

INSTRUCTION BOOK FOR ROOTS BLOWER



TS TYPE

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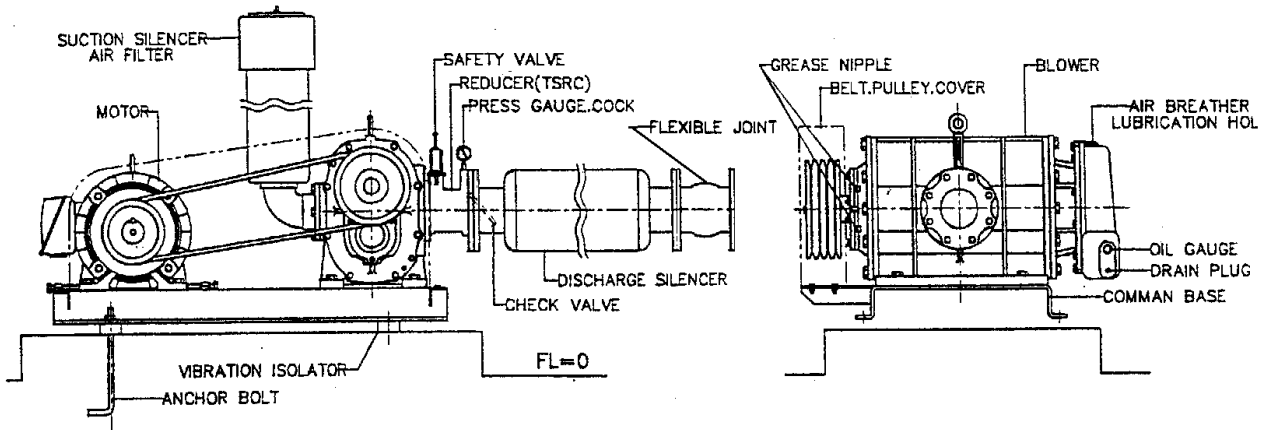
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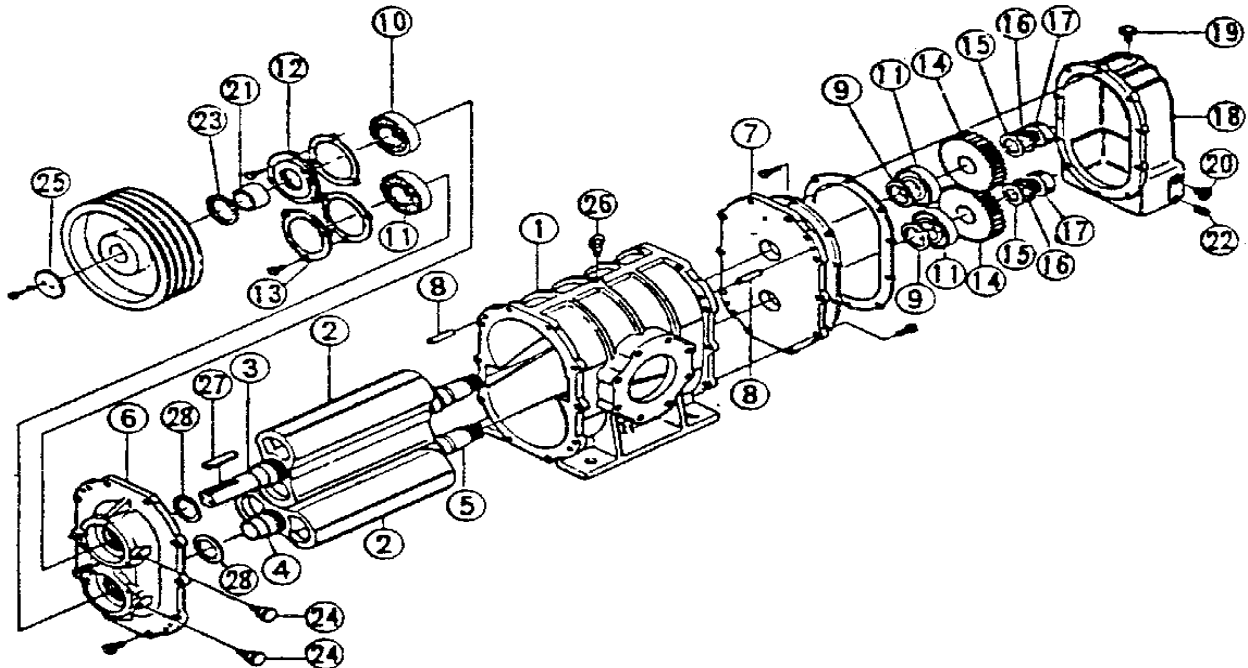
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1. PARTS NAME

