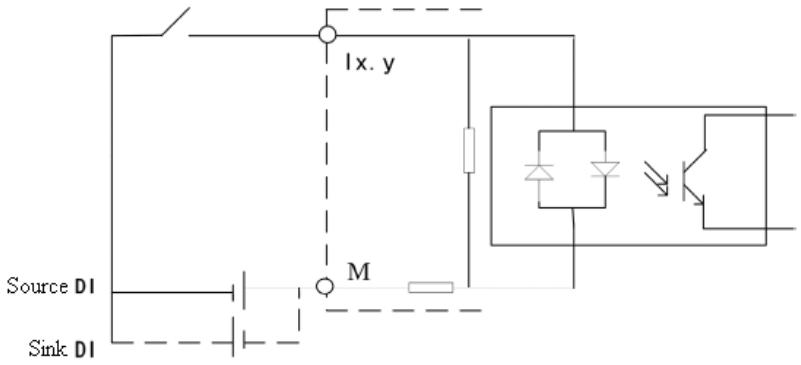


Figure 2.5 LM3104-CDT Input Channel Equivalent Circuit

- Output channel (DO) equivalent circuit shown below in Figure 2.6

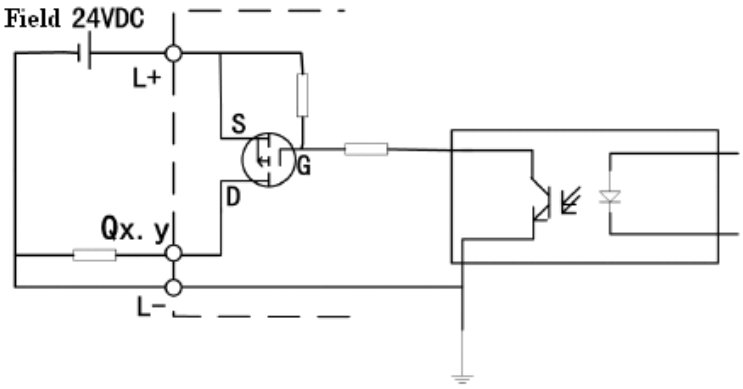


Figure 2.6 LM3104-CDT Output Channel Equivalent Circuit

2.2.5 LM3104-CDT, Software Configuration

Figure 2.7 shows the LM3104-CDT "PLC Configuration" in PowerPro Programming Software.

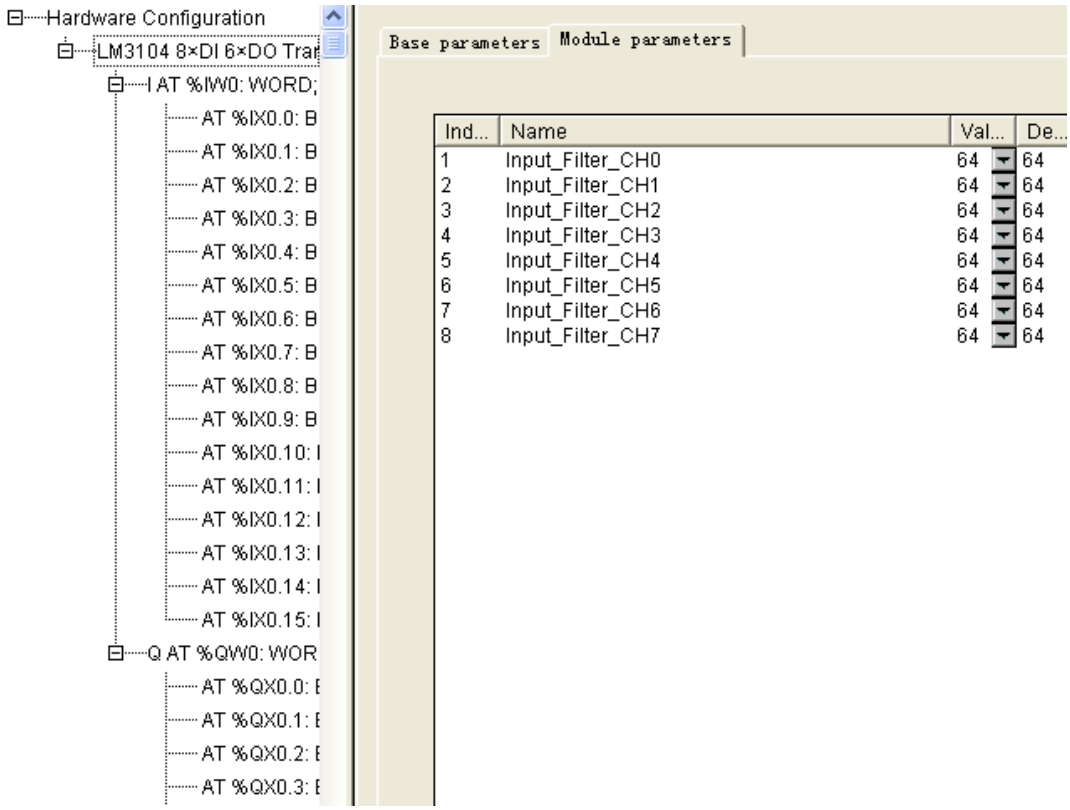


Figure 2.7 LM3104-CDT Software Configuration

Input_Filter_CH0 means that the filter parameter of LM3104 first input channel I0.0. There are eight optional filter parameters such as NO, 2, 4, 8, 16, 32, 64 and 128. NO means no filter; 2/4/8/16/32/64/128 means input signal is 1 in 2/4/8/16/32/64/128 continuous PLC scan periods, otherwise input signal is 0. Filter parameter value by default is 64.

NOTE:
Input/output has 16bits (one word) as shown in the software configuration. LM3104-CDT actually only uses IX0.0 ~ IX0.7 and QX0.0 ~ QX0.5, other channels are not in used.

2.3 LM3105-CAR, CPU MODULE

AC POWERED, 8-POINTS DI, 6-POINTS RELAY DO

2.3.1 LM3105-CAR, TECHNICAL SPECIFICATIONS

LM3105-CAR		
Local I/Os		DI 8 × 24V DC ; DO 6 × Relay output
Expandable I/O		2 modules (no LM3401 and LM3403)
High-speed counter		3 monophase counters, 100KHz / 2 biphase counters, 100KHz
High-speed output		No
Pulse catch		2 points
Interruption inputs		2 points
Analog potentiometers		2, value setting range: 0~255
Customer program memory		120K bytes
Retain area		6K bytes
Password protection		Yes
Real-time clock		Yes
Timers		Unlimited (minimum unit is 1ms)
Counters		Unlimited (maximum count range: 15bits)
Basic instructions		340
Expansion instructions		47
Calculation speed		0.37μs (Single Boolean instruction)
Power Specifications		
Power supply	Power supply voltage	24V AC@50Hz
	Allowed range	187~242V AC@50Hz
	Current consumption (MAX)	120mA
Output power supply	Output voltage	24V DC
	Allowed range	22.8V DC～25.2V DC
Output current	+24V DC (To expansion bus)	260mA
	+24V DC (Output power supply)	200mA
	+5V DC (To expansion bus)	800mA
Short circuit protection		400mA, 24V DC output
Communication features		
Communication interface		1 RS232 port (non-isolation)
Communication protocol		LM MIRCO Proprietary/MODBUS RTU/Freeport protocol
Input features		
Input type		Source/Sink
Input voltage rating		24V DC
Allowed range		0V DC~30V DC
Logic 1 signal		15～30V DC, allowed minimum current 3mA

Logic 0 signal	0～5V DC, allowed maximum current 1mA
Input delay time	<0.6ms (Rated input voltage)
Isolation mode	Optical-coupler isolation
Isolation group	1 group
Isolation voltage endurance capability	500V AC
Output Features	
Output type	Relay
Output voltage	24VDC/24~230VAC
Allowed range	5~30VDC/5~250VAC
Total common end output current	<10A
Output contact capacity	2A, resistance load
Minimum load	10mA (contact voltage is 5VAC/5VDC)
Over-current protection	No
Contact impedance	<0.2Ω
Isolation groups	2 groups
Isolation voltage between coil and contact point	3000VAC, 1min, sink current 1mA
Isolation voltage between contact points	750VAC, 1min, sink current 1mA
Isolation resistance (minimum)	100MΩ (when 500VDC) between contact point/coil and contact point
Contact point switch delay time	<10ms
Contact point switch frequency (maximum)	1Hz
Relay mechanism service life	No load : above 10,000,000 times Rated resistance 2A load : above 100,000 times
Physical features	
Dimensions	125mm(L) × 90mm(W) × 70mm(H)
Weight	310g
Working temperature	0~55°C
Storage temperature	-40~+70°C
Relative humidity	5%~95% (no condensation)

Table 2.8 LM3105-CAR Technical Specification

2.3.2 LM3105-CAR, WIRING TERMINAL

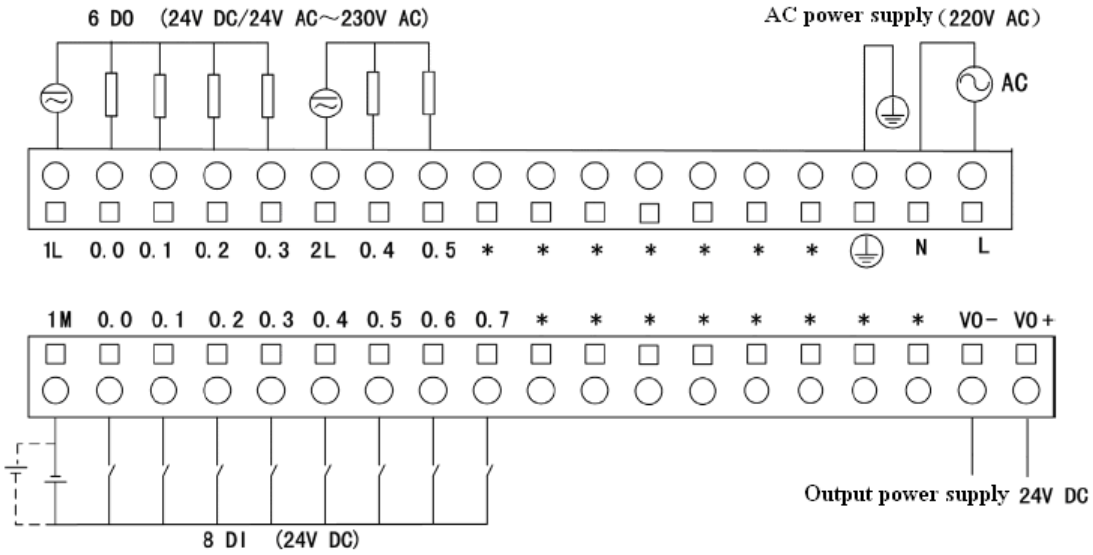


Figure 2.8 LM3105-CAR Wiring Terminals

- IM is the common terminal of DI that may be connected to transducer power supply 24VDC +/- terminal according to source/sink DI.
- DO 1L+ /2L+ and 1L- /2L- connect to load drive power supply terminals; load drive power supply can be DC or AC.
- * means that no physical wiring.

Warning:
PLC input power supply wiring must be done under all power-off situation. Pulling / drawing the PLC power supply line is not allowed when the PLC is powered on.

LM3105-CAR, Wiring terminal label and definition

Upper Terminals	Description	Lower Terminals	Description
1L	Output common terminal	1M	Input common terminal
Q0.0	Normal output terminal	I0.0	Normal input/High-speed counting input terminal
Q0.1	Normal output terminal	I0.1	Normal input/High-speed counting input control terminal
Q0.2	Normal output terminal	I0.2	Normal input/High-speed counting input terminal
Q0.3	Normal output/High-speed pulse output terminal	I0.3	Normal input/High-speed counting input control terminal
2L	Output common terminal	I0.4	Normal input/Normal counting input terminal
Q0.4	Normal output terminal	I0.5	Normal input/Normal counting input control terminal
Q0.5	Normal output terminal	I0.6	Normal input/High-speed counting input/External interruption input/Pulse catch input terminal
*	-	I0.7	Normal input/External interruption input/Pulse catch input terminal
*	-	*	-
*	-	*	-
*	-	*	-

*	-	*	-
*	-	*	-
*	-	*	-
⏚	Protection ground	*	-
N	Neutral	*	-
L	Line	VO-	-24VDC output power supply terminal
		VO+	+24VDC output power supply terminal

Table 2.9 LM3105-CAR Wiring Terminal Label and Definition

2.3.3 LM3105-CAR, RS-232 Communication Interface

LM3105-CAR RS232 port pins definition is the same as LM3104-CDT; please see Table 2.7 for details.

2.3.4 LM3105-CAR, Equivalent Circuit

- LM3105-CAR Input channel (DI) equivalent circuit is the same as LM3104-CDT, please refer to Figure 2.5.
- LM3105-CAR output channel (DO) equivalent circuit is shown below in Figure 2.9.

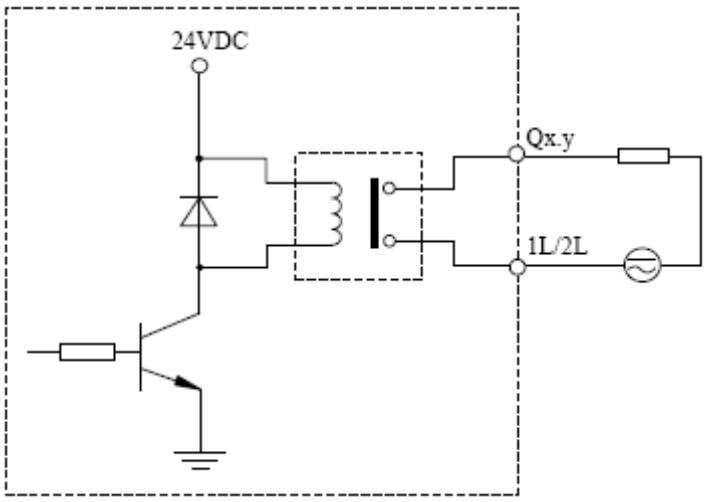


Figure 2.9 LM3105-CAR Output Channel Equivalent Circuit

2.3.5 LM3105-CAR, Software Configuration

LM3105-CAR software configuration is similar to LM3104-CDT; please refer to section 2.2.5.

2.4 LM 3106-CDT, CPU MODULE

24V DC POWERED, 14-POINTS DI, 10-POINTS TRANSISTOR DO

2.4.1 LM3106-CDT, Technical Specifications

LM3106-CDT		
Local I/Os		DI 14 × 24V DC ; DO 10 × Transistor output
Maximum expansion modules		4 expansion modules
High-speed counters		3 monophase counters, 100KHz / 2 biphase counters, 100KHz
High-speed output		2 points, 20KHz
Pulse catch		4 points
Interruption inputs		4 points
Analog potentiometers		2, setting value range: 0~255
Customer program memory		120K bytes
Retaining area		6K bytes
Password		Yes
Real-time clock		Yes
Timers		Unlimited (minimum unit is 1ms)
Counters		Unlimited (maximum count range: 15bits)
Basic instructions		340
Expansion instructions		47
Calculation speed		0.37μs (Single Boolean instruction)
Power supply specifications		
Power supply	Power supply voltage	24V DC
	Allowed range	21~27V DC
	Current consumption (MAX)	1300mA
Output power supply	Output voltage	24V DC
	Allowed range	22.8~25.2V DC
Current output	+24V DC (to expansion bus)	300mA
	+24V DC (Output power supply)	300mA
	+5V DC (to expansion bus)	800mA
Short circuit protection		400mA, 24V DC output
Communication features		
Communication interface		1 RS232 port (non-isolation)
Communication protocol		LM MIRCO Proprietary/ Modbus RTU protocol / FreePort protocol
Input features		
Input type		Sink/Source
Input rated voltage		24V DC
Allowed range		0~30V DC
Logic 1 signal		15～30V DC, allowed minimum current 3mA
Logic 0 signal		0～5V DC, allowed maximum current 1mA
Input delay time		<0.6ms (Rated input voltage)
Isolation mode		Optical-coupler isolation
Isolation groups		2 groups
Isolation voltage endurance capability		500V AC
Output features		
Output type		Transistor
Output voltage		24V DC
Allowed range		20.4～28.8V DC

Transistor conduction voltage drop	< 0.5V (when current is 1A, output logic “1”)
Contact impedance	< 0.2Ω
Logic “1” single point maximum output current	1A
Logic “0” maximum sink current	1mA
Common end total output current	< 4A
Isolation mode	Optical-coupler isolation
Isolation group	2 groups
Isolation voltage endurance capability	500V AC
Response time (state from “0” to “1”n or from “1” to “0”)	Normal output < 1ms, High-speed pulse output < 10μs
Short circuit protection	Externally provided
Physical features	
Dimensions	125mm(L) × 90mm(W) × 70mm(H)
Weight	310g
Working temperature	0~55°C
Storage temperature	-40~+70°C
Relative humidity	5%~95% (no condensation)

Table 2.10 LM3106-CDT Technical Specifications

2.4.2 LM3106-CDT, Wiring Terminals

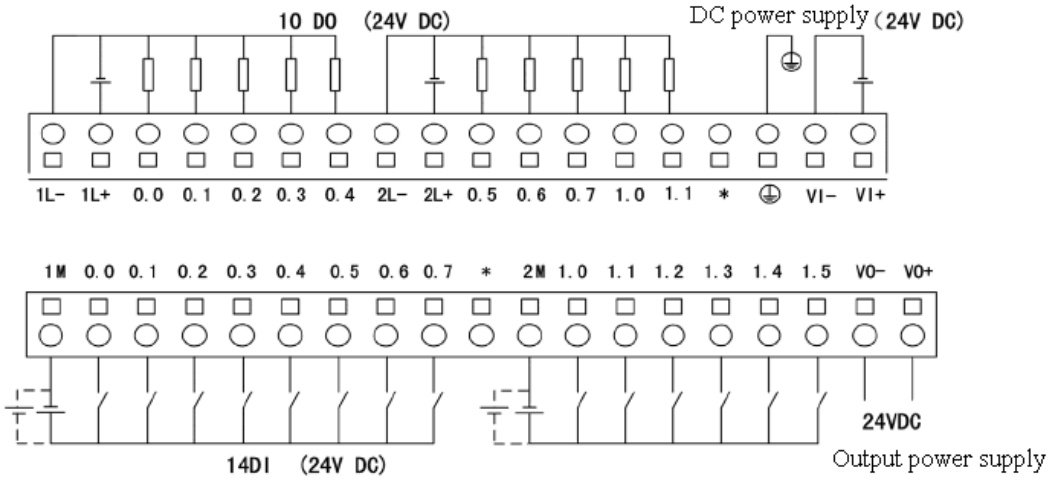


Figure 2.10 LM3106-CDT Wiring Terminals

- IM and 2M terminals are the common terminals of DI that may be connected to transducer power supply 24VDC +/- terminal according to source/sink DI.
- DO 1L+/2L+ and 1L-/2L- connect to load drive power supply 24VDC + and - terminals respectively.
- * means that no physical wiring.
- Figure 2.11 and Figure 2.12 show two examples of the connection between LM3106-CDT high-speed output and the motor. 1.6KΩ resistance is used to driver rated current value between 10 and 20mA. The connection method shown in Figure 2.10 is recommended as it has better anti-jamming ability. The connection method shown in Figure 2.11 is the same with normal output wiring, and adopted without high precision requirement.

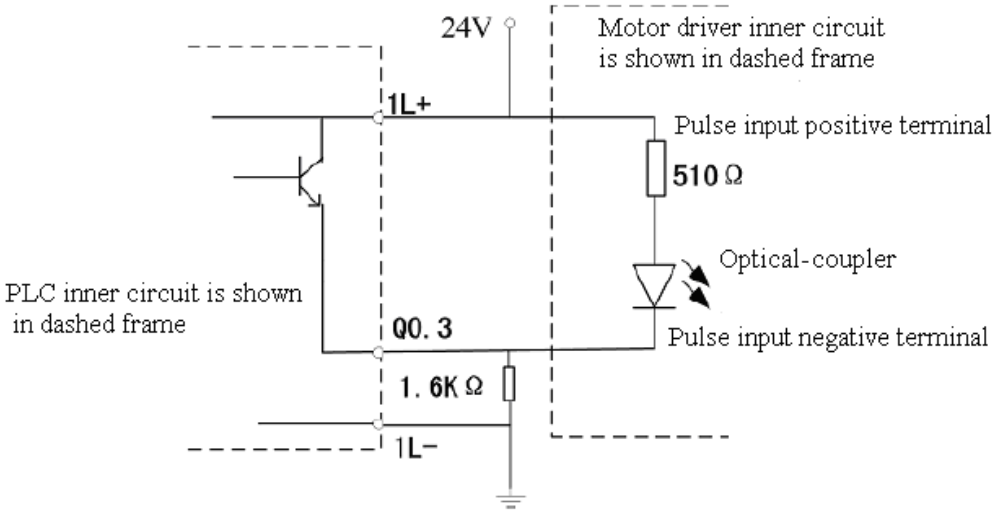


Figure 2.11 Example1: The Connection between LM3106-CDT High-speed Output and Motor (same connection method to Q1.1)

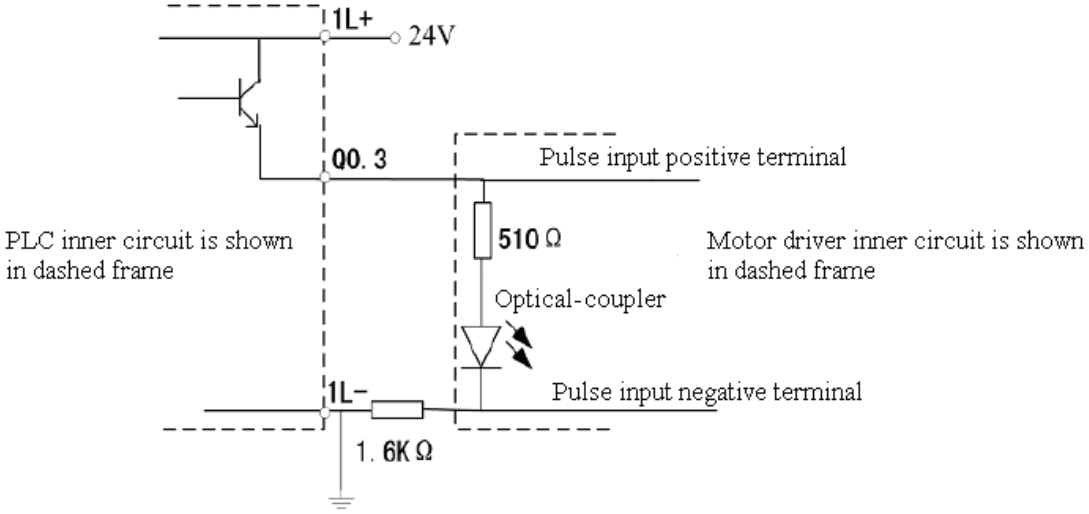


Figure 2.12 Example2: The Connection between LM3106-CDT High-speed Output and Motor same connection method to Q1.1)

Note:
External resistance is used to the motor driver with 5V pulse voltage. The motor drivers with different pulse voltage connect with different external resistance. Please refer to the motor driver manual for details.

LM3106-CDT, Wiring terminal label and definition

Upper Terminals	Description	Lower Terminals	Description
1L-	Load drive power supply GND	1M	DI common terminal
1L+	Load drive power supply +24VDC	I0.0	Normal input/High-speed counting input terminal
Q0.0	Normal output terminal	I0.1	Normal input/High-speed counting input control terminal
Q0.1	Normal output terminal	I0.2	Normal input/High-speed counting input terminal
Q0.2	Normal output terminal	I0.3	Normal input/High-speed counting input control terminal
Q0.3	Normal output/High-speed pulse output terminal	I0.4	Normal input/Normal counting input terminal
Q0.4	Normal output terminal	I0.5	Normal input/Normal counting input control terminal
2L-	Load drive power supply GND	I0.6	Normal input/High-speed counting input/External interruption input/Pulse catch input terminal
2L+	Load drive power supply +24VDC	I0.7	Normal input/External interruption input/Pulse catch input terminal
Q0.5	Normal output terminal	*	-
Q0.6	Normal output terminal	2M	DI common terminal
Q0.7	Normal output terminal	I1.0	Normal input/External interruption input/Pulse catch input terminal
Q1.0	Normal output terminal	I1.1	Normal input/External interruption input/Pulse catch input terminal
Q1.1	Normal output/High-speed pulse output terminal	I1.2	Normal input terminal
*	-	I1.3	Normal input terminal
⏚	Protection ground	I1.4	Normal input terminal
VI-	24VDC power supply negative terminal	I1.5	Normal input terminal
VI+	24VDC power supply positive terminal	VO-	-24VDC output power supply terminal
		VO+	+24VDC output power supply terminal

Table 2.11 LM3106-CDT Wiring Terminal Label and Definition

2.4.3 LM3106-CDT, RS-232 Communication Interface

- LM3106-CDT RS232 port pins definition is the same as LM3104-CDT. Please see Table 2.7 for more details

2.4.4 LM3106-CDT, Equivalent Circuit

- LM3106-CDT DI equivalent circuit is the same as LM3104-CDT; please refer to Figure 2.5.
- LM3105-CAR DO equivalent circuit is the same as LM3104-CDT; please refer to Figure 2.6.

2.4.5 LM3106-CDT, Software Configuration

- LM3106-CDT software configuration is similar to LM3104-CDT; please see the section 2.2.5.

