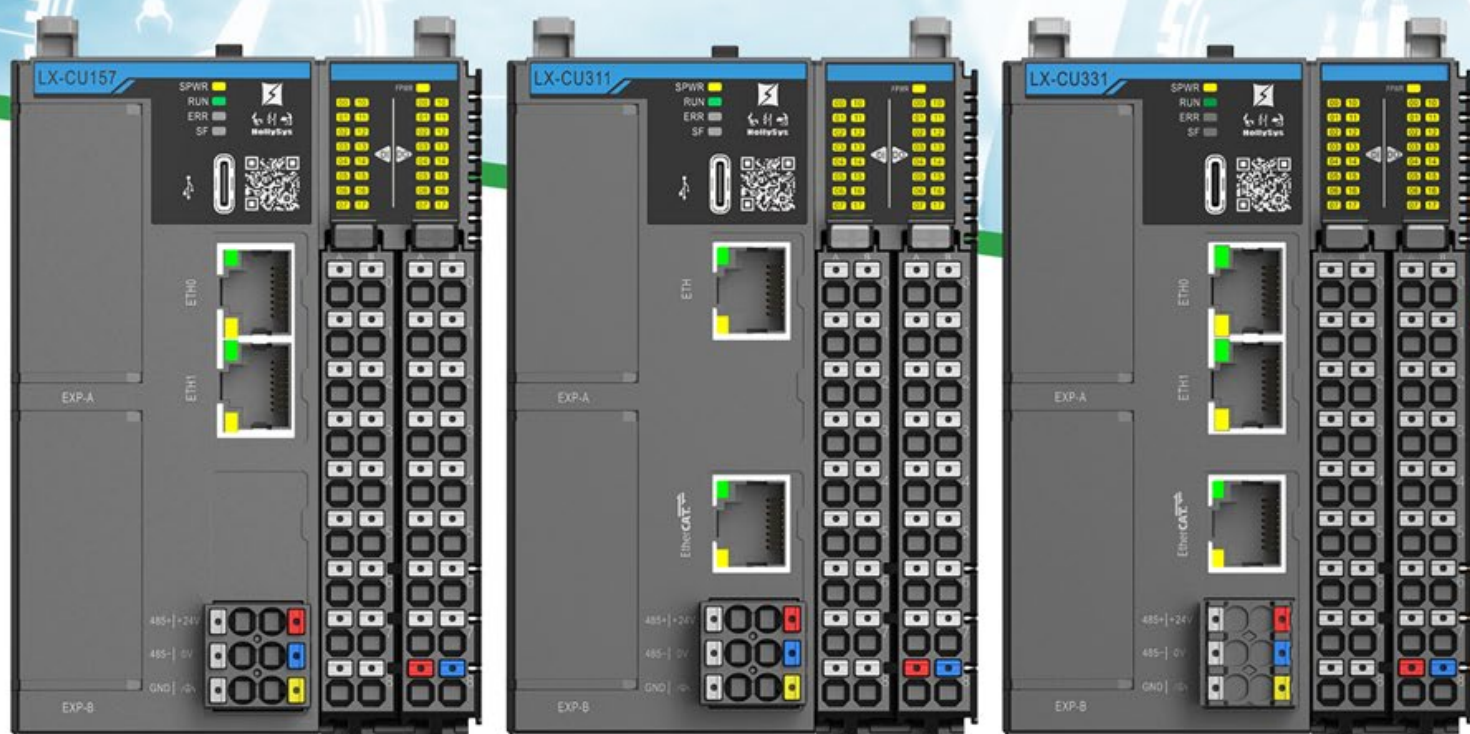


LX Series Compact PLC

Module Manual



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Chapter 1 Preface

Document Overview

This document mainly introduces the LX series compact PLC modules and related knowledge, including module dimension drawings, wiring diagrams, parameter specifications, and other information.

Intended Audience

This manual is intended for engineers with expertise in automation and control systems, or related technical professionals.

Usage Statement

- The content of this manual has been tested according to regulations, and the diagrams correspond to the described software and hardware products. However, errors are inevitable, and complete consistency cannot be guaranteed. If you have any suggestions for improving or correcting the content of this manual, please inform us promptly, and we will make corrections in the next version.
- Due to product iteration and updates, relevant parameters and information in this manual are subject to change. If you have any questions, please consult technical support.
- As the equipment described in this manual can be used in various ways, the user and the person responsible for the equipment usage must ensure the permissibility of each method. HollySys will not bear legal responsibility for any direct or indirect losses caused by the use or misuse of this equipment.
- Due to uncertain factors in practical applications, HollySys does not assume responsibility for directly using the data provided in this manual.

Safety Statement

- Before using this product, please read and comply with these safety precautions.
- To ensure personal and equipment safety, strictly adhere to the identification information on the product and the safety precautions in the manual when using this product.
- The "Note", "Caution", "Warning", and "Danger" items in the manual do not represent all safety measures to be followed but serve as supplements to all safety precautions.
- This product should be used in environments that meet the design specification requirements. Otherwise, malfunctions may occur. Equipment damage caused by failure to comply with relevant regulations is not covered by the product quality guarantee.
- HollySys is not responsible for any personal safety accidents or property losses resulting from any operations performed not in accordance with this manual or by unqualified personnel.

Symbol Convention

For your personal safety and to avoid property loss, please pay attention to the warning prompts in this manual. The following warning prompts indicate hazard levels from high to low. When multiple hazard levels exist, only the highest level is prompted. If the highest level is a warning leading to personal injury, there may also be warnings leading to property loss.

Symbol	Meaning
	Danger. Indicates that improper operation may cause serious accidents resulting in equipment damage or personal injury/death.

	Warning. Indicates that improper operation may cause equipment failure, electric shock, or personal injury accidents.
	Caution. Indicates content that requires special attention during operation.
	Note. Indicates supplementary explanatory content.

Revision History

Date	Version	Description
2026.06.30	V1.2	● New Content: Added description of software version compatibility with LT-e modules ● New Specification: Network Variables, Data Snapshot, LX-CU311 / LX-CU331 / LX-CU332 / LX-CU333 support the functional safety module LX-LG901, LX-CU33X series controllers support File Transfer Protocol (FTP), Motion Control Commands, LX-EC006 supports CAN free protocol and CANopen protocol, and is compatible with CAN2.0A and CAN2.0B
2026.05.30	V1.1	● New Specification: Added LT-eBus bus protocol to controller technical specifications ● New Module: LX-CU155
2026.04.10	V1.0	First official release.

Chapter 2 Related Manuals

All manuals for the Compact PLC product can be downloaded from the HollySys official website:
https://fa.hollysys.com/product_detail/c-_detailId%3D1329047041887494144.html#c_relevant_052-17326776315060

Chapter 3 Software/Hardware Version Compatibility

Table

There is a one-to-one correspondence between the firmware version of the compact PLC controller and the target configuration version in the Intelligent AutoThink programming software. When programming with Intelligent AutoThink, the target configuration must be selected according to the controller's firmware version; otherwise, the program cannot be downloaded to the controller.

Controller Firmware Version and Software Version Compatibility Table

Firmware Version (Controller Image Version)	Intelligent AutoThink Version				
	Intelligent AutoThink V5.0.0A5	Intelligent AutoThink V5.0.0A6	Intelligent AutoThink V5.0.0A8	Intelligent AutoThink V5.0.0A9	Intelligent AutoThink V5.0.0A10
LX-CU153-A01_V1.0.0		√			
LX-CU153-A01_V1.0.1			√		
LX-CU153-B01_V1.1.0				√	
LX-CU153-B01_V1.1.1					√
LX-CU155-A01_V1.1.0				√	
LX-CU155-A01_V1.1.1					√
LX-CU157-A01_V1.0.0		√			
LX-CU157-A01_V1.0.1			√		
LX-CU157-B01_V1.1.0				√	
LX-CU157-B01_V1.1.1					√
LX-CU311-A01_V1.0.1	√				
LX-CU311-A01_V1.0.2		√			
LX-CU311-A01_V1.0.3			√		
LX-CU311-B01_V1.1.0				√	
LX-CU311-B01_V1.1.1					√
LX-CU331-A01_V1.0.0			√		
LX-CU331-B01_V1.1.0				√	
LX-CU331-B01_V1.1.1					√
LX-CU332-A01_V1.0.0			√		
LX-CU332-B01_V1.1.0				√	

LX-CU332-B01_V1.1.1					√
LX-CU333-A01_V1.0.0			√		
LX-CU333-B01_V1.1.0				√	
LX-CU333-B01_V1.1.1					√

Software Version and LT-e Series Module Version Compatibility Table

Intelligent AutoThink Version	LT-e Series Module
Intelligent AutoThink V5.0.0A5 and above	LT-eDI01、LT-eDI02、LT-eDO01、LT-eDO02、LT-eAI01、LT-eAO01、LT-eDO04、LT-eTC01、LT-ePT01、LT-eIM01、LT-eIM03
Intelligent AutoThink V5.0.0A8 and above	LT-eAI02、LT-eAI03、LT-eAO02、LT-eAO03
Intelligent AutoThink V5.0.0A9 and above	LT-eDI11、LT-eDI12、LT-eDO11、LT-eDO12、LT-eCM01
Intelligent AutoThink V5.0.0A10 and above	LT-eIO01、LT-eIO02、LT-eIO11、LT-eIO12

Chapter 4 Product List

Type	Module	Dimensions W×H×D	Weight	PD
Controller	LX-CU153 Compact Standard Controller	70mm×100mm×80mm	≤300g	3.5W
	LX-CU155 Compact Network Controller	70mm×100mm×80mm	≤300g	3.5W
	LX-CU157 Compact Standard Controller	70mm×100mm×80mm	≤300g	3.5W
	LX-CU311 Compact Motion Controller	70mm×100mm×80mm	≤300g	3.5W
	LX-CU331 Compact Network Motion Controller	70mm×100mm×80mm	≤300g	3.5W
	LX-CU332 Compact Network Motion Controller	70mm×100mm×80mm	≤300g	3.5W
	LX-CU333 Compact Network Motion Controller	70mm×100mm×80mm	≤300g	4.5W
Expansion Card	LX-EC001 1-Channel RS-232 Communication Expansion Card	60mm×41.4mm×24mm	≤30g	0.15W
	LX-EC002 1-Channel RS-485 Communication Expansion Card	60mm×41.4mm×24mm	≤30g	0.15W
	LX-EC003 RS-232/RS-485 Hybrid Communication Expansion Card	60mm×41.4mm×24mm	≤30g	0.15W
	LX-EC004 1-Channel RS-232 with Clock Communication Expansion Card	60mm×41.4mm×24mm	≤30g	0.15W
	LX-EC005 1-Channel RS-485 with Clock Communication Expansion Card	60mm×41.4mm×24mm	≤30g	0.15W
	LX-EC006 CAN Communication Expansion Card	60mm×41.4mm×24mm	≤60g	0.2W
	LX-EC007 PROFINET Slave RT Communication Expansion Card	72mm×41.4mm×32mm	≤40g	1.5W
	LX-EC011 4-Channel Digital Input Expansion Card	60mm×41.4mm×24mm	≤30g	0.1W
	LX-EC012 4-Channel Digital Output Expansion Card	60mm×41.4mm×24mm	≤30g	0.2W
	LX-EC021 2-Channel Analog Input and 1-Channel Analog Voltage Output Extension Card	60mm×41.4mm×24mm	≤30g	0.2W
	LX-EC022 2-Channel Analog Input and 1-Channel Analog Current Output Extension Card	60mm×41.4mm×24mm	≤30g	0.5W
	LX-EC031 SD Card Slot Expansion Card	60mm×41.4mm×24mm	≤30g	0.2W
	LX-EC032 RTC Clock Expansion Card (Battery Type)	60mm×41.4mm×24mm	≤30g	0.1W
	LX-EC033 RTC Clock Expansion Card (Capacitor Type)	60mm×41.4mm×24mm	≤30g	0.1W
Other	LT-eEP02 Terminal Matching Module	100mm×75mm×7.9mm	≤40g	-

Chapter 5 Overview of Integrated PLC Hardware System

The Compact PLC serves as a supplement to the current LX-CU500 series products. The controllers in the Compact PLC series are bus + pulse type controllers. They feature 32 I/O points on the main unit, support high-speed input axes and pulse output axes, and also support axes via the built-in EtherCAT bus. They come standard with an Ethernet port and support a rich set of network protocols and expandable functionalities.

Typical System Structure

The typical structure of the Compact PLC is shown in the figure below. The controller module has two expansion slots on its left side, which can be used to expand communication, RTC, SD card, digital channel, and analog channel functionalities.

The northbound Ethernet interface connects to the host configuration software. Some controllers use the EtherCAT protocol for the southbound backbone network to expand LX series I/O, LT series I/O, third-party I/O modules, and servo drives.

The maximum connection limits for the controller network are as follows:

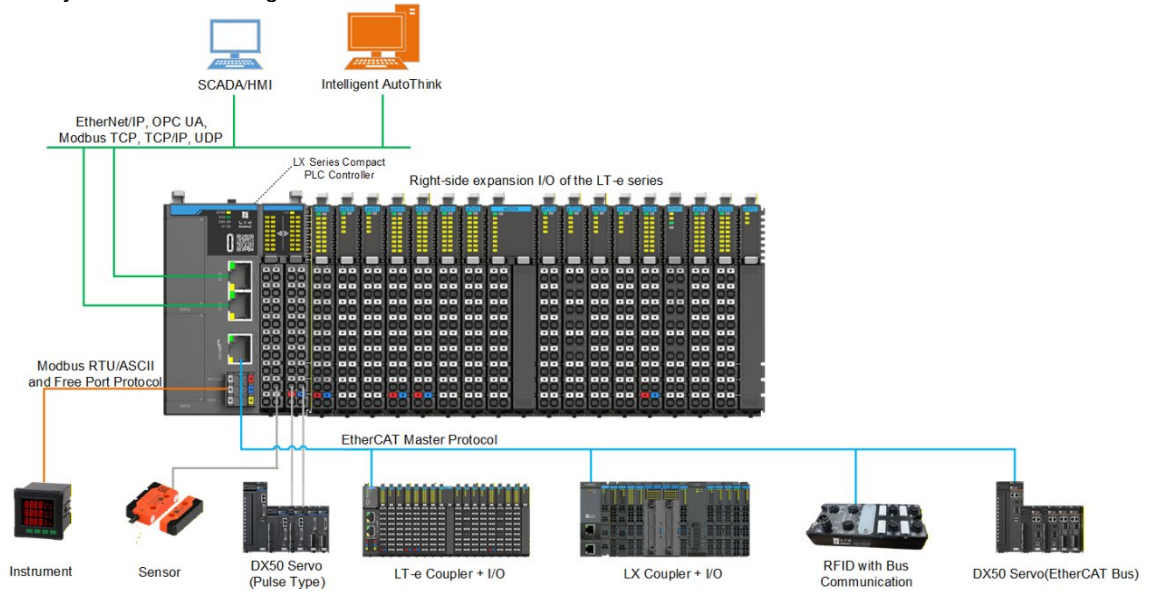
Protocol Type	Controller Model			
	LX-CU153	LX-CU155	LX-CU157	LX-CU311
LT-eBus Protocol (Right-side Expansion)	Up to 16 I/O modules	Up to 16 I/O modules	Up to 16 I/O modules	Up to 16 I/O modules
EtherNet/IP	Master: Max 30 Slave: Max 30	Master: Max 32 Slave: Max 32	Master: Max 32 Slave: Max 32	Master: Max 32 Slave: Max 32
EtherNet/IP Tag Communication	- Cyclic Communication: Controller as Master: Supports up to 30 connections Controller as Slave: Supports up to up to 15 output tag groups, 30 connections - Acyclic Communication: Supports up to 30 connections	- Cyclic Communication: Controller as Master: Supports up to 32 connections Controller as Slave: Supports up to up to 15 output tag groups, 32 connections - Acyclic Communication: Supports up to 32 connections	- Cyclic Communication: Controller as Master: Supports up to 32 connections Controller as Slave: Supports up to up to 15 output tag groups, 32 connections - Acyclic Communication: Supports up to 32 connections	- Cyclic Communication: Controller as Master: Supports up to 32 connections Controller as Slave: Supports up to up to 15 output tag groups, 32 connections - Acyclic Communication: Supports up to 32 connections
OPC UA	Not Supported	Not Supported	Not Supported	Not Supported
Modbus TCP	Master: Max 16 Slave: Max 32	Master: Max 16 Slave: Max 32	Master: Max 16 Slave: Max 32	Master: Max 16 Slave: Max 32
Modbus RTU/Modbus ASCII	Max 32 slaves	Max 32 slaves	Max 32 slaves	Max 32 slaves

EtherCAT Slave	Not Supported	Not Supported	Not Supported	32
TCP/IP Free Protocol	32	32	32	32
UDP	Unicast: 32 network nodes Multicast: 32 network nodes	Unicast: 32 network nodes Multicast: 32 network nodes	Unicast: 32 network nodes Multicast: 32 network nodes	Unicast: 32 network nodes Multicast: 32 network nodes
Network Variable	Transmit/Receive Groups: 16 each	Transmit/Receive Groups: 16 each	Transmit/Receive Groups: 16 each	Transmit/Receive Groups: 16 each
FTP	Not Supported	Not Supported	Not Supported	Not Supported
PROFINET	The controller can operate as a slave device.	The controller can operate as a slave device.	The controller can operate as a slave device.	The controller can operate as a slave device.
CANOpen	64 slaves or 32 axes	64 slaves or 32 axes	64 slaves or 32 axes	Not Supported

Protocol Type	Controller Model		
	LX-CU331	LX-CU332	LX-CU333
LT-eBus Protocol (Right-side Expansion)	Up to 16 I/O modules	Up to 16 I/O modules	Up to 16 I/O modules
EtherNet/IP	Master: Max 32 Slave: Max 32	Master: Max 32 Slave: Max 32	Master: Max 32 Slave: Max 32
EtherNet/IP Tag Communication	- Cyclic Communication: Controller as Master: Supports up to 32 connections Controller as Slave: Supports up to up to 15 output tag groups, 32 connections - Acyclic Communication: Supports up to 32 connections	- Cyclic Communication: Controller as Master: Supports up to 32 connections Controller as Slave: Supports up to up to 15 output tag groups, 32 connections - Acyclic Communication: Supports up to 32 connections	- Cyclic Communication: Controller as Master: Supports up to 32 connections Controller as Slave: Supports up to up to 15 output tag groups, 32 connections - Acyclic Communication: Supports up to 32 connections
OPC UA	Maximum number of sessions: 5. Each session supports up to 5 subscriptions, allowing a total of 25 subscriptions simultaneously.	Maximum number of sessions: 5. Each session supports up to 5 subscriptions, allowing a total of 25 subscriptions simultaneously.	Maximum number of sessions: 5. Each session supports up to 5 subscriptions, allowing a total of 25 subscriptions simultaneously.
Modbus TCP	Master: Max 16 Slave: Max 32	Master: Max 16 Slave: Max 32	Master: Max 16 Slave: Max 32
Modbus RTU/Modbus ASCII	Max 32 slaves	Max 32 slaves	Max 32 slaves
EtherCAT Slave	96	96	96
TCP/IP Free Protocol	32	32	32
UDP	Unicast: 32 network nodes Multicast: 32 network nodes	Unicast: 32 network nodes Multicast: 32 network nodes	Unicast: 32 network nodes Multicast: 32 network nodes
Network Variable	Transmit/Receive	Transmit/Receive	Transmit/Receive

	Groups: 32 each	Groups: 32 each	Groups: 32 each
FTP	Supports Server	Supports Server	Supports Server
PROFINET	The controller can operate as a slave device.	The controller can operate as a slave device.	The controller can operate as a slave device.
CANOpen	Not Supported	Not Supported	Not Supported

The system structure diagram is shown below:



5.1 Technical Features

- Supports motion control.
- Expands proprietary I/O and third-party devices via EtherCAT, featuring high data transfer rates and fast system response.
- Supports multiple communication protocols, offering flexible configuration and strong scalability.
- Wide operating temperature range (-20°C to 60°C) that exceeds industry standards.

5.2 General Specifications

Specification			Rating
Electromagnetic Compatibility	Immunity	Electrostatic Discharge	IEC 61000-4-2: Contact discharge $\pm 6.6\text{KV}$ Air discharge $\pm 8.8\text{KV}$
		Radiated RF Field Immunity	IEC 61000-4-3: 11V/m, 80MHz~6GHz, 80%AM(1KHz)
		Electrical Fast Transient/Burst	IEC 61000-4-4: AC power ports $\pm 2.2\text{KV}$, 5KHz/100KHz Signal ports $\pm 1.1\text{KV}$, 5KHz/100KHz
		Surge Immunity	IEC 61000-4-5: AC power ports $\pm 500\text{V}$, $\pm 1\text{KV}$, $\pm 2.2\text{KV}$, DM: $\pm 500\text{V}$, $\pm 1.1\text{KV}$ CM

			Signal ports ±1.1KV CM
		Conducted RF Immunity	IEC 61000-4-6: 11V, 150KHz~80MHz, 80%AM (1KHz)
		Power Frequency Magnetic Field Immunity	IEC 61000-4-8: • Magnetic field strength 33A/m, duration 100s • Magnetic field strength 330A/m, duration 3s
	Emissions	Radiated Emissions	• 30MHz~1GHz • 1GHz~6GHz
		Conducted Emissions	150KHz~30MHz
Environmental Compatibility	Climatic Environment	Operating Temperature	-20°C~60°C
		Operating Humidity	5%~95%, non-condensing
		Operating Altitude	≤2500m
		Storage Temperature	-40°C~85°C
		Storage Humidity	5%~95%, non-condensing
		Storage Altitude	≤3000m, ≥70kPa atmospheric pressure
	Mechanical Environment	Vibration	IEC60068-2-6: • 5Hz≤f≤8.4 Hz, 3.5mm(peak-to-peak amplitude) • 9Hz≤f≤150Hz, 1.0g, constant acceleration • 1 octave per minute (±10%) • 10 sweeps in each of the three mutually perpendicular directions
		Shock	IEC60068-2-27: • Random amplitude of 15g (peak acceleration) half-sine wave with 11ms duration, in each of three mutually perpendicular directions • 3 shocks in positive and negative directions for each of the three mutually perpendicular directions, totaling 18 shocks
		Free Fall	Shipping packaging drop height 1000mm, product packaging drop height 300mm, once for each of 6 faces, 12 edges, and 8 corners
	Ingress Protection	Enclosure IP Rating	IEC60529: IP20 (Protected against solid objects ≥12.5mm, no protection against water)
Electrical Safety	Isolation Type		System side to channel
	Isolation Withstand Voltage		500V, 1min, ≤10mA
	Insulation Resistance		≥10MΩ (500VDC)

5.3 Naming Rule

Take LX-CU311 as an example:

LX - CU 311 - P
 1 2 3 4

No.	Name	Description
1	Product Series Name	The product series to which the module belongs.
2	Module Type	CU: CPU, Controller Module EC: Expansion Card Module
3	Model Number	The model number of the module.
4	Moisture, Mold, and Salt Spray Resistance	Without P: Not support With P: Support



In Intelligent AutoThink, no distinction is made between rugged and non-rugged models — both share the same model number.

Chapter 6 Hardware Details

6.1 Declaration

- In the detailed module introduction, all images are for illustrative purposes only. The actual appearance of the module may vary slightly depending on the hardware version. Please refer to the actual product.
- Modules with the same external dimensions are represented by the same illustrative image in the introduction. For the true appearance of the module, please refer to the actual product.

6.2 Controller

6.2.1 LX-CU153 Compact Standard Controller

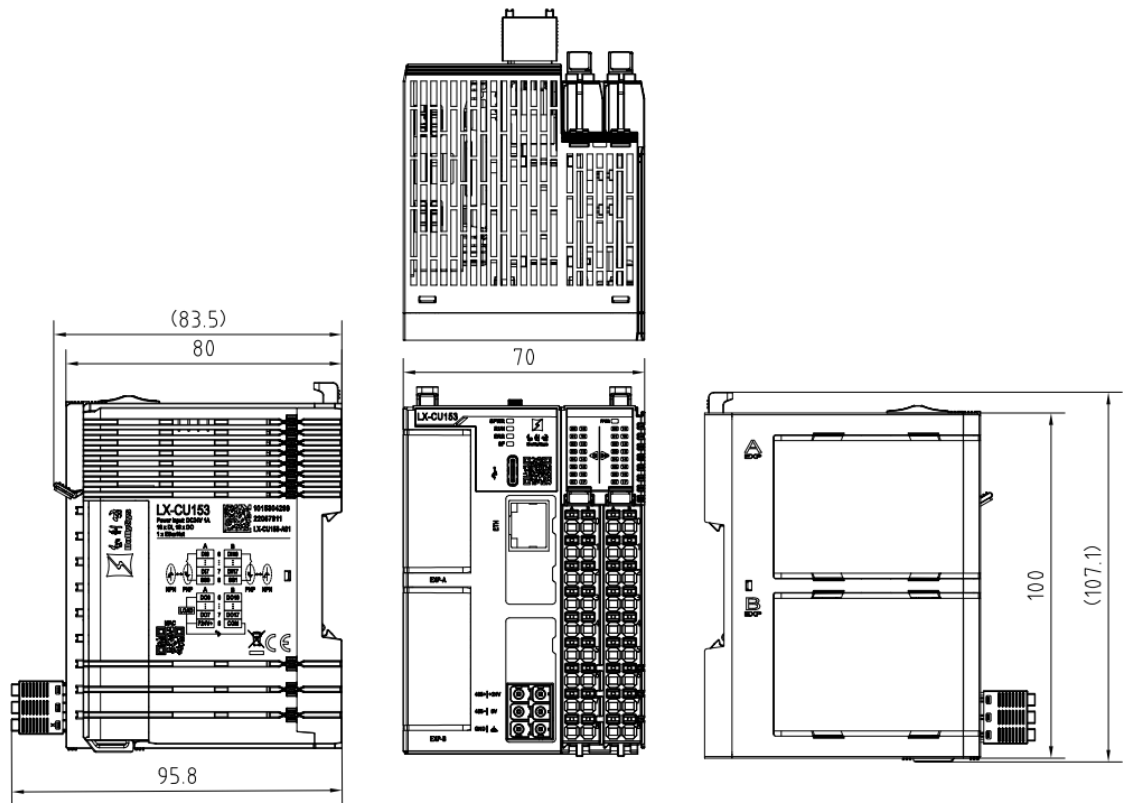
The LX-CU153 performs the "Input-Calculation-Output" control process and motion control. Its main functions are as follows:

- Supports a single northbound Ethernet interface;
- Supports pulse-based motion control;
- Features two expansion card slots on the main unit;
- Main unit includes 12 high-speed DI and 4 regular DI channels;
- Main unit includes 16 high-speed DO channels;
- Supports one isolated RS-485 interface;
- Expands LT-e distributed I/O to the right via bus.

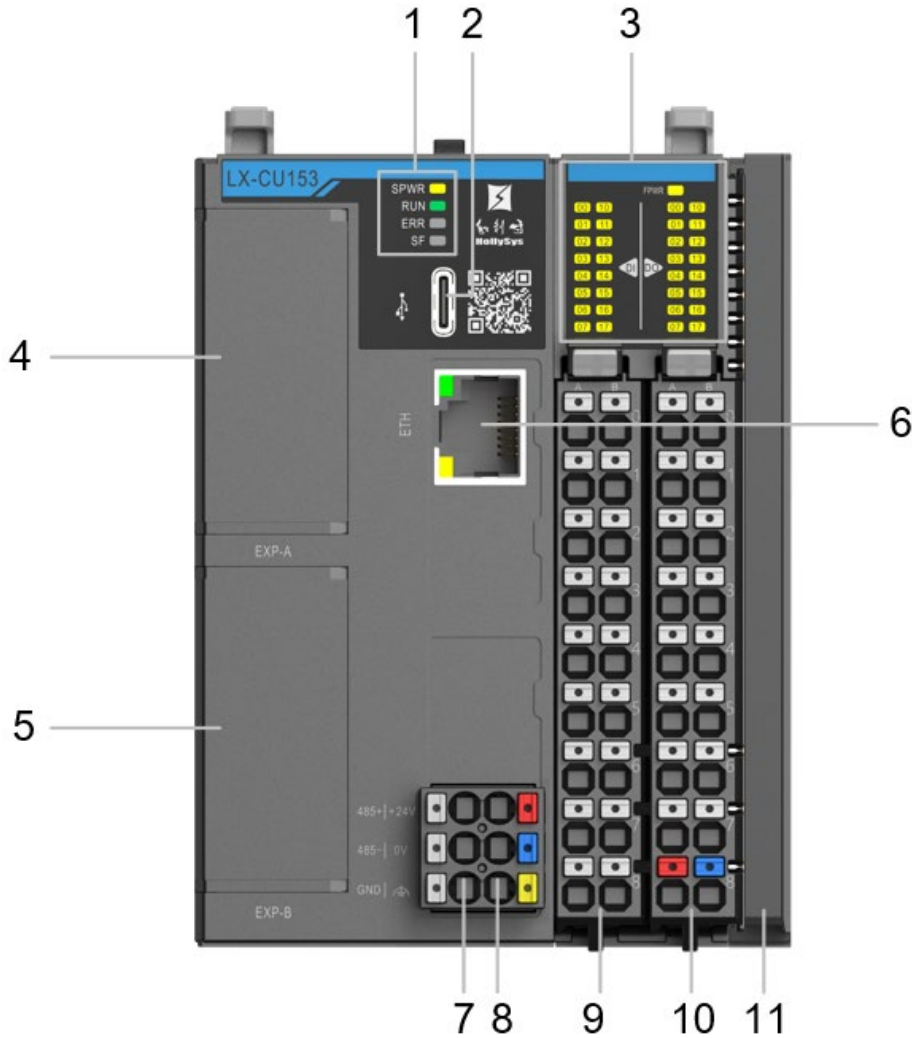
6.2.1.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-CU153 are shown in the following figure (unit: mm).



Component Description

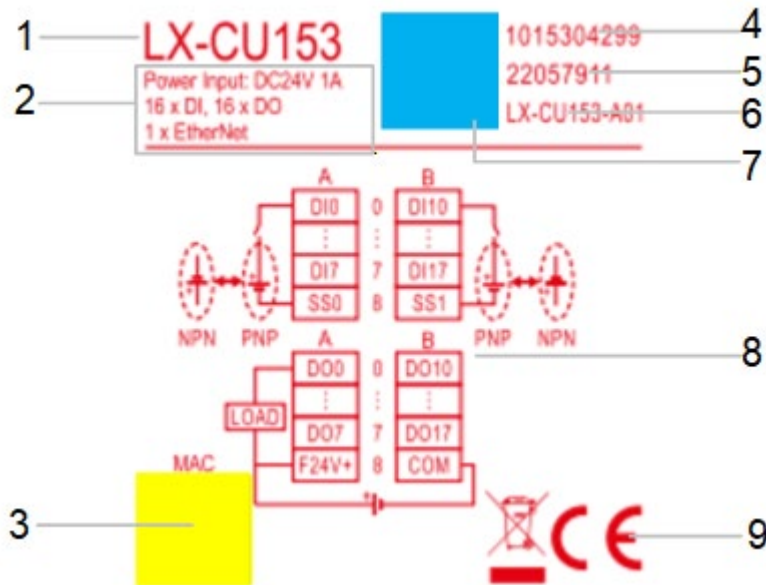


No.	Name	Description
1	Operation Status Indicator	Indicates the module operation status. For details, refer to Indicator Description .
2	Type-C Port	Provides one USB2.0_Device interface via Type-C. Reserved.
3	Digital Input/Output Indicator Panel	Indicates the status of DI/DO channels. For details, refer to Indicator Description .
4	Expansion Card Slot A	Used for installing expansion cards. For specific expansion card options, refer to Expansion Card Compatibility List .
5	Expansion Card Slot B	
6	Ethernet Port	One northbound Ethernet interface. For detailed information, refer to the Ethernet port description .
7	RS-485 Terminal Block	For detailed description, refer to RS-485 Interface .
8	Power Interface	For detailed description, refer to Power Interface .
9	Pluggable DI Terminal Block	16-channel input terminal block. For pin definitions, refer to DI Terminal Signal Definition .
10	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For pin definitions, refer to DO Terminal and Field Power Signal Definition .
11	Dust Cover	Each controller comes with a dust cover for protecting the module.



No.	Name	Description
12	Operating Mode Switch	Indicates the module's operating mode. For details, refer to Operating Mode Description .
13	DIN Rail Top Mounting Latch	• Pull this latch upward to the unlocked state before mounting the module onto the DIN rail. • Press this latch downward to the locked state after mounting the module onto the DIN rail.
14	Edge Connector	Internal bus contact points for inter-module data transmission, system power supply, etc.
15	Field Power Through-Board Terminal	Field-side power supply terminal.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Module Basic Information	Indicates information such as power supply, communication, and terminals.
3	MAC Address	Indicates the module's MAC address (QR code).
4	SN Code	Indicates the serial number of the module (Plain Code).
5	Batch Number	Indicates the module's production batch number.
6	Module Hardware Version	Indicates the hardware version and firmware serial number at the time of factory shipment. In "LX-CU153-YYY", X is the hardware version number, and YY is the firmware serial number. If the module hardware version is LX-CU153-P-YYY, it indicates that the module supports moisture, mold, and salt spray resistance.
7	SN Code	Indicates the serial number of the module (QR code).
8	Terminal Block Diagram	Shows the connection diagram for the DI/DO terminal blocks.
9	Certification Standards	Indicates the certification standards that the module complies with.

6.2.1.2 Technical Specifications

Basic Information

Parameter	Specification
Protection Rating	IP20
Moisture, Mold, and Salt Spray Resistance	Support
Power-on Startup Time	10s
Re-power-on Time Interval	≥10s
Data Retention Time	1 year
Storage Media Erase/Write Cycles	100,000 times
IEC Task Quantity	≤6
Public Variable Quantity	≤10,000

System Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 0.5A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Supported, threshold 13V
	Undervoltage Alarm	Supported, threshold 17.5V
	Overvoltage Protection	Not Supported
	Short-Circuit Protection	Supported
	Module Power Consumption	Max 3.5W
Field Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 6A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Not Supported
	Overvoltage Protection	Not Supported
	Short-Circuit and Overcurrent Protection	Not Supported
Dimensions (W*H*D)		70mm*100mm*80mm
Weight		≤300g
Hot Swapping		Hot plugging not supported for left-side expansion cards, right-side LT-e modules, 6-pin power terminals, and DI/DO channel wiring terminals.
Data Snapshot		Support

Memory

Parameter		Specification
SD Card		Maximum 32GB supported when optional SD expansion card is installed.
User Program Capacity		512KB
User Data Capacity		1MB
Retentive Memory Capacity		64KB
Data Area Size	M Area (Direct Address Area)	131,072 bytes, %MB0~%MB3999 support data retention.
	I Area (Input Area)	65,536 bytes
	Q Area (Output Area)	65,536 bytes
	G Area (General Variable Area)	458,752 bytes
	L Area (Retentive Data Area)	65,536 bytes
	D Area (Diagnostic Area)	262,144 bytes. The first 128KB does not support variable definition; it is read-only and cannot be forced. The last 128KB supports system-defined variables (axis groups); it does not support user-defined variables, reading, or writing.

Motion Control

Parameter	Specification
Motion Control Method	Supports pulse control.
Motion Control Commands	PLCopen standard commands, HMC motion commands, CANopen axis control commands
Number of Pulse Control Axes	6 axes

Communication

Parameter	Specification
-----------	---------------

USB-Type-C			
Number of Ports		1	
Interface Type		Type-C, reserved	
LT-eBus Protocol			
Expand the quantity of LT-e series I/O and CM modules on the right side		16	
Northbound Ethernet			
Number of Ports		1	
Interface Type		RJ45	
Supported Protocols		EtherNet/IP Master/Slave, Modbus TCP Master/Slave, TCP/UDP, Tag Communication, Network Variable	
Communication Cable		Ethernet Cat.5e or higher shielded twisted pair cable	
Communication Speed		10Mbps/100Mbps auto-negotiation	
Maximum Cable Length		100m	
EtherNet/IP Master/Slave Protocol		Cyclic Data Length	For versions below LX-CU153-B01_V1.1.0: 1400 bytes For LX-CU153-B01_V1.1.0 and above: 1444 bytes
		Acyclic Data Length	For versions below LX-CU153-B01_V1.1.0: 1400 bytes For LX-CU153-B01_V1.1.0 and above: 1444 bytes
		Maximum Number of Connections	Controller as master: Supports up to 30 connections Controller as slave: Supports up to 30 connections
		Reconnection After IP Change	If the master's IP changes, it will automatically reconnect to slaves. If a slave's IP changes, masters connected to that slave need to be re-downloaded.
EtherNet/IP Tag Communication	Cyclic Communication (Class 1)	Communication Data Volume	Single connection maximum support 1444 bytes
		Maximum Number of Connections	Controller as Master: Supports up to 30 connections (shared with Instance ID connections and Class 3 connections) Controller as Slave: Supports up to up to 15 output tag groups, 30 connections (Class 1 + Class 3 limited to 30)
		Connection Type	Support Point-to-Point, Multicast
		RPI Time	Range: 1 to 16,000, unit: ms, default: 10
	Acyclic Communication (Class 3)	Communication Method	Communication via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication Data Volume	Maximum of 1444 bytes per connection
		Maximum Number of Connections	Supports up to 30 connections
		Number of Accessible Variables	No more than 5000 variables across all connections

Modbus TCP Protocol	Input/Output Area Size	131,072 bytes (M Area)
	Max Master/Slave Connections	Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters
	Supported Function Codes	01, 02, 03, 04, 05, 06, 0F, 10, 17 (hexadecimal)
	Number of Function Code Channels	32
TCP/IP Free Protocol	Input/Output Area Size	1000 bytes
	Maximum Number of Connections	32
UDP Protocol	Input/Output Area Size	1000 bytes
	Maximum Number of Connections	Unicast: 32 network nodes Multicast: 32 network nodes
Network Variable	Communication Type	UDP Protocol
	Communication Rate	100 Mbit/s
	Transmission Speed	Minimum transmission cycle: 1 ms
	Maximum Number of Supported Transmit/Receive Groups	16 each, supporting simultaneous configuration of transmit groups and receive groups
	Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
	Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
Onboard Serial Communication		
Number of Interfaces	1	
Interface Type	Plug-in Terminal	
Electrical Standard	RS-485	
Supported Protocols	Modbus RTU Master/Slave, Modbus ASCII Master/Slave, Freeport Protocol	
Supported Function Codes	01, 02, 03, 04, 05, 06, 0F, 10, 17 (hexadecimal)	
Number of Function Code Channels	32	
Maximum Number of Connected Slaves	Supports up to 32 (slave distance to main bus trunk $\leq 3\text{m}$)	
Baud Rate (bps)	Supports 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200, configurable.	
Communication Distance	At 115200bps: transmission distance $< 100\text{m}$ At 19200bps: transmission distance $< 1000\text{m}$	
Data Bits	7 bits / 8 bits, default 8 bits	
Stop Bits	1 bit / 2 bits, default 2 bits	
Parity	Odd/Even/None, default is None	
Cable Impedance	120 Ω	
Isolation Withstand Voltage	Isolation between system and channels: 500VAC, 1min,	

	leakage current <10mA
Termination Resistor	No built-in 120Ω termination resistor, external connection as needed.
Other	Prevents accidental 24VDC input.

Right-side DI Channels

Parameter	Specification		
Number of Channels	16 channels in total 12 high-speed inputs: CH0~CH5 and CH10~CH15 4 standard inputs: CH6/CH7/CH16/CH17 Channel count may be derated based on ambient temperature and installation method. For details, see Derating Requirements .		
Maximum Signal Frequency per Channel	200KHz		
Response Time ON/OFF	High-speed	OFF→ON: <2μs ON→OFF: <2μs	
	Standard	OFF→ON: <1000μs ON→OFF: <1000μs	
Channel Mode	Configurable as PNP/NPN, 8 channels per group sharing one common terminal.		
High-Speed Input Signal Type	4 channels AB-phase (signal source: external input pulse, supports 1/2/4 multiplication) 12 channels single-phase (signal source: external input pulse) 4 channels CW/CCW (signal source: external input pulse) 4 channels Pulse+Direction (signal source: external input pulse) For details, see Terminal Definitions .		
High-Speed Input Counter Value	32-bit		
High-Speed Input Counting Mode	Linear mode		
High-Speed Counter Reset Mode	- Z-phase + software reset (software sets Z-phase signal for reset) - Software reset (operation command reset)		
High-Speed Counter Compare Control Method	Target value comparison triggers interrupt (supports up to 100 interrupt segments. Target value can be set to relative or absolute mode. Interrupt modes include single, cycle, and cam modes).		
High-Speed Functions	- Probe: 12 probe input terminals. Input pulse width: above 2μs (probe signal source can be main controller high-speed counter, pulse axis, or slave). - External Interrupt: 8 input terminals. Input pulse width: above 2μs. Trigger mode: rising edge, falling edge, edge trigger. - Frequency Measurement: 4 channels in total. Measurement frequency 200KHz, single-cycle measurement accuracy error 50ns. (For details, see Terminal Definitions)		
Threshold Voltage	ON/OFF	PNP	NPN
	ON Voltage	>15V	<5V
	OFF Voltage	<5V	>15V
Voltage Range	24VDC±20% (19.2VDC ~ 28.8VDC)		
Software Filter	Filter time adjustable per terminal. Standard input: 2~1000, unit "ms". High-speed input: 2~10000, unit "100ns".  Channel valid value is above 1μs. 200ns~1μs is primarily for internal signal filtering.		

	To ensure effective counting, the filter time must not exceed: (minimum signal pulse width - 500ns).
Isolation Withstand Voltage	Channels to system: 1000 VAC, 1 minute, leakage current <5mA
Channel-to-Channel Isolation	Supported
Connection Method	Front face connection, 2*9PIN plug-in terminal.
Maximum Current per Channel	- High-speed input channels: 10mA at 24VDC - Standard input channels: 4mA at 24VDC
Diagnostics	No diagnostics
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	- Standard application: 100m (standard cable, 1.5mm² wire gauge) - High-speed motion control application: 3m (double-shielded cable)

Right-side DO Channels

Parameter	Specification
Number of Channels	16 high-speed output channels in total Channel load current may be derated based on ambient temperature and installation method. For details, see Derating Requirements .
Channel Type	NPN type, one common terminal
Threshold Voltage	ON Voltage <5V
	OFF Voltage >15V
OFF Maximum Leakage Current	100uA (-20~60°C) 10uA (25°C)
Channel Output Frequency @ Maximum Load Current	2KHz~200KHz@100mA 0Hz~2KHz@500mA Note: Resistive load
Channel Maximum Output Frequency @ Load Type	- Resistive load: 200KHz - Inductive load: 0.5Hz - Lamp load: 10Hz
Response Time ON/OFF	OFF→ON: <1μs ON→OFF: <1μs Note: External load for high-speed DO channels <3KΩ
PWM Performance	Maximum frequency 200KHz, minimum resolution 2.5μs, adjustable duty cycle 0%~100%
Channel Safe Value	Each channel can be configured individually. Output can be configured as: - Output Hold - Output Preset Value The above output configurations take effect when the iAT project stops.
Output Load	0.5A/channel, 4A/16 channels (resistive load) 7.2W/channel, 18W/16 channels (inductive load) 5W/channel, 18W/16 channels (lamp load)  - No built-in freewheeling diode; external connection required. - Output load capacity is subject to derating based on ambient temperature and installation method. For details, see Derating Requirements.
Parallel Connection Support	Not Supported
Conduction Voltage Drop	Less than 0.5V

(500mA)	
Channel-to-Channel Isolation	Not Supported
Isolation Withstand Voltage	Channels to system: 1000 VAC, 1 minute, leakage current <5mA
Power Reverse Polarity Protection	Field-side power reverse polarity protection (COM and F24V+)
Channel Protection Features	Supports overcurrent protection (individual current limiting, hiccup) Supports overtemperature protection (all channels disconnect) Output recovery method after protection: Automatic recovery
Connection Method	Front face connection, 2*9PIN plug-in terminal.
Diagnostics	No diagnostics
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	- Standard application: 100m (standard cable, 1.5mm² wire gauge) - High-speed motion control application: 3m (double-shielded cable)

Left-side Expansion Slots

Parameter	Specification
Number of Expansion Slots	2
Slot Assignment	Slot A bound to: LX-EC031 Slot B bound to: LX-EC006/LX-EC007 Other expansion cards support mixing in Slot A/B.
Hot Plugging	Not Supported

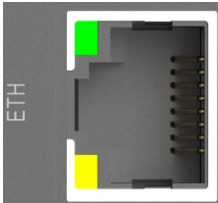
6.2.1.3 Indicators Lights



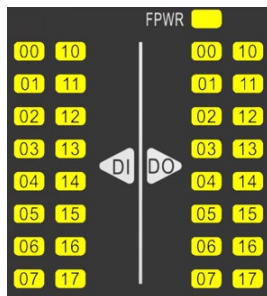
LED Name	Color	Status	Description
SPWR	Yellow	Steady On	System-side power is on
		Steady Off	System-side power is off
RUN	Green	Steady On	User project loaded but not running
		Slow Flashing	User project is running
		Steady Off	No user project loaded
ERR	Red	Steady On	Fault occurred
		Steady Off	No fault
SF	Yellow	Fast Flashing	No configuration for LT right-side expansion, or configuration does not match the actual scanned I/O modules
		Single Flash	Initialization communication failure for LT right-side expansion or I/O module communication offline (500ms on, 500ms off)
		Steady Off	LT right-side expansion modules have no fault



- During upgrade, RUN and ERR flash alternately in slow mode (0.5s on, 0.5s off).
- When the controller enters the judgment process for "Reset" and "Restore Factory Settings", RUN and ERR flash simultaneously in slow mode (0.5s on, 0.5s off).

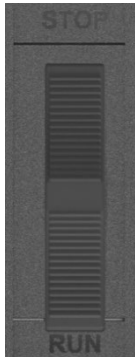


LED Name	Color	Status	Description
ETH RJ45 Built-in LED	Top: Green Bottom: Yellow	Green LED Steady Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Steady Off	Link not established



LED Name	Color	Status	Description
FPWR	Yellow	Steady On	Field-side power is on
		Steady Off	Field-side power is off
32*IO	Yellow	According to channel status	On: ON
			Off: OFF

6.2.1.4 Operating Modes



- RUN: Run Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.
STOP Stop Mode	Stop mode.

RUN

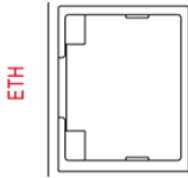
- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

- The controller does not execute the user project; all POUs under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.1.5 Module Communication Interface and Terminal Wiring Diagram

Ethernet Port



ETH:

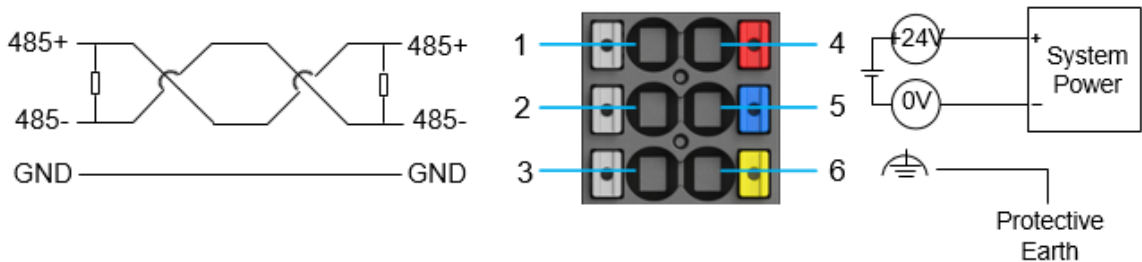
- Northbound Ethernet interface
- Default IP Address: 192.168.0.250
- Supported Protocols: EtherNet/IP Master/Slave, Modbus TCP Master/Slave, TCP/UDP, Tag Communication, Network Variable
- Supports program download and online monitoring/debugging

USB Port



A USB2.0_Device interface is brought out via Type-C, reserved for future use.

RS-485/Power Interface



The RS-485 interface and 24VDC system power share a 2*3pin terminal block. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth

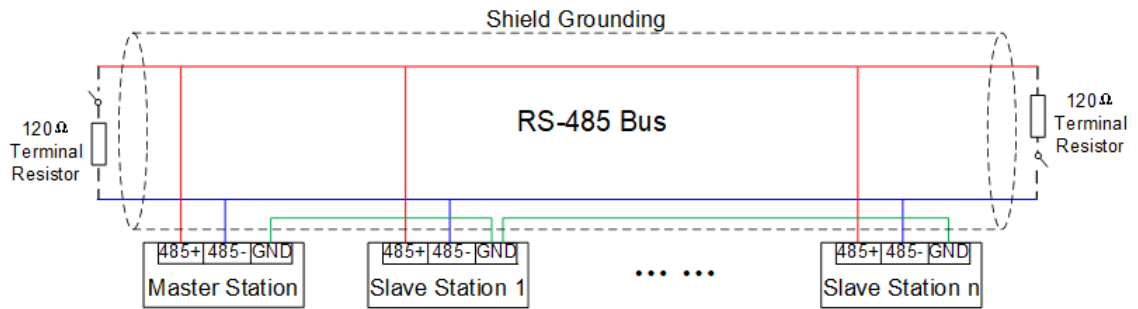


Terminating resistors should be connected externally as needed.

Additional Information:

It is recommended to use shielded twisted-pair cable for the RS-485 bus connection. Connect 485+ and 485- using twisted pairs. Connect 120Ω terminating resistors at both ends of the bus to prevent signal reflection. Connect the signal ground of all 485 signal nodes together. A maximum of 32 nodes are supported, and the distance of each node branch should be less than 3m.

The RS-485 bus connection topology is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-speed Digital Input 0	B0	DI10	High-speed Digital Input 10
A1	DI1	High-speed Digital Input 1	B1	DI11	High-speed Digital Input 11
A2	DI2	High-speed Digital Input 2	B2	DI12	High-speed Digital Input 12
A3	DI3	High-speed Digital Input 3	B3	DI13	High-speed Digital Input 13
A4	DI4	High-speed Digital Input 4	B4	DI14	High-speed Digital Input 14
A5	DI5	High-speed Digital Input 5	B5	DI15	High-speed Digital Input 15
A6	DI6	High-speed Digital Input 6	B6	DI16	High-speed Digital Input 16
A7	DI7	High-speed Digital Input 7	B7	DI17	High-speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1



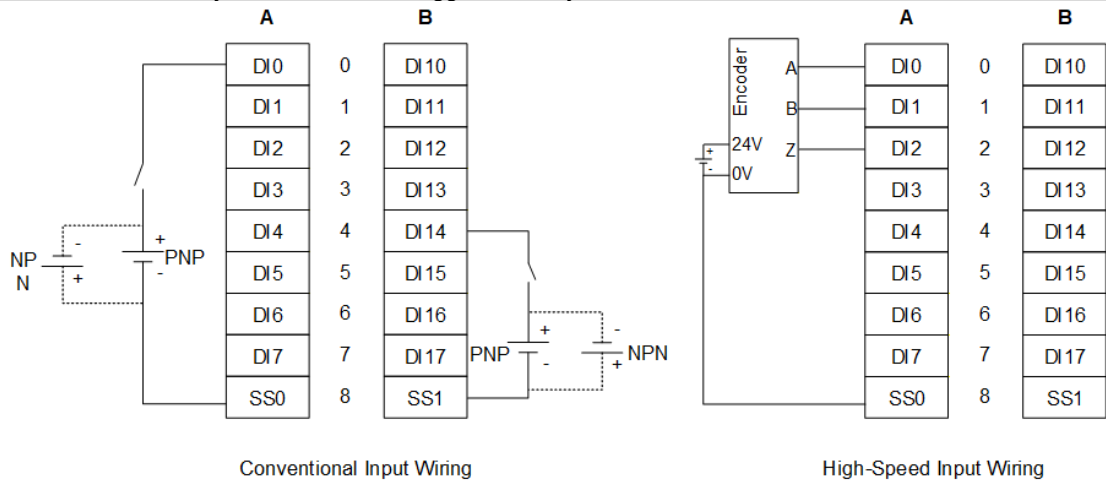
- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single-phase	CW/CC W	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max. Frequency	100KHz	200KHz	100KHz	200KHz	200KHz	200KHz	-
DI0	A0	√	CW0	Pulse 0	√	√	
DI1	B0	√	CCW0	Direction 0	√	√	
DI2	Z0	√	Z0	Z0	√	√	√

DI3	A1	√	CW1	Pulse 1	√	√	√
DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse 2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse 3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for channels DI6/DI7/DI16/DI17 is 50KHz; for other channels it is 200KHz.
- There are 12 single-phase channels in total, which can be configured to any unoccupied terminal.
- There are 12 probe channels in total, which can be configured to any unoccupied terminal.
- There are 4 frequency measurement channels in total, which can be configured to any unoccupied terminal.
- When high-speed functions and the corresponding channel filter parameters are set simultaneously, the filter parameters take priority. For the same high-speed counter, the filter parameters for its two terminals must be set consistently; an alarm will be triggered if they are inconsistent.



The DO terminal and field power signal definitions are shown in the table below.

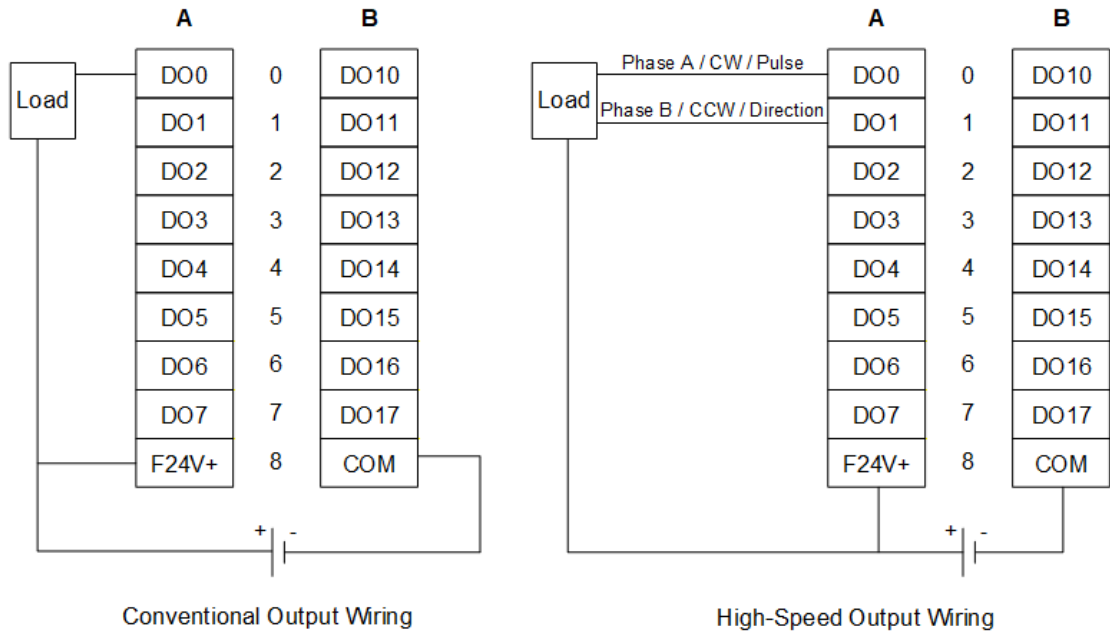
Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-speed Digital Output 0	B0	DO10	High-speed Digital Output 10
A1	DO1	High-speed Digital Output 1	B1	DO11	High-speed Digital Output 11
A2	DO2	High-speed Digital Output 2	B2	DO12	High-speed Digital Output 12
A3	DO3	High-speed Digital Output 3	B3	DO13	High-speed Digital Output 13
A4	DO4	High-speed Digital	B4	DO14	High-speed Digital

		Output 4			Output 14
A5	DO5	High-speed Digital Output 5	B5	DO15	High-speed Digital Output 15
A6	DO6	High-speed Digital Output 6	B6	DO16	High-speed Digital Output 16
A7	DO7	High-speed Digital Output 7	B7	DO17	High-speed Digital Output 17
A8	F24V+	Field Power Positive	B8	COM	Field Power Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unoccupied terminal. The direction terminal is controlled by the user.	√	√	√	√
DO1	√		√	√	√	√
DO2	√		√	√	√	√
DO3	√		√	√	√	√
DO4	√		√	√	√	√
DO5	√		√	√	√	√
DO6	√		√	√	√	√
DO7	√		√	√	√	√
DO10	√		√	√	√	√
DO11	√		√	√	√	√
DO12	√		√	√	√	√
DO13	√		√	√	√	√
DO14	√		√	√	√	√
DO15	√		√	√	√	√
DO16	√		√	√	√	√
DO17	√		√	√	√	√



- LX-CU153 supports up to 6 axes.
- For LX-CU153, 3 axes support four modes: Single Pulse, Pulse + Direction, CW/CCW, A/B. The other 3 axes support only two modes: Single Pulse, Pulse + Direction.
- There are 4 PWM channels in total, which can be configured to any unoccupied terminal.



