

1. Safety Precautions

- In order to ensure that this product is used safely, be sure that you read and understand the following precautions fully and use the product only as directed. Be sure to read these Safety Precautions carefully before installing, connecting, operating, maintaining, or inspecting this product. Follow all the precautions and directions given here.
- This product has been designed and manufactured for use as a device to be used in general industrial machinery, and may not be used as a standalone product.
- The product of our company (hereafter called the product) falls into the category of the products specified in the Attached List 1, Item 16 (Class 84, Item 14) of the Export Trade Control Ordinance. To export the product as an individual part or to export a product into which the product is assembled, the "Information Requirements" and "Objective Requirements" that the Ministry of Economy, Trade and Industry established based on the "Catchall Controls" must be studied for applicability. Based on information on applicability and specified requirements, appropriate export formalities must be performed.

In order to prevent any possible bodily injury or damage to property or equipment, the following precautions for ensuring safety are displayed according to the following two ranks of importance:

 Danger	Handling or using the product improperly and in disregard of the instructions with this mark might result in serious bodily injury or death.
 Warning	Handling or using the product improperly and in disregard of the instructions with this mark might result in bodily injury or physical amage.

※ Note: Items marked "Warning" might also result in serious bodily injury or death in some circumstances. Always follow the instructions for items marked "Danger".

Descriptions of the precautions to be taken to ensure safety are given below.

Danger

- If the product is used in medical appliances or other types of equipment that affect people's lives, sufficient safety-related evaluations and preparations must be made in advance, and the product or the type of equipment into which the product is assembled must be used on the user's own responsibility.
- If the product is used in types of equipment that have a strong social and public impact, sufficient prior evaluations and safety-related evaluations and preparations must be made, and the product or the type of equipment into which the product is assembled must be used on the user's own responsibility.
- If the product is used in an environment where there are vibrations, for example, in a car or aboard a ship, sufficient prior evaluations and safety-related evaluations and preparations must be made, and the product or the piece of equipment into which the product is assembled must be used on the user's own responsibility.
- Connect all wires properly and securely. Failure to do so might result in burns, fire, or exposure to electrical shock.
- If there are any grounding taps or wires, attach all grounds securely. Failure to do so might result in exposure to electrical shock.
- Never use in explosive atmosphere, as doing so might result in fires, burns, or bodily injury.
- Never operate with any live wires exposed, as doing so might result in electrical shock.
- Never allow any persons or objects to approach or come into contact with the rotor while in operation, as doing so might result in damage or personal injury.
- Turn off the power and stop using the product immediately if you notice any sparks, smoke, odd odors, sounds, or anything unusual during operation. Failure to do so might result in fire, burns, or electrical shock.
- Never allow the product to fall, topple over, or otherwise be subjected to excessive shocks when moving it, as doing so might result in product breakdown or substandard operation.
- The product should be handled only by personnel with sufficient training and knowledge and under the responsibility of the end user.
- Never attempt to disassemble, repair, or alter this product in any way, as doing so might result in fire, burns, or electrical shock.
- Dispose of the product as industrial waste. Please contact your local government office for further details about disposal.

Warning

Handling

- Installation, placement, connections, wiring, or relocation of the product should be performed by knowledgeable or correctly licensed personnel. Never perform such work while the product is live as this might lead to injury, electrical shock, burns, or fire.
- Do not use the fan if not fixed or stand in hand.
- Never allow yourself to come into contact with the ends of wires or plugs when measuring the insulation resistance or dielectric strength voltage. This might result in electrical shock.
- Never attempt to disassemble or alter this product in any way. Doing so might invalidate any warranties concerning the functions or performance of the product, and might also result in fire, burns, bodily injury, or electrical shock.

Instruction

- If the fan stops during operation, give proper consideration to the device for its protection.
- Never use the product at voltages, temperatures, or any other settings which exceed those given in the product specifications. This might result in substandard operation, breakdown, fire, bodily injury, or electrical shock.
- The fan may fail to operate properly if there is insufficient power capacity, because the starting current is several times larger than the rated current will flow at the moment of the voltage is supplied to the fan. Be sure to inquire about startup current levels for individual models.
- Do not control the speed of the fan by changing power voltage. It may cause fan failure.
- Start up all fans at the same possible timing if two or more fans which wind interferes with each other are installed in the device. If the fan is exposed to wind from other fans at start up, it may cause fan failure or the fan may not start up correctly.
- Never insert or remove any plug cords or connectors while the power is turned on. When inserting or removing plugs or connections, always be sure to first check that the power has been turned off and hold the housing of the plug or connector when doing so. Failure to do so might result in damage or exposure to electrical shock.
- Do not remove the lead wire of the DC fan from the frame hook. It may scratch and damage the surface of the lead wire.
- Never remove the product identification plate or install the product so that the identification cannot be seen after installation. This could result in the product being improperly used, and subsequently result in fires.
- Do not push the nameplate of the DC fan with strong force. The nameplate may break and touch the shaft.
- The product might become damaged if foreign objects or external forces are allowed to interfere with normal fan operation.
- Do not implement ON-OFF of power supply in negative line. That might cause damage of the fan.