2.5 LM3107-CAR, CPU MODULE

AC PowerED, 14-POINTS DI, 10-points RELAY DO

2.5.1 LM3107-CAR, Technical Specifications

LM3107-CAR		
Local I/Os		DI 14 × 24V DC ; DO 10× Relay output
Maximum expansion modules		4 modules
High-speed counter		3 monophase counters, 100KHz / 2 biphase counters, 100KHz
High-speed output		No
Pulse catch		4 points
Interruption input		4 points
Analog potentiometer		2, value setting range 0~255
Customer program memory		120Kbytes
Retain area		6Kbytes
Password protection		Yes
Real-time clock		Yes
Timer		Unlimited (1ms as minimum unit)
Counter		Unlimited (Maximum counting range: 15bit)
Basic instructions		340
Expansion instructions		47
Compute speed		0.37μs (Single Boolean instruction)
Power Specifications		
Input power supply	Power supply voltage	220V AC@50Hz
	Allowed range	187~242V AC@50Hz
	Current consumption (MAX)	120mA
Output power supply	Output voltage	24V DC
	Allowed range	22.8V DC～25.2V DC
Output current	+24V DC (To expansion bus)	260mA
	+24V DC (To Output power supply)	200mA
	+5V DC (To expansion bus)	800mA
Short circuit protection		400mA, 24V DC output
Communication features		
Communication interface		1 RS-232 (Non-isolation)
Communication protocol		LM MIRCO Proprietary / MODBUS RTU / FreePort protocol
Input features		
Input type		Source/Sink
Input voltage rating		24V DC
Allowed range		0V DC~30V DC
Logic 1 signal		15～30V DC, allowed minimum current 3mA
Logic 0 signal		0～5V DC, allowed maximum current 1mA

Input delay time	<0.6ms (Rated input voltage)
Isolation mode	Optical-couple isolation
Isolation group	2 groups
Isolation endurance voltage	500V AC
Output Features	
Output type	Relay
Output voltage	24VDC/24~230VAC
Allowed range	5~30VDC/5~250VAC
Common end output current total	<10A
Output contact capacity	2A, resistance load
Minimum load	10mA (contact voltage is 5VAC/5VDC)
Over-current protection	No
On state impedance	<0.2Ω
Isolation groups	2 groups
Isolation voltage between coil and contact	3000VAC, 1min, sink current 1mA
Isolation voltage between contacts	750VAC, 1min, sink current 1mA
Isolation resistance (minimum)	100MΩ (when 500VDC) between contacts/coil and contact
Contact switch delay time	<10ms
Contact switch frequency (maximum)	1Hz
Relay mechanism service life	No load : above 10,000,000 times Rated resistance 2A load : above 100,000 times
Physical features	
Dimensions	125mm(L) × 90mm(W) × 70mm(H)
Weight	380g
Working temperature	0~55°C
Storage temperature	-40~+70°C
Relative humidity	5%~95% (no condensation)

Table 2.10 LM3106-CDT Technical Specifications

2.5.2 LM3107-CAR, Wiring Terminals

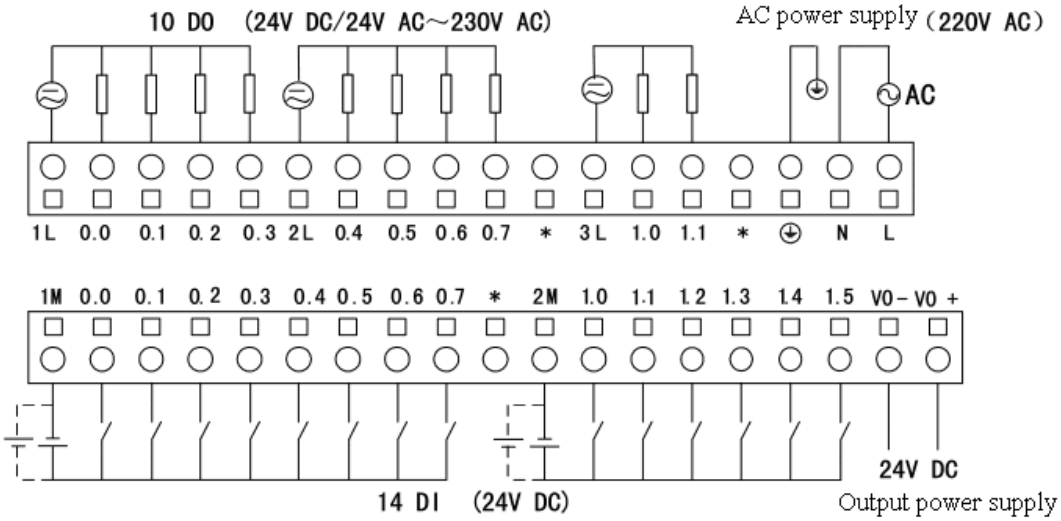


Figure 2.13 LM3107-CAR Wiring Terminal Label and Definition

- IM/2M is the common terminal of DI that may be connected to transducer power supply 24VDC +/- terminal according to source/sink DI.
- DO 1L /2L/3L is load drive power supply terminal; load driver power supply can be DC or AC.
- * means no physical wiring.

Warning:
PLC input power supply wiring must be done under all power-off situation. Pulling / drawing the PLC power supply line is not allowed when the PLC is powered on.

LM3107-CAR, Wiring terminal label and definition

Upper Terminals	Description	Lower Terminals	Description
1L	Output common terminal	1M	Input common terminal
Q0.0	Normal output terminal	I0.0	Normal input/High-speed counting input terminal
Q0.1	Normal output terminal	I0.1	Normal input/High-speed counting input control terminal
Q0.2	Normal output terminal	I0.2	Normal input/High-speed counting input terminal
Q0.3	Normal output terminal	I0.3	Normal input/High-speed counting input control terminal
2L	Output common terminal	I0.4	Normal input/Normal counting input terminal
Q0.4	Normal output terminal	I0.5	Normal input/Normal counting input control terminal
Q0.5	Normal output terminal	I0.6	Normal input/High-speed counting input/External interruption input/Pulse catch input terminal
Q0.6	Normal output terminal	I0.7	Normal input/External interruption input/Pulse catch input terminal
Q0.7	Normal output terminal	*	-
*	-	2M	External input common terminal
3L	Output common terminal	I1.0	Normal input/External interruption input/Pulse catch input terminal

Q0.0	Normal output terminal	I1.1	Normal input/External interruption input/Pulse catch input terminal
Q0.1	Normal output terminal	I1.2	Normal input terminal
*	-	I1.3	Normal input terminal
⏚	Protection ground	I1.4	Normal input terminal
N	Line	I1.5	Normal input terminal
L	Neutral	VO-	-24VDC output power supply terminal
		VO+	+24VDC output power supply terminal

Table 2.11 LM3106-CDT Wiring terminal label and definition

2.5.3 LM3107-CAR, RS-232 Communication Interface

- LM3107-CAR RS232 port pins definition is the same as LM3104-CDT. Please see Table 2.7 for details.

2.5.4 LM3107-CAR, Equivalent Circuit

- LM3107-CAR Input channel (DI) equivalent circuit is the same as LM3104-CDT; please refer to Figure 2.5.
- LM3105-CAR output channel (DO) equivalent circuit is the same as LM3105-CAR; please refer to Figure 2.6.

2.5.5 LM3107-CAR, Software Configuration

- LM3107-CAR software configuration is similar to LM3104-CDT; please refer to section 2.2.5

2.6 LM3107E-CAR, CPU MODULE

AC POWERED, 12-POINTS DI, 8-POINTS RELAY DO, 2-CHANNEL AI, 1-CH*ANNEL AO

2.6.1 LM3107E-CAR, Technical Specifications

Model		LM3107E-CAR
CPU Specifications		
Native I/O		14 DI, 24VDC; 10 DO, relay; 2 AI; 1 AO
Expansion modules		4
High-speed counters		Monophase counters: 3 points, 100KHz Biphase counters: 2 points, 100KHz
High-speed output		N/A
Pulse catch		4 points
Interruption input		4 points
Analog potentiometer		2, value setting range 0～255
Program memory		120 Kbytes
Retain memory		6 Kbytes
Timer		No limit (1ms as minimum unit)
Counter		No limit (Maximum counting range: 16 bit)
Operation speed		0.37μs (Boolean instruction)
Power Specifications		
Power supply		220VAC@50Hz
Allowed range		85～242VAC@47~63Hz
Current consumption (Max.)		120mA
Output voltage		24VDC
Allowed range		22.8～25.2VDC
Output current	+24VDC(To expansion bus)	260mA
	+24VDC(To the outside)	200mA
	+5VDC(To expansion bus)	800mA
Short circuit protection		400mA，24VDC output
Communication Specifications		
Communication interface		1 RS232(Non-isolation)
Communication protocol		LM MIRCO protocol/MODBUS RTU protocol/FreePort protocol
Digital Input		
Input type		Sink/Source
Input voltage rated value		24VDC
Allowed range		0VDC～30VDC
Logic 1 signal		15～30VDC, allowed minimum current 3mA
Logic 0 signal		0～5VDC，allowed maximum current 1mA
Input delay time		<0.6ms (Rated input voltage)
Isolation mode		Photocoupler isolation
Isolation group		2 groups
Maximum isolation voltage		1000VAC
Digital Output		
Output type		Relay
Output voltage		24VDC / 24～230VAC
Allowed range		5～30VDC / 5～250VAC
Common end output current total		<10A
Output switch capacity		2A, resistance load
Minimum load		10mA (Contact voltage 5VAC or 5VDC)
Over current protection		N/A

Isolation voltage between coil and contact		3000VAC@1 minute, leakage current 1mA
Isolation voltage between contacts		750VAC@1minute, leakage 1mA
Isolation group		2 groups
Contact switch delay time		<10ms
Relay mechanical life		No load: over 10,000,000 times Rated resistive load 2A: over 100,000 times
Analog Input		
Input ranges	Voltage	0～10V
	Current	0～20mA
Decimal code of input range		0～10000
Input precision (monopole)		1%F.S.@25℃
Input impedance		>1MΩ（voltage）, 250Ω（Current）
Maximum input current		30mA
Maximum input voltage		30V
Isolation		N/A
Step response time		<20ms（no filtering, not include scan time）
Analog output		
Output ranges	Voltage	0～10V
	Current	0～20mA
Decimal code of input range		0～4095
Output precision		1%F.S.@25℃
Drive capacity		Voltage: 2000Ω (Min.); Current: 600Ω (Max.)
Setup time		Voltage output: ≤2ms； Current output: ≤2ms
Isolation		N/A
Output refresh time		1 scan cycle
Physical Specifications		
Dimensions (W×H×D)		125mm×90mm×70mm
Weight		380g
Work temperature		0～+55℃
Storage temperature		-40～+70℃
Relative humidity		5～95% (no condensation)

Table 2.12 LM3107E-CAR Technical Specifications

2.6.2 LM3107E-CAR, Wiring Terminal

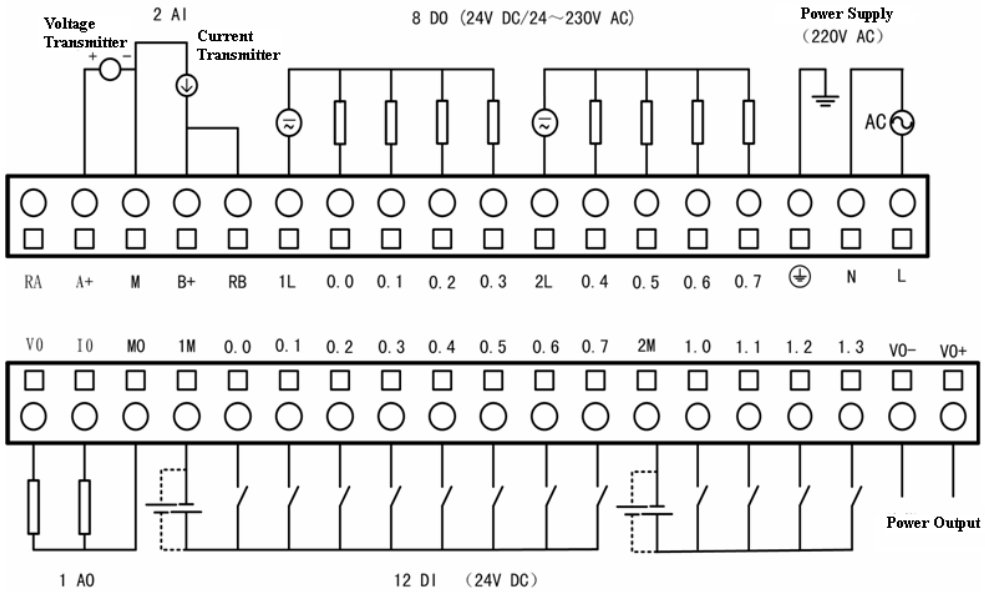


Figure 2.14 LM3107E-CAR Terminal Definition and Connection

- 1M and 2M are the DI common ends that can be connected to either transmitter 224VDC power supply positive end (source) or negative end (sink).
- 1L and 2L are DO load drive power supply ends; the power supply can be 24VDC/24~230VAC.
- V0, I0 and M0 are output ends of one AO channels. RA, A+, RB, B+ and M are input ends of two AI channels; A+ and M (or B+ and M) can be connected to voltage input; RA and A+ (or RB and B+) can be shorted to connected to current input.
- "*"means no connection.

Warning:
PLC input power supply wiring must be done under all power-off situation. Pulling / drawing the PLC power supply line is not allowed when the PLC is powered on.

LM3107E-CAR, Wiring terminal label and definition

Upper Terminals	Description	Lower Terminals	Description
RA	Current input of channel A	V0	Voltage output
A+	Voltage input of channel A	I0	Current output
M	Common end of AI	M0	Common end of AO
B+	Voltage input of channel B	1M	Common end of DI
RB	Current input of channel B	I0.0	Digital input/High-speed counting input
1L	Common end of DO	I0.1	Digital input/High-speed counting control input
Q0.0	Digital output	I0.2	Digital input/High-speed counting input
Q0.1	Digital output	I0.3	Digital input/High-speed counting control input
Q0.2	Digital output	I0.4	Digital input/Normal counting input
Q0.3	Digital output	I0.5	Digital input/Normal counting control input
2L	Common end of DO	I0.6	Digital input/High-speed counting input/External interruption input/Pulse catch input
Q0.4	Digital output	I0.7	Digital input/External interruption input/Pulse catch

			input
Q0.5	Digital output	2M	Common end of DI
Q0.6	Digital output	I1.0	Digital input/External interruption input/Pulse catch input
Q0.7	Digital output	I1.1	Digital input/External interruption input/Pulse catch input
⏚	Protection ground	I1.2	Digital input
N	Neutral	I1.3	Digital input
L	Line	VO-	-24VDC power output
		VO+	+24VDC power output

Table 2.13 LM3107E-CAR Wiring Terminal Label and Definition

2.6.3 LM3107E-CAR, RS-232 Communication Interface

- LM3107E-CAR RS232 port pins definition is the same as LM3104-CDT. Please refer to Table 2.7.

2.6.4 LM3107E-CAR, Channel Interface Circuit

- DI interface circuit is the same as LM3104-CDT, please refer to Figure 2.5
- DO interface circuit is the same as LM3105-CAR, please refer to Figure 2.8.
- AI interface circuit diagram is shown below in Figure 2.14.

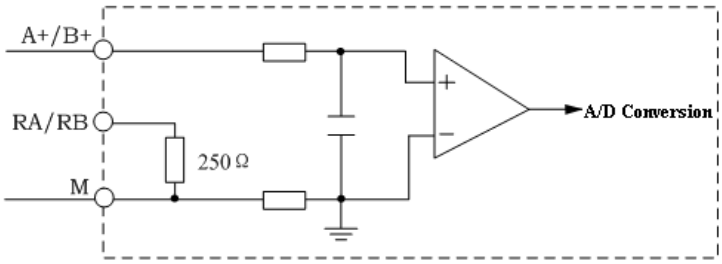


Figure 2.15 LM3107E-CAR AI Interface Circuit Diagram

- AO interface circuit diagram is shown below in Figure 2.15.

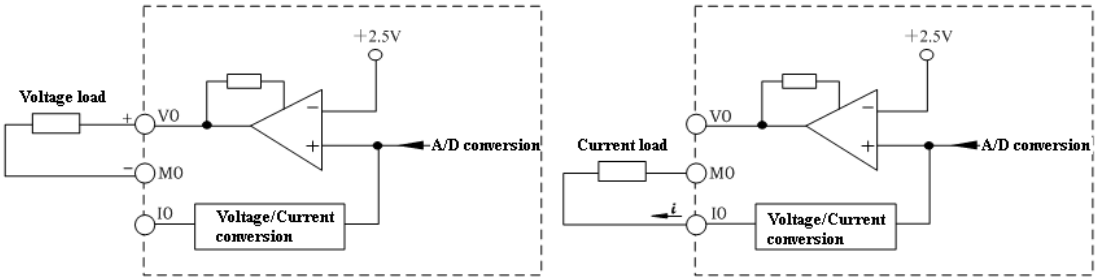


Figure 2.16 LM3107E-CAR AO Interface Circuit Diagram

2.6.5 LM3107E-CAR, Software Configuration

As shown in Figure 2.16, LM3107E-CAR input data occupy 3 words (IW) and output data occupy 2 words (QW) in PowerPro programming software; one digital channel occupies one bit of one word from bit0, and one analog channel occupies one word.

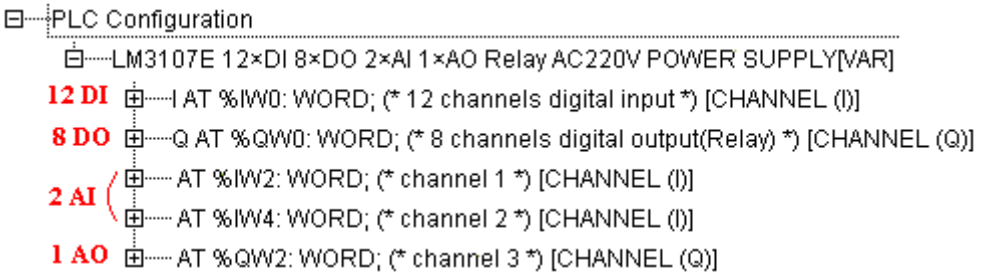


Figure 2.17 LM3107E-CAR Input and Output Data

Click "**LM3107E 12×DI 8×DO 2×AI 1×AO Relay AC220V POWER SUPPLY[VAR]",** LM3107E-CAR parameters interface will be shown in the right of PLC Configuration interface as shown in Figure 2.17. Input_Fliter_CH0~ CH11 are the filter parameters of DI0~DI11. The value of the filter parameter can be No_Filer, 2, 4, 8, 16, 32, 64 (default). The value means scan cycles number selected ("No_Filter" means 0), for example "4" means that the input signal is 1 if the input signal keeps 1 during 4 scan cycles, or else the signal is 0.

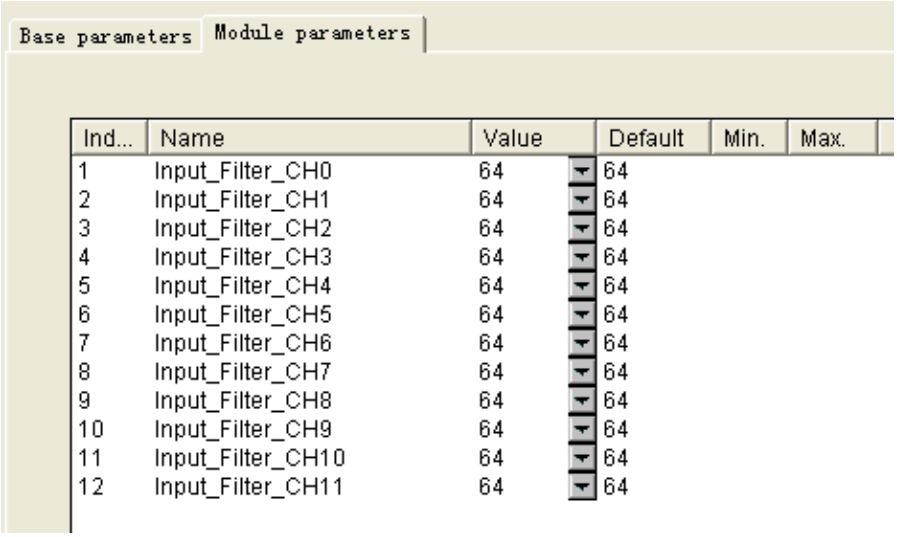
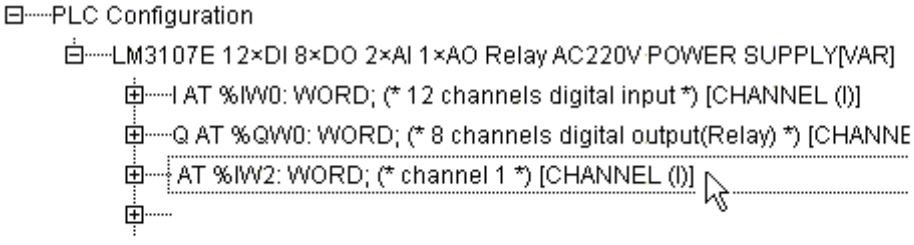


Figure 2.18 LM3107E-CAR Module Parameters Setting

Click any of the AI channels, the channel parameters interface will be shown in the right of PLC Configuration interface as shown in Figure 2.18.



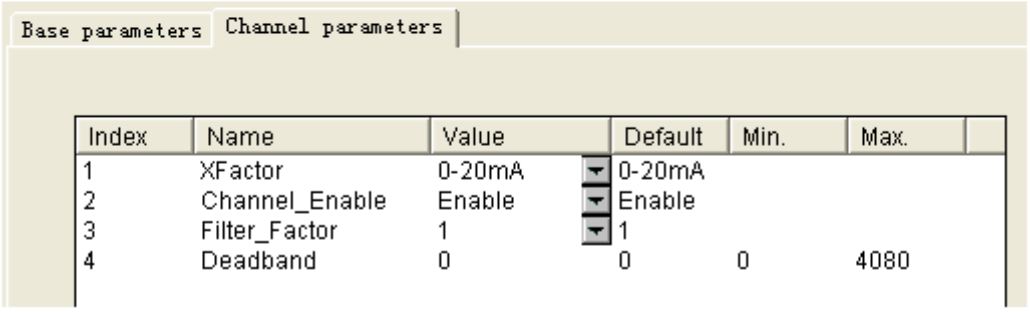


Figure 2.19 LM3107E-CAR AI Channel Parameters Setting

- **XFactor** is the channel input signal type parameter, can be 0~20mA (default) or 0~10V according to the practice signal.
- **Filter_Factor** is the filter parameter, can be 1 (default), 2, 4, 8, 16 and 32. The corresponding relation between the filter parameter and the time constant of RC lowpass filter is shown in Table 1.1.3. Filter parameter "1" (no filter) is recommend if no special requirement.
- **Channel_Enable** is the channel enables parameter, can be Enable (default) and Disable. The parameter should be "Enable" if the channel is used to measure signal.
- **Deadband** is the deadband parameter, can be 0 (default) ~4080. When channel filter function is enable, if the difference between AI current sample value and the value filtered last time is more than the deadband value LM3107E-CAR outputs the current sample value, or else outputs the value filtered. The deadband value is 0; it means deadband parameter is disabling.

Filter Parameter	Time Constant of RC Lowpass Filter
1（default）	No filter
2	80ms
4	160ms
8	320ms
16	640ms
32	1280ms

Table 2.14 Corresponding Relation between The Filter Parameter and Time Constant of RC Lowpass Filter

Click AO channel, the channel parameters interface will be shown in the right of PLC Configuration interface as shown in Figure 2.19.

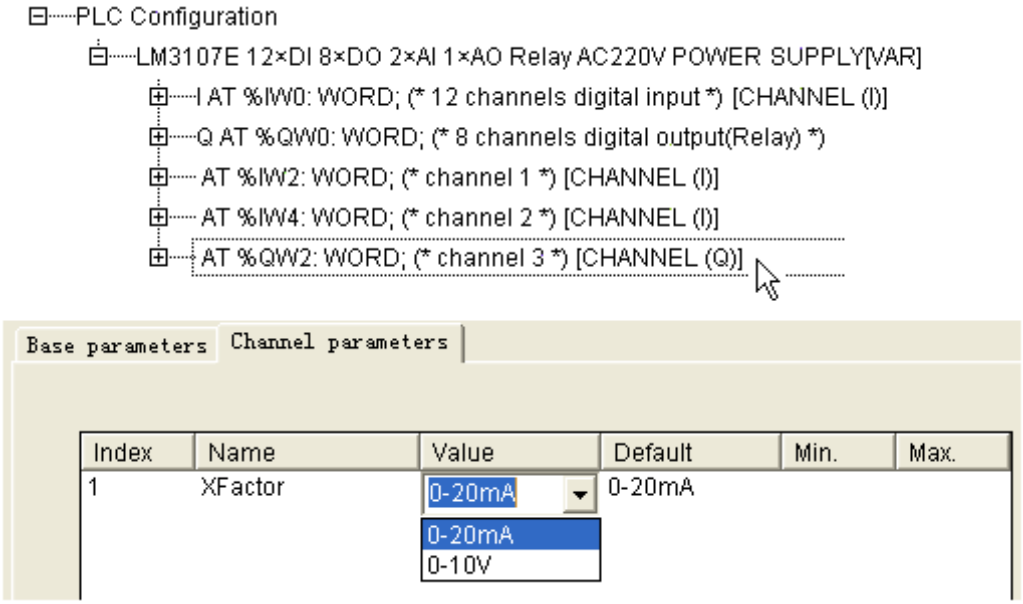


Figure 2.20 LM3107E-CAR AO Channel Parameter Setting

XFactor is channel output signal type parameter, can be 0~20mA (default) or 0~10V according to the practice signal.