6.2.2 LX-CU155 Compact Standard Controller

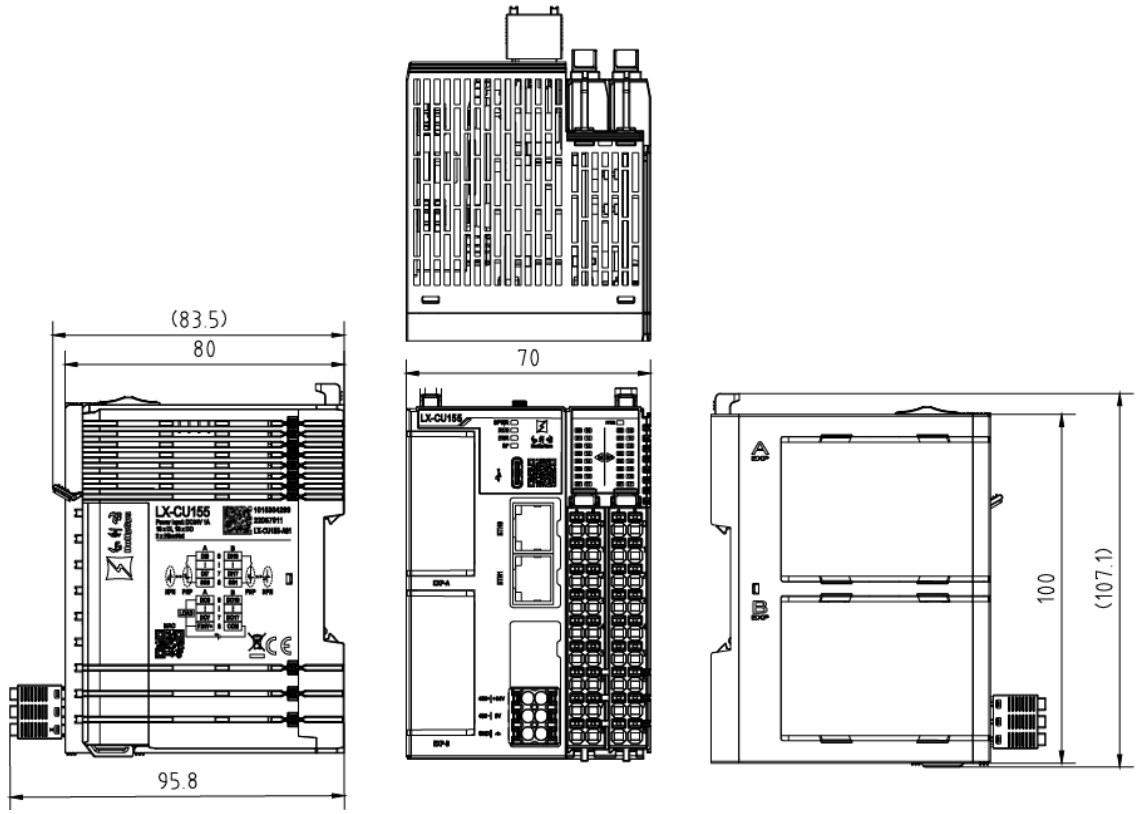
The LX-CU155 completes the "Input-Calculation-Output" control process and motion control. Its main functions are as follows:

- Supports single IP and dual northbound Ethernet interfaces;
- Supports pulse-based motion control;
- Built-in with 16 high-speed DI channels;
- Built-in with 4 high-speed DO channels and 12 low-speed DO channels;
- Supports one isolated RS-485 interface;
- Right expansion of LT distributed I/O via bus.

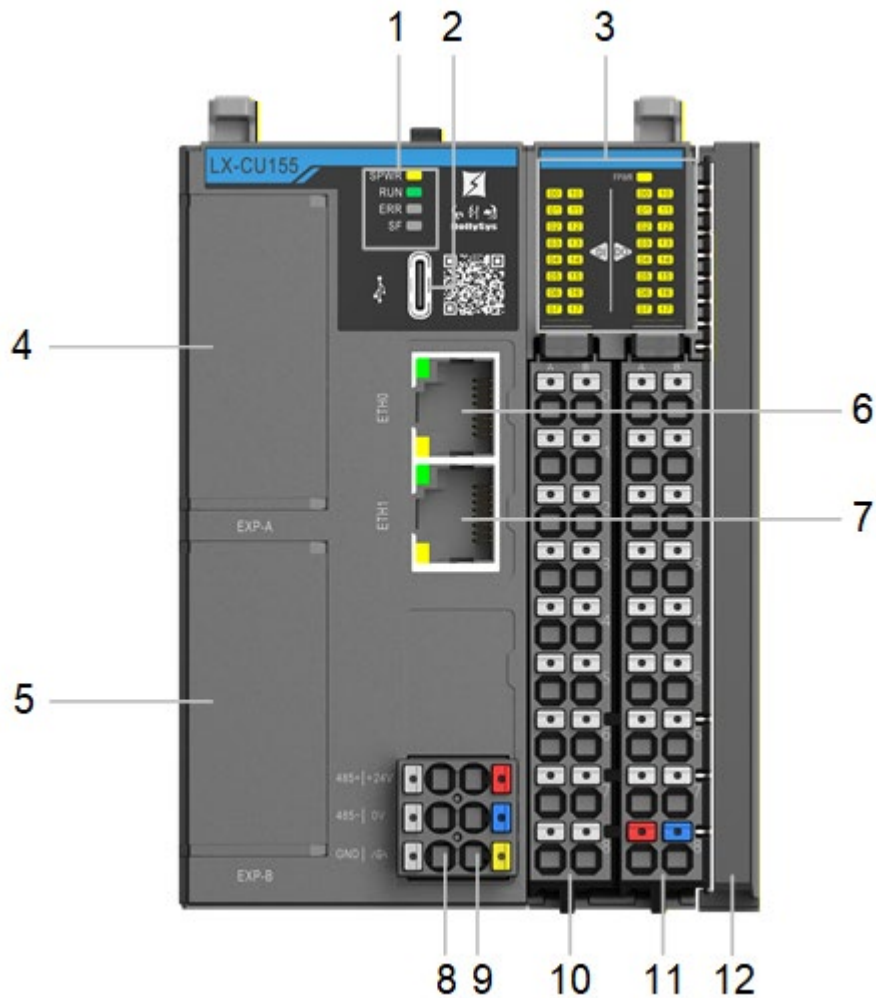
6.2.2.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-CU155 are shown in the figure below (unit: mm).



Component Description

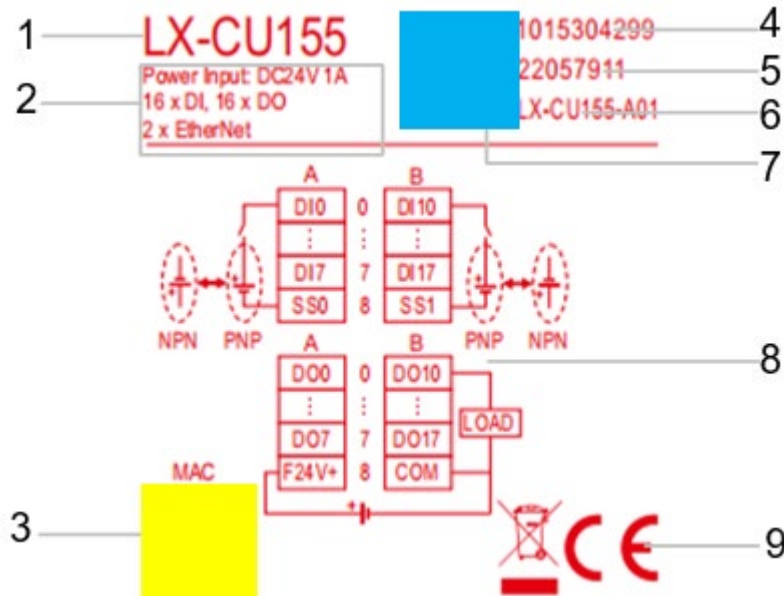


No.	Name	Description
1	Operating Status LED	Indicates the module operating status. For detailed definitions, refer to LED Indicator Description .
2	Type-C Interface	Connects one USB2.0 Device interface. Reserved.
3	Digital Input/Output LED Panel	Indicates DI/DO channel status. For detailed definitions, refer to LED Indicator Description .
4	Expansion Card Slot A	Used for installing expansion cards. For specific expansion card options, refer to Expansion Card Adaptation Table .
5	Expansion Card Slot B	
6	Ethernet Interface 1	Two northbound Ethernet interfaces. For detailed information, refer to the Ethernet port description .
7	Ethernet Interface 2	
8	RS-485 Terminal Block	For detailed description, refer to RS-485 Interface .
9	Power Interface	For detailed description, refer to Power Interface .
10	Removable DI Terminal Block	16-channel input terminal block. For detailed definitions, refer to DI Terminal Signal Definition .
11	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For detailed definitions, refer to DO Terminal and Field Power Signal Definition .
12	Dust Cover	Each controller comes with a dust cover to protect the module.



No.	Name	Description
13	Operating Mode Switch	Indicates the module's operating mode. For detailed definitions, refer to Operating Mode Description .
14	DIN Rail Top Mounting Latch	• Pull this latch upwards to the unlocked state before mounting the module onto the DIN rail. • Press this latch downwards to the locked state after mounting the module onto the DIN rail.
15	Gold Finger (Edge Connector)	Internal bus contact point for data transmission between modules, system power supply, etc.
16	Through-hole Field Power Terminal	Through-hole field-side power supply.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Module Basic Information	Indicates module power supply, communication, terminal, etc. information.
3	MAC Address	Indicates the module's MAC address (QR code).
4	SN Code	Indicates the module's serial number (plain text).
5	Batch Number	Indicates the module's production batch number.
6	Module Hardware Version	Indicates the module's hardware version and firmware sequence number at factory shipment. In LX-CU155-YYY, X is the hardware version, and YY is the firmware sequence number. If the module hardware version is LX-CU155-P-YYY, it indicates that the module supports conformal coating.
7	SN Code	Indicates the module's serial number (QR code).
8	Terminal Block Connection Diagram	Indicates the schematic diagram of the module's DI/DO terminal block connections.
9	Certification Standards	Indicates the certification standards the module complies with.

6.2.2.2 Technical Specifications

Basic Information

Parameter	Specification
Protection rating	IP20
Conformal coating	Supported
Power-on startup time	10s
Power-off to power-on interval	≥10s
Data retention time	1 year
Storage medium write/erase cycles	100,000 times
Number of IEC tasks	≤6
Number of published	≤10000

variables		
System power supply	Input voltage	24 VDC (19.2 V ~ 28.8 V)
	Input current	Max 0.5 A
	Reverse polarity protection	Supported
	Undervoltage protection	Supported, undervoltage threshold 13 V
	Undervoltage alarm	Supported, undervoltage threshold 17.5 V
	Overvoltage protection	Not supported
	Short circuit protection	Supported
	Module power dissipation	Max 3.5 W
Field power supply	Input voltage	24 VDC (19.2 V ~ 28.8 V)
	Input current	Max 6 A
	Reverse polarity protection	Supported
	Undervoltage protection	Not supported
	Overvoltage protection	Not supported
	Short circuit and overcurrent protection	Not supported
Dimensions (W x H x D)	70 mm x 100 mm x 80 mm	
Weight	≤300 g	
Hot swap	Hot swap not supported for left expansion cards, right LT-e modules, 6-pin power terminal, and DI/DO channel terminals.	
Data Snapshot	Support	

Memory

Parameter		Specification
SD card		Supports up to 32 GB when SD expansion card is equipped
User program size		1 MB
User data size		2 MB
Retentive data size		128 KB
Data area size	M area (direct address area)	524288 bytes, %MB0~%MB3999 support retentive
	I area (input area)	131072 bytes
	Q area (output area)	131072 bytes
	G area (global variable area)	917504 bytes
	L area (retentive area)	131072 bytes
	D area (diagnostic area)	262144 bytes, the first 128 KB does not support variable definition and is read-only and cannot be forced; the last 128 KB supports system-defined variables (axis groups) and does not support user-defined variables, read, or write.

Motion Control

Parameter	Specification
Motion control method	Supports pulse control
Motion Control Commands	PLCopen standard commands, HMC motion commands, CANopen axis control commands
Number of pulse control axes	2 axes

Communication

Parameter	Specification
-----------	---------------

USB Type-C			
Number of communication ports		1	
Communication interface		Type-C, reserved	
LT-eBus bus protocol			
Number of right-expanding LT-e series I/O and CM modules		16	
Northbound Ethernet			
Number of communication ports		2	
Communication interface		RJ45	
Supported protocols		EtherNet/IP master/slave protocol, Modbus TCP master/slave protocol, TCP/UDP, tag communication, Network Variable	
Communication cable		Ethernet Cat.5e or better shielded twisted-pair cable	
Communication rate		10 Mbps / 100 Mbps auto-negotiation	
Maximum cable length		100 m	
EtherNet/IP master/slave protocol		Cyclic data length	1444 bytes
		Acyclic data length	1444 bytes
		Maximum number of connections	Controller as master: Supports up to 32 connections Controller as slave: Supports up to 32 connections
		Reconnection after IP change	After the master IP is changed, it will automatically reconnect to slaves. After the slave IP is changed, the master connected to this slave needs to re-download.
EtherNet/IP tag communication	Cyclic communication (Class 1)	Communication data size	Maximum 1444 bytes per connection
		Maximum number of connections	Controller as master: Supports up to 32 connections (shares 30 connections with instance ID connections and Class 3 connections) Controller as slave: Supports up to 15 output tag groups, 32 connections (Class 1 + Class 3 limited to 32)
		Connection type	Supports point-to-point and multicast
		RPI time	Range 1~16000, unit ms, default is 10
	Acyclic communication (Class 3)	Communication method	Communicate via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication data size	Maximum 1444 bytes per connection
		Maximum number of connections	Supports up to 32 connections
		Number of accessible variables	No more than 5000 across all connections
	Modbus TCP protocol		Input/output area size
Maximum number of connections			Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters

	Function code types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (hexadecimal)
	Number of function code channels	32
TCP/IP free protocol	Input/output area size	1000 bytes
	Maximum number of connections	32
UDP protocol	Input/output area size	1000 bytes
	Maximum number of connections	Unicast: 32 network nodes Multicast: 32 network nodes
Network Variable	Communication Type	UDP Protocol
	Communication Rate	100 Mbit/s
	Transmission Speed	Minimum transmission cycle: 1 ms
	Maximum Number of Supported Transmit/Receive Groups	16 each, supporting simultaneous configuration of transmit groups and receive groups
	Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
	Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
Onboard Serial Communication		
Number of interfaces	1	
Interface type	Pluggable terminal	
Level standard	RS-485	
Supported protocols	Modbus RTU master/slave protocol, Modbus ASCII master/slave protocol, free port protocol	
Function code types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (hexadecimal)	
Number of function code channels	32	
Number of connectable slaves	Supports up to 32 (distance from slave to bus trunk ≤ 3 m)	
Communication rate (bps)	Supports 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200 configurable	
Data bits	7 bits / 8 bits, default 8 bits	
Stop bits	1 bit / 2 bits, default 2 bits	
Parity	None / Odd / Even, default None	
Communication distance	Rate 115200 bps: Transmission distance < 100 m Rate 19200 bps: Transmission distance < 1000 m	
Cable impedance	120 Ω	
Isolation withstand voltage	System to channel isolation, 500 VAC, 1 minute, below 10 mA	
Termination resistor	No built-in 120 Ω termination resistor, external connection as needed	

Other	Prevents incorrect connection of 24 VDC
-------	---

Right-Side DI Channels

Parameter	Specification		
Number of channels	Total of 16 channels • 12 high-speed inputs: CH0~CH7 and CH10~CH17 • The maximum frequency for channels CH6, CH7, CH16, and CH17 is 50KHz The number of channels may be derated depending on ambient temperature and installation method. Refer to Derating Requirements for details.		
Maximum channel signal frequency	200 kHz		
Response time ON/OFF	High-speed	OFF→ON: < 2 μs ON→OFF: < 2 μs	
	Standard	OFF→ON: < 1000 μs ON→OFF: < 1000 μs	
High-speed input counter value	32-bit		
High-speed input counting mode	Linear mode		
High-speed counter reset mode	• Z-phase + software reset (software configures Z-phase signal reset) • Software reset (reset via operation command)		
High-speed counting compare control method	Target value compare generates interrupt (can generate up to 100 segments of interrupts; target value can be set to relative mode or absolute mode; interrupts include single mode, cyclic mode, and cam mode).		
High-speed functions	• Probe: 12 probe input terminals, signal input pulse width: ≥ 2 μs (probe signal source can be master controller high-speed counter, pulse axis, or slave station) • External interrupt: 8 input terminals, input pulse width: ≥ 2 μs, trigger modes: rising edge, falling edge, edge trigger • Frequency measurement: 4 channels total, measurement frequency 200 kHz, single-cycle measurement accuracy error 50 ns (Refer to Terminal Definitions for details).		
Threshold voltage	ON/OFF	PNP	NPN
	ON voltage	> 15 V	< 5 V
	OFF voltage	< 5 V	> 15 V
Voltage range	24 VDC ±20 % (19.2 VDC ~ 28.8 VDC)		
Software filter	 Filter time adjustable per terminal Standard input: 2~1000, unit “ms” High-speed input: 2~10000, unit “100 ns” ○ The effective channel value is above 1 μs. 200 ns ~ 1 μs is mainly used for internal signal filtering. ○ To ensure effective counting, the filter time must not be greater than: minimum signal pulse width - 500 ns.		
Channel-to-channel isolation	Supported		
Isolation withstand voltage	Channel to system: 1000 VAC for 1 minute, leakage current < 5 mA		
Interface type	Front-facing wiring, 2x9-pin terminal, pluggable		
Maximum current per	• High-speed input channels: 10 mA at 24 VDC		

channel	• Standard input channels: 4 mA at 24 VDC
Diagnostics	No diagnostics
Terminal wire gauge range	0.2 ~ 1.5 mm ²
Terminal wire length	• General applications: 100 m (standard cable, 1.5 mm² wire gauge) • High-speed motion control applications: 3 m (double-shielded cable)

Right-Side DO Channels

Parameter	Specification
Number of channels	There are 16 outputs in total, of which 4 support high-speed output. The high-speed terminals are DO0, DO1, DO10, and DO11, while the others are low-speed terminals. Channel load current may be derated depending on ambient temperature and installation method. Refer to Derating Requirements for details.
Channel type	PNP, one common terminal
Threshold voltage	ON voltage > 15 V
	OFF voltage < 5 V
Maximum OFF-state leakage current	• 100 μA (-20 ~ 60 °C) • 10 μA (25 °C)
Channel output frequency at maximum load current	2 kHz ~ 200 kHz @ 100 mA 0 Hz ~ 2 kHz @ 500 mA Note: Resistive load
Maximum channel output frequency by load type	• Resistive load: 200kHz (high-speed channel), 100Hz (low-speed channel) • Inductive load: 0.5 Hz • Lamp load: 10 Hz
Response time ON/OFF	High-speed channel: <1 μ s (OFF→ON), <1 μ s (ON→OFF) Low-speed channel: <200 μ s (OFF→ON), <200 μ s (ON→OFF) Note: The minimum load current for the high-speed DO channel is > 10mA.
PWM performance	Maximum frequency 200 kHz, minimum resolution 2.5 μ s, configurable duty cycle 0% ~ 100%
Channel safe state	Supports individual configuration per channel; output can be configured as: • Output hold • Output preset value The above output configurations take effect when the iAT project stops.
Output load	• 0.5 A/point, 4 A/16 points (resistive load) • 7.2 W/point, 18 W/16 points (inductive load) • 5 W/point, 18 W/16 points (lamp load)  ○ No built-in freewheeling diode, external connection required. ○ Output load capability is derated based on ambient temperature and installation method. Refer to Derating Requirements for details.
Parallel connection supported	Not supported
Saturation voltage at 500 mA	Less than 0.5 V

Channel-to-channel isolation	Not supported
Isolation withstand voltage	Channel to system: 1000 VAC for 1 minute, leakage current < 5 mA
Reverse polarity protection on power supply	Field-side power supply reverse polarity protection (COM to F24V+)
Channel protection features	Supports overcurrent protection Supports overtemperature protection (standard speed channels only) Protection Mechanism: • High-speed channel: When current exceeds 0.8A ($\pm 5\%$) for more than 50μs, the output is shut off. • Low-speed channel: When current exceeds 0.8A ($\pm 5\%$), the current is clamped. If continuous overcurrent leads to overheating, the output is shut off. Recovery Method after Protection: • High-speed channel: Cyclic retry every 6 seconds. • Low-speed channel: Output is restored after the temperature drops below the threshold.
Interface type	Front-facing wiring, 2x9-pin terminal, pluggable
Diagnostics	No diagnostics
Terminal wire gauge range	0.2 ~ 1.5 mm ²
Terminal wire length	• General applications: 100 m (standard cable, 1.5 mm² wire gauge) • High-speed motion control applications: 3 m (double-shielded cable)

Left Expansion Slots

Parameter	Specification
Number of expansion slots	2
Expansion slots	Dedicated slot A: LX-EC031 Dedicated slot B: LX-EC006 / LX-EC007 Other expansion cards support mixing in slots A/B.
Hot swap	Not supported

6.2.2.3 Indicator Lights

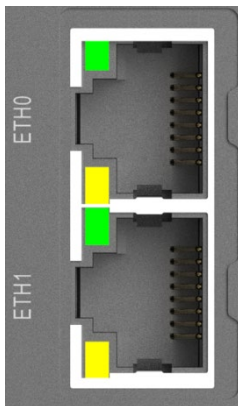


LED Name	Color	Status	Description
SPWR	Yellow	Steady On	System-side power is on
		Off	System-side power is off
RUN	Green	Steady On	User project is loaded but not running
		Slow Flashing	User project is running
		Off	No user project is loaded
ERR	Red	Steady On	Fault occurred
		Off	No fault
SF	Yellow	Fast Flashing	LT right expansion has no configuration or the

			configuration does not match the actual scanned I/O modules
		Single Flash (500ms on, 500ms off)	LT right expansion initialization communication failed or I/O module communication is offline
		Off	LT right expansion module has no fault



- During firmware upgrade, RUN and ERR alternate slow flashing (0.5s on, 0.5s off).
- When the controller enters the "Reset" and "Restore Factory Settings" judgment process, RUN and ERR flash slowly simultaneously (0.5s on, 0.5s off).

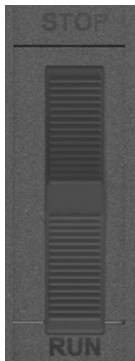


LED Name	Color	Status	Description
ETH0 Built-in RJ45 LED	Top Green, Bottom Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established
ETH1 Built-in RJ45 LED	Top Green, Bottom Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established



LED Name	Color	Status	Description
FPWR	Yellow	Steady On	Field-side power is on
		Off	Field-side power is off
32*IO	Yellow	According to channel status	On: ON
			Off: OFF

6.2.2.4 Operating Mode



- RUN: Run Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.
STOP Stop Mode	Stop mode.

RUN

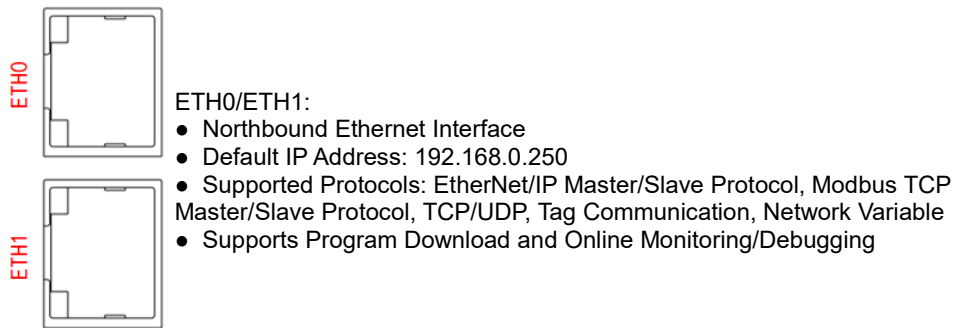
- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

- The controller does not execute the user project; all POU's under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.2.5 Module Communication Interface and Terminal Wiring Diagram

Ethernet Ports

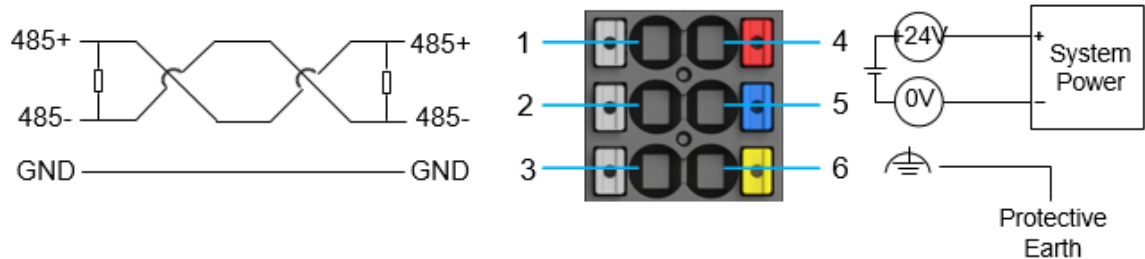


USB Interface



One USB2.0_Device interface is brought out via Type-C. Reserved.

RS-485/Power Interface



The RS-485 interface and 24VDC system power share a 2*3pin terminal block. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth (PE)



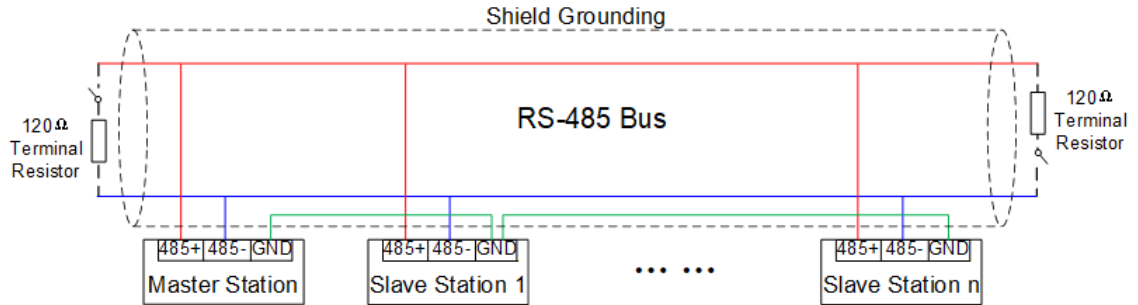
External terminal matching resistors are to be connected as required.

Additional Information:

It is recommended to use shielded twisted-pair cables for the RS-485 bus connection. Connect the 485+ and 485- using twisted pairs. Connect a 120Ω terminal matching resistor at both ends of the bus to prevent signal reflection. Connect the signal ground of all 485 signal nodes together. Up to 32 nodes can be connected, and

the distance of each node's branch line should be less than 3m.

The connection topology of the RS-485 bus is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-Speed Digital Input 0	B0	DI10	High-Speed Digital Input 10
A1	DI1	High-Speed Digital Input 1	B1	DI11	High-Speed Digital Input 11
A2	DI2	High-Speed Digital Input 2	B2	DI12	High-Speed Digital Input 12
A3	DI3	High-Speed Digital Input 3	B3	DI13	High-Speed Digital Input 13
A4	DI4	High-Speed Digital Input 4	B4	DI14	High-Speed Digital Input 14
A5	DI5	High-Speed Digital Input 5	B5	DI15	High-Speed Digital Input 15
A6	DI6	High-Speed Digital Input 6	B6	DI16	High-Speed Digital Input 16
A7	DI7	High-Speed Digital Input 7	B7	DI17	High-Speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1



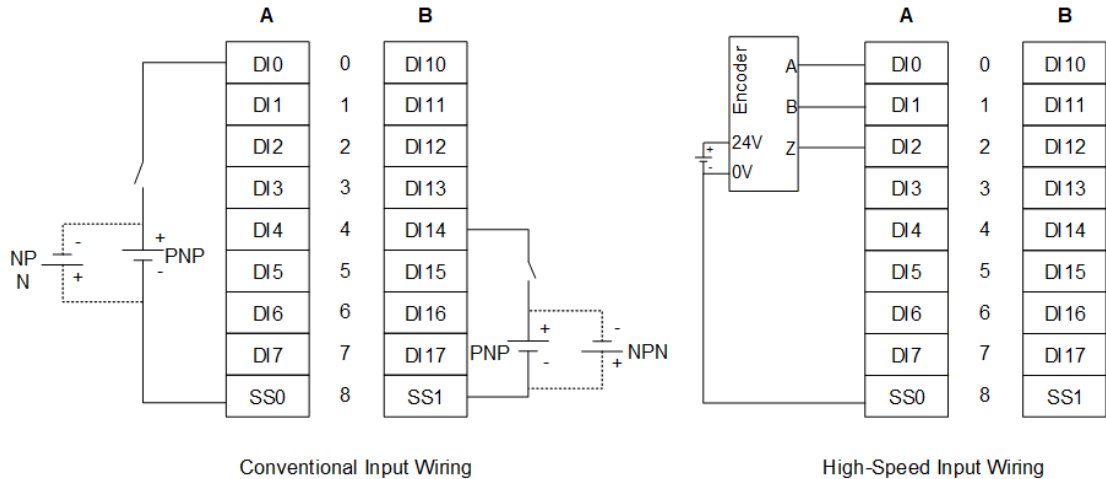
- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single-Phase	CW/CCW	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max. Frequency	100KHz	200KHz	100KHz	200KHz	200KHz	200KHz	-
DI0	A0	√	CW0	Pulse0	√	√	
DI1	B0	√	CCW0	Direction	√	√	

				0			
DI2	Z0	√	Z0	Z0	√	√	√
DI3	A1	√	CW1	Pulse1	√	√	√
DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for DI6/DI7/DI16/DI17 channels is 50KHz; for others, it is 200KHz.
- There are 12 single-phase channels in total, which can be configured to any unoccupied terminal.
- There are 12 probe channels in total, which can be configured to any unoccupied terminal.
- There are 4 frequency measurement channels in total, which can be configured to any unoccupied terminal.
- When high-speed functions and corresponding channel filter parameters are set simultaneously, the filter parameters take priority. For the same high-speed counter, the filter parameters for its two terminals must be set consistently; an alarm will be triggered if they are inconsistent.



The DO terminal and field power signal definitions are shown in the table below.

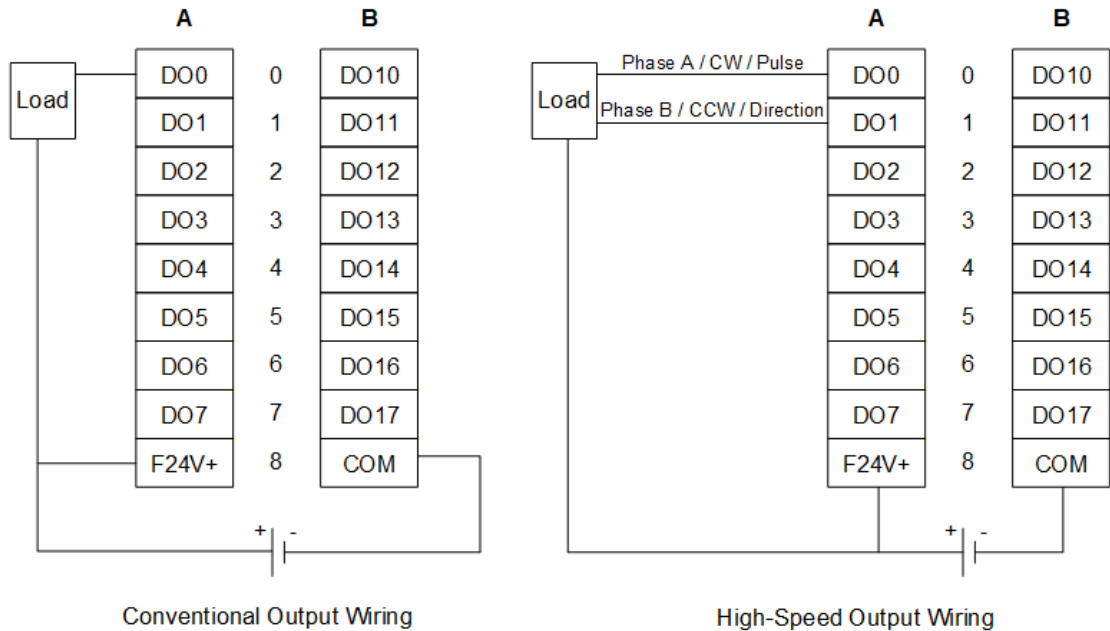
Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-Speed Digital Output 0	B0	DO10	High-Speed Digital Output 10
A1	DO1	High-Speed Digital Output 1	B1	DO11	High-Speed Digital Output 11
A2	DO2	High-Speed Digital Output 2	B2	DO12	High-Speed Digital Output 12
A3	DO3	High-Speed Digital	B3	DO13	High-Speed Digital

		Output 3			Output 13
A4	DO4	High-Speed Digital Output 4	B4	DO14	High-Speed Digital Output 14
A5	DO5	High-Speed Digital Output 5	B5	DO15	High-Speed Digital Output 15
A6	DO6	High-Speed Digital Output 6	B6	DO16	High-Speed Digital Output 16
A7	DO7	High-Speed Digital Output 7	B7	DO17	High-Speed Digital Output 17
A8	F24V+	Field Power Positive	B8	COM	Field Power Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unoccupied terminal. The direction terminal is user-controlled.	√	√	√	√
DO1	√					√
DO2						
DO3						
DO4						
DO5						
DO6						
DO7	√					
DO10	√		√	√	√	√
DO11						√
DO12						
DO13						
DO14						
DO15						
DO16						
DO17						



- The LX-CU155 main unit supports up to 2 axes.
- On the LX-CU155 main unit, 2 axes support CW/CCW, A/B, and pulse + direction, while 4 axes support single pulse.
- There are 4 PWM channels in total, which can only be assigned to the terminals of the high-speed channel.



6.2.3 LX-CU157 Compact Standard Controller

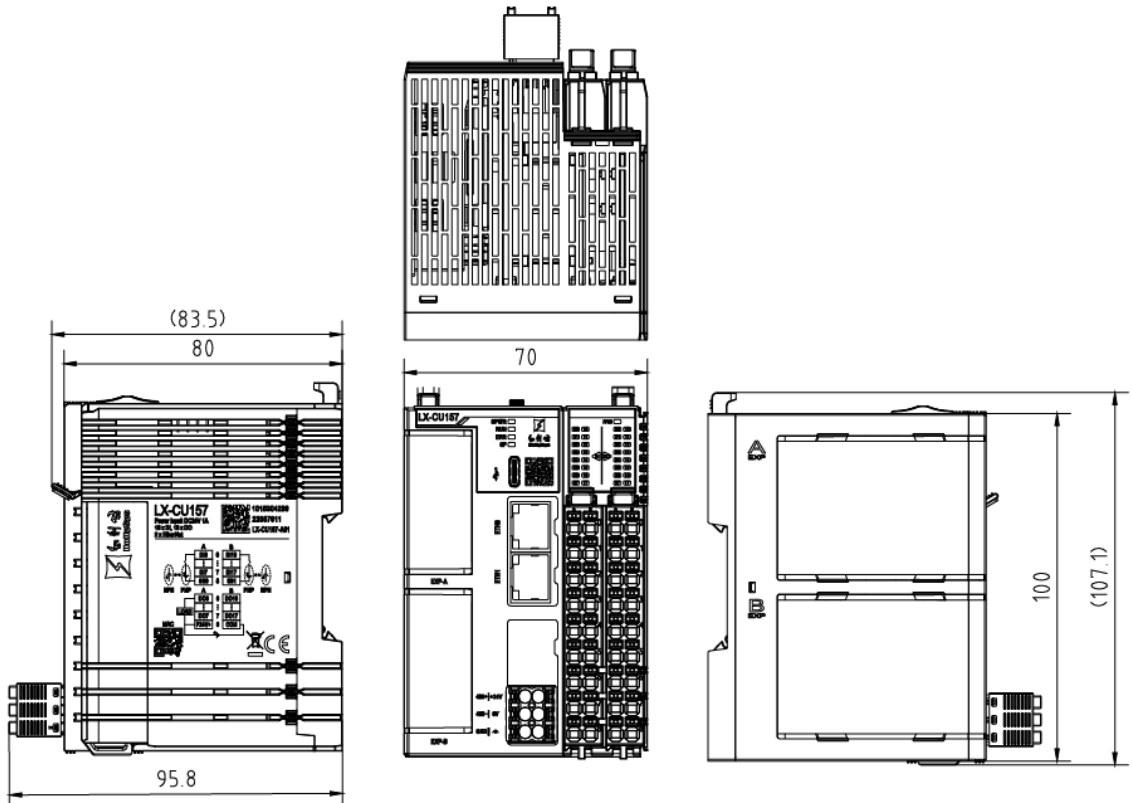
The LX-CU157 performs the "Input-Calc-Output" control process and motion control, with main functions as follows:

- Supports single IP, dual northbound Ethernet interfaces;
- Supports pulse-based motion control;
- Integrates 12 high-speed DI channels and 4 regular DI channels;
- Integrates 16 high-speed DO channels;
- Supports one isolated RS-485 interface;
- Right-side expansion of LT distributed I/O via bus.

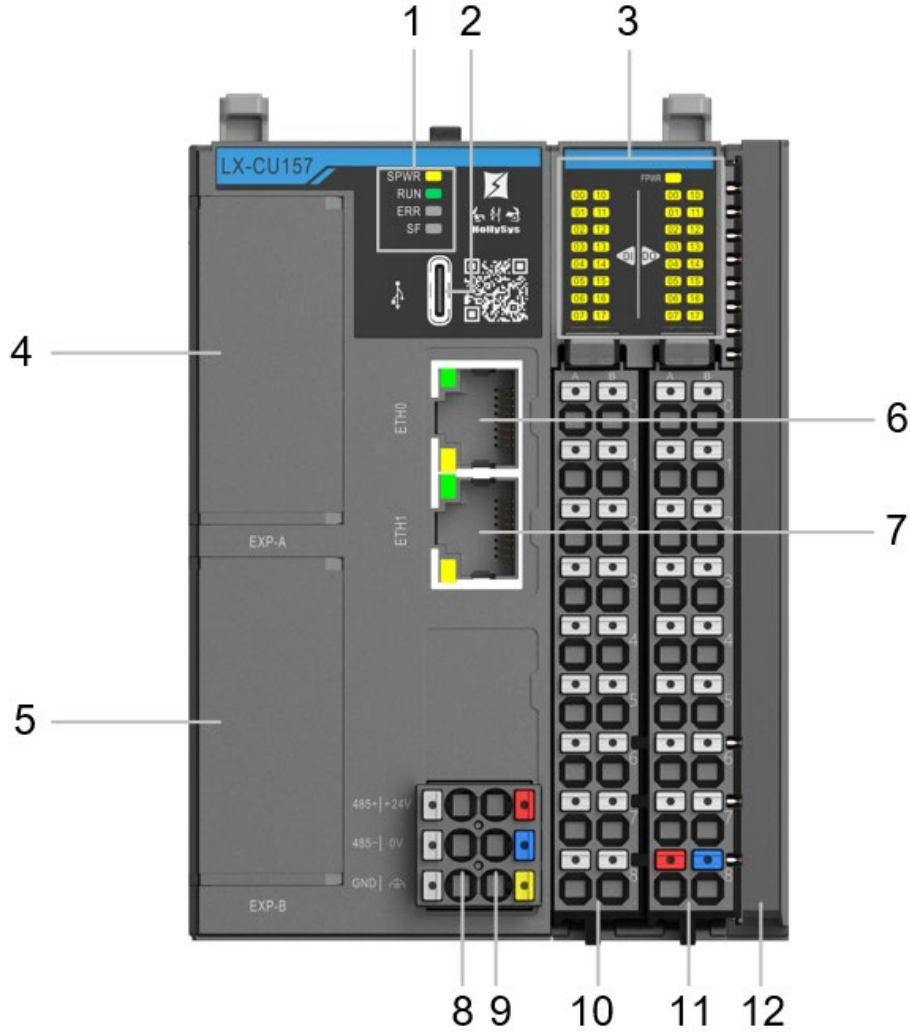
6.2.3.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-CU157 are shown in the following figure (unit: mm).



Component Description

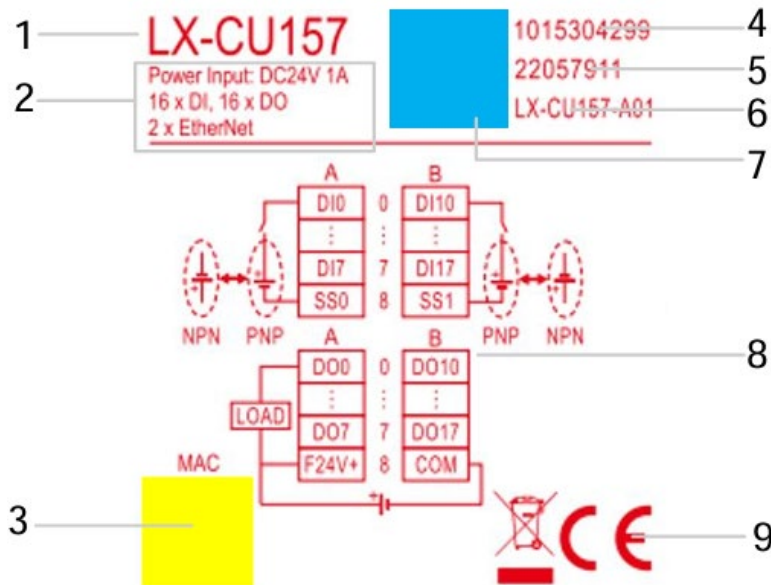


No.	Name	Description
1	Operation Status Indicator	Indicates the module operation status. For details, refer to Indicator Description .
2	Type-C Port	Connects to one USB2.0 Device interface. Reserved.
3	Digital Input/Output Indicator Panel	Indicates the status of DI/DO channels. For details, refer to Indicator Description .
4	Expansion Card Slot A	Used for installing expansion cards. For specific expansion card options, refer to Expansion Card Compatibility List .
5	Expansion Card Slot B	
6	Ethernet Port 1	Two northbound Ethernet interfaces. For detailed information, refer to the Ethernet port description .
7	Ethernet Port 2	
8	RS-485 Terminal Block	For detailed description, refer to RS-485 Interface .
9	Power Interface	For detailed description, refer to Power Interface .
10	Pluggable DI Terminal Block	16-channel input terminal block. For pin definitions, refer to DI Terminal Signal Definition .
11	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For pin definitions, refer to DO Terminal and Field Power Signal Definition .
12	Dust Cover	Each controller comes with a dust cover for protecting the module.



No.	Name	Description
13	Operating Mode Switch	Indicates the module's operating mode. For details, refer to Operating Mode Description .
14	DIN Rail Top Mounting Latch	• Pull this latch upward to the unlocked state before mounting the module onto the DIN rail. • Press this latch downward to the locked state after mounting the module onto the DIN rail.
15	Edge Connector	Internal bus contact points for inter-module data transmission, system power supply, etc.
16	Field Power Through-Board Terminal	Field-side power supply terminal.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Module Basic Information	Indicates information such as power supply, communication, and terminals.
3	MAC Address	Indicates the module's MAC address (QR code).
4	SN Code	Indicates the serial number of the module (Plain Code).
5	Batch Number	Indicates the module's production batch number.
6	Module Hardware Version	Indicates the hardware version and firmware serial number at the time of factory shipment. In "LX-CU157-XYZ", X is the hardware version number, and YY is the firmware serial number. If the module hardware version is LX-CU157-P-XYZ, it indicates that the module supports moisture, mold, and salt spray resistance.
7	SN Code	Indicates the serial number of the module (QR code).
8	Terminal Block Diagram	Shows the connection diagram for the DI/DO terminal blocks.
9	Certification Standards	Indicates the certification standards that the module complies with.

6.2.3.2 Technical Specifications

Basic Information

Parameter	Specification
Protection Rating	IP20
Moisture, Mold, and Salt Spray Resistance	Support
Power-on Startup Time	10s
Re-power-on Time Interval	≥10s
Data Retention Time	1 year
Storage Media Erase/Write Cycles	100,000 times
IEC Task Quantity	≤6
Public Variable Quantity	≤10,000

System Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 0.5A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Supported, Threshold 13V
	Undervoltage Alarm	Supported, Threshold 17.5V
	Overvoltage Protection	Not Supported
	Short Circuit Protection	Supported
	Module Power Consumption	Max 3.5W
Field Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 6A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Not Supported
	Overvoltage Protection	Not Supported
	Short Circuit & Overcurrent Protection	Not Supported
Dimensions (W*H*D)		70mm*100mm*80mm
Weight		≤300g
Hot Swapping		Not supported for left expansion cards, right LT-e modules, 6-pin power terminals, and DI/DO channel wiring terminals
Data Snapshot		Support

Memory

Parameter		Specification
SD Card		Supports up to 32GB with optional SD expansion card
User Program Capacity		1MB
User Data Capacity		2MB
Retentive Memory Capacity		128KB
Data Area Size	M Area (Direct Address Area)	524288 bytes, %MB0~%MB3999 supports power-down retention
	I Area (Input Area)	131072 bytes
	Q Area (Output Area)	131072 bytes
	G Area (Global Variable Area)	917504 bytes
	L Area (Retentive Area)	131072 bytes
	D Area (Diagnostic Area)	262144 bytes, the first 128KB does not support variable definition, is read-only and cannot be forced; the last 128KB supports system-defined variables (axis groups), but does not support user-defined variables, read or write operations.

Motion Control

Parameter	Specification
Motion Control Method	Supports Pulse Control
Motion Control Commands	PLCopen standard commands, HMC motion commands, CANopen axis control commands
Number of Pulse Control Axes	Built-in: 8 axes Dual-slot LX-EC012: 4 axes

Communication

Parameter	Specification
USB-Type-C	
Number of Ports	1

Interface		Type-C, Reserved	
LT-eBus Protocol			
Expand the quantity of LT-e series I/O and CM modules on the right side		16	
Northbound Ethernet			
Number of Ports		2	
Interface		RJ45	
Supported Protocols		EtherNet/IP Master/Slave Protocol, Modbus TCP Master/Slave Protocol, TCP/UDP, Tag Communication, Network Variable	
Communication Cable		Shielded Twisted Pair Cable, Ethernet Cat.5e or above	
Communication Rate		10Mbps/100Mbps Auto-negotiation	
Maximum Cable Length		100m	
EtherNet/IP Master/Slave Protocol		Cyclic Data Length	For versions below LX-CU157-B01_V1.1.0: 1400 bytes For LX-CU157-B01_V1.1.0 and above: 1444 bytes
		Acyclic Data Length	For versions below LX-CU157-B01_V1.1.0: 1400 bytes For LX-CU157-B01_V1.1.0 and above: 1444 bytes
		Maximum Number of Connections	Controller as master: Supports up to 32 connections Controller as slave: Supports up to 32 connections
		Reconnection After IP Modification	Master modifies IP: Automatically reconnects to slaves. Slave modifies IP: The master connected to this slave needs to be re-downloaded.
EtherNet/IP Tag Communication	Cyclic Communication (Class 1)	Communication Data Volume	Single connection maximum support 1444 bytes
		Maximum Number of Connections	Controller as Master: Supports up to 32 connections (shared with Instance ID connections and Class 3 connections) Controller as Slave: Supports up to up to 15 output tag groups, 32 connections (Class 1 + Class 3 limited to 32)
		Connection Type	Support Point-to-Point, Multicast
		RPI Time	Range: 1 to 16,000, unit: ms, default: 10
	Acyclic Communication (Class 3)	Communication Method	Communication via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication Data Volume	Maximum of 1444 bytes per connection
		Maximum Number of Connections	Supports up to 32 connections
		Number of Accessible Variables	No more than 5000 variables across all connections
Modbus TCP Protocol		Input/Output Area Size	524288 bytes (M Area)

	Maximum Connections	Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters
	Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)
	Number of Function Code Channels	32
TCP/IP Free Protocol	Input/Output Area Size	1000 bytes
	Maximum Connections	32
UDP Protocol	Input/Output Area Size	1000 bytes
	Maximum Connections	Unicast: 32 network nodes Multicast: 32 network nodes
Network Variable	Communication Type	UDP Protocol
	Communication Rate	100 Mbit/s
	Transmission Speed	Minimum transmission cycle: 1 ms
	Maximum Number of Supported Transmit/Receive Groups	16 each, supporting simultaneous configuration of transmit groups and receive groups
	Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
	Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
Onboard Serial Communication		
Number of Interfaces	1	
Interface Type	Plug-in Terminal Block	
Signal Standard	RS-485	
Supported Protocols	Modbus RTU Master/Slave Protocol, Modbus ASCII Master/Slave Protocol, Free Port Protocol	
Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)	
Number of Function Code Channels	32	
Maximum Number of Slaves	Supports up to 32 (distance from slave to bus trunk $\leq 3\text{m}$)	
Communication Rate (bps)	Supports 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200, configurable	
Data Bits	7/8 bits, default 8 bits	
Stop Bits	1/2 bits, default 2 bits	
Parity	Odd/Even/None, default is None	
Communication Distance	Rate 115200bps: Transmission distance $<100\text{m}$ Rate 19200bps: Transmission distance $<1000\text{m}$	
Cable Impedance	120 Ω	
Isolation Withstand Voltage	System-to-channel isolation, 500VAC, 1min, leakage current $<10\text{mA}$	
Terminating Resistor	No built-in 120 Ω terminating resistor, external connection as needed	

Other	Prevents accidental 24VDC connection
-------	--------------------------------------

Right-side DI Channels

Parameter	Specification		
Number of Channels	Total 16 channels • 12 high-speed inputs: CH0~CH7 and CH10~CH17 • The maximum frequency for channels CH6, CH7, CH16, and CH17 is 50KHz Number of channels may be derated depending on ambient temperature and installation method. See Derating Requirements for details.		
Maximum Signal Frequency per Channel	200KHz		
Response Time ON/OFF	High-speed	OFF→ON: <2μs ON→OFF: <2μs	
	Regular	OFF→ON: <1000μs ON→OFF: <1000μs	
High-speed Input Count Value	32-bit		
High-speed Input Counting Mode	Linear Mode		
High-speed Counter Reset Mode	• Z-phase + Software Reset (Z-phase signal reset via software) • Software Reset (via operation instruction)		
High-speed Count Comparison Control Method	Target value comparison generates interrupts (supports up to 100 interrupt segments. Target value can be set in relative or absolute mode. Interrupt modes include single-shot, cycle, and cam mode.)		
High-speed Functions	• Probe: 12 probe input terminals, input pulse width: 2μs or more (probe signal source can be main controller high-speed counter, pulse axis, or slave station) • External Interrupt: 8 input terminals, input pulse width: 2μs or more, trigger mode: rising edge, falling edge, edge trigger • Frequency Measurement: 4 channels total, measurement frequency 200KHz, single-cycle measurement accuracy error 50ns (See Terminal Definitions for details)		
Threshold Level	ON/OFF	PNP	NPN
	ON Voltage	> 15V	< 5V
	OFF Voltage	< 5V	> 15V
Voltage Range	24VDC±20% (19.2VDC ~ 28.8VDC)		
Software Filtering	Filtering time adjustable per terminal Regular input: 2~1000 unit "ms" High-speed input: 2~10000 unit "100ns"  - Channel effective value is 1μs or more. 200ns~1μs is mainly used for internal signal filtering. - To ensure effective counting, the filter time must not exceed: minimum signal pulse width - 500ns		
Channel-to-channel Isolation	Supported		
Isolation Withstand Voltage	Channel to system: 1000 VAC, 1 minute, leakage current <5mA		
Connection Method	Front wiring, 2*9PIN terminal block, pluggable		

Maximum Current per Channel	- High-speed input channel: 10mA at 24VDC - Regular input channel: 4mA at 24VDC
Diagnostics	No diagnostics
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	- General application: 100m (standard cable, wire gauge 1.5mm²) - High-speed motion control application: 3m (double-shielded cable)

Right-side DO Channels

Parameter	Specification
Number of Channels	Total 16 high-speed outputs Channel load current may be derated depending on ambient temperature and installation method. See Derating Requirements for details.
Channel Type	NPN type, one common terminal
Threshold Voltage	ON Voltage < 5V
	OFF Voltage > 15V
Maximum OFF-state Leakage Current	100uA (-20~60°C) 10uA (25°C)
Channel Output Frequency @ Maximum Load Current	2KHz~200KHz @ 100mA 0Hz~2KHz @ 500mA Note: Resistive load
Maximum Channel Output Frequency @ Load Type	- Resistive load: 200KHz - Inductive load: 0.5Hz - Lamp load: 10Hz
Response Time ON/OFF	OFF→ON: <1μs ON→OFF: <1μs Note: External load for high-speed DO channel <3KΩ
PWM Performance	Maximum frequency 200KHz, minimum resolution 2.5μs, adjustable duty cycle 0%~100%
Channel Safety Value	Supports individual configuration per channel. Output can be configured as: - Hold Last State - Output Preset Value The above output configurations take effect when the iAT project is stopped.
Output Load	0.5A/point, 4A/16 points (resistive load) 7.2W/point, 18W/16 points (inductive load) 5W/point, 18W/16 points (lamp load)  - No built-in freewheeling diode, external diode required. - Output load capacity is derated depending on ambient temperature and installation method. See Derating Requirements for details.
Parallel Connection Support	Not Supported
Conduction Voltage Drop (500mA)	Less than 0.5V
Channel-to-channel Isolation	Not Supported
Isolation Withstand Voltage	Channel to system: 1000 VAC, 1 minute, leakage current <5mA
Power Supply Reverse	Field side power supply reverse polarity protection (between COM and

Polarity Protection	F24V+)
Channel Protection Functions	Supports overcurrent protection (individual current limiting, hiccup mode) Supports overtemperature protection (all channels disconnect) Output recovery mode after protection: Automatic recovery
Connection Method	Front wiring, 2*9PIN terminal block, pluggable
Diagnostics	No diagnostics
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	- General application: 100m (standard cable, wire gauge 1.5mm²) - High-speed motion control application: 3m (double-shielded cable)

Left Expansion Slots

Parameter	Specification
Number of Expansion Slots	2
Expansion Slots	Slot A (bound): LX-EC031 Slot B (bound): LX-EC006/LX-EC007 Other expansion cards support mixed installation in Slot A/B.
Hot Swapping	Not Supported

6.2.3.3 Indicator Lights

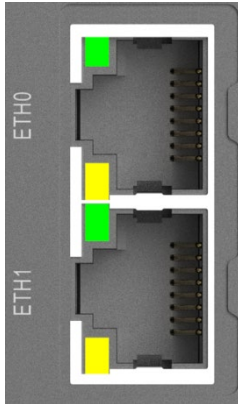


LED Name	Color	Status	Description
SPWR	Yellow	Steady On	System-side power is on
		Off	System-side power is off
RUN	Green	Steady On	User project is loaded but not running
		Slow Flashing	User project is running
		Off	No user project is loaded
ERR	Red	Steady On	Fault occurred
		Off	No fault
SF	Yellow	Fast Flashing	LT right expansion has no configuration or the configuration does not match the actual scanned I/O modules
		Single Flash (500ms on, 500ms off)	LT right expansion initialization communication failed or I/O module communication is offline
		Off	LT right expansion module has no fault

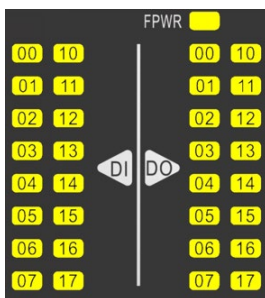


- During firmware upgrade, RUN and ERR alternate slow flashing (0.5s on, 0.5s off).

- When the controller enters the "Reset" and "Restore Factory Settings" judgment process, RUN and ERR flash slowly simultaneously (0.5s on, 0.5s off).

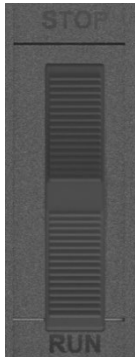


LED Name	Color	Status	Description
ETH0 Built-in RJ45 LED	Top Green, Bottom Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established
ETH1 Built-in RJ45 LED	Top Green, Bottom Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established



LED Name	Color	Status	Description
FPWR	Yellow	Steady On	Field-side power is on
		Off	Field-side power is off
32*IO	Yellow	According to channel status	On: ON
			Off: OFF

6.2.3.4 Operating Mode



- RUN: Run Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.
STOP Stop Mode	Stop mode.

