Digitized Automation for a Changing World

DVP-SE2 Series
Hardware and Operation Manual

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Revision History

Version	Revision	Date
1st	The first version was published.	2024/9/4

DVP-SE2 Series

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Chapter 1 Product Introduction

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1.1 Introduction

This manual introduces the slim-type DVP-SE2 Series PLC CPU; their functions, electrical specifications, hardware configuration, appearances, dimensions, as well as wiring and so forth are presented here. Refer to DVP Series Module Manual for more information on the extension I/O modules of DVP-SE2 Series PLC CPU.

1.1.1 Related Manuals

The related manuals for DVP-SE2 Series programmable logic controllers are listed below.

- DVP-ES2/EX2/EC5/SS2/SA2/SX2/SE/SE2 &TPOperation Manual-Programming

  This introduces programming for the DVP-SE2 Series programmable logic controllers, basic instructions, and applied instructions.

- ISPSoft User Manual

  This introduces the use of ISPSoft software, programming language (Ladder, SFC), POUs, and tasks.

  Note*: Do NOT use WPLSoft for PLC programming.

- DVP-SE2Series Hardware and Operation Manual

  This introduces electrical specifications, dimensions, CPU functions, devices, extension I/O module placement, troubleshooting, and so forth.

- DVPSeries Module Manual

  This introduces the extension modules, e.g. network modules, analog modules and temperature measurement modules.

1.1.2 DVP-SE2 Series CPU Modules and Their Extension Modules

Classification	Model Name	Description
Power supply module	DVPPS01	Input:100~240VAC，50/60Hz Output:24VDC/1A，24W
	DVPPS02	Input:100~240VAC，50/60Hz Output:24VDC/2A，48W
	DVPPS05	Input:100~240VAC，50/60HzOutput:24VDC/5A，120W
DVP-SE2 Series CPU module	DVP28SE211T	24 VDC powered CPU module Transistor, NPN output (sinking), 1x Ethernet port (dual-interface with Switch function), 2x RS-485 ports, 1x USB & CAN port, supporting 28 I/Os (16 DI + 12 DO) and up to 256 inputs and 252 outputs. Program capacity: 64K steps, removable terminal blocks

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Classification	Model Name	Description
	DVP28SE211S	24 VDC powered CPU module Transistor, PNP output, 1x Ethernet port (dual-interface with Switch function), 2x RS-485 ports, 1x USB & CAN port, supporting 28 I/Os (16 DI + 12 DO) and up to 256 inputs and 252 outputs. Program capacity: 64K steps, removable terminal blocks
Digital I/O module	DVP06SN11R	6 Relay outputs; 250 VAC; Below 30 VDC 6A/output
	DVP08SN11R	8 Relay outputs; 250 VAC; Below 30 VDC 1.5A/output, 5A/COM
Digital I/O module	DVP08SN11T	Transistor, 8 NPN outputs (sinking), 30 VDC; 55°C, 0.1A/output; 50°C, 0.15A/output; 45°C, 0.2A/output; 40°C, 0.3A/output; 2A/COM
	DVP16SN11T	Transistor, 16 NPN outputs (sinking), 30 VDC; 55°C, 0.1A/output; 50°C, 0.15A/output; 45°C, 0.2A/output; 40°C, 0.3A/output; 2A/COM
	DVP08SP11R	4 inputs; 24 VDC; 4.2 mA 4 Relay outputs; 250 VAC; Below 30 VDC; 1.5A/output, 5A/COM
	DVP08SP11T	4 inputs; 24 VDC; 4.2 mA 4 transistor outputs, 30 VDC; 55°C 0.1A/output; 50°C 0.15A/output; 45°C, 0.2A/output; 40°C, 0.3A/output, 2A/COM
	DVP08SM11N	8 inputs; 24 VDC; 4.2 mA
	DVP08SM10N	8 inputs; 85-132 VAC (50~60Hz) ; 9.2 mA (10VAC/60Hz)
	DVP08SN11TS	8 transistor outputs (sourcing); 30 VDC; 55°C, 0.3A/output, 2A/COM
	DVP08ST11N	8 inputs (dip switch)
	DVP16SP11R	8 inputs; 24 VDC; 4.2 mA 8 Relay outputs; 250 VAC; Below 30 VDC; 1.5A/output, 5A/COM
	DVP08SP11TS	4 inputs; 24 VDC; 4.2 mA 4 transistor outputs (sourcing), 30 VDC; 55°C 0.3A/output, 2A/COM
	DVP16SP11T	8 inputs; 24 VDC; 4.2 mA 8 transistor outputs (sinking), 30 VDC; 55°C 0.1A/output; 50°C, 0.15A/output; 45°C, 0.2A/output; 40°C, 0.3A/output, 2A/COM
	DVP16SP11TS	8 inputs; 24 VDC; 4.2 mA 8 transistor outputs (sourcing); 30 VDC; 55°C, 0.3A/output, 2A/COM
	DVP16SN11TS	16 transistor outputs (sourcing); 30 VDC; 55°C, 0.3A/output, 2A/COM
	DVP16SM11N	16 inputs; 24 VDC; 4.2 mA
	DVP32SM11N	32 inputs; 24 VDC; 4.2 mA
	DVP32SN11TN	32 transistor outputs (sinking); 5-30 VDC; 0.1A/output; 55°C, 1.0A/COM; 25°C, 2.2A/COM

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Classification	Model Name	Description
Analog I/O module	DVP04AD-S2	4 channel analog inputs (differential) 14-bit resolution: -10 to 10 V, -6 to 10 V 13-bit resolution: -20 to 20 mA, -12 to 20 mA Conversion time: 3ms/channel
	DVP04DA-S2	4 channel analog outputs 12-bit resolution: 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA Conversion time: 3ms/channel
Analog I/O module	DVP06XA-S2	4 channel analog inputs (differential) 12-bit resolution: -10 to 10 V, -6 to 10 V 11-bit resolution: -20 to 20 mA, -12 to 20 mA Conversion time: 3ms/channel 2 channel analog outputs 12-bit resolution: 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA Conversion time: 3ms/channel
	DVP02DA-S	2 channel analog outputs 12-bit resolution: 0 to 10 V, 2 to 10 V, 0 to 20 mA, 4 to 20 mA Conversion time: 3ms/channel
	DVP06AD-S	6 channel analog inputs 14-bit resolution: -10 to 10 V, -6 to 10 V 13-bit resolution: -20 to 20 mA, -12 to 20 mA Conversion time: 3ms/channel
Left-side high-speed analog I/O module	DVP04AD-SL	4 channel analog inputs (differential) 16-bit resolution: -10 to 10 V, -5 to 5 V, -20 to 20 mA 15-bit resolution: 0 to 20 mA, 4 to 20 mA Conversion time: 250 µs/channel
	DVP04DA-SL	4 channel analog outputs 16-bit resolution: 0 to 10 V, -10 to 10 V 15-bit resolution: 0 to 20 mA, 4 to 20 mA Conversion time: 250 µs/channel
Left-side high-speed load cell module	DVP201LC-SL	1 channel 24-bit resolution: 0~80mV/V With one RS-485 port, it can work alone.
	DVP211LC-SL	1 channel 24-bit resolution: 0~80mV/V I/O: 2DI/4DO/1AO With one RS-485 port, it can work alone.
	DVP202LC-SL	2 channels 24-bit resolution: 0~80mV/V With one RS-485 port, it can work alone.

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Classification	Model Name	Description
Left-side high-speed load cell module	DVP02LC-SL	2 channels 20-bit resolution: 0~6mV/V
	DVP01LC-SL	1 channel 20-bit resolution: 0~6mV/V
Temperature measurement module	DVP04PT-S	4-channel, 2-wire/3-wire RTD; Sensor type: Pt100 / Pt1000 / Ni100 / Ni1000 / LG-Ni1000 / Cu100 / Cu50 / 0~300Ω / 0~3000Ω; Resolution: 0.1°C/0.18°F; Conversion time: 200 ms/channel; PID controller
	DVP06PT-S	6-channel, 2-wire/3-wire RTD; Sensor type: Pt100 / Pt1000 / Ni100 / Ni1000 / LG-Ni1000 / Cu100 / Cu50 / 0~300Ω / 0~3000Ω; Resolution: 0.1°C/0.18°F; Conversion time: 160 ms/channel
	DVP04TC-S	4-channel thermocouple; J, K, R, S, T; Resolution: 0.1°C/18°F; Conversion time: 200 ms/channel PID controller
	DVP08NTC-S	8-channel thermistor (NTC) Sensor type: Pt1000, Ni1000, LG-Ni1000, CTN10K, CTN100K, NTC20K, NTC30K, PT-42H, PT-43, PT-51F, PT-25E2, PT-312, KTY81, two user-defined tables Resolution: 0.1°C
Remote temperature measure module	DVP02TUN-S	2 generic analog inputs: 0~10V, 0~20 mA, 4~20 mA Thermocouple: J, K, R, S, T, E, N, B, C, L, U, TXK (L), PLII Thermistor: Pt100, JPt100, Pt1000, Cu50, Cu100, Ni100, Ni120, Ni1000, LG-Ni1000 Resolution: 0.1°C (16-bit) 4 transistor (sinking) outputs: 24 VDC/300 mA Output points: controlled by PID or manual
Remote temperature measure module	DVP02TUR-S	2 generic analog inputs: 0~10V, 0~20 mA, 4~20 mA Thermocouple: J, K, R, S, T, E, N, B, C, L, U, TXK (L), PLII Thermistor: Pt100, JPt100, Pt1000, Cu50, Cu100, Ni100, Ni120, Ni1000, LG-Ni1000 Resolution: 0.1°C (16-bit) 4 relay outputs: 240 VAC/2 A Output points: controlled by PID or manual

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Classification	Model Name	Description
	DVP02TUL-S	2 generic analog inputs: 0~10V, 0~20 mA, 4~20 mA Thermocouple: J、K、R、S、T、E、N、B 、C、L、U、TXK（L）、PLII Thermistor: Pt100、JPt100、Pt1000、Cu50、Cu100、Ni100、Ni120、Ni1000、LG-Ni1000 Resolution: 0.1°C (16-bit) 2 analog outputs: 0~10V, 0~20 mA, 4~20 mA Resolution: 12-bit Output points: controlled by PID or manual
	DVP02TKN-S	2 generic analog inputs: 0~10V, 0~20 mA, 4~20 mA Thermocouple: J, K, R, S, T, E, N, B, C, L, U, TXK (L), PLII Thermistor: Pt100, JPt100, Pt1000, Cu50, Cu100, Ni100, Ni120, Ni1000, LG-Ni1000 Resolution: 0.1°C (16-bit) 4 transistor (sinking) outputs: 24 VDC/300 mA Output points: controlled by PID or manua
	DVP02TKR-S	2 generic analog inputs: 0~10V, 0~20 mA, 4~20 mA Thermocouple: J, K, R, S, T, E, N, B, C, L, U, TXK (L), PLII Thermistor: Pt100, JPt100, Pt1000, Cu50, Cu100, Ni100, Ni120, Ni1000, LG-Ni1000 Resolution: 0.1°C (16-bit) 4 relay outputs: 240 VAC/2 A Output points: controlled by PID or manual
	DVP02TKL-S	2 generic analog inputs: 0~10V, 0~20 mA, 4~20 mA Thermocouple: J, K, R, S, T, E, N, B, C, L, U, TXK (L), PLII Thermistor: Pt100, JPt100, Pt1000, Cu50, Cu100, Ni100, Ni120, Ni1000, LG-Ni1000 Resolution: 0.1°C (16-bit) 2 analog outputs: 0~10V, 0~20 mA, 4~20 mA Resolution: 12-bit Output points: controlled by PID or manual
Positioning module	DVP01PU-S	Single axis positioning module; 200k Hz
Left-side positioning module	DVP02PU-SL	2-axis motion control 5-24 VDC, 1 differential input (A/B/Z phase), maximum hardware input frequency at 200k Hz, 24 VDC, 5 mA, 5 inputs, maximum hardware input frequency at 1 kHz, 5 VDC, 2-axis (4 points) differential outputs, maximum output frequency at 200k Hz
Left-side high-speed communication module	DVPEN01-SL	Ethernet module; 10/100Mbps
	DVPDNET-SL	DeviceNet Master module; 500kbps
	DVPCOPM-SL	CANopen Master module; 1Mbps
	DVPSCM12-SL	RS-485/RS-422 series communication module; 460kbps
	DVPSCM52-SL	BACnet MS/TP Slave module; 460kbps

1.2   Overview

DVP-SE2 is slim-type advanced controller. With up to 4-axis (pulse) for positioning outputs and Delta Servos, they can

optionally work with a total of 8-axis (CANopen) communication positioning outputs. Up to 4 high speed input counters, it provides a strong network function, and you can create connection among devices on the network through software.

DVP-SE2 PLC CPU also provides structured programming. You can assign programs to different tasks and write programs which are frequently executed in a function block. Moreover, choose different programming languages ladder diagrams (LD), sequential function charts (SFC) dealt with by IEC 61131-3 according to needs when writing programs. Create DVP-SE2 PLC CPU hardware configuration by software. Also restore or back up a system rapidly through the built-in SD interface in this DVP Series PLC CPU. This manual introduces the basic operation and help you familiarize yourself with DVP-SE2 Series.

1.3   Characteristics

(1) **High efficiency**

- A 32-bit high-speed processor is used. The overall PLC program execution speed is approximately twice as fast as the DVP-SE host.

