M0011493E

San Ace PWM Controller Instruction Manual

9PC8666X Series

Thank you for purchasing the San Ace *PWM Controller*.
Please read this instruction manual thoroughly before using the product to fully understand its functions. After thoroughly reading this manual, keep it handy for reference.

⚠ Caution

- To ensure that this product is used safely, be sure that you read and understand the following precautions fully and use it only as directed.
- Be sure to read these Safety Precautions carefully before installing, connecting, operating, maintaining, or inspecting the product. Follow all the precautions and directions given here.
- The product has been designed and manufactured for built-in use in general industrial machinery, and might not be used otherwise.
- The product falls into the Category 16 (Class 85, Item 43) of the Appended Table 1 of the Export Trade Control Order. When exporting the product either as a standalone item or as part of another product, be sure to implement the necessary procedures including the "Informed Cases" and "Objective Cases" based on the "Catch-All Controls" defined by the Ministry of Economy, Trade and Industry of Japan.
- When disposing the product, treat it as industrial waste. For instructions on proper disposal methods, please contact local government authorities.
- When using the product in equipment that could affect people's lives or health, that is used on a car, ship, or aircraft, or that could have a major impact on society or on the public, use it at your own discretion only after deploying sufficient safety measures and making prior evaluation.
- Fully understand the Safety Precautions described in this document before using the product. SANYO DENKI will not be liable for any accidents resulting in death, injury, or property damage due to the failure of the product.
- Safety precautions necessary for preventing any possible bodily injury or damage to property or equipment are ranked in two levels:

⚠ **Warning**	Denotes hazards which could cause severe bodily injury or death as a result of incorrect operation.
⚠ **Caution**	Denotes hazards which could cause bodily injury or property damage as a result of incorrect operation.

Note: Even those items marked '**Caution**' might also result in serious consequences depending on the situation. Be sure to observe them carefully to the same extent as items marked '**Warning**.'

Safety Precautions (1/2)

⚠ Warning

- When using the product in the following equipment, use it at your own discretion only after deploying sufficient safety measures and making prior evaluation.
  - Equipment that could affect people's lives or health
  - Equipment that is used on a car, ship, or aircraft
  - Equipment that could have a major impact on society or on the public
  - SANYO DENKI will not be liable for any accidents involving human casualties (death, injury, etc.) or property damage due to the failure of the product while use in such equipment.
- Ensure that wiring is done correctly. Failure to do so might result in fire, burns, or electrical shock.
- Never use in explosive atmospheres, as doing so might result in fires, burns, or bodily injury.
- Do not operate the product with live parts exposed. Doing so might result in electric shock.
- Turn off the power and stop using the product immediately if you notice any sparks, smoke, odd odors or sounds, or anything unusual during operation. Failure to do so might result in fire, bodily injury, or electrical shock.
- Never allow the product to fall, topple over, or be subjected to excessive shocks when moving it. Doing so might result in product failure or performance deterioration.
- The product should be handled by technically qualified personnel or someone with sufficient expertise; the personnel shall be assigned at your own discretion.
- Never attempt to disassemble, repair, or alter the product in any way, as doing so might result in electrical shock, fire, or bodily injury.

Safety Precautions (2/2)

⚠ Caution

Handling

- Installation, mounting, connections, wiring, and relocation of the product should be done by technically qualified personnel or someone with sufficient expertise; the personnel shall be assigned at your own discretion. Never perform such work while the product is on, as this might lead to injury, electrical shock, burns, or fire.
- Never allow yourself to come into contact with the product when measuring insulation resistance or dielectric strength. There is danger of electric shock.
- Never attempt to disassemble or alter the product in any way. Doing so might not only result in substandard performance, but also fire, burns, bodily injury, or electrical shock.