RUN

- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

- The controller does not execute the user project; all POUs under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.3.5 Module Communication Interface and Terminal Wiring Diagram

Ethernet Ports



ETH0/ETH1:

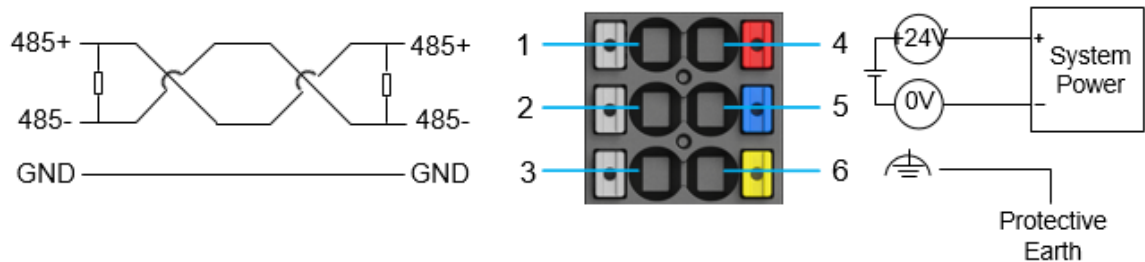
- Northbound Ethernet Interface
- Default IP Address: 192.168.0.250
- Supported Protocols: EtherNet/IP Master/Slave Protocol, Modbus TCP Master/Slave Protocol, TCP/UDP, Tag Communication, Network Variable
- Supports Program Download and Online Monitoring/Debugging

USB Interface



One USB2.0_Device interface is brought out via Type-C. Reserved.

RS-485/Power Interface



The RS-485 interface and 24VDC system power share a 2*3pin terminal block. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth (PE)

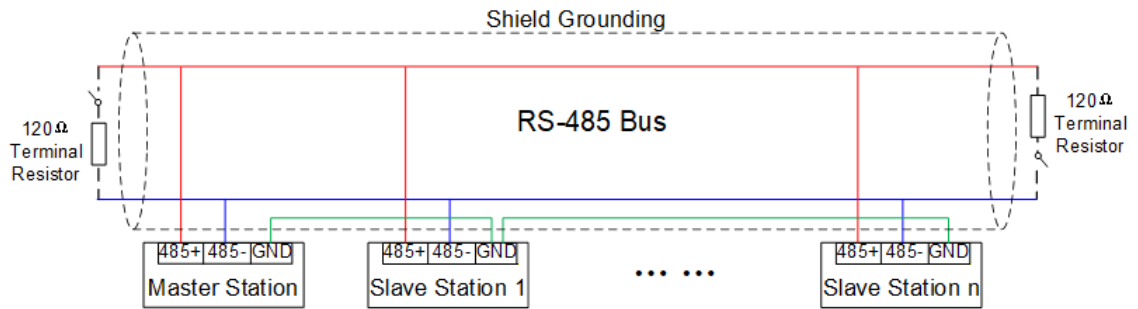


External terminal matching resistors are to be connected as required.

Additional Information:

It is recommended to use shielded twisted-pair cables for the RS-485 bus connection. Connect the 485+ and 485- using twisted pairs. Connect a 120Ω terminal matching resistor at both ends of the bus to prevent signal reflection. Connect the signal ground of all 485 signal nodes together. Up to 32 nodes can be connected, and the distance of each node's branch line should be less than 3m.

The connection topology of the RS-485 bus is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-Speed Digital Input 0	B0	DI10	High-Speed Digital Input 10
A1	DI1	High-Speed Digital Input 1	B1	DI11	High-Speed Digital Input 11
A2	DI2	High-Speed Digital Input 2	B2	DI12	High-Speed Digital Input 12
A3	DI3	High-Speed Digital Input 3	B3	DI13	High-Speed Digital Input 13
A4	DI4	High-Speed Digital Input 4	B4	DI14	High-Speed Digital Input 14
A5	DI5	High-Speed Digital Input 5	B5	DI15	High-Speed Digital Input 15
A6	DI6	High-Speed Digital Input 6	B6	DI16	High-Speed Digital Input 16
A7	DI7	High-Speed Digital Input 7	B7	DI17	High-Speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1



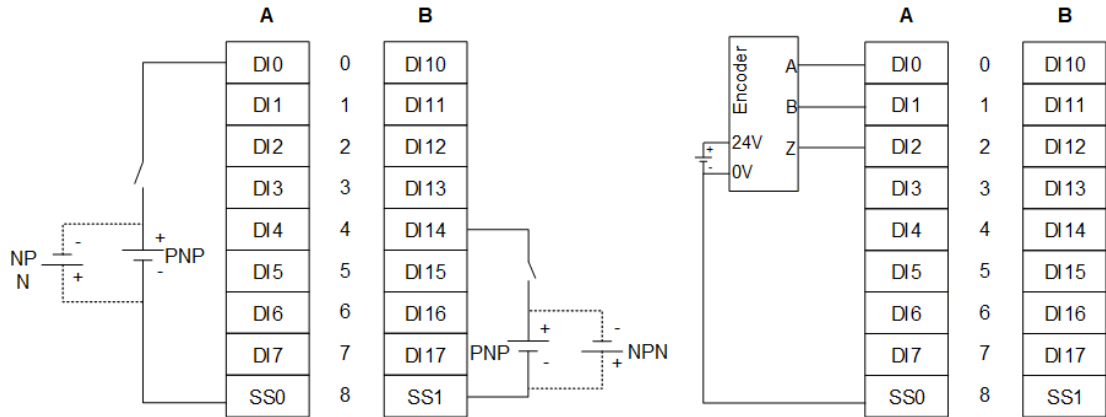
- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single-Phase	CW/CCW	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max. Frequency	100KHz	200KHz	100KHz	200KHz	200KHz	200KHz	-
DI0	A0	√	CW0	Pulse0	√	√	
DI1	B0	√	CCW0	Direction 0	√	√	
DI2	Z0	√	Z0	Z0	√	√	√
DI3	A1	√	CW1	Pulse1	√	√	√

DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for DI6/DI7/DI16/DI17 channels is 50KHz; for others, it is 200KHz.
- There are 12 single-phase channels in total, which can be configured to any unoccupied terminal.
- There are 12 probe channels in total, which can be configured to any unoccupied terminal.
- There are 4 frequency measurement channels in total, which can be configured to any unoccupied terminal.
- When high-speed functions and corresponding channel filter parameters are set simultaneously, the filter parameters take priority. For the same high-speed counter, the filter parameters for its two terminals must be set consistently; an alarm will be triggered if they are inconsistent.



Conventional Input Wiring

High-Speed Input Wiring

The DO terminal and field power signal definitions are shown in the table below.

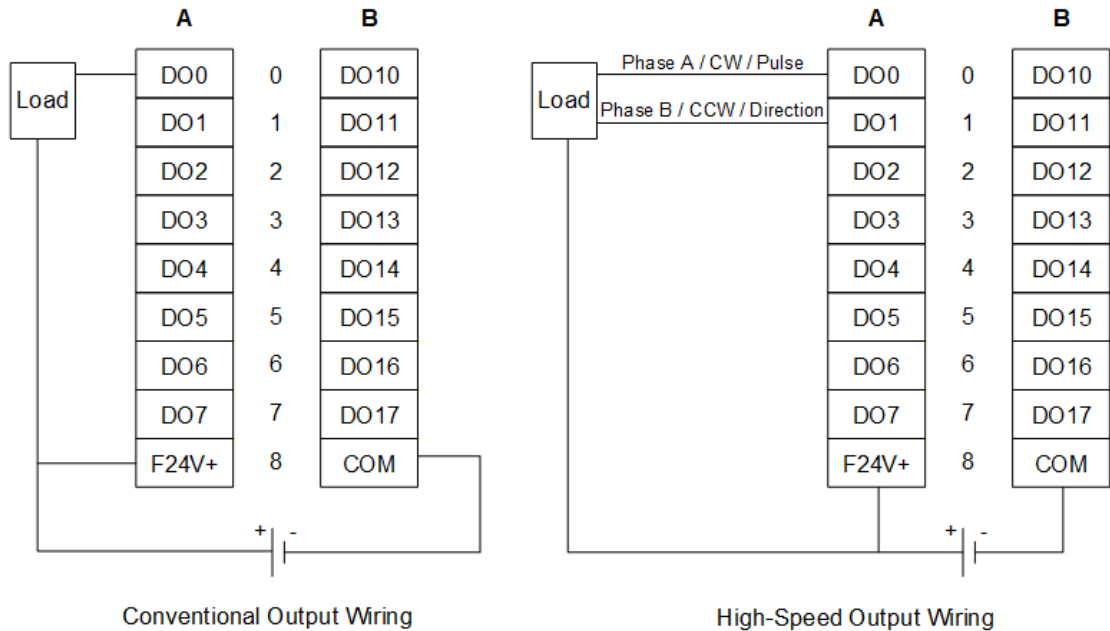
Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-Speed Digital Output 0	B0	DO10	High-Speed Digital Output 10
A1	DO1	High-Speed Digital Output 1	B1	DO11	High-Speed Digital Output 11
A2	DO2	High-Speed Digital Output 2	B2	DO12	High-Speed Digital Output 12
A3	DO3	High-Speed Digital Output 3	B3	DO13	High-Speed Digital Output 13
A4	DO4	High-Speed Digital Output 4	B4	DO14	High-Speed Digital Output 14

A5	DO5	High-Speed Digital Output 5	B5	DO15	High-Speed Digital Output 15
A6	DO6	High-Speed Digital Output 6	B6	DO16	High-Speed Digital Output 16
A7	DO7	High-Speed Digital Output 7	B7	DO17	High-Speed Digital Output 17
A8	F24V+	Field Power Positive	B8	COM	Field Power Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unoccupied terminal. The direction terminal is user-controlled.	√	√	√	√
DO1	√					√
DO2	√		√	√	√	√
DO3	√					√
DO4	√		√	√	√	√
DO5	√					√
DO6	√		√	√	√	√
DO7	√					√
DO10	√		√	√	√	√
DO11	√					√
DO12	√		√	√	√	√
DO13	√					√
DO14	√		√	√	√	√
DO15	√					√
DO16	√		√	√	√	√
DO17	√					√



- LX-CU157 supports up to 12 axes (the LX-CU157 main unit supports 8 axes, and two 4DO expansion cards each support 2 axes).
- For the LX-CU157, 6 axes support four modes: Single Pulse, Pulse+Direction, CW/CCW, A/B. The other 6 axes only support two modes: Single Pulse, Pulse+Direction.
- There are 4 PWM channels in total, which can be configured to any unoccupied terminal.



6.2.4 LX-CU311 Compact Motion Controller

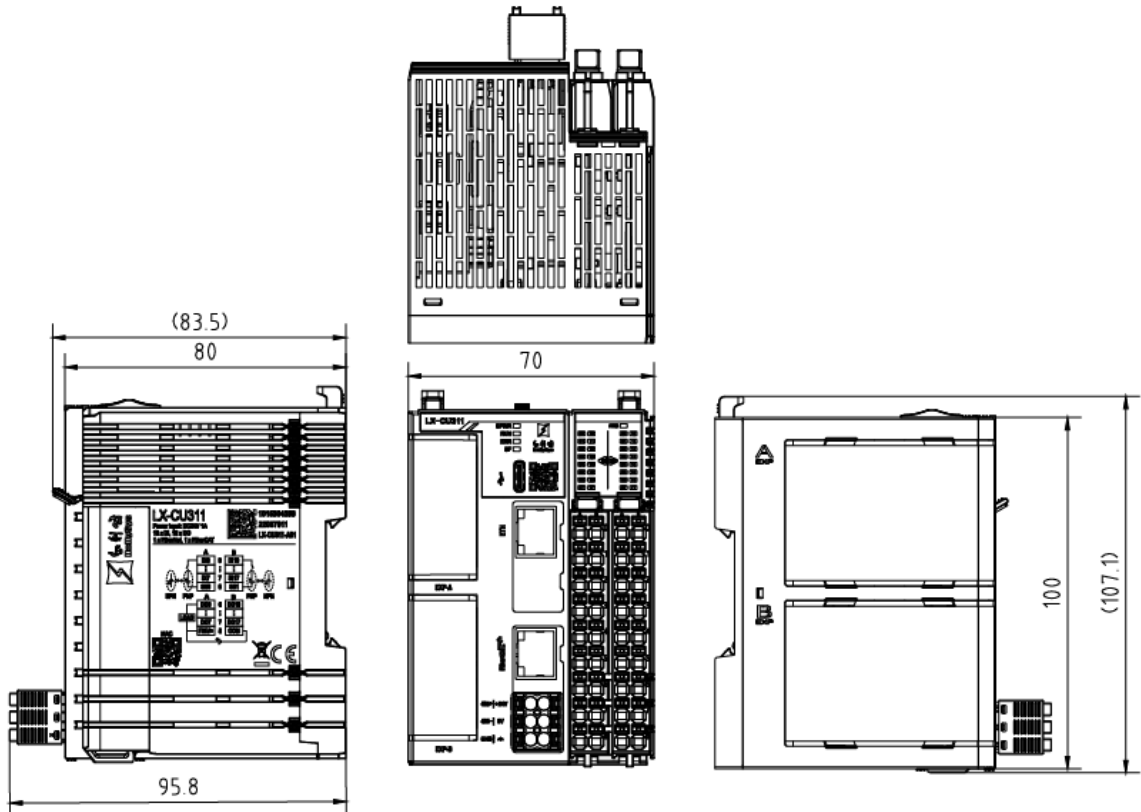
The LX-CU311 controller implements the "Input-Computation-Output" control process and motion control. Its main features are as follows:

- Supports bus-based motion control via EtherCAT interface;
- Supports pulse-based motion control;
- Built-in with two expansion card slots;
- Built-in with 12 high-speed DI and 4 regular DI channels;
- Built-in with 16 high-speed DO channels;
- Supports one isolated RS-485 interface;
- Expands LT-e distributed I/O to the right via bus.

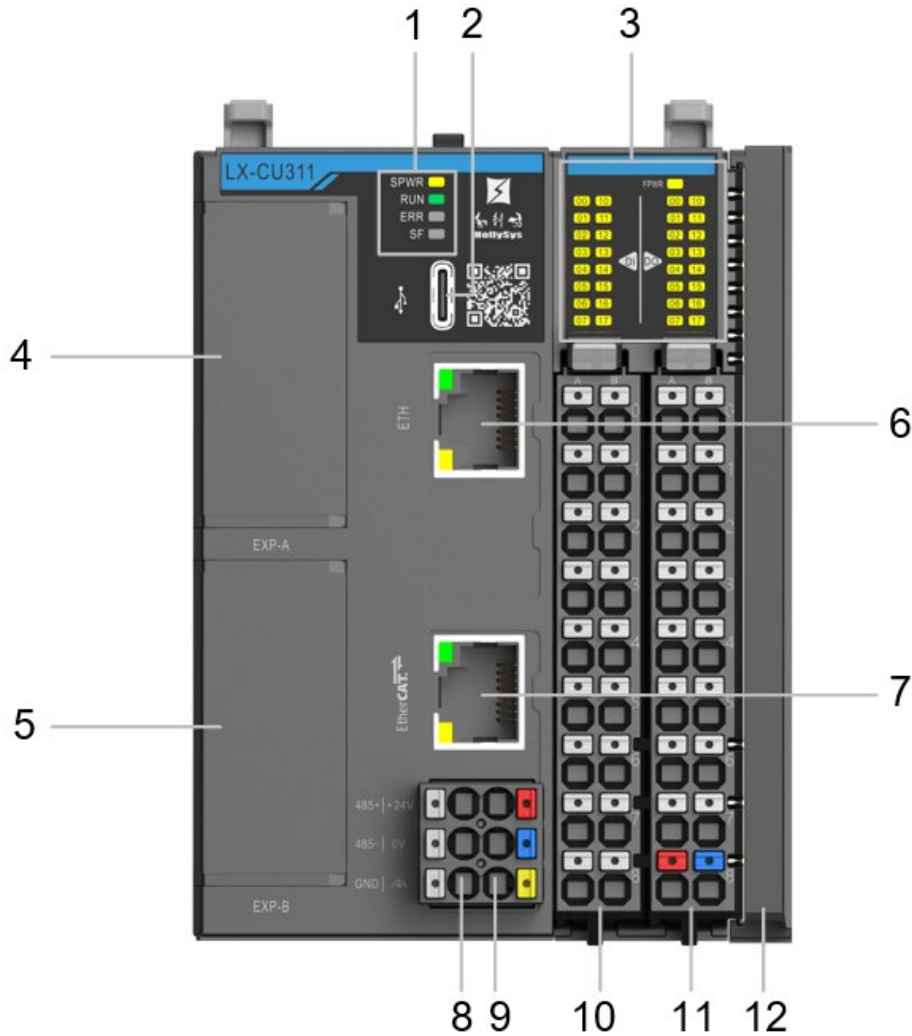
6.2.4.1 Module Appearance Introduction

Dimensions

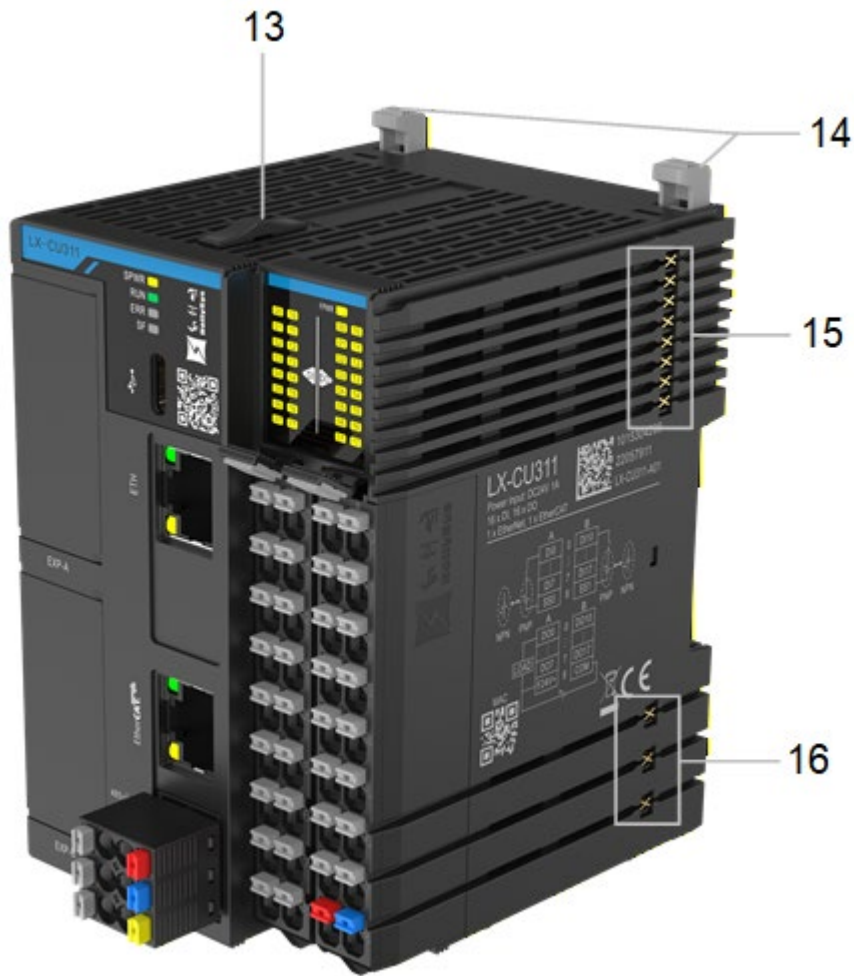
The dimensions of the LX-CU311 are shown in the figure below (Unit: mm).



Component Description

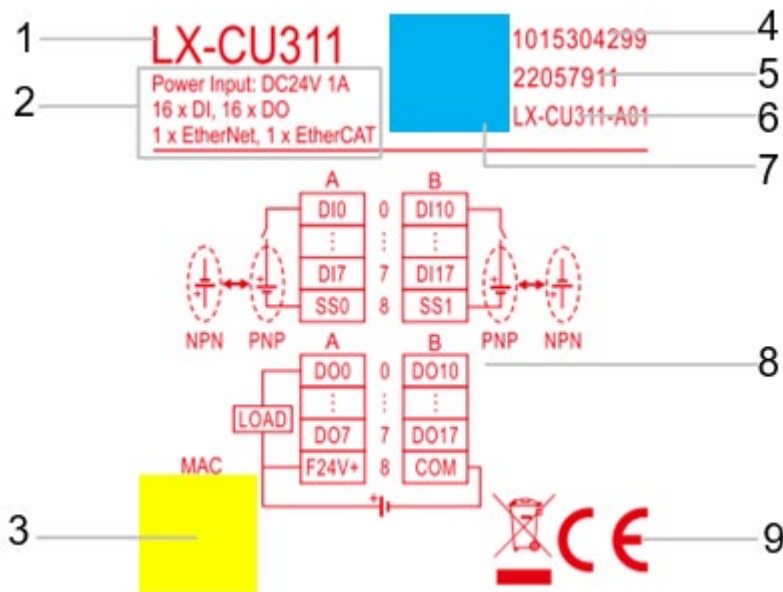


No.	Name	Description
1	Operating Status Indicator Lights	Indicates the module's operating status. For detailed definitions, refer to Indicator Light Description .
2	Type-C Port	Provides one USB2.0_Device interface via Type-C. Reserved.
3	Digital Input/Output Indicator Panel	Indicates the status of DI/DO channels. For detailed definitions, refer to Indicator Light Description .
4	Expansion Card Slot A	Used for installing expansion cards. For specific expansion card options, refer to Expansion Card Compatibility Table .
5	Expansion Card Slot B	
6	Ethernet Port	One northbound Ethernet interface. For detailed information, refer to the Ethernet port description .
7	EtherCAT Port	Used for EtherCAT communication.
8	RS-485 Wiring Terminal	For detailed description, refer to RS-485 Interface .
9	Power Supply Interface	For detailed description, refer to Power Supply Interface .
10	Pluggable DI Terminal Block	16-channel input terminal block. For detailed definitions, refer to DI Terminal Signal Definitions .
11	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For pin definitions, refer to DO Terminal and Field Power Signal Definitions .
12	Dust Cover	Each controller comes with a dust cover for module protection.



No.	Name	Description
13	Operating Mode Switch	Indicates the module's operating mode. For detailed definitions, refer to Operating Mode Description .
14	DIN Rail Top Mounting Latch	- Before mounting the module onto the DIN rail, pull this latch upwards to unlock it. - After mounting the module onto the DIN rail, press this latch downwards to lock it.
15	Gold Fingers (Edge Connector)	Internal bus contact points, used for inter-module data transmission, system power supply, etc.
16	Through-board Field Power Supply	Through-board field-side power supply.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Module Basic Information	Indicates module information such as power supply, communication, and terminals.
3	MAC Address	Indicates the module's MAC address (QR code).
4	SN Code	Indicates the serial number of the module (Plain Code).
5	Batch Number	Indicates the module's production batch number.
6	Module Hardware Version Number	Indicates the module's hardware version number and firmware serial number at the time of shipment. In LX-CU311-XXX, X is the hardware version number, and YY is the firmware serial number. If the module hardware version is LX-CU311-P-XXX, it indicates that the module supports moisture, mold, and salt spray resistance.
7	SN Code	Indicates the serial number of the module (QR code).
8	Wiring Terminal Diagram	Shows the connection diagram for the module's DI/DO wiring terminals.
9	Certification Standards	Indicates the certification standards the module complies with.

6.2.4.2 Technical Specifications

Basic Information

Parameter	Specification
Protection Rating	IP20
Moisture, Mold, and Salt Spray Resistance	Support
Power-on Startup Time	10s
Re-power-on Time Interval	≥10s
Data Retention Time	1 year
Storage Media Erase/Write Cycles	100,000 times
IEC Task Quantity	≤6
Public Variable Quantity	≤10,000

System Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 0.5A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Supported, Undervoltage Threshold 13V
	Undervoltage Warning	Supported, Undervoltage Warning Threshold 17.5V
	Overvoltage Protection	Not Supported
	Short-Circuit Protection	Supported
	Module Power Consumption	Max 3.5W
Field Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 6A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Not Supported
	Overvoltage Protection	Not Supported
	Short-Circuit and Overcurrent Protection	Not Supported
Dimensions (W*H*D)	70mm*100mm*80mm	
Weight	≤300g	
Hot Swapping	Hot-swapping of left expansion cards, right LT-e module, 6-pin power terminal, and DI/DO channel wiring terminals is not supported.	
Functional Safety Module	Supports 1 LX-LG901	
Data Snapshot	Support	

Memory

Parameter		Specification
SD Card		Maximum 32GB supported when optional SD expansion card is installed.
User Program Capacity		1MB
User Data Capacity		2MB
Retentive Memory Capacity		128KB
Data Area Size	M Area (Direct Address Area)	524,288 bytes, %MB0~%MB3999 support data retention.
	I Area (Input Area)	131,072 bytes
	Q Area (Output Area)	131,072 bytes
	G Area (General Variable Area)	917,504 bytes
	L Area (Retentive Area)	131,072 bytes
	D Area (Diagnostics Area)	262,144 bytes. The first 128KB does not support user-defined variables, is read-only and cannot be forced. The last 128KB supports system-defined variables (axis groups), but does not support user-defined variables or read/write operations.

Motion Control

Specification	Details
Motion Control Method	Supports EtherCAT bus motion control and pulse control.
Motion Control Commands	PLCopen standard commands, HMC motion commands
Bus Servo Cycle	Minimum supported cycle time: 2ms
Maximum Supported Bus Axes	8 axes
Pulse Control Axes	6 axes

Communication

Specification		Details	
USB-Type-C			
Number of Ports		1	
Interface		Type-C, reserved.	
LT-eBus Protocol			
Expand the quantity of LT-e series I/O and CM modules on the right side		16	
Northbound Ethernet			
Number of Ports		1	
Interface		RJ45	
Supported Protocols		EtherNet/IP Master/Slave Protocol, Modbus TCP Master/Slave Protocol, TCP/UDP, Tag Communication, Network Variable	
Communication Cable		Ethernet Cat.5e or higher shielded twisted-pair cable	
Communication Rate		10Mbps/100Mbps auto-negotiation	
Maximum Cable Length		100m	
EtherNet/IP Master/Slave Protocol		Cyclic Data Length	For versions below LX-CU311-B01_V1.1.0: 1400 bytes For LX-CU311-B01_V1.1.0 and above: 1444 bytes
		Acyclic Data Length	For versions below LX-CU311-B01_V1.1.0: 1400 bytes For LX-CU311-B01_V1.1.0 and above: 1444 bytes
		Maximum Number of Connections	Controller as master: Supports up to 32 connections Controller as slave: Supports up to 32 connections
		Reconnection After IP Change	After the master's IP is changed, it will automatically reconnect to slaves. After a slave's IP is changed, the connected master needs to re-download the project.
EtherNet/IP Tag Communication	Cyclic Communication (Class 1)	Communication Data Volume	Single connection maximum support 1444 bytes
		Maximum Number of Connections	Controller as Master: Supports up to 32 connections (shared with Instance ID connections and Class 3 connections) Controller as Slave: Supports up to up to 15 output tag groups, 32 connections (Class 1 + Class 3 limited to 32)
		Connection Type	Support Point-to-Point, Multicast
		RPI Time	Range: 1 to 16,000, unit: ms, default: 10
	Acyclic Communication (Class 3)	Communication Method	Communication via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication Data Volume	Maximum of 1444 bytes per connection
		Maximum Number of Connections	Supports up to 32 connections

		Number of Accessible Variables	No more than 5000 variables across all connections
Modbus TCP Protocol		Input/Output Area Size	524,288 bytes (M Area)
		Maximum Number of Master/Slave Connections	Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters
		Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
		Number of Function Code Channels	32
TCP/IP Free Protocol		Input/Output Area Size	1000 bytes
		Maximum Number of Connections	32
UDP Protocol		Input/Output Area Size	1000 bytes
		Maximum Number of Connections	Unicast: 32 network nodes Multicast: 32 network nodes
Network Variable		Communication Type	UDP Protocol
		Communication Rate	100 Mbit/s
		Transmission Speed	Minimum transmission cycle: 1 ms
		Maximum Number of Supported Transmit/Receive Groups	16 each, supporting simultaneous configuration of transmit groups and receive groups
		Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
		Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
Network Variable			
Communication Type		UDP Protocol	
Communication Rate		100 Mbit/s	
Transmission Speed		Minimum transmission cycle: 1 ms	
Maximum Number of Supported Transmit/Receive Groups		16 each, supporting simultaneous configuration of transmit groups and receive groups	
Number of Variables		Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes	
Data Type		Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.	
EtherCAT			
Number of Ports		1	
Interface		RJ45	
Maximum Number of Connectable Slaves		Up to 32 (Total of couplers and servo axes)	
Communication Cable		Ethernet Cat.5e or higher shielded twisted-pair cable	

Communication Rate	100Mbps
Maximum Cable Length	100m
Hot Connect	• Topology Types: Supports line and star topologies. • Quantity: No more than 32.  ○ The first slave cannot be a hot connect slave. ○ Synchronization Unit and Hot Connect cannot be used simultaneously. ○ When multiple modules of the same model are physically connected, to add one of them as a hot connect group, a Hot Connect Identifier in the range 1~65534 must be set.
Synchronization Unit	• Topology Types: Supports line and star topologies. • Quantity: No more than 32.  ○ Supports configuring any one or multiple slaves as a synchronization unit. ○ It is recommended not to enable both Hot Connect and Synchronization Unit functions on the same module simultaneously.
Ring Network	Not Supported
Communication Mode	FreeRun, DC, SM
Communication Cycle	Supports communication cycles: 2ms, 2.5ms, 4ms, 8ms Maximum bus cycle: 8ms, Minimum bus cycle: 2ms, Default: 2ms
Cyclic Data Volume	Maximum Input/Output Data: 8604 bytes each
Application Protocol	Supports COE (PDO\SDO)
Configure Slave Alias	Supported
Network Topology	Supports line, daisy-chain, and tree topologies.
Onboard Serial Communication	
Number of Interfaces	1
Interface Type	Pluggable Terminal
Level Standard	RS-485
Supported Protocols	Modbus RTU Master/Slave Protocol, Modbus ASCII Master/Slave Protocol, Free Port Protocol
Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
Number of Function Code Channels	32
Maximum Number of Connectable Slaves	Up to 32 (Slave distance to bus trunk ≤3m)
Communication Rate (bps)	Supports configurable rates: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200
Data Bits	7 bits / 8 bits, default 8 bits
Stop Bits	1 bit / 2 bits, default 2 bits
Parity	Odd/Even/None, default is None
Communication Distance	Rate 115200bps: Transmission distance <100m Rate 19200bps: Transmission distance <1000m
Cable Impedance	120Ω
Isolation Withstand Voltage	Isolation between system and channel: 500VAC, 1min, leakage

	current <10mA
Terminal Matching Resistor	No built-in 120Ω terminal matching resistor. Connect externally as needed.
Other	Prevents accidental connection of 24VDC.

Right-Side DI Channels

Specification	Details		
Number of Channels	16 channels total • 12 High-Speed Input channels: CH0~CH5 and CH10~CH15 • 4 Regular Input channels: CH6/CH7/CH16/CH17 The number of channels may be derated depending on ambient temperature and installation method. See Derating Requirements for details.		
Maximum Signal Frequency per Channel	200KHz		
Response Time ON/OFF	High-Speed	OFF→ON: < 2μs ON→OFF: < 2μs	
	Regular	OFF→ON: < 1000μs ON→OFF: < 1000μs	
Channel Mode	Configurable as PNP/NPN, 8 channels per group sharing one common terminal.		
High-Speed Input Signal Types	• 4-channel AB phase (signal source: external input pulse, supports 1x/2x/4x multiplication) • 12-channel single-phase (signal source: external input pulse) • 4-channel CW/CCW (signal source: external input pulse) • 4-channel pulse+direction (signal source: external input pulse) For details, see Terminal Definitions		
High-Speed Input Counter Value	32-bit		
High-Speed Input Counting Mode	Linear mode		
High-Speed Counter Reset Mode	• Z-phase + software reset (software configured Z-phase signal reset) • Software reset (via operation instruction)		
High-Speed Counter Comparison Control Method	Target value comparison generates interrupt (supports up to 100 interrupt segments. Target value can be set to relative or absolute mode. Interrupt modes include single-shot, cyclic, and cam mode).		
High-Speed Functions	• Probe: 12 probe input terminals, signal input pulse width: 2μs or more (probe signal source can be main controller high-speed counter, pulse axis, or slave). • External Interrupt: 8 input terminals, input pulse width: 2μs or more, trigger modes: rising edge, falling edge, edge trigger. • Frequency Measurement: 4 channels total, measurement frequency 200KHz, single-cycle measurement accuracy error 50ns. (See Terminal Definitions for details)		
Threshold Level	ON/OFF	PNP	NPN
	ON Voltage	> 15V	< 5V
	OFF Voltage	< 5V	> 15V
Voltage Range	24VDC±20% (19.2VDC ~ 28.8VDC)		

Software Filter	Filter time adjustable for each terminal. Regular input: 2~1000 in units of "ms". High-speed input: 2~10000 in units of "100ns".  - The effective channel value is 1μs or above. 200ns~1μs is mainly used for internal signal filtering. - To ensure effective counting, the filter time must not exceed: minimum signal pulse width - 500ns.
Channel-to-Channel Isolation	Supported
Isolation Withstand Voltage	Channel to system: 1000 VAC, 1 minute, leakage current <5mA
Interface Method	Front-facing wiring, 2*9PIN pluggable terminal.
Maximum Current per Channel	- High-speed input channel: 10mA at 24VDC - Regular input channel: 4mA at 24VDC
Diagnostics	None
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	- General application: 100m (standard cable, wire gauge 1.5mm²) - High-speed motion control application: 3m (double-shielded cable)

Right-Side DO Channels

Parameter	Specification	
Number of Channels	16 high-speed output channels total. Channel load current may be derated depending on ambient temperature and installation method. See Derating Requirements for details.	
Channel Type	NPN type, one common terminal.	
Threshold Voltage	ON Voltage	< 5V
	OFF Voltage	> 15V
OFF Maximum Leakage Current	100uA (-20~60°C) 10uA (25°C)	
Channel Output Frequency @ Maximum Load Current	2KHz~200KHz @ 100mA 0Hz~2KHz @ 500mA Note: Resistive load.	
Maximum Channel Output Frequency @ Load Type	- Resistive load: 200KHz - Inductive load: 0.5Hz - Lamp load: 10Hz	
Response Time ON/OFF	OFF→ON: < 1μs ON→OFF: < 1μs Note: External load for high-speed DO channel <3KΩ	
PWM Performance	Maximum frequency 200KHz, minimum resolution 2.5μs, adjustable duty cycle 0%~100%	
Channel Safety Value	Supports individual configuration for each channel. Output can be configured as: - Hold last value - Output preset value The above output configurations take effect when the iAT project stops.	
Output Load	0.5A/point, 4A/16 points (resistive load) 7.2W/point, 18W/16 points (inductive load) 5W/point, 18W/16 points (lamp load)	

	 - No built-in freewheeling diode; external diode required. - Output load capability is subject to derating based on ambient temperature and installation method. See Derating Requirements for details.
Parallel Connection Support	Not Supported
Conduction Voltage Drop (500mA)	Less than 0.5V
Channel-to-Channel Isolation	Not Supported
Isolation Withstand Voltage	Channel to system: 1000 VAC, 1 minute, leakage current <5mA
Power Supply Reverse Polarity Protection	Field-side power supply reverse polarity protection (COM and F24V+)
Channel Protection Functions	Supports overcurrent protection (individual current limiting, hiccup mode). Supports overtemperature protection (all channels turned off). Recovery mode after protection: Automatic recovery.
Interface Method	Front-facing wiring, 2*9PIN pluggable terminal.
Diagnostics	None
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	- General application: 100m (standard cable, wire gauge 1.5mm²) - High-speed motion control application: 3m (double-shielded cable)

Left Expansion Slot

Parameter	Specification
Number of Expansion Slots	2
Expansion Slots	Bound to Slot A: LX-EC031 Bound to Slot B: LX-EC007 Other expansion cards support mixing in either Slot A or B.
Hot-Swapping	Not Supported

6.2.4.3 Indicators Lights

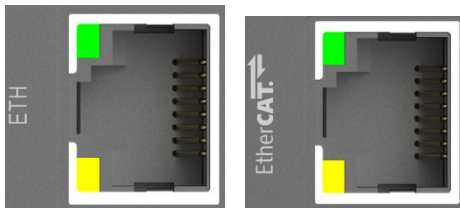


LED Name	Color	State	Description
SPWR	Yellow	Solid On	System-side power supply is ON
		Off	System-side power supply is OFF
RUN	Green	Solid On	User project is loaded but not running
		Slow Blink	User project is running
		Off	No user project loaded
ERR	Red	Solid On	A fault has occurred

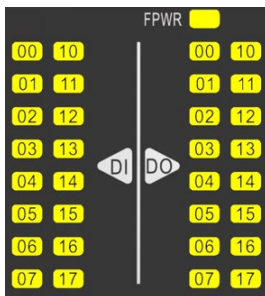
		Off	No fault
SF	Yellow	Fast Blink	No configuration for LT right-side expansion, or configuration does not match the actual scanned I/O modules
		Single Flash	LT right-side expansion initialization communication failed or I/O module communication offline (500ms on, 500ms off)
		Off	No fault on LT right-side expansion modules



- During upgrade, RUN and ERR blink slowly in alternation (0.5s on, 0.5s off).
- When the controller enters the "Reset" or "Restore Factory Settings" judgment process, RUN and ERR blink slowly simultaneously (0.5s on, 0.5s off).



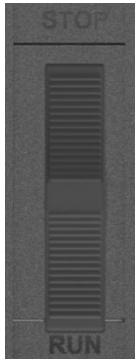
LED Name	Color	State	Description
ETH RJ45 Built-in LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Blinking	Data transmission/reception in progress
		Yellow LED Solid On	Link established
		Yellow LED Off	Link not established
EtherCAT RJ45 Built-in LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Blinking	Data transmission/reception in progress
		Yellow LED Solid On	Link established
		Yellow LED Off	Link not established



LED Name	Color	State	Description
FPWR	Yellow	Solid On	Field-side power supply is ON
		Off	Field-side power supply is OFF

32*IO	Yellow	According to Channel Status	On: ON
			Off: OFF

6.2.4.4 Operating Modes



- RUN: Run Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.
STOP Stop Mode	Stop mode.

RUN

- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

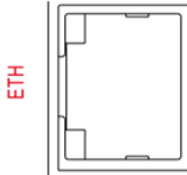
- The controller does not execute the user project; all POU's under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.4.5 Module Communication Interface and Terminal Wiring Diagram

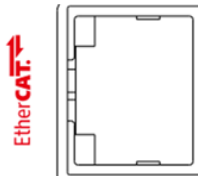
Ethernet Port

ETH:

- Northbound Ethernet Interface
- Default IP Address :
 - When the "Controller Firmware Version" is LX-CU311-A01_V1.0.1, the default IP address is 192.168.0.1. If the default IP address is not modified and the "Controller Firmware Version" is upgraded to LX-CU311-A01_V1.0.2 or later, the controller's IP address will be automatically updated to 192.168.0.250. If the default IP address has been manually modified, the controller IP address remains unchanged after the upgrade.
 - When the "Controller Firmware Version" is LX-CU311-A01_V1.0.2 or later, the default IP address is 192.168.0.250.
- Supported Protocols: EtherNet/IP Master/Slave Protocol, Modbus TCP Master/Slave Protocol, TCP/UDP, Tag Communication, Network Variable
- Supports project download and online monitoring/debugging



EtherCAT Interface



EtherCAT:

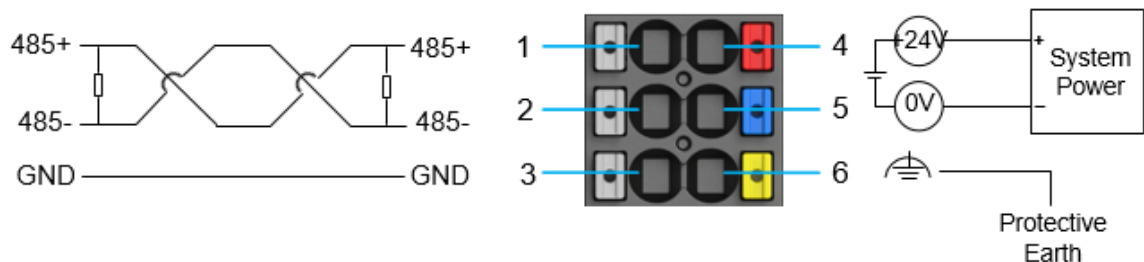
- EtherCAT Interface
- Supports EtherCAT Protocol
- Supports up to 32 slaves (total of couplers + servo axes)

USB Interface



Provides one USB2.0_Device interface via Type-C. Reserved.

RS-485 / Power Supply Interface



The RS-485 interface and the 24VDC system power supply share a 2*3pin terminal block. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth

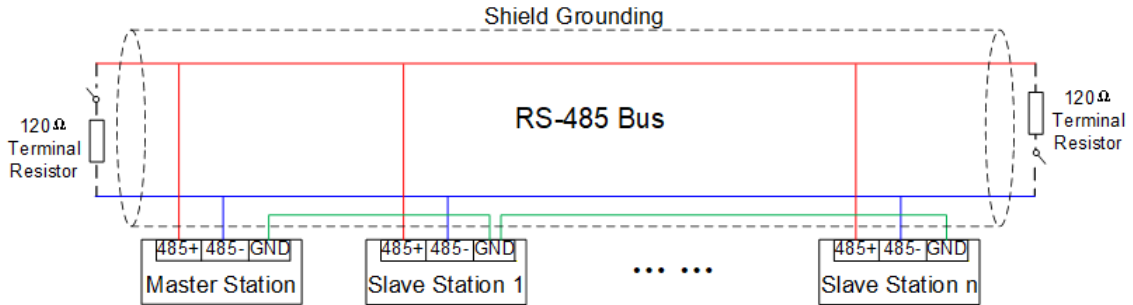


Termination resistors should be externally connected as needed.

Additional Information:

It is recommended to use shielded twisted-pair cables for the RS-485 bus, connecting 485+ and 485- with twisted pairs. Connect 120Ω termination resistors at both ends of the bus to prevent signal reflection; connect the signal ground (GND) of all 485 signal nodes together. A maximum of 32 nodes is supported, with the distance from each node's branch line to the main bus less than 3m.

The topology structure of the RS-485 bus connection is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-Speed Digital Input 0	B0	DI10	High-Speed Digital Input 10
A1	DI1	High-Speed Digital Input 1	B1	DI11	High-Speed Digital Input 11
A2	DI2	High-Speed Digital Input 2	B2	DI12	High-Speed Digital Input 12
A3	DI3	High-Speed Digital Input 3	B3	DI13	High-Speed Digital Input 13
A4	DI4	High-Speed Digital Input 4	B4	DI14	High-Speed Digital Input 14
A5	DI5	High-Speed Digital Input 5	B5	DI15	High-Speed Digital Input 15
A6	DI6	High-Speed Digital Input 6	B6	DI16	High-Speed Digital Input 16
A7	DI7	High-Speed Digital Input 7	B7	DI17	High-Speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1

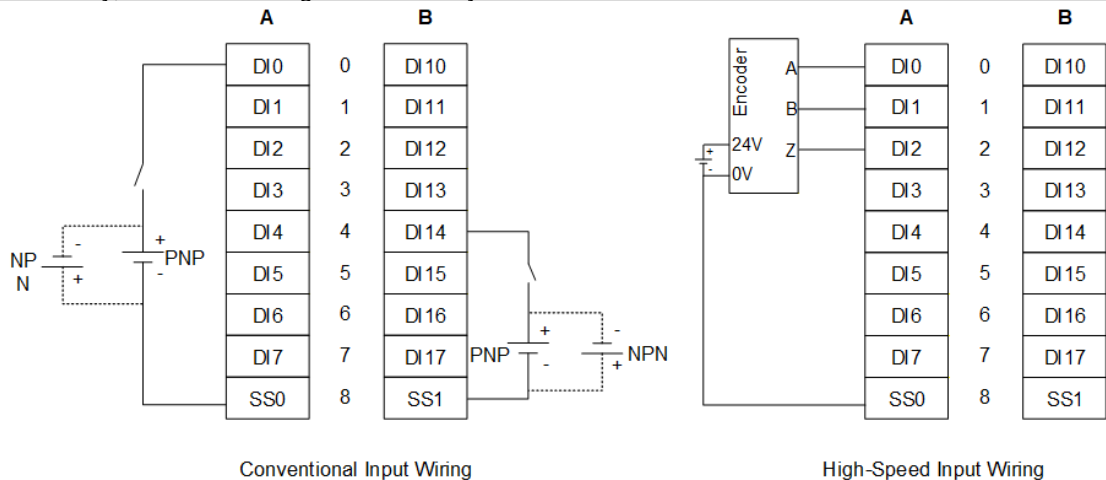


- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single-Phase	CW/CCW	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max. Frequency	100KHz	200KHz	100KHz	200KHz	200KHz	200KHz	-
DI0	A0	√	CW0	Pulse0	√	√	
DI1	B0	√	CCW0	Direction 0	√	√	
DI2	Z0	√	Z0	Z0	√	√	√
DI3	A1	√	CW1	Pulse1	√	√	√
DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for channels DI6/DI7/DI16/DI17 is 50KHz; for other channels it is 200KHz.
- There are a total of 12 single-phase channels, which can be assigned to any unoccupied terminal.
- There are a total of 12 probe channels, which can be assigned to any unoccupied terminal.
- There are a total of 4 frequency measurement channels, which can be assigned to any unoccupied terminal.
- When high-speed functions and corresponding channel filter parameters are set simultaneously, the filter parameters take priority. For the same high-speed counter, the filter parameters for its two terminals must be set identically; an alarm will be generated if they are inconsistent.



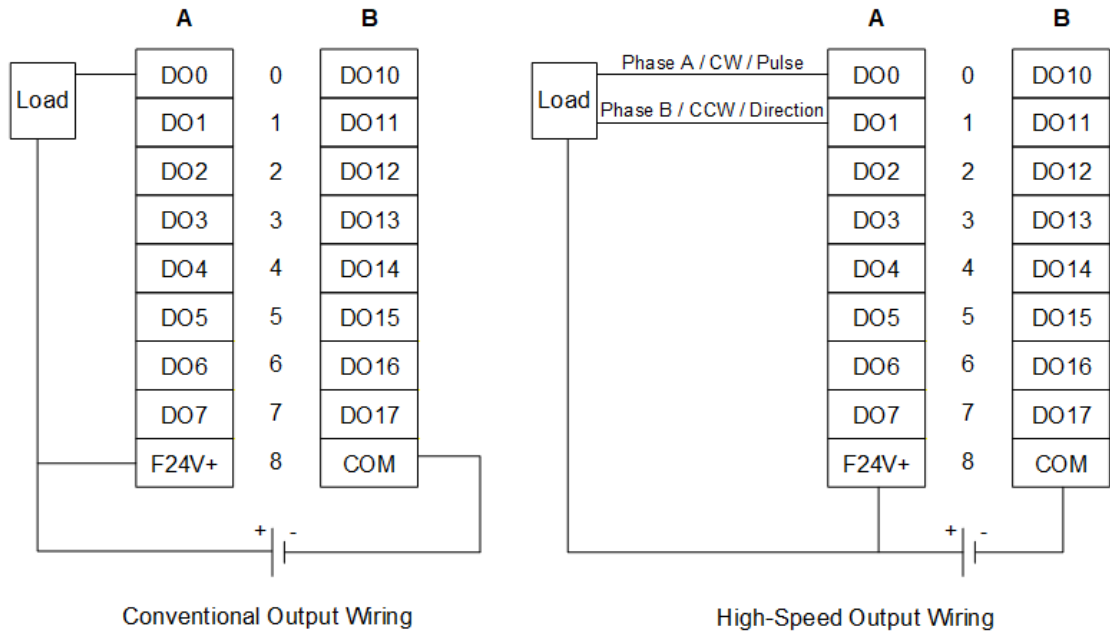
The DO terminal and field power signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-Speed Digital Output 0	B0	DO10	High-Speed Digital Output 10
A1	DO1	High-Speed Digital Output 1	B1	DO11	High-Speed Digital Output 11
A2	DO2	High-Speed Digital Output 2	B2	DO12	High-Speed Digital Output 12
A3	DO3	High-Speed Digital Output 3	B3	DO13	High-Speed Digital Output 13
A4	DO4	High-Speed Digital Output 4	B4	DO14	High-Speed Digital Output 14
A5	DO5	High-Speed Digital Output 5	B5	DO15	High-Speed Digital Output 15
A6	DO6	High-Speed Digital Output 6	B6	DO16	High-Speed Digital Output 16
A7	DO7	High-Speed Digital Output 7	B7	DO17	High-Speed Digital Output 17
A8	F24V+	Field Power Positive	B8	COM	Field Power Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unoccupied terminal; the direction terminal is user-controlled.	√	√	√	√
DO1	√		√	√	√	√
DO2	√		√	√	√	√
DO3	√		√	√	√	√
DO4	√		√	√	√	√
DO5	√		√	√	√	√
DO6	√		√	√	√	√
DO7	√		√	√	√	√
DO10	√		√	√	√	√
DO11	√		√	√	√	√
DO12	√		√	√	√	√
DO13	√		√	√	√	√
DO14	√		√	√	√	√
DO15	√		√	√	√	√
DO16	√		√	√	√	√
DO17	√		√	√	√	√



- LX-CU311 supports a maximum of 6 axes.
- For LX-CU311, 3 axes can support four modes: Single Pulse, Pulse plus Direction, CW/CCW, A/B. The other 3 axes support only two modes: Single Pulse, Pulse plus Direction.
- There are a total of 4 PWM channels, which can be assigned to any unoccupied terminal.



6.2.5 LX-CU331 Compact Network Motion Controller

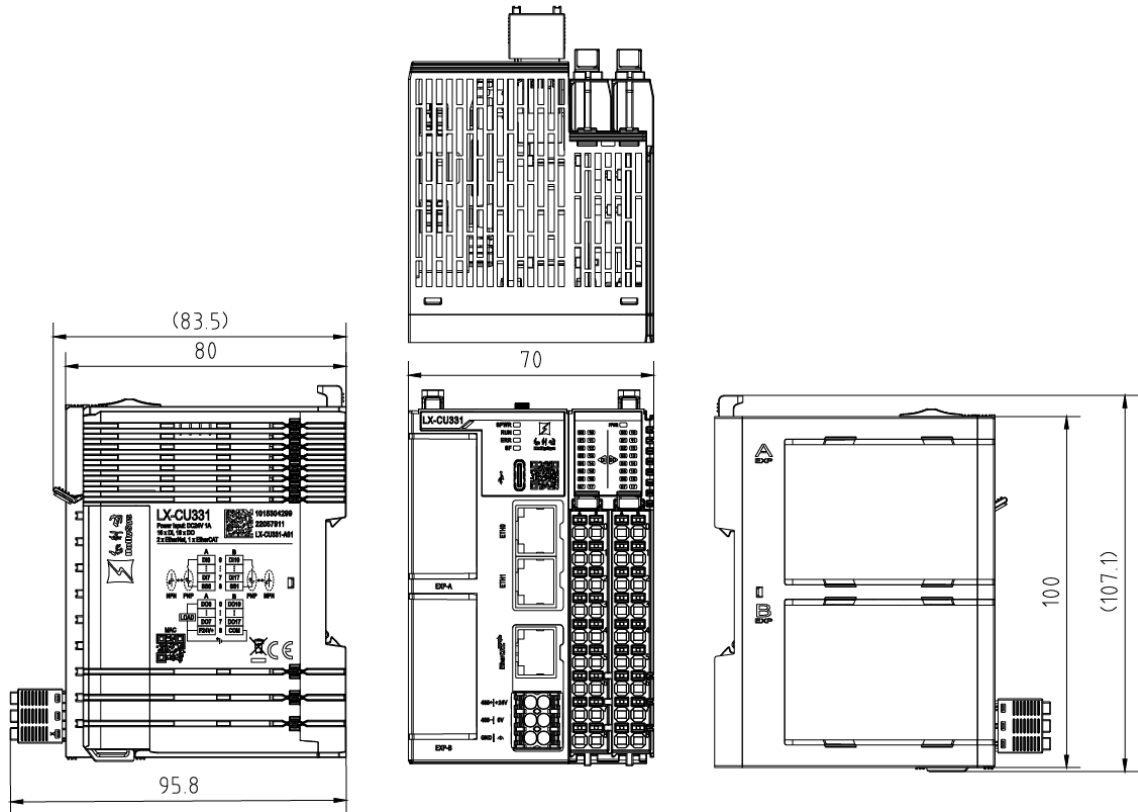
The LX-CU331 controller implements the "input - compute - output" control process and motion control. Its main functions are as follows:

- Supports single IP, dual northbound Ethernet interfaces;
- Supports bus-based motion control via EtherCAT interface;
- Supports pulse-based motion control;
- Main unit features two expansion card slots;
- Main unit includes 12 high-speed DI and 4 regular DI channels;
- Main unit includes 16 high-speed DO channels;
- Supports one isolated RS-485 interface;
- Expands to the right via bus for LT-e distributed I/O.

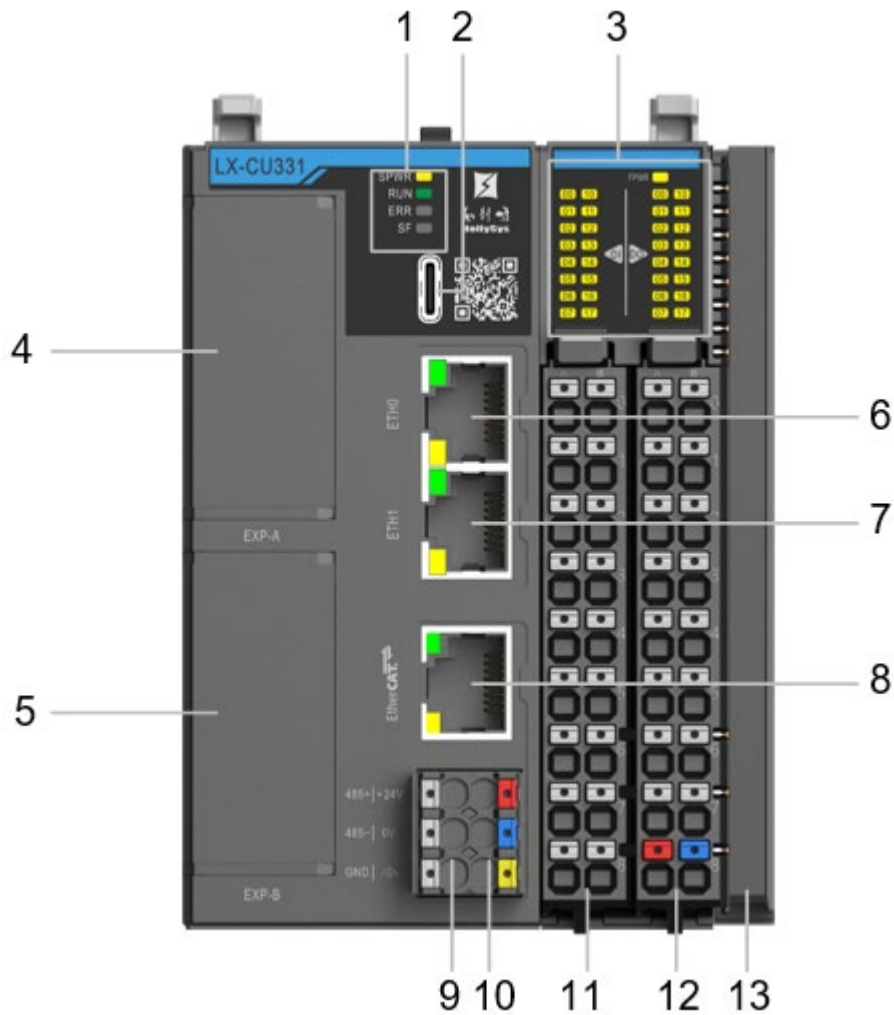
6.2.5.1 Module Appearance Introduction

Dimensions

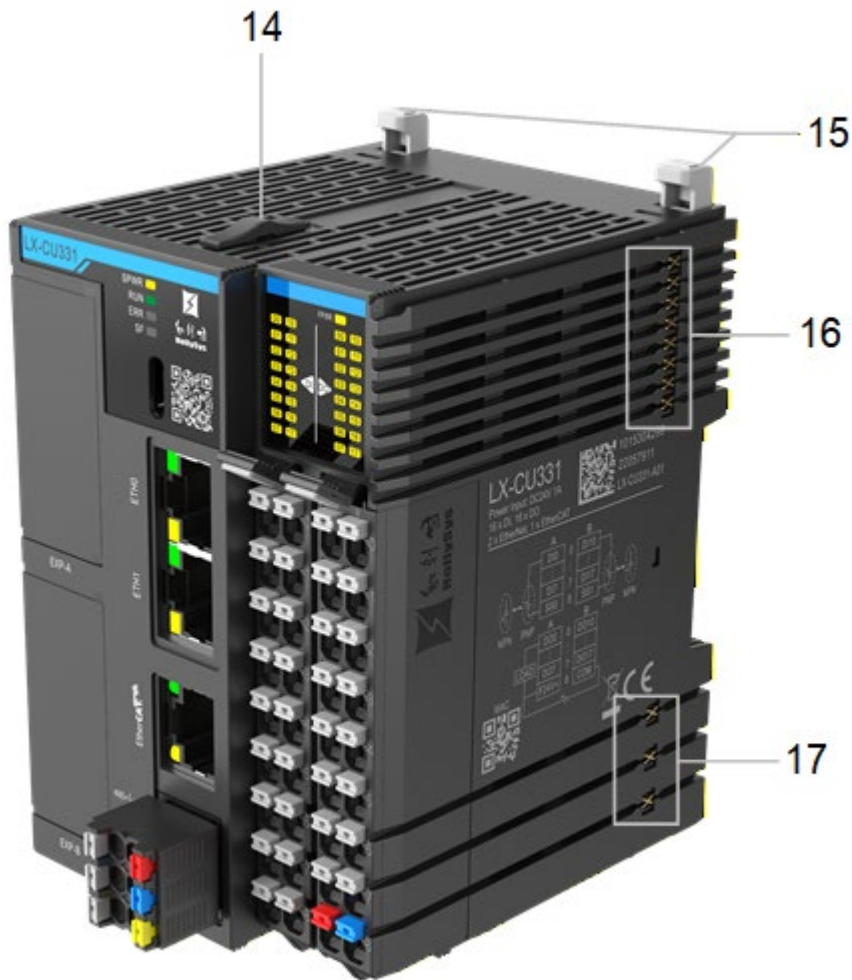
The dimensions of the LX-CU331 are shown in the figure below (unit: mm).