2.7 LM3108-CDT, CPU MODULE

24V DC POWERED, 24-POINTS DI, 16-POINTS TRANSISTOR DO

2.7.1 LM3108-CDT, Technical Specifications

LM3108-CDT		
Local I/Os		DI 24 × 24V DC ; DO 16 × Transistor output
Maximum expansion modules		7
High-speed counters		3 monophase counters, 100KHz / 2 biphase counters, 100KHz
High-speed outputs		2 points 20KHz
Pulse catch		4 points
Interrupt inputs		4 points
Analog potentiometers		2, value setting range: 0～255
Customer program memory		120Kbyte
Retain area		6Kbyte
Password protection		Yes
Real-time clock		Yes
Timers		Unlimited (1ms as minimum unit)
Counters		Unlimited (Maximum counting range: 15bit)
Basic instructions		340
Expansion instructions		47
Calculation speed		0.37μs (Single Boolean instruction)
Power Specifications		
Input power	Power voltage	24VDC
	Allowed range	21～27VDC
	Current consumption(MAX)	1500mA
Output power	Output voltage	24V DC
	Allowed range	22.8～25.2V DC
External output current	+24VDC (to expansion bus)	400mA
	+24VDC (output power supply)	400mA
	+5VDC (to expansion bus)	1500mA
Short circuit protection		900mA, 24VDC output
Communication Features		
Communication interface		1 RS232 port (non-isolation), 1 RS485 port (non-isolation)
Communication protocol		LM MIRCO Proprietary protocol(only RS232) / MODBUS RTU protocol/FreePort protocol)
Input Features		
Input type		Sink/Source
Input voltage rated value		24V DC
Allowed range		0～30V DC

Logic 1 signal	15～30V DC allowed minimum current 3 mA
Logic 0 signal	0～5V DC allowed maximum current 1 mA
Input delay time	<0.6ms (Rated input voltage)
Isolation	Optical-coupler isolation
Isolation groups	3 groups
Isolation endurance voltage	500VAC
Output Features	
Output type	Transistor
Output voltage	24V DC
Allowed range	20.4V DC～28.8V DC
Transistor Conducting voltage drop	<0.5V (output logic “1”, current 1A)
Contact impedance	<0.2Ω
Logic”1” single output maximum current	1A
Logic”0” maximum leaking current	1mA
Common end output current total	<4A
Isolation	Optical-coupler isolation
Isolation groups	2 groups
Isolation endurance voltage	500VAC
Response time (status “0” to “1” or “1” to “0”)	Common output<1ms, High-speed pulse output<10μs
Short circuit protection	External supply
Physical Features	
Dimensions	200mm(L)×90mm(W)×70mm(H)
Weight	470g
Working temperature	0～+55℃
Storage temperature	-40～+70℃
Relative humidity	5%～95% (Non-condensing)

Table 2.14 LM3108-CDT Technical Specifications

2.7.2 LM3108-CDT, Wiring Terminal

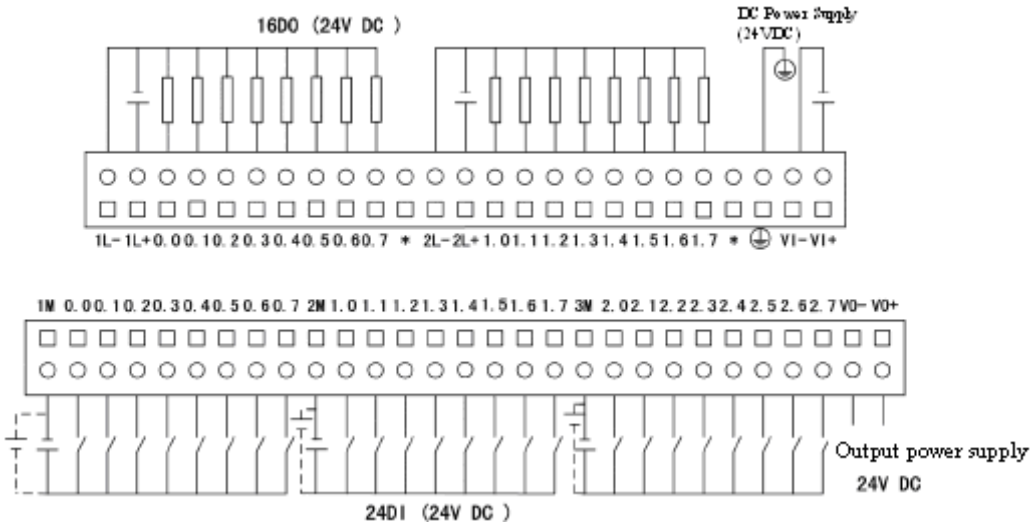


Figure 2.21 LM3108-CDT Wiring Terminals

- 1M, 2M and 3M are the common terminals of DI that may be connected to the 24VDC +/- terminal according to source/sink DI.
- DO 1L+/2L+ and 1L-/2L- connect to load drive power supply 24VDC + and – terminals.
- "*" indicates no physical wiring.

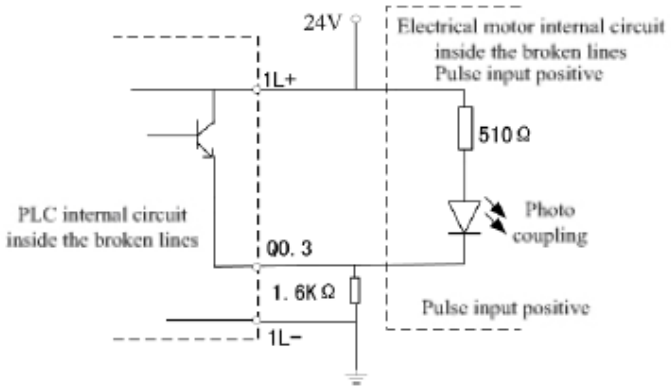


Figure 2.22 Example 1 LM3108-CDT High-Speed Output & Motor Wiring (Q1.1 same wiring)

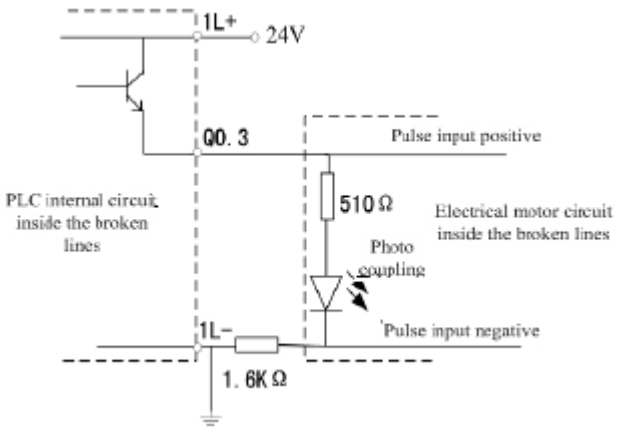


Figure 2.23 Example 2 LM3108-CDT High-Speed Output & Motor Wiring (Q1.1 same wiring)

LM3108-CDT Wiring terminal label and definition

Upper terminals	Terminal descriptions	Lower terminals	Terminal descriptions
1L-	Load drive power supply GND	1M	DI common terminal
1L+	Load drive power supply +24VDC	I0.0	Normal input/High-speed counting input terminal
Q0.0	Normal output terminal	I0.1	Normal input/High-speed counting input control terminal
Q0.1	Normal output terminal	I0.2	Normal input/High-speed counting input terminal
Q0.2	Normal output terminal	I0.3	Normal input/High-speed counting input control terminal
Q0.3	Normal output/High-speed pulse output terminal	I0.4	Normal input/Normal counting input terminal
Q0.4	Normal output terminal	I0.5	Normal input/Normal counting input control terminal
Q0.5	Normal output terminal	I0.6	Normal input/High-speed counting input/Interruption input/Pulse catch input terminal
Q0.6	Normal output terminal	I0.7	Normal input/Interruption input/Pulse catch input
Q0.7	Normal output terminal	2M	DI common terminal
*	-	I1.0	Normal input/Interruption input/Pulse catch input terminal
2L-	Load drive power supply GND	I1.1	Normal input/Interruption input/Pulse catch input terminal
2L+	Load drive power +24VDC	I1.2	Normal input terminal
Q1.0	Normal output terminal	I1.3	Normal input terminal
Q1.1	Normal output/High-speed pulse output terminal	I1.4	Normal input terminal
Q1.2	Normal output terminal	I1.5	Normal input terminal
Q1.3	Normal output terminal	I1.6	Normal input terminal
Q1.4	Normal output terminal	I1.7	Normal input terminal
Q1.5	Normal output terminal	3M	DI common terminal
Q1.6	Normal output terminal	I2.0	Normal input terminal
Q1.7	Normal output terminal	I2.1	Normal input terminal
*	-	I2.2	Normal input terminal
⏚	Ground protection	I2.3	Normal input terminal
VI-	-24VDC Power supply terminal	I2.4	Normal input terminal
VI+	+24VDC Power supply terminal	I2.5	Normal input terminal
		I2.6	Normal input terminal
		I2.7	Normal input terminal
		VO-	-24VDC output power supply terminal
		VO+	+24VDC output power supply terminal

Table 2.15 LM3108-CDT Wiring Terminal Label and Definition

2.7.3 LM3108-CDT, Communication Interface

A standard RS-232 and a RS-485 serial communication interface are both integrated on CPU module. The RS-232 interface connection between the PLC and the PC COM port with the programming cable allows the programming, downloading, and modification. The RS-485 interface is use to provide communication between PLC and field devices such as HMI display.

Figure 2.24 LM3108-CDT Communication Interface

pin No.	Definition	pin No.	Definition
1	-	6	-
2	RXD	7	-
3	TXD	8	-
4	-	9	-
5	GND		

Table 2.16 RS232 port pins definition

Linker pin No.	Definition	Linker pin No.	Definition
1	-	6	-
2	-	7	-
3	B (RxD/TxD+)	8	A (RxD/TxD-)
4	-	9	-
5	-		

Table 2.17 RS485 port pins definition

2.7.4 LM3108-CDT, Equivalent Circuit

- Input channel (DI) equivalent circuit is the same as the input channel of LM3104-CDT. Please refer to Figure 2.5.
- Output channel (DO) equivalent circuit is the same as the output channel of LM3104-CDT. Please refer to Figure 2.6.

2.7.5 LM3108-CDT, Software Configuration

- LM3108-CDT software configuration is similar to LM3104-CDT; please refer to section 2.2.5.

2.8 LM3109-CAR, CPU MODULE

AC POWERED, 24-POINTS DI, 16 POINTS RELAY DO

2.8.1 LM3109-CAR, Technical Specifications

LM3109-CAR		
Local I/Os		DI 24 × 24V DC ; DO 16 × Relay output
Maximum expansion modules		7
High-speed counters		3 monophase counters, 100KHz / 2 biphase counters, 100KHz
High-speed output		No
Pulse catch		4 points
Interruption inputs		4 points
Analog potentiometers		2, value setting range: 0～255
Customer program memory		120Kbyte
Power off Retain area		6Kbyte
Password protection		Yes
Real-time clock		Yes
Timers		Unlimited (1ms as minimum unit)
Counters		Unlimited (Maximum counting range: 15bit)
Basic instructions		340
Expansion instructions		47
Operation speed		0.37μs (Single Boolean instruction)
Power Specifications		
Input power	Power voltage	220V AC@50Hz
	Allowed range	187～242V AC@50Hz
	Current consumption(MAX)	200mA
Output power	Output voltage	24V DC
	Allowed range	22.8～25.2V DC
External output current	+24V DC (to expansion bus)	320mA
	+24V DC (Output power supply)	400mA
	+5V DC (to expansion bus)	1300mA
Short circuit protection		900mA, 24VDC output
Communication Features		
Communication interface		RS232 and RS485 (Non-isolating)
Communication protocol		LM MIRCO Proprietary protocol(only RS232) / MODBUS RTU protocol / FreePort protocol
Input Features		
Input type		Sink/Source
Input rated voltage		24V DC
Allowed range		0～30V DC

Logic 1 signal	15～30V DC allowed minimum current 3 mA
Logic 0 signal	0～5V DC allowed maximum current 1 mA
Input delay time	<0.6ms (Input rated voltage)
Isolation	Optical-coupler isolation
Isolation groups	3 groups
Isolation endurance voltage	500VAC
Output Features	
Output type	Relay
Output voltage	24V DC or 24～230VAC
Allowed range	5～30V DC or 5～250V AC
Common end output total current	<10A
Output On/Off capacity	2A, Resistance load
Minimum load	10mA (Voltage between contacts 5VAC or 5VDC)
Over current protection	None
On impedance (contact impedance)	<0.2Ω
Isolation groups	4 groups
Isolation voltage between coil and contact	3000VAC, 1 minute, leakage current 1mA
Isolation voltage between contacts	750VAC, 1 minute, leakage current 1mA
Isolation resistance (minimum)	Between contacts or between coil and contact are both 100MΩ (500VDC)
Contact On/Off delay time	<10ms
Contact On/Off frequency (maximum)	1Hz
Relay mechanism service life	No load: over 10,000,000 times Rated resistance 2A load: over 100,000 times
Physical Features	
Dimensions	200mm(L)×90mm(W)×70mm(H)
Weight	550g
Working temperature	0～+55℃
Storage temperature	-40～+70℃
Relative humidity	5%～95% (Non-condensing)

Table 2.18 RS485 port pins definition

- 1M/2M/3M is the common terminal of DI that may be connected to 24VDC +/- terminal according to source/sink DI.
- DO 1L+/2L+/3L+/4L+ and 1L-/2L-/3L-/4L- connect to load drive power supply 24VDC + and – terminals; it can either be DC or AC power.
- * means no wiring or no physical connection.

2.8.2 LM3109-CAR, Wiring Terminal

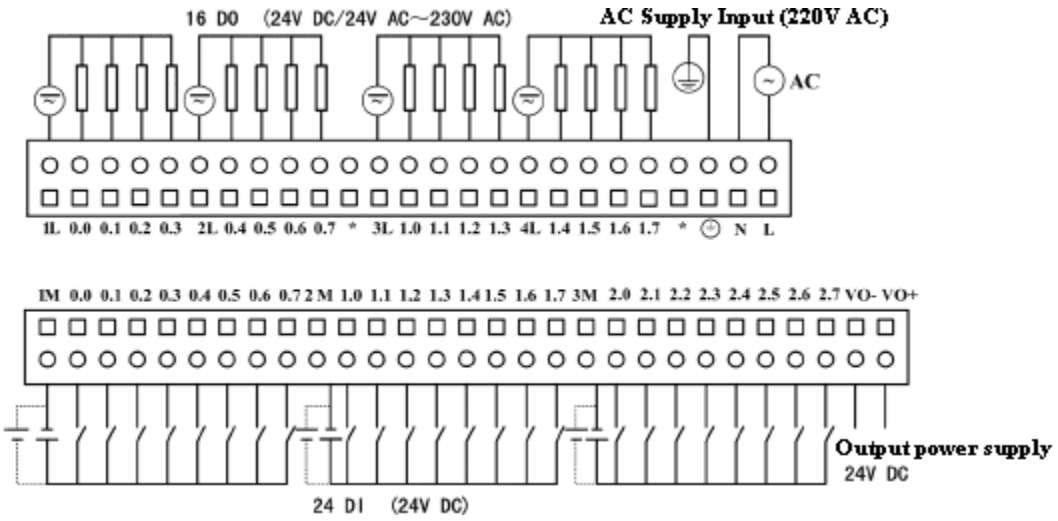


Figure 2.25 LM3109-CAR Terminal Definition & Wiring

Warning:
PLC input power supply wiring must be done under all power-off situation. Pulling / drawing the PLC power supply line is not allowed when the PLC is powered on.

LM3109-CAR, Wiring terminal label and definition

Upper terminals	Terminal descriptions	Lower terminals	Terminal descriptions
1L	DO common terminal	1M	DI common terminal
Q0.0	Normal output terminal	I0.0	Normal input/High-speed counting input terminal
Q0.1	Normal output terminal	I0.1	Normal input/High-speed counting input control terminal
Q0.2	Normal output terminal	I0.2	Normal input/High-speed counting input terminal
Q0.3	Normal output terminal	I0.3	Normal input/High-speed counting input control terminal
2L	DO common terminal	I0.4	Normal input/High-speed counting input terminal
Q0.4	Normal output terminal	I0.5	Normal input/High-speed counting input control terminal
Q0.5	Normal output terminal	I0.6	Normal input/High-speed counting input/Interruption input/Pulse catch input terminal
Q0.6	Normal output terminal	I0.7	Normal input/Interruption input/Pulse catch input terminal
Q0.7	Normal output terminal	2M	DI common terminal
*	-	I1.0	Normal input/Interruption input/Pulse catch input terminal
3L	DO common terminal	I1.1	Normal input/Interruption input/Pulse catch input terminal
Q1.0	Normal output terminal	I1.2	Normal input terminal
Q1.1	Normal output terminal	I1.3	Normal input terminal
Q1.2	Normal output terminal	I1.4	Normal input terminal

Q1.3	Normal output terminal	I1.5	Normal input terminal
4L	DO common terminal	I1.6	Normal input terminal
Q1.4	Normal output terminal	I1.7	Normal input terminal
Q1.5	Normal output terminal	3M	DI common terminal
Q1.6	Normal output terminal	I2.0	Normal input terminal
Q1.7	Normal output terminal	I2.1	Normal input terminal
*	-	I2.2	Normal input terminal
⏚	Ground protection	I2.3	Normal input terminal
N	Neutral	I2.4	Normal input terminal
L	Line	I2.5	Normal input terminal
		I2.6	Normal input terminal
		I2.7	Normal input terminal
		VO-	-24VDC output power supply terminal
		VO+	+24VDC output power supply terminal

Table 2.19 Wiring Terminal Label and Definition

2.8.3 LM3109-CAR, Communication INTERFACES

- A standard RS232 and a RS485 serial communication interface. Please see section 2.7.3 for more details.

2.8.4 LM3109-CAR, Equivalent Circuit

- Input channel (DI) equivalent circuit is the same as the input channel of LM3104-CDT. Please refer to Figure 2.5.
- Output channel (DO) equivalent circuit is the same as the output channel of LM3105-CAR. Please refer to Figure 2.8.

2.8.5 LM3109-CAR, Software Configurations

- LM3109-CAR software configuration is similar to LM3104-CDT; please see section 2.2.5.

Chapter 3

Expansion Modules

LM Micro series also provides a variety of expansion modules, the details are shown in table 3.1.

Type	Model	Description	Specification
Digital Expansion Module	LM3210-EDI	8 points digital input module	DI 8×DC24V
	LM3211-EDIA	8 points AC digital input module	DI 8×AC220V
	LM3212-EDI	16 points digital input module	DI 16×DC24V
	LM3220-EDOT	8 points transistor output module	DO 8×DC24V Transistor
	LM3221-EDOT	16 points transistor output module	DO 16×DC24V Transistor
	LM3222-EDOR	8 points relay output module	DO 8×Relay
	LM3223-EDOR	16 points relay output module	DO 16×Relay
	LM3230-EDMT	4 points DI/4 points transistor output module	DI 4×DC24V/ DO 4×DC24V Transistor
	LM3231-EDMR	4 points DI/4 points relay output module	DI 4×DC24V/ DO 4×Relay
Analog Expansion Module	LM3310-EAI	4 channel analog input module	4～20mA/0～20mA/0～10V
	LM3310A-EAI	4 channel analog input module	4～20mA/0～20mA/0～10V
	LM3310B-EAI	4 channel analog input module	0～20mA/0100mV/500mV/1V/5V/10V
	LM3311-EAI	4 channel thermocouple input module	J、K、E、N、T、B、R、S type, -80～80mV
	LM3312-EAI	4 channel RTD input module	Cu50、Pt100 type RTD
	LM3313-EAI	8 channel analog input module	-10～10V,-20～20mA
	LM3314-EAI	8 channel NTC input module	R25=10K, B value selection
	LM3320-EAO	2 channel analog output module	0～20mA/0～10V
	LM3330-EAM	4 channel analog input/1 channel analog output module	Input: 4～20mA/0～20mA/0～10V/ output: 0～20mA/0～10V
Special Function Module	LM3401-EPFD	Profibus-DP slave module	
	LM3403-EETH	Ethernet Module	

Table 3.1 Expansion Modules

Generally, the expansion modules adopt the design as shown in figure 3.1.

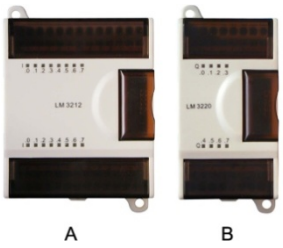


Figure 3.1 PLC Expansion Module Front View

3.1 DIGITAL EXPANSION MODULES

3.1.1 LM3210-EDI, DI module, 8 points digital dc input

LM3210-EDI module process the input of digital signals with a 24V DC rated working voltage.

LM3210-EDI, Technical Specifications

Model		LM3210-EDI		
Input Features		Physical Features		
Input points	8 points	Dimension		50mm(L)×90mm(W)×70mm(H)
Input type	Sink/source	Weight		110g
Input voltage rated value	24VDC	Power consumption	+24VDC(Expansion bus supply)	0mA
Allowed range	0～30VDC		+24VDC(Expansion supply)	40mA
Logic 1 signal	15～30VDC Allowed minimum current 3mA			
Logic 0 signal	0～5VDC Allowed maximum current 1mA		+5VDC(Expansion bus supply)	60mA
Input delay time	<10ms (rated input voltage)	Working temperature		0～+55℃
Isolation mode	Optical-coupler isolation	Storage temperature		-40～+70℃
Isolation group	2 groups	Relative humidity		5～95%, non-condensing
Isolation endurance voltage	500VAC			

Table 3.2 Technical Specification

LM3210-EDI, LED Indicator

Channel Status LED Indicator	Definition
ON	Input channel is ON
OFF	Input channel is OFF

Table 3.3 LED Definition

LM3210-EDI, Wiring Terminal

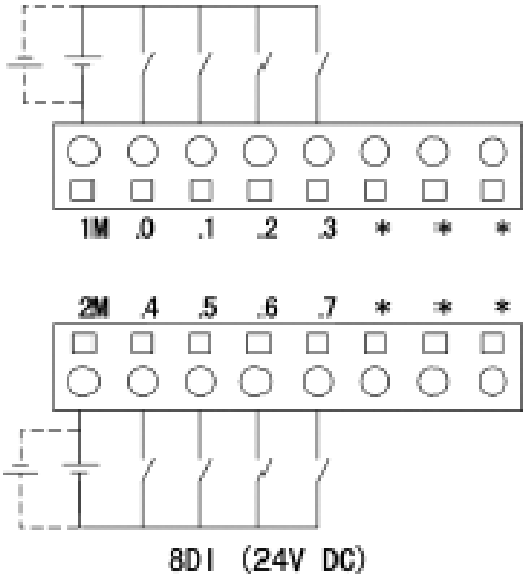


Figure 3.2 LM3210-EDI Wiring Terminal

- As shown in figure 3.2, the 1M and 2M terminals of DI points indicate the external DI common terminals that can be connected either to the positive end or the negative end of 24VDC sensor power source according to source/sink type DI.
- "*" indicates no wiring or no physical connection.

LM3210-EDI, Equivalent Circuit

The equivalent circuit of the DI point is shown in Figure 3.3.

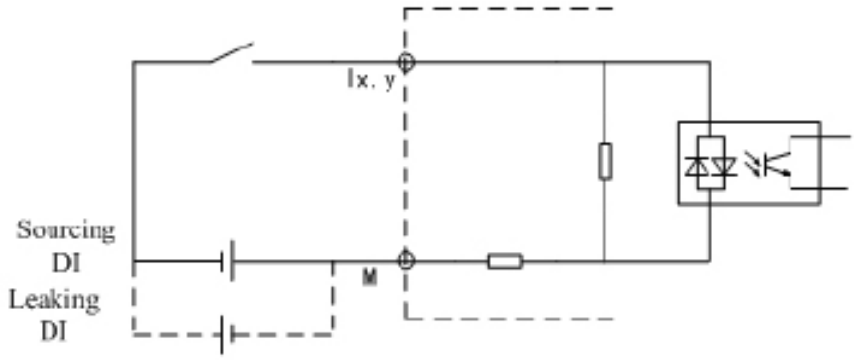


Figure 3.3 LM3210-EDI DI Points Equivalent Circuit

3.1.2 LM3211-EDIA, input module, 8 Points digital ac input

LM3211-EDIA module processes the input of digital signals with a 230V AC rated working voltage.

LM3211-EDIA, Technical Specifications

Model		LM3211-EDIA		
Input Features		Physical Features		
Input points	8 points	Dimension		75mm(L)×90mm(W)×70mm(H)
Input voltage rated value	230VAC	Weight		160g
Allowed range	164～264V AC	Power consumption	+24VDC(Expansion bus supply)	0mA
Logic 1 signal (Minimum)	164V AC		+24VDC(External supply)	0mA
Logic 0 signal	80 V AC			
Input delay time	<20ms (rated input voltage)		+5VDC(Expansion bus supply)	60mA
		Working temperature		0～+55℃
Isolation mode	Optical-coupler isolation	Storage temperature		-40～+70℃
Isolation group	8 groups	Relative humidity		5～95%, no condensation
Isolation endurance voltage	500VAC			

Table 3.4 Technical Specifications

LM3211-EDIA, LED Indicator

Channel Status LED Indicator (Green)	Definition
ON	Channel is ON
OFF	Channel is OFF

Table 3.5 LED Definition

LM3211-EDIA, Wiring Terminal

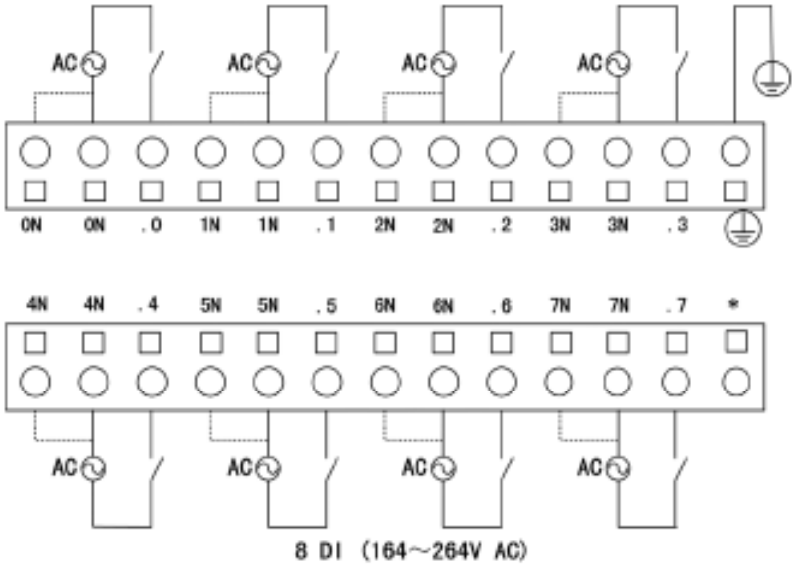


Figure 3.4 LM3211-EDIA Terminal Definition and Wiring

- 220VAC input signal connects between mN and m (m stands for number 0 to 7) and mN is connected inside circuit board (shown by broken lines in Figure 3-1-3). The terminal on the right end of upper level terminals can connect to ground protection (or earth).
- "*" indicates no wiring or no physical connection.

LM3211-EDIA, Equivalent Circuit

The equivalent circuit of the input channel (DI) is shown in Figure 3.5.

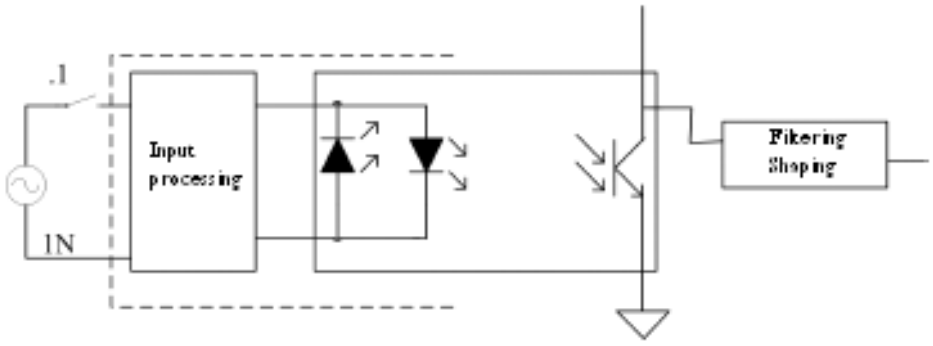


Figure 3.5 LM3211-EDIA Input Channel (DI) Equivalent Circuit

3.1.3 LM3212-EDI, input module, 16 points digital dc input

LM3212-EDI module processes the input of digital signals with a 24V DC rated working voltage.