Operation

- Take protective measures for the equipment in which the product is embedded in case the product stops, malfunctions, or fails during operation.
- Never use the product at voltages, temperatures, or any other parameters exceeding those given in the product specifications. Otherwise, it might result in substandard performance, failure, fire, bodily injury, or electrical shock.
- Do not remove the nameplate. Doing so might result in product failure or electrical shock.
- Do not turn the power on or off on the negative power line. Doing so might damage the product.
- Do not apply excessive force to the product while it is operating. Otherwise, it may result in product failure.

Installation

- When fixing the product into place, be sure to take into consideration the product's weight and all other relevant factors. Failure to do so may result in the product or its parts falling, resulting in bodily injury or device failure.
- Never install or remove the product while it is wired.
- When fixing the product with screws, ensure correct tightening torque. If the tightening torque is over the recommended values, the product structure may deform or break.
- Take proper precautions against static electricity when wiring. Failure to do so might cause failure of the product or equipment.
- Make connections correctly in accordance with the information of this Instruction Manual and the nameplate of the product. Failure to do so might result in equipment failure or the malfunction, failure, or performance degradation of the product.
- Ensure that wires are fitted with insulation to prevent accidental short-circuiting. Failure to do so may result in device failure, product failure, or product malfunction.

Operating Environments

- Avoid using or storing the product in the following environments. Otherwise, it might result in fire or the failure or performance degradation of the product.

  In environments where flammable or corrosive gas is present, where water or oil splashes, where there is much dust or humidity, where condensation occurs, where exposed to radioactive rays or direct sunlight, where a salty sea breeze blows or seawater splashes, where the product might be contaminated by such corrosive materials as sulfurous water, sulfurous volcanic ash, organic solvents, acidic and alkali chemicals, or nuclear fuel materials, where subjected to constant vibration, strong shocks, centrifugal force, acceleration, or strong magnetic force, where electromagnetic noise radiation is present, where the electromagnetic noise overlaps into power voltage, or where subjected to rapid environmental fluctuations (temperature, humidity, pressure, etc.).

Storage

- The product should be stored in packaging.
- Ensure that the product is stored in the following environments where:
  - the temperature is normal and stable;
  - the relative humidity is 20% to 85% with no sudden changes in humidity and no condensation;
  - not subjected to direct sunlight;
  - not subjected to water, oil, corrosive materials, or other hazardous substances;
  - and not subjected to vibration or shock.

Maintenance

- Maintenance and inspections of the product should be done by technically qualified personnel or someone with sufficient expertise; the personnel shall be assigned at your own discretion. Otherwise, it might result in fire, burns, bodily injury, or electrical shock.
- Perform maintenance or inspections while the product is off. Otherwise, it may result in fire, burns, bodily injury, or electrical shock.
- Never use gasoline, paint thinner, benzene, or any other organic solvents to clean the product. Also, avoid placing excessive stresses on the product. Otherwise, it might result in product deformation or performance degradation.

1. Outline

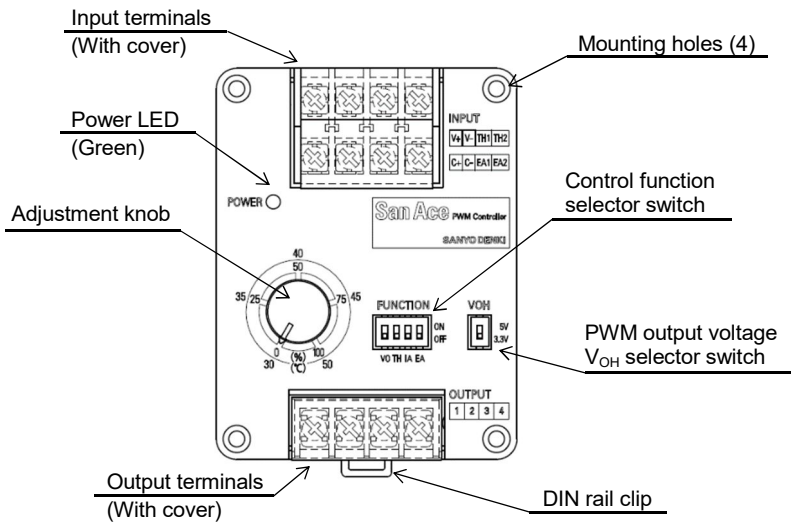
(1) The San Ace *PWM Controller* is a PWM signal generator that can control the speed of PWM control fans.