Component Description

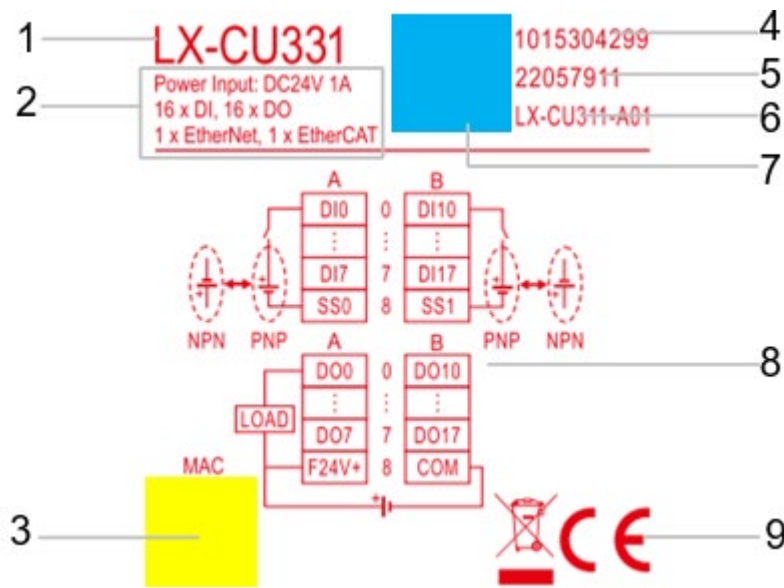


No.	Name	Description
1	Status Indicators	Indicate the operating status of the module. For detailed definitions, see Indicator Description .
2	Type-C Port	One USB2.0_Device interface is brought out via Type-C. Reserved.
3	Digital Input/Output Indicator Panel	Indicate the status of DI/DO channels. For detailed definitions, see Indicator Description .
4	Expansion Card Slot A	Used for installing expansion cards. For specific expansion card options, refer to Expansion Card Compatibility List .
5	Expansion Card Slot B	
6	Ethernet Port 1	Two northbound Ethernet interfaces. For detailed information, refer to the Ethernet port description .
7	Ethernet Port 2	
8	EtherCAT Port	Used for EtherCAT communication.
9	RS-485 Terminal Block	For detailed description, see RS-485 Interface .
10	Power Interface	For detailed description, see Power Interface .
11	Pluggable DI Terminal Block	16-channel input terminal block. For detailed definitions, refer to DI Terminal Signal Definition .
12	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For detailed definitions, refer to DO Terminal and Field Power Signal Definition .
13	Dust Cover	Each controller comes with one dust cover for module protection.



No.	Name	Description
14	Operating Mode Switch	Indicates the operating mode of the module. For detailed definition, see Operating Mode Description .
15	DIN Rail Top Mounting Latch	- Before mounting the module onto the DIN rail, pull this latch upward to the unlocked position. - After mounting the module onto the DIN rail, press this latch downward to the locked position.
16	Gold Finger Contacts	Internal bus contact points for inter-module data transmission, system power supply, etc.
17	Through-Panel Field Power	Through-panel field-side power supply.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Basic Module Information	Indicates module power, communication, terminal information, etc.
3	MAC Address	Indicates the MAC address of the module (QR code).
4	SN Code	Indicates the serial number of the module (Plain Code).
5	Batch Number	Indicates the production batch number of the module.
6	Module Hardware Version Number	Indicates the hardware version number and firmware serial number at the time of factory shipment. In LX-CU331-XXX, X is the hardware version number, and YY is the firmware serial number. If the module hardware version is LX-CU331-P-XXX, it indicates that the module supports moisture, mold, and salt spray resistance.
7	SN Code	Indicates the serial number of the module (QR code).
8	Terminal Connection Diagram	Shows the connection diagram for the module's DI/DO terminals.
9	Certification Standards	Indicates the certification standards the module complies with.

6.2.5.2 Technical Specifications

Basic Information

Parameter	Specification
Protection Rating	IP20
Moisture, Mold, and Salt Spray Resistance	Support
Power-on Startup Time	10s
Re-power-on Time Interval	≥10s
Data Retention Time	1 year
Storage Media Erase/Write Cycles	100,000 times
IEC Task Quantity	For versions below LX-CU331-B01_V1.1.0: ≤6 For LX-CU331-B01_V1.1.0 and above: ≤8

Public Variable Quantity	≤20000	
System Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 0.5A
	Reverse Connection Protection	Supported
	Undervoltage Protection	Supported, Undervoltage Threshold 13V
	Undervoltage Warning	Supported, Undervoltage Threshold 17.5V
	Overvoltage Protection	Not Supported
	Short-circuit Protection	Supported
	Module Body Power Consumption	Max 4.5W
Field Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 6A
	Reverse Connection Protection	Supported
	Undervoltage Protection	Not Supported
	Overvoltage Protection	Not Supported
	Short-circuit and Overcurrent Protection	Not Supported
Dimensions (W*H*D)	70mm*100mm*80mm	
Weight	≤300g	
Hot Swapping	Not supported for hot plugging left expansion cards, right LT-e modules, 6-pin power terminals, and DI/DO channel wiring terminals	
Functional Safety Module	Supports 3 LX-LG901	
Data Snapshot	Support	

Memory

Parameter		Specification
SD Card		Up to 32GB supported when optional SD expansion card is installed
User Program Capacity		4MB
User Data Capacity		8MB
Retentive Memory Capacity		128KB
Data Area Size	M Area (Direct Address Area)	2097152 bytes, %MB0~%MB3999 support retentive memory
	I Area (Input Area)	131072 bytes
	Q Area (Output Area)	131072 bytes
	G Area (General Variable Area)	5373952 bytes
	L Area (Retentive Area)	131072 bytes
	D Area (Diagnostic Area)	524288 bytes, the first 128KB do not support variable definition, are read-only and cannot be forced; the last 384KB support system-defined variables (axis groups), but do not support user-defined variables and read/write operations

Motion Control

Parameter	Specification
Motion Control Method	Supports EtherCAT bus motion control and pulse control.
Motion Control Commands	PLCopen standard commands, HMC motion commands
Bus Servo Cycle	Minimum supported: 1ms
Maximum Supported Bus Axes	8 axes
Pulse Control Axes	6 axes

Communication

Parameter		Specification	
USB-Type-C			
Number of Ports		1	
Interface		Type-C, Reserved	
LT-eBus Protocol			
Expand the quantity of LT-e series I/O and CM modules on the right side		16	
Northbound Ethernet			
Number of Ports		2, Single IP	
Interface		RJ45	
Supported Protocols		EtherNet/IP Master/Slave, Modbus TCP Master/Slave, TCP/UDP, Tag Communication, OPC UA, Network Variable, File Transfer Protocol	
Communication Cable		Ethernet Cat.5e or higher shielded twisted pair cable	
Communication Speed		10Mbps/100Mbps Auto-negotiation	
Maximum Cable Length		100m	
EtherNet/IP Master/Slave Protocol		Cyclic Data Length	For versions below LX-CU331-B01_V1.1.0: 1400 bytes For LX-CU331-B01_V1.1.0 and above: 1444 bytes
		Acyclic Data Length	For versions below LX-CU331-B01_V1.1.0: 1400 bytes For LX-CU331-B01_V1.1.0 and above: 1444 bytes
		Maximum Number of Connections	Controller as master: Supports up to 32 connections Controller as slave: Supports up to 32 connections
		Reconnection After IP Change	When the Master's IP changes, it will automatically reconnect to Slaves. When a Slave's IP changes, the connected Master needs to be downloaded again.
EtherNet/IP Tag Communication	Cyclic Communication (Class 1)	Communication Data Volume	Single connection maximum support 1444 bytes
		Maximum Number of Connections	Controller as Master: Supports up to 32 connections (shared with Instance ID connections and Class 3 connections) Controller as Slave: Supports up to up to 15 output tag groups, 32 connections (Class 1 + Class 3 limited to 32)
		Connection Type	Support Point-to-Point, Multicast
		RPI Time	Range: 1 to 16,000, unit: ms, default: 10
	Acyclic Communication (Class 3)	Communication Method	Communication via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication Data Volume	Maximum of 1444 bytes per connection

		Maximum Number of Connections	Supports up to 32 connections
		Number of Accessible Variables	No more than 5000 variables across all connections
OPC UA		Data Types	• Simple Variables: Pointers, references, and time types are not supported. • Structures, Enumerations, Unions, Function Blocks: Only instances are supported; internal member variables within instances are not supported. • Array: Nested array is not supported; only one-dimensional multi-order arrays are supported, and array members are not supported. • GVL • POU of PRG type (only VAR, VAR_INPUT, and VAR_OUTPUT types within PRG are supported) • GVL and instances under the toolbox
		Maximum Number of Sessions	5
		Maximum Number of Subscriptions	Up to 5 subscriptions per session, supporting up to 25 subscriptions simultaneously
		Number of Accessible Variables	Up to 500 variables per subscription Up to 10,000 variables across all subscriptions
Modbus TCP Protocol		Input/Output Area Size	2097152 bytes (M Area)
		Max Master/Slave Connections	Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters
		Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)
		Number of Function Code Channels	32
TCP/IP Free Protocol		Input/Output Area Size	1000 bytes
		Maximum Number of Connections	32
UDP Protocol		Input/Output Area Size	1000 bytes
		Maximum Number of Connections	Unicast: 32 network nodes Multicast: 32 network nodes
File Transfer Protocol (FTP)		The controller can act as a server	
Network Variable		Communication Type	UDP Protocol
		Communication Rate	100 Mbit/s
		Transmission Speed	Minimum transmission cycle: 1 ms
		Maximum Number of Supported Transmit/Receive Groups	16 each, supporting simultaneous configuration of transmit groups and receive groups

	Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
	Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
EtherCAT		
Number of Ports	1	
Interface	RJ45	
Connectable Slave Devices	Up to 96 (Coupler + servo axis total)	
Communication Cable	Ethernet Cat.5e or higher shielded twisted pair cable	
Communication Speed	100Mbps	
Maximum Cable Length	100m (Transmission distance between two nodes shall not exceed 100m)	
Hot Connect	 • Topology Types: Supports line and star topologies • Quantity: No more than 32 ○ The first slave cannot be a hot connect. ○ Synchronization Unit and Hot Connect cannot be used simultaneously. ○ When multiple modules of the same model are physically connected, if one of them needs to be added as a Hot Connect group, a Hot Connect Identifier in the range of 1~65534 must be set.	
Synchronization Unit	 • Topology Types: Supports line and star topologies • Quantity: No more than 32 ○ Any one or more slaves can be configured as a synchronization unit. ○ It is recommended not to enable both Hot Connect and Synchronization Unit functions on the same module simultaneously.	
Ring Network	Not Supported	
Communication Mode	FreeRun, DC, SM	
Communication Cycle	Supports communication cycles of 1ms, 1.5ms, 2ms, 2.5ms, 3ms, 3.5ms, 4ms, 4.5ms, 5ms, 5.5ms, 6ms, 6.5ms, 7ms, 7.5ms, 8ms Maximum bus cycle: 8ms, Minimum bus cycle: 1ms, Default: 2ms	
Cyclic Data Size	Maximum input/output data volume: 8604 bytes each	
Application Protocol	Supports COE (PDO/SDO)	
Configure Slave Alias	Supported	
Network Topology	Supports line, daisy-chain, tree topologies	
Onboard Serial Communication		
Number of Interfaces	1	
Interface Type	Plug-in Terminal Block	

Signal Standard	RS-485
Supported Protocols	Modbus RTU Master/Slave, Modbus ASCII Master/Slave, Freeport Protocol
Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)
Number of Function Code Channels	32
Connectable Slave Devices	Up to 32 supported (slave to bus backbone ≤3m)
Baud Rate (bps)	Supports 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200 configurable
Data Bits	7 bits/8 bits, default 8 bits
Stop Bits	1 bit/2 bit, default 2 bits
Parity	Odd/Even/None, default is None
Communication Distance	Baud rate 115200bps: Transmission distance <100m Baud rate 19200bps: Transmission distance <1000m
Cable Impedance	120Ω
Isolation	System to channel isolation, 500VAC, 1min, leakage current <10mA
Terminating Resistor	No built-in 120Ω terminating resistor, external connection required as needed
Others	Prevents 24VDC misconnection

Right-side DI Channels

Parameter	Specification	
Number of Channels	16 channels in total • 12 high-speed inputs: CH0~CH5 and CH10~CH15 • 4 regular inputs: CH6/CH7/CH16/CH17 Channel count may be derated depending on ambient temperature and installation method. For details, see Derating Requirements	
Maximum Channel Signal Frequency	200KHz	
Response Time ON/OFF	High-Speed	OFF→ON: <2μs ON→OFF: <2μs
	Regular	OFF→ON: <1000μs ON→OFF: <1000μs
Channel Mode	PNP/NPN configurable, 8 channels per group sharing one common terminal	
High-speed Input Signal Types	• 4 channels AB-phase (signal source: external input pulse, supports 1/2/4x multiplication) • 12 channels single-phase (signal source: external input pulse) • 4 channels CW/CCW (signal source: external input pulse) • 4 channels pulse+direction (signal source: external input pulse) For details, see Terminal Definitions	
High-speed Input Count Value	32-bit	
High-speed Input Counting Mode	Linear Mode	
High-speed Counter Reset Mode	• Z-phase + Software Reset (Z-phase signal reset via software) • Software Reset (via command instruction)	
High-speed Counter Comparison Control Method	Target value comparison generates interrupt (Supports up to 100 interrupt segments, target value can be set to relative or absolute mode, interrupt includes single mode, cyclic mode, and cam mode)	

High-speed Functions	- Probe: 12 probe input terminals, input pulse width: 2μs or more (probe signal source can be main controller high-speed counter, pulse axis, or slave device) - External Interrupt: 8 input terminals, input pulse width: 2μs or more, trigger mode: rising edge, falling edge, edge trigger - Frequency Measurement: 4 channels, measurable frequency 200KHz, measurement error per single cycle 50ns (For details, see Terminal Definitions)		
Threshold Voltage	ON/OFF	PNP	NPN
	ON Voltage	>15V	<5V
	OFF Voltage	<5V	>15V
Voltage Range	24VDC±20% (19.2VDC ~ 28.8VDC)		
Software Filtering	Filter time adjustable per terminal Regular input: 2~1000 unit "ms" High-speed input: 2~10000 unit "100ns"  - Channel effective value is 1μs or more. 200ns~1μs is mainly used for internal signal filtering. - To ensure effective counting, the filter time must not exceed: minimum signal pulse width - 500ns.		
Inter-channel Isolation	Supported		
Isolation Withstand Voltage	Channel to system: 1000 VAC, for 1 minute, leakage current <5mA		
Connection Method	Front-panel wiring, 2*9PIN terminal block, pluggable		
Maximum Current per Channel	- High-speed input channel: 10mA at 24VDC - Regular input channel: 4mA at 24VDC		
Diagnostics	None		
Terminal Wire Gauge Range	0.2~1.5mm ²		
Terminal Wire Length	- General application: 100m (standard cable, 1.5mm² gauge) - High-speed motion control application: 3m (double-shielded cable)		

Right-side DO Channels

Parameter	Specification	
Number of Channels	16 high-speed output channels in total Channel load current may be derated depending on ambient temperature and installation method. For details, see Derating Requirements	
Channel Type	NPN type, one common terminal	
Threshold Voltage	ON Voltage	<5V
	OFF Voltage	>15V
OFF Maximum Leakage Current	100uA (-20~60°C) 10uA (25°C)	
Channel Output Frequency @ Max Load Current	2KHz~200KHz@100mA 0Hz~2KHz@500mA Note: Resistive load	
Channel Maximum Output Frequency @ Load Type	- Resistive load: 200KHz - Inductive load: 0.5Hz - Lamp load: 10Hz	
Response Time ON/OFF	OFF→ON: <1μs ON→OFF: <1μs Note: External load for high-speed DO channel <3KΩ	
PWM Performance	Maximum frequency 200KHz, minimum resolution 2.5μs, adjustable duty cycle 0%~100%	
Channel Safe Value	Supports individual configuration per channel, output can be	

	configured as: • Hold last value • Output preset value The above output configurations take effect when the iAT project stops.
Output Load	• 0.5A/point, 4A/16 points (resistive load) • 7.2W/point, 18W/16 points (inductive load) • 5W/point, 18W/16 points (lamp load)  ○ No built-in freewheeling diode, external diode required. ○ Output load capacity may be derated depending on ambient temperature and installation method. For details, see Derating Requirements
Parallel Connection Supported	Not Supported
Conduction Voltage Drop (500mA)	Less than 0.5V
Inter-channel Isolation	Not Supported
Isolation Withstand Voltage	Channel to system: 1000 VAC, for 1 minute, leakage current <5mA
Power Supply Reverse Connection Protection	Field-side power supply reverse connection protection (COM and F24V+)
Channel Protection Functions	Supports overcurrent protection (current limiting, hiccup) Supports overtemperature protection (all channels turn off) Output recovery method after protection: Automatic recovery
Connection Method	Front-panel wiring, 2*9PIN terminal block, pluggable
Diagnostics	None
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	• General application: 100m (standard cable, 1.5mm² gauge) • High-speed motion control application: 3m (double-shielded cable)

Left Expansion Slots

Parameter	Specification
Number of Expansion Slots	2
Expansion Slots	Bound to Slot A: LX-EC031 Bound to Slot B: LX-EC007 Other expansion cards support mixing in Slot A/B
Hot Plugging	Not Supported

6.2.5.3 Indicators Lights

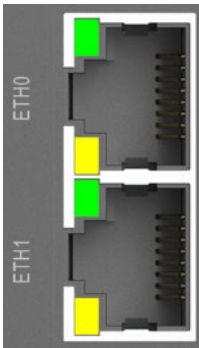


LED Name	Color	Status	Description
SPWR	Yellow	Steady On	System-side power supply is on
		Steady Off	System-side power supply is off

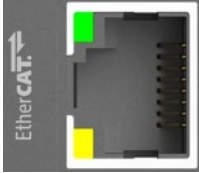
RUN	Green	Steady On	User project is loaded but not running
		Slow Flashing	User project is running
		Steady Off	User project is not loaded
ERR	Red	Steady On	Fault occurred
		Steady Off	No fault
SF	Yellow	Fast Flashing	LT right expansion has no configuration or the configuration does not match the actual scanned I/O modules
		Single Flash	LT right expansion initialization communication failed or I/O module communication is offline (500ms on, 500ms off)
		Steady Off	LT right expansion module has no fault



- During upgrade, RUN and ERR flash alternately at a slow rate (0.5s on, 0.5s off).
- When the controller enters the "Reset" and "Restore Factory Settings" judgment process, RUN and ERR flash simultaneously at a slow rate (0.5s on, 0.5s off).



LED Name	Color	Status	Description
ETH0 Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Steady Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Steady Off	Link not established
ETH1 Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Steady Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Steady Off	Link not established

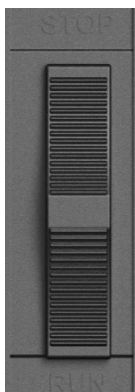


LED Name	Color	Status	Description
EtherCAT Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Steady Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Steady Off	Link not established



LED Name	Color	Status	Description
FPWR	Yellow	Steady On	Field-side power supply is on
		Steady Off	Field-side power supply is off
32*IO	Yellow	According to channel status	On: ON
			Off: OFF

6.2.5.4 Operating Modes



- RUN: Operating Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.

STOP Stop Mode	Stop mode.
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RUN

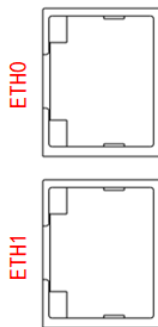
- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

- The controller does not execute the user project; all POU's under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.5.5 Module Communication Interface and Terminal Wiring Diagram

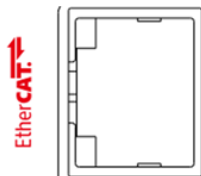
Ethernet Ports



ETH0/ETH1:

- Northbound Ethernet Interface
- Default IP Address: 192.168.0.250
- Supported Protocols: EtherNet/IP Master/Slave Protocol, Modbus TCP Master/Slave Protocol, TCP/UDP, Tag Communication, OPC UA, Network Variable, File Transfer Protocol
- Supports program download, online monitoring, and debugging

EtherCAT Interface



EtherCAT:

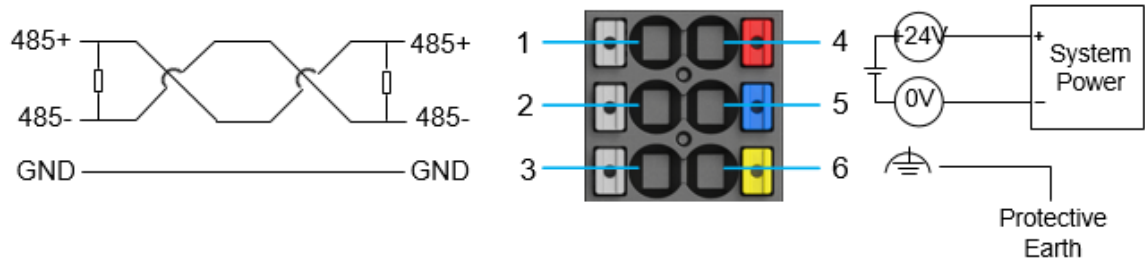
- EtherCAT Interface
- Supports EtherCAT Protocol
- Supports up to 96 slaves (total of couplers and servo axes)

USB Interface



One USB2.0_Device interface is provided via Type-C, reserved.

RS-485 / Power Interface



The RS-485 interface shares the 2*3-pin terminal with the 24VDC system power supply. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth (PE)

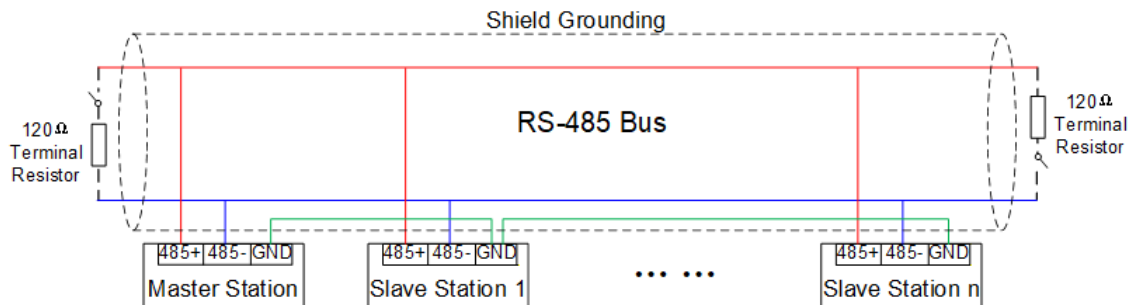


Terminating resistors should be externally connected as required.

Additional Information :

It is recommended to use shielded twisted-pair cable for RS-485 bus connection, with 485+ and 485- connected via twisted pairs. Connect a 120Ω terminating resistor at each end of the bus to prevent signal reflection. Connect the signal ground of all RS-485 nodes together. A maximum of 32 nodes are supported, and the distance of each node branch should be less than 3m.

The RS-485 bus connection topology is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-speed Digital Input 0	B0	DI10	High-speed Digital Input 10
A1	DI1	High-speed Digital Input 1	B1	DI11	High-speed Digital Input 11
A2	DI2	High-speed Digital Input 2	B2	DI12	High-speed Digital Input 12
A3	DI3	High-speed Digital Input 3	B3	DI13	High-speed Digital Input 13
A4	DI4	High-speed Digital Input 4	B4	DI14	High-speed Digital Input 14
A5	DI5	High-speed Digital Input 5	B5	DI15	High-speed Digital Input 15
A6	DI6	High-speed Digital Input 6	B6	DI16	High-speed Digital Input 16
A7	DI7	High-speed Digital Input 7	B7	DI17	High-speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1

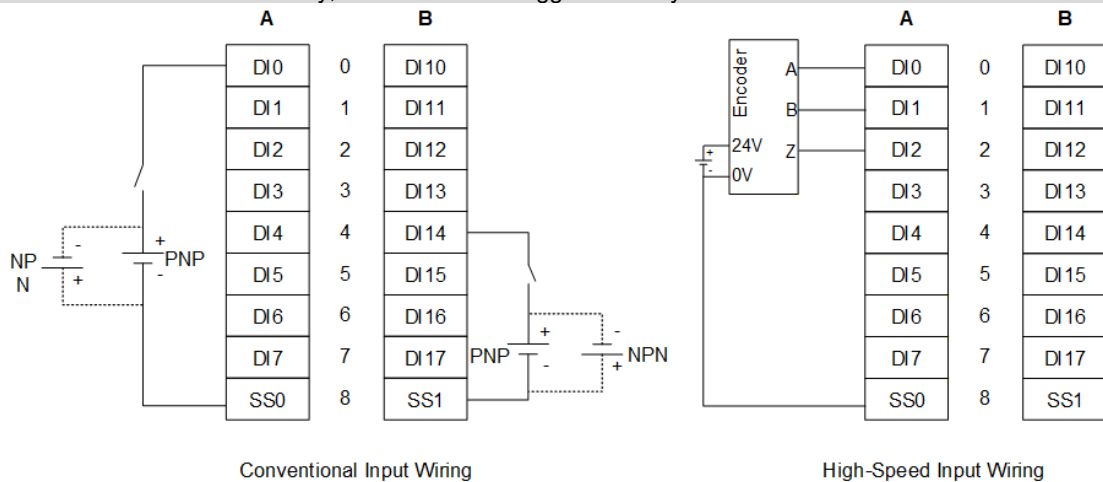


- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single-phase	CW/CCW	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max. Frequency	100KHz	200KHz	100KHz	200KHz	200KHz	200KHz	-
DI0	A0	√	CW0	Pulse0	√	√	
DI1	B0	√	CCW0	Direction 0	√	√	
DI2	Z0	√	Z0	Z0	√	√	√
DI3	A1	√	CW1	Pulse1	√	√	√
DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for channels DI6/DI7/DI16/DI17 is 50KHz, while it's 200KHz for other channels.
- There are 12 single-phase channels in total, which can be configured to any unused terminal.
- There are 12 probe channels in total, which can be configured to any unused terminal.
- There are 4 frequency measurement channels in total, which can be configured to any unused terminal.
- When high-speed functions and the corresponding channel filter parameters are set simultaneously, the filter parameters take precedence. For the same high-speed counter, the filter parameters for the two terminals must be set consistently; an alarm will be triggered if they are inconsistent.



The DO terminal and field power signal definitions are shown in the table below.

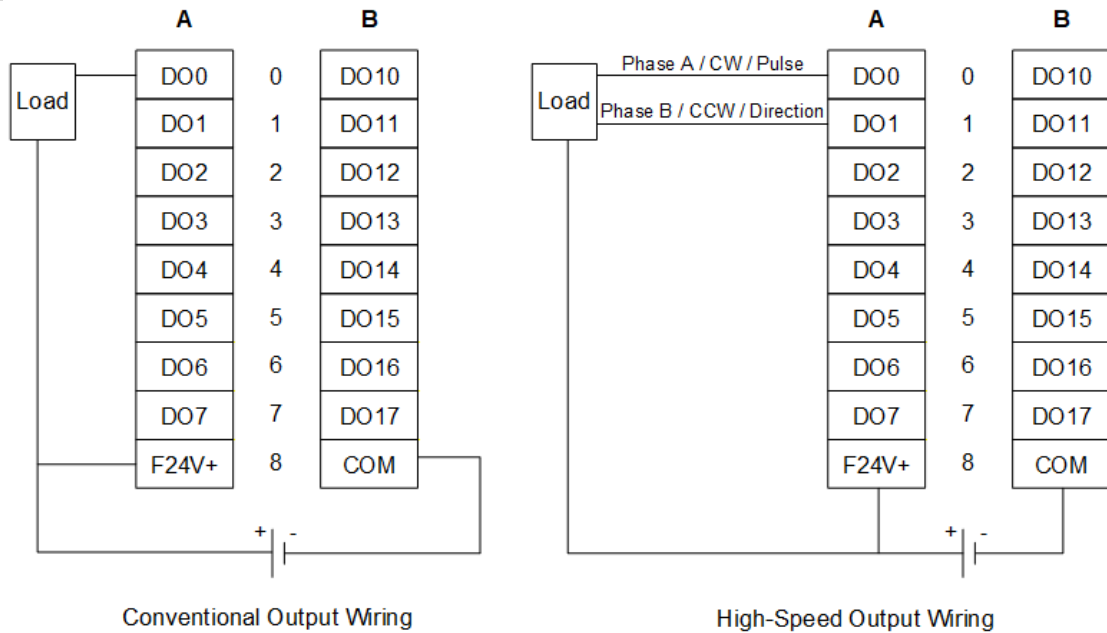
Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-speed Digital Output 0	B0	DO10	High-speed Digital Output 10
A1	DO1	High-speed Digital Output 1	B1	DO11	High-speed Digital Output 11
A2	DO2	High-speed Digital Output 2	B2	DO12	High-speed Digital Output 12
A3	DO3	High-speed Digital Output 3	B3	DO13	High-speed Digital Output 13
A4	DO4	High-speed Digital Output 4	B4	DO14	High-speed Digital Output 14
A5	DO5	High-speed Digital Output 5	B5	DO15	High-speed Digital Output 15
A6	DO6	High-speed Digital Output 6	B6	DO16	High-speed Digital Output 16
A7	DO7	High-speed Digital Output 7	B7	DO17	High-speed Digital Output 17
A8	F24V+	Field Power Supply Positive	B8	COM	Field Power Supply Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unused terminal; the	√	√	√	√
DO1	√					√

DO2	√	direction terminal is controlled by the user.	√	√	√	√
DO3	√					√
DO4	√		√	√	√	√
DO5	√					√
DO6	√		√	√	√	√
DO7	√					√
DO10	√		√	√	√	√
DO11	√					√
DO12	√		√	√	√	√
DO13	√					√
DO14	√		√	√	√	√
DO15	√					√
DO16	√		√	√	√	√
DO17	√					√



- The LX-CU331 supports a maximum of 6 axes.
- For the LX-CU331, 3 axes support four modes: Single Pulse, Pulse + Direction, CW/CCW, A/B. The other 3 axes only support two modes: Single Pulse, Pulse + Direction.
- There are 4 PWM channels in total, which can be configured to any unused terminal.



6.2.6 LX-CU332 Compact Network Motion Controller

The LX-CU332 controller implements the "Input-Computation-Output" control process and motion control, with the following main functions:

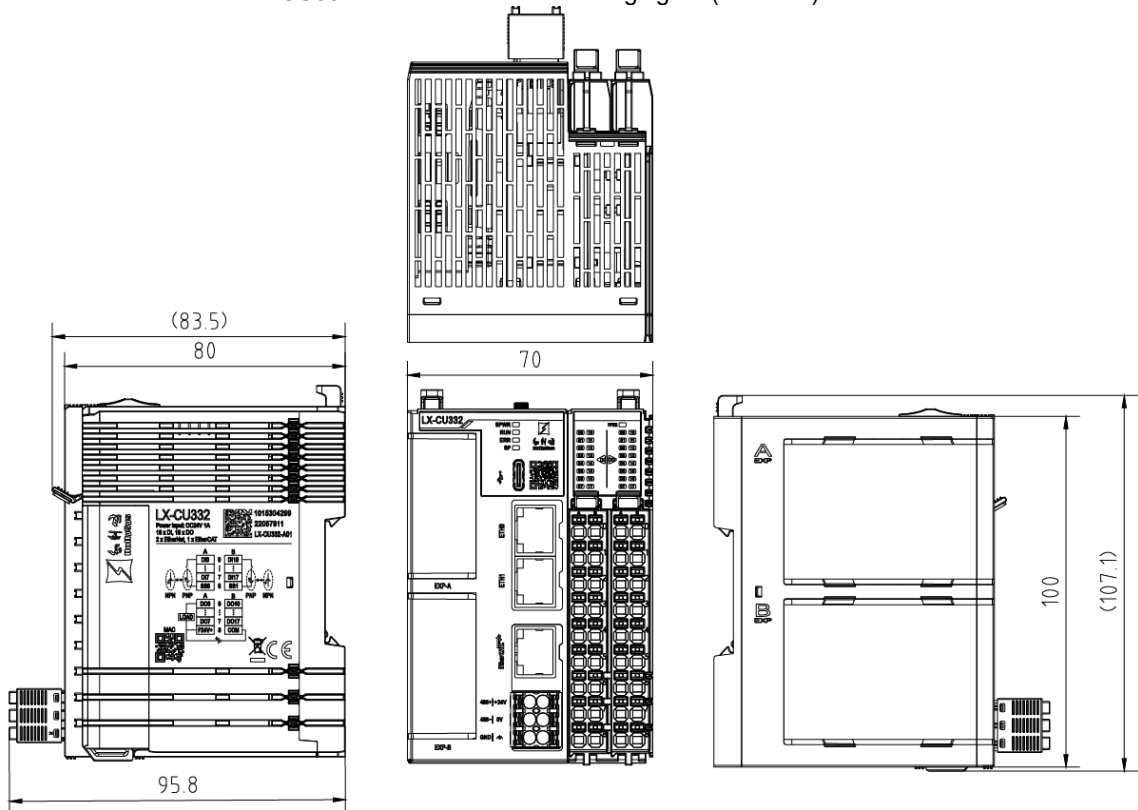
- Supports single IP, dual northbound Ethernet interfaces;
- Supports bus-based motion control based on EtherCAT interface;
- Supports pulse-based motion control;

- Main unit features two expansion card slots;
- Main unit includes 12 high-speed DI channels and 4 standard DI channels;
- Main unit includes 16 high-speed DO channels;
- Supports one isolated RS-485 interface;
- Extends to LT-e distributed I/O to the right via bus.

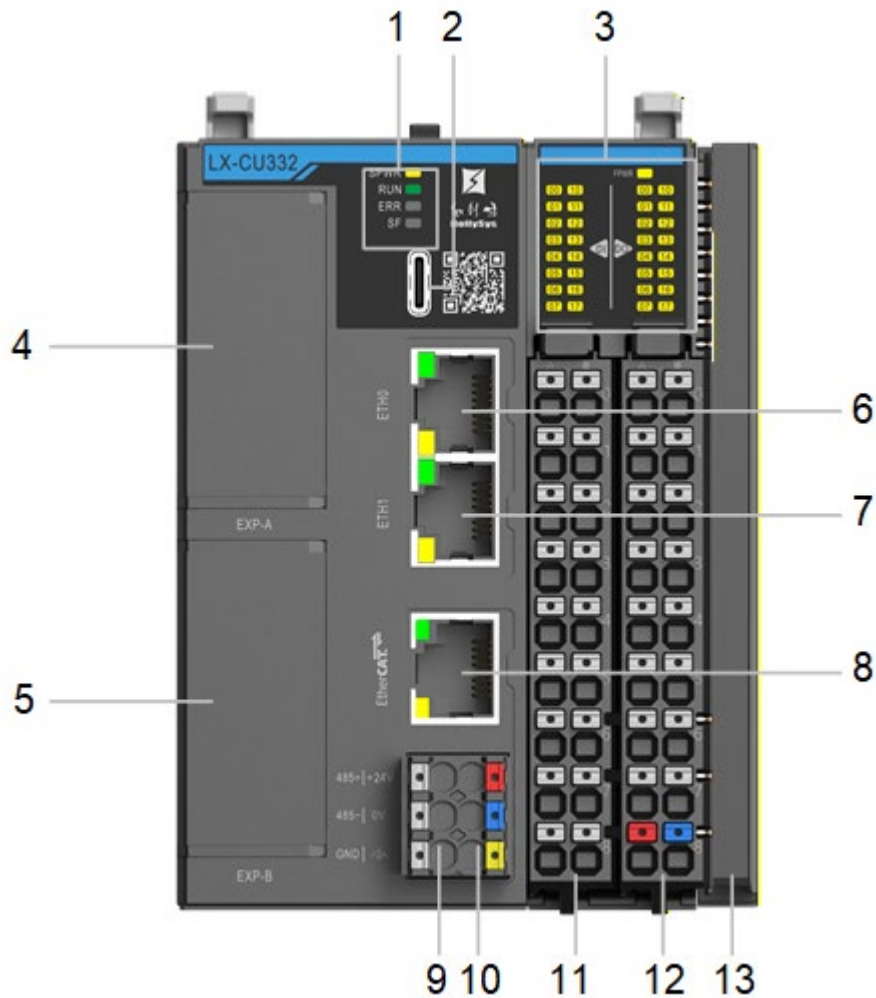
6.2.6.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-CU332 are shown in the following figure (unit: mm).

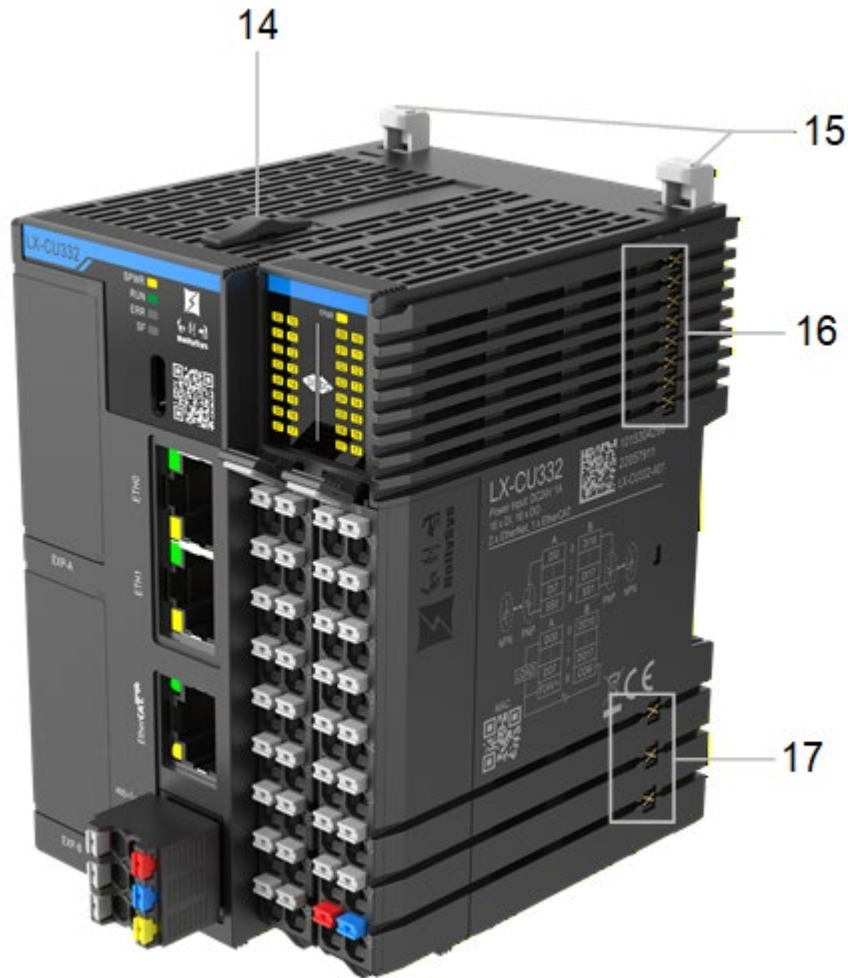


Component Description



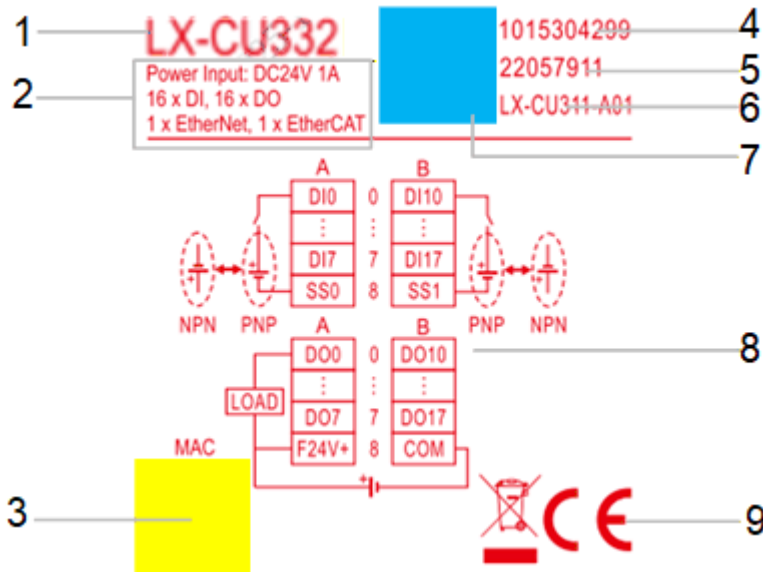
No.	Name	Description
1	Operation Status Indicators	Indicate the module operation status. For detailed definitions, see Indicator Description .
2	Type-C Port	Provides one USB2.0_Device interface via Type-C. Reserved.
3	Digital Input/Output Indicator Panel	Indicates DI/DO channel status. For detailed definitions, see Indicator Description .
4	Expansion Card Slot A	For installing expansion cards. For specific expansion card selection, see Expansion Card Compatibility Table .
5	Expansion Card Slot B	
6	Ethernet Port 1	Two northbound Ethernet interfaces. For detailed information, refer to the Ethernet port description .
7	Ethernet Port 2	
8	EtherCAT Port	For EtherCAT communication.
9	RS-485 Wiring Terminal	For detailed description, see RS-485 Interface .
10	Power Interface	For detailed description, see Power Interface .
11	Pluggable DI Terminal Block	16-channel input terminal block. For pin definitions, refer to DI Terminal Signal Definition .
12	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For pin definitions, refer to DO Terminal and Field Power Signal Definition .

13	Dust Cover	Each controller comes with one dust cover for module protection.
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No.	Name	Description
14	Operation Mode Switch	Indicates the module operation mode. For detailed definitions, see Operation Mode Description .
15	DIN Rail Top Mounting Latch	- Before installing the module onto the DIN rail, pull this latch upward to the unlocked position. - After installing the module onto the DIN rail, press this latch downward to the locked position.
16	Gold Fingers	Internal bus contacts for inter-module data transmission, system power supply, etc.
17	Through-plate Field Power Supply	Through-plate field-side power supply.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Module Basic Information	Indicates module power, communication, terminal, and other information.
3	MAC Address	Indicates the module's MAC address (QR code).
4	SN Code	Indicates the serial number of the module (Plain Code).
5	Batch Number	Indicates the module production batch number.
6	Module Hardware Version Number	Indicates the module hardware version number and firmware serial number at factory shipment. In LX-CU332-XXX, X is the hardware version number, and YY is the firmware serial number. If the module hardware version is LX-CU332-P-XXX, it indicates that the module supports moisture, mold, and salt spray resistance.
7	SN Code	Indicates the serial number of the module (QR code).
8	Wiring Terminal Diagram	Shows the connection diagram for the module's DI/DO wiring terminals.
9	Certification Standards	Indicates the certification standards the module complies with.

6.2.6.2 Technical Specifications

Basic Information

Parameter	Specification
Protection Rating	IP20
Moisture, Mold, and Salt Spray Resistance	Support
Power-on Startup Time	10s
Re-power-on Time Interval	≥10s
Data Retention Time	1 year
Storage Media Erase/Write Cycles	100,000 times
IEC Task Quantity	For versions below LX-CU332-B01_V1.1.0: ≤6 For LX-CU332-B01_V1.1.0 and above: ≤8

Public Variable Quantity	≤20,000	
System Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 0.5A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Supported, Undervoltage Threshold 13V
	Undervoltage Alarm	Supported, Undervoltage Threshold 17.5V
	Overvoltage Protection	Not Supported
	Short-Circuit Protection	Supported
	Module Power Consumption	Max 4.5W
Field Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 6A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Not Supported
	Overvoltage Protection	Not Supported
	Short-Circuit and Overcurrent Protection	Not Supported
Dimensions (W*H*D)	70mm*100mm*80mm	
Weight	≤300g	
Hot Swapping	Hot swapping of left expansion cards, right LT-e modules, 6-pin power terminals, and DI/DO channel wiring terminals is not supported.	
Functional Safety Module	Supports 5 LX-LG901	
Data Snapshot	Support	

Memory

Parameter		Specification
SD Card		Maximum 32GB supported when optional SD expansion card is installed.
User Program Capacity		10MB
User Data Capacity		20MB
Retentive Memory Capacity		256KB
Data Area Size	M Area (Direct Addressing Area)	4,194,304 bytes, %MB0~%MB3999 support power-loss retention.
	I Area (Input Area)	524,288 bytes
	Q Area (Output Area)	524,288 bytes
	G Area (General Variable Area)	14,942,208 bytes
	L Area (Retentive Area)	262,144 bytes
	D Area (Diagnostic Area)	524,288 bytes, The first 128KB does not support variable definition, is read-only and cannot be forced. The latter 384KB supports system-defined variables (axis groups), but does not support user-defined variables, reading, or writing.

Motion Control

Parameter	Specification
Motion Control Method	Supports EtherCAT bus motion control and pulse control.
Motion Control Commands	PLCopen standard commands, HMC motion commands
Bus Servo Cycle	Minimum support 1ms
Maximum Supported Bus Axes	16 axes
Pulse Control Axes	6 axes

Communication

Parameter		Specification	
USB-Type-C			
Port Quantity		1	
Interface		Type-C, Reserved	
LT-eBus Protocol			
Expand the quantity of LT-e series I/O and CM modules on the right side		16	
Northbound Ethernet			
Port Quantity		2, Single IP	
Interface		RJ45	
Supported Protocols		EtherNet/IP Master/Slave, Modbus TCP Master/Slave, TCP/UDP, Tag Communication, OPC UA, Network Variable, File Transfer Protocol	
Cable		Shielded twisted pair cable, Ethernet Cat.5e or above	
Baud Rate		10Mbps/100Mbps Auto-negotiation	
Maximum Cable Length		100m	
EtherNet/IP Master/Slave Protocol		Cyclic Data Length	For versions below LX-CU332-B01_V1.1.0: 1400 bytes For LX-CU332-B01_V1.1.0 and above: 1444 bytes
		Acyclic Data Length	For versions below LX-CU332-B01_V1.1.0: 1400 bytes For LX-CU332-B01_V1.1.0 and above: 1444 bytes
		Maximum Number of Connections	Controller as master: Supports up to 32 connections Controller as slave: Supports up to 32 connections
		Reconnection after IP Change	Master reconnects to slaves automatically after its IP is changed. The master connected to a slave needs to be reloaded after the slave's IP is changed.
EtherNet/IP Tag Communication	Cyclic Communication (Class 1)	Communication Data Volume	Single connection maximum support 1444 bytes
		Maximum Number of Connections	Controller as Master: Supports up to 32 connections (shared with Instance ID connections and Class 3 connections) Controller as Slave: Supports up to up to 32 output tag groups, 32 connections (Class 1 + Class 3 limited to 32)
		Connection Type	Support Point-to-Point, Multicast
		RPI Time	Range: 1 to 16,000, unit: ms, default: 10
	Acyclic Communication (Class 3)	Communication Method	Communication via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication Data Volume	Maximum of 1444 bytes per connection

		Maximum Number of Connections	Supports up to 32 connections
		Number of Accessible Variables	No more than 5000 variables across all connections
OPC UA	Data Types		• Simple Variables: Pointers, references, and time types are not supported. • Structures, Enumerations, Unions, Function Blocks: Only instances are supported; internal member variables within instances are not supported. • Array: Nested array is not supported; only one-dimensional multi-order arrays are supported, and array members are not supported. • GVL • POU of PRG type (only VAR, VAR_INPUT, and VAR_OUTPUT types within PRG are supported) • GVL and instances under the toolbox
	Maximum Number of Sessions		5
	Maximum Number of Subscriptions		Up to 5 subscriptions per session, supporting up to 25 subscriptions simultaneously
	Number of Accessible Variables		Up to 500 variables per subscription Up to 10,000 variables across all subscriptions
Modbus TCP Protocol	I/O Area Size		4,194,304 bytes (M Area)
	Master/Slave Maximum Connections		Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters
	Function Code Types		01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)
	Function Code Channel Quantity		32
TCP/IP Free Protocol	I/O Area Size		1000 bytes
	Maximum Connections		32
UDP Protocol	I/O Area Size		1000 bytes
	Maximum Connections		Unicast: 32 network nodes Multicast: 32 network nodes
File Transfer Protocol (FTP)		The controller can act as a server	
Network Variable	Communication Type		UDP Protocol
	Communication Rate		100 Mbit/s
	Transmission Speed		Minimum transmission cycle: 1 ms
	Maximum Number of Supported Transmit/Receive Groups		16 each, supporting simultaneous configuration of transmit groups and receive groups

	Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
	Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
EtherCAT		
Port Quantity	1	
Interface	RJ45	
Connectable Slave Quantity	Maximum 96 (Sum of couplers and servo axes)	
Cable	Shielded twisted pair cable, Ethernet Cat.5e or above	
Baud Rate	100Mbps	
Maximum Cable Length	100m (Transmission distance between two nodes shall not exceed 100m)	
Hot Connect	 • Topology Type: Supports line and star topology • Quantity: No more than 32 ○ The first slave cannot be a hot connect slave. ○ Synchronization Unit and Hot Connect cannot be used simultaneously. ○ When multiple modules of the same model are physically connected, if one of them needs to be added to a hot connect group, a hot connect ID in the range of 1~65534 must be set.	
Synchronization Unit	 • Topology Type: Supports line and star topology • Quantity: No more than 32 ○ Supports configuring any one or multiple slaves as one synchronization unit. ○ It is recommended not to enable both Hot Connect and Synchronization Unit functions on the same module simultaneously.	
Ring Network	Not Supported	
Communication Mode	FreeRun, DC, SM	
Communication Cycle	Supports communication cycles: 500μs, 1ms, 1.5ms, 2ms, 2.5ms, 3ms, 3.5ms, 4ms, 4.5ms, 5ms, 5.5ms, 6ms, 6.5ms, 7ms, 7.5ms, 8ms Maximum bus cycle: 8ms, Minimum bus cycle: 500μs, Default: 2ms	
Cyclic Data Size	Maximum input and output data volume: 8604 bytes each	
Application Protocol	Supports CoE (PDO/SDO)	
Configure Slave Alias	Supported	
Network Topology	Supports line, daisy-chain, and tree topologies	
Onboard Serial Communication		
Interface Quantity	1	
Interface Type	Removable Terminal Block	
Signal Standard	RS-485	

Supported Protocols	Modbus RTU Master/Slave, Modbus ASCII Master/Slave, Freeport Protocol
Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)
Function Code Channel Quantity	32
Maximum Connectable Slaves	Maximum 32 (Distance from slave to bus trunk $\leq 3\text{m}$)
Baud Rate (bps)	Supports 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200, configurable.
Data Bits	7 bits/8 bits, default 8 bits
Stop Bits	1 bit/2 bits, default 2 bits
Parity	Odd/Even/None, default is None
Communication Distance	At 115200bps: Transmission distance $< 100\text{m}$ At 19200bps: Transmission distance $< 1000\text{m}$
Cable Impedance	120 Ω
Isolation Withstand Voltage	Isolation between system and channel, 500VAC, 1min, leakage current $< 10\text{mA}$
Termination Resistor	No built-in 120 Ω termination resistor; external connection as needed.
Other	Prevents accidental 24VDC connection.

Right-side DI Channels

Parameter	Specification	
Channel Quantity	Total 16 channels • 12 high-speed inputs: CH0~CH5 and CH10~CH15 • 4 regular inputs: CH6/CH7/CH16/CH17 The number of usable channels is subject to derating due to ambient temperature and installation method. For details, see Derating Requirements	
Maximum Signal Frequency per Channel	200KHz	
Response Time ON/OFF	High-speed	OFF→ON: $< 2\mu\text{s}$ ON→OFF: $< 2\mu\text{s}$
	Regular	OFF→ON: $< 1000\mu\text{s}$ ON→OFF: $< 1000\mu\text{s}$
Channel Mode	PNP/NPN configurable, 8 channels per group, each group shares a common terminal.	
High-Speed Input Signal Types	• 4 channels A/B phase (Signal source: external input pulse, supports 1x/2x/4x multiplication) • 12 channels single phase (Signal source: external input pulse) • 4 channels CW/CCW (Signal source: external input pulse) • 4 channels Pulse + Direction (Signal source: external input pulse) For details, see Terminal Definitions	
High-Speed Input Counter Value	32-bit	
High-Speed Input Counting Mode	Linear Mode	
High-Speed Counter Reset Mode	• Z-phase + Software Reset (Software configures Z-phase signal for reset) • Software Reset (Operational instruction reset)	
High-Speed Counter Comparison Control Method	Target value comparison generates interrupt (Supports up to 100 interrupt segments. Target value can be set to relative or absolute mode. Interrupt modes include single-shot, cyclic, and cam modes).	

