

# DVP Slim

Digital I/O Extension Unit

## Instruction Sheet

### WARNING

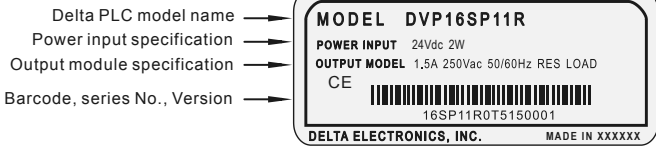
-  This Instruction Sheet provides descriptions for electrical specifications, installation & wiring.
-  This is an OPEN TYPE Controller. The PLC should be kept in an enclosure away from airborne dust, humidity, electric shock risk and vibration. Also, it is equipped with protective methods such as some special tools or keys to open the enclosure, so as to avoid the hazard to users and the damage to the PLC.
-  DC type PLC never connect the AC main circuit power supply to any of the input/output terminals, as it will damage the PLC. Check all the wiring prior to power up.

### INTRODUCTION

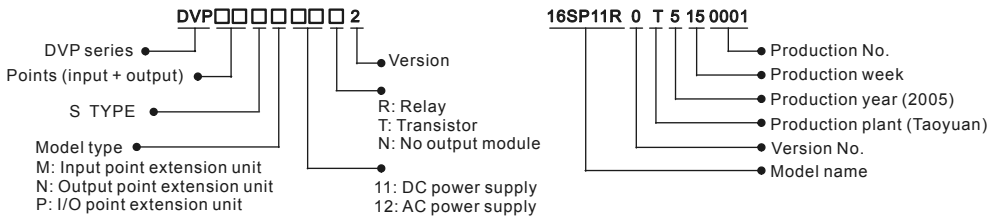
#### 1.1. Model Explanation & Peripherals

Thank you for choosing DVP-SS/SA/SX/SC series PLC. The 6 ~ 16 points extension offered by SS/SA/SX/SC series make the maximum digital I/O extension including the MPU reach 128 points. In addition, maximum 8 special modules (AD/DA/PT/TC/XA/RT) are extendable to DVP Slim series.

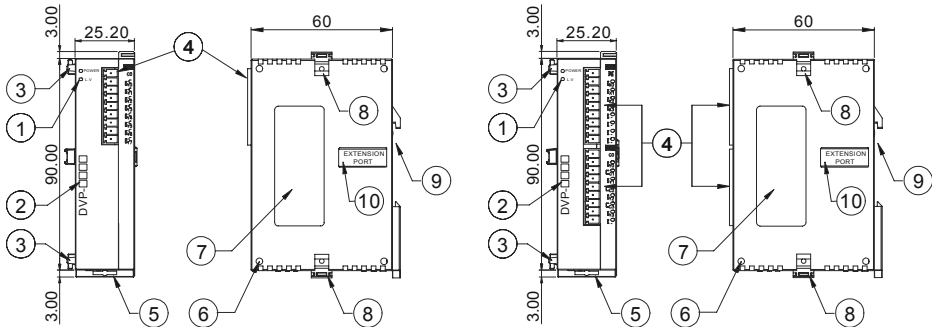
##### Nameplate Explanation



##### Model/Serial No. Explanation



#### 1.2. Product Profile and Outline



- |                                             |                                        |
|---------------------------------------------|----------------------------------------|
| 1. Status indicator (Power and low voltage) | 6. Mounting hole of the extension unit |
| 2. Model Name                               | 7. Nameplate                           |
| 3. Extension unit clip                      | 8. Extension unit clip                 |
| 4. Input/output terminal                    | 9. DIN rail (35mm)                     |
| 5. DIN rail clip                            | 10. Extension port                     |

#### 1.3. Model Numbers

| Model      | Input Unit |                     | Output Unit |            | Dimensions (mm) | Weight (g) |
|------------|------------|---------------------|-------------|------------|-----------------|------------|
|            | Point      | Type                | Point       | Type       |                 |            |
| DVP08SP11R | 4          | DC Type Sink/Source | 4           | Relay      | 25.2 x 90 x 60  | 141        |
| DVP16SP11R | 8          |                     | 8           | Transistor |                 | 162        |
| DVP08SP11T | 4          |                     | 4           |            |                 | 136        |
| DVP16SP11T | 8          |                     | 8           |            |                 | 154        |
| DVP08SM10N | 8          | 100~120VAC          | 0           | None       |                 | 141        |
| DVP08SM11N | 8          | DC Type Sink/Source | 0           | None       |                 | 162        |
| DVP08SN11R | 0          |                     | 8           | Relay      |                 | 136        |
| DVP08SN11T | 0          |                     | 8           | Transistor |                 | 154        |
| DVP06SN11R | 0          |                     | 6           | Relay      |                 | 200        |