(2) It can use the same or separated DC power supply (12/24/48) as the connected DC fan(s). When using separated DC power supply, the negative line must be common.

(3) The controller can perform four types of control functions, enabling you to select the best control function to suit your purpose. Only one function can be used at a time.

(4) The controller can be connected to up to four fans and can be mounted to a DIN rail or mounted with screws.

2. Part Names



3. Mounting

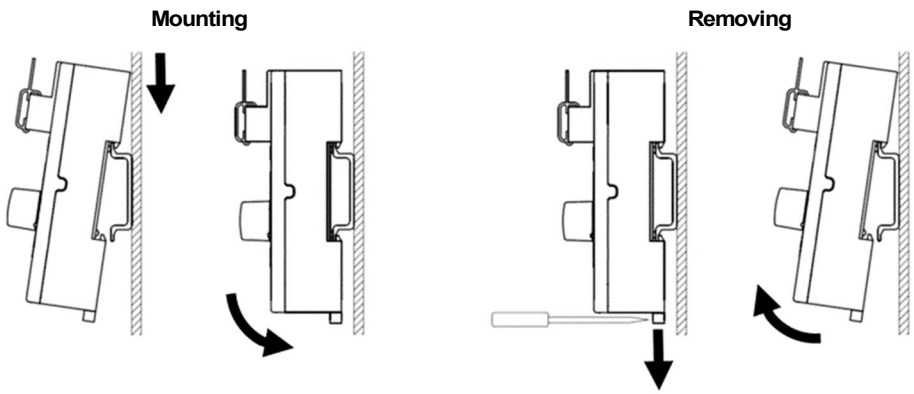
The controller can be mounted to a 35 mm DIN rail or mounted with screws.

3-1. Mounting the Controller to a DIN Rail

Set the controller so that the DIN rail clip is at the bottom. On the rear side, place the controller's upper hook onto the upper lip of the DIN rail and press on the lower part of the controller until you hear a 'click'.

3-2. Removing the Controller from a DIN Rail

While pulling down the DIN rail clip using a slotted screwdriver, lift the controller up and away from the rail.



3-3. Mounting with Screws

Insert an M3 screw in each of the four mounting holes and tighten. (Tightening torque: 0.5 N·m max.)

4. I/O Terminals

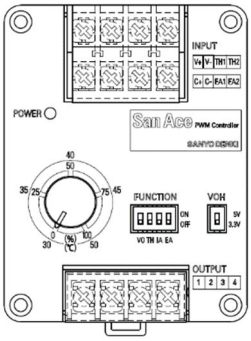
4-1. Arrangement and Functions

Input Terminals

Terminal	Function
V+	Power supply input
V-	Ground
TH1	Thermistor connection
TH2	Thermistor connection
C+	Control voltage input
C-	Control voltage ground or variable resistor connection
EA1	Variable resistor connection
EA2	Variable resistor connection

Input Terminal Arrangement

V+	V-	TH1	TH2
C+	C-	EA1	EA2



⚠ Caution
Ensure correct wiring.
Incorrect wiring may result in product failures.

Output Terminals

Terminal	Function
1 to 4	PWM signal output

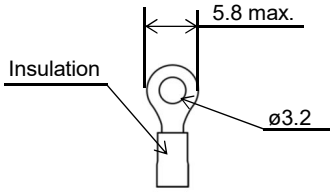
Output Terminal Arrangement

1	2	3	4

4-2. Wiring

(1) Remove the terminal cover, insert the wire underneath the screw head, and tighten the terminal screw. (M3 terminal screw, tightening torque: 0.5 N·m max.)
(2) Connect the solderless terminal.
(3) After confirming the wiring, reattach the terminal cover and turn the power on.
(4) The PWM signal output may be subject to noise and impedance due to the wiring conditions. Use wires as thick and short as possible.