- Built with 4 high speed counters with the maximum frequency is 100 kHz for each; four-axis (8 points) high speed position output at 100 kHz.

(2) **Support more inputs and outputs**

- The DVP-SE2 PLC CPU supports up to 512 digital I/Os (256 inputs + 256 outputs). The 512 I/Os are shared by the PLC CPU (16DIs and 16 DOs), 8 right-side extension modules and 8 left-side high-speed extension modules. It is recommended not to connect more than 14 right-side slim type extension modules.

(3) **Larger program capacity and memory**

- The CPU modules have 64k steps of program capacity. 12000 general registers (12000 for specific use), and 8000 words of memory (that can be used for storing parameters).

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(4) **Support IEC61131-3**

- The DVP-SE2 PLC CPU supports IEC 61131-3.

- There are two types of programming languages: ladder diagram (LD), sequential function chart (SFC).
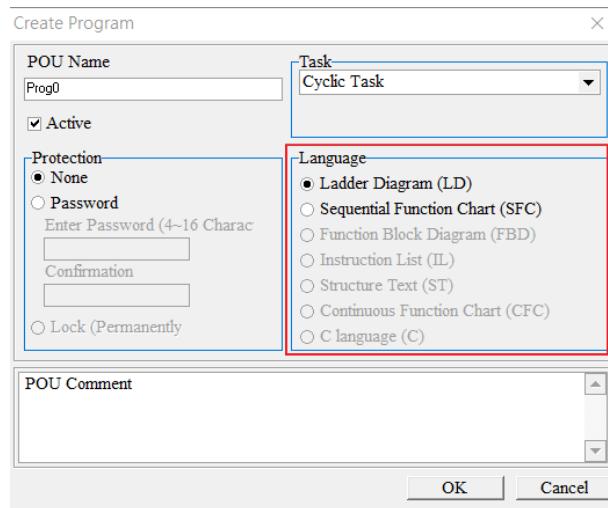
- You can select a programming language according to your preference. Programming languages support one another so that programs written by different users are compatible.

(5) **Strong function block**

- Both standard IEC61131-3 function blocks and convenient functions blocks provided by Delta Electronics, Inc. are supported. You can use function blocks for frequently used programs for greater structure and convenience.

- The symbol for a function block in a ladder diagram is similar to an integrated circuit (IC) in a circuit diagram. Because the ladder diagram is based on the traditional circuit diagram, the operation of a function block is similar to the function of an integrated circuit. You only need to send the signal to the corresponding input of the function block. Do not need to consider the processing procedure inside the function block.
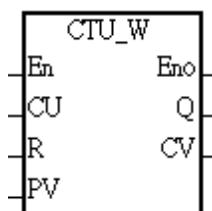
- A function block is a program element equipped with the operation function. It is similar to a subroutine, and is a type of POU (Program Organization Unit). It cannot operate by itself, and must be called through the main program POU. The function defined by the function block is executed after being called with the related parameters. The final result can be sent to the device or variable in the superior POU after the function block completes.

- You can set passwords in ISPSoft to provide function block security. The program inside a function block cannot be read, and business patents cannot be compromised.

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(6) **Increasing hardware configuration efficiency through a USB cable and ISPSoft**

● The DVP-SE2 PLC CPU provides a standard USB 2.0 interface. USB 2.0 increases the data transfer rate and decreases the time it takes to download the program, monitor the program, and configure the hardware. You do not need to buy a special communication cable for the CPU module. You can use a general USB cable to connect to the DVP PLC CPU module.

(7) **Serial control interface (RS-485 and CAN) with multiple functions**

● DVP-SE2 Series CPU modules provide two RS-485 serial control interfaces, COM1 and COM2, which can be set as a either master or slave.

● Built-in CAN communication port is for Delta Special Drive (8-axis servo and 8 motor drive) and CANopen DS301 communication mode (up to 64 Slaves).

(8) **High-speed Ethernet communication interface**

● DVP-SE2 Series CPU modules are equipped with a 10/100 M Ethernet communication interface. It includes built-in switch function for dual ports, allowing for daisy chain topology configuration without the need for additional switches.

● Support functions such as software tuning, Webpage, MODBUS TCP Client/Server, Ethernet/IP Adapter and TCP/UDP Socket.

(9) **Support on-line editing mode**

● The on-line editing mode allows you to update the program without affecting the system operation.

● When the system is in the on-line monitoring mode, enter the on-line editing mode by clicking .

● After the program is modified and compiled, you can update the program in the CPU module by clicking to download it to the CPU.

Chapter 2 Specifications and System Configuration

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2.1 DVP-SE2 Series

2.1.1 General Specifications

Item	Specifications
Operating temperature	0~55°C
Storage temperature	-25~70°C
Operating humidity	5~95% No condensation
Storage humidity	5~95% No condensation
Work environment	No corrosive gas exists
Installation location	In a control box
Pollution degree	2
Ingress protection (IP ratings)	IP20(NOT UL Certified)
EMC (electromagnetic compatibility)	Refer to Appendis A for more information.
Vibration resistance	Tested with： 5Hz ≦ f ≦ 8.4Hz，constant amplitude 3.5 mm； 8.4Hz ≦ f ≦ 150Hz，constant acceleration 1g Duration of oscillation：10 sweep cycles per axis on each direction of the 3 mutually perpendicular axes International Standard IEC 61131-2 & IEC 60068-2-6（TEST Fc）
Shock resistance	Tested with： Half-sine wave： Strength of shock 15g peak value，11ms duration； Shock direction：The shocks in each in direction per axis，on 3 mutually perpendicular axes（total of 18 shocks） International Standard IEC 61131-2 & IEC 60068-2-27（TEST Ea）
Safety	IEC 61131-2、UL 61010-2-201、UL 508
Ambient air temperature-barometric pressure-altitude	Operating: 1013~795hPa (0 ~ 2000 m) Storage: 1013~660hPa (0 ~ 3500 m)
UL 94 Flame CI	UL94V-0

2.1.2   CPU Module Specifications

2.1.2.1   Functional Specifications

Item	DVP28SE211T DVP28SE211S	Remark
Execution	The program is executed cyclically	
Input/Output Control	Regenerated inputs/outputs Direct inputs/outputs	
Programming language	IEC61131-3	
	LD、SFC	
Number of instructions	Over 600 instructions	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.	Setting the parameter
Program capacity (step)	64k Steps (128k Bytes)	
Installation	DIN rails or screws	
Installation of module	No backplane installation; only module after module	
Maximum number of modules which can be installed	Up to 240 digital inputs and 240 outputs are supported. Right-side special module: up to 8 modules. Left-side special module: up to 8 modules.	
Number of inputs/outputs	512	Number of inputs/outputs accessible to actual input/output module
Input relays [X]	256 (X0~X377)	Octal format
Output relays [Y]	256 (Y0~Y377)	Octal format
Internal relays [M]	4096 (M0~M4095)	
Timers [T]	256 (T0~T255)	
Counters [C]	256 (C0~C255)	
Data register [D]	12000 (D0~D11999)	
Stepping relay [S]	1024 (S0~S1023)	
Index register [E]	16 (E0~E7，F0~F7)	
Special auxiliary relay [M]	1000 (M1000~M1999)	
Special data register [D]	1000 (D1000~D1999)	
Serial communication port	2* RS-485	
Ethernet port	10/100M, dual port. MODBUS TCP, Ethernet/IP Adapter protocols are supported. Please refer to DVP-ES2/EX2/EC5/SS2/SA2/SX2/SE/SE2 &TP operation manual – programming for the Ethernet specification.	
USB port	Mini B type USB	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks The accuracy	Active about one week, storing in an electric double layer capacitor
CANopen DS301(Master)	Maximum node: 64; maximum bytes: 2000	Built-in CAN communication port
CANopen DS301(Slave)	Maximum PDO: 8; maximum bytes: 8	

Real-time clock accuracy table:

Temperature(°C/°F)	0/32	25/77	55/131
Deviation (seconds per month)	-117	52	-132

2.1.2.2   Electrical specifications

Model / Item	DVP28SE211T DVP28SE211S
Supply voltage	24VDC（20.4VDC~28.8VDC）(-15%~+20%）
Fuse capacity	4A/30VDC
Power consumption	4W
Protection	24VDC output equipped with short-circuit protection and over-current protection.
Surge voltage protection	0.5KV
Grounding	1. Grounding spring is used for grounding under the rail. 2. The diameter of the ground should not be less than the diameters of the cables connected to the terminals 24V and 0V.
Communication port isolation	Coupling Voltage：1K V
Weight (g)	250

- **Electrical specifications for the inputs on DVP-ES3 Series PLC CPU. The signals passing through the inputs are 24 VDC signals.**

Model / Item		DVP28SE211T DVP28SE211S
Number of inputs		16（X0~X7，X10~X17）
Connector type		Removable terminal blocks
Input type		Digital input
Input form		Direct current (sinking or sourcing)
Input voltage/ current		X0~X7：24VDC，5mA X10~X17：24VDC，4.2mA
Action level	OFF→ON	>15VDC
	ON→OFF	<5VDC
Response time	OFF→ON	X0~X7：< 2.5μs X10~X17：< 25μs
	ON→OFF	X0~X7：< 2.5μs X10~X17：< 25μs
Maximum input frequency		X0~X5：100kHz X6~X7：25kHz X10~X17：1kHz
Input impedance		X0~X7：4.7KΩ X10~X17：5.6 KΩ
Digital input isolation		500VAC
Input display		The input LED indicator is ON.

● **Electrical specifications for the outputs on DVP-SE2 Series**

Model(DVP) / Item		DVP28SE211T	DVP28SE211S
Connector type		Removable terminal blocks	
Output form		Transistor-T (sinking)	Transistor-P (sourcing)[*2]
Number of digital outputs		12 points (Y0~Y7、Y10~Y13)	
Voltage		5~30VDC	
Maximum load	**Resistance**	0.5A	
	Inductance	N/A	
	Bulb	N/A	
Switching frequency[*1]	**Resistance**	Y0~Y7: up to 100kHz Y10~Y13: up to 1kHz	
	Inductance	N/A	
	Bulb	N/A	
Maximum Response time	**OFF→ON**	Y0~Y7: 2.5μs Y10~Y13: 250us	Y0~Y7: 2.5μs Y10~Y13: 200us
	ON→OFF		
Digital output isolation		500VAC	

*1. For general digital outputs, the actual switching frequency will be affected by the scan cycle.

*2. UP, ZP should include external aid power 24VDC (-15% ~ +20%) and the rated consumption is around 1mA/point.

2.1.2.3 CPU Module Profiles

Unit: mm
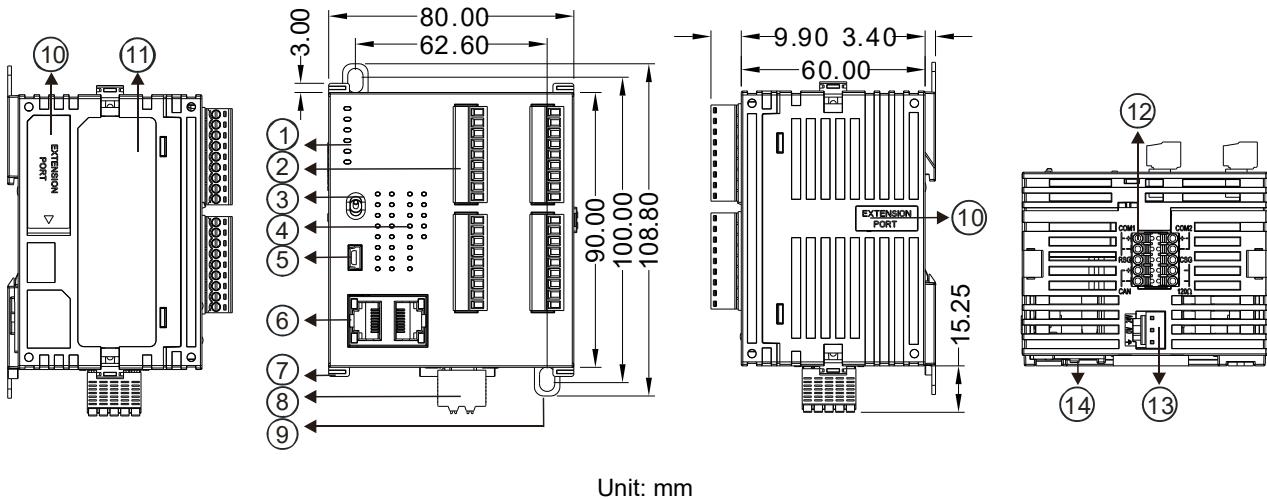
● **LED indicator descriptions**

No.	Name	Description
1	Power LED	Power status of the CPU module ON: Power is being supplied. OFF: Power is NOT supplied.
	Run LED	Operating status of the module ON: PLC program is running. OFF: PLC program is stopped. Blinking: PLC program detects error
	Error LED	Error status of the module Blinking (0.5 seconds ON and OFF): Error Blinking rapidly (0.2 seconds ON and OFF): Low voltage Blinking 4 times (0.2 seconds ON and OFF), wait for 1 second, then repeat the blinking cycle: the data can NOT be read/written because of the hardware components malfunction. Blinking slowly (1 second ON, 3 seconds OFF): Warning ON: scan timeout
	USB communication LED COM1 communication LED COM2 communication LED	Communication status OFF: No communication Blinking: In communication
2	Removable terminal blocks	Connects the module and the wiring module
3	RUN/STOP	RUN: executes the program STOP: stops the program
4	Input/Output LED	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
	CAN communication LED	ON: In communication OFF: No communication
5	USB port	Mini USB communication port.