Installation

- When fixing this product into place, be sure to take into consideration the product's weight, the vibrations generated during operation, and all other relevant factors. Failure to do so might cause the product or parts of it to fall out of position, resulting in bodily injury or malfunction of the product.
- Be sure to check the direction of installation (i.e., the fan), as failing to do so might result in bodily injury or mechanical breakdown.
- In order to ensure that the product operates properly, allow spaces for ventilation and take whatever steps necessary to prevent the entry of foreign objects. Failure to do so might result in bodily injury or mechanical breakdown.
- When fixing the fan with screws, make sure the screw and sheet metal do not deform the frame of the fan before operation. If the frame of the fan is deformed, mechanical failure may be occurred or specified performance may not be generated.
- When fixing the fan with screws, ensure the screwing torque. If the screwing torque is over the recommended torque, fan frame may be deformed or damaged. Use a ribbed frame when using screw for piercing. In order to prevent from loosening screw, please use plain washer and spring lock washer. For screwing torque of each fan type, contact SANYO DENKI or SANYO DENKI distributor.
- When fixing the fan with self-tapping screws, fan frame may be damaged.
- When excessive shock is attacked to fan, impeller may be protruded from the surface of fan frame. Make sure that impeller does not touch cover such as finger guard and mounting plate. Do not give excessive shock to fan to avoid fan failure and deteriorate of fan performance.

- Pulling or pinching the lead wires could result in damage to the wire, and you should avoid placing excessive stresses on these wires. The device should also be installed so that the lead wires are not allowed to come into contact with the rotor or blades. Failure to do so might result in damage or exposure to electrical shock.
- Take proper precautions against static electricity when making electrical connections. Failure to do so might cause the breakdown of the fan or device.
- Install a finger guard or other cover if there is any danger of fingers, hands or objects coming into contact with the rotor or blades. Failure to do so might result in bodily injury or mechanical breakdown.
- Install the finger guard, filter, and plate to the fan in the correct position while avoiding touching of the rotor blade. Avoiding this will prevent device failure.
Please use SANYO DENKI genuine finger guards and filter kits.

Installation of Centrifugal Fan

- The fan shall be fixed with screws. For screw size of each fan type, refer to drawing or catalog.
- Do not use the screws with length over the depth of mounting screw. Fan might not be fixed by damaging threaded hole. For depth of mounting screw of each fan type, refer to drawing or catalogue.
- When fixing the fan with screws, ensure the screwing torque. If the screwing torque is over the recommended torque, threaded holes may be damaged. Also, in order to prevent from loosing screw, please use plain washer and spring lock washer. For screwing torque of each fan type, contact SANYO DENKI or SANYO DENKI distributor.
- When excessive shock is given to fan, impeller may be protruded. Make sure that impeller does not touch cover such as inlet nozzle and finger guard, and mounting plate. For positional relation among the fan, inlet nozzle, and plate of each fan type, refer to drawing or catalog.
- Install the inlet nozzle, finger guard, and plate to the fan in the correct position while avoiding touching of the rotor blade. Avoiding this will prevent device failure. Please use SANYO DENKI genuine inlet nozzle.

Environment of usage

- The product must not be used or stored in a flammable or corrosive gas atmosphere, in a place where water or oil splashes (not applicable to Splash Proof or Oil Proof Fans), in a place where there is much dust or humidity, in a place where condensation occurs, in a place where the product is exposed to radioactive rays or is in direct sunlight, in a place where a salty sea breeze blows or seawater splashes, or in an environment where the product may be contaminated by such corrosive materials as sulfurous water, sulfurous volcanic ash, organic solvents, acidic chemicals, alkali chemicals, etc., such hazardous substances as nuclear fuel materials, etc. If it is used or stored in such places or environments, there is the possibility that a fire may occur, the product may malfunction or its performance may deteriorate.
- Avoid using or storing the product in locations and an environment where it could be constantly exposed to vibrations, strong shocks, magnetic or electromagnetic noise, and which the electromagnetic noise overlaps into power voltage. This might result in product breakdown or substandard operation.
- Avoid using or storing the product under environments where rapidly changed such as thermal and humidity change. This might result in product breakdown or deterioration.