Recommended Solderless Terminal

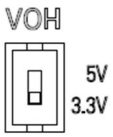


5. Using the *PWM Controller*

5-1. Selecting V_{OH}

PWM output voltage V_{OH} can be set to 3.3 V or 5 V using the switch.
Select the V_{OH} matching the specifications of the connected fan(s).

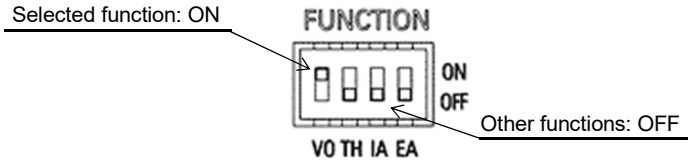
V_{OH} Selector Switch



5-2. Selecting the Control Functions

(1) The controller can perform four types of control functions.
(2) Make sure only the function being used is ON and that all other functions are OFF. When all functions are OFF or more than one function is ON, the output duty cycle will be set to 100%.
(3) Turn off the power when changing control functions.

Control Function Selector Switch



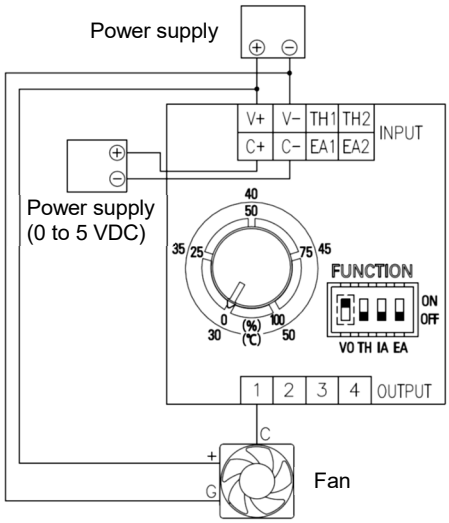
VO: Voltage control
TH: Thermistor control
IA: Internal adjustment control
EA: External adjustment control

5-3. Description of Control Functions

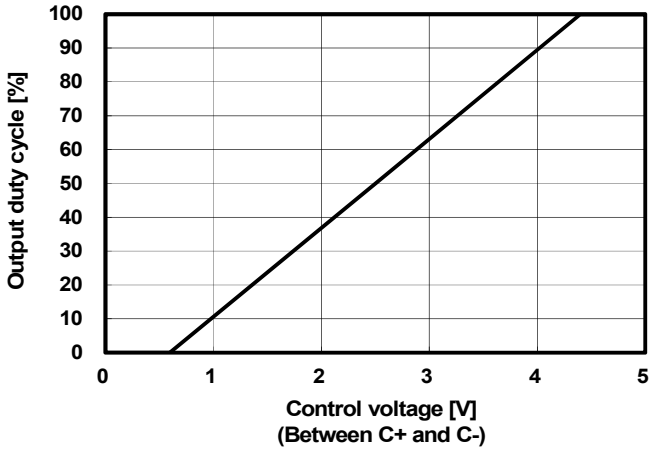
5-3-1. Voltage Control Function

(1) This function controls the output duty cycle by externally applying voltage from 0 to 5 V.
(2) Set the VO control function selector switch to ON to use the voltage control function.
(3) Do not apply more than 5.5 V to the voltage input terminals.
(4) Do not apply control voltage when the power is off.