1-1. Assembly of Standard Blower








1-2. Construction of Blower Body



No.	Name	Material	Q'ty	No.	Name	Material	Q'ty
1	Casing	FC250	1	15	Gear Plate	SS41	2
2	Impeller	FC250	2	16	Lock washer	SS41	2
3	Drive Shaft	S45C	1	17	Lock nut	SS41	2
4	Driven shaft	S45C	1	18	Gear case	FC25	1
5	Gear shaft	FC250	2	19	Lubrication plug	Resin	1
6	Side Cover(Drive Side)	FC250	1	20	Oil gauge	Plastic	1
7	Side Cover(Gear Side)	SUJ2	1	21	Collar	S45CH	1
8	PIN	S20C	4	22	Drain plug	FCMB28	1
9	Oil seal (Gear Side)	NBR	2	23	Z seal	NBR	1
10	Ball bearing (Drive side)	SUJ2	2	24	Grease nipple	SS41	2
11	Ball bearing (Gear side)	SUJ2	2	25	End plate	SS41	1
12	Bearing cover(Drive Side)	FC250	1	26	Eye bolt	SS41	1
13	Bearion cover(Driven Side)	FC250	1	27	Parallel key	S50C	1
14	Gear	SCM21	2	28	Oil seal (Drive Side)	NBR	2

2. CAUTIONS TO SAFETY

The following caution marks are used in this manual.
Each mark has the following meaning.

Mark	Denotation
 CAUTION	Potential risks resulting from improper handling, as it can cause death or serious injuries of personnel.
 CARE	Potential risks resulting from improper handling, as it can cause personnel injuries or material damages.
	Requires careful attention, as denoted in the note symbols or letters inside or near the triangle.
	MUST-NOT-DO'S; details are denoted by symbols or letters inside or near the mark.
	MUST-DO'S; details are denoted by symbols or letters inside or near the mark.

3. PRIOR TO USE

CAUTION

- The serviceable gas for this Blower is the air of room temperature and at ambient pressure.
 - Use of any hazardous gas could cause its leakage from the seal.
 - Use of corrosive or erosive gas could cause damage of the machine due to rust inside.


**ONLY AIR
SERVICEABLE**

- Upon receiving the Blower, check :
 - if the name plate of the Blower indicates its specifications as ordered;
 - if all accessories are furnished;
 - if the Blower is free breaks or damages caused in transit;
- In certain applications where air supply must be consecutive, such as fish raising, be sure to provide a spare Blower.

4. INSTALLATION



CAUTION

- In transferring or moving the Blower, exercise full care.
 - For crate packing, do not lift the crate directly, as it could be broken and result in injuries.
 - To transfer or move the Blower, lift by a band through the pallet at the bottom crate, or use a fork lift.

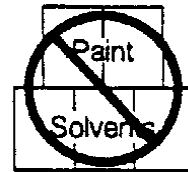


MOVE WITH CARE

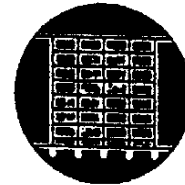


CARE

- Do not install in the areas where inflammable or corrosive gases exist, e.g., solvent or paints.
 - If installed, it could be cause of fire or gas poisoning while servicing.