High-Speed Functions	- Probe: 12 probe input terminals, input pulse width: 2μs or more (Probe signal source can be main controller high-speed counter, pulse axis, or slave) - External Interrupt: 8 input terminals, input pulse width: 2μs or more, trigger mode: rising edge, falling edge, edge trigger - Frequency Measurement: 4 channels total, measurement frequency 200KHz, single-cycle measurement precision error 50ns (For details, see Terminal Definitions)		
Threshold Level	ON/OFF	PNP	NPN
	ON Voltage	> 15V	< 5V
	OFF Voltage	< 5V	> 15V
Voltage Range	24VDC ±20% (19.2VDC ~ 28.8VDC)		
Software Filtering	Filter time configurable per terminal. Regular input: 2~1000 unit "ms" High-speed input: 2~10000 unit "100ns"  - Channel effective value is 1μs or more. 200ns~1μs is primarily for internal signal filtering. - To ensure valid counting, the filter time must not exceed: (Minimum input pulse width) - 500ns.		
Channel-to-Channel Isolation	Supported		
Isolation Withstand Voltage	Channel to System: 1000 VAC, 1 minute duration, leakage current <5mA		
Interface Method	Front-face wiring, 2*9PIN terminal block, removable		
Maximum Current per Channel	- High-speed input channel: 10mA at 24VDC - Regular input channel: 4mA at 24VDC		
Diagnostics	None		
Terminal Wire Gauge Range	0.2~1.5mm ²		
Terminal Wire Length	- Regular applications: 100m (Standard cable, wire gauge 1.5mm²) - High-speed motion control applications: 3m (Double-shielded cable)		

Right-side DO Channels

Parameter	Specification	
Channel Quantity	Total 16 high-speed outputs Channel load current is subject to derating due to ambient temperature and installation method. For details, see Derating Requirements	
Channel Type	NPN type, one common terminal	
Threshold Voltage	ON Voltage	< 5V
	OFF Voltage	> 15V
OFF Maximum Leakage Current	100uA (-20~60°C) 10uA (25°C)	
Channel Output Frequency @ Maximum Load Current	2KHz~200KHz @100mA 0Hz~2KHz @500mA Note: Resistive load	
Channel Maximum Output Frequency @ Load Type	- Resistive load: 200KHz - Inductive load: 0.5Hz - Lamp load: 10Hz	
Response Time ON/OFF	OFF→ON: <1μs	

	ON→OFF: <1μs Note: External load for high-speed DO channel <3KΩ
PWM Performance	Maximum frequency 200KHz, minimum resolution 2.5μs, adjustable duty cycle 0%~100%
Channel Safety Value	Supports individual configuration per channel. Output can be configured as: • Hold Last State • Preset Value The above configurations take effect when the iAT project stops.
Output Load	• 0.5A/point, 4A/16 points (Resistive load) • 7.2W/point, 18W/16 points (Inductive load) • 5W/point, 18W/16 points (Lamp load)  ○ No built-in flyback diode; external diode required. ○ Output load capacity is subject to derating due to ambient temperature and installation method. For details, see Derating Requirements
Parallel Connection Support	Not Supported
Conduction Voltage Drop (500mA)	Less than 0.5V
Channel-to-Channel Isolation	Not Supported
Isolation Withstand Voltage	Channel to System: 1000 VAC, 1 minute duration, leakage current <5mA
Power Supply Reverse Polarity Protection	Field-side power supply reverse polarity protection (between COM and F24V+)
Channel Protection Functions	Supports overcurrent protection (individual current limiting, hiccup mode) Supports overtemperature protection (all channels turn off) Output recovery method after protection: Automatic recovery
Interface Method	Front-face wiring, 2*9PIN terminal block, removable
Diagnostics	None
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	• Regular applications: 100m (Standard cable, wire gauge 1.5mm²) • High-speed motion control applications: 3m (Double-shielded cable)

Left Expansion Slot

Parameter	Specification
Expansion Slot Quantity	2
Expansion Slots	Slot A bound to: LX-EC031 Slot B bound to: LX-EC007 Other expansion cards support mixed installation in Slot A/B.
Hot Swapping	Not Supported

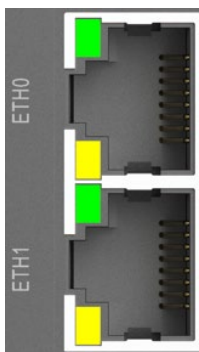
6.2.6.3 Indicator Lights



LED Name	Color	Status	Description
SPWR	Yellow	Steady On	System-side power is on
		Off	System-side power is off
RUN	Green	Steady On	User project is loaded but not running
		Slow Flash	User project is running
		Off	No user project loaded
ERR	Red	Steady On	Fault detected
		Off	No fault
SF	Yellow	Fast Flash	No configuration for LT right-side expansion, or the configuration does not match the actual scanned I/O modules
		Single Flash (500ms on, 500ms off)	LT right-side expansion initialization communication failed, or I/O module communication is offline
		Off	No fault in LT right-side expansion modules

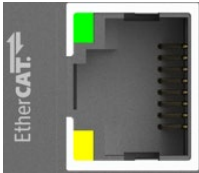


- During upgrade, RUN and ERR flash alternately at a slow rate (0.5s on, 0.5s off).
- When the controller enters the judgment process for "Reset" and "Restore Factory Settings", RUN and ERR flash simultaneously at a slow rate (0.5s on, 0.5s off).



LED Name	Color	Status	Description
ETH0 Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established

ETH1 Built-in RJ45 LED	Upper Green, Lower Yellow	Yellow LED Off	Link not established
		Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established

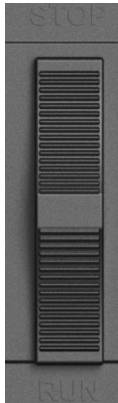


LED Name	Color	Status	Description
EtherCAT Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established



LED Name	Color	Status	Description
FPWR	Yellow	Steady On	Field-side power is on
		Off	Field-side power is off
32*IO	Yellow	According to channel status	On: ON
			Off: OFF

6.2.6.4 Operating Modes



- RUN: Operating Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.
STOP Stop Mode	Stop mode.

RUN

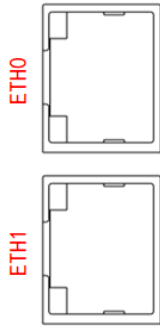
- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

- The controller does not execute the user project; all POU's under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.6.5 Module Communication Interface and Terminal Wiring Diagram

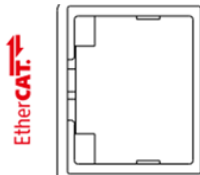
Ethernet Ports



ETH0/ETH1:

- Northbound Ethernet Interface
- Default IP Address: 192.168.0.250
- Supported Protocols: EtherNet/IP Master/Slave, Modbus TCP Master/Slave, TCP/UDP, Tag Communication, OPC UA, Network Variable, File Transfer Protocol
- Supports program download and online monitoring/debugging

EtherCAT Interface



EtherCAT:

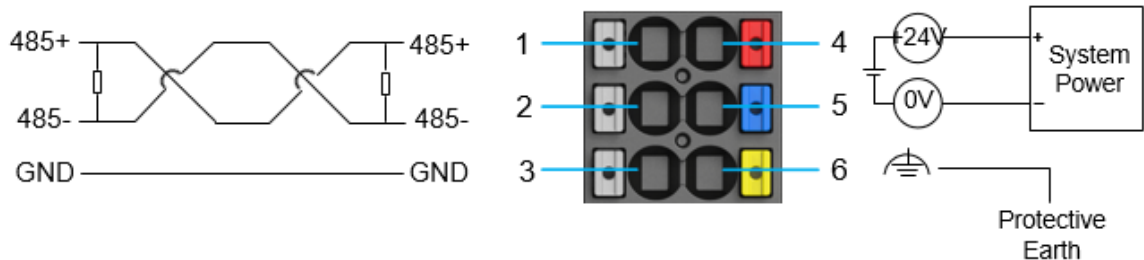
- EtherCAT Interface
- Supports EtherCAT Protocol
- Supports up to 96 slaves (total of couplers and servo axes)

USB Interface



Provides one USB2.0_Device interface via Type-C, reserved.

RS-485/Power Interface



The RS-485 interface and 24VDC system power share a 2*3pin terminal block. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth

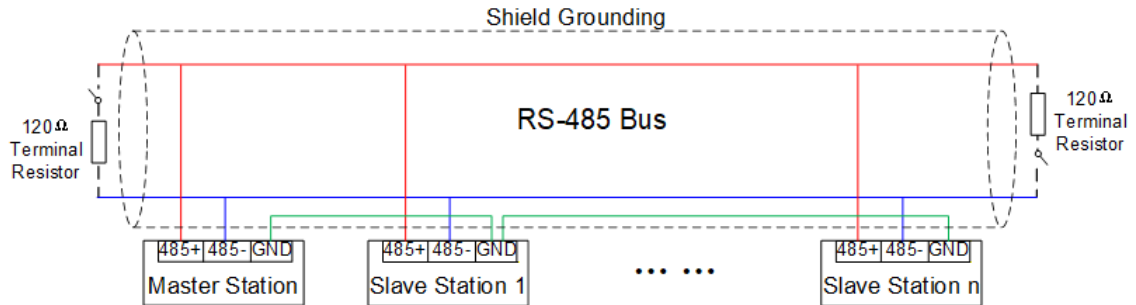


Terminating resistors should be connected externally as required.

Additional Information:

It is recommended to use shielded twisted pair cables for the RS-485 bus, connecting 485+ and 485- with twisted pairs. Connect 120Ω terminating resistors at both ends of the bus to prevent signal reflection. Connect the signal ground of all RS-485 nodes together. A maximum of 32 nodes is supported, and the distance of each node's branch should be less than 3m.

The connection topology of the RS-485 bus is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-Speed Digital Input 0	B0	DI10	High-Speed Digital Input 10
A1	DI1	High-Speed Digital Input 1	B1	DI11	High-Speed Digital Input 11
A2	DI2	High-Speed Digital Input 2	B2	DI12	High-Speed Digital Input 12
A3	DI3	High-Speed Digital Input 3	B3	DI13	High-Speed Digital Input 13
A4	DI4	High-Speed Digital Input 4	B4	DI14	High-Speed Digital Input 14
A5	DI5	High-Speed Digital Input 5	B5	DI15	High-Speed Digital Input 15
A6	DI6	High-Speed Digital Input 6	B6	DI16	High-Speed Digital Input 16
A7	DI7	High-Speed Digital Input 7	B7	DI17	High-Speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1



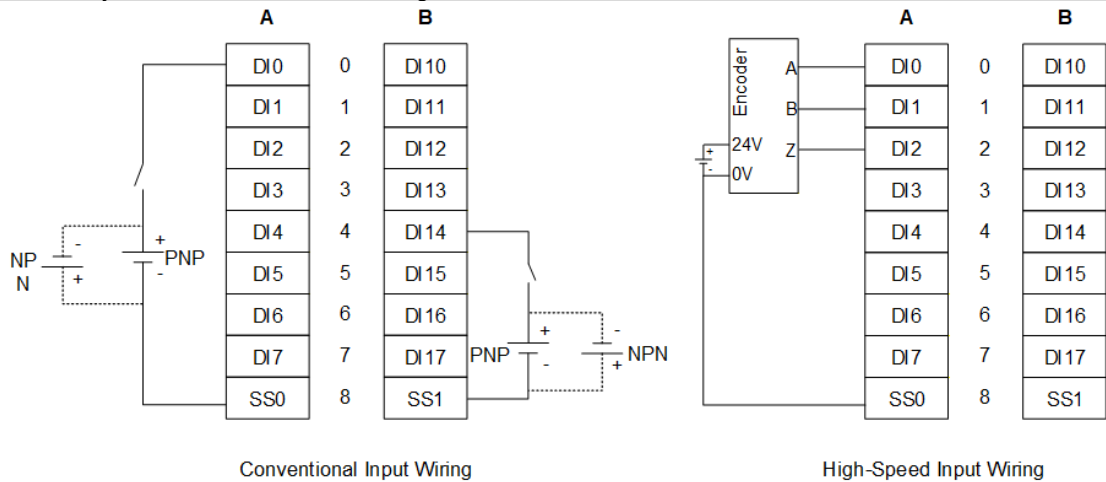
- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single Phase	CW/ CCW	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max.	100KH	200KH	100KH	200KHz	200KH	200KHz	-

Frequency	Z	Z	Z		Z		
DI0	A0	√	CW0	Pulse0	√	√	
DI1	B0	√	CCW0	Direction 0	√	√	
DI2	Z0	√	Z0	Z0	√	√	√
DI3	A1	√	CW1	Pulse1	√	√	√
DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for DI6/DI7/DI16/DI17 channels is 50KHz, while other channels support up to 200KHz.
- There are 12 single-phase channels in total, which can be configured to any unused terminals.
- There are 12 probe channels in total, which can be configured to any unused terminals.
- There are 4 frequency measurement channels in total, which can be configured to any unused terminals.
- When high-speed functions and corresponding channel filter parameters are set simultaneously, the filter parameters take priority. For the same high-speed counter, the filter parameters for both terminals must be set identically; otherwise, an alarm will be generated.



The DO terminal and field power signal definitions are shown in the table below.

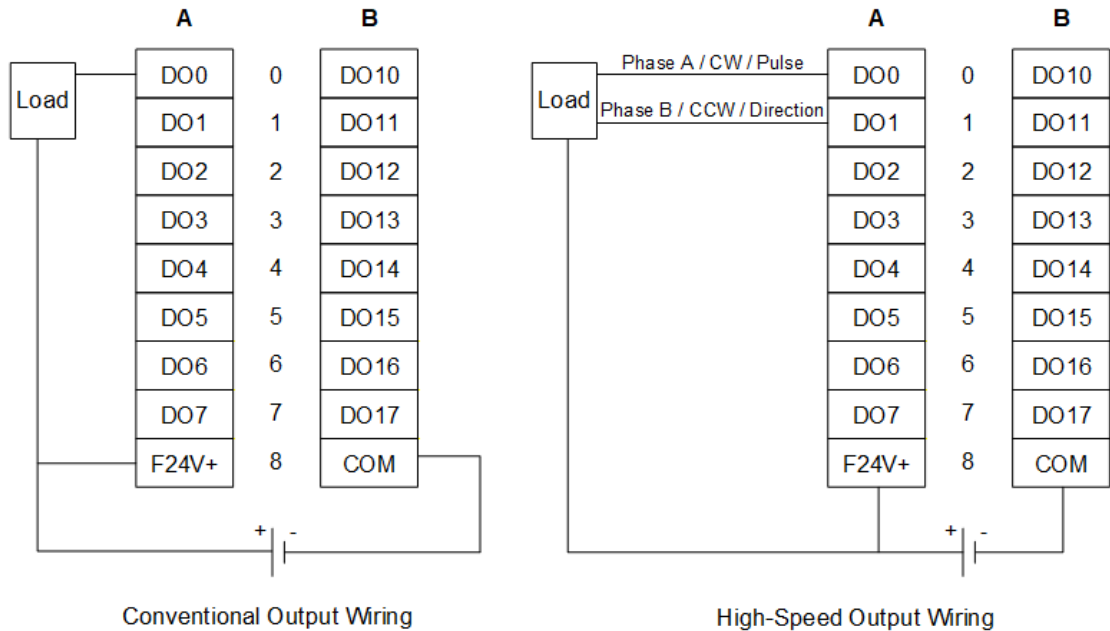
Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-Speed Digital Output 0	B0	DO10	High-Speed Digital Output 10

A1	DO1	High-Speed Digital Output 1	B1	DO11	High-Speed Digital Output 11
A2	DO2	High-Speed Digital Output 2	B2	DO12	High-Speed Digital Output 12
A3	DO3	High-Speed Digital Output 3	B3	DO13	High-Speed Digital Output 13
A4	DO4	High-Speed Digital Output 4	B4	DO14	High-Speed Digital Output 14
A5	DO5	High-Speed Digital Output 5	B5	DO15	High-Speed Digital Output 15
A6	DO6	High-Speed Digital Output 6	B6	DO16	High-Speed Digital Output 16
A7	DO7	High-Speed Digital Output 7	B7	DO17	High-Speed Digital Output 17
A8	F24V+	Field Power Positive	B8	COM	Field Power Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unused terminal; direction terminal is user-controlled	√	√	√	√
DO1	√					√
DO2	√		√	√	√	√
DO3	√					√
DO4	√		√	√	√	√
DO5	√					√
DO6	√		√	√	√	√
DO7	√					√
DO10	√		√	√	√	√
DO11	√					√
DO12	√		√	√	√	√
DO13	√					√
DO14	√		√	√	√	√
DO15	√					√
DO16	√		√	√	√	√
DO17	√					√



- LX-CU332 supports up to 6 axes.
- For LX-CU332, 3 axes can support four modes: Single Pulse, Pulse+Direction, CW/CCW, A/B. The other 3 axes only support two modes: Single Pulse, Pulse+Direction.
- There are 4 PWM channels in total, which can be configured to any unused terminals.



6.2.7 LX-CU333 Compact Network Motion Controller

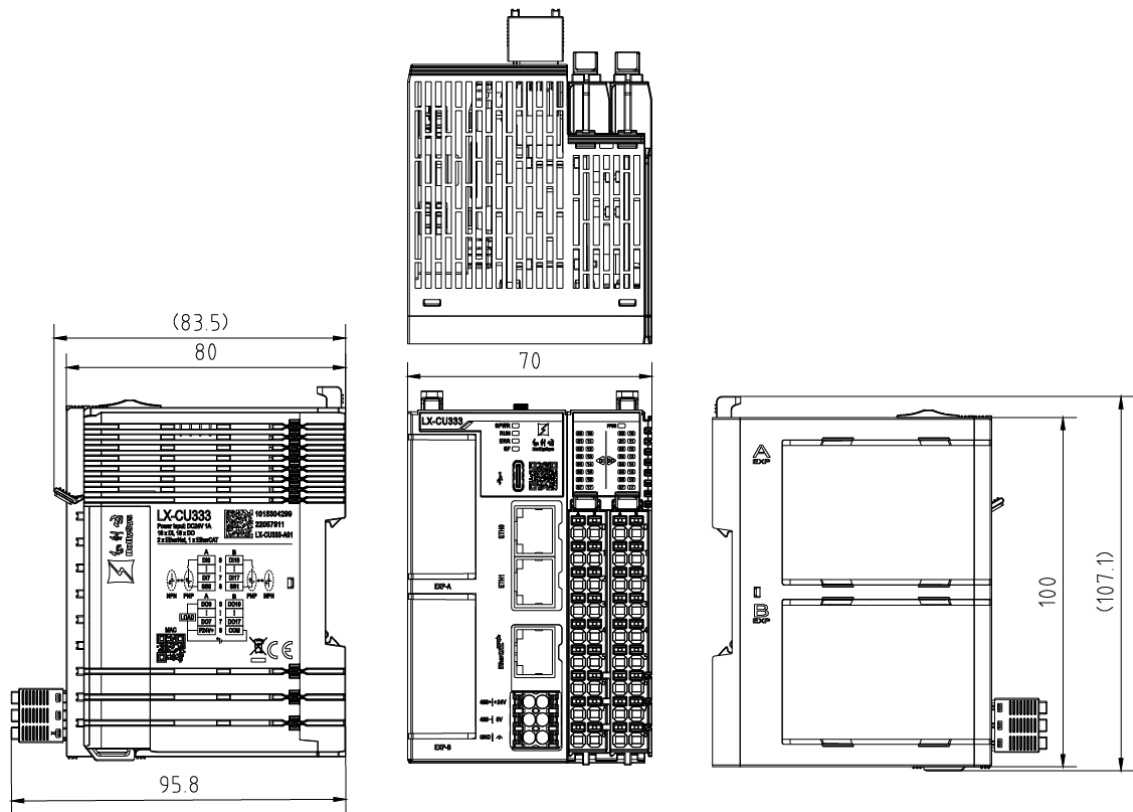
The LX-CU333 controller implements the "Input - Calculation - Output" control process and motion control. Its main functions are as follows:

- Supports single IP, dual northbound Ethernet interfaces;
- Supports EtherCAT interface-based bus motion control;
- Supports pulse-type motion control;
- Features two expansion card slots on the main unit;
- Features 12 high-speed DI and 4 regular DI channels on the main unit;
- Features 16 high-speed DO channels on the main unit;
- Supports one isolated RS-485 interface;
- Expands to the right with LT-e distributed I/O via bus.

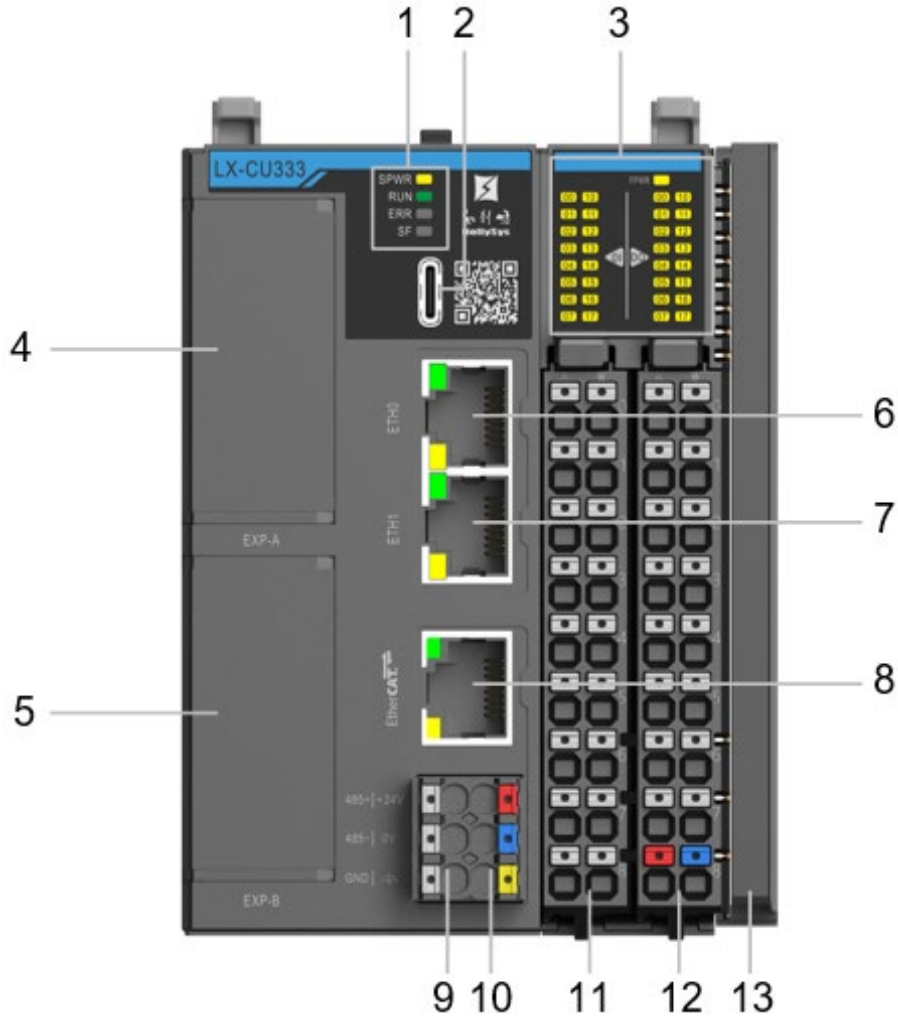
6.2.7.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-CU333 are shown in the figure below (unit: mm).

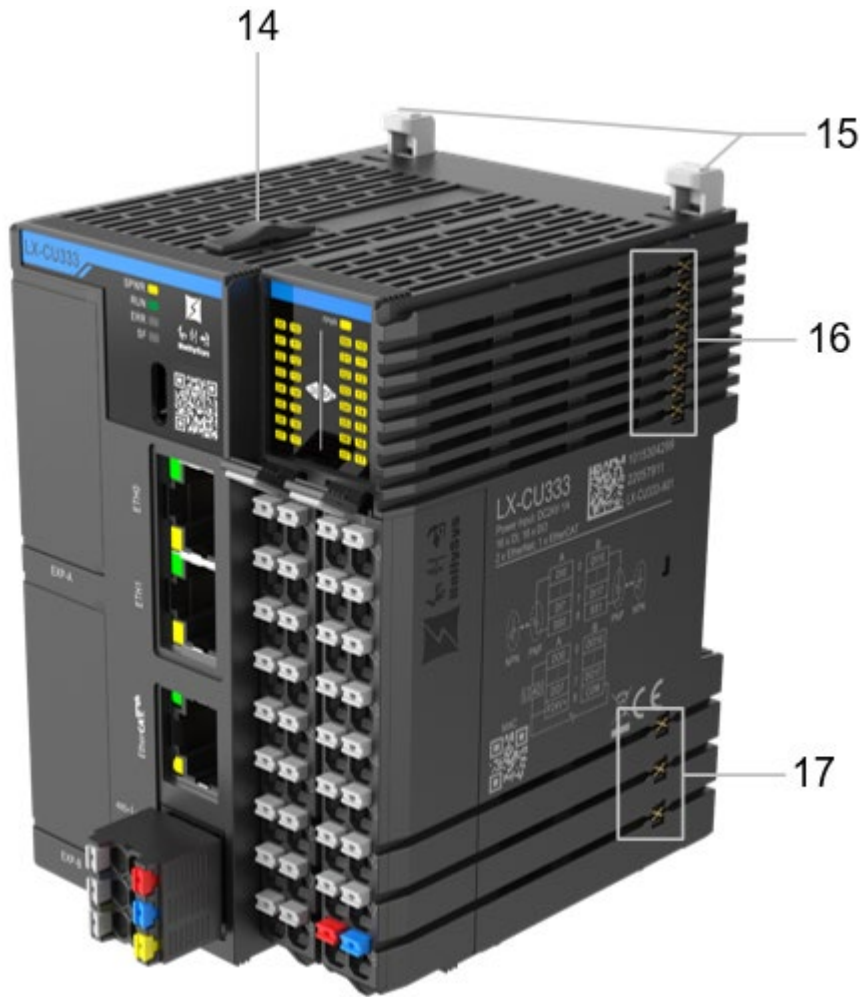


Component Description



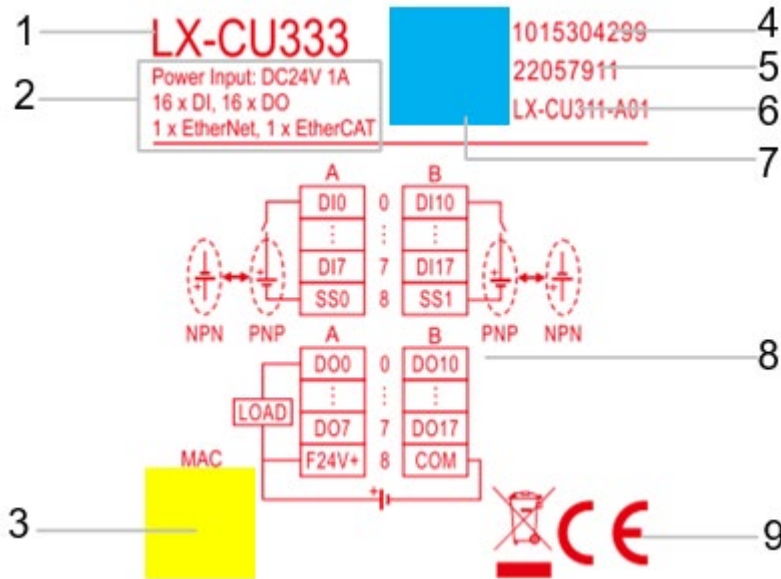
No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For details, refer to Indicator Description .
2	Type-C Interface	Provides one USB2.0_Device interface via Type-C. Reserved.
3	Digital Input/Output Indicator Panel	Indicates DI/DO channel status. For details, refer to Indicator Description .
4	Expansion Card Slot A	Used for installing expansion cards. For specific expansion card options, refer to Expansion Card Compatibility Table .
5	Expansion Card Slot B	
6	Ethernet Port 1	Two northbound Ethernet interfaces. For detailed information, refer to the Ethernet port description .
7	Ethernet Port 2	
8	EtherCAT Interface	Used for EtherCAT communication.
9	RS-485 Wiring Terminal	For details, refer to RS-485 Interface .
10	Power Interface	For details, refer to Power Interface .
11	Pluggable DI Terminal Block	16-channel input terminal block. For detailed definitions, refer to DI Terminal Signal Definition .
12	Pluggable DO Terminal Block and Field Power Interface	16-channel output terminal block and field power wiring terminal (with color identification). For detailed definitions, refer to DO Terminal and Field Power Signal Definition .

13	Dust Cover	Each controller comes with a dust cover for module protection.
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No.	Name	Description
14	Operation Mode Switch	Indicates the module's operation mode. For details, refer to Operation Mode Description .
15	DIN Rail Top Mounting Latch	- Before mounting the module onto the DIN rail, pull this latch upwards to unlock it. - After mounting the module onto the DIN rail, press this latch downwards to lock it.
16	Gold Finger Contacts	Internal bus contact points, used for inter-module data transmission, system power supply, etc.
17	Through-board Field Power	Through-board field-side power.

Nameplate



No.	Name	Description
1	Module Model	Indicates the module model.
2	Module Basic Information	Indicates module power, communication, terminal, and other information.
3	MAC Address	Indicates the module's MAC address (QR code).
4	SN Code	Indicates the serial number of the module (Plain Code).
5	Batch Number	Indicates the module's production batch number.
6	Module Hardware Version Number	Indicates the module's hardware version number and firmware serial number at the time of shipment. In LX-CU333-XYX, X is the hardware version number, and YY is the firmware serial number. If the module hardware version is LX-CU333-P-XYX, it indicates that the module supports moisture, mold, and salt spray resistance.
7	SN Code	Indicates the serial number of the module (QR code).
8	Wiring Terminal Diagram	Shows the connection diagram for the module's DI/DO wiring terminals.
9	Certification Standards	Indicates the certification standards the module complies with.

6.2.7.2 Technical Specifications

Basic Information

Parameter	Specification
Protection Rating	IP20
Moisture, Mold, and Salt Spray Resistance	Support
Power-on Startup Time	10s
Re-power-on Time Interval	≥10s
Data Retention Time	1 Year
Storage Media Erase/Write Cycles	100,000 times

IEC Task Quantity	For versions below LX-CU333-B01_V1.1.0: ≤6 For LX-CU333-B01_V1.1.0 and above: ≤8	
Public Variable Quantity	≤20,000	
System Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 0.5A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Supported, Threshold 13V
	Undervoltage Alarm	Supported, Threshold 17.5V
	Overvoltage Protection	Not Supported
	Short-Circuit Protection	Supported
	Module Power Consumption	Max 4.5W
Field Power Supply	Input Voltage	24VDC (19.2V~28.8V)
	Input Current	Max 6A
	Reverse Polarity Protection	Supported
	Undervoltage Protection	Not Supported
	Overvoltage Protection	Not Supported
	Short-Circuit and Overcurrent Protection	Not Supported
Dimensions (W*H*D)	70mm*100mm*80mm	
Weight	≤300g	
Hot Swapping	Does not support hot swap for left expansion cards, right LT-e modules, 6-pin power terminals, and DI/DO channel wiring terminals.	
Functional Safety Module	Supports 5 LX-LG901	
Data Snapshot	Support	

Memory

Parameter		Specification
SD Card		Maximum 32GB supported with optional SD expansion card.
User Program Capacity		10MB
User Data Capacity		20MB
Retentive Memory Capacity		512KB
Data Area Size	M Area (Direct Address Area)	4,194,304 bytes, %MB0~%MB3999 support power-down retention.
	I Area (Input Area)	524,288 bytes
	Q Area (Output Area)	524,288 bytes
	G Area (General Variable Area)	14,680,064 bytes
	L Area (Retentive Area)	524,288 bytes
	D Area (Diagnostic Area)	524,288 bytes. The first 128KB does not support variable definition, is read-only and cannot be forced. The last 384KB supports system-defined variables (axis groups), and does not support user-defined variables or read/write operations.

Motion Control

Parameter	Specification
Motion Control Method	Supports EtherCAT bus motion control and pulse control.
Motion Control Commands	PLCopen standard commands, HMC motion commands
Bus Servo Cycle Time	Minimum supported: 1ms
Maximum Supported Bus Axes	32 Axes

Pulse Control Axes	6 Axes
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Communication

Parameter		Specification	
USB-Type-C			
Number of Ports		1	
Port Type		Type-C, reserved.	
LT-eBus Protocol			
Expand the quantity of LT-e series I/O and CM modules on the right side		16	
Northbound Ethernet			
Number of Ports		2, single IP	
Port Type		RJ45	
Supported Protocols		EtherNet/IP Master/Slave protocol, Modbus TCP Master/Slave protocol, TCP/UDP, Tag Communication, OPC UA, Network Variable, File Transfer Protocol	
Communication Cable		Ethernet Cat.5e or above shielded twisted pair cable.	
Communication Speed		10Mbps/100Mbps Auto-negotiation	
Maximum Network Length		100m	
EtherNet/IP Master/Slave Protocol		Cyclic Data Length	For versions below LX-CU333-B01_V1.1.0: 1400 bytes For LX-CU333-B01_V1.1.0 and above: 1444 bytes
		Acyclic Data Length	For versions below LX-CU333-B01_V1.1.0: 1400 bytes For LX-CU333-B01_V1.1.0 and above: 1444 bytes
		Maximum Number of Connections	Controller as master: Supports up to 32 connections Controller as slave: Supports up to 32 connections
		Reconnection after IP Change	After a master station changes its IP, it will automatically reconnect to the slave station. After a slave station changes its IP, the master station connected to it needs to re-download the configuration.
EtherNet/IP Tag Communication	Cyclic Communication (Class 1)	Communication Data Volume	Single connection maximum support 1444 bytes
		Maximum Number of Connections	Controller as Master: Supports up to 32 connections (shared with Instance ID connections and Class 3 connections) Controller as Slave: Supports up to up to 32 output tag groups, 32 connections (Class 1 + Class 3 limited to 32)
		Connection Type	Support Point-to-Point, Multicast
		RPI Time	Range: 1 to 16,000, unit: ms, default: 10

	Acyclic Communication (Class 3)	Communication Method	Communication via function blocks: CIPOpen, CIPRead, CIPWrite, CIPClose
		Communication Data Volume	Maximum of 1444 bytes per connection
		Maximum Number of Connections	Supports up to 32 connections
		Number of Accessible Variables	No more than 5000 variables across all connections
OPC UA		Data Types	• Simple Variables: Pointers, references, and time types are not supported. • Structures, Enumerations, Unions, Function Blocks: Only instances are supported; internal member variables within instances are not supported. • Array: Nested array is not supported; only one-dimensional multi-order arrays are supported, and array members are not supported. • GVL • POU of PRG type (only VAR, VAR_INPUT, and VAR_OUTPUT types within PRG are supported) • GVL and instances under the toolbox
		Maximum Number of Sessions	5
		Maximum Number of Subscriptions	Up to 5 subscriptions per session, supporting up to 25 subscriptions simultaneously
		Number of Accessible Variables	Up to 500 variables per subscription Up to 10,000 variables across all subscriptions
Modbus TCP Protocol		Input/Output Area Size	4,194,304 bytes (M Area)
		Maximum Master/Slave Connections	Controller as master: Supports up to 32 slaves Controller as slave: Supports up to 16 masters
		Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (hexadecimal)
		Number of Function Code Channels	32
TCP/IP Free Protocol		Input/Output Area Size	1000 bytes
		Maximum Connections	32
UDP Protocol		Input/Output Area Size	1000 bytes
		Maximum Connections	Unicast: 32 network nodes Multicast: 32 network nodes
File Transfer Protocol (FTP)		The controller can act as a server	
Network Variable		Communication Type	UDP Protocol
		Communication Rate	100 Mbit/s
		Transmission Speed	Minimum transmission cycle: 1 ms

	Maximum Number of Supported Transmit/Receive Groups	16 each, supporting simultaneous configuration of transmit groups and receive groups
	Number of Variables	Each network group supports a maximum of 512 variables, with a total size not exceeding 512 bytes
	Data Type	Supports IEC basic data types, arrays of basic types, and structs (and their arrays) that do not contain FBs or unions. Does not support FBs, unions, or any other data types that contain these elements.
EtherCAT		
Number of Ports	1	
Port Type	RJ45	
Connectable Slave Quantity	Maximum 96 (total of couplers and servo axes)	
Communication Cable	Ethernet Category 5, 5e, or above shielded twisted pair cable.	
Communication Speed	100Mbps	
Maximum Network Length	100m (the transmission distance between two nodes should not exceed 100m)	
Hot Connect	• Topology Type: Supports line and star topologies. • Quantity: No more than 32.  ○ The first slave cannot be hot-connected. ○ Does not support simultaneous use of sync unit and hot connect. ○ When multiple modules of the same model are physically connected, if one of them needs to be added as a hot connect group, a hot connect identifier in the range of 1~65534 must be set.	
Sync Unit	• Topology Type: Supports line and star topologies. • Quantity: No more than 32.  ○ Supports configuring any one or multiple slaves as one sync unit. ○ The same module is not recommended to enable hot connect and sync unit functions simultaneously.	
Ring Network	Not Supported	
Communication Mode	FreeRun, DC, SM	
Communication Cycle	Supported communication cycles: 250μs, 500μs, 1ms, 1.5ms, 2ms, 2.5ms, 3ms, 3.5ms, 4ms, 4.5ms, 5ms, 5.5ms, 6ms, 6.5ms, 7ms, 7.5ms, 8ms. Maximum bus cycle: 8ms, minimum bus cycle 250μs, default 2ms.	
Cyclic Data Scale	Maximum input/output data size: 8604 bytes each.	
Application Protocol	Supports COE (PDO/SDO).	
Slave Station Alias Configuration	Supported	
Network Topology	Supports line, daisy-chain, and tree topologies.	
On-board Serial Communication		

Number of Interfaces	1
Interface Type	Pluggable Terminal
Level Standard	RS-485
Supported Protocols	Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free Port protocol.
Function Code Types	01, 02, 03, 04, 05, 06, 0F, 10, 17 (hexadecimal)
Number of Function Code Channels	32
Connectable Slave Quantity	Maximum supports 32 (distance from slave to main trunk ≤3m).
Communication Speed (bps)	Supports configurable speeds: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200.
Data Bits	7 bits / 8 bits, default 8 bits.
Stop Bits	1 bit / 2 bits, default 2 bits.
Parity	Odd/Even/None, default is None
Communication Distance	Speed 115200bps: Transmission distance <100m Speed 19200bps: Transmission distance <1000m
Cable Impedance	120Ω
Isolation	Isolation from system to channel, 500VAC, 1 minute, leakage current less than 10mA.
Terminating Resistor	No built-in 120Ω terminating resistor, connect externally as required.
Others	Prevents accidental connection of 24VDC.

Right-side DI Channels

Parameter	Specification	
Number of Channels	Total 16 channels • 12 high-speed input channels: CH0~CH5 and CH10~CH15 • 4 regular input channels: CH6/CH7/CH16/CH17 Channel count may be derated based on ambient temperature and installation method. See Derating Requirements for details.	
Maximum Channel Signal Frequency	200KHz	
Response Time ON/OFF	High-Speed	OFF→ON: <2μs ON→OFF: <2μs
	Regular	OFF→ON: <1000μs ON→OFF: <1000μs
Channel Mode	PNP/NPN configurable, 8 channels per group, each group shares one common terminal.	
High-Speed Input Signal Types	• 4-channel AB phase (signal source: external input encoder, can achieve 1/2/4 frequency multiplication) • 12-channel single-phase (signal source: external input encoder) • 4-channel CW/CCW (signal source: external input encoder) • 4-channel pulse+direction (signal source: external input encoder) See Terminal Definitions for details.	
High-Speed Input Counter Value	32-bit	
High-Speed Input Counter Mode	Linear Mode	
High-Speed Counter Reset Mode	• Z phase + software reset (software configures Z phase signal reset) • Software reset (reset via operation command)	
High-Speed Counter	Target value comparison generates interrupt (can generate up to 100	

Comparison Control Mode	interrupt segments, target value can be selected as relative mode or absolute mode, interrupt includes single mode, loop mode, and gear mode).		
High-Speed Functions	- Probe: 12 probe input terminals, input pulse width: $\geq 2\mu\text{s}$ (probe signal source can be main controller high-speed counter, encoder axis, or slave station). - External Interrupt: 8 input terminals, input pulse width: $\geq 2\mu\text{s}$, trigger method: rising edge, falling edge, edge trigger. - Frequency Measurement: total 4 channels, measurement frequency 200KHz, measurement error for a single cycle: 50ns. (See Terminal Definitions for details)		
Threshold Level	ON/OFF	PNP	NPN
	ON Voltage	>15V	<5V
	OFF Voltage	<5V	>15V
Voltage Range	24VDC $\pm$ 20% (19.2VDC to 28.8VDC)		
Software Filter	Filter time for each terminal is adjustable. Regular Input: 2~1000, unit "ms" High-Speed Input: 2~10000, unit "100ns"  - Channel effective value is 1μs or more. 200ns~1μs is mainly used for internal signal filtering. - To ensure effective counting, the filter time must not exceed: Minimum signal pulse width - 500ns.		
Inter-Channel Isolation	Supported		
Isolation Withstand Voltage	Channel to system: 1000 VAC, for 1 minute, leakage current <5mA.		
Interface Method	Front face wiring, 2*9PIN terminal, pluggable.		
Maximum Single-Channel Current	- High-speed input channel: 10mA at 24VDC - Regular input channel: 4mA at 24VDC		
Diagnostics	None		
Terminal Wire Gauge Range	0.2~1.5mm ²		
Terminal Wire Length	- Regular application: 100m (ordinary cable, wire gauge 1.5mm²) - High-speed motion control application: 3m (dual-shielded cable)		

Right-side DO Channels

Parameter	Specification
Number of Channels	Total 16 high-speed output channels Channel load current is derated based on ambient temperature and installation method. See Derating Requirements for details.
Channel Type	NPN type, one common terminal
Threshold Voltage	ON Voltage <5V
	OFF Voltage >15V
OFF Maximum Leakage Current	100 μA (-20~60°C) 10 μA (25°C)
Channel Output Frequency @ Maximum Load Current	2KHz~200KHz @ 100mA 0Hz~2KHz @ 500mA Note: Resistive Load
Maximum Channel Output Frequency @ Load Type	- Resistive Load: 200KHz - Inductive Load: 0.5Hz - Lamp Load: 10Hz
Response Time ON/OFF	OFF→ON: <1 μs ON→OFF: <1 μs Note: External load for high-speed DO channels <3K Ω

PWM Performance	Maximum frequency 200KHz, minimum resolution 2.5μs, adjustable duty cycle 0%~100%.
Channel Safe State	Each channel can be configured individually, output can be configured as: • Output hold • Output preset value The above output configurations take effect when the iAT engineering is stopped.
Output Load	• 0.5A/point, 4A/16 points (Resistive Load) • 7.2W/point, 18W/16 points (Inductive Load) • 5W/point, 18W/16 points (Lamp Load)  ○ No built-in freewheeling diode, requires external connection. ○ Output load capability is derated based on ambient temperature and installation method. See Derating Requirements for details.
Parallel Connection Support	Not Supported
Conduction Voltage Drop (500mA)	Less than 0.5V
Inter-Channel Isolation	Not Supported
Isolation Withstand Voltage	Channel to system: 1000 VAC, for 1 minute, leakage current <5mA.
Power Supply Reverse Polarity Protection	Field side power supply reverse polarity protection (COM to F24V+)
Channel Protection Functions	Supports overcurrent protection (individual current limiting, blow fuse). Supports overtemperature protection (all channels disconnect). Output recovery method after protection: automatic recovery.
Interface Method	Front face wiring, 2*9PIN terminal, pluggable.
Diagnostics	None
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Length	• Regular application: 100m (ordinary cable, wire gauge 1.5mm²) • High-speed motion control application: 3m (dual-shielded cable)

Left Expansion Slot Position

Parameter	Specification
Number of Expansion Slots	2
Expansion Slot	Fixed Slot A: LX-EC031 Fixed Slot B: LX-EC007 Other expansion cards support mixed insertion in Slot A/B.
Hot Swap Support	Not Supported

6.2.7.3 Indicator Lights

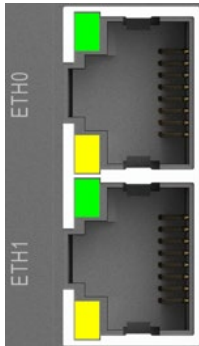


LED Name	Color	Status	Description
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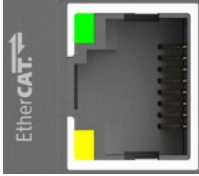
SPWR	Yellow	Steady On	System-side power is on
		Off	System-side power is off
RUN	Green	Steady On	User project is loaded but not running
		Slow Flash	User project is running
		Off	No user project loaded
ERR	Red	Steady On	Fault detected
		Off	No fault
SF	Yellow	Fast Flash	No configuration for LT right-side expansion, or the configuration does not match the actual scanned I/O modules
		Single Flash (500ms on, 500ms off)	LT right-side expansion initialization communication failed, or I/O module communication is offline
		Off	No fault in LT right-side expansion modules



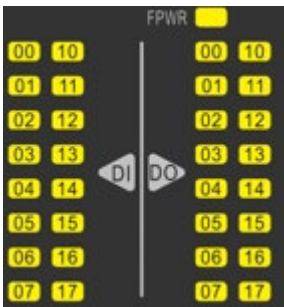
- During upgrade, RUN and ERR flash alternately at a slow rate (0.5s on, 0.5s off).
- When the controller enters the judgment process for "Reset" and "Restore Factory Settings", RUN and ERR flash simultaneously at a slow rate (0.5s on, 0.5s off).



LED Name	Color	Status	Description
ETH0 Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established
ETH1 Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established



LED Name	Color	Status	Description
EtherCAT Built-in RJ45 LED	Upper Green, Lower Yellow	Green LED Off	No data transmission/reception
		Green LED Flashing	Data transmission/reception in progress
		Yellow LED Steady On	Link established
		Yellow LED Off	Link not established



LED Name	Color	Status	Description
FPWR	Yellow	Steady On	Field-side power is on
		Off	Field-side power is off
32*IO	Yellow	According to channel status	On: ON
			Off: OFF

6.2.7.4 Operating Modes



- RUN: Run Mode
- STOP: Stop Mode

Name	Description
RUN Run Mode	Run mode.

STOP Stop Mode	Stop mode.
-------------------	------------

RUN

- The controller automatically executes the user project. The user project runs cyclically by default, which can be modified via the configuration software.
- When the module is connected to the programming software, the user project can be started/stopped via the configuration software.

STOP

- The controller does not execute the user project; all POU's under all tasks stop running.
- When the module is connected to the configuration software, the user project cannot be started via the software.
- The controller's data area continues to refresh.
- The controller communication operates normally.
- The controller communicates normally with the configuration software, allowing the user project to be downloaded.
- Motion control functions stop running; all axis movements cease immediately, and PWM outputs stop.

6.2.7.5 Module Communication Interface and Terminal Wiring Diagram

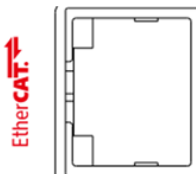
Ethernet Ports



ETH0/ETH1:

- Northbound Ethernet Interface
- Default IP Address: 192.168.0.250
- Supported Protocols: EtherNet/IP Master/Slave, Modbus TCP Master/Slave, TCP/UDP, Tag Communication, OPC UA, Network Variable, File Transfer Protocol
- Supports program download and online monitoring/debugging

EtherCAT Interface



EtherCAT:

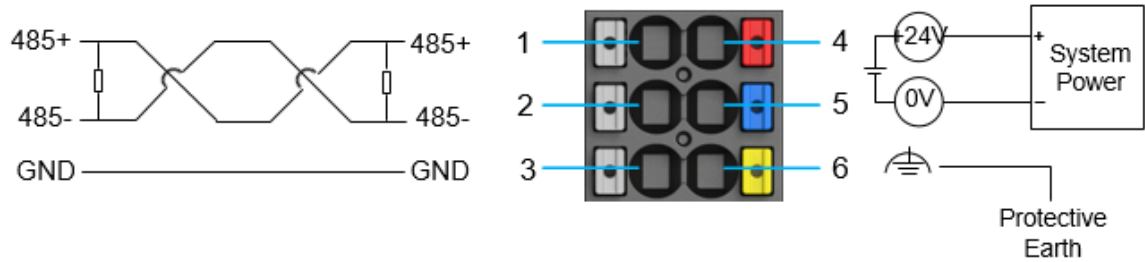
- EtherCAT Interface
- Supports EtherCAT Protocol
- Supports up to 96 slaves (total of couplers and servo axes)

USB Interface



One USB2.0_Device interface is brought out via Type-C, reserved.

RS-485/Power Interface



The RS-485 interface shares the 2*3pin terminal with the 24VDC system power supply. The terminal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
1	485+	RS-485 Port A Signal	4	+24V	System Power 24VDC
2	485-	RS-485 Port B Signal	5	0V	System Power 0VDC
3	GND	Signal Ground	6		Protective Earth

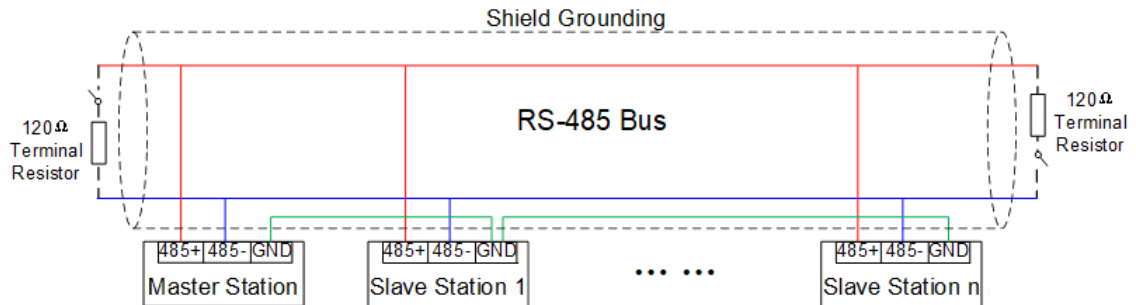


Termination resistors are externally connected as needed.

Additional Information:

It is recommended to use shielded twisted pair cables for the RS-485 bus connection. Connect 485+ and 485- using twisted pairs. Connect a 120Ω termination resistor at each end of the bus to prevent signal reflection. Connect the signal ground of all RS-485 nodes together. A maximum of 32 nodes are supported, and the stub length for each node should be less than 3m.

The connection topology of the RS-485 bus is shown in the figure below.



DI/DO and Field Power Interface



Terminals A8 and B8 on the DI side are common terminals, without color marking. Terminals A8 and B8 on the DO side are field power supply terminals, with color marking. Since the module terminals are pluggable, do not confuse them, as it may cause a short circuit.

The DI terminal signal definitions are shown in the table below.

Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DI0	High-Speed Digital Input 0	B0	DI10	High-Speed Digital Input 10
A1	DI1	High-Speed Digital Input 1	B1	DI11	High-Speed Digital Input 11
A2	DI2	High-Speed Digital Input 2	B2	DI12	High-Speed Digital Input 12
A3	DI3	High-Speed Digital Input 3	B3	DI13	High-Speed Digital Input 13
A4	DI4	High-Speed Digital Input 4	B4	DI14	High-Speed Digital Input 14
A5	DI5	High-Speed Digital Input 5	B5	DI15	High-Speed Digital Input 15
A6	DI6	High-Speed Digital Input 6	B6	DI16	High-Speed Digital Input 16
A7	DI7	High-Speed Digital Input 7	B7	DI17	High-Speed Digital Input 17
A8	SS0	Common Terminal 0	B8	SS1	Common Terminal 1

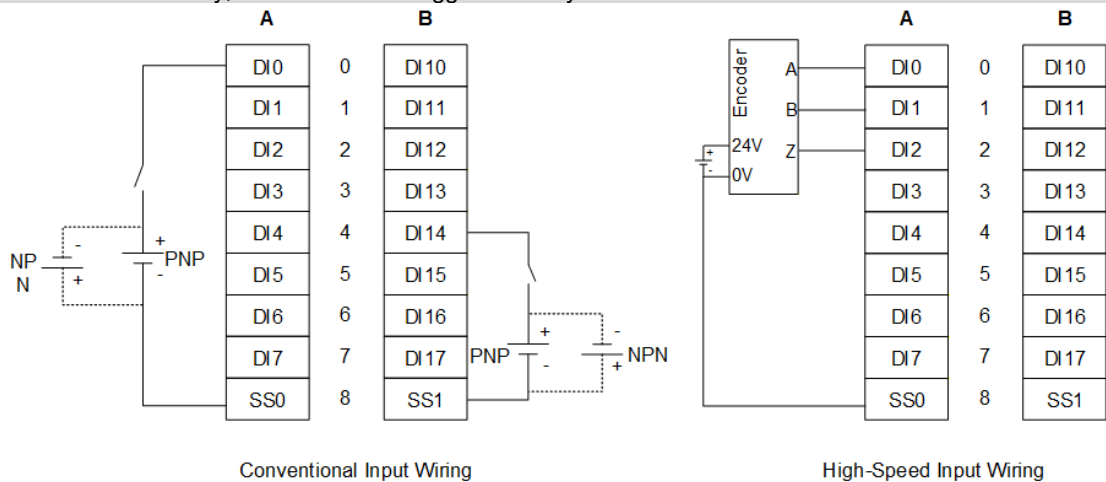


- Common Terminal 0 corresponds to DI0-DI7.
- Common Terminal 1 corresponds to DI10-DI17.

Type	A/B	Single Phase	CW/CCW	Pulse + Direction	Probe	Frequency Measurement	External Interrupt
Max. Frequency	100KHz	200KHz	100KHz	200KHz	200KHz	200KHz	-
DI0	A0	√	CW0	Pulse0	√	√	
DI1	B0	√	CCW0	Direction 0	√	√	
DI2	Z0	√	Z0	Z0	√	√	√
DI3	A1	√	CW1	Pulse1	√	√	√
DI4	B1	√	CCW1	Direction 1	√	√	√
DI5	Z1	√	Z1	Z1	√	√	√
DI6		√			√	√	
DI7		√			√	√	
DI10	A2	√	CW2	Pulse2	√	√	
DI11	B2	√	CCW2	Direction 2	√	√	
DI12	Z2	√	Z2	Z2	√	√	√
DI13	A3	√	CW3	Pulse3	√	√	√
DI14	B3	√	CCW3	Direction 3	√	√	√
DI15	Z3	√	Z3	Z3	√	√	√
DI16		√			√	√	
DI17		√			√	√	



- The maximum frequency for DI6/DI7/DI16/DI17 channels is 50KHz, while it is 200KHz for other channels.
- There are 12 single-phase channels in total, which can be assigned to any unused terminal.
- There are 12 probe channels in total, which can be assigned to any unused terminal.
- There are 4 frequency measurement channels in total, which can be assigned to any unused terminal.
- When high-speed functions and the corresponding channel filter parameters are set simultaneously, the filter parameters take precedence. For the same high-speed counter, the filter parameters for its two terminals must be set consistently; an alarm will be triggered if they are inconsistent.



The DO terminal and field power signal definitions are shown in the table below.

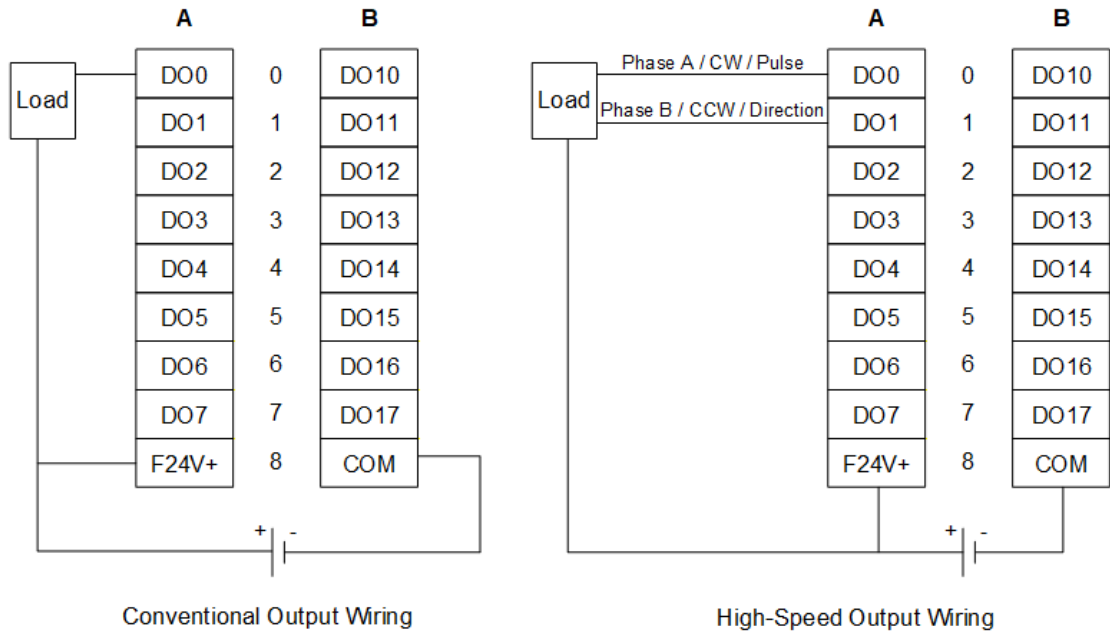
Pin	Symbol	Signal Description	Pin	Symbol	Signal Description
A0	DO0	High-Speed Digital Output 0	B0	DO10	High-Speed Digital Output 10
A1	DO1	High-Speed Digital Output 1	B1	DO11	High-Speed Digital Output 11
A2	DO2	High-Speed Digital Output 2	B2	DO12	High-Speed Digital Output 12
A3	DO3	High-Speed Digital Output 3	B3	DO13	High-Speed Digital Output 13
A4	DO4	High-Speed Digital Output 4	B4	DO14	High-Speed Digital Output 14
A5	DO5	High-Speed Digital Output 5	B5	DO15	High-Speed Digital Output 15
A6	DO6	High-Speed Digital Output 6	B6	DO16	High-Speed Digital Output 16
A7	DO7	High-Speed Digital Output 7	B7	DO17	High-Speed Digital Output 17
A8	F24V+	Field Power Positive	B8	COM	Field Power Negative & Common Terminal

Type	Single Pulse Terminal	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency	200KHz		200KHz	200KHz	100KHz	200KHz
DO0	√	Any unused terminal, direction terminal controlled	√	√	√	√
DO1	√		√	√	√	√
DO2	√		√	√	√	√

DO3	√	by user				√
DO4	√					√
DO5	√		√	√	√	√
DO6	√					√
DO7	√		√	√	√	√
DO10	√					√
DO11	√		√	√	√	√
DO12	√					√
DO13	√		√	√	√	√
DO14	√					√
DO15	√		√	√	√	√
DO16	√					√
DO17	√		√	√	√	√



- LX-CU333 supports a maximum of 6 axes.
- 3 axes of LX-CU333 support four modes: Single Pulse, Pulse+Direction, CW/CCW, A/B. The other 3 axes only support two modes: Single Pulse, Pulse+Direction.
- There are 4 PWM channels in total, which can be assigned to any unused terminal.