Connection Diagram for Voltage Control Function



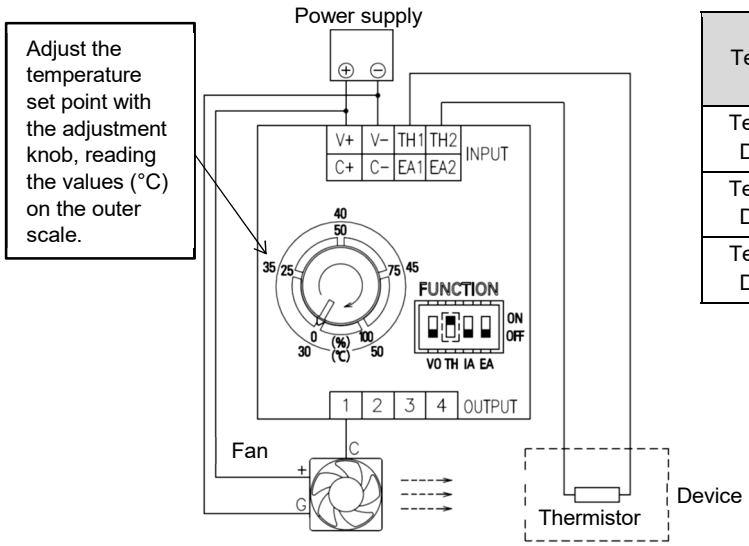
Control Voltage - Output Duty Cycle Characteristics



5-3-2. Thermistor Control Function

(1) This function automatically controls the output duty cycle by using the controller's temperature set point (30 to 50°C) and an external thermistor to detect the temperature. As the temperature detected by the thermistor nears the temperature set point, the fan automatically increases, decreases, or maintains rotational speed.
(2) Set the TH control function selector switch to ON to use the thermistor control function.
(3) Connect a thermistor only when using the thermistor control function.
(4) Confirm the cooling performance of the fan before connecting it.
(5) A thermistor is not included so you will need to supply your own.
Thermistor specifications: NTC thermistor with cable, R_{25} = 10 kΩ, $B_{25/85}$ = 3435K

Connection Diagram for Thermistor Control Function



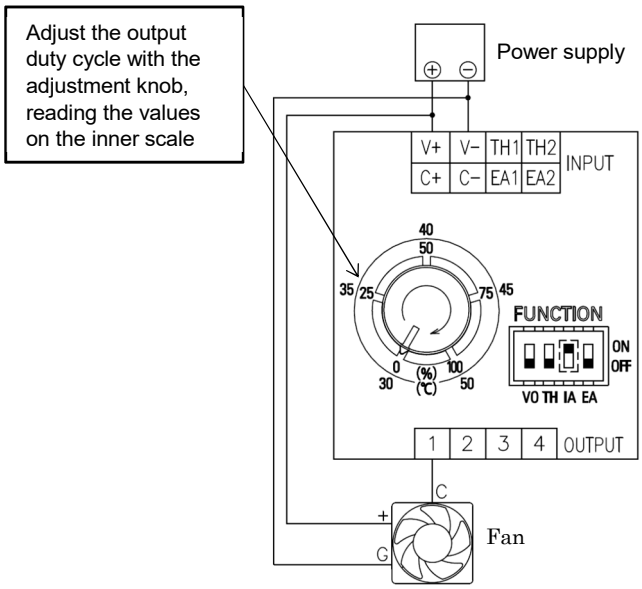
Control Conditions

Temperature conditions	Output duty cycle	Fan rotational speed (For reference)
Temperature set point < Detected temperature	Increases	Increases
Temperature set point > Detected temperature	Decreases	Decreases
Temperature set point ≈ Detected temperature	Maintains	Maintains

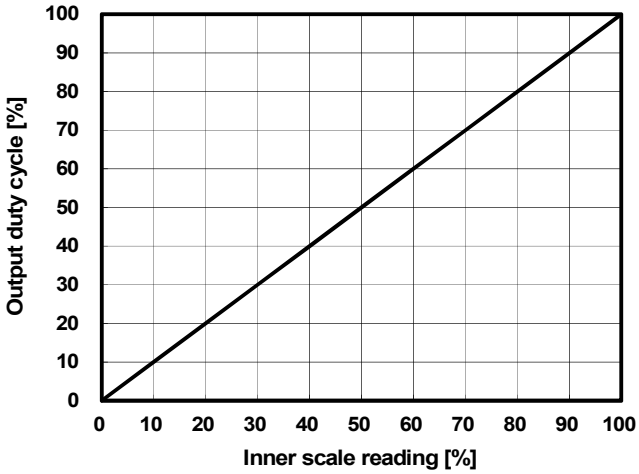
5-3-3. Internal Adjustment Control

(1) This function controls the output duty cycle using the adjustment knob.
(2) Set the IA control function selector switch to ON to use the internal adjustment control function.