No.	Name	Description
6	Ethernet port and indicator LED	Provides Ethernet Switch communication interface for dual RJ45 communication ports Orange LED (ACT): Blinkg: data transmiting /receiving; OFF: no data transmission Green LED (LINK): ON: port connected; OFF: no port connected
7	I/O module securing clip	Secures the modules
8	10-pin removable terminal block	Connects the COM1/COM2/CAN ports (standard accessories)
9	DIN rail slot	For the DIN rail
10	Left-side/ right-side external module connection port	Connects the left-side and right-side modules.
11	Label	Nameplate
12	COM1/COM2/CAN port	An interface for RS-485/CAN communication
13	Power port	For power supply (accessories pack includes the power input connecting cable)
14	Grounding spring	For grouding

2.1.2.4 CPU Module Input/Output Terminals

DVP28SE211T	DVP28SE211S
S/S C0 X0 Y0 X1 Y1 X2 C0 X3 Y2 X4 Y3 X5 C1 X6 Y4 X7 Y5 S/S C1 X10 Y6 X11 Y7 X12 ● X13 C2 X14 Y10 X15 Y11 X16 Y12 X17 Y13	S/S UP0 X0 ZP0 X1 Y0 X2 Y1 X3 Y2 X4 Y3 X5 Y4 X6 Y5 X7 Y6 S/S Y7 X10 ● X11 ● X12 UP1 X13 ZP1 X14 Y10 X15 Y11 X16 Y12 X17 Y13

2.1.3　Power Supply Module

2.1.3.1　General Specifications

● **DVPPS01/DVPPS02/DVPPS05**

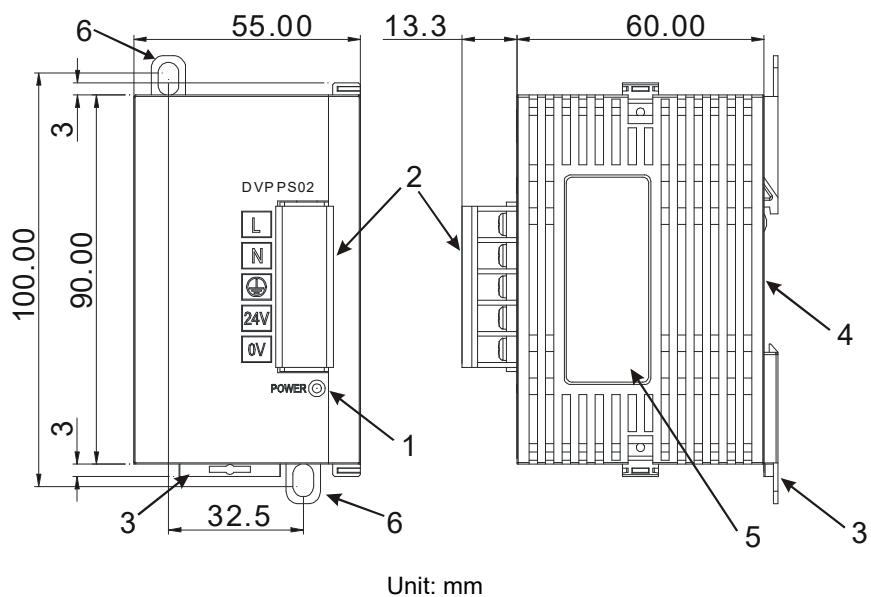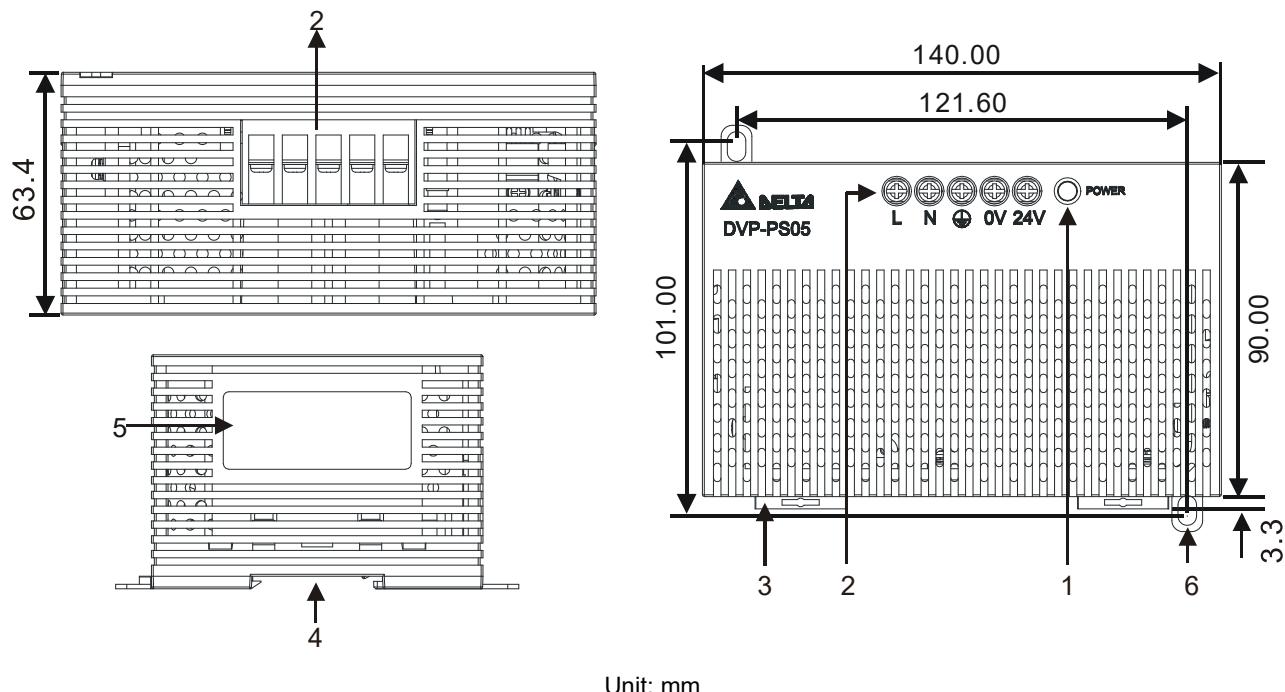| Model \ Item	DVPPS01	DVPPS02	DVPPS05
Supply voltage	100~240VAC（-15%~+10%），50/60Hz		
Output voltage	24VDC（±3%）		
Maaximum output current	1A	2A	5A
Ripple & Noice	Less than 100mV$_{p-p}$ @ full load	Less than 240mV$_{p-p}$ @ full load	
Efficiency	78%~87% @ full load		More than 88% @ full load
Overcurrent / short circuit protection	Auto recovery		
Overvoltage / overtemperature protection	--		Overvoltage protection: When the device is experiencing overvoltage, power it off for 5 seconds and it will be back to normal after powering on again. Overtemperature protection: When the device is experiencing overtemperature, power it off for 5 seconds and after the internal temperature is below 85ºC, powering it on again.
Ground	The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N. (When multiple PLCs are used at the same time, be sure to ground each one separately.)		
Weight	158g	250g	488g

2.1.3.2 Power Supply Module Profiles

● **DVPPS01**

Unit: mm

● **DVPPS02**

Unit: mm

● **DVPPS05**

Unit: mm
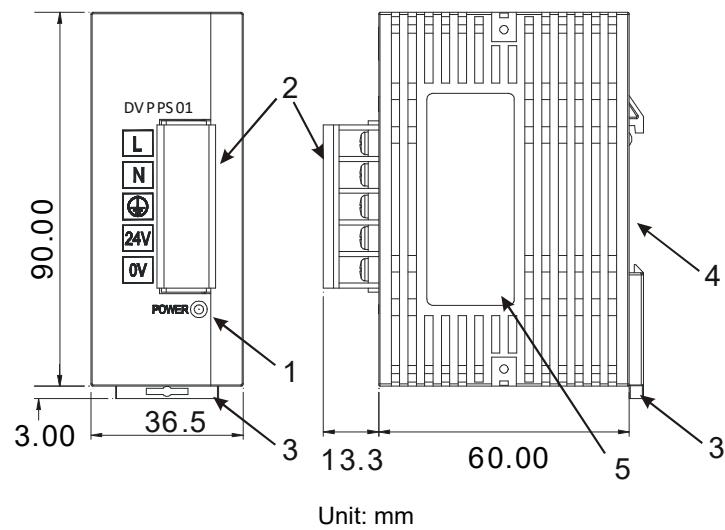
Number	Name	Description
1	Power LED	Power status of the power module
2	Output terminal configuration	24V: DC power output: 24VDC 0V: DC power output reference ground
2	Input terminal configuration	L: AC power input (Line) N: AC power input (Neutral) ⊕ : Earth ground terminal
3	DIN rail clip	Secures the module onto the DIN rail
4	DIN rail slot (35 mm)	For the DIN rail
5	Label	Nameplate
6	Mounting hole	Used for the module to be securely attached or mounted to a surface

3

Chapter 3 Installing Hardware and Wiring

Table of Contents

3.1 DVP-SE2 Series

3.1.1 DVP-SE2 Hardware Framework

The DVP-SE2 series programmable logic controller is a small programmable logic control (PLC). The execution speed and memory capacity are increased. Use of function blocks is also supported. In order to meet more advanced application requirements, the DVP-ES3/EX3 series programmable logic controllers provide more flexible system extension framework. Under such hardware framework, you do not need to use several CPU modules to control the system if there are excessive I/O points or the device is too far away. This new hardware framework maintains the integrity of the system and allows users to work more efficiently during the project development process.

● One CPU module and one switch power supply module (DVPPS01/DVPPS02/DVPPS05) are the minimum requirements for the DVP-SE2 hardware framework:

The main function of the power supply module is to convert the AC power into DC power, while the DVP CPU module serves as the core of the system control and management. We provide various CPU modules for different applications; you can choose the model according to your needs.

SE2 CPU module + the power supply module (the example below uses DVP28SE2 model)
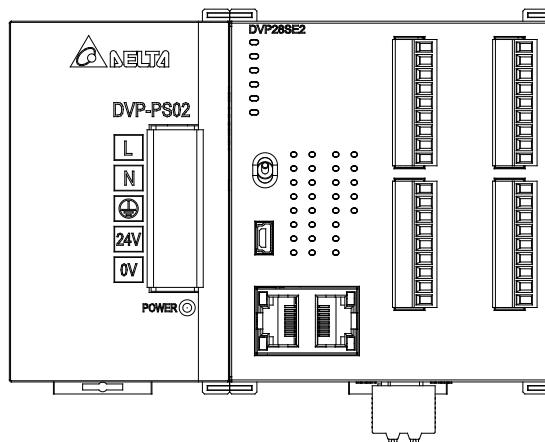
● Communication cable

Several communication interfaces are included in a CPU module, and many types of network modules are available. You can choose communication cables according to the actual usage situation.

The following table lists information about communication interfaces and main application.

Interface	Connector	Application
Communication port	10-pin removable terminal block	Computer, HMI communication, industrial control network (2x RS-485)
Ethernet	RJ45	Computer, HMI communication, remote control, data exchange, industrial control network
USB	Mini USB	Computer communication

● Optional components - extension modules

Apart from the standard communication ports on a CPU module, the CPU module is equipped with I/O functions. Refer to section 1.1.2 for a selection of extension modules. You can find a suitable extension module according to your needs.

The following lists the limits for setting up a common framework of the DVP-SE2 PLC system. Exceeding the first three limits causes the PLC to send an error message.

Limit 1: The maximum number of digital I/O points is 512(256 DI + 256 DO). The built-in digital I/O points of the CPU module are included. (For example: if DI points are 262, DO points are 60, then DI points exceed the limit range.)

Limit 2: You can connect up to 8 right-side modules (includes analog I/O module, temperature module, position control module, communication module) to the PLC.

Limit 3: You can connect up to 8 left-side modules (includes left-side high-speed analog I/O module, left-side high-speed Load Cell module, left-side high-speed communication module) to the PLC.

Limit 4: The maximum power consumption of CPU module and extension module should be within the range of what a CPU module or a power module can supply. Refer to section 3.1.5.4 for the maximum power consumption of modules.

Limit 5: Up to 14 right-side extension modules can be connected to a DVP slim type PLC CPU. The input point starts from X20 and output point starts from Y20. Refer to the combination example below:

Example of system combination:

	PLC	Model	Number of inputs	Number of outputs	Input number	Output number
MPU EXT 1 EXT 2 EXT 3 EXT 4	MPU	SE2	8	6	X0~X7	Y0~Y5
	EXT1	16SP11T	8	8	X20~X27	Y20~Y27
	EXT2	08SM11N	8	0	X30~X37	-
	EXT3	06SN11R	0	6	-	Y30~Y35
	EXT4	08SP11R	4	4	X40~X43	Y40~Y43

● Though the 3rd extension module 06SN11R will be regarded as a module with 8 output points, the number of corresponding actual output points will only be 6; the last 2 output points are excluded.

● Though the 4th extension module 08SP11R will be regarded as a module with 8 input points and 8 output points, the number of corresponding actual output points will only be 4 and input points will only be 4; the last 4 input and 4 output points are excluded.

● To have a more orderly arrangement, it is recommended to install modules with true to number of points first.

