

Fan Instruction Manual

Axial fan with adjustable-at-rest blades

快流®

(KAIRYU / smooth flow)

[Instruction manual for V-belt-drive type]



 **Showa Denki**

Fan Instruction Manual

Introduction

Thank you for purchasing a Showa Denki KAIRYU fan. As a specialized manufacturer of fans and dust collectors, Showa Denki works diligently to manufacture products with our flow technology and rotary equipment technology at their cores. The KAIRYU series are high-performance, low-energy-consumption axial fans based on these core technologies. In order to obtain the best performance from this product and use it safely for a long time without problems, please handle and operate this product according to this instruction manual. Store this instruction manual carefully for future reference.



Applicable types for this instruction manual

This manual provides instructions on how to set up and use the following fan types:

Fan type:	KAIRYU series (Axial flow fan with adjustable-at-rest blades)
Fan models:	A□V□□-□□□ The characters in □ will vary according to the fan specifications, including size, compatible motor, performance, etc. For details, refer to p. 5 "Types and meanings of model indications".
Fan drive system:	V-belt-drive type

Marks used in this manual

The marks used in this manual have the following meaning:

 Warning	Indicates a point, action, etc. for which improper handling may result in death or serious injury.
 Caution	Indicates a point, action, etc. for which improper handling may result in injury or damage to property.



indicates a prohibited action.



indicates a point requiring care.



indicates a compulsory action.

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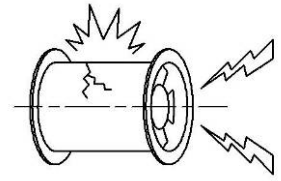
1 Safety precautions

Warning



Intake of dangerous gases or installation in dangerous locations is prohibited.

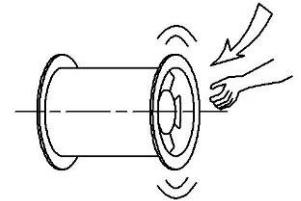
This product does not have an explosion-proof structure. Intake of flammable gases or operation in an explosive atmosphere may result in an explosion caused by sparks due to static electricity, electrical devices, metal contact, etc.



Attach metal screens to the inlets and outlets of fans and ducts.

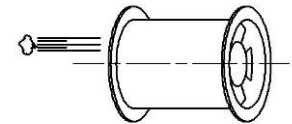
If ducts are not attached to the inlets and outlets of fans or if the ends of the attached ducts are left open, be sure to attach a screen to cover the opening.

If no screen is attached, parts of a person's body or objects may get sucked in or sucked-in objects may be blown out, leading to a serious accident.



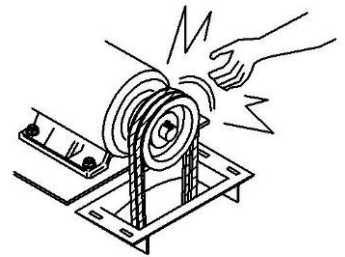
Do not place your face close to the outlet.

Small debris, etc. sucked in by the fan may fly out of the outlet at high speed. If such objects get in the eye, it may result in loss of eyesight. Because of this, do not place your face close to the outlet.



Never operate without guard.

If the fan is operated with the belt guard removed, hands or clothes may get caught and pulled in, resulting in physical injury.



When hanging, be sure to use the holes labeled "つり位置" (Hang here).

Hanging by other parts may result in deformation of the fan, or cause an accident by tipping over or falling down.

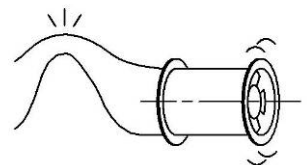


Do not increase speed using an inverter, etc.

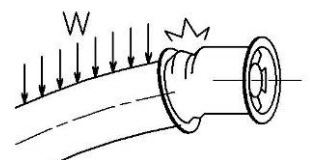
Doing so increases the centrifugal force and air flow pressure force on the rotator, which may cause the impeller to break, burnout of the motor due to excessive loads, etc.

Caution

When planning ductwork layout, plan it so that resistance is extremely low and air can flow smoothly through the ducts. If fan is operated with duct shaped so that it is blocked, it may result in stall operation. Abnormal vibrations due to stall operation may cause impeller blades to be broken.

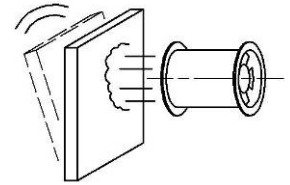


Do not transfer the load of the ductwork to the fan. Doing so may result in deformation of the fan, causing the rotator to come in contact with the housing, resulting in a fire or breakage.





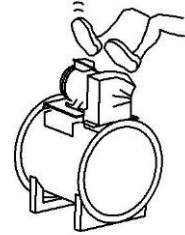
Be sure that there are no objects which may tip over or fall due to vibrations or air flow force in the area around fans or ducts. Such objects may result in an accident in such cases.



Wiring of the motor should be performed according to Electrical Installation Technology Standards and Internal Wiring Standards by a licensed electrician. (Also refer to the instruction manual of the motor.)