LM3212-EDI, Technical Specifications

<table>
<tr><td colspan="2">Model</td><td colspan="3">LM3212-EDI</td></tr>
<tr><td colspan="2">Input Features</td><td colspan="3">Physical Features</td></tr>
<tr><td>Input points</td><td>16 points</td><td colspan="2">Dimension</td><td>75mm(L)×90mm(W)×70mm(H)</td></tr>
<tr><td>Input type</td><td>Sink/source</td><td colspan="2">Weight</td><td>160g</td></tr>
<tr><td>Input voltage rated value</td><td>24V DC</td><td rowspan="4">Power consumption</td><td>+24VDC(Expansion bus supply)</td><td>0mA</td></tr>
<tr><td>Allowed range</td><td>0～30V DC</td><td rowspan="2">+24VDC
(External supply)</td><td rowspan="2">80mA</td></tr>
<tr><td>Logic 1 signal</td><td>15～30V DC
Allowed minimum current 3 mA</td></tr>
<tr><td>Logic 0 signal</td><td>0～5V DC
Allowed maximum current 1 mA</td><td>+5VDC(Expansion bus supply)</td><td>90mA</td></tr>
<tr><td>Input delay time</td><td><10ms (Rated input voltage)</td><td colspan="2">Working temperature</td><td>0～+55℃</td></tr>
<tr><td>Isolation mode</td><td>Optical-coupler isolation</td><td colspan="2" rowspan="2">Storage temperature</td><td rowspan="2">-40～+70℃</td></tr>
<tr><td>Isolation group</td><td>4 groups</td></tr>
<tr><td>Isolation endurance voltage</td><td>500VAC</td><td colspan="2">Relative humidity</td><td>5～95%, non-condensing</td></tr>
</table>

Table 3.6 Technical Specifications

LM3212-EDI, LED Indicator

Channel Status LED Indicator (Green)	Definition
ON	Channel is ON
OFF	Channel is OFF

Table 3.7 LED Definition

LM3212-EDI, Wiring Terminal

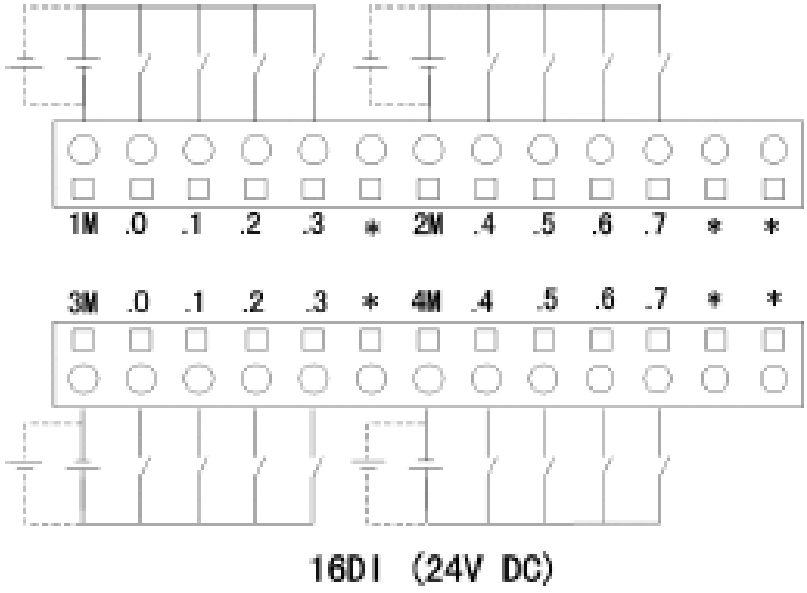


Figure 3.6 LM3212-EDI Wiring Terminal

- As shown in figure 3.6, the1M, 2M, 3M and 4M terminals of DI channel are external DI common ends that can be connected to either the positive end or the negative end of 24VDC sensor power in accordance to source/sink type DI.
- "*" indicates no wiring or no physical connection.

LM3212-EDI, Equivalent Circuit

The equivalent circuit of the input channel (DI) is the same as LM3210-EDI, as shown in Figure 3.3.

3.1.4 LM3220-EDOT, output module, 8 Digital Transistor DC Output

LM3220-EDOT module outputs digital signals with a 24V DC rated load voltage.

LM3220-EDOT, Technical Specifications

Model			LM3220-EDOT		
Input Features			Physical Features		
Output points		8 points	Dimension		50mm(L)×90mm(W)×70mm(H)
Output type		Transistor	Weight		120g
Output voltage		24V DC	Power consumption	+24VDC(Expansion bus supply)	0mA
Allowed range		20.4～28.8V DC			
Transistor Conducing voltage drop		<0.5V(Output logic “1”, current 1 A)		+24VDC (External supply)	According to actual load
Logic 1 max. output current		1A			
Logic 0 max. leakage current		1mA		+5VDC (Expansion bus supply)	100mA
Common end output current total		<4A			
Surge current		<8A, 100ms			
On impedance (Contact impedance)		<0.2Ω	Working temperature		0～+55℃
Short circuit protection		External supply			
Response time	Status “0” to “1”	<1ms	Storage temperature		-40～+70℃
	Status”1” to “0”	<1ms			
Isolation mode		Optical-coupler isolation			
Isolation group		2 groups	Relative humidity		5～95%, non-condensing
Isolation endurance voltage		500VAC			

Table 3.8 Technical Specifications

LM3220-EDOT, LED Indicator

Channel Status LED Indicator(Green)	Definition
ON	Channel ON
OFF	Channel OFF

Table 3.9 LED Definition

LM3220-EDOT, Wiring Terminal

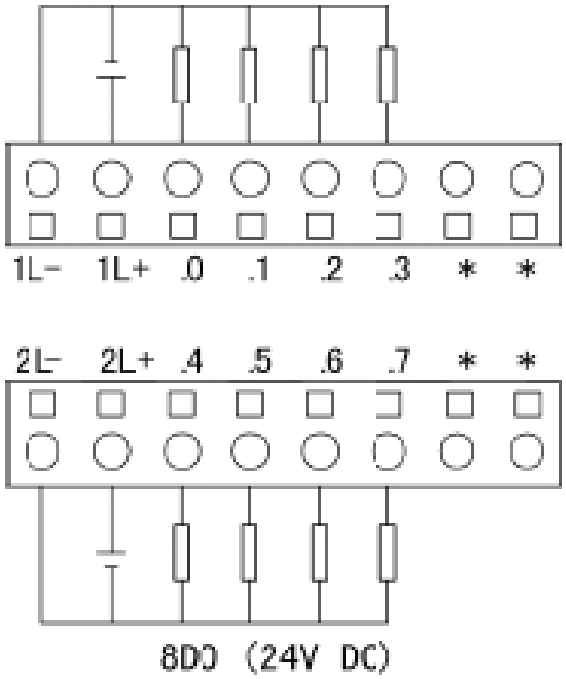


Figure 3.7 LM3220-EDOT Wiring Terminal

- As shown in figure 3.7, 1L+ and 1L- of DO channel are connected to the positive and negative end of a 24VDC drive power supply under external load; 2L+ and 2L- are connected to the positive and negative end of another channel (or the same channel) of 24VDC.
- "*" indicates no wiring or no physical connection.

LM3220-EDOT, Equivalent Circuit

The equivalent circuit of the DO channel is shown in Figure 3.8.

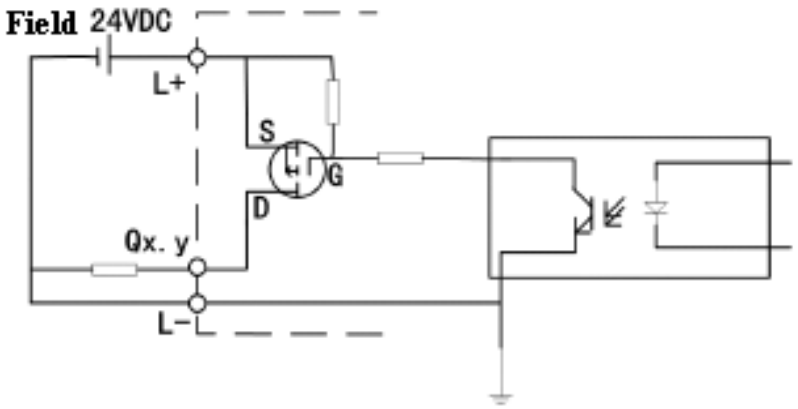


Figure 3.8 LM3220-EDOT DO Channel Equivalent Circuit

3.1.5 LM3221-EDOT output module, 16 Digital Transistor DC Output

LM3221-EDOT module outputs digital signals with a 24V DC rated load voltage.

LM3221-EDOT, Technical Specifications

<table>
<tr><td colspan="3">Model</td><td colspan="3">LM3221-EDOT</td></tr>
<tr><td colspan="3">Input Features</td><td colspan="3">Physical Features</td></tr>
<tr><td colspan="2">Output points</td><td>16 points</td><td colspan="2">Dimension</td><td>75mm(L)×90mm(W)×70mm(H)</td></tr>
<tr><td colspan="2">Output type</td><td>Transistor</td><td colspan="2">Weight</td><td>170g</td></tr>
<tr><td colspan="2">Output voltage</td><td>24V DC</td><td rowspan="5">Power consumption</td><td>+24VDC(Expansion bus supply)</td><td>0mA</td></tr>
<tr><td colspan="2">Allowed range</td><td>20.4～28.8V DC</td><td>+24VDC
(External supply)</td><td>According to actual load</td></tr>
<tr><td colspan="2">Transistor Conducing voltage drop</td><td><0.5V(Output logic “1”,current 1 A)</td><td rowspan="2">+5VDC
(Expansion bus supply)</td><td rowspan="2">180mA</td></tr>
<tr><td colspan="2">Logic 1 max. output current</td><td>1A</td></tr>
<tr><td colspan="2">Logic 0 max. leakage current</td><td>1mA</td></tr>
<tr><td colspan="2">Common end output current total</td><td><4A</td><td colspan="2" rowspan="4">Working temperature</td><td rowspan="4">0～+55℃</td></tr>
<tr><td colspan="2">Surge current</td><td><8A, 100ms</td></tr>
<tr><td colspan="2">On impedance (Contact impedance)</td><td><0.2Ω</td></tr>
<tr><td colspan="2">Short circuit protection</td><td>External supply</td></tr>
<tr><td rowspan="2">Response time</td><td>Status “0” to “1”</td><td><1ms</td><td colspan="2" rowspan="3">Storage temperature</td><td rowspan="3">-40～+70℃</td></tr>
<tr><td>Status”1” to “0”</td><td><1ms</td></tr>
<tr><td colspan="2">Isolation group</td><td>4 groups</td></tr>
<tr><td colspan="2">Isolation mode</td><td>Optical-coupler isolation</td><td colspan="2" rowspan="2">Relative humidity</td><td rowspan="2">5～95%, non-condensing</td></tr>
<tr><td colspan="2">Isolation endurance voltage</td><td>500VAC</td></tr>
</table>

Table 3.10 Technical Specifications

LM3221-EDOT, LED Indicator

Channel Status LED Indicator (Green)	Definition
ON	Channel ON
OFF	Channel OFF

Table 3.9 LED Definition

LM3221-EDOT, Wiring Terminal

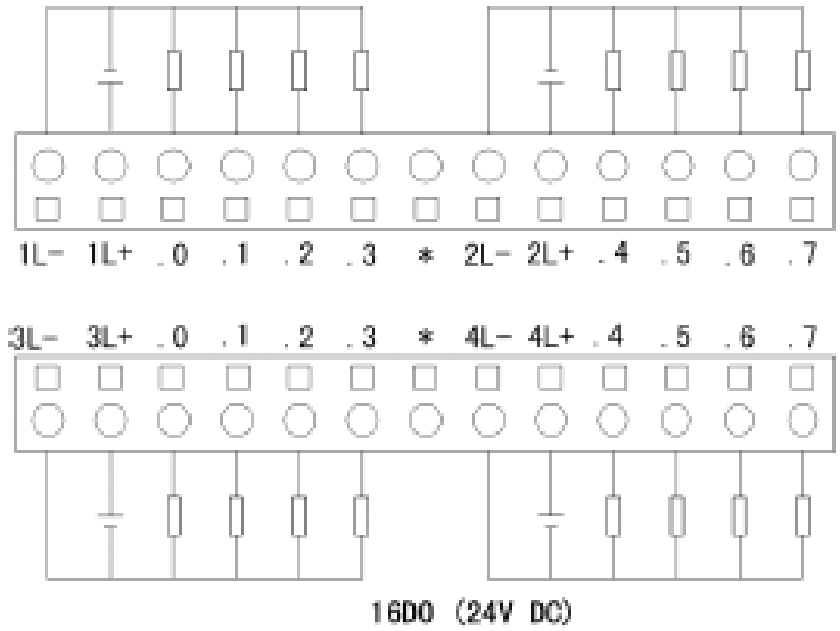


Figure 3.9 LM3321-EDOT Wiring Terminal

- As shown in figure 3.9, 1L+ and 1L- of DO channel are connected to the positive and negative end of a 24VDC drive power supply under external load, 2L+,2L-,3L+,3L-,4L+ and 4L- are connected to the positive and negative end of another channel (or the same channel) of 24VDC .
- "*" indicates no channel or no physical connection.

LM3221-EDOT, Equivalent Circuit

The equivalent circuit of the output channel (DO) is the same as LM3220-EDOT module, as shown in Figure 3.8.

3.1.6 LM3222-EDOR, output module, 8 digital relay DC/AC output

LM3222-EDOR module outputs digital signals with a 24V DC or 230V AC rated load.

LM3222-EDOR, Technical Specifications

Model		LM3222-EDOR		
Output Features		Physical Features		
Output points	8 points	Dimension		50mm(L)×90mm(W)×70mm(H)
Output type	Relay	Weight		140g
Output voltage	24V DC or 24～230VAC	Power consumption	+24VDC(Expansion bus supply)	40mA
Allowed range	5～30V DC or 5～250VAC		+24VDC (External supply)	According to actual load
Common end output current total	<10 A		+5VDC (Expansion bus supply)	60mA
Output On/Off capacity	2A, Resistance load			
Minimum load	10mA(Voltage between contacts 5VAC or 5VDC)	Working temperature		0～+55℃
Over current protection	None			
On impedance	<0.2Ω			
Isolation group	2 groups			
Isolation voltage between coil and contact	3000VAC,1 minute, leakage current 1mA	Storage temperature		-40～+70℃
Isolation resistance(minimum)	Between contacts or between coil and contact are both 100MΩ(500VDC)			
Contact On/Off delay time	<10ms			
Contact On/Off frequency (max)	1Hz	Relative humidity		5～95%, non-condensing
Relay mechanical life	No load: over 10,000,000 times; Rated resistance 2A load: over 100,000 times			

Table 3.9 LED Definition

LM3222-EDOR, LED Indicator

Channel Status LED Indicator (Green)	Definition
ON	Channel is ON
OFF	Channel is OFF

Table 3.10 LED Definition

LM3222-EDOR, Wiring Terminal

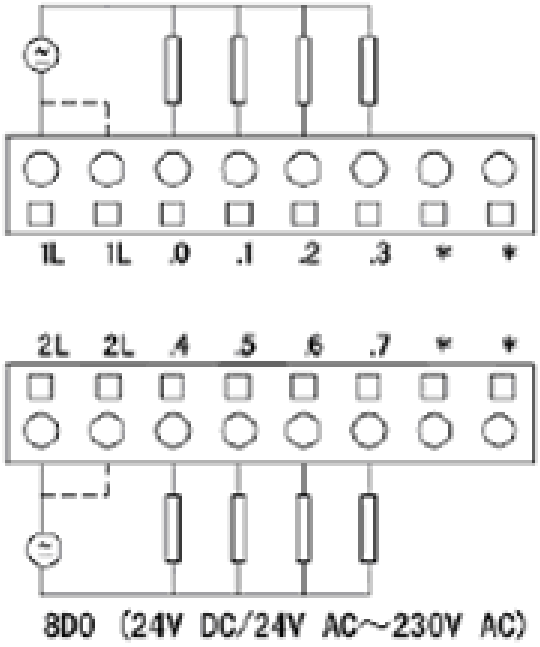


Figure 3.10 LM3222-EDOR Wiring Terminal

- As shown in figure 3.10, 1L and 2L of DO channel are two pairs of load drive supply output terminals that can output either DC or AC supply.
- 1L and 1L, 2L and 2L are connected inside the circuit board (indicated by broken lines in Figure3.10).
- "*" indicates no wiring or no physical connection.

LM3222-EDOR, Equivalent Circuit

The equivalent circuit of the output channel (DO) is shown in Figure 3.11.

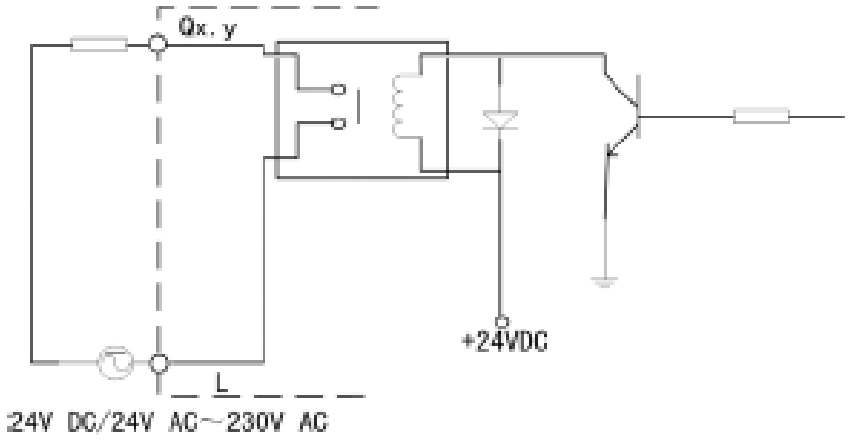


Figure 3.11 LM3222-EDOR Output Channel (DO) Equivalent Circuit

3.1.7 LM3223-EDOR output module, 16 digital relay dc/ac output

LM3223-EDOR module outputs contact digital signals with a 24V DC or 230V AC rated load.

LM3223-EDOR, Technical Specifications

Model		LM3223-EDOR		
Output Features		Physical Features		
Output points	16 points	Dimension		75mm(L)×90mm(W)×70mm(H)
Output type	Relay	Weight		200g
Output voltage	24VDC or 24～230V AC	Power consumption	+24VDC(Expansion bus supply)	80mA
Allowed range	5～30VDC or 5～250VAC		+24VDC(External supply)	According to actual load
Common end output current total	<10A		+5VDC(Expansion bus supply)	120mA
Output On/Off capacity	2A, Resistance load	Working temperature		0～+55℃
Min. load	10mA(Voltage between contacts 5VAC or 5VDC)	Storage temperature		-40～+70℃
		Relative humidity		5～95%, no condensation
Over current protection	None	Output features		
On impedance	<0.2Ω	Isolation resistance (min)		100MΩ between contacts or between coil and contact (500VDC)
Isolation group	4 groups	Contact On/Off delay time		<10ms
Isolation voltage between coil and contact	3000VAC, 1 minute, leakage current 1mA	Contact On/Off frequency (max)		1Hz
Isolation voltage between contacts	750VAC, 1 minute, leakage current 1mA	Relay mechanical life		No load: over 10,000,000 times; Rated resistance 2A load: over 100,000 times

Table 3.10 Technical Specification

LM3222-EDOR, LED Indicator

Channel Status LED Indicator(Green)	Definition
ON	Channel is ON
OFF	Channel is OFF

Table 3.11 LED Definition

LM3223-EDOR, Wiring Terminal

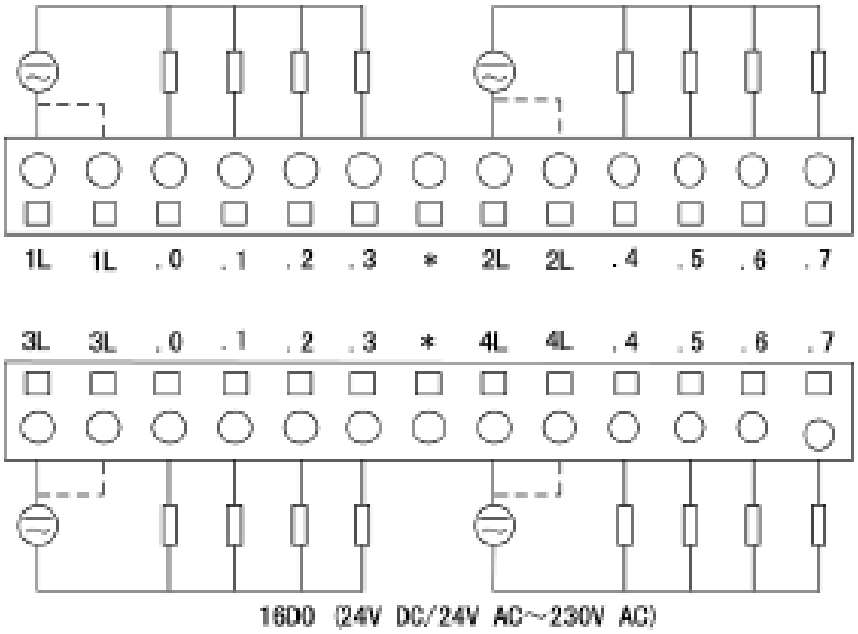


Figure 3.12 LM3223-EDOR Wiring Terminal

- As shown in figure 3.12, 1L, 2l, 3L and 4L of DO channel are four pairs of load drive supply output terminals that can output either DC or AC supply.
- mL is connected inside the circuit board (indicated by broken lines in figure 3.12).
- "*" indicates no wiring or no physical connection.

LM3223-EDOR, Equivalent Circuit

The equivalent circuit of the output channel (DO) is the same as LM3222-EDOR, as shown in Figure 3.11.

3.1.8 LM3230-EDMT module, 4 digital DC input, 4 digital transistor DC output

LM3230-EDMT module includes 4 DI points and 4 transistor output points. The rated working voltage of DI signals is 24V DC and the output rated load voltage is 24V DC.

LM3230-EDMT, Technical Specifications

Model		LM3230-EDMT		
Input Features		Physical Features		
Input point	4 points	Dimension		50mm(L)×90mm(W)×70mm(H)
Input type	Relay	Weight		120g
Input voltage rated value	24VDC	Power consumption	+24VDC(Expansion bus supply)	0mA
Allowed range	0～30VDC		+24VDC(External supply)	Input 20Ma,output according to actual load
Logic 1 signal	15～30VDC, allowed minimum current 3 mA		+5VDC(Expansion bus supply)	90mA
Logic 0 signal	0～5VDC, allowed maximum current 1mA	Working temperature		0～+55℃
Input delay time	<10ms(rated input voltage)	Storage temperature		-40～+70℃
Isolation mode	Optical-coupler isolation	Relative humidity		5～95%, non-condensing
Isolation group	1 group			
Isolation endurance voltage	500VAC			
Output features				
Logic “1” single output max. current	1A	Logic “0” single output max. current		1mA
Output points	4 points	Surge current		<8A, 100ms
Output type	Transistor	On impedance (Contact impedance)		<0.2Ω
Output voltage	24VDC	Short circuit protection		External supply
Allowed range	20.4～28.8VDC	Response time	Status “0” to “1”	<1ms
Transistor conducting voltage drop	<0.5V(Output logic “1”,current 1A)		Status “1” to “0”	<1ms
		Isolation group		1 group
Isolation mode	Optical-coupler isolation	Isolation endurance voltage		500VAC

Table 3.12 LED Definition

LM3230-EDMT, LED Indicator

Channel Status LED Indicator (Green)	Definition
ON	Channel is ON
OFF	Channel is OFF

Table 3.13 LED Definition

LM3230-EDMT, Wiring Terminal

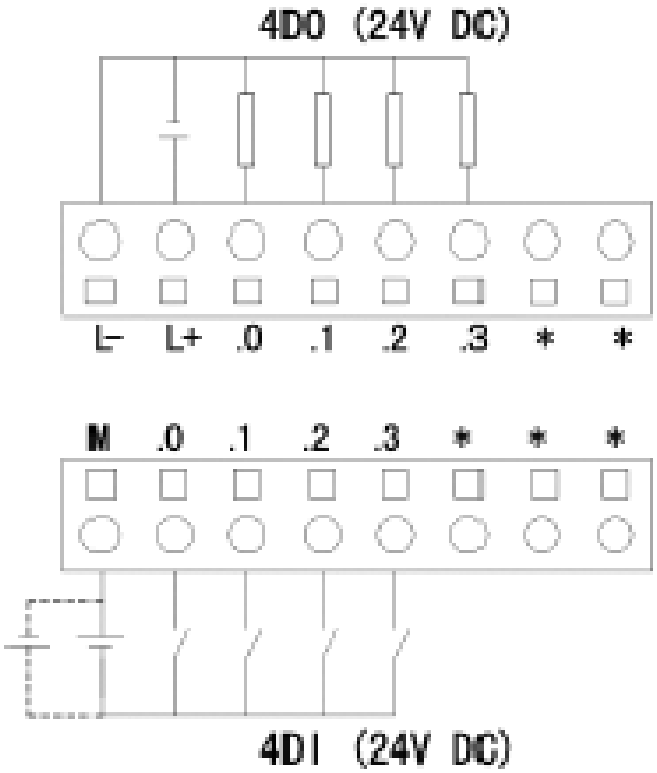


Figure 3.13 LM3230-EDMT Wiring

- The M end of DI channel is the common end of external DI that can be connected to either the positive or the negative end of the sensor power supply 24VDC according to source/sink type DI.
- L+ and L- of DO channel are the positive and negative ends of the 24VDC external load drive power supply.
- "*" indicates no wiring or no physical connection.

3.8.4 LM3230-EDMT Equivalent Circuit

- The equivalent circuit of the input channel (DI) is the same as LM3210-EDI, as shown in Figure 3.3.
- The equivalent circuit of the output channel (DO) is the same as LM3220-EDOT, as shown in Figure 3.8.

3.1.9 LM3231-EDMR module, 4 Digital DC Input, 4 Digital Relay DC/AC output

LM3231 module includes 4 DI processing points and 4 relay output processing points. Its rated load voltage of output is 24VDC or 220VAC.