Maintenance

- Maintenance and inspections should always be performed by personnel with sufficient training and knowledge. Failure to do so might result in fire, burns, bodily injury, or electrical shock.
- Never perform any maintenance or inspections while the product is in operation. Also note that the blades continue to rotate for some time immediately after operation ceases. You should always be sure to check to see that all rotating parts have come to a stop before beginning work.
- Never use gasoline, paint thinner, benzene, or any other organic solvents to clean the product as this could result in the deformation or substandard operation.

2. Operating precautions

Handling explanations and precautions for the use of fans are described below. Items without fan models are common contents. However, specifications may differ for some model numbers. Please check the catalog or drawing for the product specifications for the model number on the nameplate.

[1] Temperature conditions

- Operating temperature : -10°C - +70°C (Non condensing)
- Storage temperature : -30°C - +70°C (Non condensing)

※ Rapid change in temperature may cause condensation. Prevent condensation when storing. Condensation may affect lubrication performance and insulation.

[2] Power specifications

For the specification of rated voltage and voltage range, please check the catalog or drawing for the model number.

※ Use of voltage exceeding the specified range may lead to performance degradation, device failure, or fire hazards. Do not apply voltage that exceeds specifications to the fan.

※ An electronic circuit is used for the DC fan. For power supply, use power with ripple less than 5% with low line noise and surge to prevent electronic circuit trouble.

[3] Connection

The overview of the connection method is described below.

● AC fan

· Connection to power supply

Lead wire type : Connect AC power supply at specified voltage to lead wire of fan motor.

Plug cord type : Connect special plug cord to power supply terminal and connect AC power supply at specified voltage to plug cord wire.

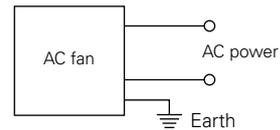
· Connection to earth ground

Be sure to connect to earth ground through earth tapping or earth terminal on the fan motor.

· Sensor wire

Aln the case of AC fan with sensor output, the fan has lead wire for the sensor. Confirm "Specification for AC fan sensor" in San Ace AC fan catalog regarding detail of sensor specification.

· Don't connect AC power supply to sensor lead wire. Fan should be broken.



● DC fan and blowers

The lead wire from the fan unit is connected to the DC power supply with specified voltage. The red wire is +, and the black or blue wire is - (GND) in principal.

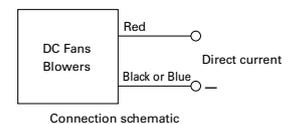
· Sensor wire

In the case of DC fan sensor output specification, a yellow lead wire is attached.

Connect this yellow lead wire to the receiving circuit of the sensor. Sensor specifications differ among each model number. Do not let electric currents above the default value flow through the lead wire of the sensor. The fan may become damaged. For details regarding sensor specifications, refer to the enclosed technical information "DC fan sensor specifications".

· Control line

In the case of the 2-speed fan, external thermistor type temperature variable speed fan or fans with PWM speed control function, a brown lead wire is attached. Use the brown lead wire for control. For details regarding connection methods, refer to the San Ace catalogue "fans with PWM speed control function" and technical information "the built-in / external type temperature adjustable speed fan".



● CPU cooler

The CPU cooler has lead terminal with connector at its tip. Apply specified DC power through the connector. Yellow wire(Pin No2) is +, black wire(Pin No1) is -(GND) in principal. Green wire(Pin No3) is pulse sensor.

※ Since DC fan, blower and CPU cooler have a function of "Reverse polarity protection", the motor doesn't break even if + and - lead wire are connected in reverse within specified operating voltage.

Specifications for DC fan and blower sensors

● Pulse sensor (Tach output type) example

Pulse sensor outputs two pulse waves per revolution of fan, and it is good to detect fan speed. Pulse sensors can be incorporated in all kinds of DC fans.

* Noise from inside the fan or from external devices may effect sensor output. For details, refer to specifications. The special IC that detects a pulse sensor and raises the alarm is available.

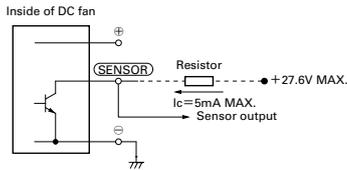
Typical standard model: 9G1212H101

Output circuit: Open collector

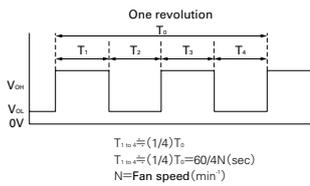
Specifications

$V_{CE} = +30V$ MAX. (For a 48V-rated fan: $V_{CE} = +60V$ MAX.)

