FL8 Series PLC and Extension Module Hardware Manual

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Revision History

Date	Version	Revision History
2024-08-09	01	Initial publication

Contents

Preface

Overview

Thank you for choosing Flexem products. This manual provides a detailed introduction to the hardware structure and specifications of FL8 series PLC and its extension modules.

The content provided in this manual only serves as general guidance and does not guarantee coverage of all usage scenarios for all product models. Due to reasons such as version upgrades, different device models and configuration files, the content provided in the manual may not match the actual device interface used by the user. Please refer to the actual information displayed on the user's device interface. The manual will not provide a detailed explanation of the differences caused by the aforementioned situations.

For the purpose of functional introduction and configuration examples, the manual may use IP addresses, URLs, domain names, etc. Unless otherwise specified, the aforementioned content is for illustration only and does not represent any actual significance.

Target Reader

This document is mainly intended for readers who are interested in learning about the hardware structure and specifications of FL8 series PLC and its extension modules, including hardware engineers, installation engineers, etc. This document assumes that readers have a certain level of knowledge in the following areas:

- Basic network communication protocols such as TCP/IP
- Modbus protocol
- PLC operating principle

Format Convention

This manual follows the following content formatting conventions:

Content	Description
Bold	Bold represents the names and contents of various controls on the software interface. For example, "Select **Window/Current Window Properties** from the menu bar to enter the **Modify Window** page, and select the **Timer** tab."
/	When describing the operation steps on the software interface, slash is used to isolate the clicked objects

Content	Description
	(menu item, sub-menu, button, etc.). For example, “Select **Component/Switch/Bit Set** from the menu bar, and create a new bit set switch component”.
Italic	Variables, must be replaced by actual values accordingly. For example, “Enter ‘ftp://*the IP of HMI*’ in the browser address bar, and press Enter to enter the file directory interface of the HMI.”

This manual follows the icon formatting conventions below.

Icon	Description
	Tips, operation tips for users to solve problems.
	Description, supplementary and explanatory information for the main text.
	Reminder, reminders for operation precautions, improper operation may cause potential device damage or data loss.
	Warning, the content following this icon requires special attention, otherwise it may result in personal injury.

Get Help

If you have any problem during use, please call the service hotline at 4008-033-022.

Please visit https://www.flexem.com/download to obtain more documents.

Contact information

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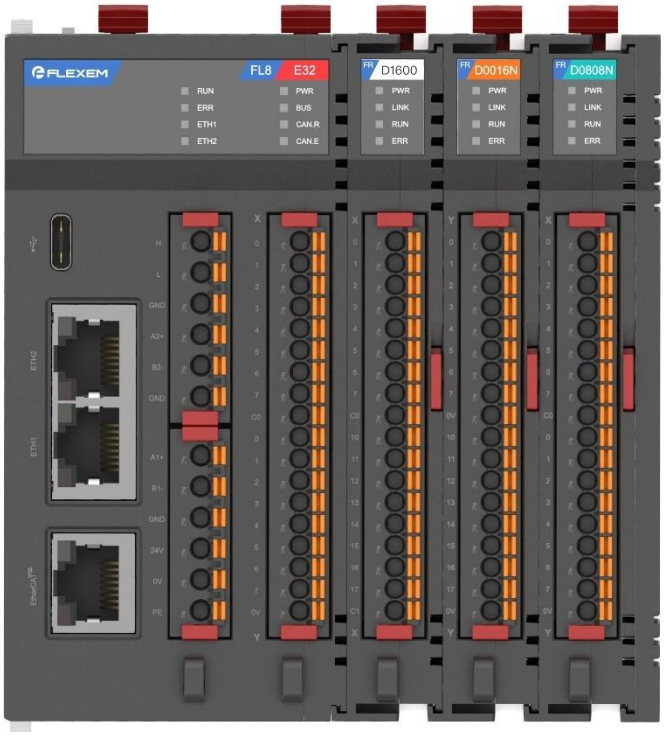
1 FL8 Series PLC

1.1 Product Overview

The FL8 series PLC is a domestically produced programmable controller based on the Codesys system. On the basis of the Codesys underlying system, it integrates functions such as high-speed I/O application, CANopen communication, and Internet of Things data transmission, to achieve seamless data connection from the device end to the cloud, thereby achieving cloud-edge coordination, device informatization, factory automation, and unmanned management.