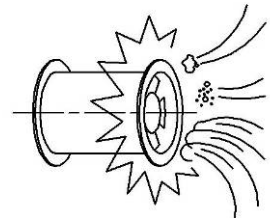
Before performing test operation, make sure that there are no materials, bolts, nuts, tools, etc. left behind after installation inside the connected ducts or casing or near the inlet or outlet. If such objects are left behind, they may be sucked in or blown out during test operation, resulting in damage.



Do not climb or stand on the fan. Doing so may result in deformation and damage of the fan or falling off of the worker.

Intake of gases at temperatures outside the specified temperature range may result in failure of the motor or wiring section or in breakage of the impeller.

(Temperature range: -10 to 40°C; Relative humidity: 90% or less)



Solid objects, dust, or liquids cannot be sucked in. Doing so may result in damage.



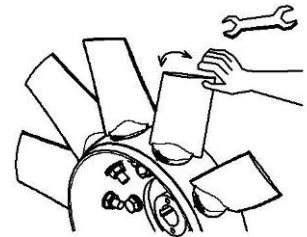
When speed is reduced using an inverter, etc., vibration amplification or sound may occur at specific frequencies (rotation speeds) due to resonance between the fan body, surrounding ductwork, and mounting plates. If this occurs, avoid operation at those frequencies. Shipment inspection* of the fan is performed only at the rated rotation speed. Operation at other speeds (frequencies) is not guaranteed.

* Operation testing cannot be performed for non-standard products or parts in some cases.



Cautions regarding adjustable-at-rest impeller blades

Although with this fan the angle at which the blades are attached to the impeller can be changed to achieve other performance characteristics, it is also possible that problems may occur due to the following factors if the blade angle is changed by the customer. There is a danger of damage. The blade attachment angles are set at the factory to meet the performance requirements of customers; if the blade angle must be changed later, please consult our company's service personnel. (Service charges will apply.) For details, please contact your dealer or sales office.



Factors causing problems due to angle change

- Power may be increased, causing the motor to become overloaded and burned out.
- Changes in the attachment positions of blades may make the impeller unbalanced.
- If the angle change is non-uniform, abnormal flow may occur, causing malfunctions due to abnormal noise or vibration.
- If nut tightening torque is insufficient, the nut may become loose, allowing the blade to rattle and causing a malfunction.



Precautions for the use of an inverter to operate the blower.

- 1) The standard motor may not be used for the operation in some cases as shown below.
 - In the case of no margin for temperature rise in the motor
- 2) At factory shipment, the setting of a commercial inverter is not suitable for the blower. Change the following values at least.
 - Base frequency: Adjust to the rated frequency of the blower (50 Hz or 60 Hz).
 - Highest frequency: Adjust to the rated frequency of the blower.
 - Maximum output voltage: Adjust to the rated voltage of the motor.
 - Upper-limit frequency: Highest frequency: Adjust to the rated frequency of the blower.
 - Lower-limit frequency: 25 to 30 Hz (based on the cooling characteristics of the motor).
 - V/f characteristics: Change to square reduction torque.
 - Acceleration time: 30 to 60 sec. or more If the acceleration time is short, an over-current error may occur.
 - Deceleration time: 30 to 60 sec. or more If the deceleration time is short, a regenerative current error may occur.
- 3) Other precautions
 - Vibrations of components (belt, casing, etc.) making up the blower may increase at a specific frequency. If the increase in vibration cannot be eliminated even after other set values are changed, a resonance point may be causing it. In such a case, set the jump frequency to prevent the increase in frequency.
 - If the blower is installed on a vibration isolation table (rubber, spring, etc.), a decrease in frequency may become a resonance frequency. In such a case, set the jump frequency to prevent this symptom (otherwise, the blower and motor are individually affected).
 - If the carrier frequency is set higher, current leakage may increase, and the earth leakage breaker may be activated.
 - Do not use the inverter output power for applications other than electric motors.

2 Product overview

2.1 Types and meanings of model indications

The types and meanings of model indications for standard specifications are shown in the table below. The model indication is shown on the product nameplate on the side of the fan body (casing).

