# San Ace Cooling Fan Manual

## 1. Safety Precautions

- To ensure that this fan 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 fan. Follow all the precautions and directions given here.
- The fan has been designed and manufactured for built-in use in general industrial machinery, and might not be used otherwise.
- The fan falls into the Category 16 (Class 84, Item 14) of the Appended Table 1 of the Export Trade Control Order. When exporting the fan 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 fan, treat it as industrial waste. For instructions on proper disposal methods, please contact local government authorities.
- When using the fan 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 fan.

**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**.'

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

### ⚠ Warning

- When using the fan 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 fan while use in such equipment.
- Ensure that wiring is done correctly. Failure to do so might result in fire, burns, or electrical shock.
- If there are any grounding taps or wires, ground them securely. Failure to do so might result in electric shock.
- Never use in explosive atmospheres, as doing so might result in fires, burns, or bodily injury.
- Do not operate the fan with live parts exposed. Doing so might result in electric shock.
- Never allow any persons or objects to approach or come into contact with the fan's rotor while in operation, as doing so might result in damage or personal injury.
- Turn off the power and stop using the fan 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 fan to fall, topple over, or be subjected to excessive shocks when moving it. Doing so might result in product failure or performance deterioration.
- The fan 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 fan in any way, as doing so might result in electrical shock, fire, or bodily injury.

### ⚠ Caution

#### Handling

- Installation, mounting, connections, wiring, and relocation of the fan 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.
- Do not operate the fan if it is not secured, nor while held in hand.
- Never allow yourself to come into contact with the fan when measuring insulation resistance or dielectric strength. There is danger of electric shock.
- Never attempt to disassemble or alter the fan in any way. Doing so might not only result in substandard performance, but also fire, burns, bodily injury, or electrical shock.

#### Instruction

- Take protective measures for the equipment in which the fan is embedded in case the fan stops, malfunctions, or fails during operation.
- Never use the fan 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.
- Any specifications not listed in this document, such as fan or sensor behaviors after the fan power is turned off, will not be covered by our warranty. Please contact us in advance if you need to make any special arrangements for the specifications not listed in the Product Specification.
- Using a power supply with insufficient capacity might result in faulty fan operation because an inrush current several times larger than the rated current will flow at the moment of fan startup. Be sure to use a power supply with sufficient capacity.
- Start all fans at the same time when two or more fans are positioned in equipment in a way that creates wind interference. If the fan is exposed to wind from other fans at startup, it might result in fan failure or faulty fan startup. Also, evaluate the influence to individual fans in advance and use them at your own discretion.
- Never connect or disconnect lead wires, plug cords, or connectors while the power is on. Be sure to connect or disconnect them while holding the frame only after power-off. Otherwise, it might result in fan damage or electrical shock.
- Do not remove the lead wire of the fan from the frame hook. Doing so might scratch and damage the surface of the lead wire.
- Do not remove the nameplate. Doing so might result in fan failure or electrical shock.
- Do not press down hard on the nameplate of the fan. Otherwise, the nameplate might break or come into contact with the shaft, hindering proper operation.
- The fan might be damaged or burned out if foreign objects or external forces hinder normal fan operation.
- Do not use the power supply's PWM to control the speed of the fan. Doing so might result in fan malfunction.
- Do not turn the power on or off on the negative power line. Doing so might damage the fan.
- Turning the power on and off frequently or turning the power back on before the fan comes to a complete stop might result in fan failure or damage. Before conducting such operations, fully evaluate the equipment in which the fan is embedded.
- The IP ratings of Splash Proof Fans apply only to the live electric parts and motor coils of the fan in accordance with IEC 60529. The protection does not apply to the non-live parts of the fan. If the fan is to be used for a long period of time in an environment subject to dust, water, or condensation, take measures required for the operating environment.
- Do not wash the fan during maintenance of equipment. Doing so might result in failure of the fan.
- For DC fans, even if the positive and negative lead wires of the power supply are connected in reverse, the fan will not be affected by the motor protection function. However, when wiring fans with sensors or PWM speed control function, connecting positive and negative leads in reverse may damage the fans.