Connection Diagram for Internal Adjustment Control Function



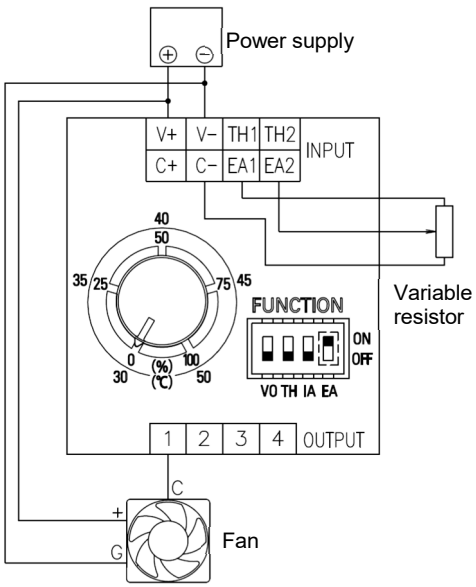
Inner Scale Reading - Output Duty Cycle Characteristics



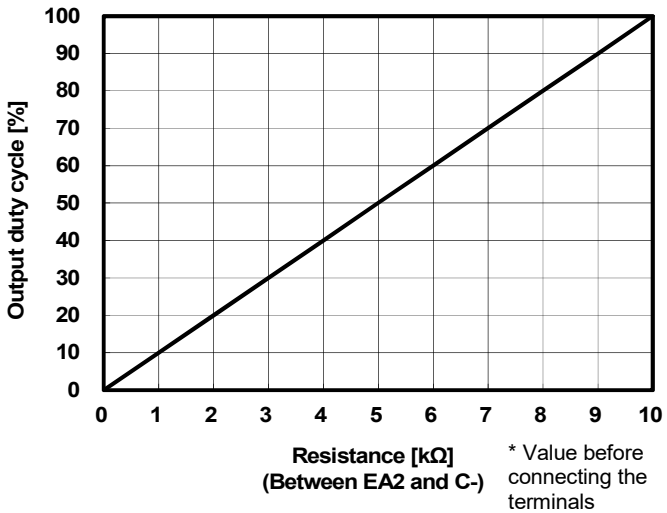
5-3-4. External Adjustment Control

(1) This function controls the output duty cycle using a variable resistor.
(2) Set the EA control function selector switch to ON to use the external adjustment control function.
(3) Connect a variable resistor only when using the external adjustment control function.
(4) A variable resistor is not included, so you will need to supply your own.
Variable resistor specifications: Total resistance = 10 kΩ, resistance taper = B