6.3 Expansion Card

6.3.1 Expansion Card Compatibility List

A connector for attaching expansion modules is provided on the left side of the compact PLC controller. The maximum number of expansion modules is 2. The expansion specifications are shown in the table below.

Table 1 Controller and Expansion Card Compatibility List (1)

Expansion Card	LX-CU153		LX-CU155		LX-CU157		LX-CU311		Description
	Slot	Total Quantity	Slot	Total Quantity	Slot	Total Quantity	Slot	Total Quantity	
LX-EC001	A/B	2	A/B	2	A/B	2	A/B	2	- Up to 2 channels of serial communication (RS-232 or RS-485 or RS-232+RS-485) can be expanded. - Only one expansion card with RTC function is supported per controller.
LX-EC002	A/B	2	A/B	2	A/B	2	A/B	2	
LX-EC003	A/B	1	A/B	1	A/B	1	A/B	1	
LX-EC004	A/B	1	A/B	1	A/B	1	A/B	1	
LX-EC005	A/B	1	A/B	1	A/B	1	A/B	1	
LX-EC006	B	1	B	1	B	1	Not Supported		-
LX-EC007	B	1	B	1	B	1	B	1	-
LX-EC011	A/B	2	A/B	2	A/B	2	A/B	2	-
LX-EC012	A/B	2	A/B	2	A/B	2	A/B	2	-
LX-EC021	A/B	2	A/B	2	A/B	2	A/B	2	Up to 2 units can be combined; both slots can be occupied simultaneously.
LX-EC022	A/B	2	A/B	2	A/B	2	A/B	2	
LX-EC031	A	1	A	1	A	1	A	1	Only one unit can be expanded.
LX-EC032	A/B	1	A/B	1	A/B	1	A/B	1	Only one expansion card with RTC function is supported per controller.
LX-EC033	A/B	1	A/B	1	A/B	1	A/B	1	

Table 2 Controller and Expansion Card Compatibility List (2)

Expansion Card	LX-CU331		LX-CU332		LX-CU333		Description
	Slot	Total Quantity	Slot	Total Quantity	Slot	Total Quantity	
LX-EC001	A/B	2	A/B	2	A/B	2	- Up to 2 channels of serial communication (RS-232 or RS-485 or RS-232+RS-485) can be expanded. - Only one expansion card with RTC function is supported per
LX-EC002	A/B	2	A/B	2	A/B	2	
LX-EC003	A/B	1	A/B	1	A/B	1	
LX-EC004	A/B	1	A/B	1	A/B	1	
LX-EC005	A/B	1	A/B	1	A/B	1	

							controller.
LX-EC006	Not Supported		Not Supported		Not Supported		-
LX-EC007	B	1	B	1	B	1	-
LX-EC011	A/B	2	A/B	2	A/B	2	-
LX-EC012	A/B	2	A/B	2	A/B	2	-
LX-EC021	A/B	2	A/B	2	A/B	2	Up to 2 units can be combined; both slots can be occupied simultaneously.
LX-EC022	A/B	2	A/B	2	A/B	2	
LX-EC031	A	1	A	1	A	1	Only one unit can be expanded.
LX-EC032	A/B	1	A/B	1	A/B	1	Only one expansion card with RTC function is supported per controller.
LX-EC033	A/B	1	A/B	1	A/B	1	

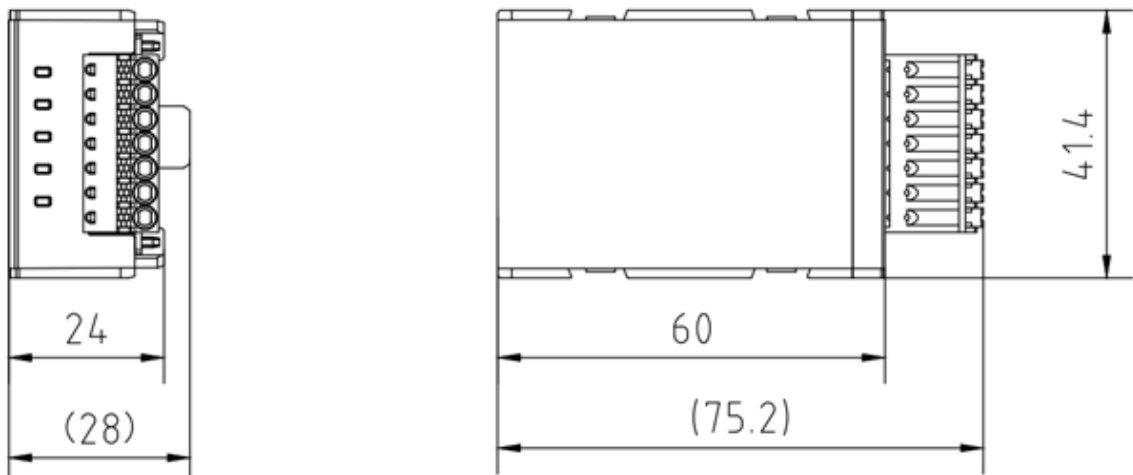
6.3.2 LX-EC001 1-Channel RS-232 Communication Expansion Card

The LX-EC001 is a serial port expansion card for the controller, enabling RS-232 communication with external devices. It supports Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol. It can be flexibly inserted into either Slot A or Slot B.

6.3.2.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC001 are as shown in the figure below (Unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module operation status. For details, refer to Indicator Description .
2	Plug-in Terminal Block	7-channel terminal block. For details, refer to Terminal Wiring Diagram .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Codes	Indicates the QR code for obtaining the relevant manual.
8	Insertable Slot	Indicates the slot into which the expansion card can be inserted.
9	Certification	Indicates the certification standard that the expansion card

	Standards	complies with.
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6.3.2.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swap Support for Expansion Card	Not Supported
Power Supply Method	Powered via the main controller connector
Power Consumption	Max 0.15W

Communication

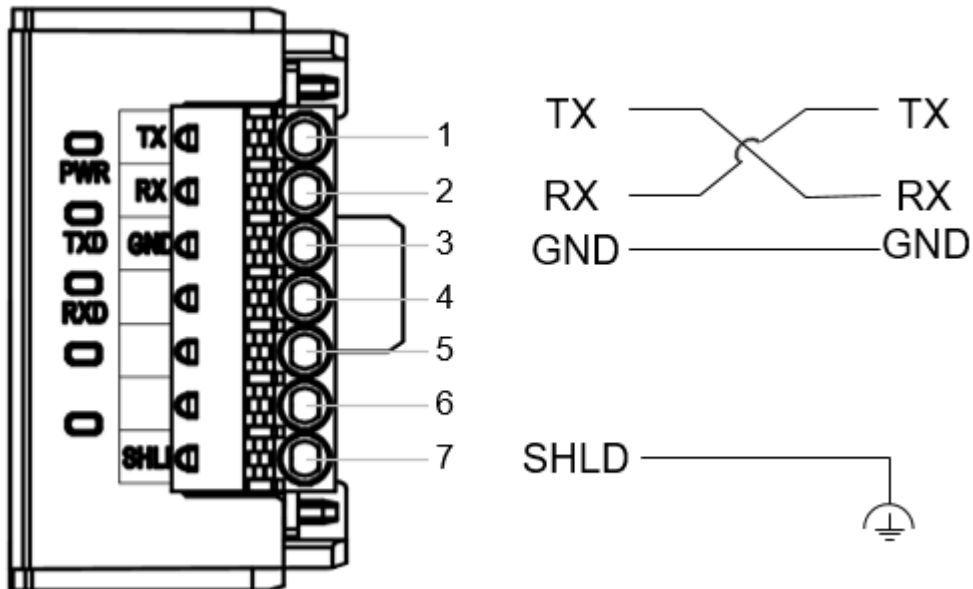
Parameter	Specification
Interface Level	RS-232
Number of Interfaces	1
Protocol Type	Modbus RTU Master/Slave Protocol, Modbus ASCII Master/Slave Protocol, Free Port Protocol
Function Code Type	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hexadecimal)
Number of Function Code Channels	32
Communication Rate (bps)	Supports configurable rates: 1200, 2400, 4800, 9600 (Default), 19200, 38400, 57600, 115200
Communication Distance	1200bps: <30m 2400bps: <25m 4800bps: <20m 9600bps: <13m 19200bps: <10m 38400bps: <7m 57600bps: <5m 115200bps: <3m
Data Bits	Supports configurable data bit length of 7/8 bits, default is 8 bits
Stop Bits	Stop bits configurable as 1 bit / 2 bits, default is 2 bits
Parity	Configurable: Odd/Even/None, default is None
Isolation Method	Non-isolated
Interface Connector	Channels 1, 2, and 3 of this 7-channel terminal block are designated for the RS-232 Transmit (TX), Receive (RX), and Signal Ground (GND), respectively.
Output Short-Circuit Protection	Not Supported

6.3.2.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Constantly On	Expansion card power is on.
		Constantly Off	Expansion card power is off.
TXD	Yellow	Constantly On	TX data is low.
		Constantly Off	TX data is high.
RXD	Yellow	Constantly On	RX data is low.
		Constantly Off	RX data is high.

6.3.2.4 Terminal Wiring Diagram



The expansion card features front-panel wiring. The terminal block pin definitions are as follows.

Pin	Symbol	Signal Description
1	TX	RS-232 Communication Write (Transmit Data)
2	RX	RS-232 Communication Read (Receive Data)
3	GND	RS-232 Communication Ground (Signal Ground)
4	NC	Not Connected

5	NC	Not Connected
6	NC	Not Connected
7	SHLD	Shield Ground

6.3.2.5 Parameter Configuration

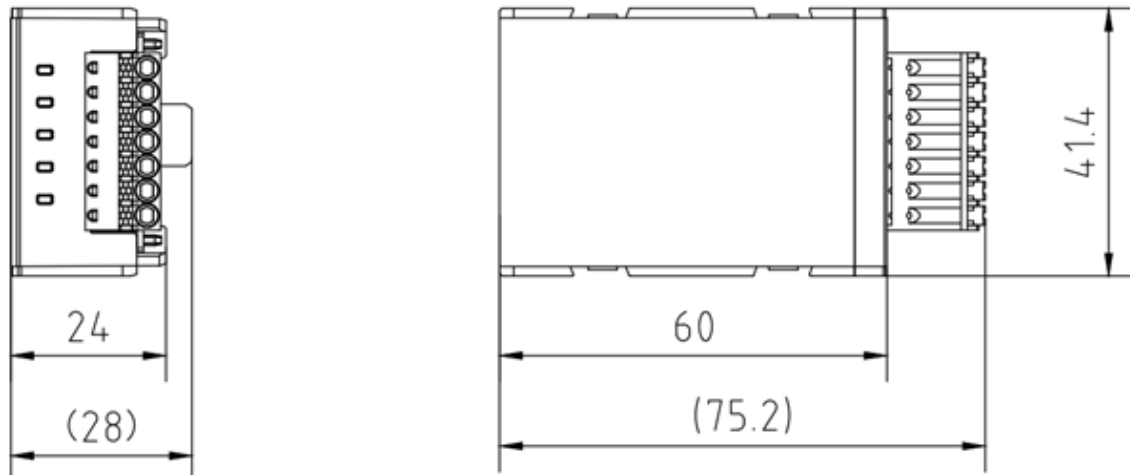
6.3.3 LX-EC002 1-Channel RS-485 Communication Expansion Card

The LX-EC002 is a serial port expansion card for the controller, enabling RS-485 communication with external devices. It supports Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol. It can be flexibly inserted into either Slot A or Slot B.

6.3.3.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC002 are as shown in the figure below (unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Description .
2	Plug-in Terminal Block	7-channel terminal block. For detailed definitions, see Module Appearance Introduction .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card	Indicates the hardware version number of the expansion card at

	Hardware Version	the time of shipment.
7	Manual Access Code	Indicates the QR Code for accessing the related manual.
8	Compatible Slots	Indicates the slots in which the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.3.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swap Support for Expansion Card	Not supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.15W

Communication

Parameter	Specification
Interface Level	RS-485
Number of Interfaces	1
Protocol Type	Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol
Function Code Type	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
Number of Function Code Channels	32
Communication Rate (bps)	Configurable: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200
Communication Distance	19200bps: <1000m 115200bps: <100m
Data Bits	Configurable: supports 7/8 data bits, default is 8 bits
Stop Bits	Configurable: 1/2 stop bits, default is 2 bits
Parity	Configurable: Odd/Even/None, default is None
Maximum Number of Connectable Slaves (Master)	Supports up to 32 slaves (distance from slave to bus trunk ≤3m)
Isolation Method	Non-isolated
Interface Connector	Channels 4, 5, and 6 of the 7-channel terminal block are designated for RS-485+, RS-485-, and signal ground (GND) respectively
Termination	Terminating resistor value is 120Ω, connected between the ends of the transmission line (between Line A and Line B), controlled by a DIP switch
Output Short-Circuit	Not supported

6.3.3.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Steady On	Expansion card power is on
		Steady Off	Expansion card power is off
TXD	Yellow	Steady On	TX data low
		Steady Off	TX data high
RXD	Yellow	Steady On	RX data low
		Steady Off	RX data high

6.3.3.4 Terminal Wiring Diagram and Termination Resistor

Terminal Wiring Diagram



The expansion card features front-panel wiring. The terminal block pin definitions are as follows.

Pin	Symbol	Description
1	NC	Suspended

2	NC	Suspended
3	NC	Suspended
4	A	RS-485+ Communication Wiring
5	B	RS-485- Communication Wiring
6	GND	RS-485 Communication Signal Ground
7	SHLD	Shield Ground

Termination Resistor



An RS-485 termination resistor is configured on the back of the expansion card. The resistor value is 120Ω. It is set via a two-position resistor DIP switch. By default, the termination resistor is not set when shipped from the factory.

On-site, according to actual requirements, both switches of the DIP switch can be set to ON to enable the termination resistor. The change takes effect immediately.



Do not set only one of the two DIP switches to ON.

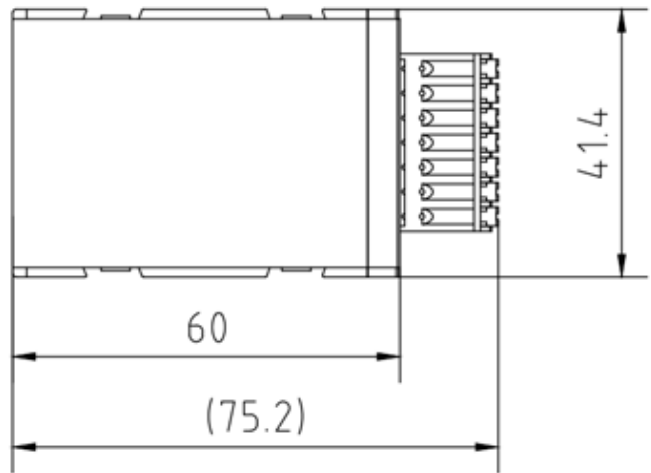
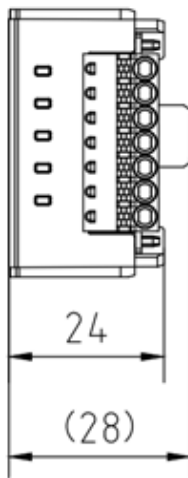
6.3.4 LX-EC003 RS-232/RS-485 Hybrid Communication Expansion Card

The LX-EC003 is a serial port expansion for the main control CPU, enabling RS-232 communication and RS-485 communication with external devices. It supports Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol. It can be flexibly inserted into either Slot A or Slot B.

6.3.4.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC003 are as shown in the figure below (unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Description .
2	Plug-in Terminal Block	7-channel terminal block. For detailed definitions, see Terminal Wiring Diagram .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR Code for accessing the related manual.
8	Compatible Slots	Indicates the slots in which the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.4.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swap Support for Expansion Card	Not supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.15W

Communication

Parameter	Specification
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Communication Interface 1	
Interface Level	RS-232, Logic 0: -15V~-3V, Logic 1: +3V~+15V
Number of Interfaces	1
Protocol Type	Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol
Function Code Type	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
Number of Function Code Channels	32
Communication Rate (bps)	Configurable: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200
Communication Distance	1200bps: <30m 2400bps: <25m 4800bps: <20m 9600bps: <13m 19200bps: <10m 38400bps: <7m 57600bps: <5m 115200bps: <3m
Data Bits	Configurable: supports 7/8 data bits, default is 8 bits
Stop Bits	Configurable: 1/2 stop bits, default is 2 bits
Parity	Configurable: Odd / Even / None, default is None
Isolation Method	Non-isolated
Interface Type	Channels 1, 2, and 3 of the 7-channel terminal block are designated for the RS-232 transmitter (TX), receiver (RX), and signal ground (GND) respectively.
Output Short-Circuit Protection	Not supported
Communication Interface 2	
Interface Level	RS-485 differential signal, Logic 0: -6V~-2V, Logic 1: +2V~+6V
Number of Interfaces	1
Protocol Type	Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol
Function Code Type	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
Number of Function Code Channels	32
Communication Rate (bps)	Configurable: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200
Data Bits	Configurable: supports 7/8 data bits, default is 8 bits
Stop Bits	Configurable: 1/2 stop bits, default is 2 bits
Parity	Configurable: Odd/Even/None, default is None
Maximum Number of Connectable Slaves (Master)	Supports up to 32 slaves (distance from slave to bus trunk ≤3m)
Communication Distance	19200bps: <1000m 115200bps: <100m
Isolation Method	Non-isolated
Interface Connector	Channels 4, 5, and 6 of the 7-channel terminal block are designated for RS-485+, RS-485-, and signal ground (GND) respectively
Termination	Terminating resistor value is 120Ω, connected between the ends of the transmission line (between Line A and Line B), controlled by a DIP switch
Output Short-Circuit Protection	Not supported

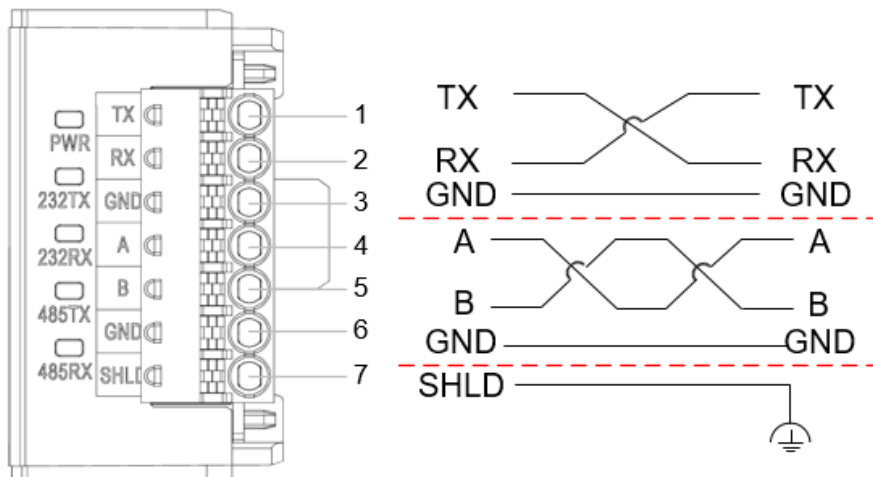
6.3.4.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Steady On	Expansion card power is on
		Steady Off	Expansion card power is off
232TX	Yellow	Steady On	TX data low
		Steady Off	TX data high
232RX	Yellow	Steady On	RX data low
		Steady Off	RX data high
485TX	Yellow	Steady On	TX data low
		Steady Off	TX data high
485RX	Yellow	Steady On	RX data low
		Steady Off	RX data high

6.3.4.4 Terminal Wiring Diagram and Termination Resistor

Terminal Wiring Diagram



The expansion card features front-panel wiring. The terminal block pin definitions are as follows.

Pin	Symbol	Description
1	TX	RS-232 Communication Write (Transmit Data)
2	RX	RS-232 Communication Read (Receive Data)
3	GND	RS-232 Communication Ground (Signal Ground)
4	A	RS-485+ Communication Wiring
5	B	RS-485- Communication Wiring
6	GND	RS-485 Communication Signal Ground
7	SHLD	Shield Ground

Termination Resistor



An RS-485 termination resistor is configured on the back of the expansion card. The resistor value is 120Ω. It is set via a two-position resistor DIP switch. By default, the termination resistor is not set when shipped from the factory.

On-site, according to actual requirements, both switches of the DIP switch can be set to ON to enable the termination resistor. The change takes effect immediately.



Do not set only one of the two DIP switches to ON.

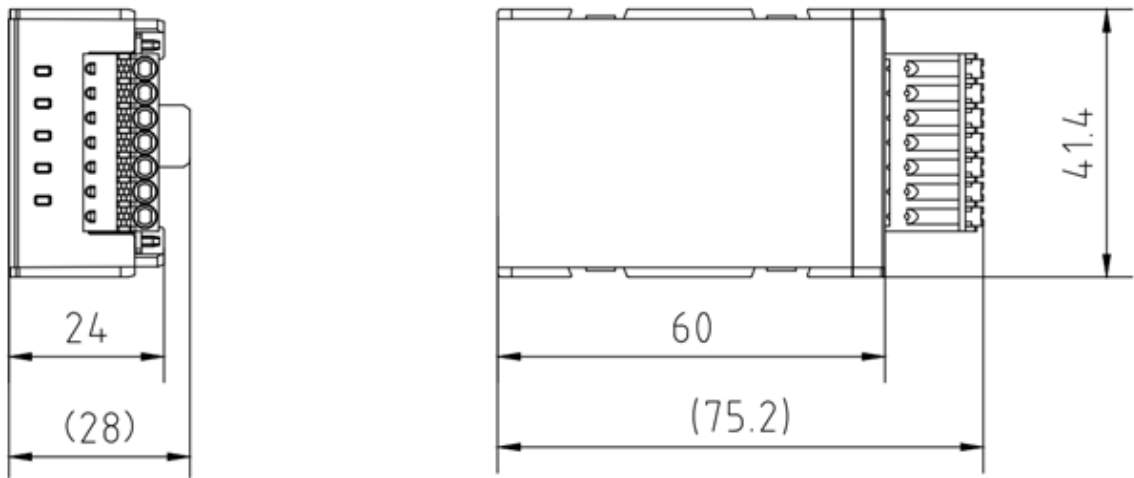
6.3.5 LX-EC004 1-Channel RS-232 with Clock Communication Expansion Card

The LX-EC004 is a serial port expansion card for the controller, which also provides a real-time clock for the compact PLC system. It enables RS-232 communication with external devices and supports Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol. It can be flexibly inserted into either Slot A or Slot B.

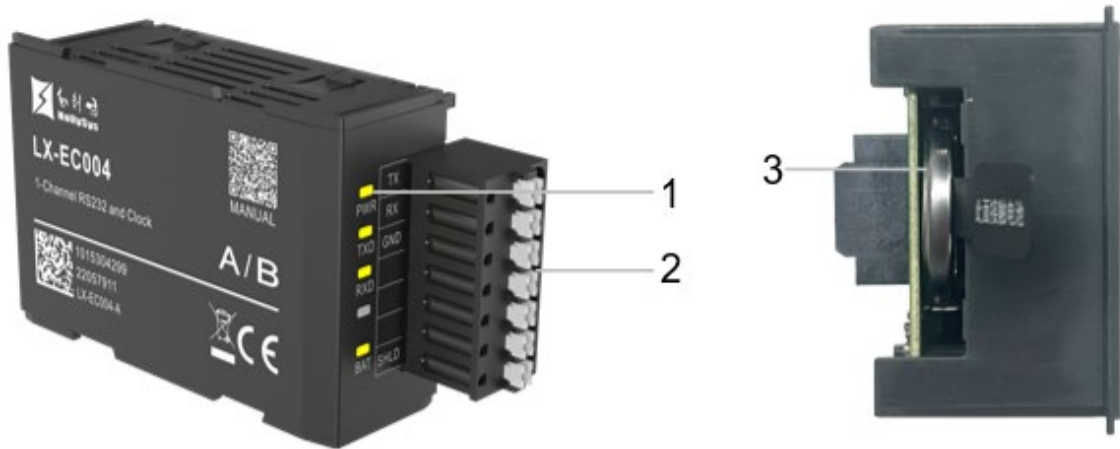
6.3.5.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC004 are as shown in the figure below (unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Description .
2	Plug-in Terminal Block	7-channel terminal block. For detailed definitions, see Terminal Wiring Diagram .
3	Battery Slot	CR2032 button battery slot. For battery usage instructions, see Battery Installation and Removal .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR Code for accessing the related manual.
8	Compatible Slots	Indicates the slots in which the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.5.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swap Support for Expansion Card	Not supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.15W

Communication

Parameter	Specification
Interface Level	RS-232
Number of Interfaces	1
Protocol Type	Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol
Function Code Type	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
Number of Function Code Channels	32
Communication Rate (bps)	Configurable: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200
Communication Distance	1200bps: <30m 2400bps: <25m 4800bps: <20m 9600bps: <13m 19200bps: <10m 38400bps: <7m 57600bps: <5m 115200bps: <3m
Data Bits	Configurable: supports 7/8 data bits, default is 8 bits
Stop Bits	Configurable: 1/2 stop bits, default is 2 bits
Parity	Configurable: Odd/Even/None, default is None
Isolation Method	Non-isolated
Interface Type	Terminals 1, 2, and 3 of the 7-terminal block are designated for the RS232 transmitter (TX), receiver (RX), and signal ground (GND) respectively.
Output Short-Circuit Protection	Not supported

RTC Clock

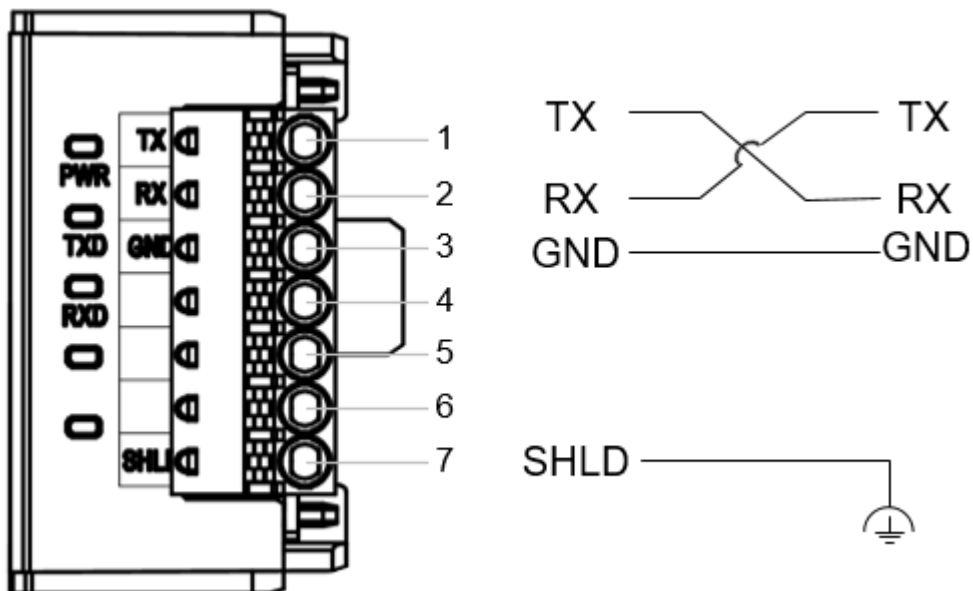
Parameter	Specification
Communication Interface	I2C
Function	Maintains perpetual calendar time
Setting Range	- LX-CU153/LX-CU155/LX-CU157/LX-CU311: 【2020-01-01 00:00:00】 to 【2038-01-19 00:00:00】 - LX-CU331/LX-CU332/LX-CU333: 【2020-01-01 00:00:00】 to 【2099-12-31 00:00:00】
Clock Accuracy	±120 seconds/month (25°C)
Clock Format	Year-Month-Day Hour-Minute-Second
Battery Specification	 CR2032 button cell battery, lifespan 5 years Note: If the system is powered off for an extended period, an insulating spacer must be inserted with the battery.
Battery Backup Life	1 year @ 25°C (system powered off)
Battery Low Voltage Warning	2.5V ±0.1V
Battery Replacement Requirement	Battery replacement process should not exceed 15 seconds

6.3.5.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Steady On	Expansion card power supply is normal
		Steady Off	Expansion card is not powered
TXD	Yellow	Steady On	TX data low
		Steady Off	TX data high
RXD	Yellow	Steady On	RX data low
		Steady Off	RX data high
BAT	Yellow	Steady On	Battery low
		Steady Off	Battery normal

6.3.5.4 Terminal Wiring Diagram



The expansion card features front-panel wiring. The terminal block pin definitions are as follows.

Pin	Symbol	Signal Description
1	TX	RS-232 Communication Write (Transmit Data)

2	RX	RS-232 Communication Read (Receive Data)
3	GND	RS-232 Communication Ground (Signal Ground)
4	NC	Not Connected
5	NC	Not Connected
6	NC	Not Connected
7	SHLD	Shield Ground

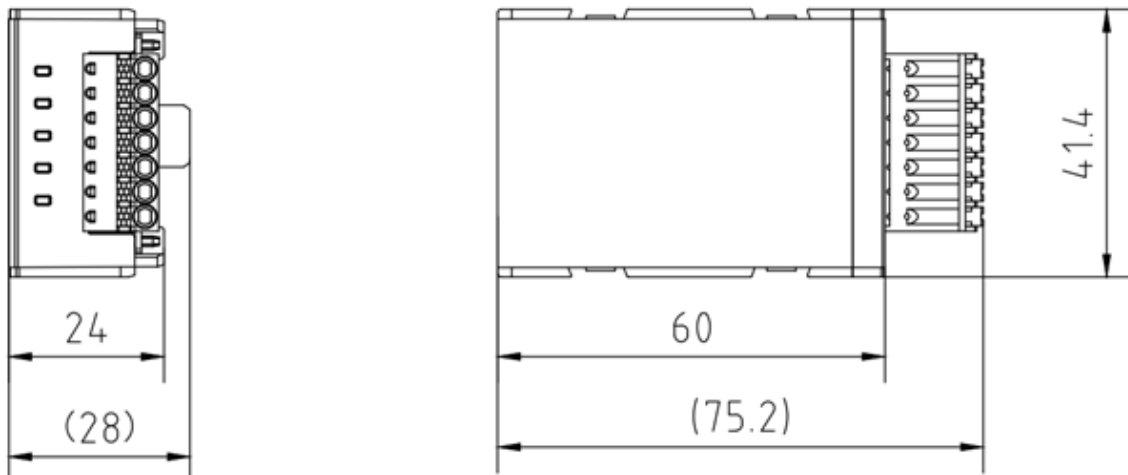
6.3.6 LX-EC005 1-Channel RS-485 with Clock Communication Expansion Card

The LX-EC005 is a serial port expansion card for the main control CPU, enabling RS-485 communication with external devices. It supports Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol. It can be flexibly inserted into either Slot A or Slot B.

6.3.6.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC005 are as shown in the figure below (unit: mm).

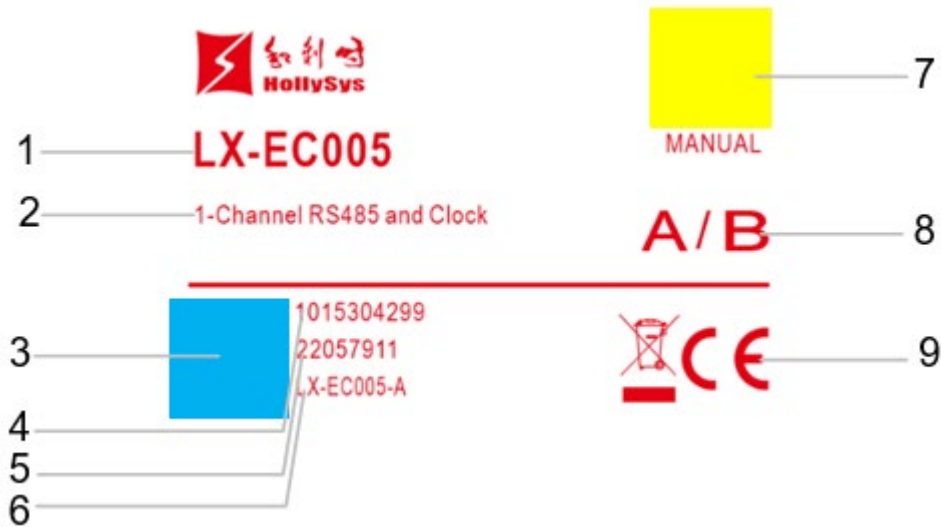


Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Description .
2	Plug-in Terminal Block	7-channel terminal block. For detailed definitions, see Terminal Wiring Diagram .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR Code for accessing the related manual.
8	Compatible Slots	Indicates the slots in which the expansion card can be inserted.
9	Certification	Indicates the certification standards that the expansion card

	Standards	complies with.
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6.3.6.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swap Support for Expansion Card	Not supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.15W

Communication

Parameter	Specification
Interface Level	RS-485, differential signal, Logic 0: -6V~-2V, Logic 1: +2V~+6V
Number of Interfaces	1
Protocol Type	Modbus RTU Master/Slave protocol, Modbus ASCII Master/Slave protocol, Free port protocol
Function Code Type	01, 02, 03, 04, 05, 06, 0F, 10, 17 (Hex)
Number of Function Code Channels	32
Communication Rate (bps)	Configurable: 1200, 2400, 4800, 9600 (default), 19200, 38400, 57600, 115200
Communication Distance	19200bps: <1000m 115200bps: <100m
Data Bits	Configurable: supports 7/8 data bits, default is 8 bits
Stop Bits	Configurable: 1/2 stop bits, default is 2 bits
Parity	Configurable: Odd/Even/None, default is None
Maximum Number of Connectable Slaves (Master)	Supports up to 32 slaves (distance from slave to bus trunk ≤3m)
Isolation Method	Non-isolated
Interface Connector	3-wire terminal
Termination	Terminating resistor value is 120Ω, connected between the ends of the transmission line (between Line A and Line B), controlled by a DIP switch
Output Short-Circuit Protection	Not supported

RTC Clock

Parameter	Specification
Communication Interface	I2C
Function	Maintains perpetual calendar time

	【2000-01-01 00:00:00】 to 【2038-01-19 03:14:07】
Clock Accuracy	±120 seconds/month (25°C)
Clock Format	Year-Month-Day Hour-Minute-Second
Battery Specification	CR2032 button cell battery, lifespan 5 years  Note: If the system is powered off for an extended period, an insulating spacer must be inserted with the battery.
Battery Backup Life	1 year @ 25°C (system powered off)
Battery Low Voltage Warning	2.5V ±0.1V
Battery Replacement Requirement	Battery replacement process should not exceed 15 seconds

6.3.6.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Steady On	Expansion card power is on
		Steady Off	Expansion card power is off
BAT	Yellow	Steady On	Battery low
		Steady Off	Battery normal
TXD	Yellow	Steady On	TX data low
		Steady Off	TX data high
RXD	Yellow	Steady On	RX data low
		Steady Off	RX data high

6.3.6.4 Terminal Wiring Diagram and Termination Resistor

Terminal Wiring Diagram



The expansion card features front-panel wiring. The terminal block pin definitions are as follows.

Pin	Symbol	Description
1	NC	Not Connected
2	NC	Not Connected
3	NC	Not Connected
4	A	RS-485+ Communication Wiring
5	B	RS-485- Communication Wiring
6	GND	RS-485 Communication Signal Ground
7	SHLD	Shield Ground

Termination Resistor



An RS-485 termination resistor is configured on the back of the expansion card. The resistor value is 120Ω. It is set via a two-position resistor DIP switch. By default, the termination resistor is not set when shipped from the factory.

On-site, according to actual requirements, both switches of the DIP switch can be set to ON to enable the termination resistor. The change takes effect immediately.



Do not set only one of the two DIP switches to ON.

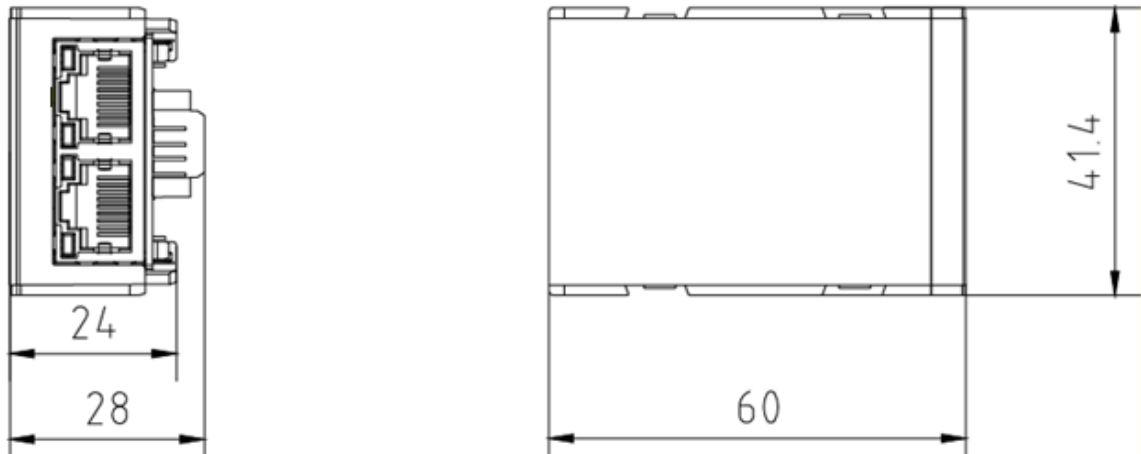
6.3.7 LX-EC006 CAN Communication Expansion Card

The LX-EC006 is a peripheral expansion for the main control CPU, providing CAN bus communication for the LX series compact PLC system. It must be inserted into the controller's Slot B when in use.

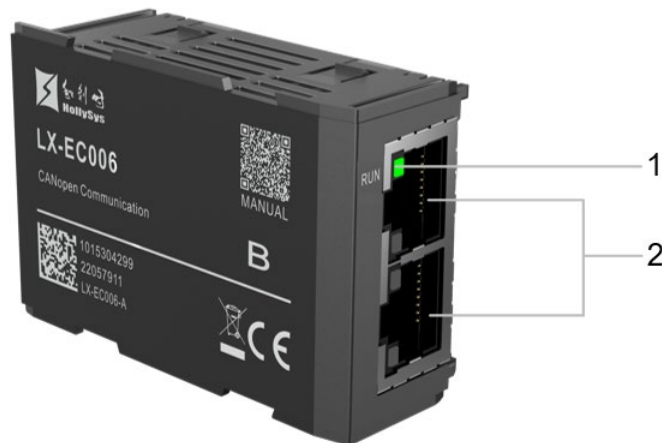
6.3.7.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC006 are as shown in the figure below (unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Description .
2	Ethernet Ports	2 standard RJ45 ports, used for CANopen communication.

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR Code for accessing the related manual.
8	Compatible Slots	Indicates the slots in which the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.7.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	B (Supported only by LX-CU153, LX-CU155 and LX-CU157)
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Hot-swap Support for Expansion Card	Not supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.2W

Communication

Parameter	Specification	
Interface Level	CAN	
Number of Interfaces	1	
Interface Type	Dual RJ45	
Communication Cable	Shielded twisted pair cable, Ethernet Cat.5e or above	
Communication Type	• Supports CANopen protocol (CiA 301 and CiA 402 standards), and is configurable for CAN2.0A and CAN2.0B. • Supports CAN Free Protocol, compliant with CAN 2.0A/2.0B, and communicates with slave stations via read/write commands.	
Maximum Number of Connectable Slaves	Slaves (CiA301 standard)	64
	Axes (CiA402 standard) Note: For LX-EC006 with axis configuration, it must be used in conjunction with CANopen axis control commands.	32
Communication Rate	• CANopen Protocol: 50 Kbps, 100 Kbps, 125 Kbps, 250 Kbps, 500 Kbps (default), 800 Kbps, 1 Mbps (configurable) • CAN Free Protocol: 50 Kbps, 100 Kbps, 125 Kbps, 200 Kbps, 250 Kbps, 500 Kbps (default), 800 Kbps, 1 Mbps (configurable)	
Communication Distance	50Kbps: < 1000m 100Kbps: < 500m 125Kbps: < 300m 250Kbps: < 150m 500Kbps: < 80m 1Mbps: < 20m	
Slave Data Volume	• PDO: ○ Total TPDO and RPDO across all slaves: up to 256 entries ○ Cumulative RPDO data size of all slaves must not exceed 1024 bytes ○ Cumulative TPDO data size of all slaves must not exceed 1024 bytes • SDO: ○ Automatic SDO: up to 32 entries per slave ○ Manual SDO: up to 60 entries per slave	
Isolation Method	Non-isolated	
Terminating Resistor	120Ω (controlled by DIP switch)	
Output Short-Circuit Protection	Supported	

6.3.7.3 Indicator Lights

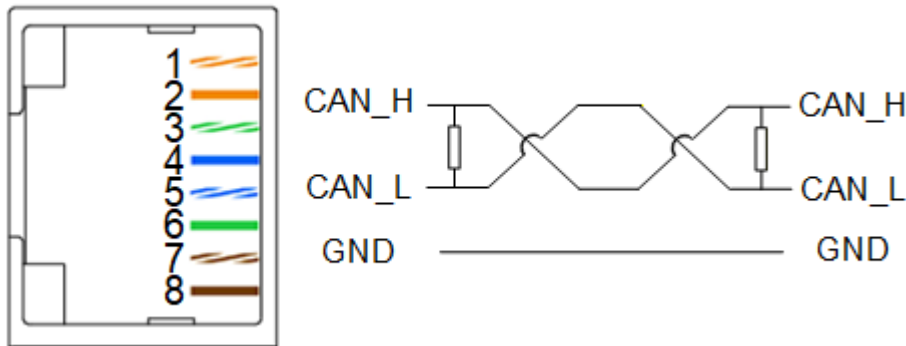


LED Name	Color	Status	Description
RUN	Green	Steady On	All slaves online
		Blinking	Partial slaves offline
		Steady Off	All slaves offline or no communication established

6.3.7.4 Terminal Wiring Diagram and Termination Resistor

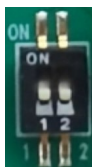
Terminal Wiring Diagram

The LX-EC006 is equipped with standard RJ45 ports. If the network interface of the connected slave station is not of the RJ45 type, it is necessary to cut open the Ethernet cable and follow the wiring method and pinout definition shown in the figure below for connection.



Pin	Wire Color	Meaning
1	White and Orange	CAN_H
2	Orange	CAN_L
3	White and Green	GND (CAN Signal Ground)
4	Blue	-
5	White and Blue	-
6	Green	-
7	White and Brown	-
8	Brown	-

Termination Resistor



A termination resistor is configured on the back of the expansion card. The resistor value is 120Ω. It is set via a two-position resistor DIP switch. By default, the termination resistor is not set when shipped from the factory.

On-site, according to actual requirements, both switches of the DIP switch can be set to ON to enable the termination resistor. The change takes effect immediately.

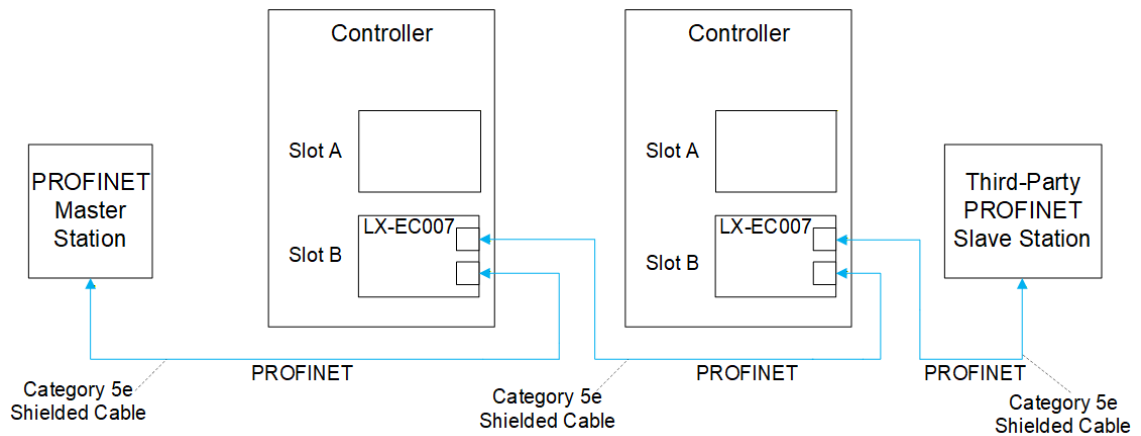


Do not set only one of the two DIP switches to ON.

6.3.8 LX-EC007 PROFINET Slave RT Communication Expansion Card

6.3.8.1 Network Topology

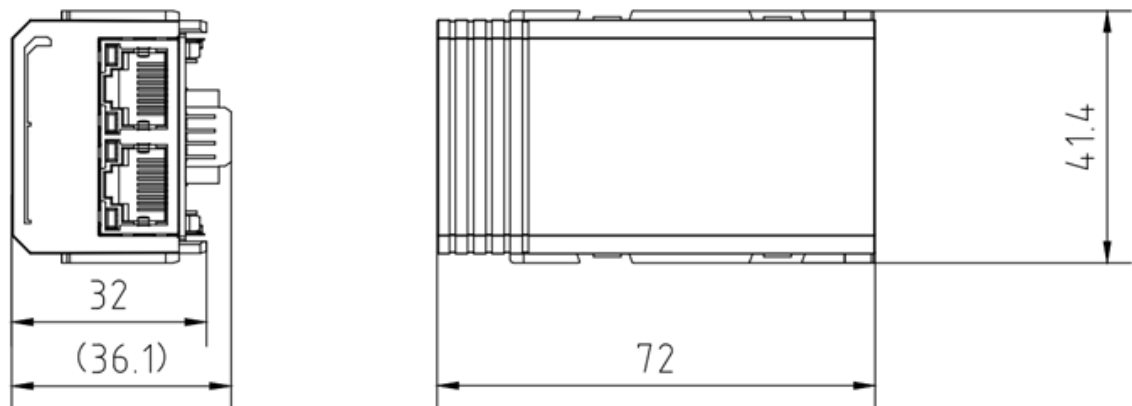
The LX-EC007 is an expansion card for compact PLC products, enabling communication with PROFINET masters and network topology construction through its 2-port PROFINET interface.



6.3.8.2 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC007 are shown in the following figure (unit: mm).



Components Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Light Description .
2	Ethernet Interface	Two standard RJ45 interfaces for PROFINET communication.

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the expansion card model.
2	Basic Information	Indicates expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number and firmware serial number at the time of shipment. In LX-EC007-XXX, X is the hardware version, YY is the firmware serial number.
7	Manual Access Code	Indicates the QR code for accessing relevant manuals.
8	Compatible Slots	Indicates the compatible slots for the expansion card.
9	Certification Standards	Indicates the certification standards met by the expansion card.

6.3.8.3 Technical Specifications

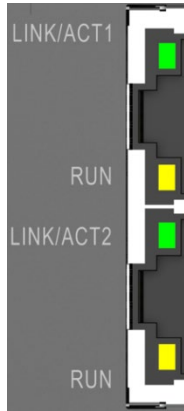
Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	72mm*41.4mm*32mm
Weight	≤40g
Hot-swap Support for Expansion Card	Not Supported
Power Supply	Powered via the main control connector
Power Consumption	Max 1.5W

Communication

Parameter	Specification
Protocol Type	PROFINET Slave, RT
Communication Byte Size	Maximum 1440 bytes, usable length 1024 bytes, minimum communication cycle 1ms
Interface Type	Dual RJ45, supporting switch function
Communication Cable	Ethernet Cat.5e or higher grade shielded twisted pair cable
Communication Speed	100Mbps, Full Duplex
Ring Network	Supports MRP
Topology	Supports linear, star, and tree topologies
PROFINET Version	V2.3 and above
I&M Data	I&M0 to I&M3
Configuration	No configuration required when replacing LX-CU311
Firmware Upgrade	- Provides a firmware upgrade interface; firmware can be deployed to the LX-EC007 PROFINET expansion card module via the controller - During the upgrade process, operations that may interrupt the upgrade, such as power off, operating device ports, or unplugging network cables, are not supported

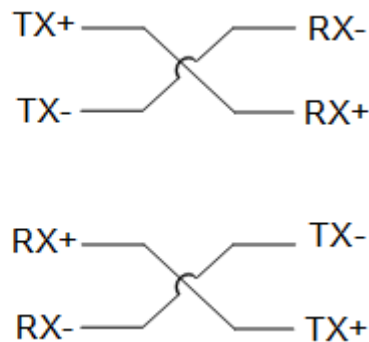
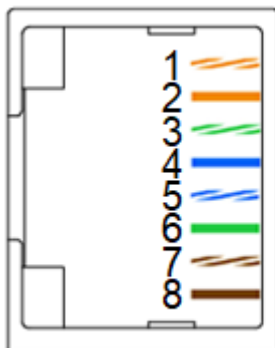
6.3.8.4 Indicator Lights



LED Name	Color	Status	Description
LINK/ACT1	Green	Constantly Off	No connection established
		Flashing	Connection established, data transmitting/receiving
RUN	Yellow	Constantly Off	Module not powered or firmware not running
		Slow Flash	Indicator test
		Fast Flash	PROFINET connection not established
		Constantly On	PROFINET communication status normal
LINK/ACT2	Green	Constantly Off	No connection established
		Flashing	Connection established, data transmitting/receiving
RUN	Yellow	Constantly Off	Module not powered or firmware not running
		Slow Flash	Indicator test
		Fast Flash	PROFINET connection not established
		Constantly On	PROFINET communication status normal

6.3.8.5 Terminal Wiring Diagram

The LX-EC007 is equipped with standard RJ45 ports. The wiring method and pin definitions are as follows.



Pin	Cable Color	Definition
1	White and Orange	Transmit Data Negative (TX+)
2	Orange	Transmit Data Positive (TX-)
3	White and Green	Receive Data Negative (RX+)
4	Blue	-
5	White and Blue	-
6	Green	Receive Data Positive (RX-)
7	White and Brown	-
8	Brown	-

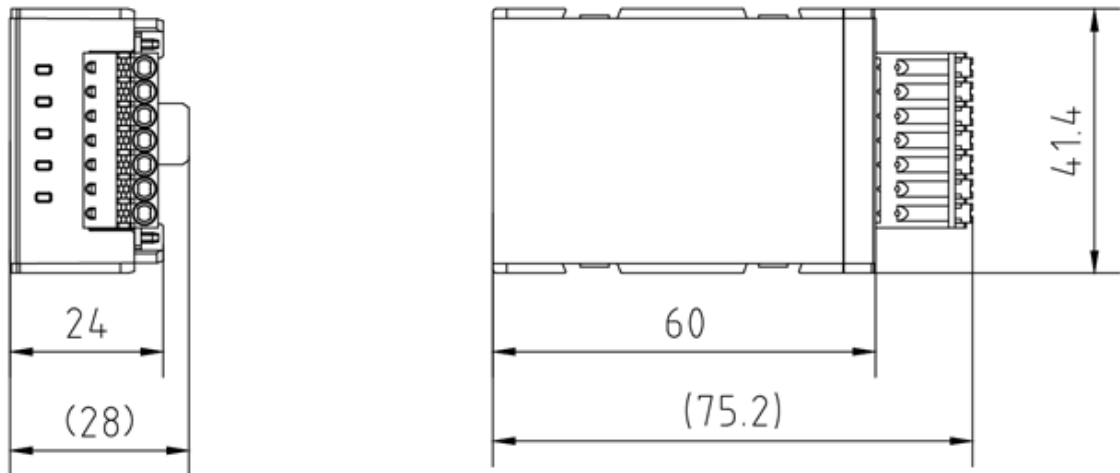
6.3.9 LX-EC011 4-Channel Digital Input Expansion Card

The LX-EC011 is a controller peripheral expansion card for compact PLC products, providing 4 channels of general-purpose digital (PNP/NPN) input. It can be flexibly inserted into either Slot A or Slot B.

6.3.9.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC011 are shown in the following figure (unit: mm).



Components Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module and channel operating status. For detailed definitions, see Indicator Light Description .
2	Removable Terminal Block	7-channel DI terminal block. For detailed definitions, see Terminal Wiring Diagram .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the expansion card model.
2	Basic Information	Indicates expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR code for accessing relevant manuals.
8	Compatible Slots	Indicates the compatible slots for the expansion card.
9	Certification Standards	Indicates the certification standards met by the expansion card.

6.3.9.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Extension Card Hot-swap	Not Supported
Power Supply Method	Powered via the main controller connector
Power Consumption	Max 0.1W

Channels

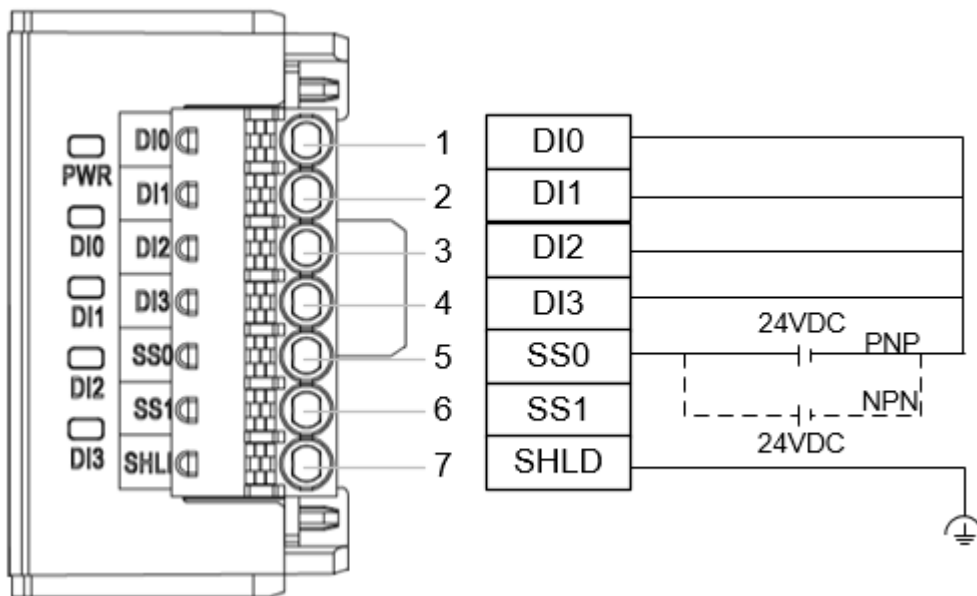
Parameter	Specification		
Number of Channels	4 channels		
Channel Type	PNP type / NPN type		
Threshold Voltage	ON/OFF	PNP	NPN
	ON Voltage	> 15V	< 5V
	OFF Voltage	< 5V	> 15V
Input Voltage Level	24VDC±20%		
Maximum Current per Channel	4mA at 24VDC		
Response Time (PNP/NPN type)	OFF→ON: < 1000μs ON→OFF: < 1000μs		
Channel Wiring	Shielded or unshielded cable		
Channel Input Filter Time	Terminal filter time configurable, 2ms ~ 1000ms		
Inter-channel Isolation	Supported		
Isolation Withstand Voltage	Channel to System: 1000VAC for 1 minute, leakage current < 5mA		

6.3.9.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Constantly On	Expansion card power is on
		Constantly Off	Expansion card power is off
4*DI	Yellow	Constantly On	Channel status ON
		Constantly Off	Channel status OFF

6.3.9.4 Terminal Wiring Diagram



Pin	Symbol	Signal Description
1	DI0	Input port 0
2	DI1	Input port 1
3	DI2	Input port 2
4	DI3	Input port 3
5	SS0	Common terminal
6	SS1	Common terminal

7	SHLD	Shield Ground
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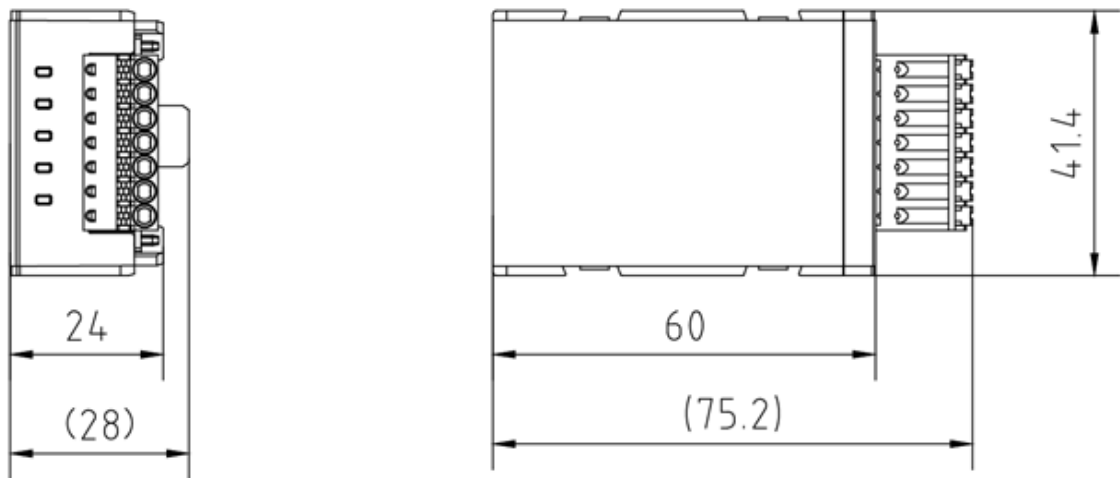
6.3.10 LX-EC012 4-Channel Digital Output Expansion Card

The LX-EC012 is a controller peripheral expansion card for compact PLC products, supporting 4 channels of NPN-type digital output. It can be flexibly inserted into either Slot A or Slot B.