#### Installation (Common to All Fans)

- Install and secure the fan properly with its weight and vibration during operation taken into account. Failure to do so might result in bodily injury or equipment failure due to the fan or its parts falling off.
- Ensure that the fan is installed in the right orientation. Failure to do so might result in bodily injury or equipment failure.
- For the fan to perform to its full capacity, secure air vents and take measures to prevent foreign objects from entering the fan. Failure to do so might result in bodily injury or fan failure.
- Do not subject the fan to excessive shock. Doing so might result in failure or substandard performance of the fan.
- Pulling or pinching lead wires might result in damage and stress to the wire. Also, make connections so that the lead wires do not come into contact with the rotating blades. Failure to do so might result in equipment failure or electrical shock.
- Take proper precautions against static electricity when wiring. Failure to do so might cause failure of the fan or equipment.
- Take safety measures such as installing a finger guard and displaying a warning symbol if there is any danger of fingers or objects coming into contact with the rotating blades. Failure to do so might result in bodily injury or fan failure.
- When installing an inlet nozzle, finger guard, filter, or base plate to the fan, ensure that they are positioned correctly according to the Product Specification, catalog, or other specification documents so that they do not come into contact with the rotating blades. Also, use the fan only after checking that the rotating blades do not come into contact with anything. Otherwise, it might result in equipment failure.
- Please use only genuine SANYO DENKI inlet nozzles and finger guards.
- Make connections correctly in accordance with the information of the Product Specification, catalog, or the label on the fan. Failure to do so might result in equipment failure or the malfunction, failure, or performance degradation of the fan.

#### Installation (Axial Fan and Blower)

- When mounting the fan with screws, make sure that the screw and base plate will not deform the frame of the fan before mounting. A deformed frame might result in failure or substandard performance of the fan.
- When mounting the fan with screws, ensure that the screw tightening torque is correct. If the tightening torque exceeds the recommended torque, the fan frame might be deformed or damaged. Choose a ribbed frame model if mounting fans with plastic frames through both sides of the frame with throughscrews. To prevent loose screws, use plain washers or spring washers. For the screwing torque of each fan type, contact SANYO DENKI or a SANYO DENKI distributor.
- Note that mounting the fan with self-tapping screws might damage the fan frame. If using self-tapping screws, be sure to choose the screw that we recommend and conduct evaluations before using it.

#### Installation (Centrifugal Fan)

- The fan shall be mounted with screws. For the screw size for each fan model, see the Product Specification or catalog.
- Choose screws with the right length taking into account the fan mounting hole depth and base plate thickness. Failure to do so might result in stripped screw holes and improper fan mounting. For the mounting hole depth of each fan model, see the Product

Specification or catalog.
· Ensure that the screw tightening torque is correct. If the tightening torque exceeds the recommended torque, the screw hole might be deformed or damaged. Also, to prevent loose screws, use plain washers and spring washers. For the tightening torque for each fan model, see the Product Specification or catalog.
· For the inlet nozzle and base plate installation dimensions for each fan model, see the Product Specification or catalog.

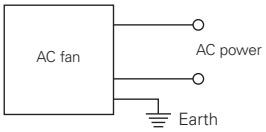
**Operating Environments**
· Avoid using or storing the fan in the following environments. Otherwise, it might result in fire or the failure or performance degradation of the fan. In environments where flammable or corrosive gas is present, where water or oil splashes, where there is much dust or humidity, where condensation occurs, where exposed to radioactive rays or direct sunlight, where a salty sea breeze blows or seawater splashes, where the fan 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 fan should be stored in packaging.
· Ensure that the fan 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.