$I_c = 10mA$ MAX. [$V_{OL} = V_{CE}$ (SAT) = 0.4V or less]



Output waveform (Need pull-up resistor)
In case of steady running



* If you want detailed specifications that apply when the rotor is locked, please contact SANYO DENKI.

● Locked rotor sensor (rotation/lock detection type) example

Locked rotor sensor outputs fan status signals. It is good to check whether the fan is running or locked

* Noise from inside the fan or from external devices may effect sensor output.

* Regarding details of the reverse logic and specifications of lock sensor output signals, please contact SANYO DENKI.

* Lock sensor can not be used in some models. Contact us for more information.

Typical standard model: 9G1212H1D01

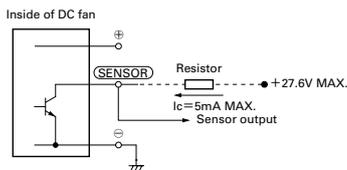
Output circuit: Open collector

Specifications

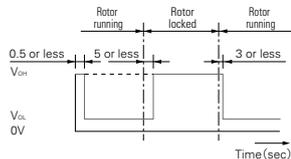
$V_{CE} = +27.6V$ MAX. (For a 48V fan $V_{CE} = +60V$ MAX.)

$I_c = 5mA$ MAX. [$V_{OL} = V_{CE}$ (SAT) = 0.6V or less]

(For a 48V fan: V_{CE} (SAT) = 0.4V or less)



Output waveform (Need pull-up resistor)



Note: The output is completely at V_{OL} with 0.5 seconds or less after power-up.

Tightening Torque

This shows the recommended values for the tightening torque when installing the fans. If the tightening torque is higher than the recommended values, the fan can be deformed or damaged. Use care when tightening. Also, be sure to always use a fan with a ribbed structure when using screws to pass through and secure the fan.

Recommended screw torques

· DC fan and blower

Fans : 0.44N · m (4.5kgf · cm) or less (with M3 screws)

(Applies to fan motors of 52mm×52mm MAX.)

Fans : 0.78N · m (8kgf · cm) or less (with M4 screws)

(Applies to fan motors of 60mm×60mm MAX.)

Fans : 0.98N · m (10kgf · cm) or less (with M4 screws)($\phi 200mm$)

Fans : 0.75N · m (7.35kgf · cm) or less (with M4 screws)($\phi 220mm$)

· AC fan

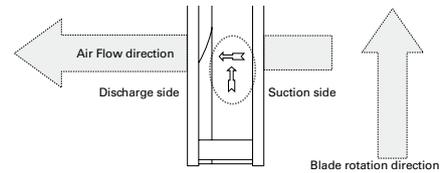
Fans : 0.44N · m (4.5kgf · cm) MAX. (with M3 screws)

Fans : 0.78N · m (8kgf · cm) MAX. (with M4 screws)

(160mm×160mm, $\phi 172mm$)

Installation

There are no limitations on the installation direction of fans or blowers. Fans have symbols on the fan indicating the airflow direction and blade rotation direction. When installing, use these symbols to check the airflow direction.



Symbols indicating the fan airflow direction and blade rotation direction

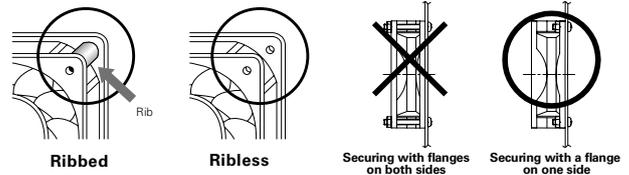
Comparison of ribbed and ribless structures

Regarding plastic frame, we have a option ribbed and ribless about mounting. Please use preferred type up to your application. Please use ribbed fan in case that you hook fan up clamping either side fan mounting hole target. (According to the model, only models with or without ribs are available.)

* Use a fan with a rib structure when using a screw for piercing.

* The plastic frame models of DC fans are classified into ribbed models and ribless models based on the shape of the installation section of the frame.

· When securing screws to ribless plastic frame models, use a flange to secure on one side.



Handling precautions

The fan motor is equipped with a precision ball bearing. Therefore, please handle the motors carefully in order not to shock the bearings.

3. Burnout protective function

When the fan blade is constrained, the line surge causes the winding temperature of the fan to rise and may lead to performance degradation, device failure, or fire hazards.

To prevent such accidents from occurring, our company's fans feature a "burnout protective function". See the catalog for information regarding the types of protective functions.