LM3231-EDMR, Technical Specifications

Model		LM3231		
Input Features		Physical Features		
Input points	4 points	Dimension		50mm(L)×90mm(W)×70mm(H)
Input type	Sink/source	Weight		120g
Input voltage	24V DC	Power consumption	+24VDC (Expansion bus supply)	20mA
Allowed range	0～30V DC			
Logical 1 signal	15～30V DC allowed minimum current 3mA		+24VDC(External supply)	Input 20mA Output according to actual load
Logical 0 signal	0～5V DC allowed maximum current 1mA		+5VDC(External bus supply)	90mA
Input delay time	<10ms(Rated input voltage)	Working temperature		0～+55℃
Isolation mode	Optical-coupler isolation	Storage temperature		-40～+70℃
Isolation group	1 group	Relative humidity		5～95%, non-condensing
Isolation endurance voltage	500VAC			
Output Features				
Output points	4 points	On impedance		<0.2Ω
Output type	Relay	Isolation group		1 group
Output voltage	24V DC or 24～230V AC	Isolation voltage between coil and contact		3000VAC, 1 minute, leakage current 1mA
		Isolation voltage between contacts		750VAC, 1 minute , leakage current 1mA
Allowed range	5～30VDC or 5～250V AC	Isolation resistance (minimum)		Between contacts or between coil and contact are both 100MΩ (500VDC)
Common end output current total	<10A	Contact On/Off delay time		<10ms
Output On/Off capacity	2A, Resistance load	Contact On/Off frequency(max)		1Hz
Min load	10mA (Voltage between contacts 5VAC or 5VDC)	Relay mechanical life		No load: over 10,000,000 times; Rated resistance 2A load: over 100,000 times
Over current protection	None			

Table 3.14 Technical Specifications

LM3231-EDMR, LED Indicator

Channel Status LED Indicator (Green)	Definition
ON	Channel is ON
OFF	Channel is OFF

Table 3.15 LED Definition

LM3231-EDMR, Wiring Terminal

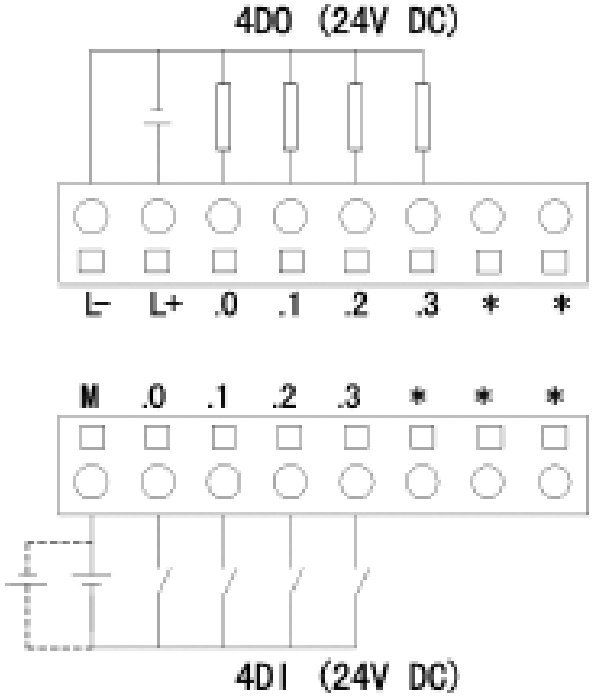


Figure 3.14 LM3231 Wiring Terminal

- As shown in figure 3.14, the M end of DI channel is the common end of external DI that can be connected to either the positive or the negative end of the 24VDC sensor power supply in accordance to source/sink DI.
- The L end of DO channel in Figure 3.14 is the output load drive supply terminal that can output either DC or AC supply.
- L and L are connected inside the circuit board. (indicated by the broken lines in figure 3.14)
- "*" indicates no wiring or no physical connection.

LM3231-EDMR, Equivalent Circuit

- The equivalent circuit of the input channel (DI) is the same as LM3210-EDI, as shown in Figure 3.3.
- The equivalent circuit of the output channel (DO) is the same as LM3222-EDOR, as shown in Figure 3.11

3.2 ANALOGUE EXPANSION MODULES

3.2.1 LM3310-EAI input module, 4 Channel Analog pseudo-differential Input, 12-bit resolution

LM3310-EAI module inputs, acquires and processes the analog signals from the field. Its work power and local power are 24VDC respectively.

LM3310-EAI, Technical Specifications

Model		LM3310-EAI		
Input Features		Physical Features		
Input channel	4 channels	Dimension		75mm(L)×90mm(W)×70mm(H)
Input Ranges: Voltage	0～10V	Weight		170g
Input Ranges: Current	0～20mA	Power consumption	+24VDC (Expansion bus supply)	20mA
Input Ranges: Current	4～20mA			
Input precision (monopole)	0.5%FS@25℃(FS means full range,@25℃ means at 25℃)			
Input type	difference			
CM voltage	Signal voltage +CM voltage<13V			
CMMRR	>60dB (DC to 50Hz)		+5VDC (Expansion bus supply)	100mA
A/D conversion time	<200μs			
Input impedance	>1MΩ (Voltage) 250Ω (Current)			
Maximum input current	<30mA			
Maximum input voltage	<30V			
Temperature drift	±100ppm/℃			
Isolation mode	Isolation between field & system digital part; no isolation between channels	Working temperature		0～+55℃
Isolation endurancevoltage	1000VDC	Storage temperature		-40～+70℃
Sampling refresh time (every 4 channels)	6ms	Relative humidity		5～95%, non-condensing

Table 3.16 Technical Specifications

LM3310-EAI, LED Indicator

Module Status	Power Indicator
Nornal operation	On
Power not connected or module failure	Off

Table 3.17 LED Definition

LM3310-EAI, Input Channel Signal Type & Range

Signal mode	Range	Corresponding Data Range	
		Decimal value	Hex value
Voltage signal	0～10V	0～65535	0x00～0xFFFF
Current signal	0～20mA	0～65535	0x00～0xFFFF
Current signal	4～20mA	0～65535	0x00～0xFFFF

Table 3.18 Relationship in between Input Signal Range & Input Data Range

LM3310-EAI, Wiring Terminal

LM3310-EAI module provides 4 analog input channels.

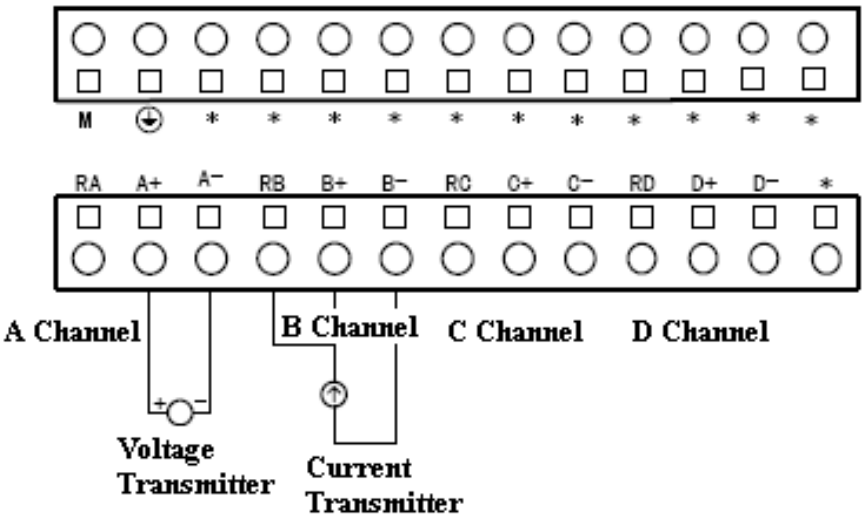
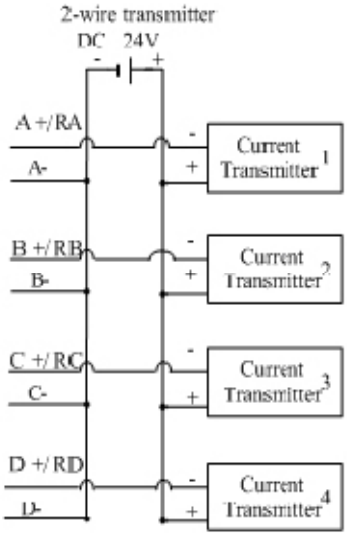


Figure 3.15 LM3310-EAI Wiring Terminals

- M indicates the negative end of internal analog processing circuit. If the input signal is not within the CM voltage range defined in the technical specifications, the negative end of input signal shall be connected to M to obtain the steady measuring value.
- " ⏚ "indicates the channel is connected to ground protection. Its connection to the cabinet ground provides a static release channel for the internal analog processing circuit.
- The terminals located in the lower row are the signal input channels. Input signal can be either voltage or current signals. When input signal is voltage signal, A+ connects to the positive end of voltage transmitter and A- connects to its negative end. When input signal is current signal, A+ connects to the positive end of current transmitter after short connected to RA and A- connects to the negative end of current transmitter.
- Figure 3.16 and Figure 3.17 illustrate the wiring of LM3310-EAI with 2-wire and 4-wire current transmitters. The 2-wire current transmitter adopts the external power supply that can be chosen from the 24VDC output power of CPU module or other external power supplies according to different power capacity demands.
- "*" indicates no wiring or no physical connection.



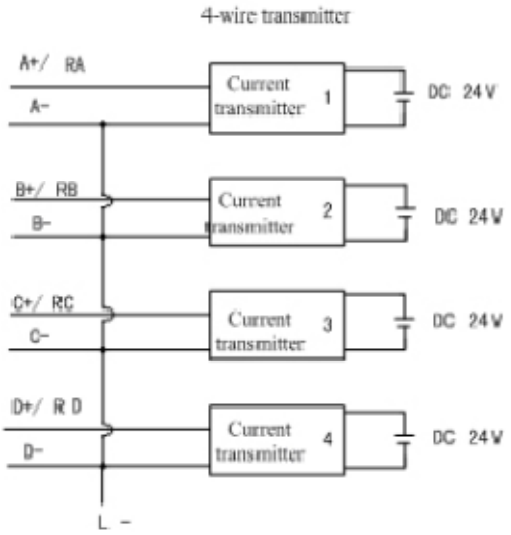


Figure 3.16 Wiring for 2-Wire Current Transmitter **Figure 3.17 Wiring for 4-Wire Current Transmitter**

LM3310-EAI, Equivalent circuit

The equivalent circuit of the input channel (AI) (voltage, current signal input) is shown in Figure 3.18.

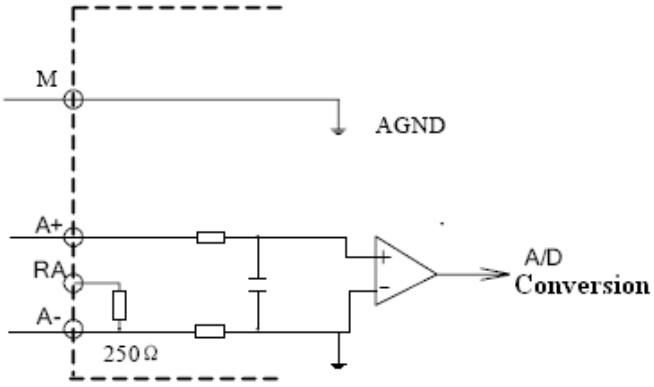


Figure 3.18 LM3310-EAI Input Channel Equivalent Circuit

LM3310-EAI, Software Configuration

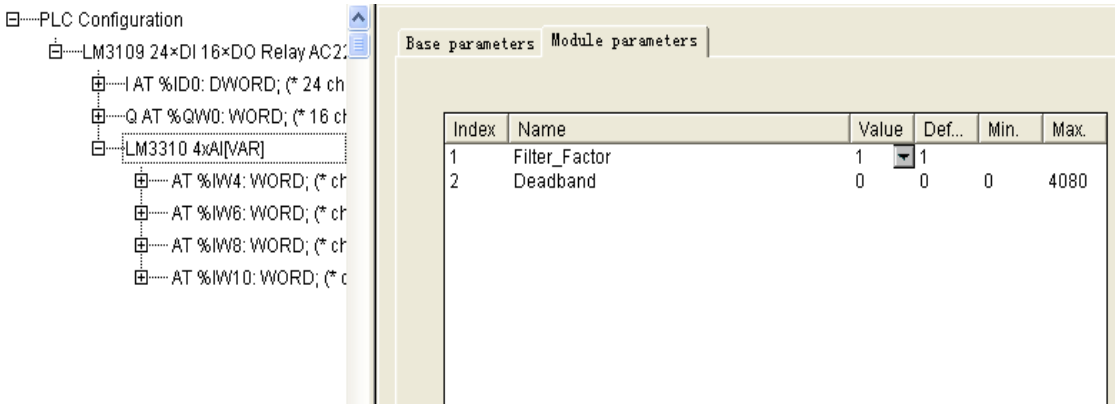


Figure 3.19 LM3310-EAI Software Configuration

As shown in figure 3.19, LM3310-EAI occupies four input words, IW2, IW4, IW6 and IW8. Each word indicates one channel, the first, the second, the third and the fourth channel. Click on

"LM3310", a menu as shown on the right side in Figure 3.19 will be displayed for the users to configure the Filter parameters of LM3310-EAI.

Filter Parameter: Filter_Factor indicates Filter parameters, its value could be 1, 2, 4, 8, 16 and 32. The filter parameter corresponds to the time value of RC lowpass, as shown in table 3.19. If there is no special request, the filter parameter generally adopts the default value.

"Deadband" indicates the dead area value set by users, of which the value range is 0～4080. When the filter functions are started, if the difference between the current collected result of analog value and the value after last filtering exceeds the set dead area value, LM3310-EAI will output the current collected result value directly; otherwise it will output the conversion result after filtering. Dead area value equals 0 indicates the dead area parameter is forbidden.

Filter Parameter Value	Corresponding the time value of RC lowpass
1 (Default value)	(no filter)
2	80ms
4	160ms
8	320ms
16	640ms
32	1280ms

Table 3.19 Relationship in between filter parameter and the time value of RC lowpass

Click to choose one of the channels and a menu as shown in Figure 3.20 will appear.

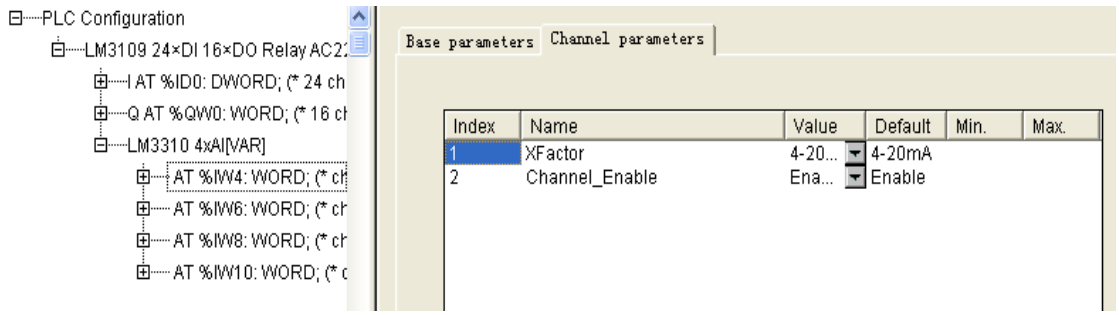


Figure 3.20 LM3310-EAI Channel Configurations

- **XFactor** is the input signal of the selected channel, value 4-20mA,0-20mA or 0-10V may be chosen according to the actual input signal type; the default value is 4-20mA;
- **Channel_Enable** is the enable setting of the channel: to use the channel, Enable shall be selected here.

Note:
LM3310- EAI channel parameter setting must be in accordance with the actual input signal. For the software configuration of the rest items, please refer to the software manual.

3.2.2 LM3310A-EAI, input module, 4 analog single-ended input, 12-bit resolution

The difference between LM3310-EAI and LM3310A-EAI is that LM3310-EAI adopts Pseudo-Differential Inputs and LM3310A-EAI adopts Single-Ended Inputs.

LM3310A-EAI, Technical Specifications

Model		LM3310A-EAI		
Input Features		Physical Features		
Input channel	4 channels	Dimension		75mm(L)×90mm(W)×70mm(H)
Input Ranges Voltage	0～10V	Weight		170g
Input Ranges Current	0～20mA	Power consumption	+24VDC (Expansion bus supply)	10mA
Input Ranges Current	4～20mA			
Input precision (monopole)	0.5%FS@25℃(FS means full range,@25℃ means at "25℃")			
Input type	Single terminal			
A/D conversion time	<200μs			
Input impedance	>1MΩ(voltage) 250Ω(Current)		+5VDC (Expansion bus supply)	40mA
Max. input current	<30mA			
Max. input voltage	<30V			
Temperature drift	±100ppm/℃			
Isolation mode	No isolation between field & system internal, isolation between channels	Working temperature		0～+55℃
Isolation endurance voltage	1000VDC	Storage temperature		-40～+70℃
Sampling refresh time (every four channels)	6ms	Relative humidity		5%～95%, non-condensing

Table 3.20 Technical Specifications

LM3310A-EAI, LED Indicator

Module Status	Power Indicator
Nornal operation	on
Power off or module failure	off

Table 3.21 LED Definitions

LM3310A-EAI, Input Channel Signal Type & Range

Signal mode	Range	Corresponding Input Data Range	
		Decimal value	Hex value
Voltage signal	0～10V	0～65535	0x00～0xFFFF
Current signal	0～20mA	0～65535	0x00～0xFFFF
Current signal	4～20mA	0～65535	0x00～0xFFFF

Table 3.20 Relationship in between Input Signal Range and Input Data Range

LM3310A-EAI, Wiring Terminal

See Figure 3.21 below for the terminal definition and typical field wiring of LM3310A-EAI.

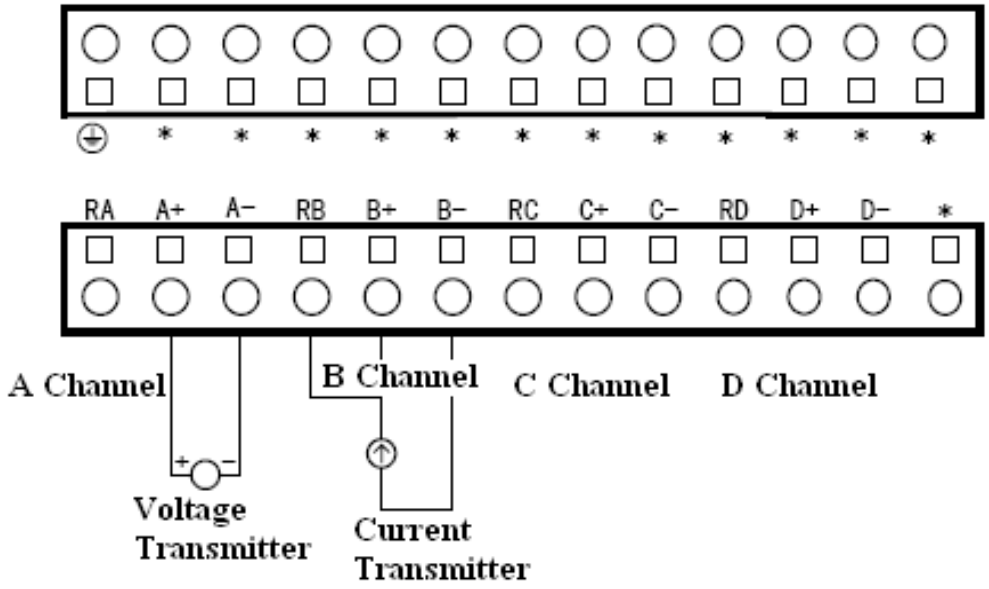
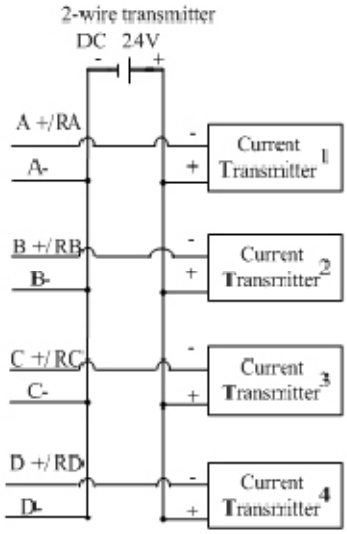


Figure 3.21 LM3310A-EAI Terminal Definition & Wiring

- " ⏚ "indicates that the channel is connected to ground protection. Its connection to the cabinet ground provides the static release channel for internal analog processing circuit.
- the terminals located in the lower row are the signal input channels. Input signal can be either voltage or current signals. When input signal is voltage signal, A+ connects to the positive end of voltage transmitter and A- connects to its negative end. When input signal is current signal, A+ connects to the positive end of current transmitter after short connected to RA and A- connects to the negative end of current transmitter.
- Figure 3.22 and Figure 3.23 illustrate the wiring of LM3310A-EAI with 2-wire and 4-wire current transmitters. The 2-wire current transmitter adopts the external power supply that can be chosen from the 24VDC output power of CPU module and other external power supplies according to the power capacity demand.
- "*" indicates no wiring or no physical connection in this channel.



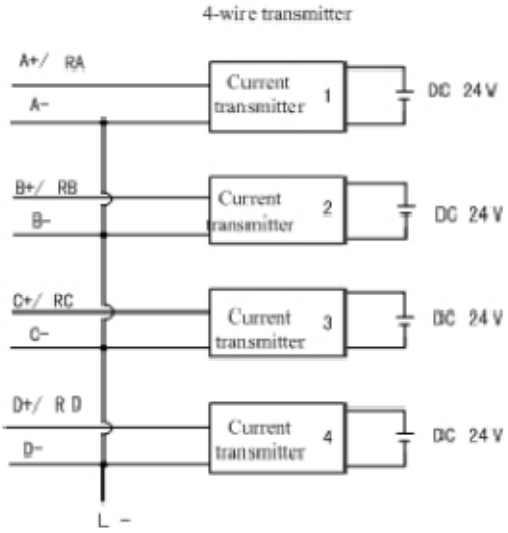


Figure 3.22 Wiring for 2-wire current transmitter **Figure 3.23 Wiring for 4-wire current transmitter**

LM3310A-EAI, Equivalent Circuit

The equivalent circuit of the input channel (AI) (voltage, current signal input) is shown in Figure 3.24.

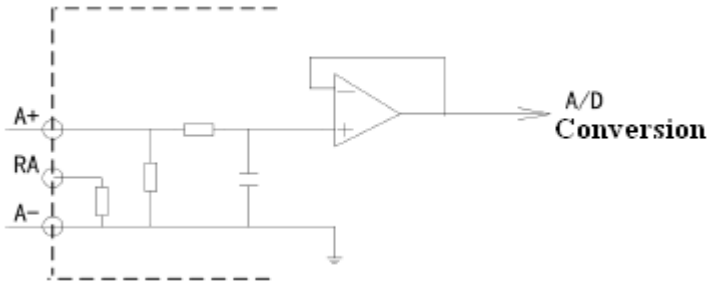


Figure 3.24 LM3310A-EAI Input Channel Equivalent Circuit

LM3310A-EAI, Software Configuration

The PLC type in the software configuration of LM3310A-EAI module isLM3310 and the parameter settings are the same as LM3310-EAI. Please refer to section 3.10.6 for the details of LM3310 software configuration.

Note:
LM3310A-EAI module adopts Single-Ended Inputs. Therefore, in case of the transmitter negative terminals cannot be short connected, this module can only connect to one transmitter, or the LM3310 module shall be adopted.

3.2.3 LM3310B-EAI input module, 4 analog single-ended input 16-bit resolution

LM3310B-EAI adopts Single-Ended Inputs and the accuracy of its data processing procedure is higher than that of LM3310-EAI module. The resolution is 16 bit.

LM3310B-EAI, Technical Specifications

<table>
<tr><td colspan="3">Model</td><td colspan="3">LM3310A-EAI</td></tr>
<tr><td colspan="3">Input Features</td><td colspan="3">Physical Features</td></tr>
<tr><td colspan="2">Input channel</td><td>4 channels</td><td colspan="2">Dimension</td><td>75mm(L)×90mm(W)×70mm(H)</td></tr>
<tr><td rowspan="3">Input ranges</td><td>Voltage</td><td>0～10V</td><td colspan="2">Weight</td><td>170g</td></tr>
<tr><td>Current</td><td>0～20mA</td><td rowspan="8">Power consumption</td><td>+24VDC (Expansion bus supply)</td><td>0mA</td></tr>
<tr><td>Current</td><td>0～20mA
0-100mV/500mV/1V/5V/10V</td><td rowspan="3">+24VDC (External supply)</td><td rowspan="3">30mA</td></tr>
<tr><td colspan="2">Input precision (monopole)</td><td>0.5%FS@25℃(FS means full range,@25℃ means at “25℃”)</td></tr>
<tr><td colspan="2">Input type</td><td>Single terminal</td></tr>
<tr><td colspan="2">A/D conversion time</td><td><200μs</td><td rowspan="4">+5VDC (Expansion bus supply)</td><td rowspan="4">60mA</td></tr>
<tr><td colspan="2">Input impedance</td><td>>1MΩ(voltage) 250Ω(Current)</td></tr>
<tr><td colspan="2">Max. input current</td><td><30mA</td></tr>
<tr><td colspan="2">Max. input voltage</td><td><30V</td></tr>
<tr><td colspan="2">Temperature drift</td><td>±100ppm/℃</td><td colspan="2">Working temperature</td><td>0～+55℃</td></tr>
<tr><td colspan="2">Isolation mode</td><td>Isolation between field & system internal, no isolation between channels</td><td colspan="2">Storage temperature</td><td>-40～+70℃</td></tr>
<tr><td colspan="2">Isolation endurance voltage</td><td>500VDC</td><td colspan="2">Relative humidity</td><td>5%～95%, non-condensing</td></tr>
<tr><td colspan="2">Sampling refresh time (every four channels)</td><td>50ms</td><td colspan="3"></td></tr>
</table>

Table 3.21 Technical Specifications

LM3310B-EAI, LED Indicator

Module Status	Power Indicator
Nornal operation	on
Power off or module failure	off

Table 3.22 LED Definitions

LM3310B-EAI, Input Channel Signal Type & Range

Signal mode	Range	Corresponding Input Data Range	
		Decimal value	Hex value
Voltage signal	0-100mV/500mV/1V/5V/10V	0～65535	0x0000～0xFFFF
Current signal	0～20mA	0～65535	0x0000～0xFFFF

Table 3.23 Relationship in between Input Signal Range and Input Data Range

LM3310B-EAI, Wiring Terminal

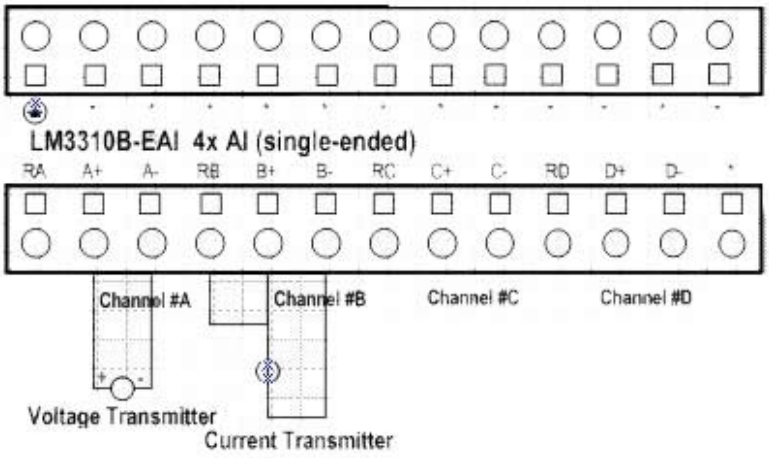


Figure 3.25 LM3310B-EAI Wiring Terminal

- The terminals located in the lower row are the signal input channels. Input signal can be either voltage or current signals. When input signal is voltage signal, A+ connects to the positive end of voltage transmitter and A- connects to its negative end. When input signal is current signal, A+ connects to the positive end of current transmitter after short connected to RA and A- connects to the negative end of current transmitter;
- Figure 3.26 and Figure 3.27 illustrate the wiring of LM3310B with 2-wire and 4-wire current transmitters. The 2-wire current transmitter adopts external power supply that can be chosen from the 24VDC output power of CPU module or other external power supplies according to power capacity demand.
- " ⏚ " indicates that the channel is connected to ground protection;
- "*" indicates no wiring or no physical connection in this channel.