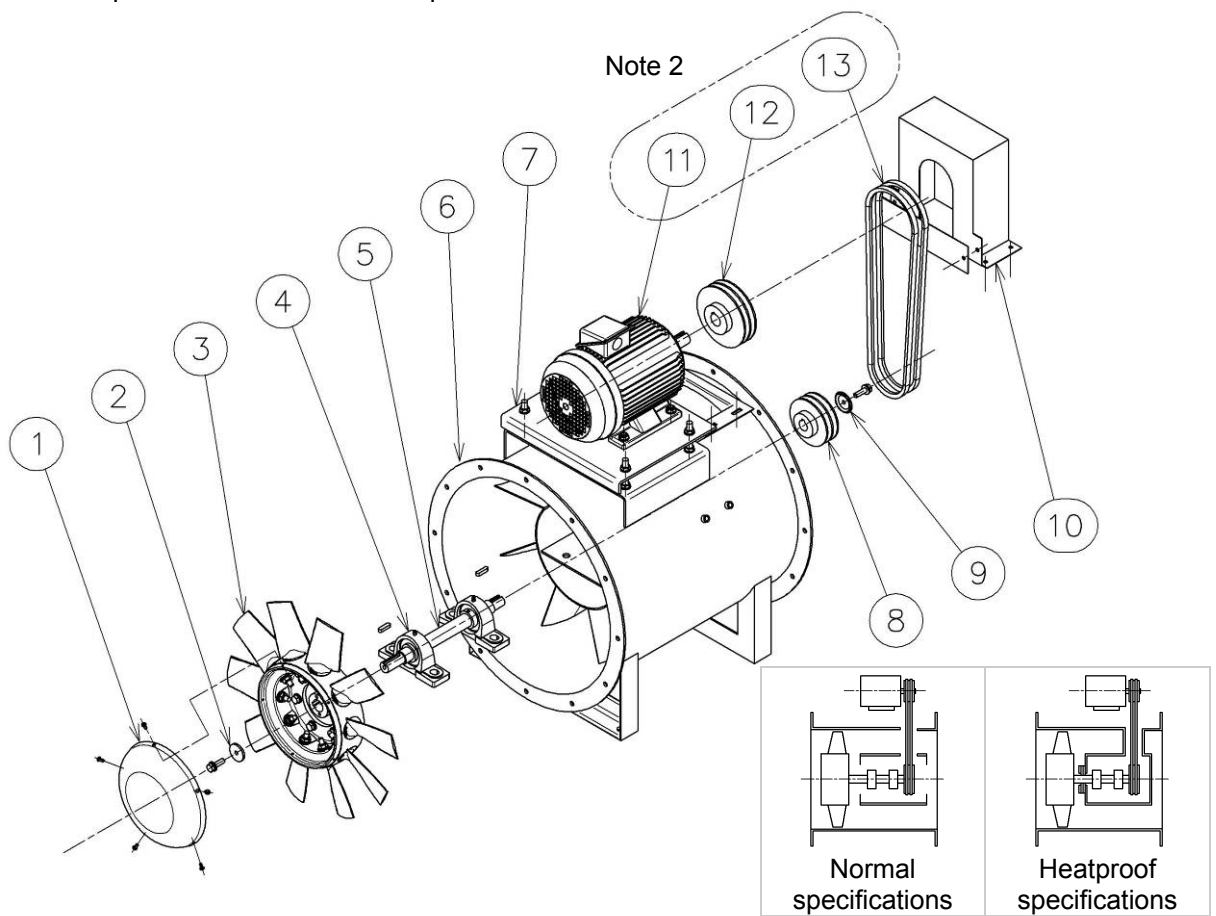
	1	2	3	4	5	6	7	8	9		
Indication example	A	1	D	6	E	-	4	1	2		
Indication meaning	Classification	Type (Motor rotation speed)	Drive system	Casing diameter (mm) / 100	Motor output (kW)	-	Performance number (Blade angle number)	Voltage (V)	Frequency (Hz)		
Indication type/contents	A Axial fan	1 Low-noise type (low-speed specifications)	D Motor direct drive motor type	3	300	A	0.4	1 2 3 4 5 6 7 Large → Air volume → Small	1	200	1 50
		2 High-pressure type (high-speed specifications)		V V-belt drive type	4	400	B		0.75	2	
5	500		C		1.5	3	346				
6	630		D		2.2	4	380				
7	710		E		3.7	5	400		2 60		
8	800	F	5.5	6	460						
9	900	G	7.5	7							
10	1000	H	11								
				I	15						
				J	18.5						
				K	22						
				L	30						
				M	37						
				N	45						

The combination of type (motor rotation speed) indication and motor pole count are shown below.

Indication	Motor pole count	
	Small type; Diameter: ≤7	Large type; Diameter >7
1	4P	6P
2	2P	4P

2.2 Product structure and names of parts

2.2.1 Exploded structural view and parts list



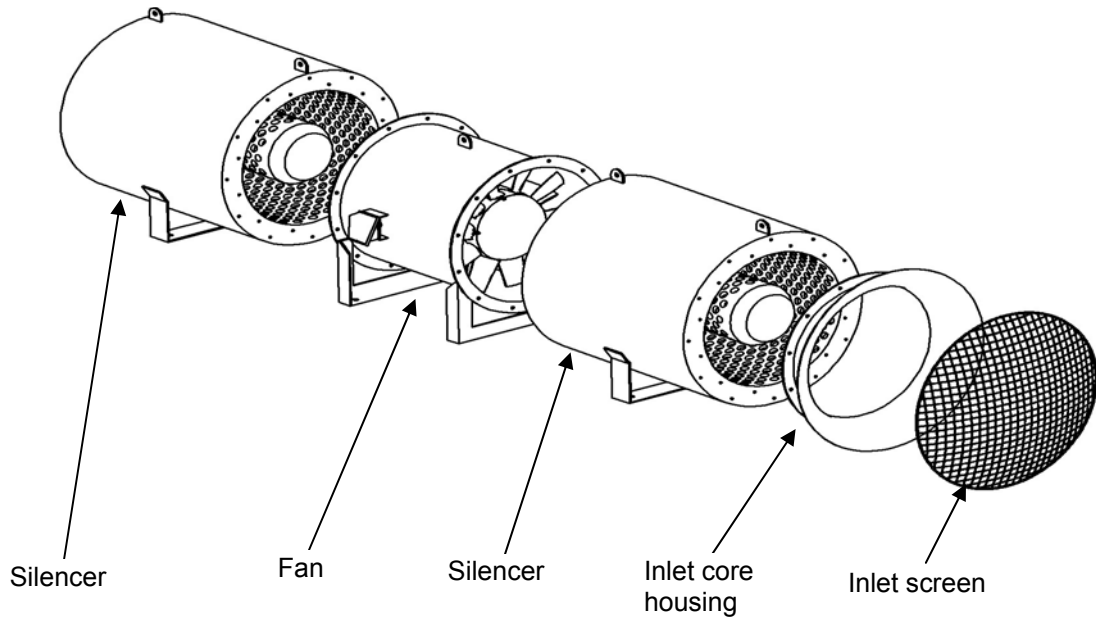
Structure is different depending on temperature specifications.