1.2 System Structure

The FL8 series PLC connects to extension modules through the connection interfaces on both sides of the main unit.

The CPU of the FL8 series PLC can connect up to 31 extension modules at right side and 1 IoT extension module at left side, flexibly achieve device configuration and the function of migrating data to the cloud.

Due to the limitations of the CPU's power supply capacity, the exact number of extension modules that the CPU can carry is determined by the types and specifications of the modules carried in the specific project.

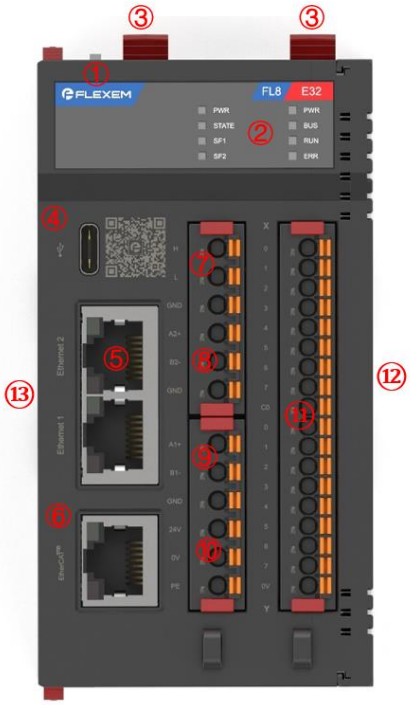
1.3 Hardware Specifications

Please refer to the table below for the hardware specifications of each model.

Model	Power supply	EtherCAT axes	Input points	NPN output points	High-speed counting (points)	Pulse output (points)	Ethernet communication ports
FL8-E8-D	DC 24V	8	8	8	7	6	2
FL8-E16-D		16	8	8	7	6	2
FL8-E32-D		32	8	8	7	6	2

2 Hardware Structure

2.1 Device Appearance



1. Run/Stop switch; 2. Status indicator lights; 3. DIN rail clips; 4. USB; 5. Ethernet port; 6. EtherCAT communication port; 7. CANopen communication terminal; 8. RS485 communication terminal; 9. RS485 communication terminal; 10. Power terminal; 11. Input/Output terminal; 12. Right extension module interface; 13. Left extension module interface.

2.2 Component Characteristics

2.2.1 CPU and Memory(Storage)

Series	FL8		
Model	FL8-E8-D	FL8-E16-D	FL8-E32-D
CPU	Quad-core, 1GHz		
Memory	1GB	2GB	2GB

Hard disk	4GB	8GB	8GB

2.2.2 Communication Port

The FL8 series PLC has the following types of built-in communication ports:

- EtherCAT high-speed motion control bus port
- Ethernet port
- USB port (Type-C)
- Serial communication port
- CANopen communication port

2.2.3 General Input/Output

FL8 has the following types of built-in I/O:

- Digital input
- High-speed pulse input
- High-speed pulse output
- Conventional transistor output

2.2.4 Extension Module

The number of I/Os can be extended by adding I/O modules to the controller. The types of extension modules are as follows:

- Digital input module
- Digital output module
- Digital input/output module
- Analog input module
- Analog output module
- Temperature sensor input module

2.2.5 Real-time Clock

The FL8 series PLCs are all equipped with built-in RTCs (real-time clocks), which not only provide system date and time information, but also support functions that require a real-time clock. Even after external power is cut off, the real-time clock can still run for one year using the built-in power supply.

2.2.6 Transistor Input

Characteristic		Parameter
Rated voltage		DC 24V
Input range		DC 0V~28.8V
Rated current		7mA
Peak value	Voltage	30V
	Current	9mA
Status	Voltage (status 1)	>15V
	Voltage (status 0)	<5V
	Current (status 1)	>2.5mA
	Current (status 0)	<1.0mA
Isolation	-	Optocoupler
Input impedance		3.3kΩ
Filter time		Default setting is 1ms. The range from no filtering to 250ms is divided into 16 levels that can be selected.
Compatibility		Compatible with 2-wire and 3-wire sensors.
Input type		Source/Sink
Wire length and type		Maximum 100m for shielded cables or 50m for unshielded cables.
Protection (overvoltage)		Maximum 30V, with a frequency limit of 1 hour per day.
Terminal block		Removable terminal block