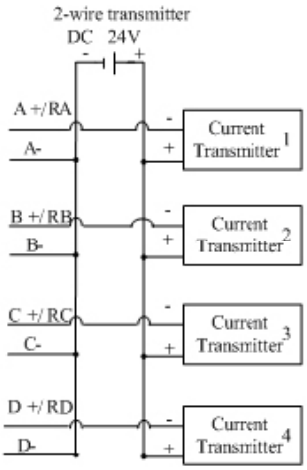


Figure 3.26 Wiring for 2-wire current transmitter

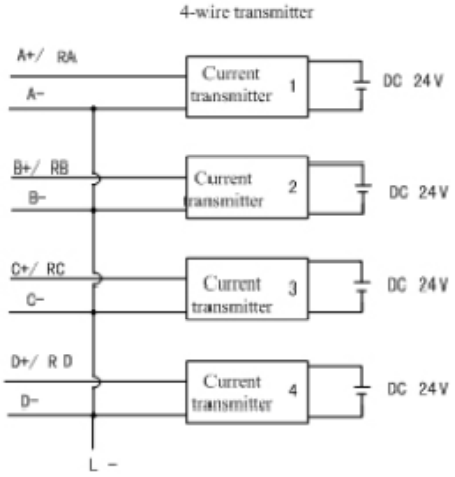


Figure 3.27 Wiring for 4-wire current transmitter

LM3310B-EAI, Equivalent Circuit

The equivalent circuit of the input channel (AI) (voltage, current signal input) is shown in Figure 3.28.

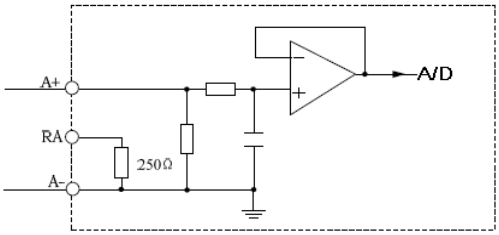


Figure 3.28 LM3310B-EAI Input Channel Equivalent Circuit

LM3310B-EAI, Software Configuration

The PLC type in the software configuration of LM3310B-EAI module is "LM3310". The corresponding time values of LM3310B-EAI filter parameter is shown in following table3.24. The dead area parameter is invalid because LM3310B-EAI is not a fast acquisition module. The rest settings are the same as LM3310-EAI. Please refer to section 3.10.6 for more details.

Filter parameter value	Corresponding time value of RC lowpass filter
1 (Default value)	(no filter)
2	1s
4	1.6s
8	2.8s
16	4.2s
32	4.2s

Table 3.24 Relationship between LM310B-EAI filtering parameter and time value

Note:
LM3310B-EAI module adopts Single-Ended Inputs. Therefore, in case of the transmitter negative terminals cannot be short connected, this module can only connect to one transmitter, or the LM3310 module shall be adopted.

3.2.4 LM3311-EAI, input Module, 4 channels Thermocouple Analog Input

LM3311-EAI collects and processes thermocouple milli-volt voltage signals from the field.

LM3311-EAI, Technical Specifications

Model		LM3311-EAI		
Input Features		Physical Features		
Input channel	4 channels	Dimension (W*H*D)		75mm(L)×90mm(W)×70mm(H)
Input signal	J、K、T、N、E、R、S、B type thermocouple, -80～80mV	Weight		160g
Input precision	0.1%FS@ (25℃, ±80mV (voltage))(FS means full range, @25℃ means 25℃)	Power consumption	+24VDC(Expansion supply)	0mA
Temperature differential rate	0.1℃			
Cold end error	±1.5℃		+5VDC(Expansion supply)	100mA
Input impedance	>1MΩ			
NMMRR	Better than 70dB@50Hz (filter factor is 8, 16, 32)	Working temperature		0～+55℃
Temperature drift	±50ppm/℃			
Isolation mode	Isolation between field & system digital part, no isolation between channels	Storage temperature		-40～+70℃
Isolation endurance voltage	500VAC			
Sampling refreshing time	450ms (every 4 channels)			
Cold end compensation	Yes	Relative humidity		5～95%, No condensation
Disconnection detection	Yes			

Table 3.25 Technical Specifications

LM3311-EAI, LED Indicator

Module Status	ERROR	Power indicator
Normal operation	Off	on
Power off	Off	off
Incorrect configuration or module failure	On	on
Broken thermocouple or signal over range	Flash	on

Table 3.25 LED Definitions

Range scope (note: The corresponding relation between input data and analog signal is non-linear.)

Input signal	Temperature (℃)	Corresponding input data range
J	-210～1200	-2100～12000
K	-270～1370	-2700～13700
E	-270～1000	-2700～10000
N	-270～1300	-2700～13000
T	-270～400	-2700～4000
R	-50～1768	-500～17680
S	-50～1768	-500～17680
B	0～1820	0～18200
-80～80mV	--	-8000～8000

Table 3.25 Relationship in between Input Temperature Range and Input Data Range

LM3311-EAI, Wiring Terminal

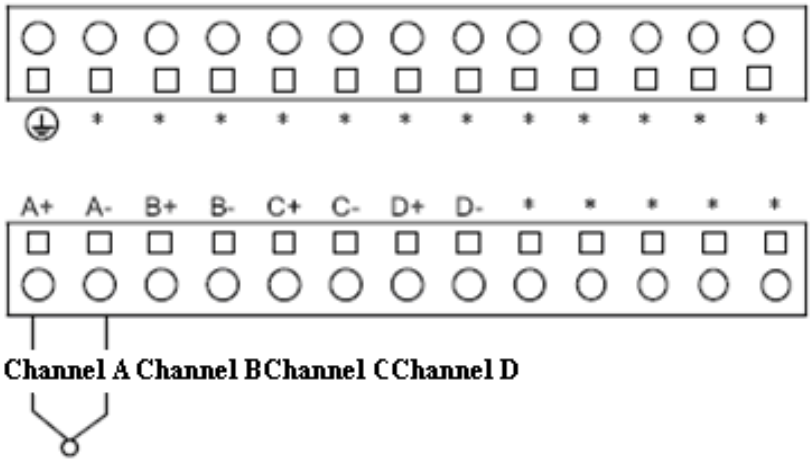


Figure 3.29 LM3311-EAI Terminal Wiring

- As shown in figure 3.29, A+ and A- are the two terminals of an input signal channel connecting to a thermocouple. B+ and B- are similar.
- " ⏚ " indicates that this channel is connected to ground protection;
- "*" indicates no wiring or no physical connection.

Note:
In case of the transmitter negative terminals cannot be connected in short, LM3311-EAI module can only be connected to one transmitter.

LM3311-EAI, Software configuration

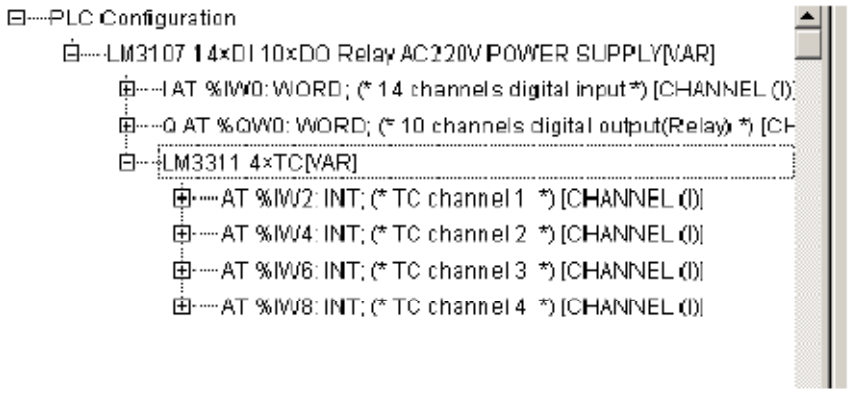


Figure 3.30 LM3311-EAI Software Configuration

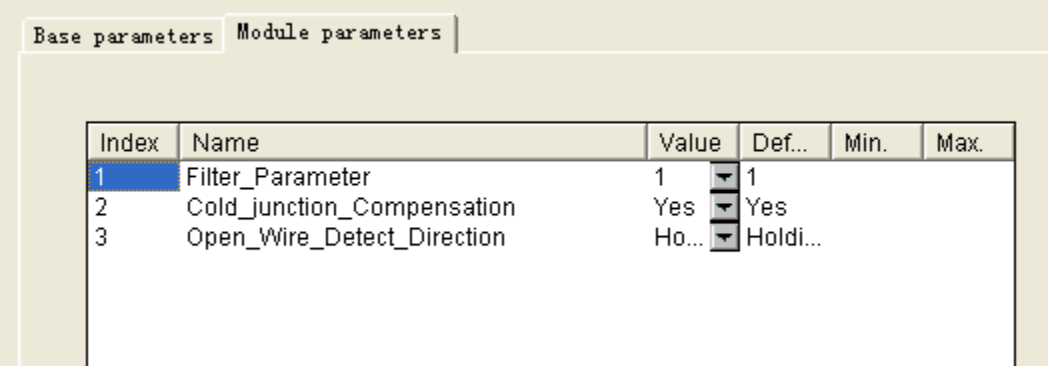


Figure 3.31 LM3311-EAI Module Parameter Configuration

- **Filter_Parameter**: value can be set as 1, 2, 4, 8, 16 and 32.
- Filter_parameter corresponds to the time value of RC lowpass, as shown in table 3.19;
- **Cold_Junction_Compensation**: by selecting “Yes” or “No” to enable or disable the compensation;
- **Open Wire Detect Direction**: Detect the direction when a broken wiring occurs;
- **Holding**: The current value will be held when a broken wiring occurs;
- **Upscale**: Positive value limit will be accessed when a broken wiring occurs;
- **Downscale**: negative value will be accessed when a broken wiring occurs.

The software configuration of the LM3311-EAI channels is shown in Figure 3.32. TC Type stands for thermocouple type and Channel_Enable sets the channel as enabled or disabled.

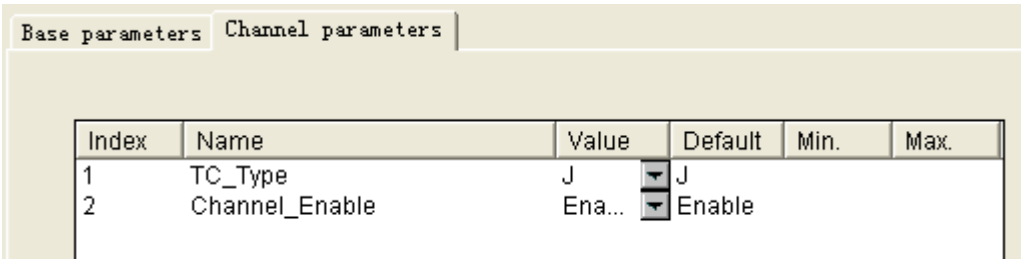


Figure 3.32 Configuration of LM3311-EAIChannel Parameters

3.2.5 LM3312-EAI, input module, 4-Channel RTD Analog Input Module

LM3312-EAI, Technical Specifications

Model		LM3312		
Input Features		Physical Features		
Input channel	4 channel	Dimension (W*H*D)		75mm(L)×90mm(W) ×70mm(H)
Input type	Cu50, Pt100	Weight		160g
Input range	Cu50 (-50-140.1℃)	Power consumption	+24VDC (Expansion bus supply)	0mA
	Cu50 (-50-150℃)			
	Pt100 (-150-157.2℃)			
	Pt100(-150-619.6℃)			
Input precision	±1℃@25℃, full range		+5VDC (Expansion bus supply)	120mA
Temperature drift	±50ppm/℃			
Isolation mode	Isolation between field & system digital part, no isolation between channels			
Isolation endurance voltage	500VAC			
NMMRR	Better than 70dB@50Hz	Working temperature		0～+55℃
Sampling refresh time	450ms (every four channels)	Storage temperature		-40～+70℃
Open-wire detection	Support	Relative humidity		5～95%, non-condensing

LM3312-EAI, LED Indicator

Module Status	ERROR	Power indicator
Normal operation	off	on
power off	off	off
Incorrect configuration or module failure	on	on
Broken wiring or signal over range	flash	on

LM3312-EAI, Range scope

Input signal	Corresponding input data range
Cu50 (-50-140.1℃)	-500～1401
Cu50 (-50-150℃)	-500～1500
Pt100 (-150-157.2℃)	-1500～1572
Pt100 (-150-619.6℃)	-1500～6196

LM3312-EAI, Terminal definition & wiring

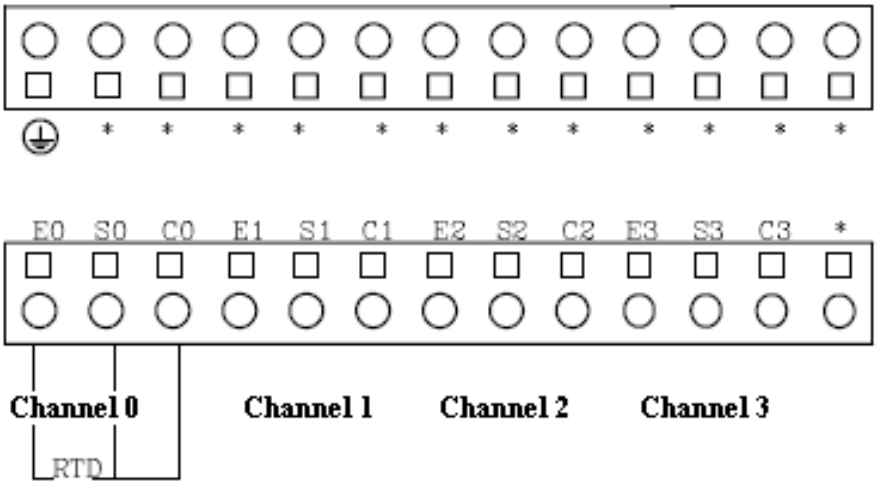


Figure 3.33 LM3311-EAI Terminal Definition & Wiring

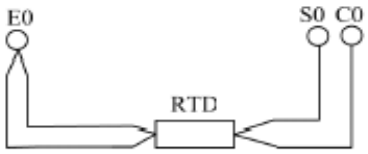


Figure 3.34 4-Wire RTD connections

- This module can measure RTD signals of 4 channels through 2-wire, 3-wire, or 4-wire type of input wiring. In case of 2-wire connection, S and C shall be short connected, RTD shall be bridge connected between E and S. For 3-wire connections, one end of RTD shall be connected to E, and the other end to S and C. See Figure 3.34 for 4-wire connection.
- In case of the floating value occurs in the channel while no signals are inputted, E, S and C shall be short connected to avoid the floating ground input error.
- " ⏚ " indicates that this channel is connected to ground protection;
- "*" indicates no wiring or no physical connection.

LM3312-EAI, Software configuration

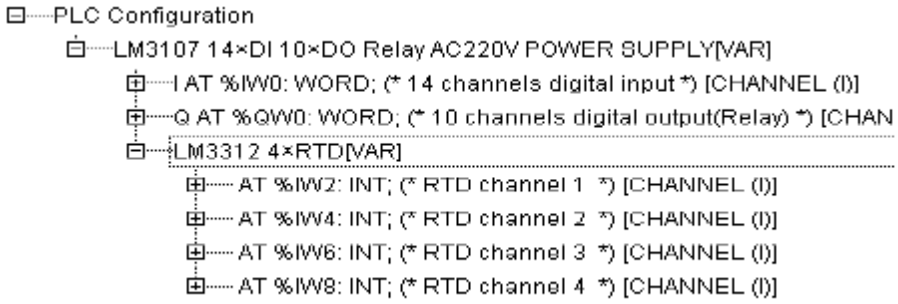


Figure 3.35 LM3312 Software Configuration

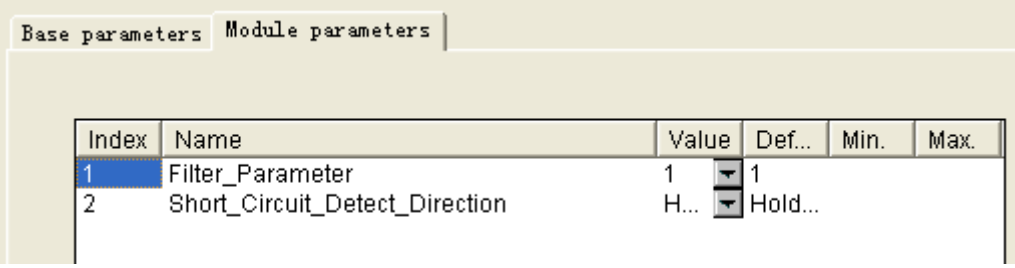


Figure 3.36 LM3312 Module Parameter Configuration

- Filter Parameter: value can be set as 1, 2, 4, 8, 16 and 32.
- Filter parameter corresponds to the time constant of RC lowpass, as shown in table 3.19;
- Short Circuit Detection: Detecting direction when short circuit failure occurs.
- Holding: the current value will be held when short circuit failure occurs.
- Upscale: Positive value limit will be accessed when short circuit failure occurs.
- Downscale: Negative value will be accessed when short circuit failure occurs.

The software configuration of the LM3312 channels is shown in Figure 3.37. TC Type stands for thermocouple type and Channel_Enable sets the channel as enabled or disabled.

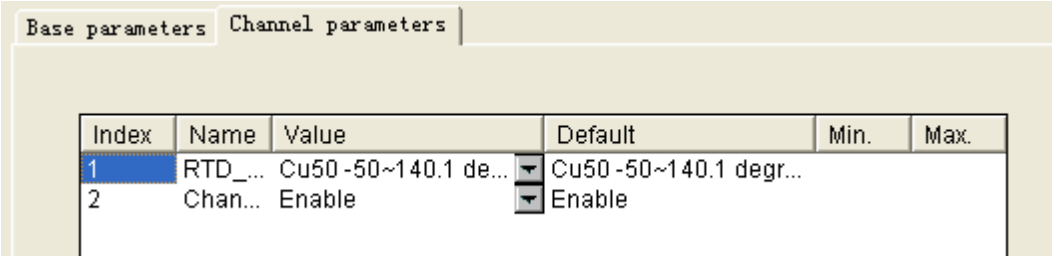


Figure 3.37 LM3312 Channel Parameter Configuration

Note:
When a channel of LM3312 is not in use, the channel parameter should be set as Disable; otherwise the error indicator might be turned on mistakenly.

3.2.6 LM3313-EAI, input module, 8-Channel Analog Input Module

The power of LM3313-EAI module is supplied by the expansion bus.

LM3313-EAI, Technical Specifications

Model			LM3313-EAI		
Input Features			Physical Features		
Input channel		8 channels	Dimension (W*H*D)		75mm(L)×90mm(W)×70mm(H)
Input range	Voltage	-10～10V	Weight		170g
	Current	-20～20mA	Power consumption	+24VDC (Expansion bus supply)	35mA
Input type		Single terminal input			
Input precision (monopole)		0.1%FS@ 25℃ (FS means full range, @25℃ means 25℃)			
Input impedance		>1MΩ(Voltage) 500Ω(current)			
Max input current		<30mA		+5VDC (Expansion bus supply)	100mA
Max. input voltage		<15V			
Temperature drift		±100ppm/℃			
Isolation mode		Isolation between field & system digital part, no isolation between channels	Working temperature		0～+55℃
Isolation endurance voltage		500VDC	Storage temperature		-40～+70℃
Sampling refresh time		15ms (every 8 channels)	Relative humidity		5～95%, non-condensing

LM3313-EAI, LED Indicator

Module Status	Power indicator
Normal operation	On
Power off or module failure	Off

LM3313-EAI, Range scope

Signal type	Range scope	Corresponding input data range
Voltage signal	-10V～10V	-32000～32000
Current signal	-20mA～20mA	-32000～32000

LM3313-EAI, Terminal definition & wiring

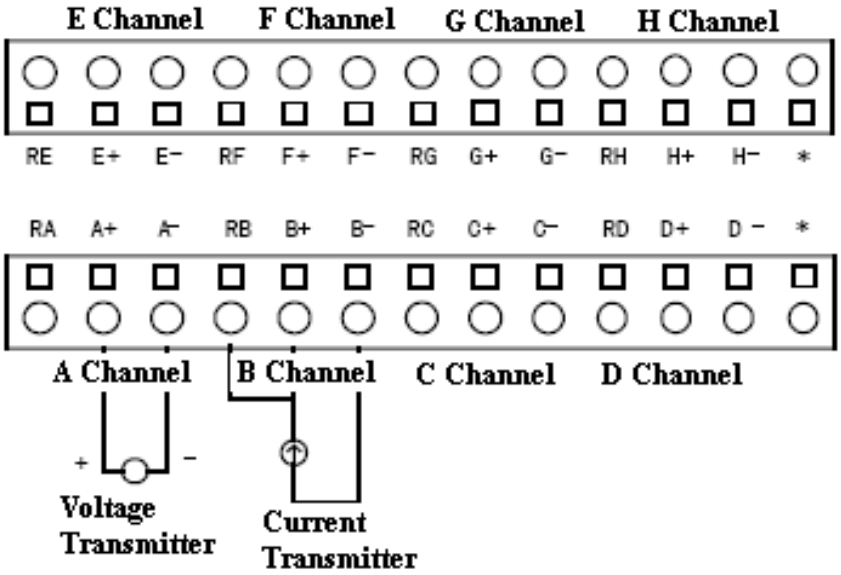


Figure 3.38 LM3313 Terminal Definition & Wiring

Descriptions:

- Input signals can be either voltage or current signals. As shown in figure 3.38, when the input signal is voltage signal, A+ connects to the positive end of voltage transmitter and A- connects to its negative end. When input signal is current signal, RA and A+ shall be short connected;
- The 2-wire and 4-wire current transmitter wiring method of LM3313-EAI are the same as LM3310. The 2-wire current transmitter adopts external power supply that can be chosen from the 24VDC output power of CPU module or other external power supplies according to power capacity demand. Please see figure 3.16. Please see figure3.17 for the method of 4-wire current transmitter wiring with LM3313;
- "*" indicates no wiring or no physical connection in this channel.

LM3313-EAI, Software configuration

LM3313 software configuration is similar to LM3310. Please refer to section3.10.6 for more details.

Note:
LM3313-EAI adopts Single-Ended Inputs. Therefore, in case of the transmitter negative terminals cannot be short connected, this module can only connect to one transmitter.

3.2.7 LM3314-EAI, 8-Channels NTC Input Module

LM3314-EAI requires that the R value of NTC is 10K at 25℃ to guarantee the measuring procedure.

LM3314-EAI, Technical Specifications

Model		LM3314		
Input Features		Physical Features		
Input channel	8 channels	Dimension (W*H*D)		75mm(L)×90mm(W)×70mm(H)
		Weight		160g
NTC type	R = 10K at 25℃; B optional	Power consumption	+24VDC (Expansion bus supply)	0mA
Input precision	0.2%FS@25℃ (FS means full range, @25℃ means 25℃)		+24VDC (External supply)	40mA
Temperature resolution	0.1℃		+5VDC (Expansion bus supply)	100mA
Temperature drift	±100ppm/℃			
Open-wire detection	Support			
Isolation mode	Isolation between field & system digital part, no isolation between channels	Working temperature		0～+55℃
Isolation endurance voltage	1500VAC			
NMMRR	Better than 60dB@50Hz	Storage temperature		-40～+70℃
Sampling refresh time (every 8 channels)	1s	Relative humidity		5～95%, no condensation

LM3314-EAI, LED Indicator

Module Status	ERROR	Power indicator
Normal operation	off	On
Power off or module failure	off	Off
Incorrect configuration or module failure	on	On
Broken wiring or signal over range	flash	On

LM3314-EAI, Range scope

Measuring temperature signal scope	Corresponding input data range
-20℃～100℃	-200～1000

LM3314-EAI, Terminal definition & wiring

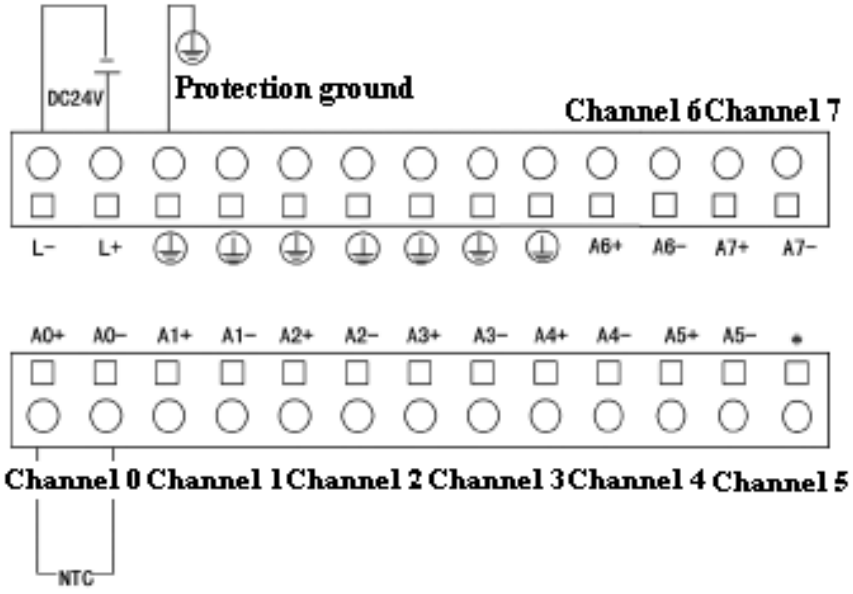


Figure 3.39 LM3314 Terminal Definition & Wiring

Descriptions:

- L+ and L- on the left side of the upper row terminals are respectively the positive and negative ends of 24VDC power supply for the module;
- This module can measure NTC signals of 8 channels. As shown in figure 3.39, A0+ and A0- are respectively the input terminals of NTC channel 0; the rest channels are similar;
- " ⏚ " indicates that this channel is connected to ground protection;
- "*" indicates no wiring or no physical connection.

LM3314-EAI, Software configuration

See figure 3.40 for LM3314 software configuration.