3.1.2   Notes on Installation ⚠

- EN: System integrators shall be responsible for assembly of the control system and the safety of the system integration.

  FR: Lors de l'installation, la sécurité de tout système incorporant l'équipement est de la responsabilité de l'intégrateur du système.

- EN: If using the device other than those described in the standard, or in environments that do not meet the specifications in this manual, the designed protection for the device in the presence of conducted and/or radiated interference may be reduced.

  FR: Si l'équipement est utilisé d'une manière non spécifiée par le fabricant, la sécurité d'utilisation de l'équipement peut être compromise.

- EN: Make sure to use certified power supplies with dual insulation and Safety Extra-Low Voltage (SELV) output and ensure that they comply with UL60950 or UL62368 or UL61010-1 and UL61010-2-201, either LPS (Limited Power Source) or LE (Limited Energy) requirements.

  FR: Veuillez-vous assurer d'utiliser une alimentation électrique certifiée avec une sortie SELV (Safety Extra Low Voltage) ou une alimentation certifiée fournissant une double isolation évaluée selon les normes UL 62368/UL60950 LPS (Source d'alimentation limitée), ou UL61010-1 et UL61010-2-201 (Énergie limitée).

- EN: Use only a clean, dry and soft cloth to clean this module.

  FR: Utilisez un chiffon sec pour nettoyer le produit.

- EN: Before a module is installed, please make sure of the size of the module. To ensure sufficient installation space, you must take into account the size of the communication cable connector and the room which needs to be reserved.

  FR: Avant d'installer un module, veuillez vous assurer de sa taille. Pour garantir un espace d'installation suffisant, vous devez tenir compte de la taille du connecteur du câble de communication et de la place qui doit être réservée.

- EN: Make sure that the work environment conforms to the specifications for the products. It is necessary to take into account basic temperature/humidity control and dust/corrosion prevention.

  FR: Veillez à ce que l'environnement de travail soit conforme aux spécifications des produits. Il est nécessaire de contrôler la température et le taux d'humidité ainsi que l'absence de poussière et de produits corrosifs.

- EN: Electromagnetic interference can result in system malfunction. Therefore, you must design the EMC carefully. Please refer to Appendix A in this manual for more information on EMC standards.

  FR: Les interférences électromagnétiques peuvent entraîner un dysfonctionnement du système. C'est pourquoi vous devez étudier la CEM avec soin. Veuillez vous référer à l'annexe A de ce manuel pour plus d'informations sur les normes CEM.

- EN: If components such as screws and washers are specified in the manual, use components conforming to the specifications.

 FR: Si des composants tels que des vis et des rondelles sont spécifiées dans le manuel, n'utilisez que des composants conformes aux spécifications.

- EN: If a cable is connected to a communication port, make sure the cable connector is properly joined to the port on the module.

  FR: En cas d'utilisations d'un port de communication, assurez-vous que le connecteur du câble soit correctement raccordé au port du module.
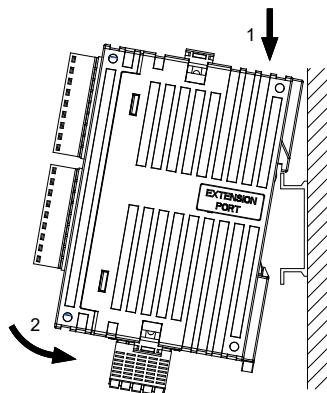
3.1.3 Installation

A PLC has to be installed in a closed control box. In order to ensure that the PLC radiates heat normally, the space between the PLC and the control box must be larger than 50 millimeters.
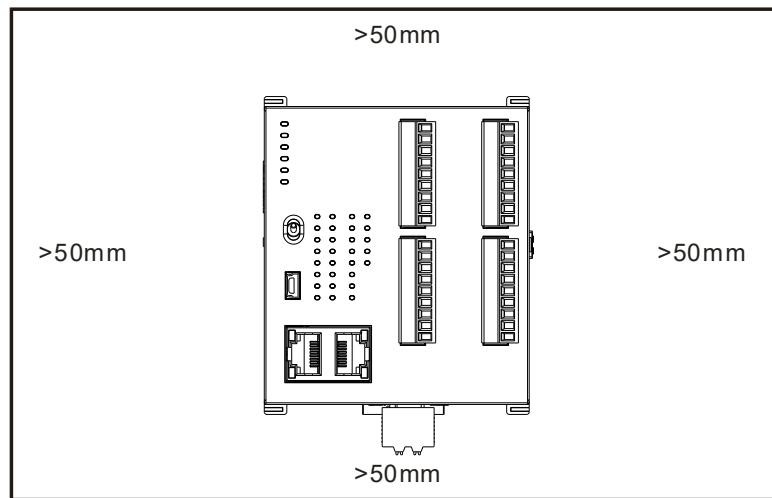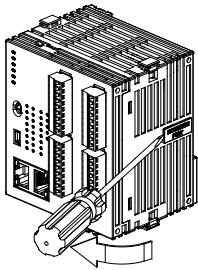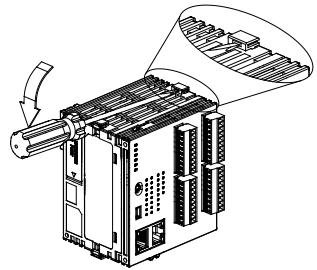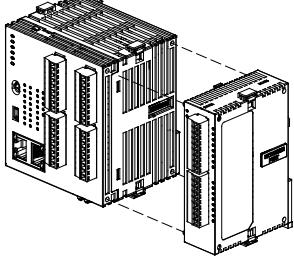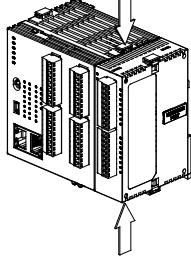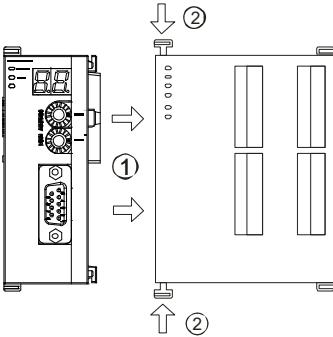

- Keep the PLC away from high-voltage equipment, high-voltage wires, and high-voltage motors.

- In order to prevent the PLC from overheating, do not install the PLC vertically on the bottom or top of the control box.

- Install the PLC horizontally in the control box, as shown above.

- If you intend to increase the number of modules, you must leave some space for installing the modules in the control box.

3.1.3.1 Mounting the Module

- Direct mounting: Use M4 screws to mount the module through the mounting hole.

- DIN rail installation and removal: The module can be secured onto a cabinet by using the DIN rail. To secure the module onto the DIN rail, link it onto the rail as the figure below shown (1) and gently push it up on the clip as the figure below shown (2) until you hear a click. To remove it, use a flat head screwdriver and press it gently on the groove of the retaining clip, pull down the retaining clip and gently pull the PLC away from the DIN rail.

3

3.1.3.2 Link the CPU Module and a Module

Step 1: Use a flat head screwdriver to open the side cover on the CPU module and you will see a connecting port.	Step 2: Use a flat head screwdriver to release the I/O module securing clip.
Step 3: Connect the CPU module and the module through the connecting port.	Step 4: Push the two I/O module securing clips towards the directions as the arrows below shown to hook the modules together.
The following is a left-side extension module; you can connect it to the CPU module the same way as the right-side extension module does as the example shown above.	

3.1.4 Wiring ⚠

⚠	• EN: Before installing or wiring a module, you must verify that the external power supply is turned off. Otherwise, you may get an electric shock, or the product may be damaged. FR: Avant d'installer ou de câbler un module, vous devez vérifier que l'alimentation électrique externe est coupée. Si l'alimentation électrique n'est pas coupée, vous risquez de recevoir un choc électrique ou d'endommager le produit. • EN: After you complete installing or wiring the module, make sure that a terminal block cover is installed on the module before turning on the power supply or operating the module. If the terminal block cover is not installed properly, you may get an electric shock, or the module may not operate normally. FR: Une fois l'installation ou le câblage du module terminé, assurez-vous que le cache-bornes est installé sur le module avant de le mettre sous tension ou de le faire fonctionner. Si le cache-bornes n'est pas installé correctement, vous risquez de recevoir un choc électrique ou le module peut ne pas fonctionner normalement. • EN: Be sure the protective ground connection (PE) ⏚ and functional ground (FE) ⏚ FE are with protective grounding conductors. Otherwise, you may get an electric shock, or the module may not operate normally. FR: Veillez à connecter les bornes Terre de protection ⏚ / Terre fonctionnelle ⏚ avec les conducteurs de terre de protection. Sinon, vous risquez de recevoir un choc électrique ou le module peut ne pas fonctionner normalement. • EN: To ensure that a PLC is wired correctly, you must check the rated voltage of the product and the arrangement of the terminals. If the PLC is connected to a power supply that does not conform to the rated voltage, or the product is not wired correctly, a fire may occur, or the product may be damaged. FR: Pour s'assurer que le PLC est correctement câblé, vous devez vérifier la tension nominale du produit et le raccordement correct des bornes. Si l'automate est connecté à une alimentation électrique qui n'est pas conforme à sa tension nominale, ou si le produit n'est pas câblé correctement, un incendie peut se produire, ou le produit peut être endommagé. • EN: The external connections should be crimped, press-welded by specific tools, or soldered correctly. Improper connections may result in a short circuit, fire, or malfunction. FR: Les connexions externes doivent être serties, soudées à la presse au moyen d'outils spécifiques ou soudées correctement. Des connexions incorrectes peuvent entraîner un court-circuit, un incendie ou un dysfonctionnement. • EN: Tighten the terminal screws to the specified torque. If the terminal screws are loose, a short circuit, fire, or faulty operation may occur. Tightening the terminal screws too far may cause damage to the terminal screws or the module, resulting in a short circuit or malfunction. FR: Serrez les vis des bornes au couple spécifié. Des vis des bornes desserrées, peuvent provoquer un court-circuit, un incendie ou un fonctionnement défectueux. Si vous serrez trop fort les vis des bornes, vous risquez d'endommager les vis ou le module, ce qui entraînerait un court-circuit ou un dysfonctionnement. • EN: Make sure there are no foreign substances such as iron filings or wiring debris inside the module. Foreign substances may result in a fire, damage, or malfunction. FR: Assurez-vous qu'il n'y a pas de substances étrangères telles que de la limaille de fer ou des débris de câblage à l'intérieur du module. Les substances étrangères peuvent provoquer un incendie, des dommages ou un dysfonctionnement.

• **Things to note while wiring an I/O module**

(1) Terminal definitions

   • Two-/three-wire (passive sensor): the sensor and the system share the same power circuit.

   • Four-wire (active sensor): the sensor uses an independent power supply and should not share the same power circuit with the system.

(2) For wiring, use single-wire cables or two-wire cables with a diameter of 24 AWG to 16 AWG and use it with a less than 2 mm needle type terminal (with the insulated coating crimp sleeve). Only use copper conducting wires with a temperature rating of 60/75°C. The tightening torque of the PLC terminal screw is 2.0 kgf-cm (1.77 lbf-in).

< 2 mm 6-8 mm   24-16 AWG
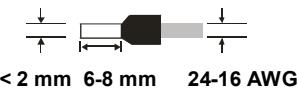
(3)   Keep the input cables, output cables, and power cable separate from one another.

(4)   If the main circuit and the power cable cannot be separated from each other, use a shielded cable, and ground it at the side of the I/O module. In some cases, the shielded cable can be grounded at the opposite side.

(5)   If you wire a module through conduit, you must ground the conduit correctly.

(6)   If the wiring length is more than 200 meters (686.67 inches), leakage current can result from parasitic capacitance, and the system will not function properly.

Note:

If cables are connected to the terminals ⏚/⏚, you must ground the cables. Do not connect ⏚/⏚ to any devices. If ⏚/⏚ are not grounded, the PLC will be susceptible to noise. Since ⏚/⏚ carries electric potential, you will get an electric shock if you touch the metal parts.

3.1.5   Connect Power Cables

3.1.5.1   Precautions

1.   Connect the power supply to the 24 VDC and 0 V terminals. The power supply ranges from 20.4 to 28.8 VDC. When the power supply voltage drops below 20.4VDC, the PLC will stop operating, all outputs will turn off, and the ERROR LED will flash rapidly.

2.   If the power-off time is less than 10 ms, the PLC operates unaffected. If the power-off time is longer than 10 ms, the PLC will stop operating and all the outputs will be Off. When the power resumes, the PLC resumes to operate. (There are auxiliary relays and registers with power-off retention in the PLC. You need to pay attention to their use when planning a program.)

3.   Use O-type or Y-type terminals for I/O wiring terminals. The specification for the terminals is as shown below. Tighten PLC terminal screws to a torque of 5 ~ 8kg-cm (4.3 ~ 6.9 in-lbs).
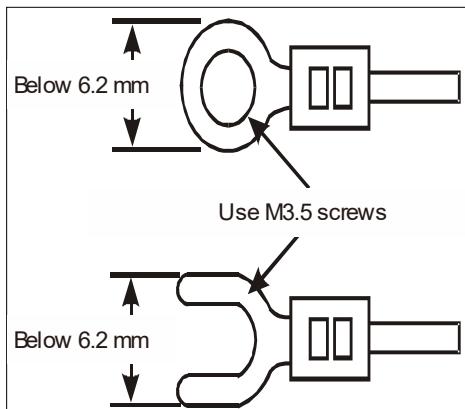
4.   Avoid tiny metal material enter DVPPS01/02/05 when screwing and wiring. After finishing wire, remove the affix that pasted on the heat sink for heat dissipation.