2.2.7 Transistor Output

Characteristic	Parameter
Output type	NPN
Rated voltage	DC 24V
Voltage range	DC 19.2V~28.8V
Rated current	2A
Current for each group	4A*number of output points of each group
Voltage drop	Maximum DC 1V
Leakage current when turned off	<5μA
Maximum power for pure resistive load	2.4W
Derating	No
Turn-on time	Maximum 34μs
Turn-off time	Maximum 250μs
Maximum output frequency	1kHz
Short-circuit protection	Yes
Short-circuit output peak current	1.3A
Self-recovery after short-circuit or overload	Every 10ms
Clamping voltage	Maximum DC 39V±1V
Isolation	AC 500V between output and internal logic
Electrical channel type	Unshielded
Cable length	50m unshielded cable
Terminal block	Removable terminal block

2.2.8 High-speed Transistor Input

Characteristic	Parameter
Rated voltage	DC 24 V
Current input range	DC 19.2V~28.8V

Characteristic		Parameter
Logic type		NPN/PNP
Rated input current		0.1A
Input impedance		2.8KΩ
Input limit	Voltage in status 1	> 15 V DC (15~28.8 V DC)
	Voltage in status 0	< 5 V DC (0~5 V DC)
	Current in status 1	> 5 mA
	Current in status 0	< 1.5 mA
HSC maximum frequency	A/B phase	100kHz
	Pulse/direction	200kHz
	Uni-phase	200kHz
Supported operation modes		◆ A/B phase counting ◆ Pulse/direction counting ◆ Single-phase/Dual-phase counting
Cable length		Maximum 5m
Cable type.		Shielded cable, including 24V DC power supply cable
Terminal block		Removable screw terminal

2.2.9 High-speed Transistor Output

Characteristic	Parameter
Rated voltage	DC 24 V
PTO power input range	DC 19.2V~28.8V
Whether support PTO reverse power supply protection	Yes
Output type	NPN
PTO/PWM output current	0.5A (when used for ordinary output)
	0.1A (when used for high-speed output)
Insulation resistance	> 10 MΩ

Characteristic	Parameter
Leakage voltage	< 1.5V (current is 0.1A)
Minimum load impedance	80Ω
Maximum PTO output frequency	NPN output: 200kHz
Operation mode	Pulse + direction output
Cable length	Maximum 5m
Cable type	Shielded cable, including 24V DC power supply cable
Terminal block	Removable screw terminal

3 Install the Device

3.1 Installation Precautions

The FL8 series PLC can be installed on a panel or standard rail, and can be mounted horizontally or vertically. The size of the FL8 series PLC is relatively small, allowing users to efficiently utilize space. To avoid device damage or personal injury due to improper use, please follow these precautions:

- Before installing the control system on the mounting rail, mounting plate or panel, all components and modules should be properly assembled. Remove the control system from the mounting rail, mounting plate or panel first, and then disassemble the device.
- According to the electrical equipment standards, the FL8 series PLC is an open-type device. The FL8 series PLC must be installed inside an enclosure, control cabinet, or power control room. Only authorized personnel are allowed to open the enclosure, control cabinet, or enter the power control room.
- The PLC should be installed in a dry environment.
- In accordance with applicable electrical and building standards, during installation, approved mechanical strength, flammability protection, and stability protection should be provided for open-type devices in specific locations.
- Conductive pollution caused by dust, humidity, and atmospheric contamination can lead to operational failure and electrical failure in the PLC.
- If the PLC is placed in an area that may have conductive pollution, the PLC must be protected by an enclosure with an appropriate protection level
- Isolate the PLC from thermal radiation source, high voltage and electrical noise.
- As a basic rule for arranging various equipment in the system, devices that generate high voltage and high electrical noise must be isolated from low-voltage logic devices such as the PLC.
- When installing the PLC on a panel, take the heat-generating equipment into consider and arrange the electronic devices in the cooler areas of the control cabinet. Minimizing exposure to high-temperature environment will extend the service life of all electronic devices.
- In addition, the wiring of the devices in the panel should also be taken into consider. Avoid routing low-voltage signal wires and communication cables in the same ducts with AC power lines and high-energy fast-switching DC lines.

3.2 Safety Requirements

3.2.1 Enclosure Requirements

The FL8 series PLC system components are designed as Class A industrial equipment for Zone B according to the published IEC standards.

If used in environments other than those described in this standard, or in environments that do not meet the specifications in this manual, the ability to meet electromagnetic compatibility requirements (if there is conducted interference and/or radiated interference) may be reduced.