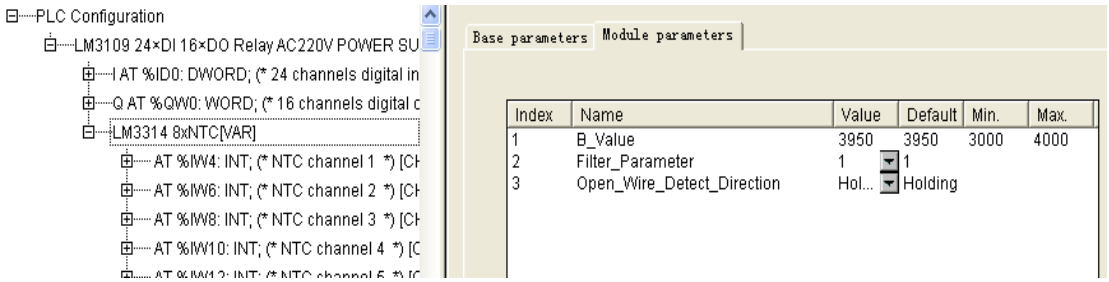


Figure 3.40 LM3314 Software Configuration

- B_Value: The minimal value is 3000, the maximal value is 4000 and default value is 3950.
- Filter_Parameter: value can be set as 1, 2, 4, 8, 16 and 32.
- The filter parameter corresponds to the time constant of RC lowpass as shown in table 3.19.
- Open Wire Detect Direction: Detect direction when short circuit failure occurs;
- Holding: The current value will be held when short circuit failure occurs;
- Upscale: The positive limit value will be read when short circuit failure occurs;
- Downscale: Then negative limit value will be read when short circuit failure occurs.

3.2.8 LM3320-EAO, output module, 2-Channel Analog output

LM3320-EAO, Technical Specifications

<table>
<tr><td colspan="3">Model</td><td colspan="3">LM3320</td></tr>
<tr><td colspan="3">Output Features</td><td colspan="3">Physical Features</td></tr>
<tr><td colspan="2">Output channel</td><td>2 channels</td><td colspan="2">Dimension (W*H*D)</td><td>75mm(L)×90mm(W)
×70mm(H)</td></tr>
<tr><td rowspan="2">Output range</td><td>Voltage</td><td>0～10V</td><td colspan="2">Weight</td><td><200g</td></tr>
<tr><td>Current</td><td>0～20mA</td><td rowspan="4">Power consumption</td><td>+24VDC(Expansion bus supply)</td><td>0mA</td></tr>
<tr><td colspan="2">Precision(0～+55℃)</td><td>2%FS (FS means full range, @25℃ means at 25℃)</td><td>+24VDC(External supply)</td><td>80mA</td></tr>
<tr><td colspan="2">Typical precision</td><td>0.5%FS@25℃ (FS means full range, 25℃ means at 25℃)</td><td>+5VDC(Expansion bus supply)</td><td>60mA</td></tr>
<tr><td rowspan="2">Setup time</td><td>Voltage output</td><td><=10μs</td><td colspan="2" rowspan="2">Working temperature</td><td rowspan="2">0～+55℃</td></tr>
<tr><td>Current output</td><td><=10μs</td></tr>
<tr><td rowspan="2">Drive</td><td>Voltage</td><td>Min.2000Ω</td><td colspan="2" rowspan="2">Storage temperature</td><td rowspan="2">-40～+70℃</td></tr>
<tr><td>Current</td><td>Max.600Ω</td></tr>
<tr><td colspan="2">Isolation mode</td><td>Optical-coupler isolation</td><td colspan="2" rowspan="2">Relative humidity</td><td rowspan="2">5～95%, no condensation</td></tr>
<tr><td colspan="2">Isolation endurance voltage</td><td>1500VAC</td></tr>
</table>

LM3320-EAO, LED Indicator

Module Status	Power indicator
Normal operation	on
power off or module failure	off

LM3320-EAO, Signal Type & Range of Output Channel

Signal Mode	Range	Corresponding input data range	
		Decimal	Hex
Voltage signal	0～10V	0～4095	0x000～0xFFF
Current signal	0～20mA	0～4095	0x000～0xFFF

LM3320-EAO, Terminal definition & wiring

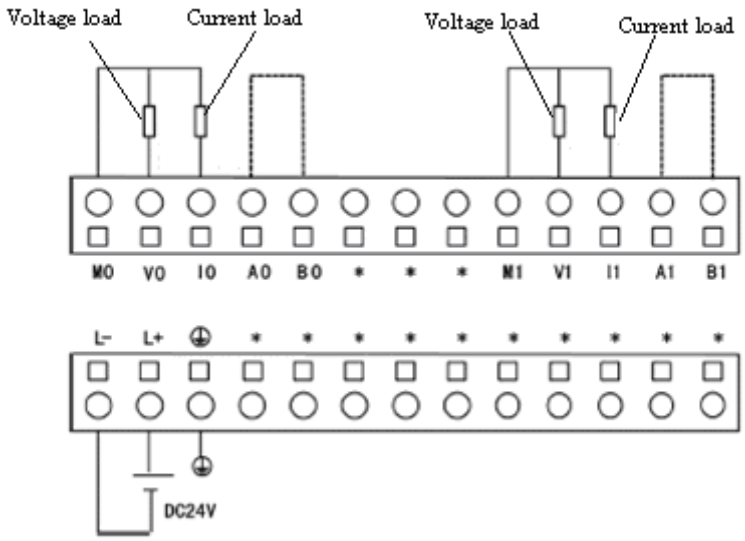


Figure 3.41 LM3320 Terminal Definition & Wiring

Descriptions:

- L+ and L- are respectively the positive and negative ends of the external 24VDC power supply.
- M0 and M1 are the common ends.
- V0 and V1 are the output ends of the external voltage load.
- I0 and I1 are the output ends of the external current load.
- When I0 end connects to the external current load, A0 and B0 should be short connected. When I1 end connects to the external current load, A1 and B1 should be short connected.
- " ⏚ " indicates that this channel is connected to ground protection.
- "*" indicates no wiring or no physical connection.

LM3320-EAO, Equivalent Circuit

The equivalent circuit of the output channel (AO) (voltage output signal) is shown in figure 3.42.

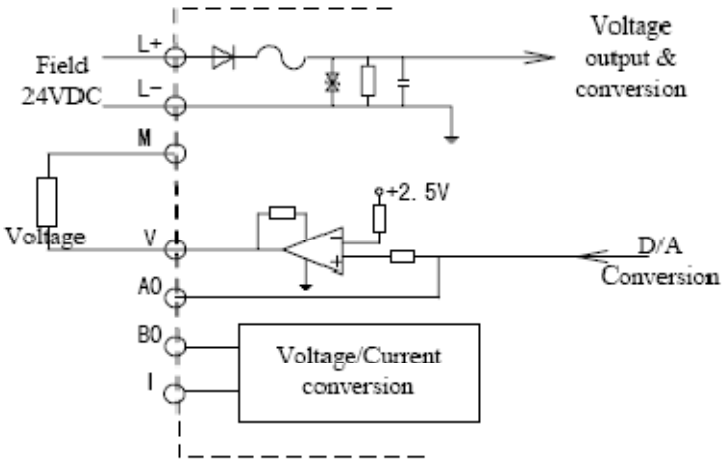


Figure 3.42 LM3320 Voltage Output Channel Equivalent Circuit

The equivalent circuit of the output channel (AO) (current output signal) is shown in Figure 3.43.

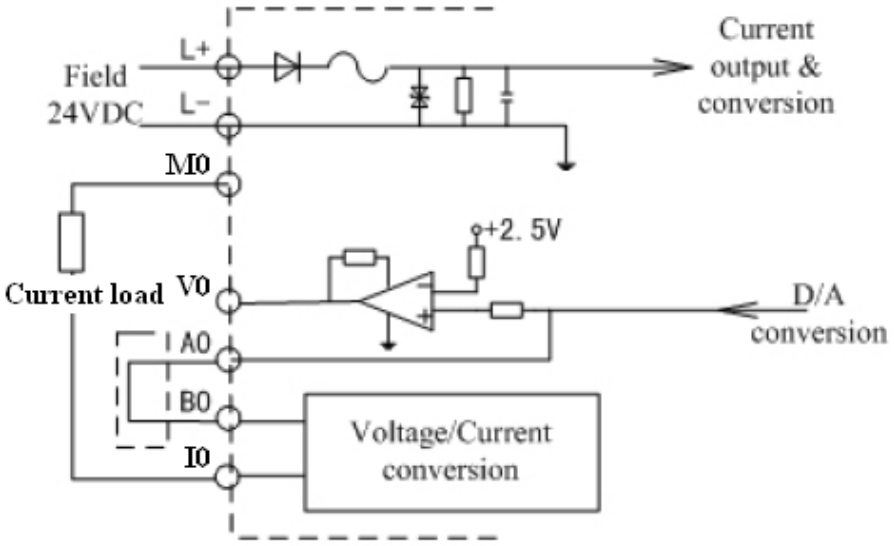


Figure 3.43 LM3320 Current Output Channel Equivalent Circuit

LM3320-EAO, Software configuration

The software configuration of LM3314 module is shown in Figure 3.44. XFactor sets the output signal type.

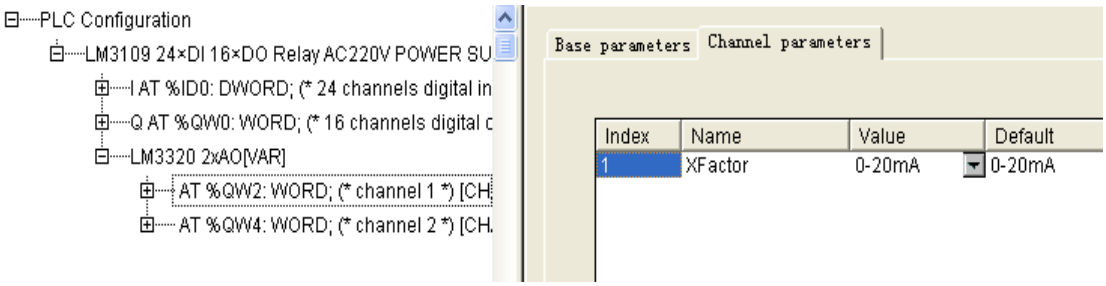


Figure 3.44 LM3320 Channel Parameter Configuration

3.2.9 LM3330-EAM, output module, 4-Channel Analog Input, 1-Channel Analog Output

LM3330-EAM, Technical Specifications

Model			LM3330		
Input Features			Output Features		
Input channel		4 channels	Output channel		1 channel
Input range	Voltage	0～10V	Output range	Voltage	0～10V
	Current	0～20mA/4～20mA		Current	0～20mA
Precision		0.5%FS@25℃(FS means full range, @25℃means at 25℃	Precision		0.5%FS@25℃(FS means full range,@25℃ means at 25℃
Digital analog conversion time		<200μs	Temperature drift		±100ppm/℃
Input type		Single input	Setup time	Voltage output	<100μs
Temperature drift		±100ppm/℃			
Sampling refresh time		6ms		Current output	<100μs
Input impedance		1 MΩ (Voltage input)	Drive	Voltage	Min. 2KΩ
		250Ω (Current input)		Current	Max. 600Ω
Isolation mode		No isolation between field & system digital part, no isolation between channels	Isolation mode		No isolation between field & system digital part, no isolation between channels
Physical Features					
Dimension (W*H*D)		75mm(L)×90mm(W) ×70mm(H)	Power consumption	+24VDC(Expansion bus supply)	30mA
Weight		200g		+24VDC(External supply)	0
Working temperature		0～+55℃		+5VDC(Expansion bus supply)	50mA
Storage temperature		-40～+70℃	Relative humidity		5～95%, no-condensing

LM3330-EAM, LED Indicator

Module Status	Power indicator
Normal operation	on
Not power-on or module fault	off

LM3330-EAM, Signal Type & Range of Channel

Analog input			
Input signal	Range	Corresponding input data range	
		Decimal	Hex
Voltage signal	0～10V	0～65535	0x0000～0xFFFF
Current signal	0～20mA	0～65535	0x0000～0xFFFF
Current signal	4～20mA	0～65535	0x0000～0xFFFF
Analog output			
Output signal	Range	Corresponding input data range	
		Decimal	Hex
Voltage signal	0～10V	0～4095	0x000～0xFFF
Current signal	0～20mA	0～4095	0x000～0xFFF

LM3330-EAM, Terminal definition & wiring

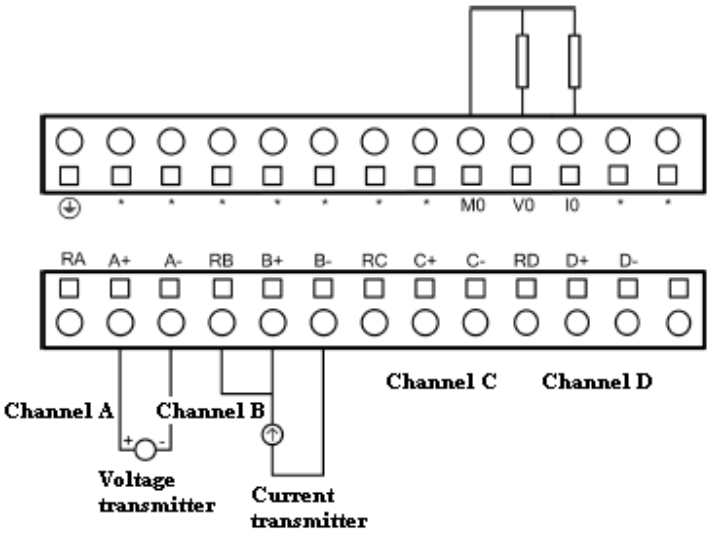


Figure 3.45 LM3330 Terminal Definition & Wiring

Descriptions:

- The terminals located in the upper row are the signal output channels that can connect to both voltage load and current load.
- The terminals located in the lower row are the signal input channels that is corresponding to four (A, B, C, D) input channels of both voltage and current input signals. For example, when voltage signal is inputted, A+ connects to the positive end of voltage transmitter and A- connects the its negative end; when current signal is inputted, RA and A+ shall be short connected and then connected to the positive end of current transmitter and A- connects to the negative end of current transmitter.
- " ⏚ " indicates that this channel is connected to ground protection. This connection provides a static release channel for the internal analog process circuit;
- "*" indicates no wiring or no physical connection.

LM3330-EAM, Equivalent Circuit

- The equivalent circuit of the input channel (AI)of LM3330 is the same as LM3310A, see figure 3.24;
- The equivalent circuit of the output channel (AI) of LM3330 is the same as LM3320, see figure 3.42 and figure 3.43.

3.3 COMMUNICATION EXPANSION MODULES

3.3.1 LM3401-EPFD, Profibus-DP Slave Station

Operate as the Profibus-DP slave station; LM 3401 module connects the LM PLC in to the Profibus-DP network, as shown in figure 3-3-1.

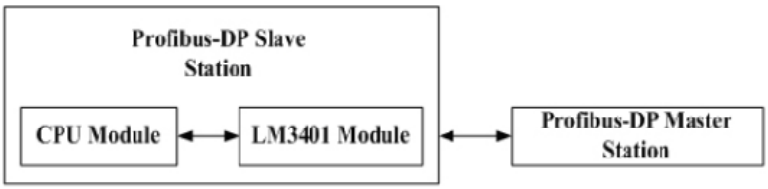


Figure 3.46 LM3401 Network Function

LM3401-EPFD, Technical Specifications

Model		LM3401-EPFD		
Communication Function		Physical features		
Number of Communication Port	1	Dimensions		75mm(L)×90mm(W) ×70mm(H)
Interface type	9 pins D type socket/ wiring terminal	Weight		160g
Isolation endurance voltage	1500VAC	Power consumption	+24VDC (External bus supply)	20mA
PROFIBUS-DP baud rate	9.6,19.2,45.45,93.75,187.5,500kbps and 1,1.5,3,6,12Mbps (auto adaptive)			
Station address setup	0～126 (set by dial switch)		+5VDC (Expansion bus supply)	120mA
Input/output size	Max. 64 byte each			
Max. station for each section	32	Working temperature		0～+55℃
Max. station for each network	126	Storage temperature		-40～+70℃
Isolation mode	Optical-coupler isolation	Relative humidity		5～95%, No condensation

LM3401-EPFD, LED Indicator

Light	OFF	Green ON	Green Flash	Red ON
RUN	power off or module failure	Module operating normally	Establishing communication	—
COMM	No communication	Communication status	—	—
ERROR	No error	—	—	Communication error

LM3401-EPFD, Terminal Definition & Wiring

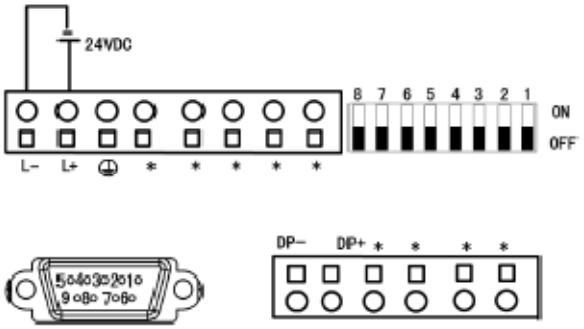


Figure 3.47 LM3401 Terminal Definition & Wiring

Descriptions:

- As shown in figure 3.47, L+ and L- indicate the positive end and negative ends of the external 24VDC power supply.
- DP+ and DP- connect to the 3(B) pin and 8(A) pin of DB9 linker inside the circuit board.
- The 8-bit dial switch is used to set the slave station address, ON-0, OFF-1, the binary value relationship between the switch status and the station address is shown in figure 3.48.

Figure 3.48 Binary Value Relationship between Switch Status & Station Address

An example is shown in figure 3-3-4 for example.

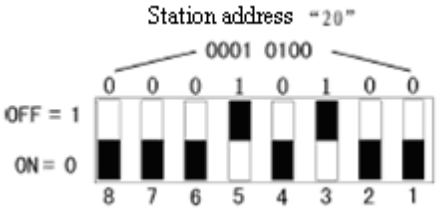


Figure 3.49 Slave Station Address Setting as 20 (decimal)

"*" indicates no wiring or no physical connection.

LM3401-EPFD, DB9 Linker Signal Definition

See Table 3-3-1 for the definition and specifications of DB9 linker.

Linker pin No.	Definition	Linker pin No.	Definition
1	Shielding, connect linker shell	6	VP (+5V,90mA)
2	—	7	—
3	B (RxD/TxD+)	8	A (RxD/TxD-)
4	CNTR-P Requesting sending signal RTS (TTL electrical level)	9	—
5	DGND, +5V ground		

Table 3-3-1 DB9 Linker Signal Definition

LM3401-EPFD, Relationship between Baud Rate & Cable Length

Baud Rate	Cable Length
≤93.75kbps	<1,200m
187.5kbps	<1,000m
500kbps	<400m
1.5Mbps	<200m
3～12Mbps	<100m

Table3-3-2 Relationship between Baud Rate & Cable Length

LM3401-EPFD, Software configuration

The software parameter of LM3401 is shown in figure 3.50. InputDataLen_Byte sets the input-data-section size and OutputDataLen_Byte sets the output-data-section size; the maximum size is 64 byte.

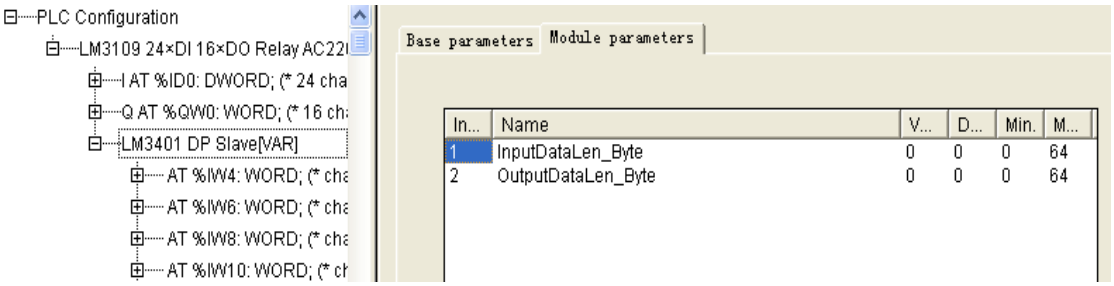


Figure 3.50 LM3401 Software Configuration

LM3401-EPFD, gsd file acquisition method under master station configuration

From software install CD >> expansion files >> get LM3401.gsd.

Note:

When the DP module is connected as an expansion module, it should be placed at the first position on the right side of CPU module.

3.3.2 LM3403-EETH, Ethernet Interface

LM3403-EETH is Ethernet expansion module. Through LM3403-EETH module, LM PLC can link to local area network as MODBUS TCP slave station.

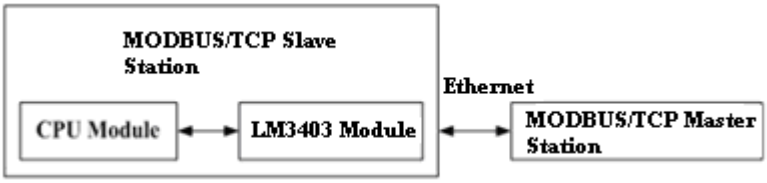


Figure 3.51 LM3403-EETH Network Function

LM3403-EETH, Technical Specifications

Model		LM3403-EETH		
Communication Function		Physical features		
Number of Communication Port	1 (can only communicate with one MODBUS TCP master station at one time)	Dimensions		75mm(L)×90mm(W)×70mm(H)
Interface type	Ethernet (RJ45)	Weight		160g
Protocol type	MODBUS TCP slave station	Power consumption	+24VDC(Expansion bus supply)	0mA
Configure content needed	IP address(leave factory default value is 172.20.45.160), subnet mask, gateway IP, read & write data length (note: MAC_Address doesn't need configuration)			
Communication rate	10Mbps		+5VDC(Expansion bus supply)	80mA
Size of input & output section	Max. 200 byte each	Working temperature		0～+55℃
Max. number of station for each network	Lie on configuration software	Storage temperature		-40～+70℃
		Relative humidity		5～95%, non-condensing

LM3403-EETH, LED Indicator

Light(status)	OFF	Green ON	Green Flash	Red ON
RUN	power off or module failure	Module operating normally	—	—
LINK	Ethernet connection not established	Ethernet connection established	—	—
RX/TX	No data received or sent	—	Data received and sent	—
ERROR	No error	—	—	Communication error

LM3403-EETH, Terminal Definition & Wiring

- This module has no practical physical connection
- The RJ45 port is used to connect the Ethernet.

LM3403-EETH, Software configuration

The software configuration of LM3403 module is shown in figure 3.52. IP_Address, Subnet_Mask, Gateway Address respectively set the IP configuration, subnet mask and gateway. No configuration is needed for MAC Address. ReadDataLen_Byte and WriteDataLen configure the size of input section and output section, the maximum of which is 200 byte.

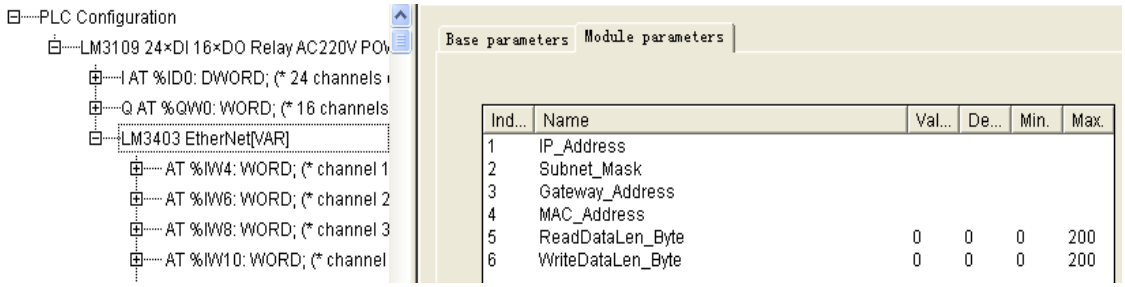


Figure 3.52 LM3403 Software Configurations

LM3403-EETH, Specifications of MODBUS TCP Functions

Function code	Name	Function(for master station)
01	Read digital output status	Get current status of a series of digital output
02	Read digital input status	Get current status of a series of digital input
03	Read analog output status	Get current status of a series of analog output
04	Read analog input status	Get current status of a series of analog input
05	Force single channel digital output	Force setting one digital output value
06	Force single channel analog output	Force setting one analog output value
15	Force multi channel digital output	Force setting multi digital output value
16	Force multi analog output	Force setting multi analog output value

Note:
When the Ethernet module is connected as an expansion module, it should be placed at the first position on the right side of CPU module.

Chapter 4

Installation

4.1 GUIDANCE PRINCIPLES

For more effective and safe use of LM Micro PLC, the following installation guidance will demonstrate the proper installation of system components, and how to ensure the installation agree with the requirements of electromagnetic compatibility.

4.1.1 Ventilation

If the electrical equipment works continuously under fierce environment with peak load and high temperature, life span of the equipment will be shortened. Therefore, the ventilation shall be taken into serious consideration.

Since LM Micro PLC adopts a natural convection ventilation method, special location and space of its installation are required. The PLC modules shall be installed as shown in Figure 4.1.1, for good ventilation under all kinds of installation modes.

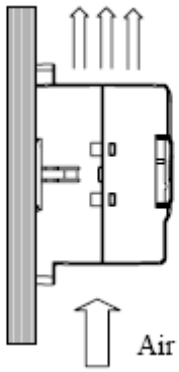


Figure 4.1.1 Recommended Ventilation

To avoid any malfunction caused by poor ventilation, please do not install the PLC as shown in figure 4.1.2.

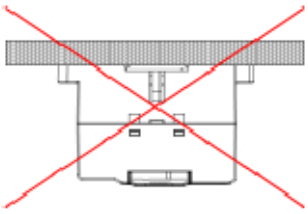


Figure 4.1.2 Poor Ventilation that shall be avoided

Meanwhile, there should be at least 50mm space above and below each module for the regular ventilation. In the case of front baffle, the depth between baffles must be kept at 100mm as shown in Figure 4.1.3.

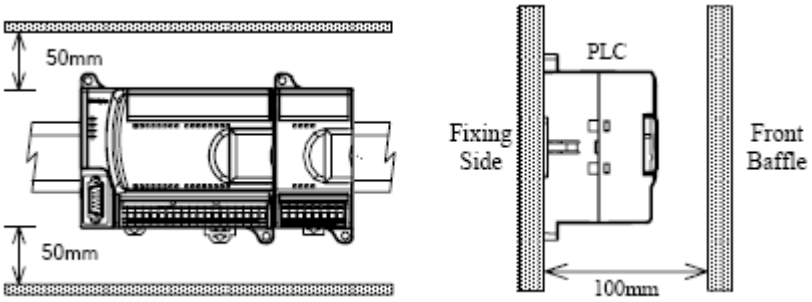


Figure 4.1.3 Installation Space Requirement of LMPLC

Please also note that there must be enough space for the expansion cable and communication cable.

4.1.2 Proper Location of Cables

The following are the general principles of cable installation and field wiring. For more details please refer to the related chapters as different modules require different wiring.