No.	Part name	Material	No.	Part name	Material
1	End cover	A1050P	8	Fan pulley	FC200
2	Holder	SS400, SPHC, etc.	9	Holder	SS400, SPHC, etc.
3	Impeller	AC4A, AC4C, FC200, etc.	10	Belt guard	SS400, SPHC, etc.
4	Bearings	SUJ2, etc.	11	Motor	-
5	Shaft	S45C	12	Motor pulley	FC200
6	Casing	SS400, SPHC, etc.	13	V-belt	Rubber
7	Motor base	SS400, SPHC, etc.			

Note 1: The diagram above is a typical example of a normal specification product. Actual product may be different depending on the product.

Note 2: For fan-only products (without motor), parts 11 to 13 are not supplied.

2.2.2 Options



- Silencer:** Reduces drive noise by approximately 10dB*.
- Inlet core housing:** When using fan with inlet side open, this core should be attached to maintain performance.
- Inlet screen:** When using fan with inlet side open, this screen should be attached to ensure safety.

* Degree of sound reduction depends on installation conditions.

3 Receiving

3.1 Unloading upon receipt and product verification

Although each product undergoes thorough inspection and only products that pass inspection are shipped, please verify the following points upon receipt of the product:

- * Fan is as ordered.
- * No abnormalities such as breakage, deformation, etc. occurred during shipment.
- * All accessories are included.
- * Bolts and nuts have not loosened.

3.2 Movement/transportation



When lifting the fan to move or transport it, always be sure to use the holes labeled "つり位置" (Hang here) for lifting. For safety, the fan should be lifted by at least 2 labeled hangers (except for products with only 1 hanger). Lifting should be performed by licensed personnel only.

3.3 Storage until installation

When fan will be stored until installation, even if the storage location is indoors, cover the entire unit with waterproof sheeting. (This is also true for outdoor specifications.) Also, to prevent rusting of the bearings, etc., turn the impeller about 10 times once per month. If turning by hand, be careful that your hand does not get caught.

4 Installation

4.1 Mounting

4.1.1 Selecting mounting location



The fan should be installed in locations that meet the following conditions:

- ◇ Locations which are within the temperature range where condensation does not occur. (Temperature range: -10 to 40°C; Relative humidity: 90% or less)
- ◇ Location where daily inspection and maintenance can be performed easily.
- ◇ Indoors where rain water will not fall on it.
- ◇ Stable location which is not subject to vibrations.
- ◇ Location where no dangerous chemicals are present.

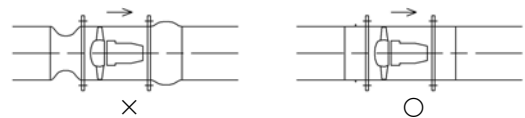
4.1.2 Foundation and mounting

- ◇ Standard shape fans should be mounted horizontally. (Vertical shape specification products are custom products.)
- ◇ For the amount of foundation concrete to use, a general reference is that an amount equal to 3 times the weight of the fan is suitable.
- ◇ When mounting on top of a frame, be sure to mount it on a surface having sufficient structural strength.
- ◇ If there is a gap between the fan and the foundation surface, use liner plates (steel plates for filling gaps) to fill the gap and verify that the fan does not rock before tightening the foundation bolts.
- ◇ Be sure to fully tighten bolts and nuts.

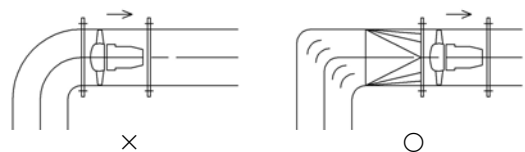
4.2 Connection to ducts

- ◇ Install removable ducts for maintenance and inspection holes before and/or after the fan. (Be sure to provide enough space for removing ducts and performing inspection.)
- ◇ Install screens at the duct inlet and/or outlet for safety. (Screens are optional accessories.)
- ◇ If the ductwork is not suitable, not only will resistance be increased and air flow be insufficient, the fan may operate stalled. This may result in breakage. Be careful of the following points when installing ductwork.

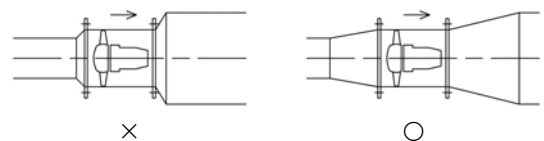
- (1) When using expansion/contraction joints, be sure to apply sufficient tension. In particular, install a collapse-prevention reinforcement ring on the inlet-side expansion/contraction joint so that it does not collapse due to vacuum and use the minimum possible length.



- (2) For small-radius-curve elbows, install corner vanes.