All FL8 series PLC system components comply with the requirements for open-type devices defined by the

European Union (CE) in EN61131-2. These components must be installed in a dedicated enclosure for the specific environmental conditions to minimize the possibility of accidental contact with dangerous voltages. Using a metal enclosure can improve the electromagnetic immunity of the FL8 series PLC system. Using an enclosure with a keyed locking mechanism can minimize unauthorized access as much as possible.

3.2.2 Environment Characteristics

This device complies with the CE requirements listed in the table below. This device is intended for use in an industrial environment with pollution degree 2. Please refer to the table below for the specific requirements.

Category	Characteristic
Operation environment temperature	-10℃~60℃
Storage temperature	-20℃~70℃
Relative humidity	55%~95%, no condensation.
Pollution level	2（IEC60664）
Protection level	IP20
Coating	Coating protection, dry film thickness ≥20μm; enhanced dry film thickness ≥40μm
Altitude	Operation: 0m~3,000m Transportation: ≤6,000m
Anti-seismic performance	5Hz~13.2Hz, amplitude 7mm; 13Hz~100Hz, acceleration 2G, 20 times in the X, Y, and Z axis directions
Shock resistance	Half-sine wave, acceleration 15G, duration 11ms, 6 times in the X, Y, and Z axis directions.

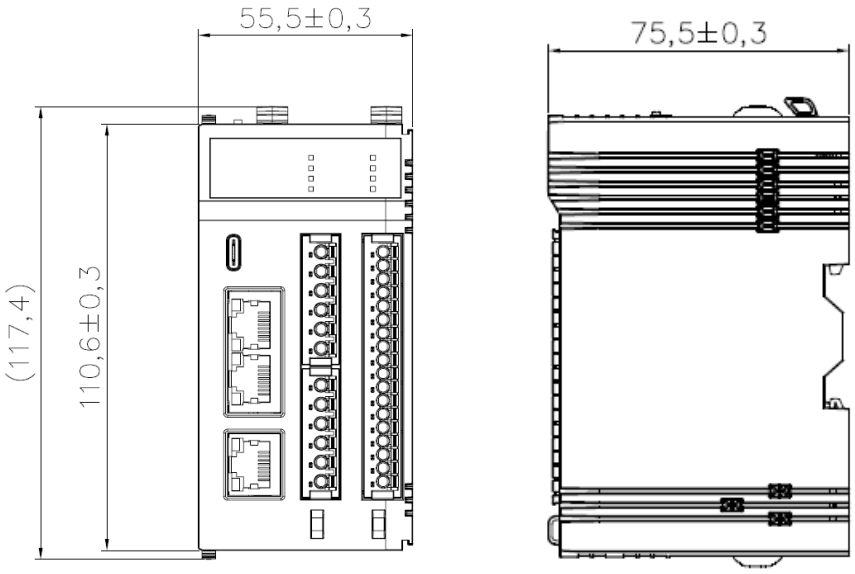
3.2.3 Electromagnetic Susceptibility

The FL8 series PLC system meets the electromagnetic compatibility specifications described in the table below.

Standard	Method	Item
EN IEC 61000-6-4:2019	CISPR 16-2-1	Conducted Emissions at AC Mains Power Port (150kHz-30MHz)

Standard	Method	Item
	CISPR 32	Conducted Emissions at Wired Network Port(150kHZ-30MHz)
	CISPR 16-2-3	Radiated Emissions(30MHZ-1GHz)
	CISPR 16-2-3	Radiated Emissions(Above 1GHz)
EN IEC 61000-6-22019	EN 61000-4-6:2014	Conducted Immunity at AC Mains Power Port(150kHZ-80MHz
	EN 61000-4-6:2014	Conducted Immunity at Signal Port150kHz-80MHz
	EN 61000-4-4:2012	Electrical Fast Transients Burst at AC Mains Power Port
	EN 61000-4-4:2012	Electrical Fast Transients Burst at Signal Port
	EN 61000-4-2:2009	Electro static Discharge
	EN 61000-4-8:2010	Power FrequencyMagnetic Field
	EN IEC 61000-4-3:2020	Radiated Immunity(80MHZ-6GHz)
	EN 61000-4-5:2014+A1:2017	Surge at AC MainsPower Port
	EN 61000-4-5:2014+A1:2017	Surge at Signal Port
	EN IEC 61000-4-11:2020	Voltage Dips and Interruptions

3.3 CPU Dimension



Unit: mm

Model	Rail size	Overall Dimension
		W×H×D
FL8-E8-D	35	56×111×76
FL8-E16-D		
FL8-E32-D		

3.4 Ventilation Requirements

The device should be installed in a well-ventilated cabinet, and ensure that there is enough space around the device to dissipate heat .