● The burnout protective function of the AC fan

· Impedance protection

This system is used for shading coil-type fans. When the blades are restricted, the current is reduced by the impedance of the coil itself to prevent a temperature rise in the coil. However, if the applied voltage exceeds the specification range, an overcurrent can occur and result in overheating, and so care needs to be taken.

· Thermal protection

This system is used for condenser phase-type fans. A temperature sensor is incorporated in the coil so that if the temperature exceeds the specification temperature, the current is cut off to prevent overheating of the coil.

● The burnout protective function of the DC fan and blower

- Electric current cutoff method

When the fan blade is constrained, the electric current of the winding is periodically blocked, and the temperature rise of the winding is suppressed. When the constraint is released, it restarts automatically. (However, the San Ace 200 109E20***** needs power activation to restart.)

4. Precautions regarding dropping and rollover

Avoid impact of dropping or rollover to the fan. Precision ball bearings are used for the bearing of the fan.

When an impact is added, the bearing suffers damage, and may lead to the degradation of product performance, such as extraordinary noise and shortening of life expectancy. Follow the next conditions with extra caution when handling transportation and installation.

- The dropping limitation of the product stand-alone : The maximum limit of dropping height is 3 cm.
- The external force limitation of the product stand-alone : A weight of 100g dropped from a height of 3 cm above the product stand-alone is the maximum limit. A force of 5 kgf to the fan blade is the maximum limit.
- The dropping limitation in a packaged condition : The maximum limit of dropping height is 30 cm.

5. Other precautions

- Regarding CPU cooler that low thermal resistance pad (Thermal Pad) is attached, take care of handling in order not to scratch it. If the low thermal resistance pad scratches, there is a possibility that it doesn't have enough cooling performance.
- The specification value of the maximum air volume and maximum static pressure that is described in the catalog is a standard value at normal temperature. Please consider enough margins when selecting a fan.
- When the fan is used in the vicinity of a power switching circuit, refer to San Ace catalogue technical material "Cautions for use of a cooling fan in the vicinity of a power switching circuit".

6. Options

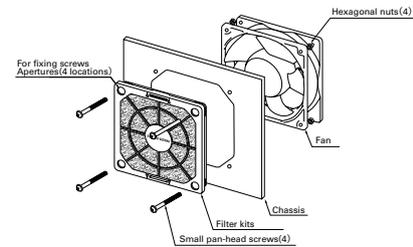
The following options are available. Please utilize if necessary.

[1] The finger guard

This is an option that prevents foreign objects, such as fingers, to make contact with the blade of the fan while in operation. Fixes with the mounting hole of the frame of the fan using a screw. Steel types or resin (plastic) types are available. In addition, suction side and discharge side types are available. In the case of installation, please be careful of the direction of airflow. Please refer to the catalog for details of model numbers and other descriptions, and apply the correct combination.

[2] Filter kit

- Filter kit is one of the options to keep air in the chassis clean filtering dust in external atmosphere when pulling-air cooling is implemented. The filter kit is hooked up through mounting hole of fan frame with screw as well as finger guard. Some performances (airflow & static pressure) of the fan motor decreases when filter kit is hooked up.
- This Filter Kit is composed of 3 components, including a guard, a filter and a cover. It is delivered as a finished product at delivery, saving assembly time when mounting. It can be mounted by inserting a screw in the apertures of the cover.
- The filter and cover can be easily removed from the guard with one touch. There is no need for fan removal when undertaking maintenance.
- Operating temperature limit is between -10°C to $+60^{\circ}\text{C}$. (non condensing)
- The filter will deteriorate with age, and the level of deterioration will vary upon usage conditions. Please be aware that the filter has a greater tendency to deteriorate under high temperature and humidity. For long-term storage, please store under the temperature range of 10°C to 30°C , humidity range of 20% to 65%. Usage and storage period is approximately 2 years.
- Cooling ability decreases with filter contamination due to clogging. Filter replacement is recommended approximately every six months of usage. Please replace the filter if deterioration or clogging is seen at inspection.
- When replacing the filter, please use genuine SANYO DENKI filters.
- Do not water-wash the filter.
- Avoid use and storage under high temperature or humidity, direct sunlight or exposure to ultraviolet light, or in corrosive gas.
- No nuts or screws for use in attachment included.



[3] Plug cord

- Plug cord is one of the options to supply AC power to AC fan that power supply input is terminal type. Plug shall be inserted to AC fan and specified power shall be applied to code. There is a lineup of plug cord with overseas safety standard as well. Please refer to the San Ace AC fan catalog for details of model numbers and other descriptions, and apply the correct combination.

[4] Thermistor

- Thermistor is one of the options for thermally speed control fan with external thermistor type. Please refer to the San Ace DC fan catalog for details.