- LM MIRCO series PLC adopts AWG28-12 (0.321～2.053mm) cables that shall adopt the correct wiring;
- The cables are divided into different types according to their functions and serial numbers are assign to them;
- The installation of the input and output cables in the same cable trough shall be avoided;
- Input and output signal cables must be shielded;
- The AC cables and high-power DC cables shall be separated from the low power signal cables;
- The installation of the big-current cables and the signal or data cables in the same trough shall be avoided.

4.2 ELECTRICAL SAFETY

For the safety of operators and equipment in the LM micro PLC operations, a safety loop must be independently established from the PLC system, functions such as the redundant protection, power overload protection and emergency shutdown shall be enabled to avoid any occurrence of emergency.

4.2.1 Restraining loop

It is recommended to add a restrain loop in the inductive load to limit the instant rise of voltage when power off. The following is recommended:

DC Transistor Protection

For the instructive load with large induction or frequent on-and-off in the LM Micro PLC DC transistor outputs, external flywheel dioxide can be used to avoid penetration of internal transistor. Figure 4.2.1 and figure 4.2.2 illustrate the typical applications of DC transistor output protection.

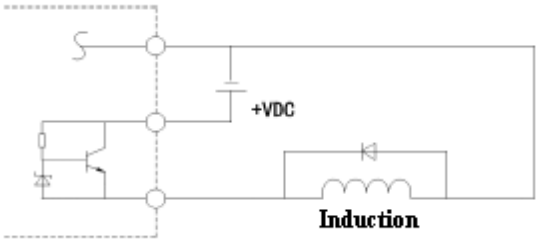


Figure 4.2.1 Normal Diode Protection of DC Transistor Output

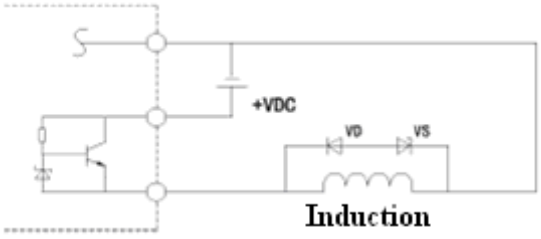


Figure 4.2.2 DC Regulated Diode Protection of Transistor Output

DC Transistor Protection

Apply resistance / capacitance network in LV(DC30V)DC relay circuit, and cross connect with load to create a relay-driven and DC load DC

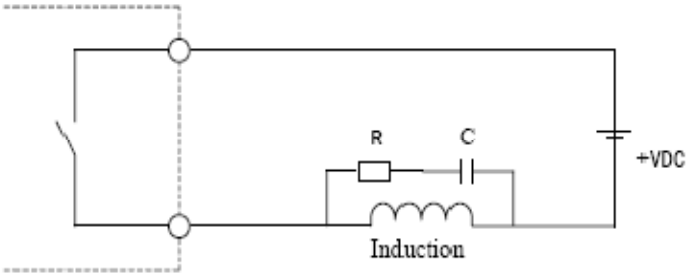


Figure 4.2.3 DC Relay Protection

AC Relay Protection

When AC Relay is used to control 220VAC load, it is recommended to cross connect the resistance/capacitance network in AC relay for the protection, as shown in Figure 4.2.4.

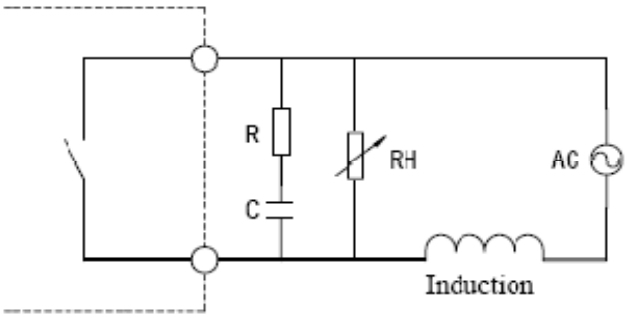


Figure 4.2.4 AC Relay Protection

4.2.2 Emergency Shutdown

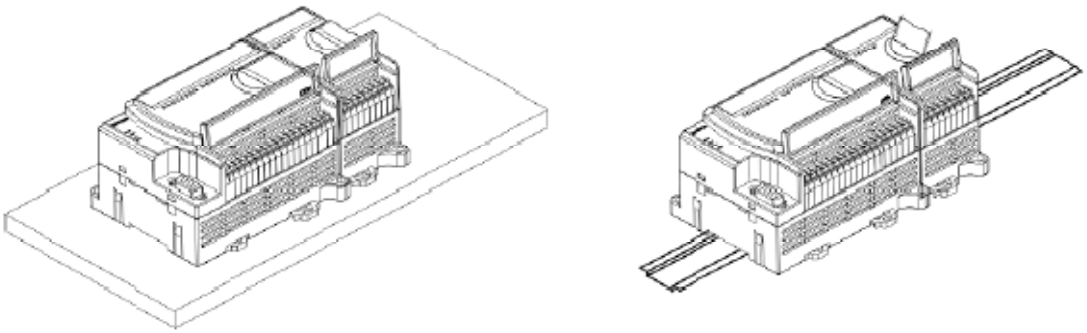
To avoid any casualty or property loss, a fast power shutdown or switch shall be provided, as well as the clear signs of “Emergency Shutdown” must be available.

4.3 INSTALLATION & DISASSEMBLY

Failure to effectively cut off the power in the installation or disassembly of LM Micro series PLCs will cause casualties or equipment damages. Therefore, all power shall be turned off before installing or disassembling PLC modules and related equipment.

4.3.1 Installation Mode

LM MIRCO micro PLC offers two installation modes for users. In different engineering environments, modules can be installed either on a flat panel or on the DIN standard rail, as shown in Figure 4-3-1.



Panel Installation DIN Rail Installation

Figure 4-3-1 Installation Modes

Panel Installation

- Set holes on the panel according to module size and installation location hole;
- Fix CPU on the panel with bolts;
- Locate and fasten the expansion module, if any, side by side in turn on the side of the adjacent module;
- Connect the expansion cable to the linker on the right side of the adjacent module in the correct direction;
- Connect signal cables.

The installation process is shown in Figure 4.3.2.

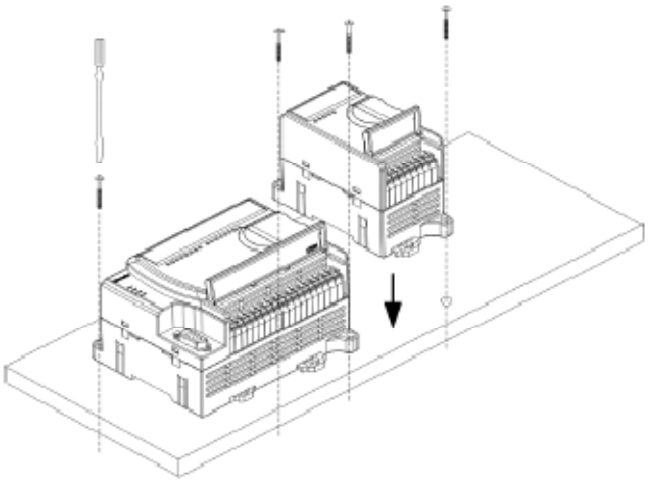


Figure 4.3.2 Panel Installation Mode

Disassembly

- Disassemble all signal cables;
- Disassemble cables that are connected to adjacent modules;
- Loosen the fixed bolts and take off modules in turn.

Disassemble process is shown in Figure 4.3.3.

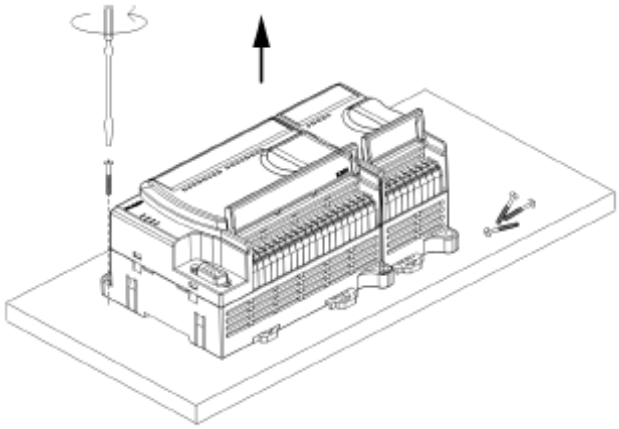


Figure 4.3.3 Module Disassembly

Standard DIN rail and DIN rail pin

To install LM Micro PLC on the standard 35mm DIN rail, first slide the PLC module horizontally along the rail. Figure 4.3.4 shows the sizes of two common DIN rails, Figure 4.3.4 illustrates the DIN rail pin.

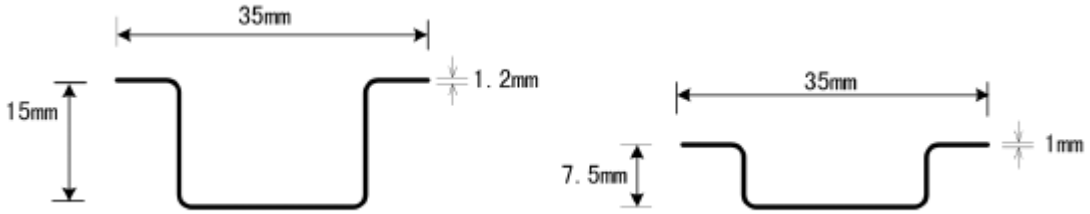


Figure 4.3.4 Standard 35mm DIN

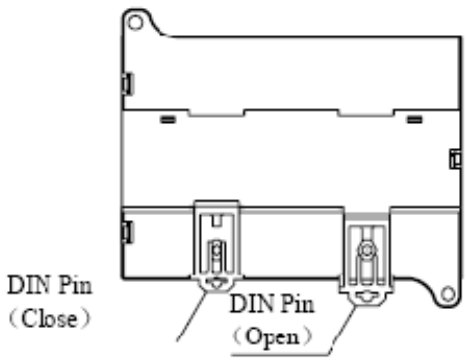


Figure 4.3.5 Rail Pin

Rail Installation

- Loosen the DIN pin on the bottom of CPU module, and place the module on the DIN rail;
- Fasten the DIN pin and make CPU module fixed compactly with the rail;
- Fasten the expansion modules, if any, side by side on the rail;

- Connect the cable of the expansion module to the linker on the right side of the adjacent module in correct direction;
- Connect the signal cables.

The installation process is shown in Figure 4.3.6

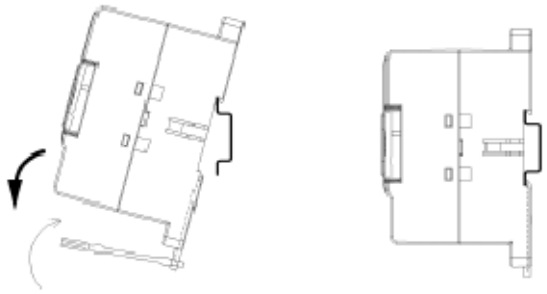


Figure 4.3.6 Rail Installation

Disassembly

- Disassemble all cables;
- Disassemble the cables connecting to the adjacent modules;
- Loosen DIN pin and remove the modules in turn.
- Disassembly process is shown in Figure 4.3.7.

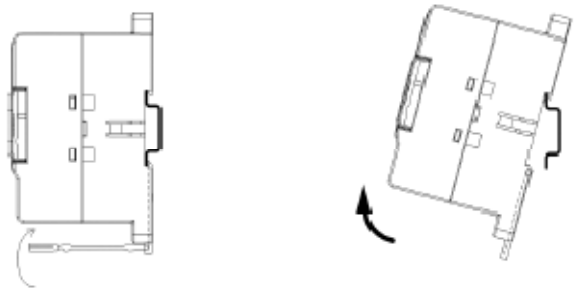


Figure 4.3.7 Disassemble Module from Rail

4.3.2 Connection of Expansion Cables

To connect modules, plug the expansion cables in the same direction as the electrical outlet notch of the expansion interface of adjacent module, as shown in Figure 4.3.8.

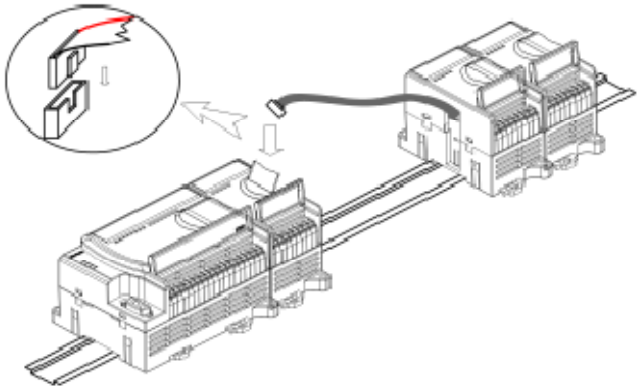


Figure 4.3.8 Connection of Expansion Cables between Modules

Last but not least, to replace failure modules during maintenance, error may incur in the control program. Incorrect replacement of expansion modules or cables will result in serious

consequences. Therefore, be sure to correctly replace the modules and properly locate the replacement modules.

4.3.3 Terminal Wiring

LM Micro series PLC adopts patent wiring terminals of WAGO Company in Germany. Its wiring is stable and easy to connect and disassemble that 75% time of wire can be saved. As the WAGO connectors adopt advanced spring holding and wiring technologies, and use the best insulating and electric materials, it provides extrusive features such as high reliability, high safety, high efficiency, anti-vibration and lower maintenance costs.

During the wiring process, first peel the insulated scarfskin with the definite length, then plug a screwdriver into the adjacent rectangular hole with terminal identifier, unplug the screwdriver after plugging the peeled lead into the unlocked circle hole(i.e. the “plug spring holding connector”) and the stainless angle reed can exert the needed pressure to impact the wire.

Figure 4.3.9 Terminal Wiring

There will be common end in the field contact wiring. According to the different location of common ends in circuit structure, the DI circuit can be divided into two architectures:

Sourcing type DI: current flows from photoelectric coupler to switch, the other end of many switches are short connected together with the power ground (as shown in Figure 4.3.10), output current is flowed to contacts for photoelectric coupler of DI devices. Therefore, it is named as Sourcing type DI.

Sinking type DI: one end of many switches are short connected to the positive end of sensor power, current flows from switch to ground through photoelectric coupler (as shown in Figure 4.3.11), it absorbs current from contacts for photoelectric coupler of DI. Therefore, it is also named as Sinking type DI .

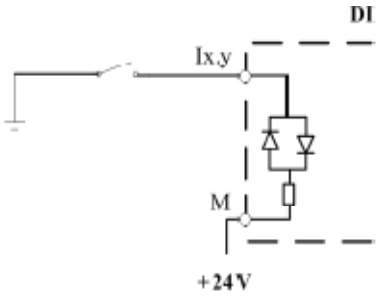


Figure 4.3.10 Sourcing type DI

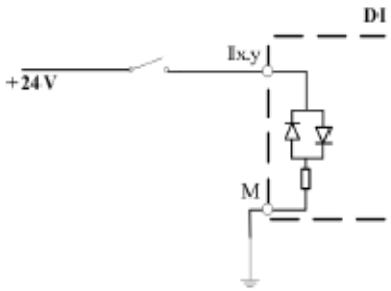


Figure 4.3.11 Sinking type DI

In general, two factors shall be considered when selecting from the Sourcing DI or Sinking DI:

(1) During debugging, for Sinking type DI, if the other end of contact is incorrectly wired to the power ground of sensor, it may cause short circuit to burn the fuse. For Sourcing type DI, no

such problem will occur because the power first passes through photoelectric coupler and current limit resistance.

(2) When direct connection of the DO module output to the DI module is needed, there will be two structures of Sinking and Sourcing, so when DO is Sinking type, the DI is required to be Sourcing type; when DO is Sourcing type, DI is required to adopt the Sinking typest.

4.4 DIMENSIONS AND STRUCTURES

The width and height of all kinds of LM Micro PLC modules are the same, only the length can be different.

Figure 4.4.1 illustrates the dimensions and structures of the LM Micro series PLC modules.

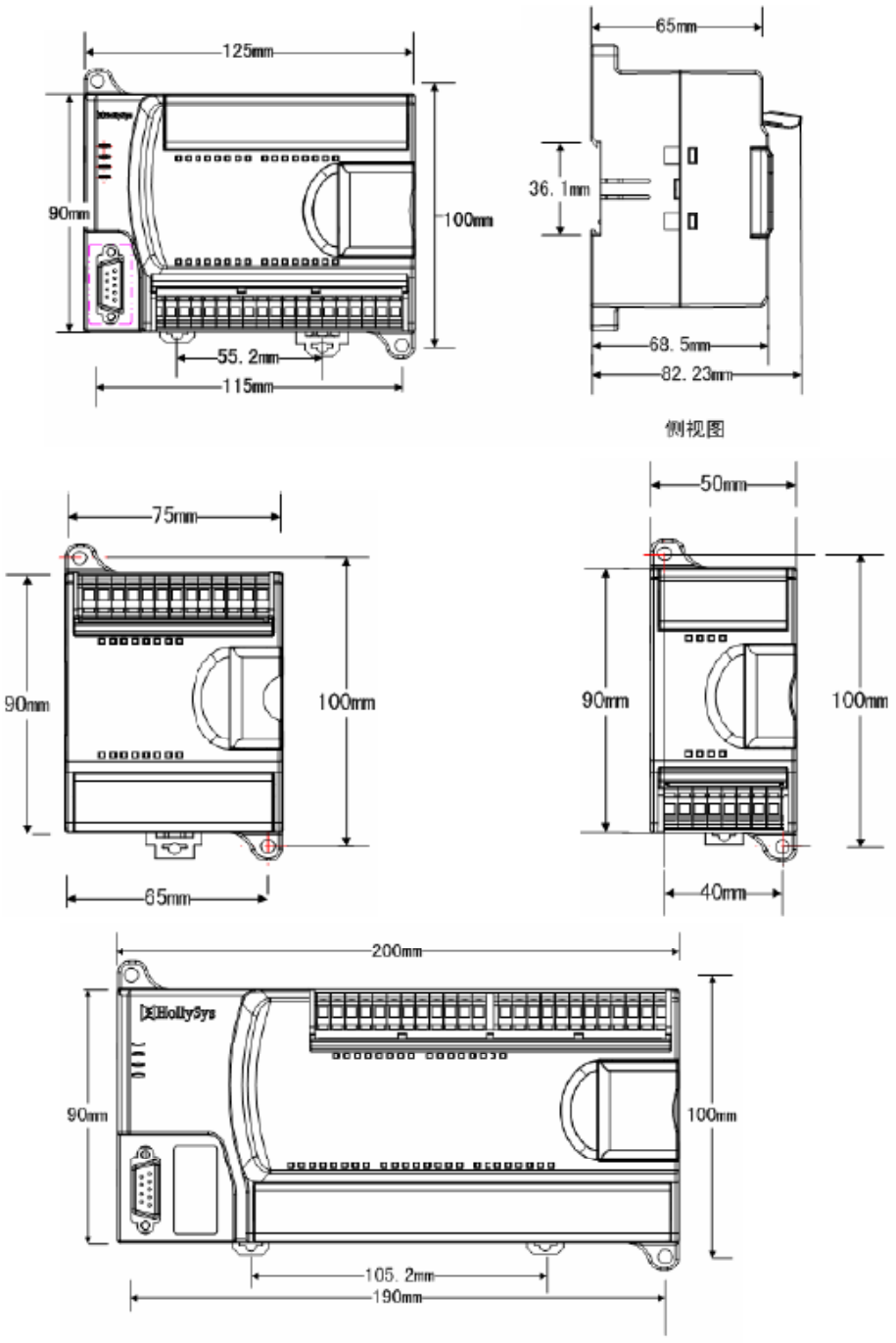


Figure 4-4-1 LM MIRCO Series Micro Integrated PLC Module Structure and Dimension

Appendix
A

Appendix

LM SERIES MICRO PLC-- PRODUCT ORDER LIST

Module type	Model	Dimension (L)×(W) ×(H)	Specifications
CPU module	LM3104-CDT	125mm×90mm×70mm	CPU, DC24V, 14 points I/O; DI 8×DC24V, DO 6×Transistor output
	LM3105-CAR	125mm×90mm×70mm	CPU, AC220V, 14 points I/O, DI 8×24VDC, DO 6×relay output
	LM3106-CDT	125mm×90mm×70mm	CPU, DC24V, 24 points I/O, DI 14×24VDC, DO 10×transistor output
	LM3107-CAR	125mm×90mm×70mm	CPU, AC220V, 24 points I/O, DI 14×24VDC, DO 10×relay output
	LM3107E-CAR	125mm×90mm×70 mm	CPU,AC220V, 23 points I/O, DI 12×24VDC, DO 8×Relay output AI×1, AO×2
	LM3108-CDT	200mm×90mm×70mm	CPU, DC24V, 40 points I/O, DI 24×DC24V, DO 16×relay output
	LM3109-CAR	200mm×90mm×70mm	CPU, DC24V, 40 points I/O, DI 24×DC24V, DO 16×relay output
Digital expansion I/O module	LM3210-EDI	50mm×90mm×70mm	8 channel DI module 8×DC24V input
	LM3211-EDIA	75mm×90mm×70mm	8 channel DI module 8×AC220V input
	LM3212-EDI	75mm×90mm×70mm	16 channel DI module 16×DC24V input
	LM3220-EDOT	50mm×90mm×70mm	8 channel DI module 8×DC24V transistor output
	LM3221-EDOT	75mm×90mm×70mm	16 channel DO module 16×DC24V transistor output
	LM3222-EDOR	50mm×90mm×70mm	8 channel DO module 8×relay output
	LM3223-EDOR	75mm×90mm×70mm	16 channel DO module 16×relay output
	LM3230-EDMT	50mm×90mm×70mm	4 channel digital input/4 channel transistor output, DI 4×DC24V+DO 4×DC24V transistor output
	LM3231-EDMR	50mm×90mm×70mm	4 channel digital input/4 channel relay output module, DI 4×DC24V+DO 4×relay output

Analog expansion I/O module	LM3310-EAI	75mm×90mm×70mm	4 channel analog input (4～20mA/0～20mA/0～10V optional)
	LM3310A-EAI	75mm×90mm×70mm	4 channel analog input (4～20mA/0～20mA/0～10V optional)
	LM3310B-EAI	75mm×90mm×70mm	4 channel analog input (4～20mA/0～20mA/0～10V optional)
	LM3311-EAI	75mm×90mm×70mm	4 channel thermocouple input (J、K、E、N、T、R、S、B type thermocouple, ±80Mv)
	LM3312-EAI	75mm×90mm×70mm	4 channel RTD input (Cu50(-50-140.1℃),Cu50(-50-150℃),Pt100(-150-157.2℃),Pt100(-150-619.6℃))
	LM3313-EAI	75mm×90mm×70mm	8 channel analog input (-10V～10V,-20mA～20mA)
	LM3314-EAI	75mm×90mm×70mm	8 channel NTC input (R25℃ is 10K, NTC of optional B value
	LM3320-EAO	75mm×90mm×70mm	2 channel analog output (0～20mA/0～10V optional)
	LM3330-EAM	75mm×90mm×70mm	4 channel analog input (4～20mA/0～20mA/0～10V optional) 1 channel analog output (0～20mA/0～10V optional)
Communication Module	LM3401-EPFD	75mm×90mm×70mm	Profibus-DP slave module
	LM3403-EETH	75mm×90mm×70mm	Ethernet module
Software & Cables	LM3600-PRO2		Programming software PowerPro
	LM3800-COM2	2 meters long	RS-232 Programming cable
Manuals / Documents	Leaflet-PLC-2008-07-00001		LM Micro Series - Overview
	CAT-PLC-LM-2008-08-00001		LM Micro Series – Selection Guide
	MAN-PLC-LM-2008-08-10001		LM Micro Series – Hardware Manual
	MAN-PLC-LM-2008-08-20001		LM Micro Series – Software Manual
	MAN-PLC-LM-2008-08-30001		LM Micro Series – Instruction Set Reference Manual

Note:
Software, Manuals, & Documents comes in electronic soft copies and is subject to version changes without prior notice. Please consult HollySys Technical Support to obtain the latest version.

LM MICRO SERIES PLC -- GENERAL TECHNOLOGY SPECIFICATION

Environment condition	Transportaion and storage	Temperature	Use temperature: 0～+55℃, storage temperature:-40～+70℃
		Humidity	5～95%, no-condensing.
		Incline and overturn	Standard: GB/T2423.7-1995, 50mm fall down four times, no package
		Free fall	Standard: GB/T2423.8-1995, 1m five times, transportation and package.
	Working condition	Libration	Standard: GB/T2423.10-1995 peak-peak value 0.3mm, 1G/Rail installation, frequency 10～150HZM, three times each axes, double frequency range/minute
		Strike	Standard: GB/T2423.5-1995 15G, 11ms, six times each axes.

		Protection degree	Mechanical protection IP20
Electromagnetic compatibility	Shell	Static discharge	Standard: IEC61000-4-2, grade: 2/3, contact discharge 4Kv, air discharge 8kV.
		Operating frequency magnetic field	Standard: IEC61000-4-8, grade: 4, steady and continuous magnetic field testing magnetic intension: 30A/m.
	AC power	Voltage drop or interruption	Standard: IEC61000-4-11, grade: 3, interrupt 0.5 period wave.
		Fast and transient pulse group	Standard: IEC61000-4-4, grade: 3, 2Kv
		Surge	Standard: IEC61000-4-5, grade: 2/3, wire to wire 1kV, wire to ground 2 kV
	I/O signal or control signal	Radio-frequency electromagnetic field radiation anti-disturbance test	Standard: IEC61000-4-3, grade: 3, 80MHz～1GHz 10V/m, 80% modulation at 1kHz.
		Fast and transient pulse group	Standard: IEC61000-4-6, grade: 3, 1kV.
		Conduction annoy of radio-frequency field induction	Standard: IEC61000-4-6, grade: 3, 10V, 0.15～80MHz, 80% modulation at 1KHz.
Electromagnetic radiation		Measurement of radiation disturbance	Standard: IEC61131-2, 30～230MHz, 10m quasi-peak value is less than 40dB(μ V/m) 230～1000MHz, 10m quasi-peak value less than 47dB(μ V/m)
		Measurement of conduction disturbance	Standard: IEC61131-2, 0.15～0.5MHz, quasi-peak value is less than 79dB(μV), the average value is less than 66dB(μV); 0.5～30MHz, quasi-peak is less than 73dB(μV),the average value is less than 60Db(μV)
		Limit value of harmonic wave current radiation	Standard: IEC61000-3-2
		Limit value of Voltage fluctuation and flash	Standard: IEC61000-3-3
environment		No caustic gas, no dust.	Use environment

Note:
LM Micro series PLC need to be installed on the metal fight with grounding, and please connect its ground wire to the metal fight directly. The cable should be connected along metal fight.

When testing radiation emission, the device must be installed in metal shell with grounding to avoid disturbance. AC input power need to connect a filter or equivalent device and filter should be near module to avoid the EFT failure. Power wire of 24VDC power and sensor must be shielded.