- Install the device with the highest heat dissipation at the top of the cabinet to ensure proper ventilation.
- Do not install this device next to or above equipment that may cause overheating.
- To ensure roper operation of the device, please ensure that the operating environment temperature is from 0℃ to 50℃.

3.4.1 Minimum Clearance

To ensure normal heat dissipation of the device, please keep sufficient clearance distance. There are 3 types of clearances as follows:

- The clearance between the device and all sides of the cabinet (including the panel door).

- Clearance between the terminal block and the wiring duct. This distance reduces electromagnetic interference between the controller and the wiring duct.
- Clearance between this device and other heat generating equipment installed in the same cabinet.

Minimum clearance requirements for PLC installation (the space between PLC upper panel, lower panel, left panel, right panel and the sides of the cabinet is at least 30mm, and the space between PLC front panel and the panel door is at least 80mm).

3.4.2 Anti-foreign Matter Sticker

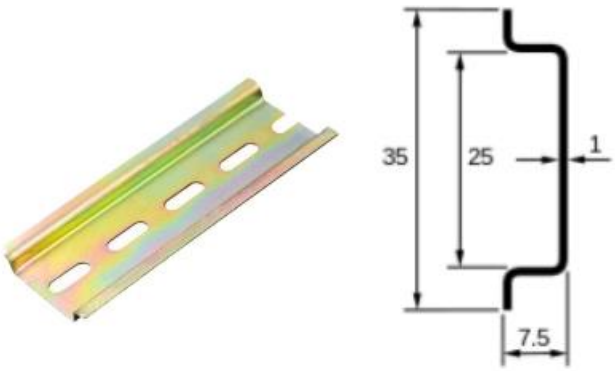
Do not remove the anti-foreign matter protective sticker during installation to avoid foreign matter falling into the inside of the machine, which may cause short circuits and other failures; when installation is completed, the anti-foreign matter protective sticker must be removed before powering on to avoid poor heat dissipation causing the PLC to overheat and malfunction.

3.5 Install the Device on DIN Rail

The device can be installed to the cabinet through DIN rail. The operation steps are as follows:

Step 1. Prepare DIN rails with the following specifications and install the DIN rails into the cabinet.

The recommended DIN rail for PLC installation is 35 mm high and 7.5 mm deep.



Step 2. Press the installation clips of the FL8 to open the DIN rail installation slot. Then clip the FL8 onto the DIN rail.

Step 3. Press the installation clips of FL8 to lock the FL8 on DIN rail.

4 Wiring

4.1 Safety Precautions

- Before removing any covers or doors, or installing or removing any components, hardware, cables or wires, disconnect the power connection of all equipment (including connected devices), except for special cases specified in the corresponding hardware manual of this equipment.
- Always use a properly rated voltage sensor to confirm that all power sources have been turned off at the indicated locations and times.
- After replacing and tightening all covers, components, hardware, cables and wires, and after confirming it is correctly grounded, power on the equipment.
- Specified voltage must be used when operating this device and related products.

4.2 Wiring Rules and Suggestions

4.2.1 Wiring Rules

The rules below must be followed when wiring PLC:

- I/O and communication cable must be separate from power cable. These two types of wiring cannot be routed in the same cable duct.
- Check whether the operating conditions and environment are within the specified allowable range.
- The specifications of the cables used must meet the voltage and current requirements.
- Only copper conductors can be used.
- Shielded twisted-pair cables must be used for analog and high-speed I/O.
- Use shielded twisted-pair cables for encoders, networks, and field buses.

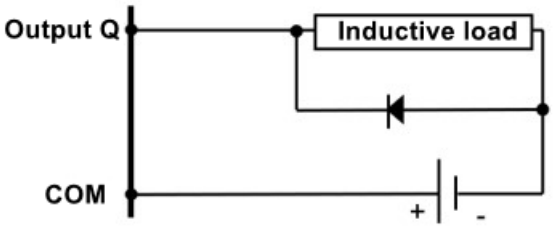
4.2.2 Wiring Suggestions

- Multiple grounding is allowed if connected to an equipotential ground to avoid damage to the cable shielding when a short-circuit current occurs in the power system.
- The cross-sectional area of the wires for the plug-in screw terminal blocks should be 0.33 to 2 square millimeters.
- Screw head: diameter 2.5 to 3.0 mm, slotted screwdriver torque (0.5N*m).
- Wire stripping length: 6.4 mm.
- Protect the output from being damaged by inductive loads.