### ELECTRICAL SPECIFICATIONS

#### 2.1 Electrical Specification

| Item                          | Model                                                                                                                                                                                                                                                                        | DVP08SM11N<br>DVP08SM10N | DVP08SN11R/T | DVP08SP11R/T | DVP16SP11R/T | DVP06SN11R |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------|--------------|--------------|------------|
| Power Supply Voltage          | 24VDC (-15%~+20%) (the counter-connection protection towards the DC input power polarity is included)                                                                                                                                                                        |                          |              |              |              |            |
| Motion Specifications         | Within 5ms of the momentary power loss, the device will keep on operating                                                                                                                                                                                                    |                          |              |              |              |            |
| Maximum Power Consumption     |                                                                                                                                                                                                                                                                              | 1W                       | 1.5W         | 1.5W         | 2W           | 1.5W       |
| Insulation Resistance         | Above 5 M $\Omega$ (500VDC between the ground and all the I/O points)                                                                                                                                                                                                        |                          |              |              |              |            |
| Noise Immunity                | ESD(IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge<br>EFT(IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Digital I/O: 1KV, Analog & Communication I/O: 1KV<br>Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV<br>RS(IEC 61131-2, IEC 61000-4-3): 26MHz~1GHz, 10V/m |                          |              |              |              |            |
| Grounding                     | The diameter of the grounding wire cannot be smaller than that of terminals L and N (if numerous PLCs are used at the same time, make sure that each PLC is grounded respectively to the ground poles)                                                                       |                          |              |              |              |            |
| Vibration/Shock Immunity      | International Standard Regulations: IEC1131-2, IEC 68-2-6 (TEST Fc)/ IEC1131-2 & IEC 68-2-27 (TEST Ea)                                                                                                                                                                       |                          |              |              |              |            |
| Operation/Storage Environment | Operation: 0 $^{\circ}$ C~55 $^{\circ}$ C (temperature), 50~95% (humidity), pollution degree: 2; Storage: -40 $^{\circ}$ C~70 $^{\circ}$ C (temperature), 5~95% (humidity)                                                                                                   |                          |              |              |              |            |

#### 2.2 Input/Output Specification

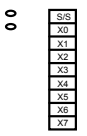
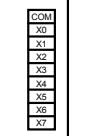
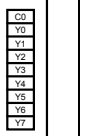
| Electrical Specification DC Input Point    |                                                                                     |                                        |
|--------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------|
| Item \ Input type                          | DC Type                                                                             | AC Type                                |
| Input Type                                 | DC (SINK or SOURCE)                                                                 | -                                      |
| Input Impedance                            | -                                                                                   | 14.5Kohm/50Hz 12Kohm/60Hz              |
| Input Voltage/Current                      | 24VDC 5mA                                                                           | 85~132VAC 50~60Hz<br>9.2mA 110VAC/60Hz |
| Motion Level                               | Off→On, greater than 16VDC                                                          | greater than 80VAC                     |
|                                            | On→Off, less than 14.4VDC                                                           | less than 30VAC                        |
| Response Time                              | Default 10ms (Adjustable range of 0~15ms could be selected through D1020 and D1021) | Off→On 15us<br>On→Off 20us             |
| Circuit Isolation/<br>Operation Indication | Photocoupler/LED On                                                                 |                                        |
| Maximum Off Current                        | 1.8mA                                                                               | 2mA                                    |

| Electrical Specification of Output Point |                            |                            |                                                                           |
|------------------------------------------|----------------------------|----------------------------|---------------------------------------------------------------------------|
| Output Type<br>Item                      | Relay-R                    | Relay-R (*1)               | Transistor-T                                                              |
| Current Spec.                            | 1.5A/1 point<br>(5A/COM)   | 6A/1 point                 | 55℃ 0.1A/1 point, 50℃ 0.15A/1 point<br>45℃ 0.2A/1 point, 40℃ 0.3A/1 point |
| Voltage Spec.                            | 250VAC, less than<br>30VDC | 250VAC, less than<br>30VDC | 30VDC                                                                     |
| Max. Loading                             | 75VA (Inductive)           | 240VA (Inductive)          | 9W                                                                        |
|                                          | 90 W (Resistive)           | 150 W (Resistive)          |                                                                           |
| Response Time                            | About 10 ms                | About 10 ms                | Off→On, 15us; On→Off, 25us                                                |