5.   Only use copper conducting wires with a temperature rating of 60/75°C

6.   To prevent electrical surge from lightning, install a surge protector as shown below.

Surge absorber

Power Supply
100~240VAC

DVPPS01
DVPPS02
DVPPS05

3
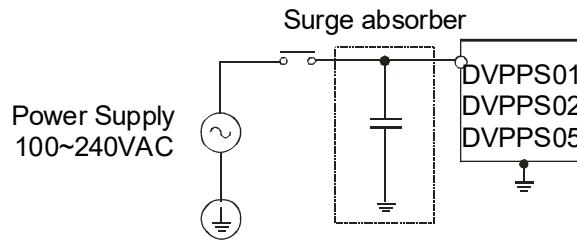
■ Environment

1.   DO NOT install the DVPPS01/02/05 in environments with heavy dust, oil fumes, metallic dust, or corrosive or flammable gases.

2.   DO NOT install the DVPPS01/02/05 in environments with high temperature or high humidity.

3.   DO NOT install the DVPS01/02/05 in areas with direct vibration and impact.

3.1.5.2   Grounding

●   The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.
●   If using multiple pieces of equipment, use a single-point ground.
●   Grounding terminal shall be grounded with a wire of 1.6mm diameter or larger.

| SE2 CPU Module | Another piece of equipment |

The single-point ground is better.

●   If you cannot use a single-point ground, use a common-point ground.

| SE2 CPU Module | Another piece of equipment |
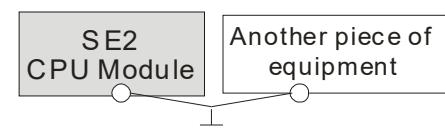
The common-point ground is permitted.

●   Do not connect equipment ground wires together as shown on the right.

| SE2 CPU Module | Another piece of equipment |
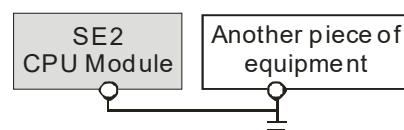
The equipment can not be grounded in this way.

3.1.5.3   Wiring Power Supply
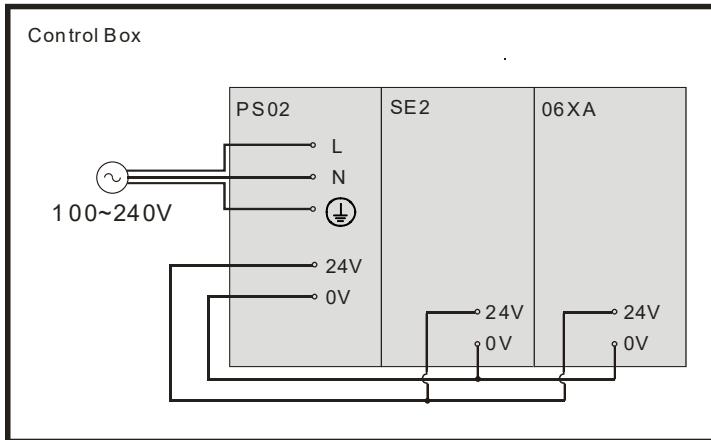
3.1.5.4   Power Consumption ⚠

Classification	Model name	Internal power consumption (mA)	Internal power consumption (W)	External power consumption (A)
CPU module	DVP28SE211T	166.67	4	6
	DVP28SE211S	166.67	4	6
Digital I/O module	DVP06SN11R	82	1.5	36
	DVP08SN11R	55	1.5	5
	DVP08SN11T	55	1.5	1.2
	DVP16SN11T	65	1	1.2
	DVP08SP11R	35	1.5	5
	DVP08SP11T	35	1.5	1.2
Digital I/O module	DVP08SM11N	15	1	0.05
	DVP08SM10N	40	1	0.08
	DVP08SN11TS	15	1.5	2
	DVP08ST11N	55	0.5	0
	DVP16SP11R	65	2	5
	DVP08SP11TS	15	1.5	1.25
	DVP16SP11T	65	2	1.2
	DVP16SP11TS	30	2	2
	DVP16SN11TS	30	1	2
	DVP16SM11N	25	2	0.1
	DVP32SN11TN	40	1.5	2
	DVP32SM11N	40	1	0.16
Analog I/O module	DVP04AD-S2	30	2	0.083
	DVP04DA-S2	30	4	0.167
	DVP06XA-S2	30	2	0.083
	DVP02DA-S	30	3	0.125
	DVP06AD-S	30	2	0.083
Left-side high-speed analog I/O module	DVP04AD-SL	40	3.5	0.015
	DVP04DA-SL	40	3.5	0.08

Classification	Model name	Internal power consumption (mA)	Internal power consumption (W)	External power consumption (A)
Left-side high-speed load cell module	DVP201LC-SL	100	5	-
	DVP211LC-SL	150	5	4.03
	DVP202LC-SL	140	5	-
	DVP02LC-SL	40	3	0.125
	DVP01LC-SL	40	3	0.125
Temperature measurement module	DVP04PT-S	30	2	0.083
	DVP06PT-S	83	2	-
	DVP04TC-S	30	2	0.083
	DVP08NTC-S	30	1	-
	DVP02TUN-S	55	2.4	0.6
	DVP02TUR-S	60	2.4	0.6
	DVP02TUL-S	75	2.4	0.04
	DVP02TKN-S	55	2.4	-
	DVP02TKR-S	60	2.4	-
	DVP02TKL-S	75	2.4	-
Positioning module	DVP01PU-S	100	2.52	0.105
Left-side positioning module	DVP02PU-SL	45	1.08	-
Left-side high-speed communication module	DVPEN01-SL	62.5	1.5	-
	DVPDNET-SL	50	1.2	0.026
	DVPCOPM-SL	50	1.2	-
	DVPSCM12-SL	62.5	1.5	-
	DVPSCM52-SL	62.5	1.5	-

Note: The total power consumption of the extension modules connected to the CPU module is limited to 36 W.

3.1.6 Wiring Digital Input Terminals on DVP-SE2 Series

3.1.6.1 Direct Current Power Supply (24 VDC)

When the digital input signal is DC input, there are two DC input types, Sinking and Sourcing. See the definition below.
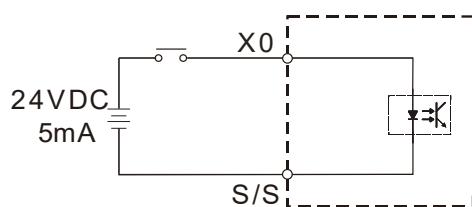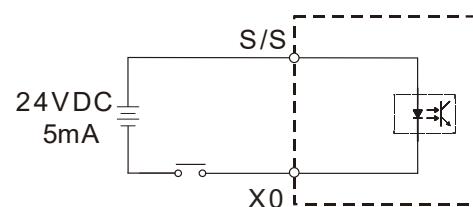
3.1.6.2 Relay Types

● **Sinking**
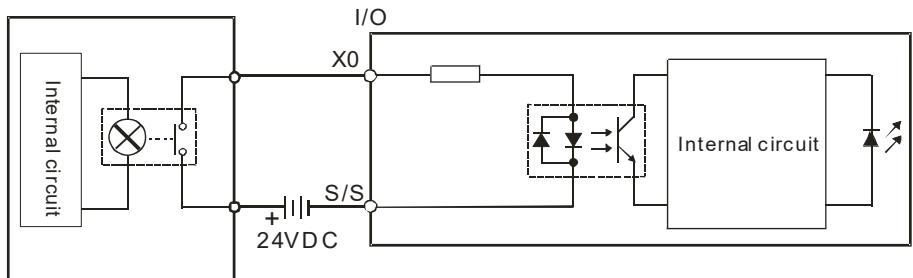
● **Sourcing**
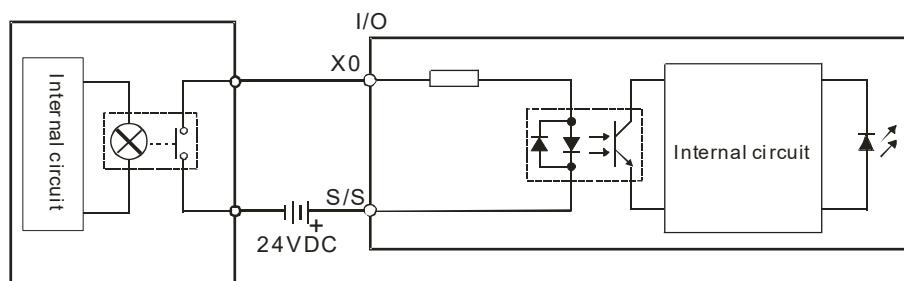
3.1.6.3 Open-collector Input Types

● **Sinking (PNP input type)**
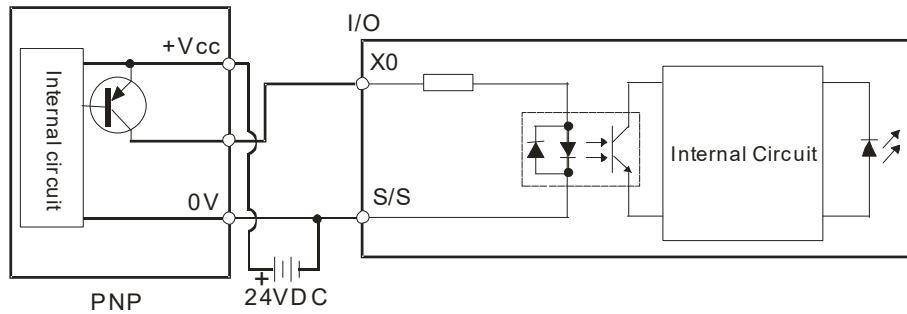
● **Sourcing (NPN input type)**
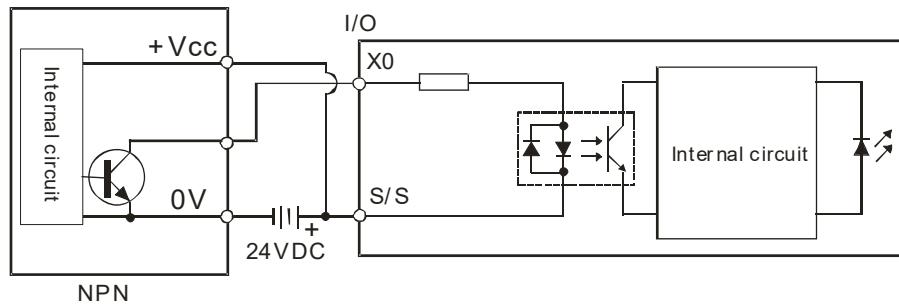
3.1.6.4 Two-wire Proximity Switch

Use the two-wire proximity switch whose leakage current IL is less than 1.5 mA when the switch is OFF. If the leakage current is larger than 1.5 mA, connect the divider resistance Rb using the formula below.

$$Rb \leq \frac{6}{IL - 1.5} \ (k\Omega)$$

● **Sinking**
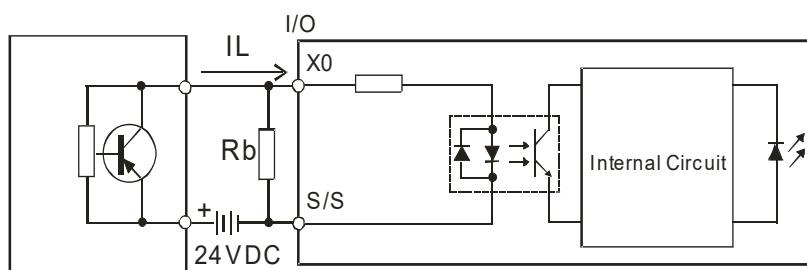
Two-wire Proximity Switch

● **Sourcing**
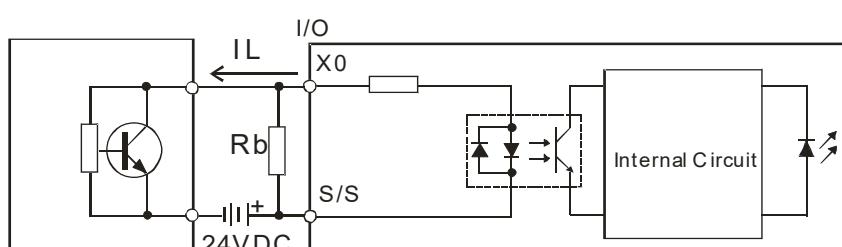
Two-wire Proximity Switch

3.1.6.5   Three-wire Proximity Switch

● **Sinking**
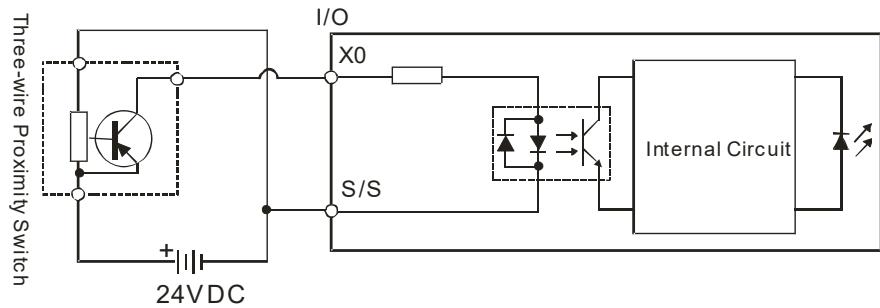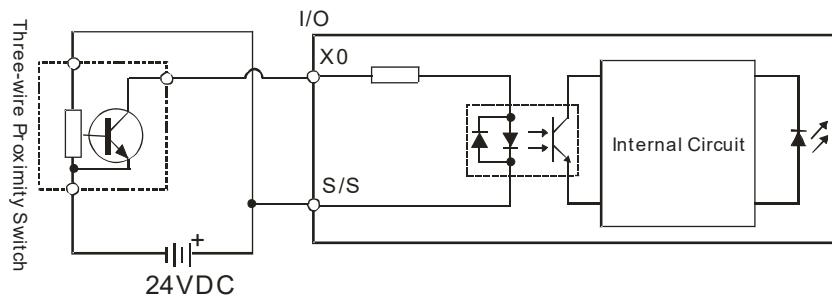
● **Sourcing**