6.3.10.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC012 are shown in the following figure (unit: mm).



Components Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module and channel operating status. For detailed definitions, see Indicator Light Description .
2	Removable Terminal	7-channel DO terminal block. For detailed definitions, see

	Block	Terminal Wiring Diagram.
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Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the expansion card model.
2	Basic Information	Indicates expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR code for accessing relevant manuals.
8	Compatible Slot	Indicates the compatible slots for the expansion card.
9	Certification Standard	Indicates the certification standards met by the expansion card.

6.3.10.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swapping of Expansion	Not Supported

Card	
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.2W
Field Power Supply Input Voltage	24VDC
Field Power Supply Input Current	Max 1.1A

Channels

Parameter	Specification	
Number of Channels	4 High-speed Output Channels	
Channel Type	NPN type, one common terminal	
Threshold Voltage	ON Voltage	< 5V
	OFF Voltage	> 15V
OFF Maximum Leakage Current	100uA (-20~60°C) 10uA (25°C)	
Channel Output Max. Frequency @ Max. Load Current	Resistive Load 2KHz~200KHz@100mA 0Hz~2KHz@500mA	
Channel Output Max. Frequency @ Load Type	Resistive Load: 200KHz Inductive Load: 0.5Hz Lamp Load: 10Hz	
Response Time ON/OFF	 Note: External load of high-speed DO channel <3KΩ	OFF→ON: < 1μs ON→OFF: < 1μs
	Standard	OFF→ON: 100μs ON→OFF: 100μs
Channel Safety Value	Supports individual configuration per channel. Output can be configured as: • Output Hold (Last State) • Output Preset Value The above output configuration takes effect when the iAT project stops.	
Output Load	0.5A/point, 1A/4 points (Resistive Load) 6W/4 points (Inductive Load) 6W/4 points (Lamp Load) No built-in freewheeling diode, requires external installation by customer. Output load capability is derated by ambient temperature and installation method. For details, see Derating Requirements	
Parallel Connection Support	Not Supported	
On-state Voltage Drop (500mA)	Less than 0.5V	
Isolation Between Channels	Not Supported	
Withstand Voltage (Isolation)	Channels to System: 1000VAC, 1 minute, leakage current < 5mA	
Power Supply Reverse Polarity Protection	Field-side power supply reverse polarity protection (between COM and F24V+)	
Channel Protection Functions	Overcurrent protection supported (individual current limiting, hiccup mode) Overtemperature protection supported (all channels disconnect)	

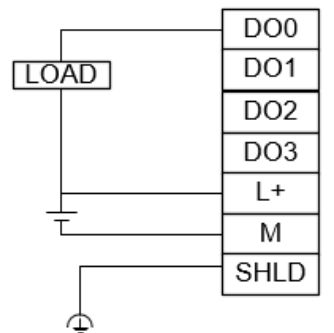
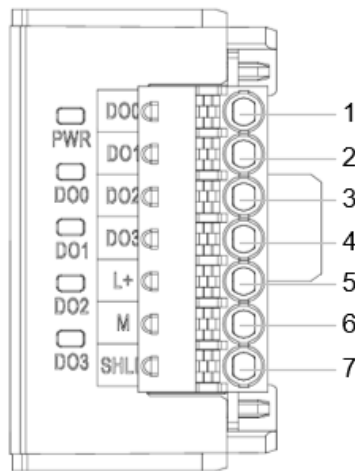
	Output recovery method after protection: Automatic recovery
Channel Cable	Shielded or unshielded cable
Terminal Wire Gauge Range	0.2~1.5mm ²
Terminal Wire Gauge Maximum Length	100m (standard cable, wire gauge 1.5mm ²) @ for standard applications 3m (double-shielded cable) @ for high-speed motion control applications

6.3.10.3 Indicator Lights

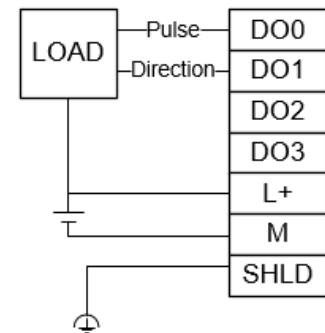


LED Name	Color	Status	Description
PWR	Yellow	Solid On	Expansion card power is on
		Solid Off	Expansion card power is off
4*DO	Yellow	Solid On	Channel status ON
		Solid Off	Channel status OFF

6.3.10.4 Terminal Wiring Diagram



Conventional Output Wiring



High-Speed Input Wiring

Table 1 Definition of Conventional Output Terminals

Pin	Symbol	Signal Description
1	DO0	Output Port 0
2	DO1	Output Port 1
3	DO2	Output Port 2
4	DO3	Output Port 3
5	L+	Field-side Input Power
6	M	Common Terminal
7	SHLD	Chassis Ground

Table 2 Definition of High-Speed Output Terminals

Type	Low-speed Output	Direction Terminal	Pulse + Direction	CW/CCW	A/B	PWM
Max. Frequency			200kHz			
DO0	√	Any unused terminal. Direction terminal controlled by user.	√			
DO1	√					
DO2	√					
DO3	√		√			

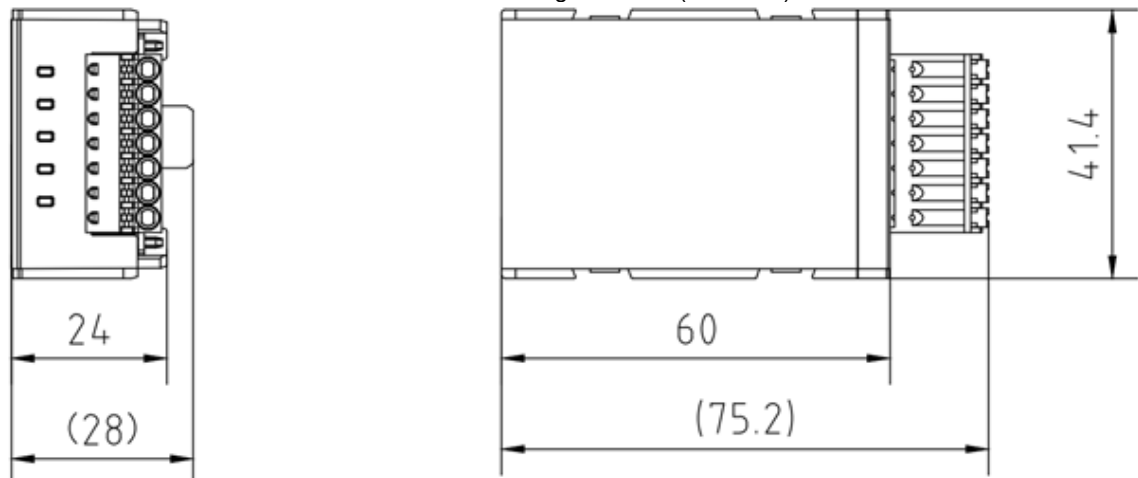
6.3.11 LX-EC021 2-Channel Analog Input and 1-Channel Analog Voltage Output Extension Card

The LX-EC021 is a 2-channel voltage/current input and 1-channel voltage output extension card. It supports 0V~5V, 1V~5V, 0V~10V signal input/output functions, and 0mA~20mA, 4mA~20mA signal input functions.

6.3.11.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC021 are shown in the figure below (Unit: mm).



Component Description



No.	Name	Description
1	Operating Status Indicator	Indicates the module's operating status. For detailed definitions, refer to Indicator Description .
2	Removable Terminal Block	7-channel AI/AO terminal block. For detailed definitions, refer to Terminal Wiring Diagram .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number and firmware serial number of the expansion card at the time of factory shipment. In LX-EC021-XXX, X is the hardware version number, and YY is the firmware serial number.

7	Manual Acquisition Code	Indicates the QR code for obtaining related manuals.
8	Compatible Slot	Indicates the controller slot into which the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.11.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swapping of Expansion Card	Not Supported
Power Supply Method	Powered via main control connector  Note: For versions below LX-EC021-B01, there is a 3-second channel stabilization period after power-on, after which the output stabilizes at 0V. For LX-EC021-B01 and later versions, the output stabilizes at 0V immediately after power-on.
Power Consumption	Max 0.2W

Channels

Parameter	Specification
Communication Cycle with Controller	≤5ms, channel mapping modification not supported
Input	
Number of Input Channels	2 Channels
Channel Specification	Each of the two channels can be configured for voltage or current
Voltage Input Range	0V~5V, 1V~5V, 0V~10V
Over-range/Under-range Diagnosis	Over-range: Input value >10.8V (for 0V~10V), Input value >5.4V (for 0V~5V, 1V~5V) Under-range: 0V < Input value < 0.6V (for 1V~5V)  Note: The range limit is based on a minimum of 8% and a maximum of 108% of the full scale.
Voltage Input Impedance	> 200KΩ
Conversion Speed	≤5ms/channel
Current Input Range	0mA~20mA, 4mA~20mA
Over-range/Under-range Diagnosis	Over-range: Input value >21.6mA (for 0mA ~ 20mA, 4mA ~ 20mA)

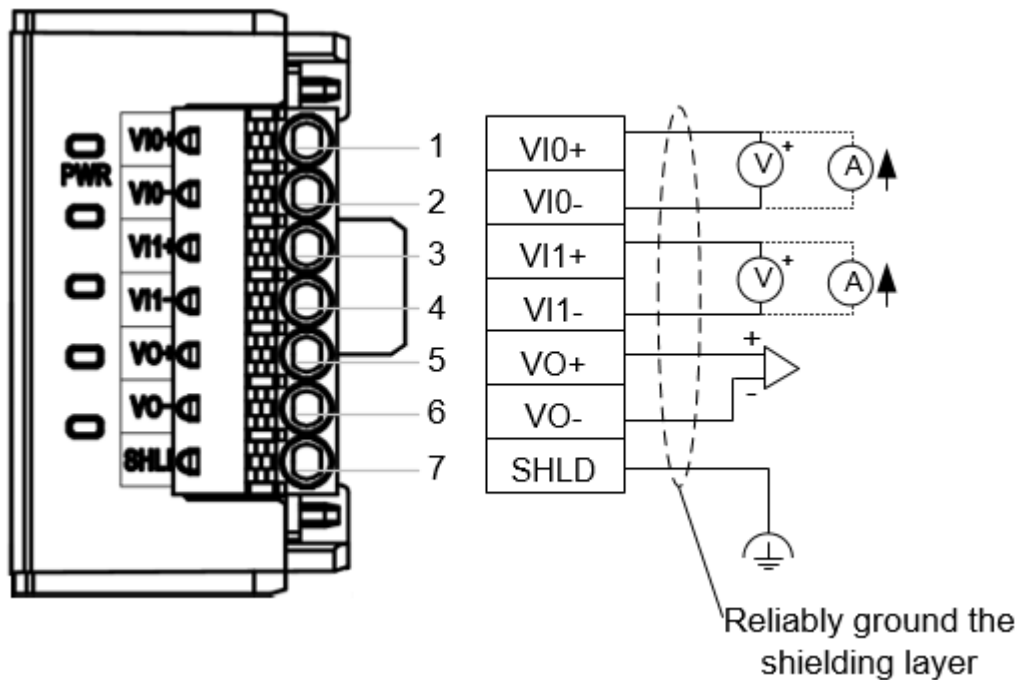
	Under-range: $0\text{mA} < \text{Input value} < 2.4\text{mA}$ (for $4\text{mA} \sim 20\text{mA}$)  Note: The range limit is based on a minimum of 8% and a maximum of 108% of the full scale.
Current Sampling Impedance	$249\Omega \pm 1\%\Omega$
Input Accuracy (at 25°C ambient temperature)	Voltage $\pm 1\%$, Current $\pm 1\%$ (of full scale)
Input Accuracy (full temperature range)	Voltage $\pm 3\%$, Current $\pm 3\%$ (of full scale)
Input Signal Frequency	$< 10\text{Hz}$
Resolution	12-bit
Digital Code Value	0 ~ 27648 (unsigned)
Output	
Number of Output Channels	1 Channel
Channel Specification	Voltage
Output Voltage Range	$0\text{V} \sim 5\text{V}$, $1\text{V} \sim 5\text{V}$, $0\text{V} \sim 10\text{V}$
Output Configuration	Output can be configured as: • Output Zero (Cleared) • Output Hold (Last State) • Output Preset Value The above output configuration takes effect when the iAT project stops.
Output Voltage Resistive Load	$\geq 2\text{k}\Omega$
Conversion Speed	$\leq 1\text{ms}$
Output Accuracy (at 25°C ambient temperature)	$\pm 1\%$ (of full scale)
Output Accuracy (full temperature range)	$\pm 5\%$ (of full scale)
Resolution	12-bit
Digital Code Value	0 ~ 27648 (unsigned)
Output Short-circuit/Open-circuit Detection	Not Supported

6.3.11.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Solid On	Expansion card power supply is normal
		Solid Off	Expansion card is not powered

6.3.11.4 Terminal Wiring Diagram



The extension card uses front panel wiring. The terminal block definitions are as follows.

Pin	Signal Definition	Description
1	VIO+	Voltage/Current Channel 0 Input +
2	VIO-	Voltage/Current Channel 0 Input -
3	VI1+	Voltage/Current Channel 1 Input +
4	VI1-	Voltage/Current Channel 1 Input -

5	VO+	Voltage Channel Output +
6	VO-	Voltage Channel Output -
7	SHLD	Shield Ground

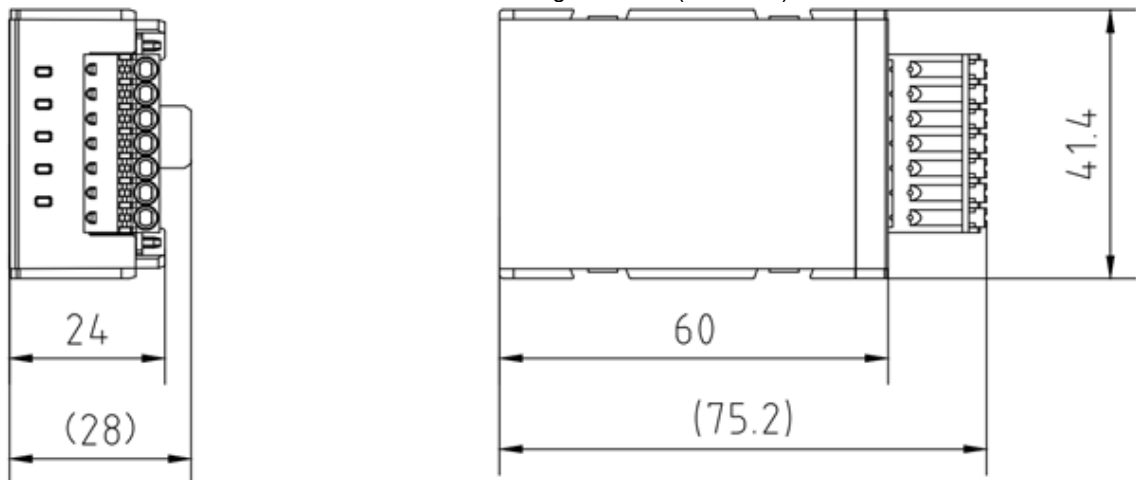
6.3.12 LX-EC022 2-Channel Analog Input and 1-Channel Analog Current Output Extension Card

The LX-EC022 is a 2-channel voltage/current input and 1-channel current output extension card. It supports 0mA~20mA, 4mA~20mA signal input/output functions, and 0V~5V, 1V~5V, 0V~10V signal input functions.

6.3.12.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC022 are shown in the figure below (Unit: mm).



Component Description



No.	Name	Description
1	Operating Status Indicator	Indicates the module's operating status. For detailed definitions, refer to Indicator Description .
2	Removable Terminal Block	7-channel AI/AO terminal block. For detailed definitions, refer to Terminal Wiring Diagram .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates the expansion card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number and firmware serial number of the expansion card at the time of factory shipment. In LX-EC022-XXX, X is the hardware version number, and YY is the firmware serial number.
7	Manual Acquisition Code	Indicates the QR code for obtaining related manuals.
8	Compatible Slots	Indicates the controller slot into which the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.12.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)

Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Fool-proofing (Keying)	Supported
Extension Card Hot-swap	Not Supported
Power Supply Method	Powered via the main controller connector
Power Consumption	Max 0.5W

Channels

Parameter	Specification
Communication Cycle with Controller	≤5ms, channel mapping modification is not supported
Input	
Number of Input Channels	2 channels
Channel Specification	Each of the two channels can be configured for voltage or current
Voltage Input Range	0V~5V, 1V~5V, 0V~10V
Over-range Diagnosis	Over-range: Input value >10.8V (0V~10V), Input value >5.4V (0V~5V, 1V~5V) Under-range: 0V < Input value < 0.6V (1V~5V)  Note: Range limits are based on minimum 8% and maximum 108% of the full scale.
Voltage Input Impedance	> 200KΩ
Conversion Speed	≤5ms per channel
Current Input Range	0mA~20mA, 4mA~20mA
Over-range Diagnosis	Over-range: Input value >21.6mA (0mA~20mA, 4mA~20mA) Under-range: 0mA < Input value < 2.4mA (4mA~20mA)  Note: Range limits are based on minimum 8% and maximum 108% of the full scale.
Current Sampling Impedance	249Ω±1%Ω
Input Accuracy (At room temperature 25°C)	Voltage ±1%, Current ±1% (of full scale)
Input Accuracy (Across full temperature range)	Voltage ±3%, Current ±3% (of full scale)
Input Signal Frequency	< 10Hz
Resolution	12-bit
Digital Code Value	0 ~ 27648 (unsigned)
Output	
Number of Output Channels	1 channel
Channel Specification	Current
Output Current Range	0mA~20mA, 4mA~20mA
Output Configuration	Output can be configured as: • Output Zero • Hold Last State • Output Preset Value The above configurations take effect when the iAT project stops.
Output Load Resistance	0Ω~500Ω

Conversion Speed	1ms
Output Accuracy (At room temperature 25°C)	±1% (of full scale) ^{NOTE}
Output Accuracy (Across full temperature range)	±5% (of full scale)
Resolution	12-bit
Digital Code Value	0~27648 (unsigned)
Output Short-circuit, Open-circuit Detection	Not Supported

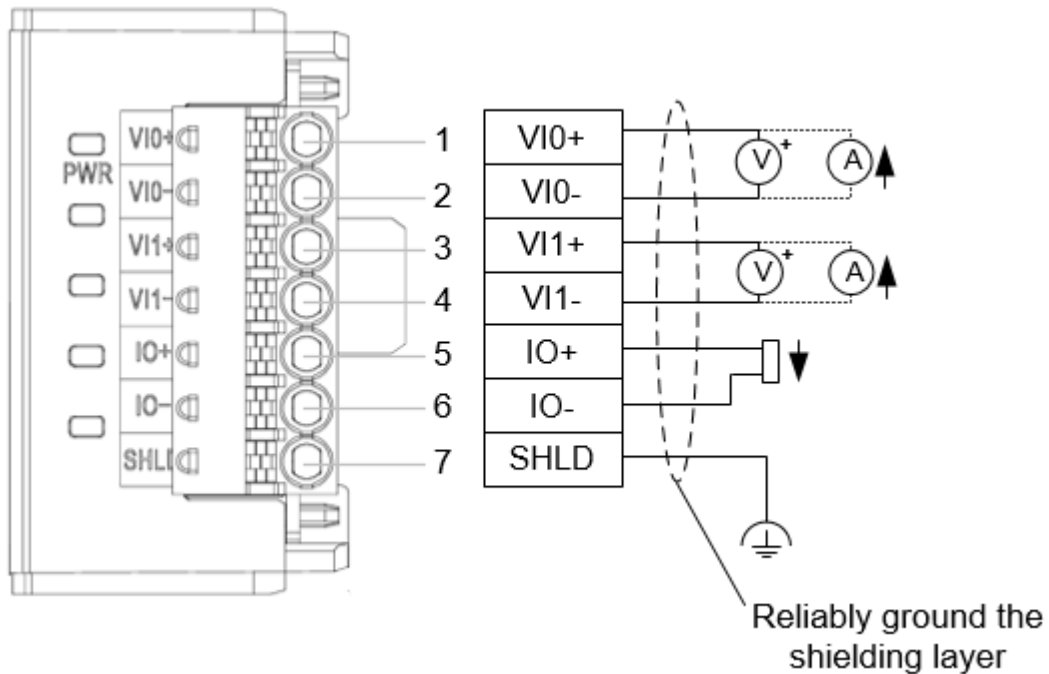
NOTE: The full scale range is 20mA.

6.3.12.3 Indicator Lights



LED Name	Color	State	Description
PWR	Yellow	Steady On	Extension card powered normally
		Steady Off	Extension card not powered

6.3.12.4 Terminal Wiring Diagram



No.	Signal Definition	Description
1	VI0+	Voltage/Current Channel 0 Input +
2	VI0-	Voltage/Current Channel 0 Input -
3	VI1+	Voltage/Current Channel 1 Input +
4	VI1-	Voltage/Current Channel 1 Input -
5	IO+	Current Channel Output +
6	IO-	Current Channel Output -
7	SHLD	Shield Ground

6.3.13 LX-EC031 SD Card Slot Extension Card

The LX-EC031 is an SD card extension card for Compact PLC product CPUs. It supports a maximum capacity of 32GB and enables program download, backup, and firmware upgrade. It must be installed in slot A of the controller during use.

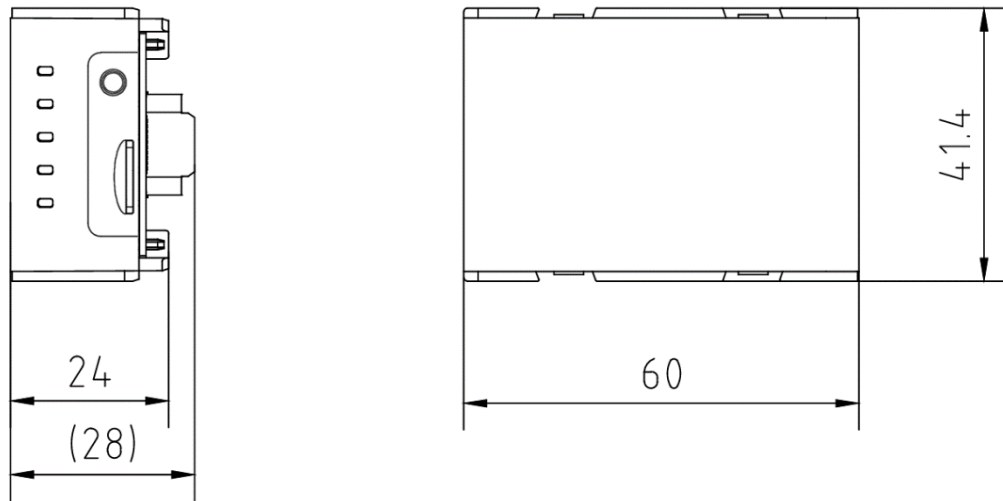


In the configuration software Intelligent AutoThink, the SD card function can still be used normally even if LX-EC031 is not added under the device configuration.

6.3.13.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC031 are as shown in the figure below (unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module operation status. For detailed definitions, see Indicator Description .
2	SD Card Eject Button	When this button is pressed, the DATA indicator will turn off, indicating the SD card has entered the removal state and can be safely ejected. Press this button before removing the SD card; otherwise, it may cause SD card data corruption or loss.
3	SD Card Slot	Maximum support: 32GB  When installing an SD card by pressing it in, ensure constant contact is maintained with the SD card until a click is heard before releasing. Otherwise, the card may fly out.

Nameplate



No.	Name	Description
1	Extension Card Model	Indicates the model of the extension card.
2	Extension Card Basic Information	Indicates the extension card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the extension card.
6	Extension Card Hardware Version Number	Indicates the hardware version number of the extension card at the time of factory shipment.
7	Manual Acquisition Code	Indicates the QR code for obtaining relevant manuals.
8	Compatible Slots	Indicates the slot where the extension card can be inserted.
9	Certification Standards	Indicates the certification standards the extension card complies with.

6.3.13.2 Technical Specifications

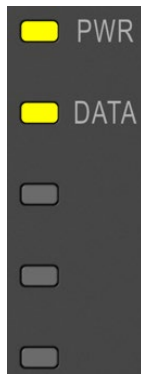
Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A(the SD card function can still be used normally when LX-EC031 is not configured)
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swapping of Expansion Card	Not Supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.2W

Storage Information

Parameter	Specification
Capacity	Maximum support for 32GB
Communication Interface	SDIO
Supported File Format	FAT32
Installation Method	Push-to-eject
Function	Supports program download/backup and firmware upgrade

6.3.13.3 Indicator Lights



LED Name	Color	Status	Description
PWR	Yellow	Solid On	Expansion card is powered on
		Solid Off	Expansion card is not powered on
DATA	Yellow	Solid Off	Removal stage, SD card can be ejected
		Solid On	SD card insertion detected
		Blinking	SD card is in data communication phase

6.3.13.4 SD Card

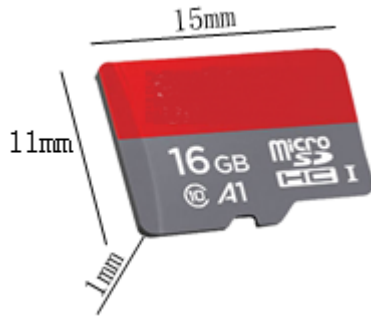
The SD card is used to store files or data. It enables controller program download and firmware update. The SD card is installed in the LX-EC031 card slot and supports a maximum capacity of 32GB.

- For detailed operations on downloading programs via the SD card, refer to [SD Card Download/Backup User Program](#).
- Controller firmware can be upgraded via the SD card. For specific operations, see the [Firmware Upgrade](#) section.

Please note the following when using the SD card:

- When removing the SD card, first press the extension card button. When the DATA indicator turns off, the SD card is in the removable stage and can be safely removed. After reinserting the SD card, the DATA indicator lights up, indicating an SD card is inserted, and it cannot be removed at this time.
- Do not remove the SD card when the DATA light is flashing, as this may cause data transmission errors.
- Before manually handling the SD card, please touch the cabinet enclosure to discharge any static electricity from the body.
- The maximum size for a single file or folder that can be operated via the software interface on the SD card is 128MB (including file upload, download, read/write, deletion); operating files or folders larger than 128MB via the software interface is not permitted.

- The folder hierarchy on the SD card that can be operated via the software interface must not exceed 5 levels.
- Folder and file names on the SD card do not support Chinese characters.



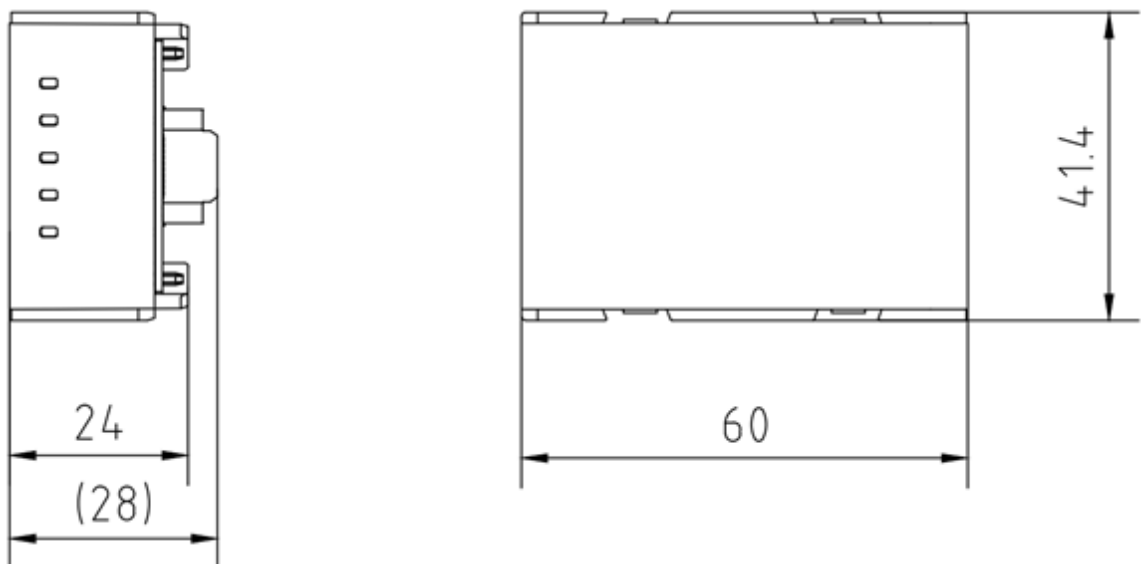
6.3.14 LX-EC032 RTC Clock Expansion Card (Battery Type)

The LX-EC032 is a controller peripheral expansion card that provides a real-time clock for the system. When the system power is off, a button cell battery supplies power to the clock chip, ensuring the real-time and accuracy of the calendar time. The monitoring circuit compares changes in the button cell battery's power level. When the battery power is low, it triggers a warning signal to prompt the user to replace the battery promptly.

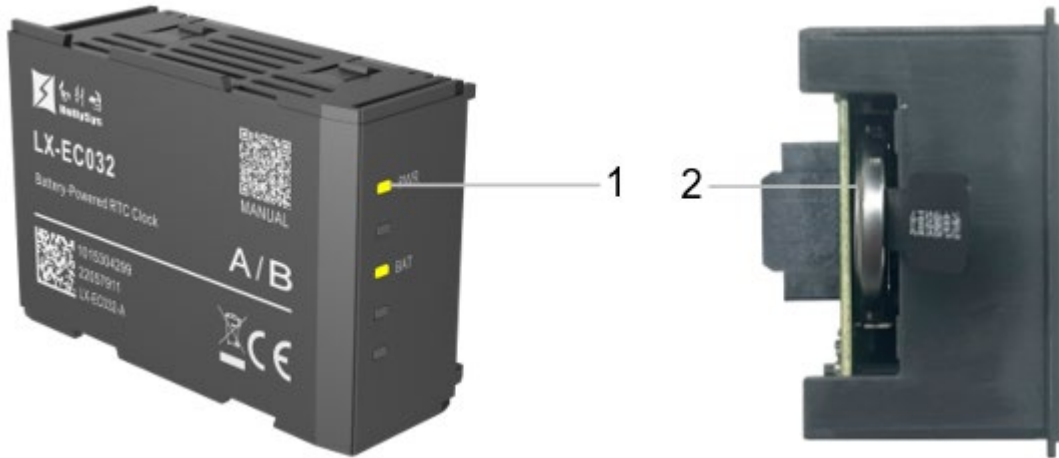
6.3.14.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC032 are as shown in the figure below (unit: mm).



Component Description



No.	Name	Description
1	Operation Status Indicator	Indicates the module operation status. For detailed definitions, see Indicator Description .
2	Battery Slot	RC2032 button battery slot. For battery usage method, see Battery Installation and Removal .

Nameplate



No.	Name	Description
1	Extension Card Model	Indicates the model of the extension card.
2	Extension Card Basic Information	Indicates the extension card information.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the extension card.
6	Extension Card Hardware Version Number	Indicates the hardware version number of the extension card at the time of factory shipment.
7	Manual Acquisition	Indicates the QR code for obtaining relevant manuals.

	Code	
8	Compatible Slots	Indicates the slot where the extension card can be inserted.
9	Certification Standards	Indicates the certification standards the extension card complies with.

6.3.14.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swapping of Expansion Card	Not Supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.1W

RTC Clock

Parameter	Specification
Communication Interface	I2C
Function	Saves perpetual calendar time
Setting Range	- LX-CU153/LX-CU155/LX-CU157/LX-CU311: 【2020-01-01 00:00:00】 to 【2038-01-19 00:00:00】 - LX-CU331/LX-CU332/LX-CU333: 【2020-01-01 00:00:00】 to 【2099-12-31 00:00:00】
Clock Accuracy	±120 seconds/month (at 25°C)
Time Format	Year-Month-Day Hour-Minute-Second
Battery Specification	CR2032 coin cell battery, 5-year lifespan  Note: If the system is powered off for an extended period, an insulating spacer must be inserted with the battery.
Battery Backup Life	1 year @ 25°C (with system powered off)
Battery Low Voltage Warning	2.5V±0.1V
Battery Replacement Requirement	The battery replacement process must not exceed 15 seconds.

6.3.14.3 Indicators



LED Name	Color	Status	Description
PWR	Yellow	Solid On	Expansion card power supply is normal
		Solid Off	Expansion card is not powered
BAT	Yellow	Solid On	Battery low
		Solid Off	Battery level is normal

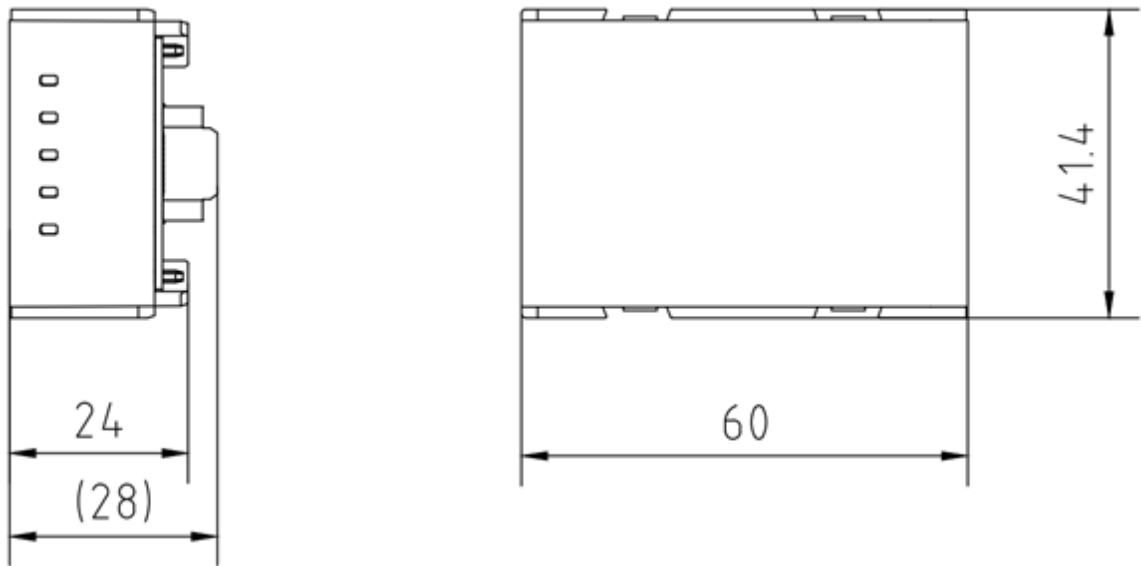
6.3.15 LX-EC033 RTC Clock Expansion Card (Capacitor Type)

The LX-EC033 is a capacitor-type real-time clock expansion card for compact PLC products. It can set the system time and provides a real-time clock for the system. It supports installation into the left expansion slot of the controller, and is compatible with both slot A and slot B.

6.3.15.1 Module Appearance Introduction

Dimensions

The dimensions of the LX-EC033 are as shown in the figure below (Unit: mm).



Component Description



No.	Name	Description
1	Operating Status Indicator	Indicates the module's operating status. For detailed definitions, see Indicator Description .

Nameplate



No.	Name	Description
1	Expansion Card Model	Indicates the model of the expansion card.
2	Expansion Card Basic Information	Indicates information about the expansion card.
3	SN Code	Indicates the serial number of the expansion card (QR Code).
4	SN Code	Indicates the serial number of the expansion card (Plain Code).
5	Batch Number	Indicates the production batch number of the expansion card.
6	Expansion Card Hardware Version Number	Indicates the hardware version number of the expansion card at the time of shipment.
7	Manual Access Code	Indicates the QR code for obtaining related manuals.
8	Compatible Slot	Indicates the controller slot where the expansion card can be inserted.
9	Certification Standards	Indicates the certification standards that the expansion card complies with.

6.3.15.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed in PLC controller's card slot
Installation Slot	A/B
Protection Rating	IP20(must be inserted into the controller slot)
Moisture, Mold, and Salt Spray Resistance	Support
Module Dimensions (W*H*D)	60mm*41.4mm*24mm
Weight	≤30g
Foolproof	Supported
Hot-swapping of Expansion Card	Not Supported
Power Supply Method	Powered via main control connector
Power Consumption	Max 0.1W

RTC Clock

Parameter	Specification
Communication Interface	I2C
Function	Saves perpetual calendar time
Setting Range	- LX-CU153/LX-CU155/LX-CU157/LX-CU311: 【2020-01-01 00:00:00】 to 【2038-01-19 00:00:00】 - LX-CU331/LX-CU332/LX-CU333: 【2020-01-01 00:00:00】 to 【2099-12-31 00:00:00】
Clock Accuracy	±120 seconds/month (at 25°C)
Time Format	Year-Month-Day Hour-Minute-Second
Capacitor Charging Duration	System powered on for more than 30 minutes
Capacitor Backup Duration	7 days @ 25°C. The system power supply must be continuously on for no less than 30 minutes beforehand.

6.3.15.3 Indicator Lights



LED Name	Color	State	Description
PWR	Yellow	Steady On	Extension card powered normally
		Steady Off	Extension card not powered

6.4 Other

6.4.1 LT-eEP02 Terminal Matching Module

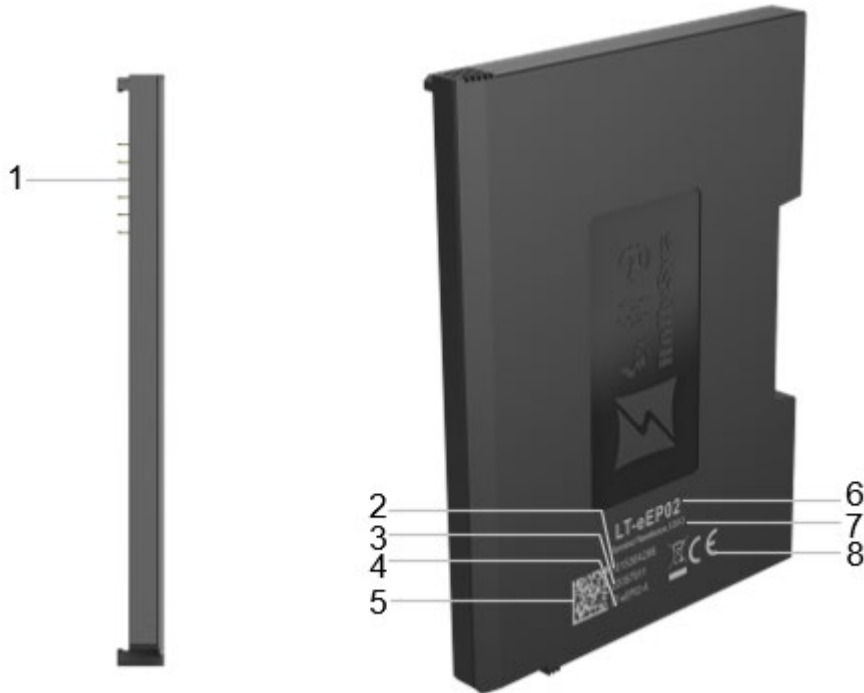
The LT-eEP02 is a terminal resistor end cover module for the compact PLC series. It comes with a built-in LT-eBus bus terminal resistor and provides dustproofing and protection for exposed metal parts.



Please install the LT-eEP02 module when used in sites with harsh electromagnetic environments.

6.4.1.1 Module Appearance Introduction

Component Description



No.	Name	Description
1	Gold Finger	Internal bus contact points.
2	SN Code	Indicates the serial number of the module (Plain Code).
3	Batch Number	Indicates the production batch number of the module.
4	Module Hardware Version Number	Indicates the hardware version number of the module at the time of factory shipment.
5	SN Code	Indicates the serial number of the module (QR Code).
6	Module Model	Indicates the model of the module.
7	Module Basic Information	Indicates the module related information.
8	Certification Standards	Indicates the certification standards the module complies with.

6.4.1.2 Technical Specifications

Basic Information

Parameter	Specification
Installation Method	Installed at the end of the expansion module on the right side of the PLC controller
Protection Rating	IP20
Module Dimensions (W*H*D)	100mm*75mm*7.9mm
Weight	≤40g

Termination Resistor	120Ω±5%
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6.4.2 Battery

Image	Model	Description
	CR2032	Battery Capacity: 210mAh Self-discharge Rate: ≤3% Operating Ambient Temperature: -20°C~70°C Storage Ambient Temperature: 0°C~35°C Warranty: 1 Year

Chapter 7 Installation and Removal

7.1 Installation Requirements

7.1.1 Installation Principles

General Principles

When selecting the installation location for the equipment, consider the following recommendations to ensure its safety and performance:

- Ensure adequate air circulation around the equipment, and avoid any obstructions blocking the ventilation openings.
- Avoid placing the equipment in environments exposed to prolonged direct sunlight.
- Choose an environment where both temperature and humidity are within the equipment's operating specifications.
- Avoid significant temperature fluctuations, which may cause condensation to form on the equipment surface.
- Avoid installing the equipment in environments with corrosive or flammable gases.
- Keep away from areas dense with dust, salt, dirt, or iron filings.
- Avoid installing the equipment in areas that may be subject to vibration or shock.
- Avoid locations where the equipment might be exposed to splashing liquids such as water, oil, or chemicals.

For special environments that may affect the normal operation of the equipment, the following preventive measures are recommended:

- When installing equipment near power lines or high-power cables, ensure appropriate isolation measures are taken.
- Avoid installing equipment in areas that may be affected by radiation.
- When installing near equipment that may generate intense high-frequency electromagnetic interference, consider appropriate shielding.
- Keep away from areas that may generate strong electric or magnetic fields to prevent interference with the equipment.
- In locations where electrostatic discharge may affect equipment performance, implement corresponding protective measures.
- In vibration-prone environments, implement corresponding reinforcement measures to prevent modules from sliding, loosening, or detaching.

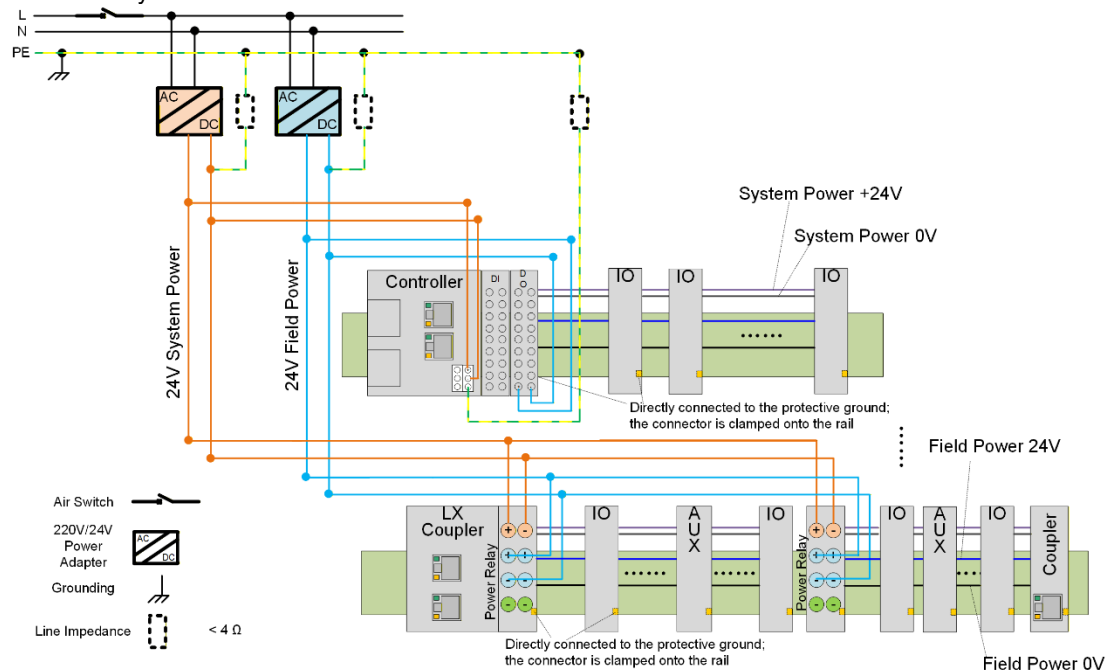
7.1.2 Power Supply Requirements

As shown in the figure below, the 220VAC power supply passes through a circuit breaker, then two 220V/24V power adapters separately output the system-side 24VDC power and the field-side 24VDC power. Each power line then goes through an air circuit breaker to provide power for the entire PLC system.



The system power supply and the field power supply must be isolated from each other; otherwise, the electrical isolation within the modules may be compromised, leading to a reduction in EMC immunity performance.

- **System Power Supply:** The power supply that ensures the normal operation of all modules in the PLC system.
- **Field Power Supply:** The input power supply on the PLC field side, mainly used to power field-side devices of the PLC system.



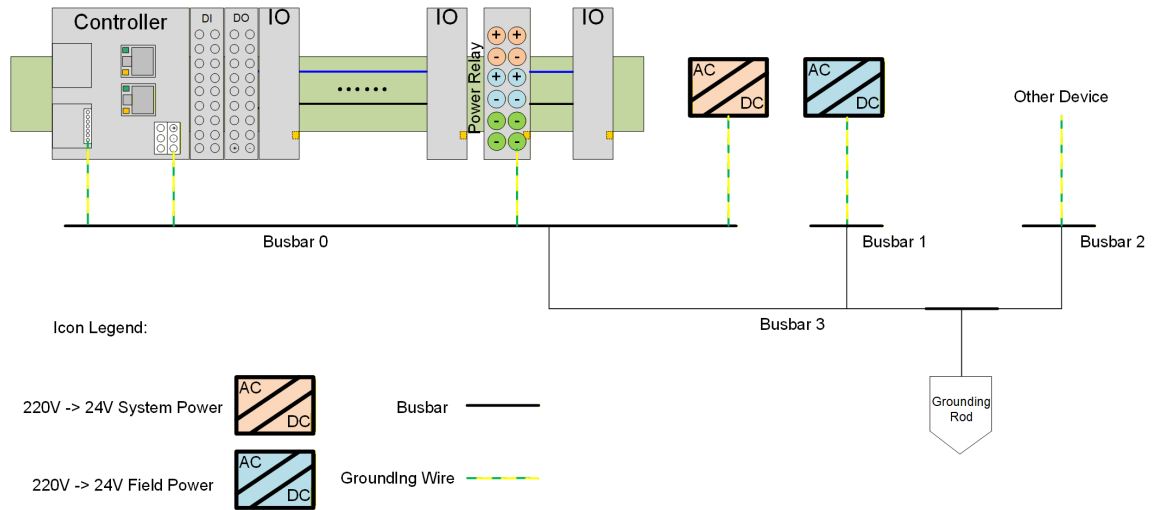
7.1.3 Grounding Requirements

The compact PLC system has three grounds: System Ground, Field Ground, and Protective Earth (PE).

Grounding Method

The negative terminal of the system power supply is connected to the negative terminal of the system-side switching power supply. The negative terminal of the field power supply is connected to the negative terminal of the field-side switching power supply. The third busbar is the protective earth, which is aggregated at the grounding plate inside the equipment and connected to a unified grounding system.

The grounding busbar inside the cabinet should be made of copper strips with an area of no less than 25mm×6mm. Each grounding plate should be connected to an insulated copper grounding cable with a cross-sectional area of no less than 2.5mm² from the main grounding busbar. Finally, they are connected to the grounding electrode at a single point.



The isolation withstand voltage between Field Ground and System Ground, between channels and System Ground, and between channels and Protective Earth is $\geq 1000\text{VAC}$ for @1min @5mA; there is no isolation requirement between channels.

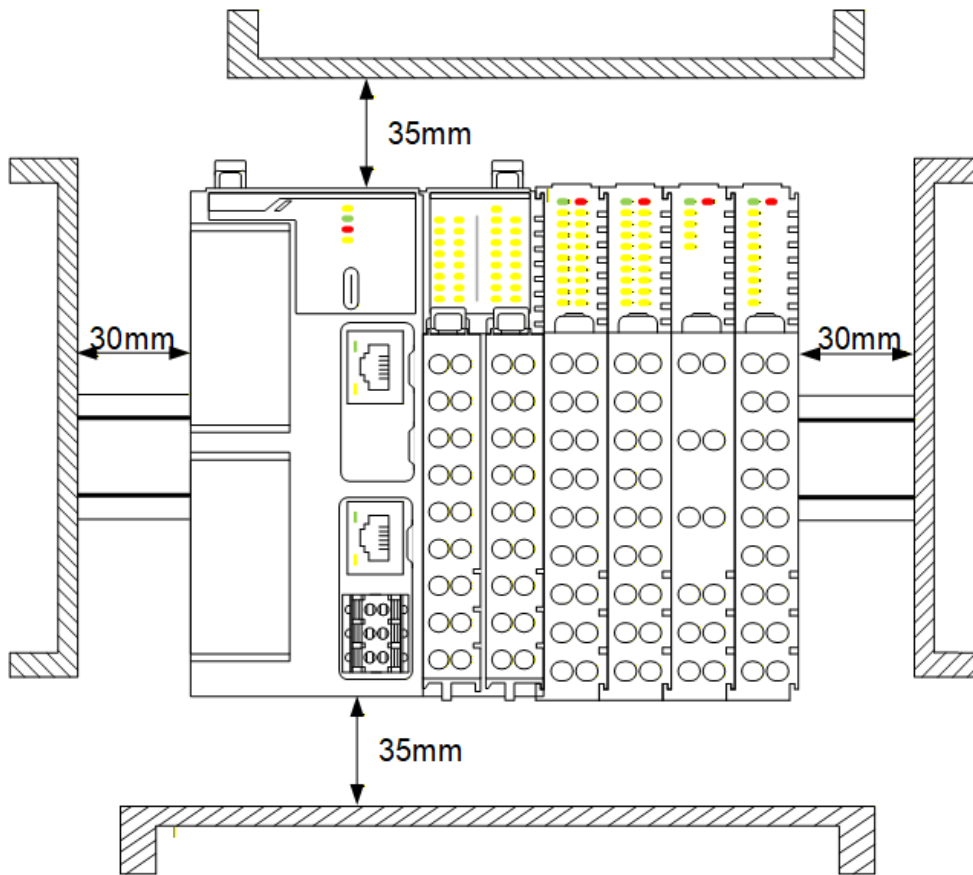
Under normal conditions, the insulation resistance between System Ground, Field Ground, and Protective Earth shall be no less than $10\text{M}\Omega$ and above @DC500V (at a temperature of $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and relative humidity of $30\% \pm 5\%$ with no condensation).

7.1.4 Environmental Requirements

- When placed horizontally, operating ambient temperature: $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$; horizontal placement is recommended.
- When placed vertically, operating ambient temperature: $-20^{\circ}\text{C} \sim 45^{\circ}\text{C}$.
- Operating relative humidity: 5% ~ 95%, non-condensing.
- Operating altitude: No higher than 2500m.

Horizontal Installation

To ensure heat dissipation requirements, horizontal placement is recommended. Considering ventilation and unit replacement, maintain a clearance of at least the dimensions shown in the figure below between the coupling unit and surrounding structural components such as wiring ducts, other equipment, structures, and parts:



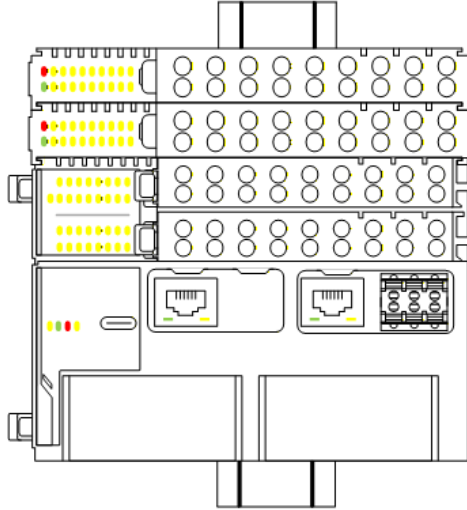
- If high-temperature heat source equipment (such as heaters, transformers, large resistors, etc.) exists near the product, maintain a gap of at least 100mm from the high-temperature heat source.
- If used in an enclosed environment, meet the requirements shown in the figure above, and add fans on both sides of the enclosure.

Non-horizontal Installation

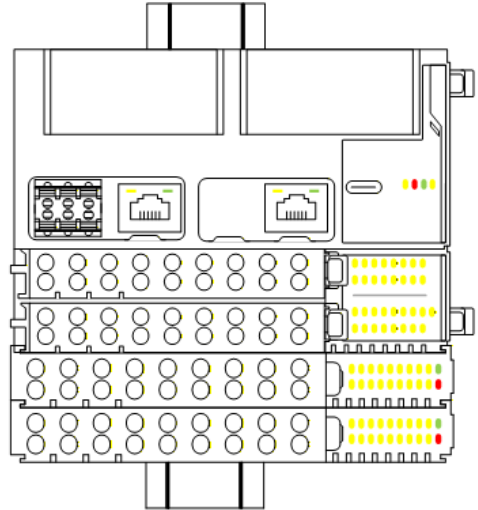
Due to special requirements, if vertical or other orientations are necessary, as shown in the installation directions in the figure below, the following requirements must be met:

- The maximum operating temperature shall not exceed 45°C.
- Use wire ducts or similar means to secure cables during wiring to prevent the weight of the cables from exerting force on the lower DIN rail clips. The clips may slide under cable weight, potentially causing malfunctions in the product.
- The number of right-side expansion I/Os shall not exceed 8.

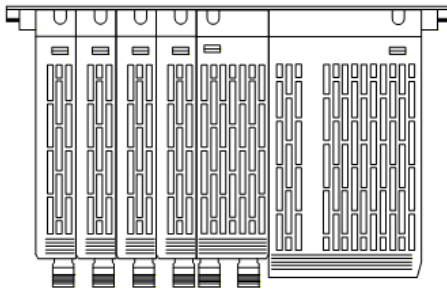
Vertical orientation installation 1



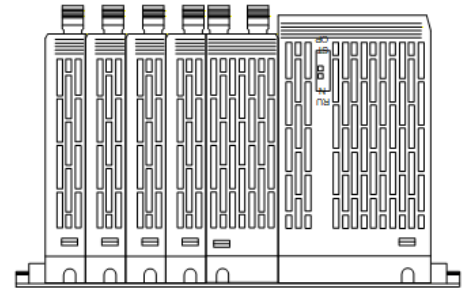
Vertical orientation installation 2



Top of electrical cabinet installation

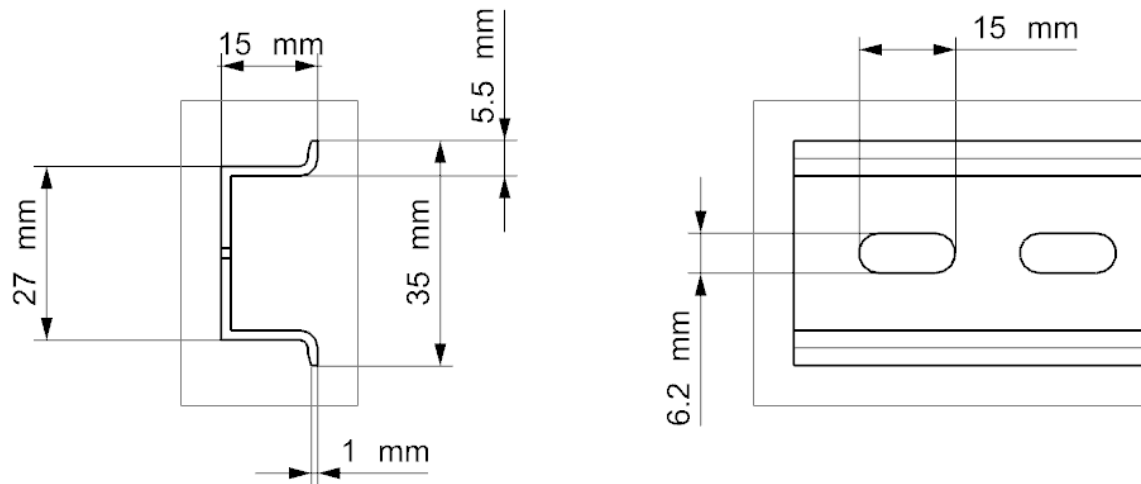


Bottom of electrical cabinet installation

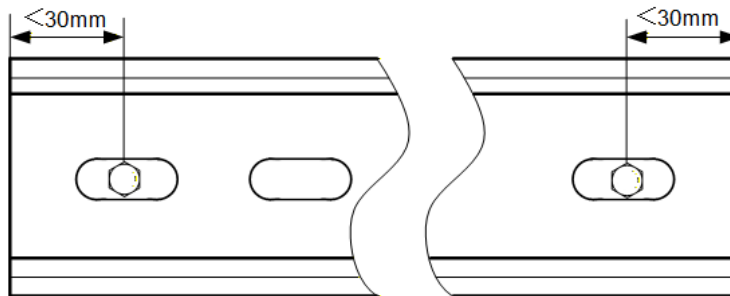


7.1.5 Rail Requirements

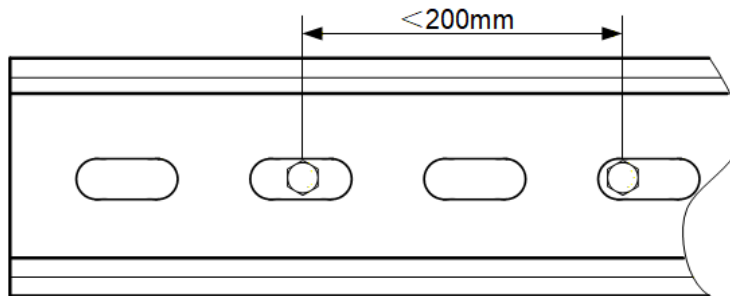
The compact PLC is installed using DIN 35mm rails. The DIN rail must comply with the EN60715 standard (35mm wide, 1mm thick). The dimensional information is shown in the figure below:



- During installation, ensure that the module's DIN rail mounting latch on the right side does not interfere with the mounting rail's fixing bolts. A rail with a height of 15mm is recommended. If a rail with a height of 7.5mm is selected, use a flush mounting connection (such as countersunk screws or rivets).
- Select the number of bolts based on the rail length. A minimum of three bolts should be installed on one rail, distributed on the left, right, and middle.
- The distance from the bolts at both ends of a rail to the outer edge of the rail is recommended to be less than 30mm.