\*1: Only for model DVP06SN11R

### INSTALLATION & WIRING

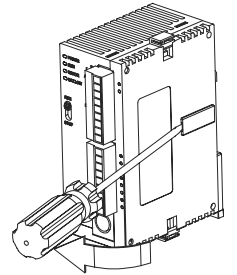
#### 3.1 Terminal Layout

| DVP08SM11N                                                                          | DVP08SM10N                                                                          | DVP08SN11R<br>DVP08SN11T                                                            | DVP08SP11R<br>DVP08SP11T                                                            | DVP16SP11R<br>DVP16SP11T                                                            | DVP06SN11R                                                                          |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |  |

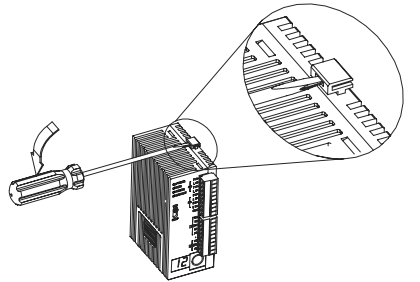
#### 3.2 System Assembly

Procedures:

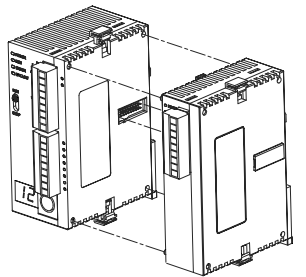
- Open the extension cover on the side of the unit with a screwdriver so that the external connector is exposed.



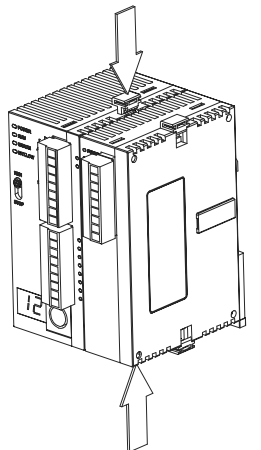
- Raise the extension clips on the top and bottom sides of the unit with a screwdriver.



- Align the pins and holes in the four corners of the control unit and extension unit, and insert the pins into the holes so that there is no gap between the units.

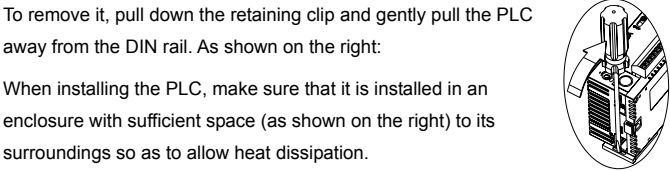


- Press down the extension clip raised in step 2 to secure the unit.



3.3 Installation of the DIN rail

The PLC can be secured to a cabinet by using the DIN rail that is 35mm high with a depth of 7.5mm. When mounting the PLC on the DIN rail, be sure to use the end bracket to stop any side-to-side motion of the PLC, thus to reduce the chance of the wires being pulled loose. At the bottom of the PLC is a small retaining clip.



3.4 Input/Output points numbering order

No matter how many points of MPU, the input of the first I/O extension unit will start from X20 and output will start from Y20.

System combined Example:

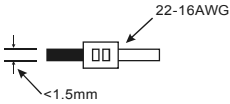
| PLC  | Models      | Input Points | Output Points | Input Numbering | Output Numbering |
|------|-------------|--------------|---------------|-----------------|------------------|
| MPU  | SS/SA/SX/SC | 8            | 4/6           | X0~X7           | Y0~Y5            |
| EXT1 | DVP16SP11T  | 8            | 8             | X20~X27         | Y20~Y27          |
| EXT2 | DVP08SM11N  | 8            | 0             | X30~X37         | -                |
| EXT3 | DVP06SM11R  | 0            | 6             | -               | Y30~Y35          |
| EXT4 | DVP08SP11R  | 4            | 4             | X40~X43         | Y40~Y43          |

Extension unit 3 DVP06SM11R will be used as 8 outputs, the higher 2 numbers of output points have no corresponding output points.

Extension unit 4 DVP08SP11R will be used as 8 input points/8 output points, the higher part numbers of inputs points and output points have no corresponding input/output points. It is recommended to place them at the end of serial wiring, so that I/O points numbering will be continuous.