3.1.6.6   Optoelectronic Switch

● **Sinking**
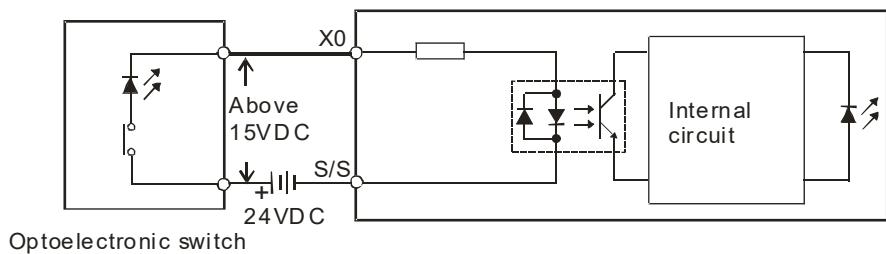
● **Sourcing**
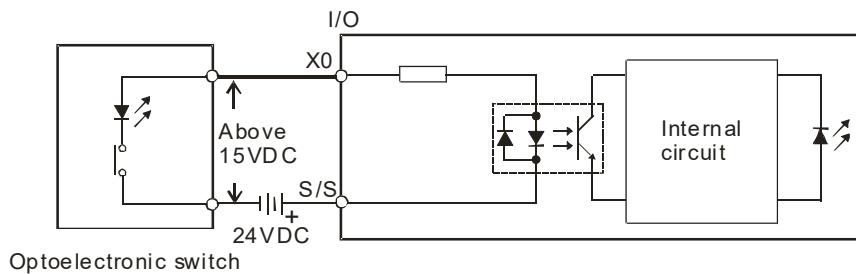
3.1.6.7   Wiring the High-Speed Point

Attentions for wiring:

1.   When connect high-speed inputs of SE2 series PLCs with (NPN / PNP) open connector outputs, we would suggest adding (pull-up/ pull-down) parallel resistors between the specified X point and S/S. For resistors, we suggest you use 3W/470ohm or 2W/1Kohm resistors.

2.   If using push-pull outputs to connect high-speed inputs of SE2 series PLCs, parallel resistors would not be required.

NPN	PNP
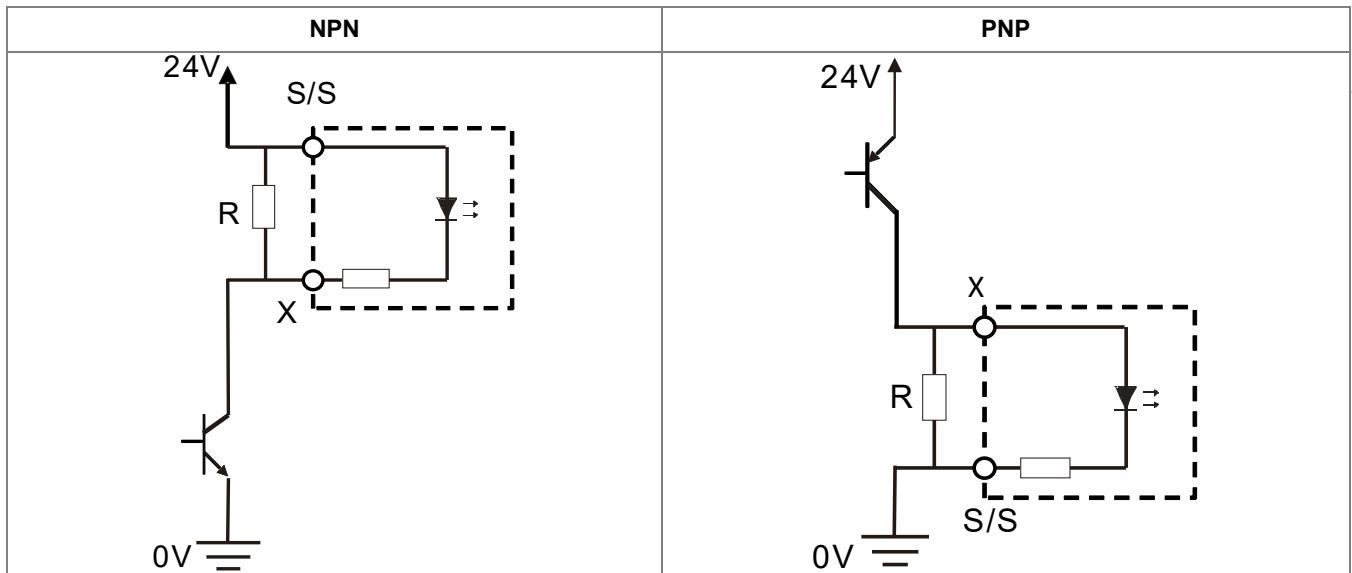
3.1.7   Wiring Digital Output Terminals on DVP-SE2 Series

1.   DVP-SE2 series PLCs output module is transistor type. When wiring the output terminals, pay attention to the connection of the common terminals.

2.   For transistor models (NPN), the output terminals Y0, Y1, Y2 and Y3 share the common terminal C0; Y4, Y5, Y6 and Y7 share the common terminal C1; Y10, Y11, Y12 and Y13 share the common terminal C2.
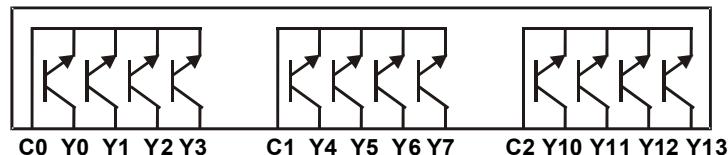
3.   For transistor models (PNP), the output terminals Y0 to Y7 share the common terminals UP0 and ZP0; Y10 to Y13 share the common terminals UP1 and ZP1. UP0 and UP1 are independent in the PLC.
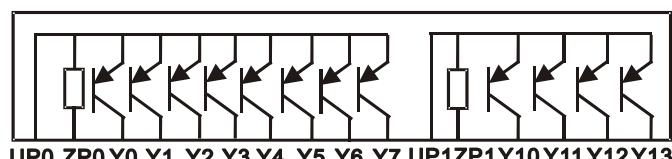
4.   Isolation circuit: Optocouplers are used between the internal circuit of the PLC and the input module to achieve signal isolation.

3.1.7.1 Output Circuits (Transistor)

● **Transistor output**

DVP28SE211T (NPN)	DVP28SE211S (PNP)
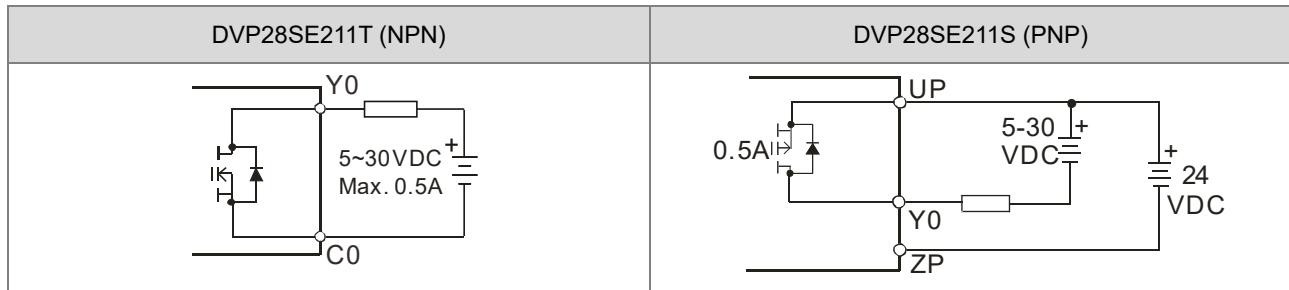
3.1.7.2 Transistor Output Circuit

DVP28SE211T (NPN)	DVP28SE211S (PNP)

①	Direct-current power supply
②	Emergency stop
③	Fuse
④	Since the output of the transistor module is open collector, if Y0/Y1 is set as pulse outputs, the output current of the resistors must be greater than 0.1 A to ensure normal operation. 1. A diode is connected to absorb the surge voltage: used in low-power situation <table><tr><td>DVP28SE211T (NPN)</td><td>DVP28SE211S (PNP)</td></tr><tr><td> D: 1N4001 Diode or its equivalent</td><td> D: 1N4001 Diode or its equivalent</td></tr></table> 2. A diode and Zener are connected to absorb the surge voltage: used in high-power and power-on/off frequently situation <table><tr><td>DVP28SE211T (NPN)</td><td>DVP28SE211S (PNP)</td></tr><tr><td> D: 1N4001 Diode or its equivalent ZD: 9V Zener, 5W</td><td> D: 1N4001 Diode or its equivalent ZD: 9V Zener, 5W</td></tr></table>
⑤	Mutually exclusive output: For example, Y2 controls the clockwise rotation of the motor, and Y3 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.

3.1.8 Wiring DVP-SE2 Communication Ports ⚠
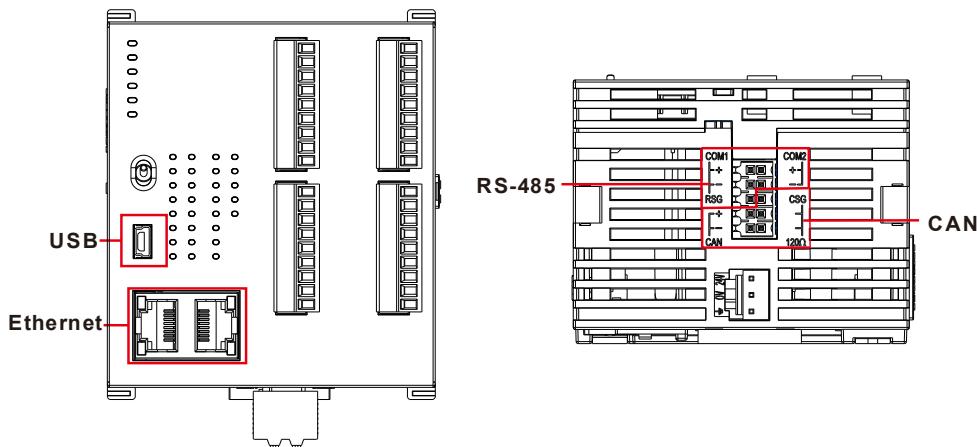
3.1.8.1 USB Ports

Pin	Function
1	VBUS（4.4–5.25V）
2	D−
3	D+
4	GROUND
5	GROUND

- Refer to Appendix A, *Installing a USB Driver in the PLC*, in DVP-ES2/EX2/EC5/SS2/SA2/SX2/SE/SE2 &TP Operation Manual – Programming if it is the first time to use USB port to communicate.

- Time to use the USB port: uploading/downloading PLC programs, monitoring during calibration and upgrading firmware.

- NOT suggested to use the USB port: applications that require a long and un-interruptible communication.

- What to do when a communication failure occurs: unplug any communication connector from the USB port and then plug the connector back. After that reconnect and try communication again.

3.1.8.2 Ethernet Ports

Pin	Signal	Description
1	TX+	Transmitting data (positive pole)
2	TX-	Transmitting data (negative pole)
3	RX+	Receiving data (positive pole)
4	--	N/C
5	--	N/C
6	RX-	Receiving data (negative pole)
7	--	N/C
8	--	N/C

3.1.8.3   RS-485 Pins and Wiring

● **RS-485 Pins**

Pin	Signal	Description
1	+	COM1 D+
3	-	COM1 D-
5	RSG	Signal Ground
2	+	COM2 D+
4	-	COM2 D-
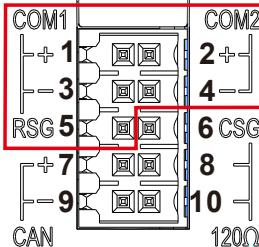
● **RS-485 Wiring**
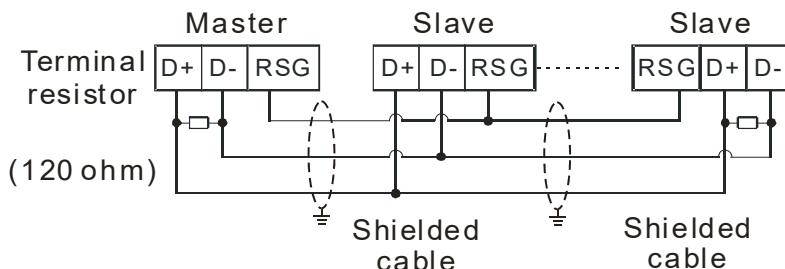
3.1.8.4   CAN Pins and Wiring

● **CAN Pins**

Pin	Signal	Description
7	CAN+	CAN_H
9	CAN-	CAN_L
6	CSG	GROUND
8	120Ω	Short-circuit can be connected; Built-in terminal resistor
10		
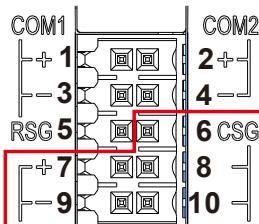
Note: Pin8 and Pin10 must be short-circuited to activate the built-in terminal resistor 120Ω and work as an impedance to reduce noise inference when signal reflections occur and ensure signal can be transmitted normally.