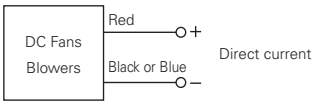
**Maintenance**
· Maintenance and inspections of the fan should be done by technically qualified personnel or someone with sufficient expertise; the personnel shall be assigned at your own discretion. Otherwise, it might result in fire, burns, bodily injury, or electrical shock.
· Never perform any maintenance or inspections while the fan is in operation. Also note that the blades continue to rotate for some time immediately after operation ceases. Always confirm that all rotating parts have come to a stop before beginning work. Failure to do so might result in bodily injury.
· Never use gasoline, paint thinner, benzene, or any other organic solvents to clean the fan. Also, avoid placing excessive stresses on the fan. Otherwise, it might result in product deformation or performance degradation.

## 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:
-20°C to +70°C / -20°C to +60°C / -10°C to +70°C / -10°C to +60°C
(Varies for each model / Non condensing)
Storage temperature:
-20°C to +70°C / -30°C to +70°C
(Varies for each model / 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 and ACDC 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 lead wire
AC Fans equipped with a sensor come with a sensor lead wire. For details on sensor specifications, refer to the San Ace DC/ACDC/AC Fan Catalog's technical material section entitled "Specifications for AC Fan Sensors" or the Product Specification document.
· 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 wire
PWM fans come with a brown lead wire. Use the brown lead wire for control connections. For detailed information on connections, refer to the San Ace DC/ACDC/AC Fan Catalog's technical material section entitled "Fans with PWM Control."

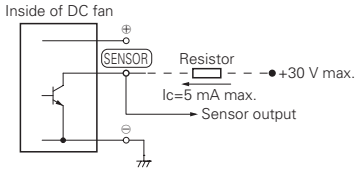


Connection schematic

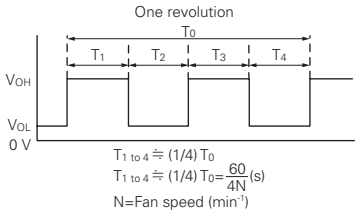
**Specifications for DC fan and blower sensors**
● Pulse sensor (Tach output type) example
Pulse sensor outputs two pulse waves per revolution of fan, and it is good to detect fan speed. Pulse sensors can be incorporated in all kinds of DC fans.
Noise from inside the fan or from external devices may effect sensor output. Contact us for more information.

Typical standard model: 9RA1212P1K001
(As the following specifications differ by model no. contact us for further information.)
**Output circuit:** Open collector

Specifications
$V_{CE}$=+30 V max.
Ic=5 mA max. [$V_{OL}$=$V_{CE}$ (SAT) =0.6 V or less]



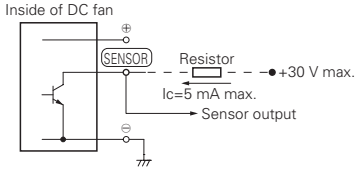

Output waveform
(Need pull-up resistor)
In case of steady running If you want detailed specifications that apply when the rotor is locked, please contact SANYO DENKI.



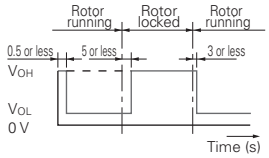

● Locked rotor sensor (rotation / lock detection type) example
Locked rotor sensor outputs fan status signals. It is good to check whether the fan is running or locked
Noise from inside the fan or from external devices may effect sensor output.
Regarding details of the reverse logic and specifications 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: 9RA1212K1D001
(As the following specifications differ by model no. contact us for further information.)
**Output circuit:** Open collector

Specifications
$V_{CE}$=+30 V max.
Ic=5 mA max. [$V_{OL}$=$V_{CE}$ (SAT)=0.6 V or less]



Output waveform
(Need pull-up resistor)
Note: The output is completely at Vol with 0.5 s or less after power-up.




**Recommended screw torque**

This shows the recommended values for the screw 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 securing by screws with both flanges.