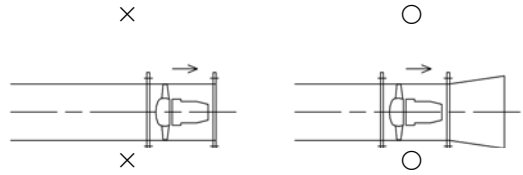
- (3) Avoid sudden expansions or shrinkage in diameter.



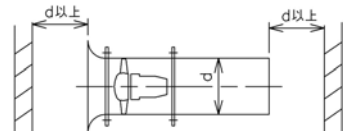
- (4) When the inlet will be left open, install the inlet cone to maintain performance.



- (5) When the outlet will be left open, install the diffuser to maintain performance.



- (6) Leave at least the diameter of the fan casing between the wall and the fan inlet or outlet.

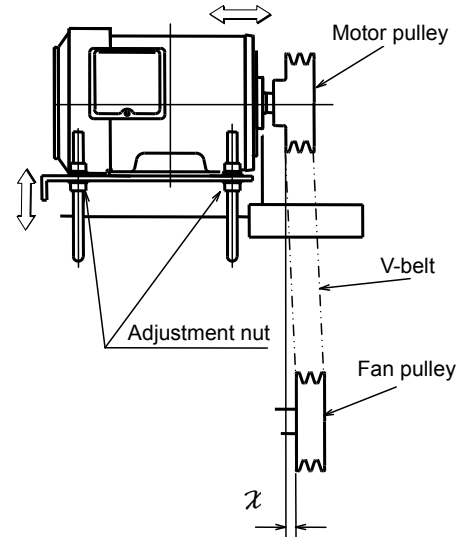


4.3 Mounting motor (when fan is supplied without motor)

4.3.1 Assembly

For names of parts, refer to "Exploded structural view and parts list" on p. 6.

- ◇ Prepare the necessary motor, motor pulley, and V-belt.
- ◇ The fan pulley and motor pulley should be accurately centered as shown in the figure at right. If operation is performed with misaligned, abnormal vibrations of the bearings or drastic reductions in V-belt, pulley, or bearing durability will occur.
- ◇ Adjust the V-belt tension as follows. Neglecting to perform tension adjustment may result in a malfunction. Perform belt tension adjustment using the adjustment nut on the motor base.



X should be approx. 0.

◇ Belt tensioning

Step 1: Calculating span

First, determine the belt span (ℓ). Span is the length of the belt between the tangential points on the motor pulley and the fan pulley.

$$\ell_{\text{Span}} = \sqrt{C^2 - \frac{(D-d)^2}{4}}$$

- ℓ : Span (mm)
- C: Distance between centers of two pulleys (mm)
- D: Large pulley diameter (mm)
- d: Small pulley diameter (mm)

Step 2: Calculating displacement

Determine the displacement (δ) from the equation at right when a displacement load is applied.

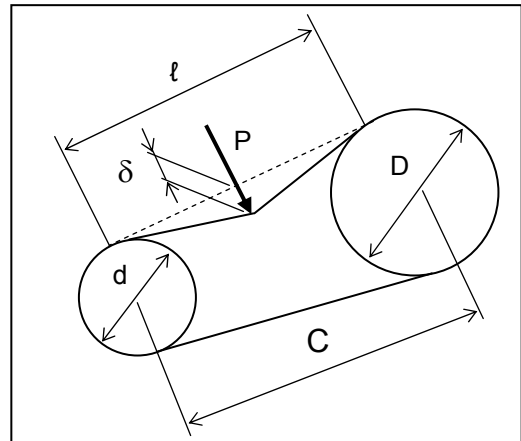
$$\delta_{\text{Displacement}} = 0.016 \times \ell$$

- δ : Displacement (mm)
- ℓ : Span (mm)

Step 3: Measuring displacement load

At the center of the span, apply the load (P) until the displacement δ mm is equal to the value calculated in step 2. Determine the load value at that time as a displacement load.

Using a tension meter, etc. to measure the displacement load is convenient.



Step 4: Adjusting tension

Recommendable belt displacement load to get the proper tension is shown in the following table.


Displacement load table

Belt type	Small pulley diameter range (mm)	Displacement load P (N/belt)		
		Minimum value	When tensioning a new belt	When retensioning a belt
M type	38 to 50	4.9	6.9	6.9
A type	65 to 80	7.8	11.8	9.8
	81 to 90	8.8	13.7	11.8
	91 to 105	10.8	16.7	13.7
	From 106	11.8	17.6	15.7
B type	115 to 135	13.7	20.6	17.6
	136 to 160	17.6	26.5	22.5
	From 161	18.6	28.4	24.5
3V type	67 to 90	17.6	24.5	21.6
	91 to 115	19.6	28.4	25.5
	116 to 150	22.5	33.3	29.4
	151 to 300	25.5	38.2	33.3
5V type	180 to 230	57.8	85.3	74.5
	231 to 310	69.6	103.9	90.2
	311 to 400	82.3	121.5	105.8

Note: The small pulley diameter range for 3V type and 5V type belts is the datum diameter.

- ◇ Insufficient or excessive belt tensioning can result in abnormal phenomenon. How to determine which is the case is shown in the table below.