- Do not install in the areas where it is crowded or kids gather around.
 - If installed, it could be cause of injuries or burns while the Blower is running.
 - A protection guard may be used to keep off people.



INSTALL IN
BEST PLACE

- Keep the Blower room temperature less than 40°C.
 - Higher temperature will make the life of Blower short significantly. Ventilators may be used to keep the temperature.



NO HIGHER THAN 40°C

- Foundation must be rigid and solid, and its mounting surface be flat and higher than the grade.
- Location of the Blower should assure to provide a space nearby for disassembling and inspection.
- If the Blower is used outside, provide its roofing to protect from rains.

5. PIPING

- Provide a flexible joint, in the piping not to have piping loads applied on the blower.
- The material of piping shall resist the discharge temperature and pressure. (Steel pipings are acceptable). Use of vinyl chloride pipings could be deformed and/ or generate noise.
- The internal of piping should be clean and free from foreign substances.
- Where practical, provide a check valve to prevent a backflow into the Blower as a result of reversing.
- When disassembling, the Blower is to be disconnected from its piping. Therefore, in case of parallel arrangement , gate valves should be provided by all means so that it can be disassembled without stopping other blowers.

6. WIRING



CAUTION

- Wiring and earthing shall be done only qualified personnel.
 - Unsatisfactory or incomplete wiring by unqualified personnel can cause leakage or fire.
 - To prevent electric shocks or fire accidents, provide an earth leakage breaker and overload protector.



ENSURE WIRING

- Earthing shall be done surely.
 - Insure earthing will result in troubles as failure or leakage.



EARTHING



CARE

- Power source cables shall be proper ones selected.
 - For longer distance and narrow cables, use care for possible seizing of motor and cables, lowering of the performance or breaking of the Blower.



PROPER CABLE

7. CHECKS BEFORE OPERATION



CAUTION

- Be sure to put on a belt cover.
 - No use of belt cover could have fingers or clothes caught in while operation, and cause injuries.



CARE

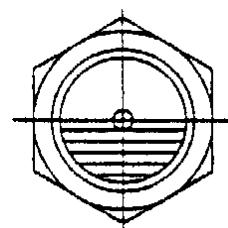
- Open the valves in piping fully.
 - Keeping valves shut will cause an overload and result in breaking of the machine.



DO NOT SHUT VALVE

- Be sure to supply gear oil.
 - Operation without gear oil will result in seizing of the gear and, as a result, make it broken. So, supply oil up to the level of gauge center when the Blower is stopped. Be noted that an excess oil will cause it to leak.

Oil Level



NO OIL IS IN THE BLOWER RECEIVED.

○ Check tension of V-belt and alignment of shafts and pulleys.

- Insufficient adjustment of V-belt will shorten its life.

V-belt may get loose or shafts and pulleys may be Misaligned during transport or assembling, although It was adjusted prior to shipping. So, be sure to check It. To adjust the belt, see Section “Maintenance and Inspection”.



ADJUST BELT

○ Check the turning direction of Blower by inching operation. Normally, it is clockwise, when see from the pulley.

- Reversing could include water in the machine, or break or damage it.



CHECK TURNING
DIRECTION

○ Check by turning the pulley manually to see if the Blower is free from irregularities.

- Inclusion of foreign substances make running dull or fell striking appreciably. In such a case, disassemble piping, and proceed with internal checks and cleaning of the Blower.



CAUTION

- To check the Blower, stop it first.
- Use care not to have fingers caught in the pulley or belts.

○ Grease the bearings.

- There are two grease nipples on the pulley side. So, grease by using a grease gun. Greasing shall continue until new grease will be over on the cast opening in the bearing cover. The Blower was greased prior to shipping.

8. INSTRUCTIONS TO OPERATION



CARE

- During operation, do not touch the Blower, motor and accessories.

- While operation, the Blower will have high temperature due to heat. So, use care not to burn.



CARE HIGH TEMP

- Do not regulate the air flow by opening/closing the valve.