4.2.3 Protective Circuit

The controller and specific module outputs may require protection circuits based on the load. Using inductive loads powered by DC voltage may generate voltage reflections that can cause overshoot, potentially damaging the output devices or shortening their service life.

- Protective circuit B: This protection circuit can be used for DC load power supply circuits.



Use a diode with the following ratings:

- Reverse withstand voltage rating: 10 times the power supply voltage of the load circuit.
- Forward current rating: Greater than the load current.

4.3 Earthing

The equipment needs to be earthed, including functional earth (to reduce electromagnetic interference between cables) and protective earth (to prevent electric leakage or lightning strikes).

For protective earth (PE), metal pipes or conductors can be used as part of the shielding length, provided the entire earthing connection is continuous and uninterrupted. For functional earth (FE), shielding is used to reduce electromagnetic interference, and the shielding of the entire cable must be continuous and uninterrupted. If the cable serves both functional and protective purposes (which is often the case for communication cables), the cable shielding must be continuous and uninterrupted. Whenever possible, cables carrying different types of signals or power should be kept separated.

Cables that carry high-speed I/O, analog I/O, and fieldbus communication signals must be shielded in the following ways:

Shielded cables must be firmly earthed. The shielding of high-speed I/O and analog I/O cables can be connected to the functional earth (FE) or protective earth (PE) points of the PLC. The shielding of fieldbus communication cables must be connected to the protective earth (PE) point using connecting clamps fixed to the conductive backplane.

The shielding of the following types of cables must be connected to the protective earth (PE) point:

- Ethernet
- Modbus

4.4 Connect Power Supply

Before connecting the power supply, please ensure that the device is properly grounded.

Before powering up the device:

- Remove any tools, instruments, and debris from the device.
- Close the device cabinet doors.
- Disconnect the ground wire from the input power supply cable.
- Perform all start-up tests recommended by the manufacturer.

4.4.1 Connect DC Power Supply

Safety precautions

- If the voltage cannot be kept within the specified range, the output may not be able to switch as expected. Please use appropriate safety interlocks and voltage monitoring circuits.
- According to IEC61140, 24V DC power supplies must be rated as Safety Extra-Low Voltage (SELV) or Protected Extra-Low Voltage (PELV). These power supplies are isolated between the electrical input and output circuits of the power supply.
- PLC must be supplied by a 24V external power supply unit. According to IEC standards, during a power failure, the PLC associated with the appropriate power supply must be able to operate normally for at least 10ms.
- For relay output (greater than or equal to 2A) wiring, please use conductors with a cross-sectional area of at least 0.5 square millimeters and a rated temperature of at least 80° C.

The FL8 series PLC models that support DC power must be supplied by a DC 24V external power supply unit. The requirements for the characteristics of the DC power supply are as follows:

Characteristic	Value
Rated voltage	DC 24V
Power voltage range	DC 20.5V~28.8V
Power interruption time	10 milliseconds at DC 24V
Maximum peak current	35A
Maximum power consumption	20W

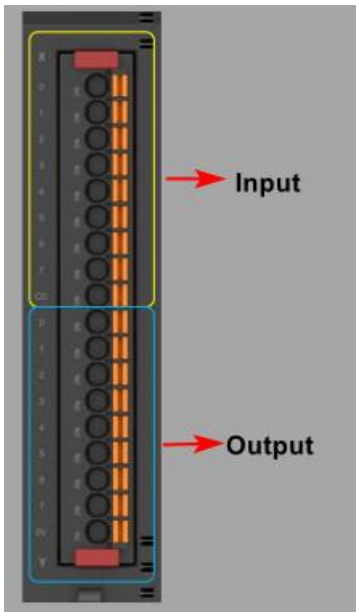
The steps to connect the DC power supply wires are as follows:

Step 1. Connect the positive terminal of the external DC power supply to the "+" terminal of the PLC DC power input.

Step 2. Connect the negative terminal of the external DC power supply to the "-" terminal of the PLC DC power input.