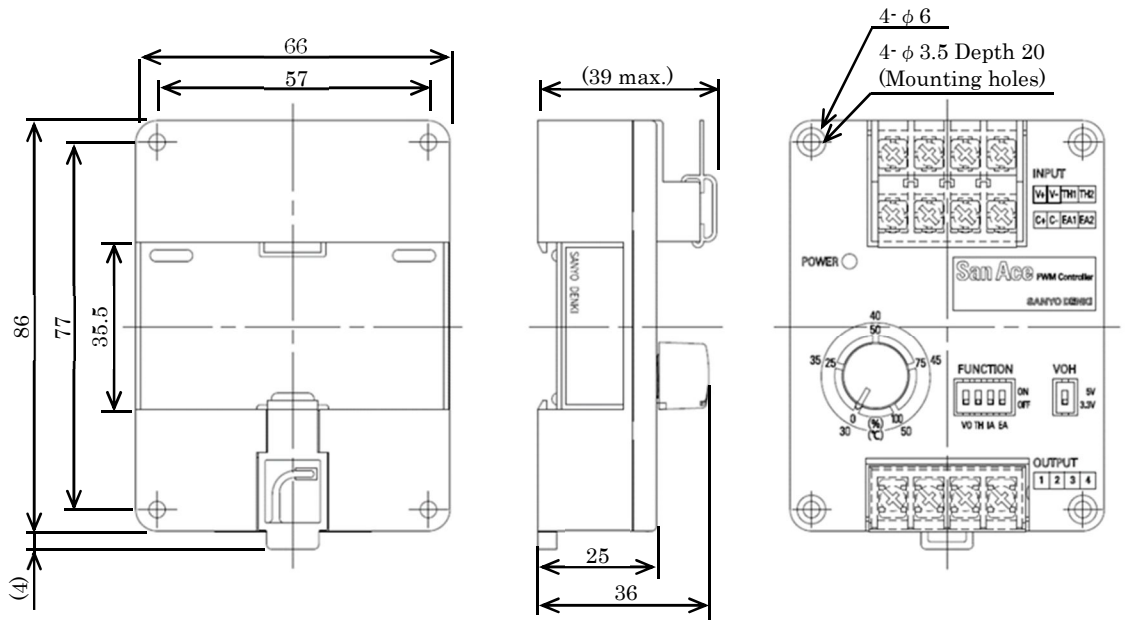
Connection Diagram for External Adjustment Control Function



Resistance - Output Duty Cycle Characteristics



6. Dimensions



7. Specifications

Item		Specifications		Remarks
		9PC8666X-S001 *	9PC8666X-S101 *	
Rated voltage		12/24/48 VDC		
Power consumption		0.2 W		Output terminals not connected
Operating voltage range		7 to 60 VDC		
Output terminals	Number of output terminals	4		Same PWM signal sent from 4 terminals
	Input/output current	20 mA or lower		Total from 4 terminals
	Output withstand voltage	6.5 V		
PWM signal output	High-level voltage (V_{OH})	3.3 V or 5 V		Output terminals not connected
	Low-level voltage (V_{OL})	0.4 V or lower		Output terminals not connected
	PWM frequency	25 kHz		Output terminals not connected
Insulation resistance		10 MΩ or higher using a 500 VDC insulation resistance tester		Between the power supply input terminal and case
Dielectric strength		500 VAC (50/60 Hz) for 1 minute		Between power supply input terminal and case
Mass		Approx. 110 g		
Mounting		DIN rail or M3 screws		
Material		Case: Plastics		
Operating temperature range		-20 to 70°C		Non-condensing
Storage temperature range		-30 to 70°C		Non-condensing
Humidity (operating and storage)		20 to 85% RH		Non-condensing

*The other last two digits shall be applied to the customized models.

8. CE, UKCA markings and Safety Standards

(1) CE, UKCA markings

・This product complies with the EMC regulations and bear the CE and UKCA markings.
Applicable Standards : EN 61000-6-4、EN 61000-6-2

・The length of cables connected to this product should be less than 3m to comply with the EMC regulations.

・The standards are for industrial environment. It does not comply with the EMC regulations in residential areas.

(2) Safety standards

This product is compliant with ;

$_{c}UL_{US}$: UL 508、CSA C22.2 No.14

TUV : EN 60950-1, EN62368-1

9. Product Warranty

(1) The warranty period is one year from the date of shipment.

(2) If the product fails within the warranty period under normal and proper use based on the contents of this instruction manual, the product will be repaired at no cost or be replaced with a new or equivalent product.

(3) The warranty does not cover repairs in the following cases:

- Failure or defects caused by improper handling such as dropping or applying an excessive force.
- Failure or defects caused by disassembling, altering, or repairing the product by the user.
- Failure or defects caused by external factors such as fires, natural disasters, pollution, salt damage, corrosive gas, and abnormal voltages.
- Failure or defects found not to be the responsibility of SANYO DENKI.

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Translated version of the original instructions