Belt abnormal phenomenon

Phenomenon for insufficient belt tension	Phenomenon for excessive belt tension
<ul style="list-style-type: none"> • Belt slips. • Belt gets hot. • Belt tips. • Belt vibrates. • Belt ages and cracks appear. • Belt surface becomes worn. 	<ul style="list-style-type: none"> • Belt becomes deformed on pulley and service life is shortened. <div style="text-align: center;">  </div> <ul style="list-style-type: none"> • Belt gets hot. • Bearings get hot.

- ◇ After using the belt for 20 to 30 hours of actual use in which the belt becomes used to the pulleys, fine-adjustment of tension should be performed.
- ◇ When using several belts, it is necessary to use matched set belts.
- ◇ After belt tensioning has been completed, be sure to attach the belt guard for safety.

4.3.2 Electrical wiring



- ◇ Wiring of the motor should be performed according to Electrical Installation Technology Standards and Internal Wiring Standards by a licensed electrician.
- ◇ For the power source for this fan, check the product nameplate and use the specified power source. If operation is performed using a different power source, there is a danger of malfunction. The product nameplate is attached to the fan casing.
- ◇ Select an earth leakage circuit breaker and/or circuit breaker that is suitable for the starting current.
- ◇ Be sure to connect the earth wire to prevent electrical shock.
- ◇ Also refer to the motor instruction manual.
- ◇ Be sure to wire the fan properly so that the rotation direction is correct. (For details, refer to section 4.4).

4.4 Test operation

Before performing test operation, be sure to inspect the following points and verify that there are no abnormalities before starting operation.

- ◇ Make sure that there are no materials, bolts, nuts, tools, etc. left behind after installation inside the connected ducts or casing or near the inlet or outlet.
- ◇ Check that there is no looseness in the mounting and that all bolts and nuts have been securely tightened.
- ◇ If the inlet or outlet is open, be sure that metal screens are installed.
- ◇ Check wiring.
- ◇ After verifying that there are no abnormalities in the above items, switch on the power and immediately switch it off again (momentary operation). In addition to checking whether there are any abnormal vibrations or contact noise, also check the rotation direction. (There is a sticker on the fan casing indicating the rotation direction.) If the rotation direction is opposite, the air from this fan will also flow in the opposite direction.



- ◇ If the rotation direction is opposite, switch off the main power. Swap the connections of two of the three power cables. Then test operation again and check the rotation direction. Since the wire color and power source phase may vary according to the power company, rotation may be opposite even if the matched wire colors are connected. When first applying power, be sure to check the rotation direction.
- ◇ If no abnormalities are found during momentary operation, start continuous operation. Record that there are no abnormal noises, measure and record the vibration value and current value, and check whether they are acceptable or not.
- ◇ When using a flow volume adjustment damper, set it to full open before starting, and then after starting gradually close the opening. When closing and opening the damper, there may be an increase in noise or vibrations or a drop in pressure. If this occurs, do not close the opening further; instead, open it more. These phenomenon are due to stall operation. For these reasons, controlling the flow volume by adjusting the impeller blade angle or by inverter speed control is recommended instead of using a damper.

5 Operation

5.1 Operation and maintenance/inspection

After starting operation of the fan, maintenance and inspection should be performed periodically. By performing the following daily inspections and keeping records of the items from the start of operation, abnormalities can be quickly discovered and trouble can be prevented. Maintenance and inspection should be performed by an experienced person or by a person who has undergone training to confirm safety. For the motor, perform inspection as directed in the motor instruction manual.

Inspection item			Recommended inspection cycle			Inspection contents
			3 months	6 months	12 months	
Condition inspection	Abnormal noise	Blower	■	□	□	Check for abnormal noise due to rattles. Check for metal contact noise. Check for other noise considered to be abnormal.
		Motor	■	□	□	Check the grease. Check for loose bolts. Check the bearings for abnormal noise.
	Vibration		■	□	□	Check the vibration value and any changes to it.
	Temperature		■	□	□	Check the temperature near the bearing and any changes to it.
	Electrical section		□	■	□	Check the current value and voltage value, and any changes to them.
Component inspection	V-belt		■	□	□	Check the tension. Check for wear or cracks.
	Pulley		□	□	■	Check for wear or cracks.
	Anti-vibration rubber		□	■	□	Check for hardening. Check for wear or cracks.
	Shaft seal		□	□	■	Check for cracks or damage.
	Packing		□	□	■	Check for damage or hardening.

5.1.1 Abnormal noise



If an abnormal noise occurs, stop operation immediately and perform inspection.
Possible types and causes of abnormal noise:

- ◇ Bearing noise
Abnormality or end of service life of motor bearings
- ◇ Contact noise
Impeller or casing deformation/damage
Intake of foreign object
Looseness due to loose bolt
- ◇ Vibration noise
Please refer to the following section "Vibrations".
- ◇ Pulsating noise (unsteady flow noise)
Excessive closing off of flow volume
Excessive resistance of equipment