4.5 Connect Input/Output Terminal

The definitions of the FL8 series PLC input/output terminal are as follows:



From top to bottom are the input X area and the output Y area. Refer to the table below for detailed definitions.

Input X area

Sign	0	1	2	3	4	5	6	7	C0
Definition	Input 0	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 7	Input common port

Output Y area

Sign	0	1	2	3	4	5	6	7	0V
Definition	Output 0	Output 1	Output 2	Output 3	Output 4	Output 5	Output 6	Output 7	Output common port

4.6 Connect USB Interface

Users can program and debug the PLC through the USB interface. The steps to connect the USB interface are as follows:

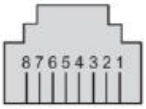
Step 1. Connect the Type-C end of the USB cable to the USB interface of the PLC.

Step 2. Connect the Type-A end of the USB cable to the USB interface of the PC.

4.7 Connect Ethernet Interface

The Ethernet interface of the PLC is an RJ45 interface, with a rate of 10M/100Mbit/s, auto-adaptive half-duplex/full-duplex.

The diagram below shows the pin definitions of the Ethernet connector.



Pin No.	Signal
1	TD+
2	TD-
3	RD+
4	-
5	-
6	RD-
7	-
8	-

Connect the Ethernet port of the PLC to the Ethernet port of the peer device (such as a PC) with a standard Ethernet cable.

5 Technical Specifications of Extension Module

5.1 General Technical Specifications of Extension Module

Attribute	Parameter
Module failure alarm	Supported
Isolation withstand voltage	500V
Certified test	CE
Protection level	IP20
Working temperature	-25℃~+60℃
Storage temperature	-40℃~+85℃
Relative humidity	95%, no condensation
Dimension（W*H*D）	18mm × 111mm × 76mm

5.2 Technical Specifications of Digital Extension Module

The corresponding digital extension modules FR-D1600, FR-D0808N, FR-D0016N are provided

Model	Input points	Output points
FR-D1600	16（NPN/PNP）	0
FR-D0808N	8（NPN/PNP）	8（NPN）
FR-D0016N	0	16（NPN）

Digital input characteristic		Parameter
Rated voltage		DC 24V
Input range		DC 0V~28.8V
Rated current		7mA
Peak value	Voltage	30V
	Current	9mA
Status	Voltage (status 1)	>15V，15V~28.8V
	Voltage (status 0)	<5V，0V~5V

	Current (status 1)	>2.5mA
	Current (status 0)	<1.0mA
Isolation	-	Optocoupler
Input impedance		3.3kΩ
Filter time		No filtering
Compatibility		Compatible with 2-wire/3-wire sensors
Input type		Source/sink
Digital output characteristic		**Parameter**
Output type		NPN/PNP (based on model)
Rated voltage		DC 24V
Voltage range		DC 19.2V~28.8V
Rated current		0.5A
Current for each group		0.5A*Number of output points of each group
Voltage drop		Maximum 1V（DC）
Leakage current when turned off		<5μA
Maximum power of incandescent light		2.4W
Derating		No
Turn-on time		Maximum 34μs
Turn-off time		Maximum 250μs
Maximum output frequency		1kHz
Short circuit protection		Supported
Short-circuit output peak current		1.3A
Self-recovery after short-circuit or overload		Every 10ms
Clamping voltage		Maximum 39±1V（DC）
Isolation		500V (AC) between output and internal logic
Electrical channel type		Unshielded
Cable length		Unshielded cable, 50m
Terminal block		Removable terminal block

5.3 Technical Specifications of Analog Input Module (to be published)

The corresponding analog extension module FR-A0400M is provided.

Model	Number of input channels	Number of output channels
FR-A0400M	4	0

Characteristic	**Parameter**	
Input range	◆ Voltage input: DC -10 ~ 10 V or DC 0~10V。 ◆ Current input: 0 ~ 20mA or 4 ~ 20mA	
Input impedance	◆ Voltage input: >200KΩ ◆ Current input: 237.5~262.5Ω	
I/O terminal	Removable terminal block	
Sampling time	1 ms /channel*number of channels+ 1 scanning cycle	
Total input system transmission time	4 ms+1 scanning cycle	
Input deviation	Maximum ±0.2% * full scale range	
Resolution	16-bit signed	
Temperature drift	±0.06% * full scale range, unit ℃	
Common mode rejection	40dB, DC to 60Hz	
Noise rejection	400, 60, 50 or 10Hz	
Nonlinearity	±0.4 % * full scale	
Maximum operating input (without damage)	±30 V（DC）	±30mA（DC）
Protection type	Isolation between input and internal power supply	
Incorrect configuration (Voltage -> Current):	◆ When the input is within ±30V (DC), it will not cause damage. ◆ When the input exceeds ±30V (DC), it will cause permanent damage.	
Incorrect configuration (Current -> Voltage):	◆ When the input is within ±30mA, it will not cause damage.	