3.5 Wiring

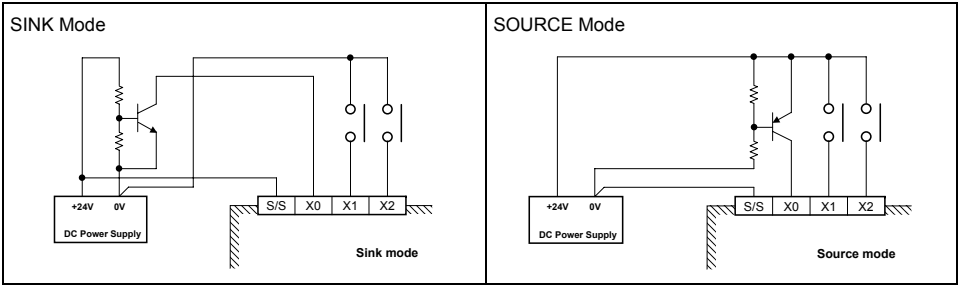
Notes:



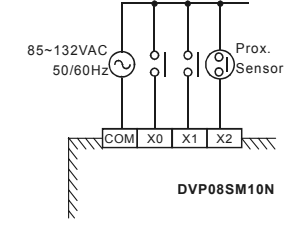
- Please use 22-16AWG (1.5mm) wiring (either single or multiple core) for I/O wiring terminals. The specification for the terminals is as shown on the left. PLC terminal screws should be tightened to 1.95 kg-cm (1.7 in-lbs). Use Copper Conductor Only, 60/75 °C.
- I/O signal wires or power supply should not run through the same multi-wire cable or conduit.

3.6 Input Point Wiring

There are two types of DC type wiring: SINK and SOURCE, defined as follows:

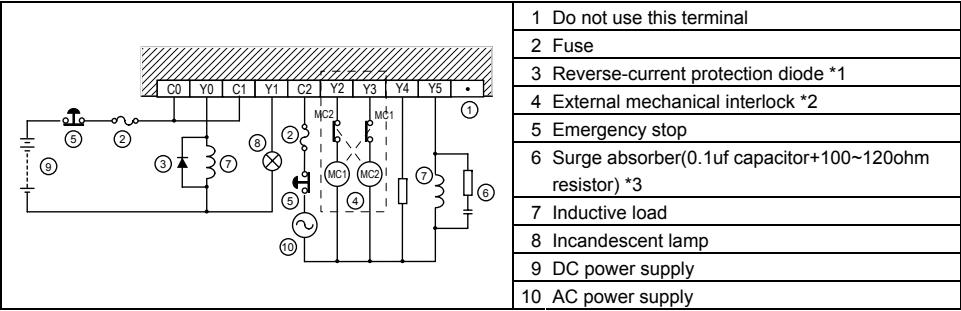


3.7 AC Type Wiring

| Input Circuit Connection                                                                             | 110V AC Input Specifications           |
|------------------------------------------------------------------------------------------------------|----------------------------------------|
|  <p>DVP08SM10N</p> | Input voltage                          |
|                                                                                                      | 85~132VAC 50~60Hz                      |
|                                                                                                      | Input impedance                        |
|                                                                                                      | 14.5Kohm/50Hz 12Kohm/60Hz              |
|                                                                                                      | Input current                          |
|                                                                                                      | 9.2mA 110VAC/60Hz                      |
|                                                                                                      | On/Off voltage level                   |
|                                                                                                      | greater than 80VAC less than 30VAC     |
|                                                                                                      | Response time                          |
|                                                                                                      | Off→On 15us On→Off 20us                |
|                                                                                                      | Circuit isolation/Operation indication |
|                                                                                                      | Photocoupler/LED On                    |

3.8 Output Point Wiring

■ The Relay Output Circuit Wiring



\*1: This PLC does not have any internal protection circuitry on the relay outputs. For switching direct current on inductive loads, a reverse-current protection diode should be installed in parallel with the load. The relay contact life decreases significantly if this is not done.

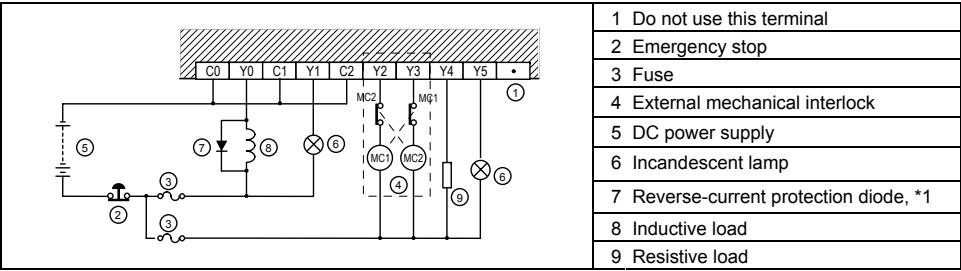
The reverse-current protection diode needs to satisfy the following specifications.