Recommended screw torques
DC fan

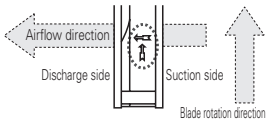
| Fan mounting hole diameter [mm] | Nominal screw diameter | Recommended screw torque |
|---|---|---|
| ø3.5 ø3.7 | M3 | 0.44 N·m max. |
| ø4.3, ø4.5 | M4 | 0.78 N·m max. |
| ø4.3, ø4.5 | M4 | 0.98 N·m max. (ø172 × 51 mm, ø172 × 150 × 51 mm, ø200 × 70 mm) |

AC fan

| Fan mounting hole diameter [mm] | Nominal screw diameter | Recommended screw torque |
|---|---|---|
| ø3.5, ø3.7 | M3 | 0.44 N·m max. |
| ø4.3 | M4 | 0.58 N·m max. (120 × 120 mm max.) |
| ø4.3, ø4.5 | M4 | 0.78 N·m max. (ACDC fan, ø172 mm) |
| ø5.5 | M4, M5 | 0.78 N·m max. (160 × 160 mm) |

**Installation**

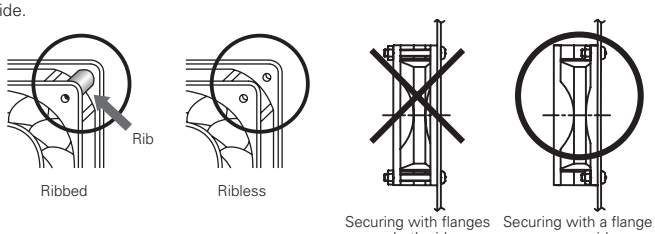
There are no limitations on the installation direction of fans or blowers.
Fans have symbols on the fan indicating the airflow direction and blade rotation direction. When installing, use these symbols to check the airflow direction.



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.
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. Overheating protection function

If the fan blades are restricted, an overcurrent occurs and leads to a rise in the fan coil temperature. This can result in reduced performance, damage, or a fire. To prevent this from occurring, SANYO DENKI's fans incorporate an overheating protection function. Refer to the catalog for the types of protection functions.

● The burnout protective function of the AC fan

· Impedance protection (60mm sq. 80mm sq. 92mm sq. 120mm sq.)
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 (160mm sq. ø172mm)
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, blower and ACDC fan

· Current cutoff system
If the fan blades are restricted, the coil current is cut off at regular cycles to prevent overheating of the coil. When the hindrance is removed, the fan restarts automatically.

## 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 100 g 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

· 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 using a fan in the vicinity of a power switching circuit, refer to the San Ace DC/ACDC/AC Fan Catalog's technical material section entitled "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.
All-in-one fan packs with a fan and finger guard are available upon request.
Only this model includes mounting screws and nuts for assembling.

[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] Resin filter kit
· A filter kit keeps air in the chassis clean by filtering dust from external air when using suction cooling. The filter kit is attached with screws through the fan frame mounting holes along with a finger guard. Some performance values (airflow & static pressure) of the fan motor degrade when a filter kit is attached.
· Resin filter kits are composed of 3 components: a guard, a filter, and a cover. It is delivered as a finished product, decreasing assembly time for mounting. It can be mounted by inserting screws through the apertures of the cover.
· The filter and cover can easily be attached or removed from the guard. There is no need for fan removal when performing filter maintenance.
· Ensure fan is disconnected from power source before exchanging filter.
· Operating temperature limit is between -10°C to +60°C. (non condensing)
· The filter will deteriorate with age, and the level of deterioration will vary with usage conditions. Please be aware that the filter has a greater tendency to deteriorate under high temperatures and humidity. For long-term storage, please store within a temperature range of +10°C to +30°C, and a humidity range of 20% to 65%. Product lifespan is two years, including time in storage.
· Cooling ability decreases with filter contamination from clogging. Filter replacement is recommended after approximately six months of usage. Replace the filter earlier if deterioration or clogging is observed during inspection.
· When replacing the filter, use only genuine SANYO DENKI filters.
· Do not water-wash the filter.
· Avoid use and storage in high temperature or humid conditions, under direct sunlight or exposure to ultraviolet light, or in the presence of corrosive gas.