Characteristic	Parameter
	◆ When the input exceeds ±30mA, it will cause permanent damage.
Wire type	Shielded cable
Wire length	Shielded cable 3m~30m

5.4 Technical Specifications of Analog Output Module (to be published)

The corresponding analog extension module FR-A0004M is provided.

Model	Number of input channels	Number of output channels
FR-A0004M	0	4

Characteristic	Parameter
Output range	◆ Voltage output: DC 0 ~10V ◆ Current output: DC 0 ~ 20 mA or DC 4~20mA
I/O terminal	Removable terminal block
Load impedance	◆ Voltage output: >2kΩ ◆ Current output: <500Ω
Load type	Resistive load
Settling time	750μs
Total output system transmission time	3 ms + 1 scanning cycle
Output deviation (total deviation)	±0.5 % of full scale
Resolution	16-bit signed
Temperature drift	±0.06% * full scale, unit℃
Nonlinearity	±0.5 %*full scale
Protection type	Isolation between input and internal power supply

Characteristic	Parameter
Output protection	◆ Short-circuit proof, no damage (voltage output) ◆ Open-circuit protection (current output)
Cable type	Shielded cable
Cable length	Shielded cable 3m~30m

5.5 Technical Specifications of Temperature Sensor Module (to be published)

Characteristic	Input characteristics of thermocouple temperature sensor
Rated power consumption	≤40mA (fully loaded)
Rated power supply	Bus DC 24V
Input sensor type	K, J, R, S, B, E, T, N, C type thermocouple; NTC
Resolution	Temperature: 0.1℃ Resistance: 15-bit signed
Measurement deviation (at 25 ° C environment emperature)	◆ Thermocouple: ±0.3% or ±1℃ of the displayed value, whichever is greater ◆ NTC: ±0.1% or ±1℃ of the displayed value, whichever is greater
Influence of measurement temperature (temperature range: -20℃～60℃)	◆ Thermocouple input (R, S, B, C): ±1% or ±2.5° C of PV, whichever is greater ◆ Other thermocouple input: ±1% or ±1° C of PV, whichever is greater
Connector type	Screw terminal
Signal type	Electric isolation
Input impedance	≥1 MΩ
Sampling cycle	≤100ms/channel
Input minimum value	0.1℃
Over-range detection	Supported
Disconnection alarm	Supported
Input filter	0~10s (0.01s as unit)
Measurement range	◆ K：–200~1300℃

	◆ J：–200~1000 ℃ ◆ R：0~1760℃ ◆ S：0~1760℃ ◆ B：0~1820 ℃ ◆ E：200~800℃ ◆ T：–200~400℃ ◆ N：–200~1300℃ ◆ C：0~2315℃ NTC： Measurement resistance range: 100 Ω~200 kΩ Calculation temperature range: -90~150℃
Characteristic	Input characteristics of platinum resistance temperature sensor
Rated power consumption	≤30mA (fully loaded)
Rated power supply	Bus DC 24V
Input sensor type	PT100, PT1000, NI100, NI1000, Cu50, Cu100
Resolution	0.1℃
Measurement deviation (at 25 ° C environment emperature)	±0.5% or ±1℃, whichever is greater
Influence of environment temperature (temperature range: -20℃～60℃)	◆ Pt100, Pt1000, Ni100, Ni1000: ± 1% or ± 1 ℃ of PV , whichever is greater ◆ Cu50, Cu100：±1% or ±1.5℃of PV , whichever is greater
Input impedance	≥1 MΩ
Sampling cycle	≤100ms/channel
Input minimum value	0.1℃
Over-range detection	Supported
Disconnection alarm	Supported
Input filter	0~10s (0.01s as unit)
Measurement range	◆ Pt100：–200~850℃ ◆ Pt1000：–200~600℃ ◆ Ni100：–60~180℃ ◆ Ni1000：–60~180℃ ◆ Cu50：-50~150℃ ◆ Cu100：-50~150℃