- The diode is rated for maximum reverse voltage of 5~10+ times the load voltage.
- The forward current is more that the load current

\*2: Ensure all loads are applied to the same side of each PLC output, see above figure. Loads which should NEVER simultaneously operate(e.g. direction control of a motor), because of a critical safety situation, should not rely on the PLC's sequencing alone. Mechanical interlocks MUST be fitted to all critical safety circuits.

\*3: This PLC does not have any internal protection circuitry on the relay output. For switching AC on inductive loads, a surge absorber (0.1uF + "100ohm to 120ohm") should be installed in parallel with the load. The relay contat life decreases significantly if this is not done. Besides protecting the internal circuitry of the PLC, a surge absorber decreases the noise emissions to the load.

■ The Transistor Output Circuit Wiring



\*1: Ensure all loads are applied to the same side of each PLC output, see above figure. Loads which should NEVER simultaneously operate (e.g. direction control of a motor), because of a critical safety situation, should not rely on the PLC's sequencing alone. Mechanical interlocks MUST be fitted to all critical safety circuits.

\*2: Transistor outputs use internal zener diode(39V) as protection circuitry. When driving the inductive load with transistor output, a reverse-current protection diode can be installed in parallel with the load if necessary.

The reverse-current protection diode needs to satisfy the following specifications.

- The diode is rated for maximum reverse voltage of 5 to 10+ times the load voltage.
- The forward current is more than the load current.

4 TRIAL RUN

4.1. Before Turning ON the Power

After wiring, be sure to check the items below before turning ON the power supply to the PLC.

| Item                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Unit mounting status | - Does the unit type match the device list during the design stage?<br>- Are all of the units firmly attached?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Power supply         | - Is operating voltage supplied correctly?<br>- Is the power supply cable properly connected?<br>- Are both voltage and polarity connected correctly for each connection?<br>- Protection against excess current: when overloaded, output voltage lowers. Although the output voltage will return to normal when the load returns to normal, be careful as long overloads or short-circuits will cause deterioration or destruction of internal elements.<br>- Attaching additional power supply units in parallel is not allowed! It may destroy internal elements and the load of the power supply. |

|                              |                                                                                                                                                                                    |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Check input/output terminals | - Does the wiring of connector and terminal match?<br>- Is the operating voltage of I/O correct?<br>- Are the connectors of I/O properly connected?<br>- Is the wire size correct? |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Note: These precautions concern the DVP-PS01/PS02 power supply unit specifically.

4.2. Turning the Power ON

After checking the items given on the section 5, perform the trial operation by adhering to the following procedure.

- Check "POWER" LED at the front of the PLC extension unit.
- Check "LV" LED at the front of the PLC extension unit.

4.3. Check Communication with PLC control unit

After Power on and PLC is completing initial setup. The total number of extensive input/output points will be stored in special data registers of D1142 and D1143. Please check D1142 and D1143 to confirm the adding extension unit is connecting with control unit normally.

5 TROUBLESHOOTING

5.1 All LEDs are OFF

- Check the power supply wiring.
- Check if the power supplied to the PLC control units is in the range of the rating. Be sure to check the fluctuation in the power supply.
- 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.

5.2 Diagnosing Input Malfunction

- Check the wiring of the input devices (input indicator LEDs are OFF)
  - Check that the power is properly supplied to the input terminals.
    - 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.
    - 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.
- Check the input condition (input indicator LEDs are ON)
  - 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.
    - 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.
- Check the settings of the I/O allocation.

5.3 Diagnosing Output Malfunction

- Check the wiring of the loads. (output indicator LEDs are ON)
  - Check if the power is properly supplied to the loads.
    - If the power is properly supplied to the load, there is probably an abnormality in the load. Check the load again.
    - If the power is not supplied to the load, there is probably an abnormality in the PLC's output circuit. Pleas contact your dealer.
- Check of output condition (output indicator LEDs are OFF)
  - Monitor the output condition using a programming tool.
    - If the output monitored is turned ON, there is probably a duplicated output error.
  - 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.