● **CAN Wiring**
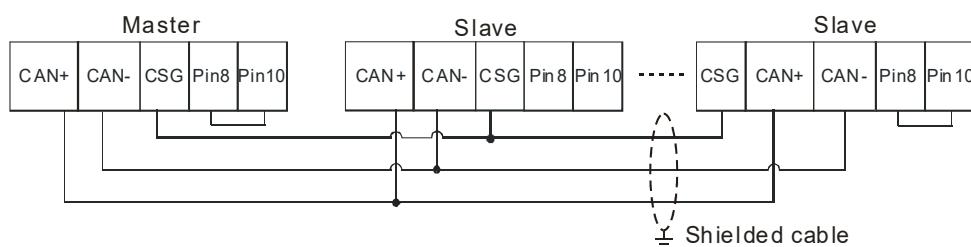
1. It is recommended to use Daisy Chain for connection and be sure to use terminal resistor in the beginning and the end of the terminal arrangement.

2. Pin8 and Pin10 must be short-circuited to activate the built-in terminal resistor 120Ω.

4

Chapter 4 Troubleshooting

Table of Contents

4.1   Troubleshooting

4.1.1   Basic Troubleshooting Steps

This chapter includes the possible errors that can occur during operation, their causes, and corrective actions.

(1) Check the following:

- The PLC should be operated in a safe environment (consider environmental, electronic, and vibration safeties).

- Connect power supply correctly to the PLC.

- Secure the module, terminal, and cable installations.

- All LED indicators show correctly.

- Set all switches correctly.

(2) Check the following operational functions:

- Switch the RUN/STOP state.

- Check the settings for the DVP-SE2 Series to RUN/STOP

- Check and eliminate errors from external devices.

- Use the System Log function in ISPSoft to check system operation and logs.

(3) Identify possible causes:

- DVP-SE2 Series or external device

- CPU or extension modules

- Parameters or program settings

4.1.2   Clear the Error States

Use the following methods to clear the error states. If the error source is not corrected, the system continues to show errors.

(1) Switch the CPU model state to STOP and then to RUN.

(2) Turn off the CPU and turn it on again.

(3) Use ISPSoft to clear the error logs.

(4) Reset the CPU to the default settings and download the program again.

4.1.3 Troubleshooting SOP

```
        ┌─────────────────┐
        (  error occurred  )
        └─────────────────┘
                 │
                 ▼
          ╱─────────────╲
         ╱    Basic      ╲        Yes    ┌──────────────────────────────┐
        ╱ troubleshooting ╲─────────────▶│  Refer to section 4.1.1 for  │
        ╲     steps       ╱              │  Basic troubleshooting steps │
         ╲     done      ╱               └──────────────────────────────┘
          ╲─────────────╱
                 │
                 No
                 ▼
          ╱─────────────╲               ┌──────────────────────────────────────────┐
         ╱               ╲      Yes      │ 1.Refer to section 4.2 for troubleshooting │
        ╱ CPU module error╲────────────▶│    for CPU module                          │
        ╲                 ╱              │ 2.Refer to section 4.3 for error codes     │
         ╲               ╱               │    and LED indicators                      │
          ╲─────────────╱               │ 3.Refer to section 4.4 for execution error flag │
                 │                       └──────────────────────────────────────────┘
                 No
                 ▼
          ╱─────────────╲
         ╱               ╲      Yes      ┌──────────────────────────────────────┐
        ╱  modules error  ╲────────────▶│ Refer to DVP Series Module Manual     │
        ╲                 ╱              └──────────────────────────────────────┘
         ╲               ╱
          ╲─────────────╱
                 │
                 No
                 ▼
          ╱──────────────────╲
         ╱  After going through╲  Yes    ┌──────────────────────────────────────┐
        ╱  troubleshooting steps,╲──────▶│ If the problem persists, please contact│
        ╲  the issues are still not╱     │              support                  │
         ╲     resolved      ╱           └──────────────────────────────────────┘
          ╲──────────────────╱
                 │
                 No
                 ▼
        The system runs normally.
```

4.2 CPU Module Troubleshooting

Refer to the following table for more the causes and the solutions for troubleshooting.

Description	Solution
All LEDs are OFF.	1. Check the power supply wiring. 2. Check if the power supplied to the PLC control units is in the range of the rating. 3. Be sure to check the fluctuation in the power supply. 4. Disconnect the power supply wiring to the other devices if the power supplied to the PLC control unit is shared with them. If the LEDs on the PLC control unit turn ON at this moment, the capacity of the power supply is not enough to control other devices as well. Prepare another power supply for other devices or increase the capacity of the power supply. 5. If the POWER LED still does not light up when the power is on after the above corrective actions, the PLC should be sent back to the dealer or the distributor whom you purchased the product from.
The ERROR LED is ON.	When the execution of the program loop takes longer than the value set in D1000 (scan timeout), the ERROR LED of the PLC will be ON. Solutions: • Check the value in D1008 to see in which Step that a scan timeout occurred. Go to the specific Step to check if that is where the problem is. • Reduce the PLC program or use the instruction WDT to increase the scan timeout time. • If the ERROR LED is ON, download the PLC program and then turn the power of PLC OFF and then ON again to see if the ERROR LED is still ON. • If the ERROR LED is still ON, turn the power of PLC OFF and check if there is any noise interference or foreign object in the PLC.
The ERROR LED blinks rapidly every 0.1 seconds.	When the ERROR LED is blinking rapidly every 0.1s, that indicates the built-in DC 24V is not sufficient. Check if the DC 24V power supply is overloaded. Please refer to section 4.6 for detailed solution for low-voltage problem.
The ERROR LED blinks every 0.5 seconds.	Possible causes: • The downloaded PLC program contains invalid instructions or parameters. • The downloaded PLC program contains illegal program syntax or devices. Solutions: • Check the value in D1004 for the error code and the value in D1137 for the Step where an error occurred. And then check the troubleshoot for the error code in the next section.
The ERROR LED blinks every 0.2 seconds and waits for one second and then starts blinking 0.2 seconds again. The blinking pattern keeps going.	The SRAM (static random-access memory) of the PLC or other critical hardware component is out of order. The PLC CPU cannot read/write data, cannot execute any communication nor operation. Contact Delta technical support team or the distributors for further help.
The ERROR LED blinks slowly (1 second ON, 3 seconds OFF)	Heartbeat error messages occurred in slave station under CANopen/ECAT communication mode. Please check whether the CANopen/ECAT communication cable is properly connected or whether the slave station is operating normally. (The last two digital codes is the ID number of error slave station, HEX should be converted to decimal).

Description	Solution
Diagnosing Input Malfunction	When there are inputs, but the input indicator LEDs are OFF, 1. Check the wiring of the input devices. 2. Check that the power is properly supplied to the input terminals. 3. If the power is properly supplied to the input terminal, there is probably an abnormality in the PLC's input circuit. Please contact your dealer. 4. If the power is not properly supplied to the input terminal, there is probably an abnormality in the input device or input power supply. Check the input device and input power supply. When there are no inputs, but the input indicator LEDs are ON, 1. Monitor the input condition using a programming tool. If the input monitored is OFF, there is probably an abnormality in the PLC's input circuit. Please contact your dealer. 2. If the input monitored is ON, check the program again. Also, check the leakage current at the input devices (e.g., two-wire sensor) and check for the duplicated use of output or the program flow when a control instruction such as MC or CJ is used. 3. Check the settings of the I/O allocation.
Diagnosing Output Malfunction	When there are no outputs, but the output indicator LEDs are ON, 1. Check the wiring of the loads. 2. Check if the power is properly supplied to the loads. 3. If the power is properly supplied to the load, there is probably an abnormality in the load. Check the load again. 4. If the power is not supplied to the load, there is probably an abnormality in the PLC's output circuit. Pleas contact your dealer. When there are outputs, but the output indicator LEDs are OFF, 1. Monitor the output condition using a programming tool. If the output monitored is turned ON, there is probably a duplicated output error. 2. Forcing ON the output using a programming tool. If the output indicator LED is turned ON, go to input condition check. If the output LED remains OFF, there is probably an abnormality in the PLC's output circuit. Please contact your dealer.

4.3   Error Code Table (Hex)

After you write the program into the PLC, the illegal use of operands (devices) or incorrect syntax in the program will result in flashing of ERROR indicator and M1004 = ON. In this case, you can find out the cause of the error by checking the error code (hex) in special register D1004. The address where the error occurs is stored in the data register D1137. If the error is a general loop error, the address stored in D1137 will be invalid.

Error code	Description	Solution
0001	Operand bit device S exceeds the valid range	Check the D1137 (Error step number) Re-enter the instruction correctly.
0002	Label P exceeds the valid range or duplicated	
0003	Operand KnSm exceeds the valid range	
0102	Interrupt pointer I exceeds the valid range or duplicated	
0202	Instruction MC exceeds the valid range	
0302	Instruction MCR exceeds the valid range	
0401	Operand bit device X exceeds the valid range	
0403	Operand KnXm exceeds the valid range	
0501	Operand bit device Y exceeds the valid range	

Error code	Description	Solution
0503	Operand KnYm exceeds the valid range	
0601	Operand bit device T exceeds the valid range	
0604	Operand word device T register exceeds limit	
0801	Operand bit device M exceeds the valid range	
0803	Operand KnMm exceeds the valid range	
0B01	Operand K, H available range error	
0D01	DECO operand misuse	
0D02	ENCO operand misuse	
0D03	DHSCS operand misuse	
0D04	DHSCR operand misuse	
0D05	PLSY operand misuse	
0D06	PWM operand misuse	
0D07	FROM/TO operand misuse	
0D08	PID operand misuse	
0D09	SPD operand misuse	
0D0A	DHSZ operand misuse	
0D0B	IST operand misuse	
0E01	Operand bit device C exceeds the valid range	
0E04	Operand word device C register exceeds limit	
0E05	DCNT operand CXXX misuse	
0E18	BCD conversion error	
0E19	Division error (divisor=0)	
0E1A	Device use is out of range (including index registers E, F)	
0E1B	Negative number after radical expression	
0E1C	FROM/TO communication error	
0F04	Operand word device D register exceeds limit	
0F05	DCNT operand DXXX misuse	
0F06	SFTR operand misuse	Check the D1137 (Error step number)
0F07	SFTL operand misuse	
0F08	REF operand misuse	Re-enter the instruction correctly.
0F09	Improper use of operands of WSFR, WSFL instructions	
0F0A	Times of using TTMR, STMR instruction exceed the range	
0F0B	Times of using SORT instruction exceed the range	
0F0C	Times of using TKY instruction exceed the range	
0F0D	Times of using HKY instruction exceed the range	
1000	ZRST operand misuse	
10EF	E and F misuse operand or exceed the usage range	
2000	Usage exceed limit (MTR, ARWS, TTMR, PR, HOUR)	

Error code	Description	Solution
C400	An unrecognized instruction code is being used	
C401	Loop Error	
C402	LD / LDI continuously use more than 9 times	
C403	MPS continuously use more than 9 times	

Error code	Description	Solution
C404	FOR-NEXT exceed 6 levels	A circuit error occurs if a combination of instructions is incorrectly specified. Select programming mode and correct the identified error
C405	STL / RET used between FOR and NEXT SRET / IRET used between FOR and NEXT MC / MCR used between FOR and NEXT END / FEND used between FOR and NEXT	
C407	STL continuously use more than 9 times	
C408	Use MC / MCR in STL, Use I / P in STL	
C409	Use STL/RET in subroutine or interrupt program	
C40A	Use MC/MCR in subroutine Use MC/MCR in interrupt program	
C40B	MC / MCR does not begin from N0 or discontinuously	
C40C	MC / MCR corresponding value N is different	
C40D	Use I / P incorrectly	
C40E	IRET doesn't follow by the last FEND instruction SRET doesn't follow by the last FEND instruction	
C40F	PLC program and data in parameters have not been initialized	
C41B	Invalid RUN/STOP instruction to extension module	
C41C	The number of input/output points of I/O extension unit is larger than the specified limit	
C41D	Number of extension modules exceeds the range	
C41F	Failing to write data into memory	
C440	Hardware error in high-speed counter	
C443	No response from extension unit	
C450	The analog-to-digital/digital-to-analog function of the MCU fails.	
C4EE	No END command in the program	
C4FF	Invalid instruction (no such instruction existing)	
C430	Error occurs while the left-side module is being initialized	Check if the module is connected securely? If there is any abnormality on the connection? If none of the above, replace with a new module.
C437	Error occurs while checking the memory of the left-side module	
C438	Error occurs while checking the model code of the left-side module	
C41C	The number of the extended X and Y points detected has exceed the supported quantity.	Make sure the number of the X and Y points of the extension DIO module is within the allowable range.
C451	The program in the old firmware version is not encrypted. If upgrading to the new firmware version directly, an error will occur.	Restore to the default settings and Power-OFF the PLC CPU and then Power-ON again. After that upgrade to the new firmware.