- The spacing between two bolts in the middle section of the rail is recommended to be less than 200mm.



7.2 Controller Installation and Removal

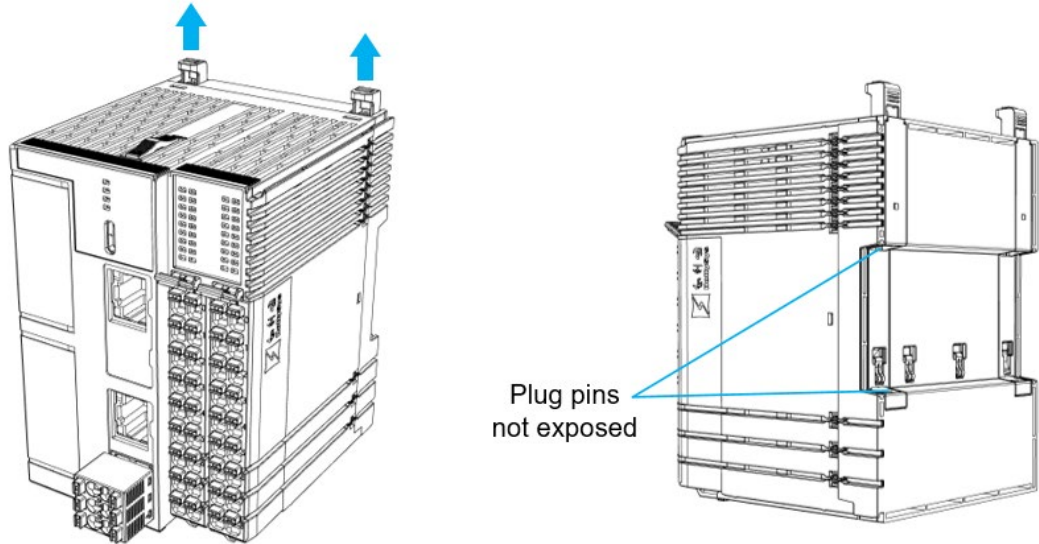
Prerequisites

- It is confirmed that the site conditions meet all installation or removal requirements.

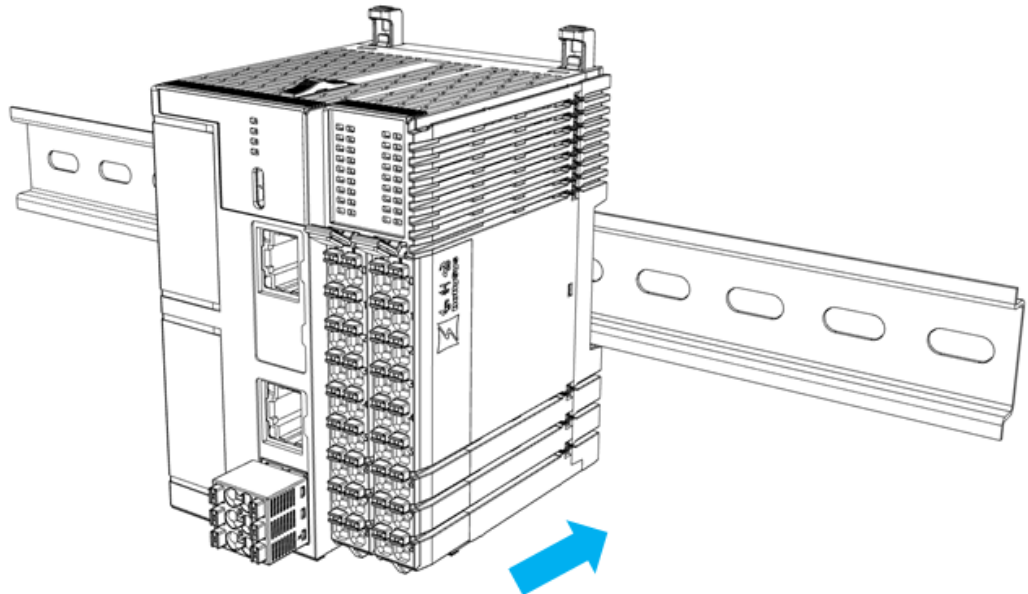
- Tools that may be needed for installation or removal are prepared (e.g., screwdriver, etc.).
- Before installation or removal, ensure the controller is powered off.

Installation Procedure

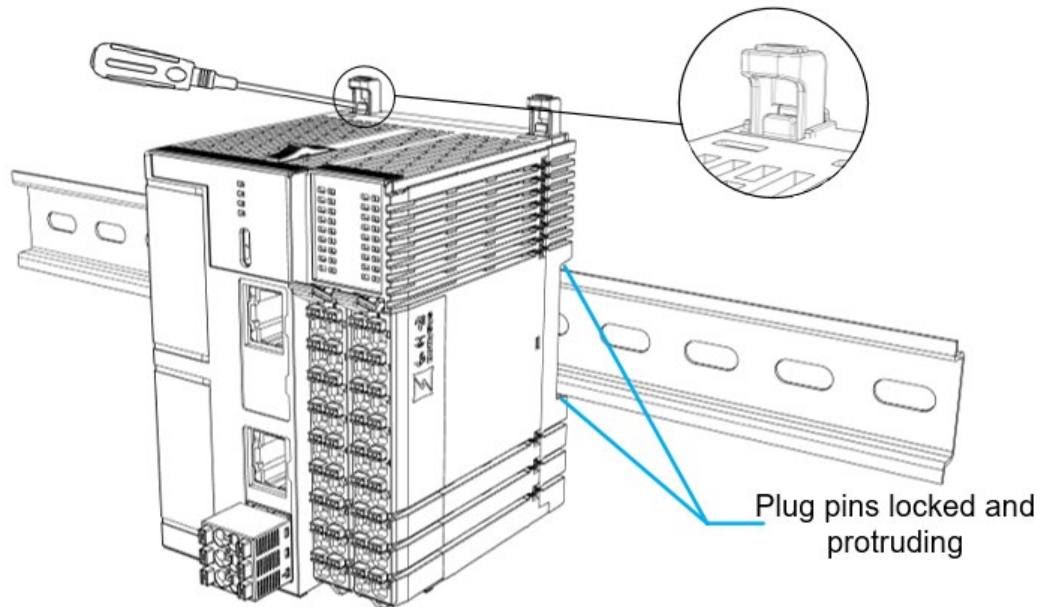
Step 1: Firmly pull the DIN rail top mounting latch until a click is heard, putting the latch into the unlocked state.



Step 2: Push the controller module straight onto the DIN rail, applying some pressure from the front.



Step 3: Gently press the release button in the mounting latch with a flathead screwdriver until a click is heard, putting the latch into the locked state.



Removal Procedure

- Step 1: Remove the fixing components at both ends.
- Step 2: If there are LT-e I/O modules on the right side, remove the LT-e modules first. For the removal method, please refer to the LT-e Series Distributed I/O Module Manual.
- Step 3: When removing the controller module, firmly pull the DIN rail top mounting latch until a click is heard, putting the latch into the unlocked state, then pull the controller away from the rail.

7.3 Expansion Card Installation and Removal

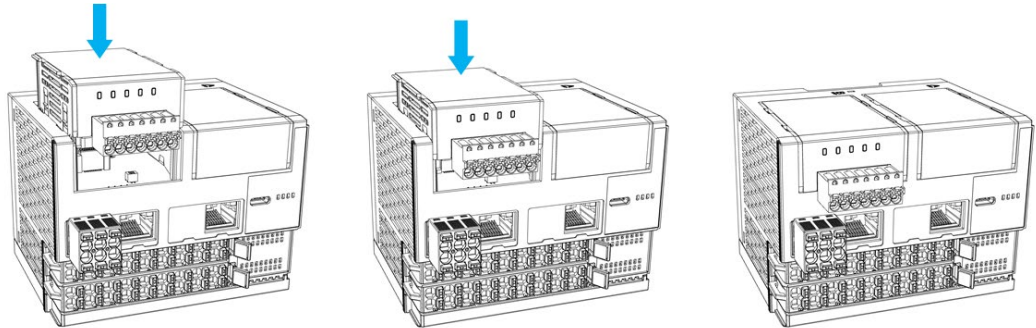
The expansion card is installed on the controller module slot using a snap-fit design, requiring no screws for fastening.

Prerequisites

- Confirm that on-site conditions meet all installation or removal requirements.
- Prepare any tools that may be needed for installation or removal (e.g., screwdriver, etc.).
- Ensure the controller is powered off before installation or removal.

Installation Procedure

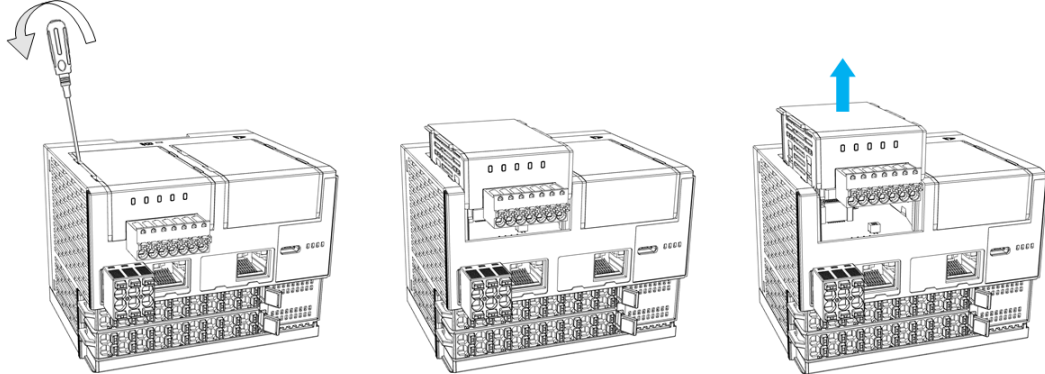
- Step 1: Place the controller module horizontally. Insert the expansion card vertically into Slot A or Slot B along the guide rib as indicated by the arrow in the figure, and press the expansion card by hand.
- Step 2: When a distinct click is heard and the surface of the expansion card is flush with the surface of the controller module (LX-EC007 does not need to be flush with the controller), the expansion card installation is complete.



Removal Procedure

Step 1: Place the controller module horizontally. Insert a flat-head screwdriver into the inner snap-fit point and pry the expansion card module outward in the direction shown in the figure below.

Step 2: After the expansion card is initially disengaged from the controller module, place two fingers on both sides of the module and pull the expansion card module straight out in the direction of the arrow.

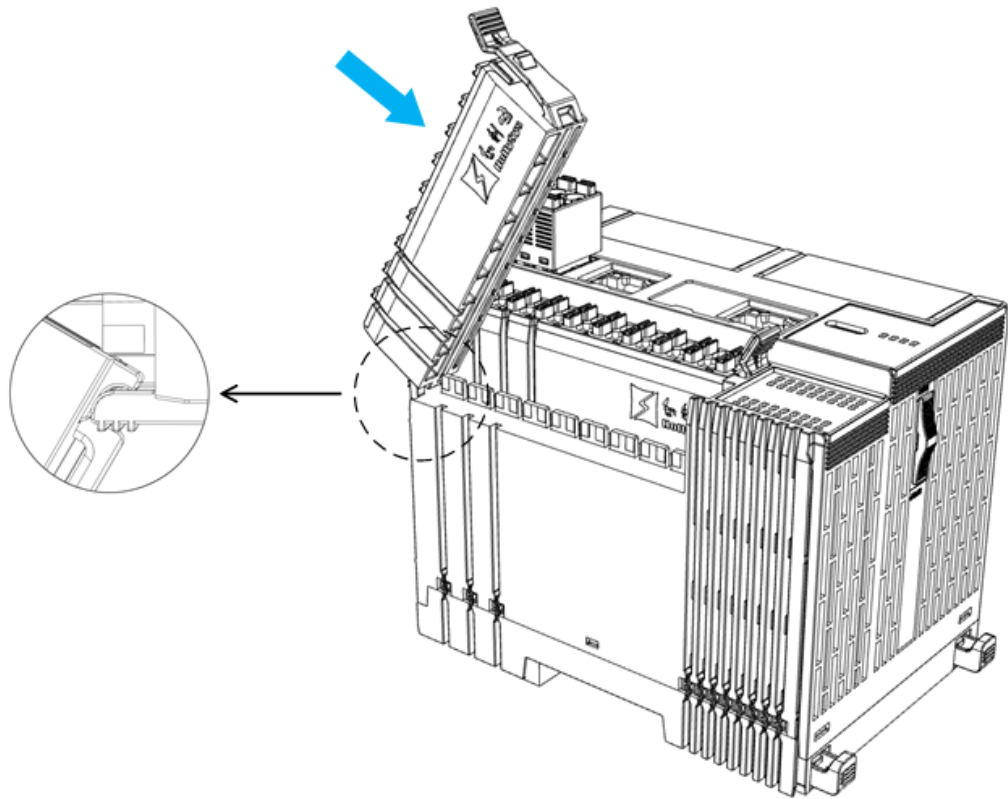


7.4 I/O Terminal Block Installation and Removal

- Confirm that all installation or removal requirements are met on site.
- Ensure the controller is powered off before installation or removal.

Installation Procedure

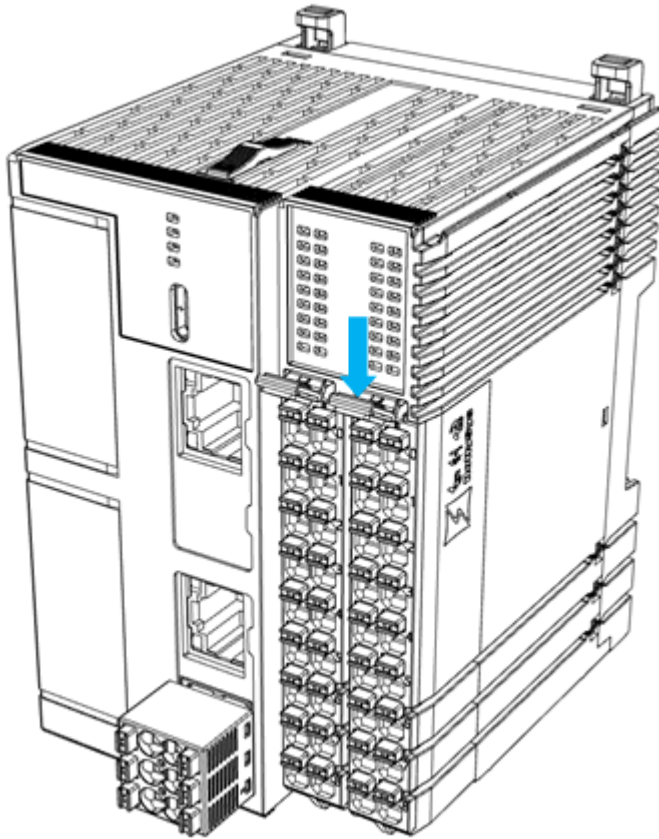
Step 1: Secure the latch at the bottom of the terminal block into the controller slot, and press the terminal block locking switch in the direction shown by the arrow in the figure.



Step 2: The terminal block installation is complete when a click is heard and the surface of the terminal block is flush with the surface of the controller module.

Removal Procedure

Step 1: Press the locking switch at the top of the terminal block, and simultaneously lift it outward to remove the terminal block.



7.5 Battery Installation and Removal

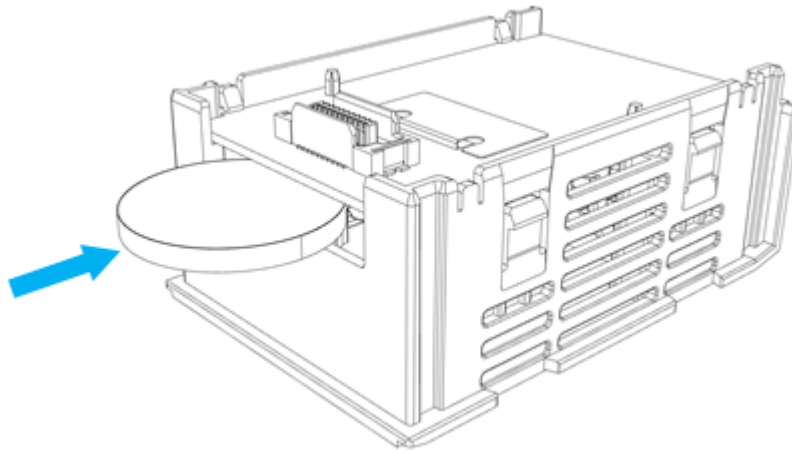
LX-EC032/LX-EC004 supports the standard CR2032 button battery. The battery is optional for installation, intended to maintain uninterrupted RTC clock operation during power outages.

For the CR2032 button battery, the smaller(recessed) side is the negative terminal, and the larger(flat) side is the positive terminal, as shown in the figure below.



Installing the Battery

Step 1: Place the clock extension card face down horizontally. With the positive terminal facing down, insert the battery into the slot and press it in.

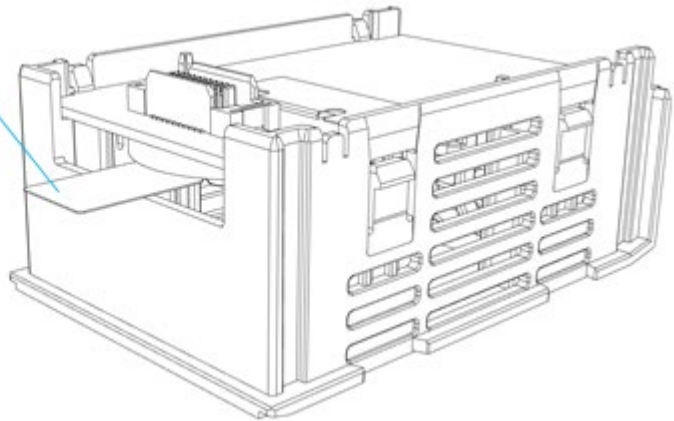


Step 2: Push the battery straight to the bottom of the slot.

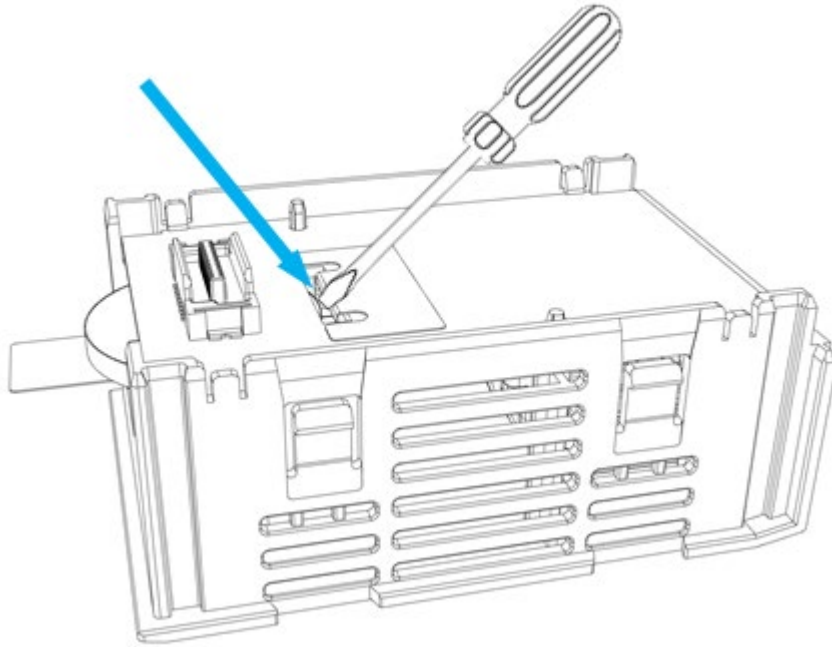
Removing the Battery

Step 1: Pinch the pull tab and pull it outward.

Pinch the pull tab
with your fingers



Step 2: At the position indicated by the arrow in the figure below, gently pry the battery outward with a flathead screwdriver and remove it.



Chapter 8 Wiring

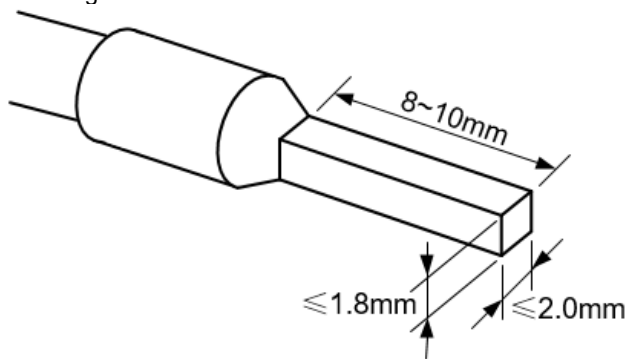
8.1 Wiring Requirements

Cable Requirements

- 0.2~1.5mm² cable for power terminals and other I/O terminals

Material	Compatible Wire Gauge	
	National Standard / mm ²	US Standard / AWG
Tubular terminal lug, copper core	0.2	24
	0.5	20
	0.75	18
	1.0	18
	1.5	16

If using a crimping tool for cable termination, please refer to the shape and dimension requirements shown in the figure below:



Ground Wire Wiring Requirements

- Must use a proper and independent grounding method.
- Use a cable with a cross-sectional area greater than or equal to 2 mm² for grounding, with grounding impedance below 100Ω.
- Locate the grounding point close to the PLC and secure the grounding cable firmly.

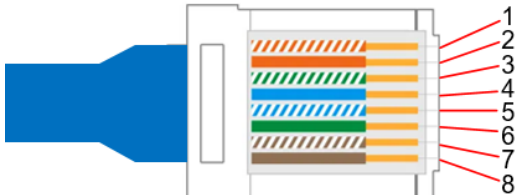
Power Line Wiring Requirements

- 220VAC and 24VDC power cables should use thick wires (maximum 2 mm² (14AWG)).
- Maintain a certain distance between different types of cables.

Ethernet Cable Wiring Requirements

- Cables must be shielded twisted pair (STP) cables of Cat.5e or higher.
- Cable connectors are standard RJ45 (T-568B, with indicators). The wiring standard is as follows:

Diagram	No.	Wiring Standard (Color)
	1	White and Orange
	2	Orange

T-568B Standard			
	1	3	White and Green
	2	4	Blue
	3	5	White and Blue
	4	6	Green
	5	7	White and Brown
	6		
	7		
	8	8	Brown

- The EtherCAT communication protocol also supports 4-core RJ45 connector termination. The termination requirements are as follows:

Diagram	No.	Wiring Standard
	1	Transmit Data Negative (TX+)
	2	Transmit Data Positive (TX-)
	3	Receive Data Negative (RX+)
	4	-
	5	-
	6	Receive Data Positive (RX-)
	7	-
	8	-

- The length of the Ethernet cable between the network port and its fixed point should not exceed 150 mm. A longer length may lead to unstable network communication in high-vibration environments.

8.2 Wiring and Unwiring Operation

Prerequisites

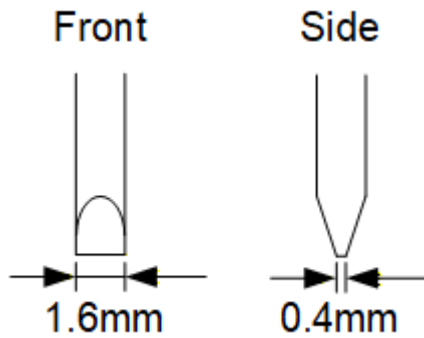
- Ensure all external power supplies are turned off and the equipment or cabinet is de-energized.
- Prepare the pre-made cables.
- Prepare a wiring diagram based on the module wiring schematic in advance, and follow the wiring diagram for connections.

Precautions

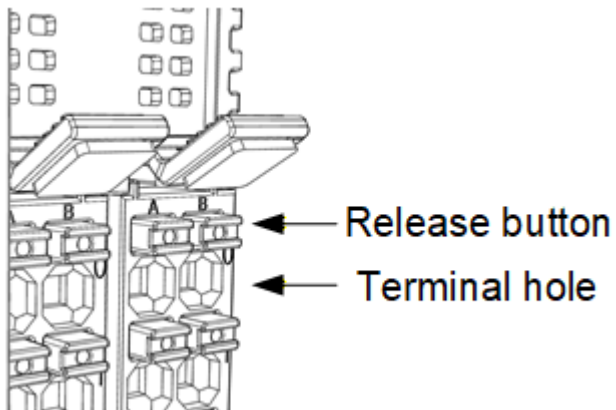
- During wiring, ensure that no copper wire burrs come into contact with adjacent terminals.
- Refer to the "Expanding Module Quantity" chapter in the LT-e series distributed I/O module manual, and configure the power relay module according to the bus current consumption.

Tools Required

Flathead screwdriver (1.6mm), as shown in the figure below.

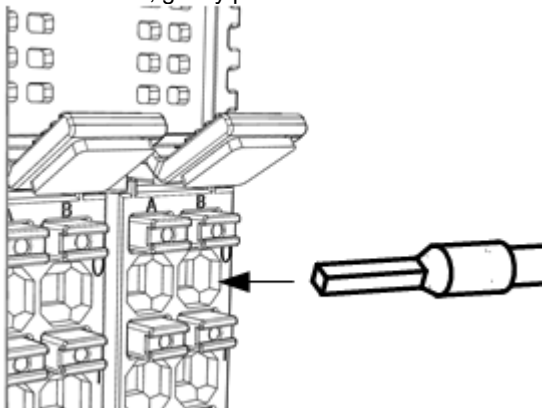


Terminal Description



Wiring Procedure

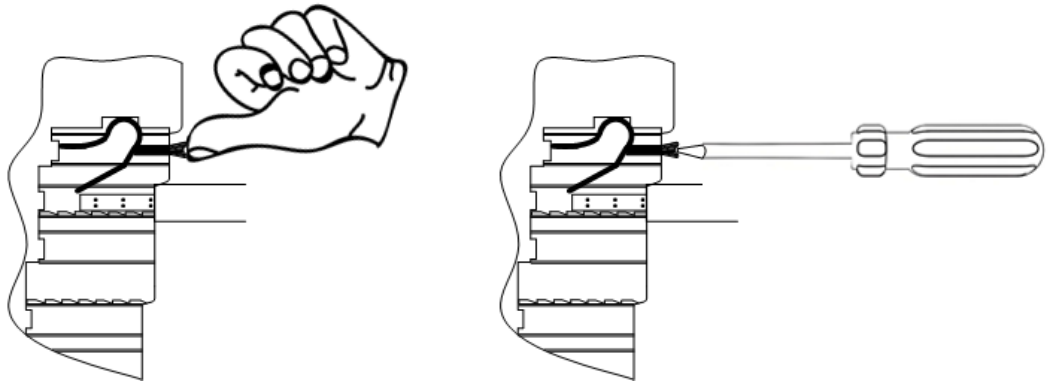
The compact series modules use embedded self-locking terminals with a Push-In design for tool-free wiring. It is not necessary to use a flathead screwdriver. Insert the prepared cable straight into the terminal hole. After insertion, gently pull the cable to confirm it is fully secured and not loose.



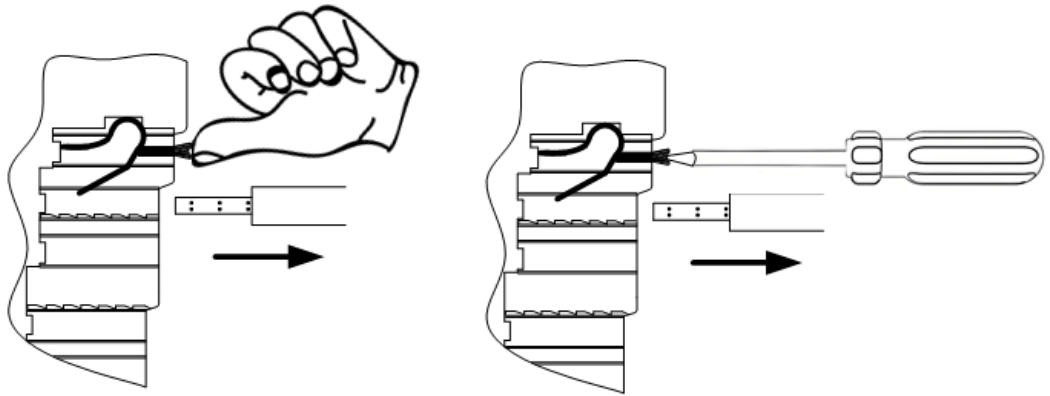
Unwiring Procedure

The compact series modules utilize spring-force technology. Pressing the release button allows easy removal of the cable from the terminal hole.

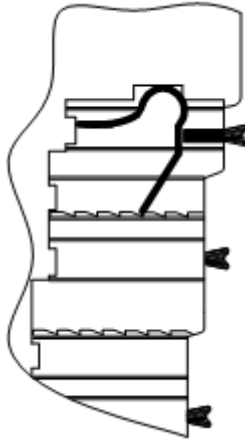
Step 1: Press the release button to the bottom by hand, using a flathead screwdriver if necessary.



Step 2: While keeping the release button pressed, pull the cable out of the terminal hole.



Step 3: Release the release button.



Chapter 9 Power On and Down

9.1 Power On

Prerequisites

- Ensure the power supply voltage and frequency meet the PLC specifications. Check that the power wiring is correctly connected without any disconnection, reverse polarity, or short circuit.
- Confirm that environmental conditions such as temperature, humidity, vibration, and air cleanliness at the PLC location meet the equipment requirements.
- If the PLC has power-off retention function, check that the battery is correctly installed and has sufficient charge.

Precautions

- Check that all expansion cards, modules, and terminals are correctly installed, with stable connections and no looseness or poor contact.
- Check all external wiring, including power lines, signal lines, and communication cables, are correctly connected as specified.
- Ensure the PLC grounding system is correct, with grounding resistance meeting requirements, and avoid ground loop issues.
- Confirm the control program has been correctly loaded, and back up the latest version of the program.
- Set the correct communication parameters as needed.
- For the LX-EC021, the first 3 seconds after power-on is the channel stabilization period; the output becomes steady-state after 3 seconds.

Operation Steps

Step 1: Power on step by step. First, ensure the switching power supply output is normal.

Step 2: Turn on the PLC system power supply switch and observe the indicator status.

Step 3: Turn on the PLC field power supply switch and observe the indicator status.

9.2 Power Down

Preconditions

- Ensure that the machine or production line controlled by the PLC has completed its current work cycle to avoid sudden power loss during production.
- Safely stop the machine or production line according to safety procedures.
- Notify all relevant personnel of the power-down plan to ensure no one is working in hazardous areas during the process.
- Ensure all programs and data have been saved to prevent data loss due to power interruption.
- Confirm that all external devices connected to the PLC (e.g., sensors, actuators) are in a safe state.

Precautions

- Back up critical programs and data in the PLC before powering down.
- After powering down, properly label the PLC and related equipment to prevent accidental operation.

Procedure

Perform the power-down sequence correctly. Typically, start from the load side, followed by the field power supply, and finally the system power supply, disconnecting the power step by step.

Chapter 10 Other Operations

10.1 SD Card Downloading/Backing Up User Program

Prerequisites

- Prepare a blank SD memory card.
- LX-CU311-A01_V1.0.1 does not support SD card download/backup of user programs.

Procedure

Step 1: After the Intelligent AutoThink project compiles without errors, select "Compile > Export Download File" and save the .update file to the target location.

Step 2: Rename the .update file exported in the previous step to "holiprg".

Step 3: In the same directory as the holiprg.update file, create a new text document and modify its name and extension to holiprg.ini.

Step 4: Open the holiprg.ini configuration file and copy the following content into it.

```
[prgsden]
Enter a value here based on the configuration file description
[prgsdbak]
Enter a value here based on the configuration file description
[prgzipbak]
Enter a value here based on the configuration file description
```

The configuration file entries are described as follows:

[prgsden]

0: Search for the project file in flash memory

1: Search for the project file in the ATUPRG directory on the SD card

2: Search for the project file in the ATUTMP directory on the SD card

[prgsdbak]

0: Project file does not need to be backed up to the SD card

1: Project file needs to be backed up to the SD card, directory: sd/ATUPRG

[prgzipbak]

0: Do not extract the SD card compressed project, directory: sd/ATUTMP

1: Extract the SD card compressed project, and after successful project loading, move the project file to Flash



- The configuration file must be written to the SD card before powering on the controller. Modifying the configuration file after power-on is ineffective.
- The project will be backed up to the SD card only after the project is downloaded and loaded successfully AND prgsdbak=1.

- If you need to move the project file to flash (prgzipbak=1), prgsden must be set to 2 only.

Step 5: Copy files to the root directory of the SD card via the card reader.

Step 6: Power on the controller module. The system will automatically download the user project.

Step 7: If you need to remove the SD card, briefly press the TF_RE button. Wait for the DATA indicator to turn off, then remove the SD card.

10.2 Controller Firmware Upgrade

Firmware is software embedded in PLC hardware that directly controls and manages the operation of hardware devices. Firmware upgrading refers to updating the internal firmware of the PLC to improve its performance, add new features, fix known issues, or enhance system stability.



Controller firmware upgrade is a high-risk operation. Please confirm the following information and refer to this guide to proceed with caution:

- Before performing a controller firmware rollback in the scenarios listed below, it is essential to back up files in the controller to prevent data loss. Please note that after the rollback is complete, the controller's IP address and routes will be restored to default values. After an upgrade, the controller retains any modified IP address and routing information; if not modified previously, default values will be used.
 - Rollback from LX-CU311-A01_V1.0.3 or later to LX-CU311-A01_V1.0.1 / LX-CU311-A01_V1.0.2.
 - Rollback from LX-CU153-A01_V1.0.1 or later to LX-CU153-A01_V1.0.0.
 - Rollback from LX-CU157-A01_V1.0.1 or later to LX-CU157-A01_V1.0.0.
- Firmware upgrade carries the risk of the controller becoming inoperable after the upgrade. In the event of this risk, you can contact HollySys to replace the controller. If the site cannot accept the significant impact of service discontinuity during the controller replacement period, you may contact HollySys before the firmware upgrade to apply for a spare controller, which can be used for immediate replacement should the risk materialize. The spare controller must be returned to HollySys after the firmware upgrade.
- Firmware upgrade carries the risk of data loss. Please ensure you have backed up all necessary user programs, data, logs, and other information before proceeding.
- Firmware upgrade can be performed via programming software or an SD card. If conditions for software operation are not available on-site, you can use the SD card method.
- During the PLC upgrade process, I/O channels are in an uncontrollable state. Ensure the equipment is in a safe, stopped condition and will not be endangered by changes in I/O channel states.
- If you encounter any issues during the upgrade, please call the HollySys consultation hotline: 400-811-1999.

Upgrading Firmware via SD Card

Prerequisites

- The controller is connected.
- The required firmware version file (.bin file) and the holibin.ini file for the upgrade are ready.
- Prepare an empty SD memory card.

Procedure

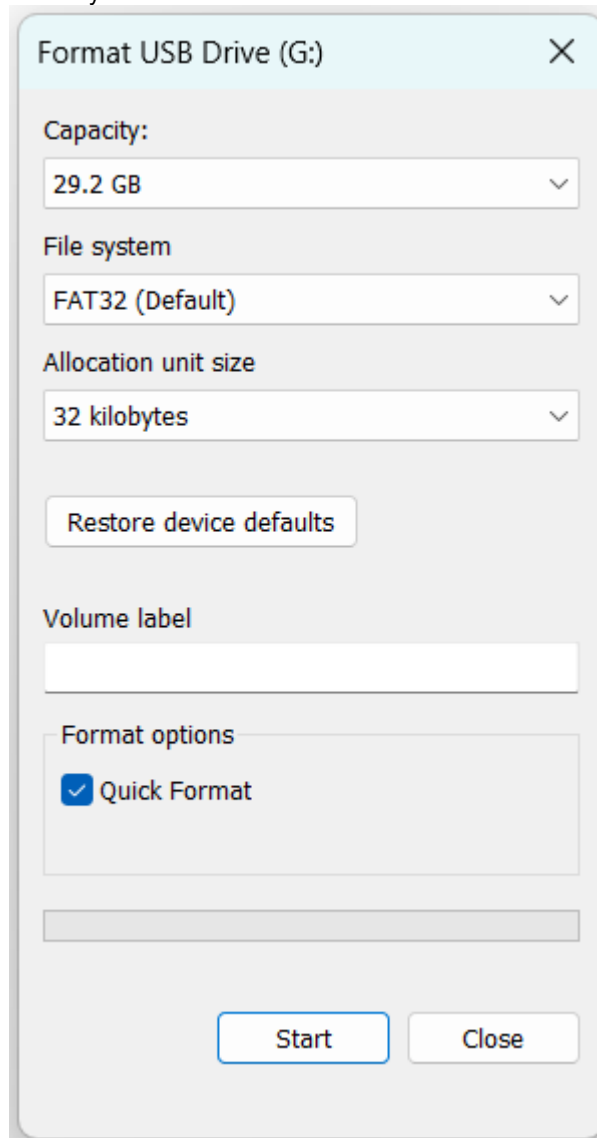
Step 1: Create a holibin.ini file with the following configuration content:

```
[binname]
```

Name of the target firmware version to be upgraded.bin

Step 2: Copy the firmware upgrade files to the SD card.

- Use a card reader to read the memory card on a computer, format the card (file system must be "FAT32"). Copy the prepared firmware upgrade file (.bin file) and the holibin.ini file to the root directory of the SD card.



Step 3: Ensure the target controller module is powered off, then insert the SD card into the expansion card slot.

Step 4: Power on the controller module again. The system will automatically perform the firmware upgrade.

Step 5: After the firmware upgrade is complete, press the TF_RE key and wait for the DATA indicator to turn off before safely ejecting the SD card.

10.3 Derating Requirements

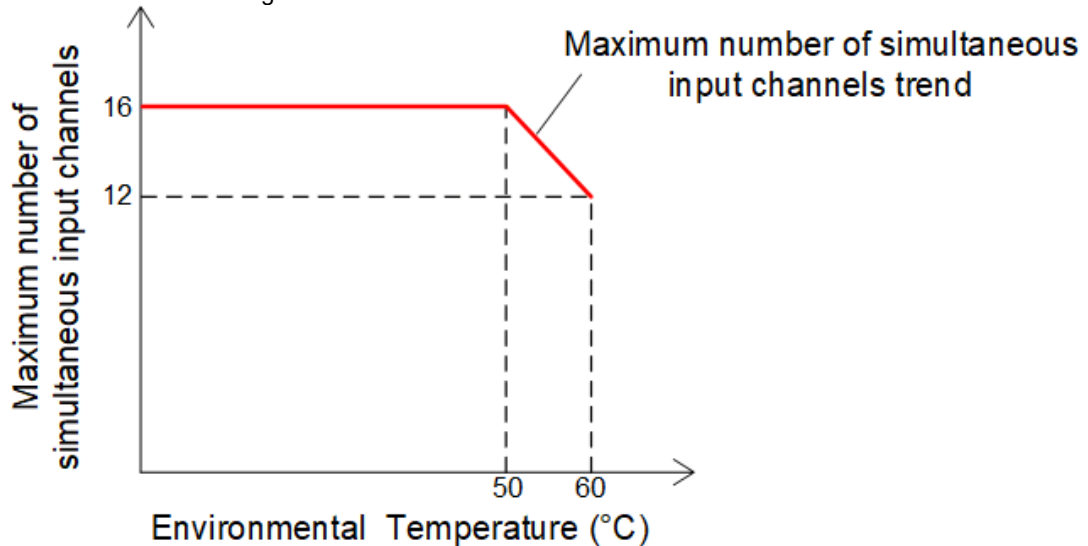
The recommended operating ambient temperatures for horizontal and non-horizontal mounting are:

- Horizontal Mounting: Operating Ambient Temperature $-20^{\circ}\text{C}\sim 60^{\circ}\text{C}$
- Non-Horizontal Mounting: Operating Ambient Temperature $-20^{\circ}\text{C}\sim 45^{\circ}\text{C}$

Controller Body DI Derating Requirements

- Under non-horizontal mounting conditions, the maximum number of inputs that can be connected simultaneously is 12 channels.
- Under horizontal mounting conditions, when the ambient temperature does not exceed 50°C , the maximum number of inputs that can be connected simultaneously is 16 channels. For every 2.5°C increase above 50°C , the maximum number of simultaneously connectable input channels decreases by 1. At an ambient temperature of 60°C , the maximum number of inputs that can be connected simultaneously is 12 channels.

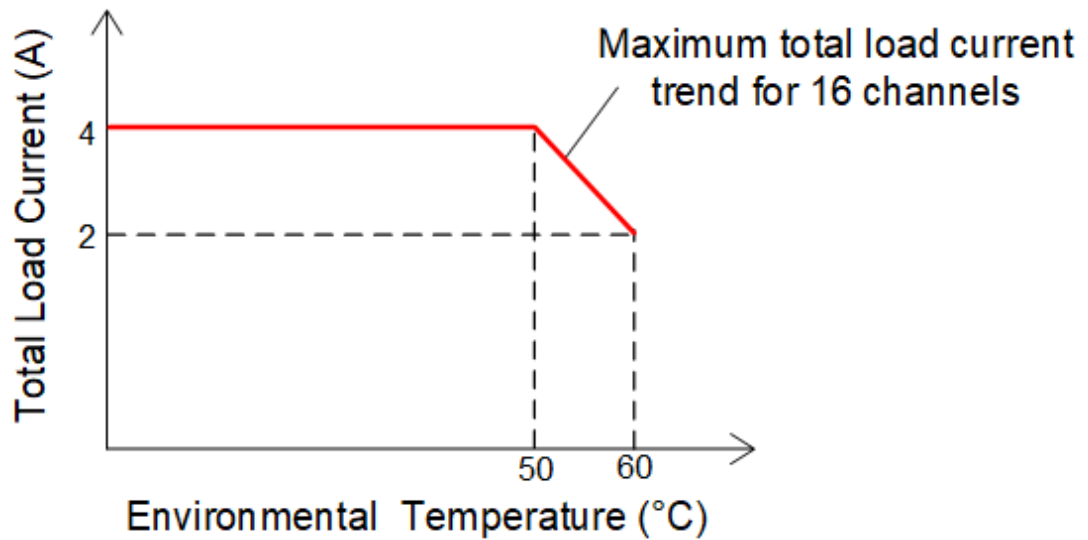
The following diagram illustrates the variation of the maximum number of input channels with temperature under horizontal mounting:



Controller Body DO Derating Requirements

- Under non-horizontal mounting conditions, the total load current for all 16 channels must not exceed 2A.
- Under horizontal mounting conditions, when the ambient temperature does not exceed 50°C , the total load current for all 16 channels must not exceed 4A. For every 1°C increase above 50°C , the maximum total load current for all 16 channels decreases by 0.2A. At an ambient temperature of 60°C , the total load current for all 16 channels must not exceed 2A.

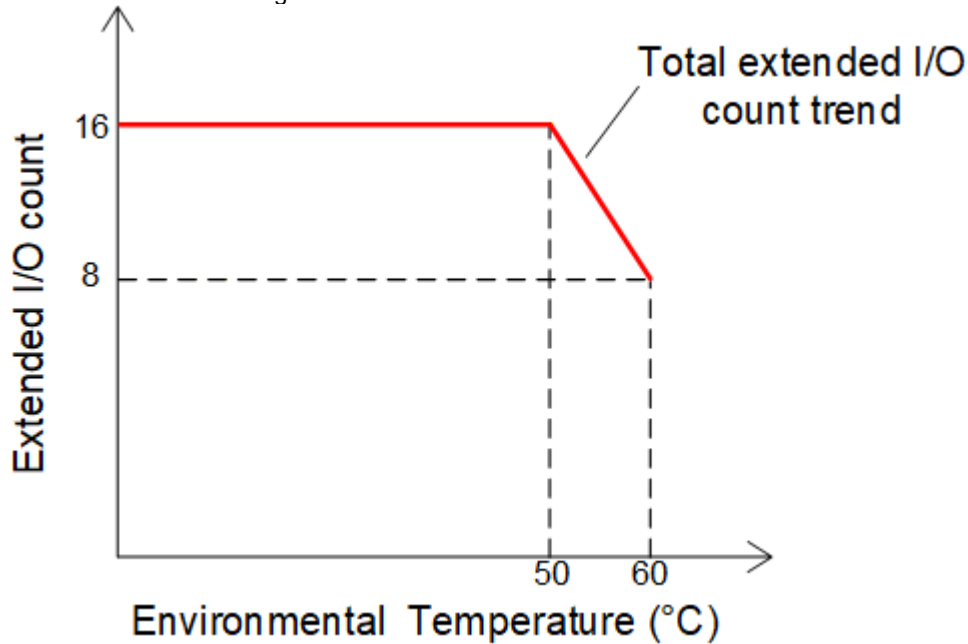
The following diagram illustrates the variation of the maximum total load current for all 16 channels with temperature under horizontal mounting:



Right-Side Extended I/O Modules for Controller

- Under non-horizontal mounting conditions, the number of right-side extended I/Os must not exceed 8.
- Under horizontal mounting conditions, when the ambient temperature does not exceed 50°C, the number of extended I/Os must not exceed 16. For every 1.25°C increase above 50°C, the total number of extended I/Os decreases by 1. At an ambient temperature of 60°C, the total number of extended I/Os must not exceed 8.

The following diagram illustrates the variation of the total number of extended I/Os with temperature under horizontal mounting:



Chapter 11 Maintenance and Repair Guide

11.1 Maintenance

PLC maintenance refers to a series of upkeep activities performed to ensure the normal operation of the equipment. On-site personnel should refer to this chapter during use to perform regular maintenance on the equipment, ensuring the PLC remains in good condition and operates correctly.

Safety Precautions

- **All modules of the Compact PLC series do not support hot-swapping. Forcibly hot-swapping may cause irreversible damage to the modules.**
- Before performing maintenance, ensure the operator is in a safe environment. Disconnect power to all equipment involved in the maintenance operation to prevent electric shock or equipment damage.
- Ensure the operator has a basic background in PLCs, has received necessary training, and is familiar with the equipment and maintenance operation procedures.

Preparation Before Maintenance

- Check the external environment of the equipment to ensure there are no obstructions affecting maintenance work or hazardous items in the vicinity.
- Prepare the necessary tools.

Daily Inspection

- Inspect the equipment's appearance to ensure there is no obvious damage or abnormality.
- Check the tightness of connectors such as terminal wires and network cables to ensure all connections are secure without looseness or corrosion.
- Check whether inputs/outputs such as power and signals are normal.
- Modules must be protected from heavy pressure to prevent damage.
- Modules must be protected from heavy impact to prevent component damage.
- Keep the supply voltage within the range specified in the manual to prevent internal component burnout.
- Modules must be protected from water ingress to prevent internal component damage.

Periodic Maintenance

- Based on equipment usage and environmental conditions, and in combination with the actual site situation, establish a reasonable maintenance schedule and perform maintenance accordingly.
- Clean the equipment regularly to remove dust, oil stains, etc.
- If moving parts are present, lubricate them regularly to maintain normal operation.
- Periodically inspect and replace wear parts, such as terminal blocks, seals, etc.

11.2 Repair

Repair refers to the replacement or return-to-factory operation performed when issues occur with PLC devices or components. Please refer to this chapter for maintenance procedures when equipment problems arise during use.

Controller and Other I/O Module Maintenance

For controllers and expansion cards in the compact PLC series, customer self-repair is not supported; all require return-to-factory maintenance. Before returning, you can follow the steps below for preliminary diagnosis and information gathering:

- Step 1: Check the PLC diagnostic information in the programming software to examine the PLC's operating status and fault conditions.
- Step 2: Based on the fault condition, preliminarily determine the cause and the modules or components that may be involved.
- Step 3: Record the symptoms of the module or component failure. If necessary, back up fault information, operation logs, or user programs to facilitate subsequent problem identification.
- Step 4: Disconnect the damaged module or component. Refer to the relevant disassembly content in the Installation and Disassembly chapter for the disassembly operation.
- Step 5: Return the damaged module or component for factory repair. When returning, please also inform the fault symptoms and provide the backup data.

Follow-up Operations:

After the module is repaired, reinstall it into the system, restart the PLC, and check if its operating status and functions are normal. Check the PLC diagnostic information in the programming software to verify the maintenance results and ensure the fault has been resolved.

Chapter 12 Appendix

12.1 Hardware Material Codes

Model	Material Name	Material Code
Button Battery	CR2032 Button Battery	1021300014
LX-CU153	LX-CU153 Compact Standard Controller	3200290328
LX-CU153-P	LX-CU153 Compact Standard Controller	3200336873
LX-CU157	LX-CU157 Compact Standard Controller	3200290329
LX-CU157-P	LX-CU157 Compact Standard Controller	3200336874
LX-CU311	LX-CU311 Compact Motion Controller	3200282090
LX-CU311-P	LX-CU311 Compact Motion Controller	3200336875
LX-CU331	LX-CU331 Compact Network Motion Controller	3200305903
LX-CU331-P	LX-CU331 Compact Network Motion Controller	3200336876
LX-CU332	LX-CU332 Compact Network Motion Controller	3200305904
LX-CU332-P	LX-CU332 Compact Network Motion Controller	3200336877
LX-CU333	LX-CU333 Compact Network Motion Controller	3200305905
LX-CU333-P	LX-CU333 Compact Network Motion Controller	3200336878
LX-EC001	LX-EC001 1-Channel RS-232 Communication Expansion Card	3200282821
LX-EC001-P	LX-EC001 1-Channel RS-232 Communication Expansion Card	3200336879
LX-EC002	LX-EC002 1-Channel RS-485 Communication Expansion Card	3200282822
LX-EC002-P	LX-EC002 1-Channel RS-485 Communication Expansion Card	3200336880
LX-EC003	LX-EC003 RS-232/RS-485 Hybrid Communication Expansion Card	3200290330
LX-EC003-P	LX-EC003 RS-232/RS-485 Hybrid Communication Expansion Card	3200336881
LX-EC004	LX-EC004 1-Channel RS-232 with Clock Communication Expansion Card	3200305906
LX-EC004-P	LX-EC004 1-Channel RS-232 with Clock Communication Expansion Card	3200336882
LX-EC005	LX-EC005 1-Channel RS-485 with Clock Communication Expansion Card	3200294301
LX-EC005-P	LX-EC005 1-Channel RS-485 with Clock Communication Expansion Card	3200336883
LX-EC006	LX-EC006 CAN Communication Expansion Card	3200305907
LX-EC006-P	LX-EC006 CAN Communication Expansion Card	3200336884
LX-EC007	LX-EC007 PROFINET Slave RT Communication Expansion Card	3200282823
LX-EC007-P	LX-EC007 PROFINET Slave RT Communication Expansion Card	3200336885

LX-EC011	LX-EC011 4-Channel Digital Input Expansion Card	3200305908
LX-EC011-P	LX-EC011 4-Channel Digital Input Expansion Card	3200336886
LX-EC012	LX-EC012 4-Channel Digital Output Expansion Card	3200294302
LX-EC012-P	LX-EC012 4-Channel Digital Output Expansion Card	3200336887
LX-EC021	LX-EC021 2-Channel Analog Input and 1-Channel Analog Voltage Output Extension Card	3200282824
LX-EC021-P	LX-EC021 2-Channel Analog Input and 1-Channel Analog Voltage Output Extension Card	3200336888
LX-EC022	LX-EC022 2-Channel Analog Input and 1-Channel Analog Current Output Extension Card	3200305909
LX-EC022-P	LX-EC022 2-Channel Analog Input and 1-Channel Analog Current Output Extension Card	3200336889
LX-EC031	LX-EC031 SD Card Slot Extension Card	3200294303
LX-EC031-P	LX-EC031 SD Card Slot Extension Card	3200336890
LX-EC032	LX-EC032 RTC Clock Expansion Card (Battery Type)	3200282825
LX-EC032-P	LX-EC032 RTC Clock Expansion Card (Battery Type)	3200336891
LX-EC033	LX-EC033 RTC Clock Expansion Card (Capacitor Type)	3200294304
LX-EC033-P	LX-EC033 RTC Clock Expansion Card (Capacitor Type)	3200336892
LT-eEP02	LT-eEP02 Terminal Matching Module	3200282826
LT-eEP02-P	LT-eEP02 Terminal Matching Module	3200336893

12.2 Abbreviations

English Abbreviation	English Name
AC	Alternating Current
ADC	Analog-to-Digital Converter
AI	Analog Input
AO	Analog Output
APRD	Auto Increment Read
APWR	Auto Increment Write
AT	AutoThink
AWG	American Wire Gauge
BAT	Battery
BOM	Bill of Material
BRD	Broadcast Read
BWR	Broadcast Write
CE	Conformité Européenne/European Conformity
CFC	Continuous Function Chart
CH	Channel
CIP	Common Industrial Protocol
CM	Communication Module
CoE	CANopen over EtherCAT
CPU	Central Processing Unit
DAC	Digital-to-Analog Converter

DC	Direct Current
DDR	Double Data Rate
DI	Digital Input
DIN	Deutsches Institut für Normung/German Institute for Standardization
DMA	Direct Memory Access
DO	Digital Output
EC	Expansion Card
EDM	External Device Monitor
EEPROM/E2PROM	Electrically Erasable Programmable read only memory
EMC	Electromagnetic Compatibility
ERR	Error
FA-AT	Factory Automation - AutoThink
FB	Function Block
FBD	Functional Block Diagram
FPRD	Configured Address Read
FPWR	Configured Address Write
F.S.	Full Scale
FSoE	Safety over EtherCAT
FUN	Function
HMI	Human Machine Interface
GND	Ground
iAT	Intelligent AutoThink
I/O	Input/Output
IDE	Integrated Development Environment
IEC	-
IM	Interface Module
INC	Incremental Encoder
IP	Ingress Protection
ISO	International Organization for Standardization
LD	Ladder Diagram
LDS	Ladder Diagram Segmented
LRD	Logical Memory Read
LWR	Logical Memory Write
LXS	LX series functional safety PLC system
MCU	Microcontroller Unit
MPU	Microprocessor Unit
MRAM	Magnetoresistive Random Access Memory
NC	Normal Close
NO	Normal Open
NTP	Network Time Protocol
OPS	Operator Station
OS	Operating System
OSSD	Output Signal Switching Device
PE	Protecting Earthing
PID	proportional, integral, derivative
PL	Performance Level
PLC	Programmable Logic Controller
PM	Power Module
POU	Program Organization Unit
PRG	Program
PTO	Pulse Train Output
PWM	Pulse-Width Modulation
RAMS	Reliability, Availability, Maintainability and Safety
RST	Reset
RTC	Real Time Clock
RTD	Resistance Temperature Device
RTS	Real Time System

Safe-AT	Safety FA-AutoThink
SD	Secure Digital
SDRAM	synchronous dynamic random-access memory
SFC	Sequential Function Chart
SIL	Safety Integrity Level
SN	Serial Number
SOE	Sequence Of Event
SRAM	Static Random-Access Memory
SSI	Synchronous Serial Interface
ST	Structured Text
STO	Safe Torque Off
SW	Switch
TC	Thermocouple
TÜV	Technischer Überwachungsverein
UART	Universal Asynchronous Receiver & Transmitter



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