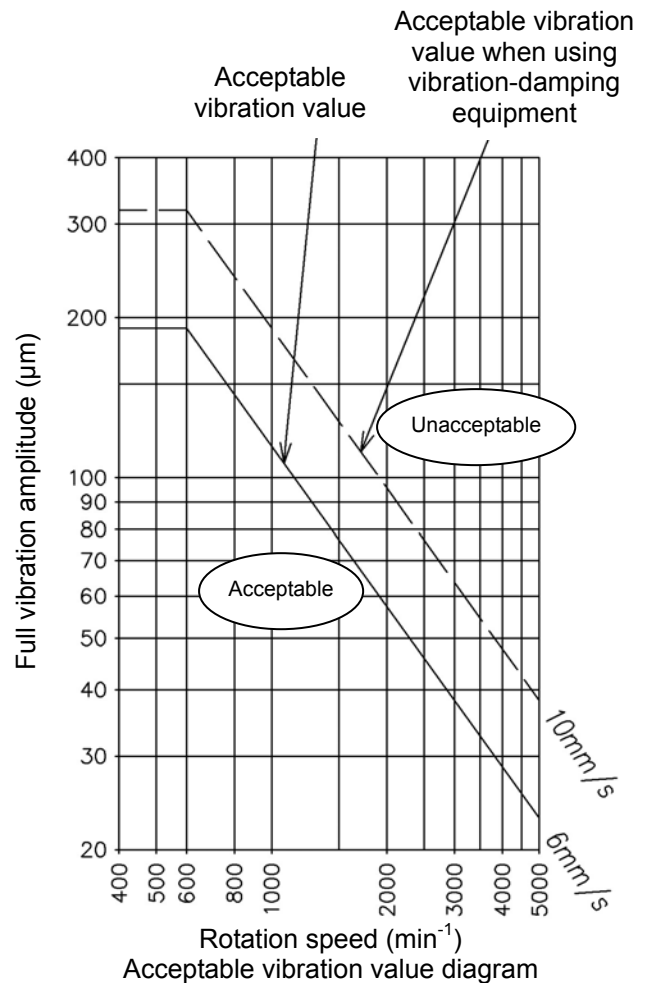
5.1.2 Vibrations



If vibrations exceed the acceptable values, stop operation and perform inspection.

Possible causes of vibrations:

- ◇ Unbalance of impeller due to dust adhesion
- ◇ Deformation/damage of impeller or casing
- ◇ Shaft or bearing abnormality
- ◇ Looseness due to loose bolt
- ◇ Stall operation, unsteady flow
- ◇ Transfer or resonance of vibrations from ducts or base
- ◇ Insufficient rigidity of ducts or base



5.2 Supplying lubricating oil (grease)

In order to use this product safely for a long time, lubricating oil (grease) must be supplied regularly to the bearings. Even for high-quality grease, as usage time passes, the grease itself deteriorates and hardens so that its lubricating function is reduced. Because of this, suitable quantities of grease must be supplied at suitable intervals.

- ◇ When supplying grease, use one in the table below.

Specified grease brand table

Fan specification	Grease maker	Grease product name
Normal	Showa Shell Sekiyu	Alvania S3
Heatproof	Toray Dow Corning	SH44M

Note: The grease type and supply period is shown in a label on the product. The names listed above are standard greases for the standard bearing type "Pillow type" used for this product. For non-standard products, please refer to the separate appendix.

- ◇ Foreign materials mixed into the grease will cause bearing damage. Put grease in a tightly sealed container for storage. In addition, do not mix with a different kind of grease.
- ◇ For supplying grease, avoid supplying excess grease per time in an attempt to reduce the number of times grease should be supplied.

- ◇ Supply grease with fan running after checking to ensure safety.
- ◇ General reference values for grease supply periods and supply amount are shown in the table below.

Grease supply period reference values

Temperature of gas handled (°C)	Environmental conditions		
	Fairly clean (normal environment)	Much garbage (powder factories, wood products factories, dust collectors, etc.)	Exceedingly large amounts of garbage, humidity, water splashing (garbage treatment facilities, aquatic products processing factories, etc.)
Less than 50	6 months	3 months	1 month
50 to 70	3 months	2 months	1 month
Below 80	2 months	1 month	1 week

※1 Direct is a thing beyond the influence of water and the garbage to a bearing.

※2 1/1.5, please do supply distance whenever it rises 10 degrees Celsius when I exceed 80 degrees Celsius.

Grease supply amount reference values

Bearing model	Supply amount (g)	Bearing model	Supply amount (g)	Bearing model	Supply amount (g)	Bearing model	Supply amount (g)	Bearing model	Supply amount (g)
UC203	1.2	UC208	4.3	UC213	12	UC307	5.4	UC312	20
204	1.2	209	4.9	214	15	308	6.7	313	27
205	1.3	210	5.6	215	16	309	8.4	314	32
206	2.3	211	8.0	216	19	310	12	315	38
207	3.5	212	9.8			311	17	316	45

(The grease gun included as a standard accessory tool by our company supplies approximately 0.5 g of grease each time the lever is operated.)

5.3 Belt maintenance

Periodically inspect the appearance of the belt and check the belt tension and adjust if necessary as described in section 4.3.1. Please note that friction between the belt and pulleys will result in the generation of fine particles of dust from the belt. This is especially true during the first two months of use of the belt. If large amounts of dust are generated, inspection should be performed since such large amounts of dust may be caused by excessive wear due to improper belt tension or improper alignment of pulleys.