4

Error code	Description	Solution
C452	PLC program - MCU unique ID is not matched. Note: PLC checks if the program can be stored. This error indicates the program cannot be stored in the built-in memory.	Download the PLC program and then Power-OFF and Power-ON again. If this error persists, it means the PLC built-in memory is broken. Replace with a new PLC.
C453	PLC program - checksum error Note: It may indicate the PLC self-check area of the memory is broken or an unexpected connection loss occurred during on-line editing or any incident that prevents all programs to be updated.	
C461	The module is detected as abnormal. (noise interferences)	Check the module connection. Replace with a new module.
C462		
C463	The number of X and Y points of the extended modules and the number of the special modules are not consistent between two module detections.	
C464	The module is detected as abnormal. (The number of X and Y points of the extended modules and the number of the special modules are not detected.)	
C465	The detected numbers of X and Y points of the extended modules and the number of the special modules are not consistent with the set values in D1248 (X points of extension module), D1254 (Y points of extension module) and D1385 (number of special modules).	Check the module connection. Check the values set in D1248, D1254 and D1385.

4.4   Error Detection Devices

Error Check Devices	Description	Drop Latch	STOP → RUN	RUN → STOP
M1067	Program execution error flag	None	Reset	Latch
M1068	Execution error latch flag	None	Latch	Latch
D1067	Algorithm error code	None	Reset	Latch
D1068	Step value of algorithm errors	None	Latch	Latch

Device D1067 Error Code	Description
0E18	BCD conversion error
0E19	Division error (divisor=0)
0E1A	Floating point exceeds the usage range
0E1B	The value of square root is negative
0E1C	Instructions FROM/TO communication error

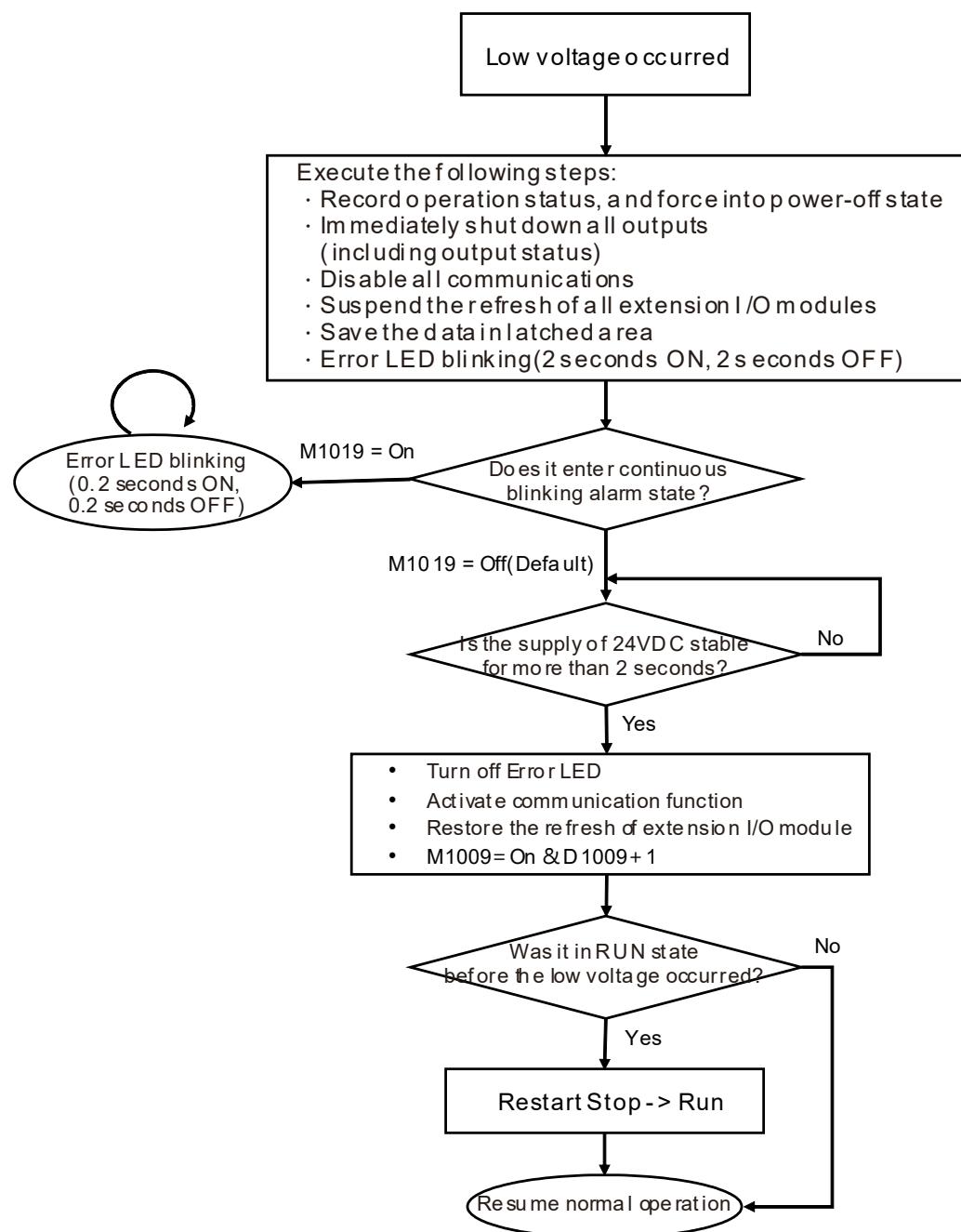## 4.5   Troubleshooting for Other Module

Please refer to DVP series module manual for troubleshooting information on other modules.

4.6   Flow Chart of Low Voltage Process

Low voltage: when the 24VDC power supply voltage drops below 17.8V(with approximately 2% tolerance) for a duration exceeding 10ms.

Below is the flowchart for handling low voltage:

A

Appendix A EMC Standards

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A.1 EMC Standards for an SE2 Series System

A.1.1 DVP-SE2 Series System EMC Standards

The EMC standards that are applicable to DVP-SE2 series system are listed in the following tables.

- **EMI**

Port	Frequency range	Level (Normative)	Reference standard
Enclosure port (radiated) (measured at a distance of 10 meters)	30-230 MHz	40dB (μV/m) quasi-peak	IEC 61000-6-4
	230-1000 MHz	47dB (μV/m) quasi-peak	
DC power port (conducted)	0.15-30 MHz	73dB (μV) quasi-peak	IEC 61000-6-4
		60dB (μV) average	

- **EMS**

Environmental phenomenon	Reference standard	Test		Test level
Electrostatic discharge	IEC 61000-4-2	Contact		±4kV
		Air		±8kV
Radio frequency electromagnetic field Amplitude modulated	IEC 61000-4-3	80% AM, 1kHz sinusoidal	80-1000 MHz	10 V/m
			1.4-2.0 GHz	3 V/m
			2.0-2.7 GHz	3 V/m
			2.7-6.0 GHz	3 V/m
Power frequency magnetic field	IEC 61000-4-8	60 Hz		30 A/m
		50 Hz		30 A/m

● **Conducted immunity test**

Environmental phenomenon		Fast transient burst	High energy surge	Radio frequency interference
Reference standard		IEC 61000-4-4	IEC 61000-4-5	IEC 61000-4-6
Interface/Port	Specific interface/port	Test level	Test level	Test level
Data communication	Shielded cable	1kV	1kV line-to-earth	10V
	Unshielded cable	1kV	1kV line-to-earth	10V
Digital I/O	DC I/O (unshielded)	1kV	1kV line-to-earth	10V
	All shielded lines (to the earth)	1kV	1kV line-to-earth	10V
Equipment power	DC power	2kV	0.5kV line-to-earth 0.5kV line-to-line	10V
I/O power and auxiliary power output	DC I/O and DC auxiliary power	2kV	0.5kV line-to-earth 0.5kV line-to-line	10V

A.1.2 Installation Instructions to meet EMC Standards

You must install an SE2 Series PLC in a control box. The control box protects the PLC and isolates electromagnetic interference generated by the PLC.

（1）Control box

   ● Use a conductive control box.

   ● Make sure to ground the control box properly, and avoid insulation caused by the paint on the grounding bolts inside the control box.

   ● Minimize the gaps in the control box to prevent radio waves from leaking. Use an EMI gasket on the gaps in the control box to suppress radio wave leakage.

（2）Connecting a power cable and a ground

   Connect the PLC system power cable and the ground as described below.

   ● Users can ground the module at any point on the aluminum rail, as well as at the module's ground terminal.

   ● Twist the ground and the power cable together; the noise flowing through the power cable is then passed to the ground. The ground and the power cable do not need to be twisted if you install a filter on the power cable.

A.1.3 Cables

● It is recommended to use shielded cables, when connecting digital I/O modules and analog I/O modules including temperature modules.

● Ground the shielding cable at a single point.

B

Appendix B Maintenance and Inspection

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B.1   Cautions

Observe the following precautions before performing maintenance and inspection. **Incorrect or careless operation will lead to injury or equipment damage.**

⚠ ● To prevent a breakdown of a PLC Series system or a fire, ensure that the ambient environment does not contain corrosive substances such as chloride gas, sulfide gas or flammable substances such as oil mist, cutting powder, or dirt.

⚠ ● To prevent the connectors from oxidizing and to prevent electric shock, do not touch the connectors.

⚠ ● To prevent electric shock, turn off the power before pulling the connectors or loosening the screws.

⚠ ● To prevent cable damage, and to prevent the connectors from being loosened, do not put weight on the cables or pull on them.

⚠ ● Ensure that the input voltage is within the rated range.

⚠ ● To prevent product breakdown, fire, or injury, do not disassemble or alter the modules.

● To prevent a controlled element from malfunctioning, ensure that the program and parameters are written into a new CPU module before restarting the PLC Series system.

● To prevent incorrect output or equipment damage, refer to the related manuals for more information about operating the modules.

● To prevent damage to the modules, touch grounded metal or wear an antistatic wrist strap to release static electricity from your body before working on a module.

● To prevent noise from causing system breakdown, keep a proper distance from the system when using a cell phone or communication device.

● Do not install a PLC Series system in direct sun or in a humid environment.

● To prevent the temperature of an element from being too high, maintain a proper distance between the PLC Series system and heat sources such as coils, heating devices, and resistors.

● To protect a PLC Series system, install an emergency stop switch and an overcurrent protection device.

● To prevent an unexpected shock from resulting in damage to the PLC Series system and a controlled element, ensure that the modules are correctly and firmly installed.

B.2   Daily Maintenance

To keep a PLC Series system operating normally, ensure that the ambient environment and the PLC Series system conform to the cautions listed in section B.1. You can then perform the daily inspection described below. If you find any problems, follow the solution and perform any necessary maintenance.

B.2.1   Daily Inspection

No.	Item	Inspection	Criterion	Remedy
1	Appearance	Check visually.	Dirt must not be present.	Remove the dirt.
2	Installing of a backplane	Check whether the set screws are loose.	The backplane must be installed firmly.	Tighten the screws.
		Check whether the backplane is installed on the DIN rail properly.		Install the backplane on the DIN rail properly.
3	Installing of a module	Check whether the module is loose that the projection is inserted into the hole on the backplane, and that the screw is tightened.	The projection under the module must be inserted into the hole in the backplane, and the screw must be tightened.	Install the module firmly.
4	Connection	Check whether the removable terminal block is loose.	The removable terminal block must not be loose.	Install the terminal block firmly.
		Check whether the connector is loose.	The connector must not be loose.	Tighten the screws on the connector.
5	Power module LED indicator	Check the status of power module	Please refer to its module manual for more information on LED indicators.	Please refer to its module manual for more information on troubleshooting.
	CPU module LED indicator	Check the status of CPU module		
	Extension module LED indicator	Check the status of extension module		

B

B.3 Periodic Maintenance

In addition to daily inspection, you should perform periodic maintenance depending on the actual operating environment. After making sure that the ambient environment and the PLC Series system conform to the cautions listed in Section B.1, perform the periodic inspection described below. If you find any problems, follow the solution and perform any necessary maintenance.

B.3.1 Periodic Inspection

No.	Item		Inspection	Criterion	Remedy
1	Ambient environment	Ambient temperature /humidity	The ambient temperature and the ambient humidity are measured by a thermometer and a hygrometer.	The ambient temperature and the ambient humidity must conform to the specifications for the modules or the backplane. If the specifications are different, the strictest specifications have priority.	To ensure that the system operates in a stable environment, determine why the environment varies, and resolve the issue.
		Atmosphere	Measure corrosive gas.	Corrosive gas must not be present.	
2	Supply voltage		Measure the AC power supply.	The power supply should meet the specifications for the power supply module.	Check the power supply.
3	Installation	Looseness	Check whether the module is loose.	The module must be installed firmly.	Please refer to its module manual for more information on installing the module.
		Adhesion of dirt	Check the appearance.	Dirt must not be present.	Remove the dirt.
4	Connection	Looseness of terminal screws	Tighten the screws with a screwdriver.	The screws must not be loose.	Tighten the screws.
		Looseness of connectors	Pull the connectors.	The connectors must not be loose.	Tighten the screws on the connectors.
5	PLC system diagnosis		Check the error logs.	No new error occurs.	Please refer to trouble shooting section for more information.
6	Maximum scan time		Check the states of SR413 and SR414 through the device monitoring table in ISPSoft.	The maximum scan cycle must be within the range specified in the system specifications.	Determine why the scan time exceeds specifications.

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*We reserve the right to change the information in this manual without prior notice.