5.4 Stopping operation and restarting after stopping

When operation will be stopped, consideration should be given to the storage conditions even if the stopped period will be short. To prevent rusting of the bearings, etc. during the stopped period, turn the impeller by hand about 10 times once per month, or run it empty for about 5 minutes once per month. Also, when restarting operation, be sure to perform the same inspections as were done for test operation. In particular, be sure that nothing is adhered to the impeller and check that there is no corrosion.

6 About the rotary sound of the bearing

For blowers used at high rotation speed or high temperature, we select bearing which internal gap is relatively big.

Therefore "a ball omission sound" may occur at the time of driving, but is not the abnormality of the bearing.

When a rolling body enters the no load zone at the load zone, I come to be able to carry out a free activity and begin to roll by gravity, and "a ball omission sound" is a sound when it collides in a retainer and the orbit.

I show the example of the typical driving sound of the bearing.

Expression of the sound	Characteristic
With ticktacks Clangor	It attract attention in low speed. It is consecutive sounds at a high-speed turn
Metallic sound	It change by a change of the rotary speed with a cylinder Roller bearing and sound like a metallic sound mainly when it is big. It stay temporarily when I supply grease.

7 Warranty

Scope of warranty

Repair service is provided free of charge for a failure during the warranty period, as long as the blower has been used in compliance with these Operating Instructions, labels attached to the body, and other instructions.

In the case that this product is incorporated into other equipment used by the customer, the warranty does not cover costs for removal from such equipment, reattachment to such equipment, costs of other incidental work, costs of transportation etc., resulting opportunity loss incurred by the customer, lost operation, or any other indirect loss or damage suffered by the customer.

- For requests for repair service, please contact our nearest branch or sales office.

Warranty period

One (1) year from the date of delivery of the product.

Even during the warranty period, only charged service is provided in principle, if any of the following applies:

- Failure or damage due to incorrect use that is not compliant with these Operating Instructions, labels attached to the body, or other instructions, and/or unauthorized repair or modification
- Failure or damage due to transportation, dropping, etc. after the purchase
- Failure or damage due to fire, earthquake, storm, flood, lightening or other natural disasters, environmental factors such as salt damage and public pollution, abnormal voltage, use of a power supply (voltage or frequency) other than that specified, or the like
- Failure or damage due to repair or modification (including punching, etc. in the product) not conducted by our company
- Failure or damage due to the use of parts other than those designated by our company
- Failure or damage due to the entry of foreign material
- Discoloration, scratching, natural consumption of consumable parts or other defects due to use or deterioration over time
- Failure or damage caused by neglecting the maintenance and inspection described in the Operating Instructions

We will not compensate for any loss or damage resulting from defects that occur during the use of this product.

[Notices]

- (1) The descriptions in these Operating Instructions are subject to change without prior notification in the future.
- (2) We have made all possible efforts to prepare these Operating Instructions. However, if you have any questions about them or find any inquiries, errors, omissions, etc., please contact our nearest branch or sales office.
- (3) If the power supply frequency changes due to a change in the location where the blower is used, it may not be used as it is. We will consider a measure in each case where it is required. In such a case, please contact our nearest branch or sales office.
- (4) At the time of inquiry, please describe the product type and the manufacturing number indicated on the product nameplate.

8 Malfunction causes and countermeasures

Fan malfunction causes and countermeasures

<div style="text-align: center;">Malfunction status</div> <div style="text-align: left;">Malfunction cause</div>	Overs and shorts of quantity of wind, the static pressure	Excess/short of motor	Bearing overheat/burnout	Abnormal vibration	Peculiar noise	Corrosion and wear	Abnormal contact	Motor not activated	Measures
Defective installation			○	○	○		○	○	Re-installation
Poor foundation			○	○	○				Renovation
Contact with the rotator?		○	○	○	○		○	○	Processing of contact part, and re-installation
Defective duct/duct joint	○		○	○	○		○	○	Renovation
Defective lubricating oil			○						Replenishment
Inappropriate oil quality, contamination, excessive amount of oil			○						Replacement or recycling
Inappropriate material				○	○	○			Replacement
Unbalanced impeller			○	○	○		○		Correction
Deformation or damage of impeller				○					Repair or replacement
Wear or corrosion of impeller	○			○					Repair or replacement
Operation at a dangerous speed			○	○	○		○		Renovation or remodeling of operation point
Abnormal bearing of the motor			○	○	○				Replacement
Wrong rotation direction	○	○			○		○	○	Change
Malfunction of the motor	○	○		○	○			○	Repair or replacement
Intake of light gas	○								Renovation/replacement of impeller
Intake of heavy gas	○	○							Renovation/replacement of impeller
Mixture of foreign object or adhesion of scale	○	○		○	○	○	○	○	Cleaning
Surging operation	○			○	○				Change of operation point
Resistance to the pipe system	○				○				Renovation
Failure of damper	○	○		○	○			○	Repair
Accumulation in the drain		○		○	○	○		○	Draining
There is less pressure loss than a plan	○	○							Damper adjustment, change of the rotary speed

Note on your purchased blower

Fan identification information that you may need when making an inquiry of us.

Model		Serial No.	
Purchased on	Date	Starting day	Date
Distribution agent	TEL () In charge:		

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<http://www.showadenki.co.jp>