- The roots-type Blower has its flow and power varied with the number of revolution, because it is displacement type. Shut-off of the valve will raise the pressure and cause an overload, which will result in damaging of the machine. Change the number of revolution, as appropriate, Or provide air relief piping.



DO NOT SHUT VALVE

- In no case, shall the Blower has be used in excess of rated values (as shown in the name plate).

- Use of the Blower in excess of rated values will result in an overload and damage the machine. The rated current of motor, especially, shall be not higher than that shown in the name plate as an excess current can shorten its life.



NEVER OVERLOADED

- Keep the cock having a pressure gauge “shut”, only except when checking the pressure, because if it is kept open, then the life of pressure gauge shortened.
- Noise may vary with the Blower even in the same type. Also, it may vary with the internal condition of mechanical chamber or piping; in some case it can be higher than that shown in the catalogue.
- At the initial operation stage, the noise or current can be higher due to the viscosity of lubricant, which, however, should be returned to its normal condition in 10 to 20 minutes. When the discharge pressure is lower than 19.6 kPa(0.2kgf/c m²), or in case

of intermittent operation, the lubricant temperature will not go high and the noise become higher due to higher lubricant viscosity. From such a reason, it is recommended that the existing oil be replaced with the one with lower viscosity (industrial multipurpose service oil (additive) ISO VG 68).

9. MAINTENANCE AND INSPECTION

Maintenance and inspection services shall be done on a regular basis in accordance with the following procedure. However, these should depend upon the existing conditions, and therefore may be modified as appropriate.



CAUTION

- To start maintenance or inspection services, shut down the power first.
 - Abrupt operation start can lead to injuries by having fingers caught. To prevent such troubles, indicate “BLOWER NOW INSPECTED” to ensure that the concerned can know the situation. Note indicating [STOP] in the following table means the power must be shut down first when starting work.



SHUT DOWN POWER FIRST

Maintenance and Inspection Table

Maintenance/ Inspection	Cycles				Remarks
	Day	Mo	1Y	3Y~	
Perssure	○				Less than that shown in the name plate
Air Flow	○				Specified vaiue±10%
Noise Level	○				No abnormal sound
Vibration	○				No abnormal vibration
Suction Air Temperature	○				Not higher than 40°C
Current	○				Less than specified value of motor
Voltage	○				<u>Motor specified value</u> ± 10%

Maintenance/ Inspection	Cycles				Remarks
	Day	Mo	1Y	3Y~	
Belt Tension and alignment [Stop]	○				
Gear Oil Amount [Stop]	○				Up to level gauge center
Suction Silencer Cleaning		○			
Gear Oil Check [Stop]		○			Supply or replace full amount of oil
Bearing Grease Check [Stop]		○			Supply or replace full amount of grease
V-belt Replacement [Stop]			○		
Filter Element Replacement [Stop]			○		
Bearing Replacement [Stop]				○	Replace when disassembling
Packing/seal Replacement [Stop]				○	Replace when disassembling
Gear Check/Replacement [Stop]				○	Check and replace when disassembling

* It is recommended that the gear oil be replaced in its full amount in one month after initial operation.



CARE

- Do not disassemble, repair or modify.
- Disassembling, repairing or modification can be cause of injuries or breaking of the machine. It must be done by a Specialist.



DO NOT DISASSEMBLE

(1) Brand Names of Oil and Grease

	Brand Name of Oil	Brand Name of Grease
Genuine	Circulation OIL R150 (CPC)	Grease HD No.2(CPC)
Recommended Brands	DAPHNY SUPER GEAR OIL (Idemitsu) BON KNOCK SP220 (Nippon Oil) SPARTAN EP220 (Esso) MOBLE GEAR 630 (Mobil) SP GEAR ROLL 220 (General) DIAMOND GEAR LUBE SP220(Mitsubishi) REDUCTUS 220 (Kyoseki) MILD EP GEAR OIL 220 (Fuji)	Use genuine grease always. should the brand in use be changed inevitably, use Li-soap base hest-resisting grease. In some combinations, mixing of dissimilar grease can make its property changed greatly. So, it needs care.

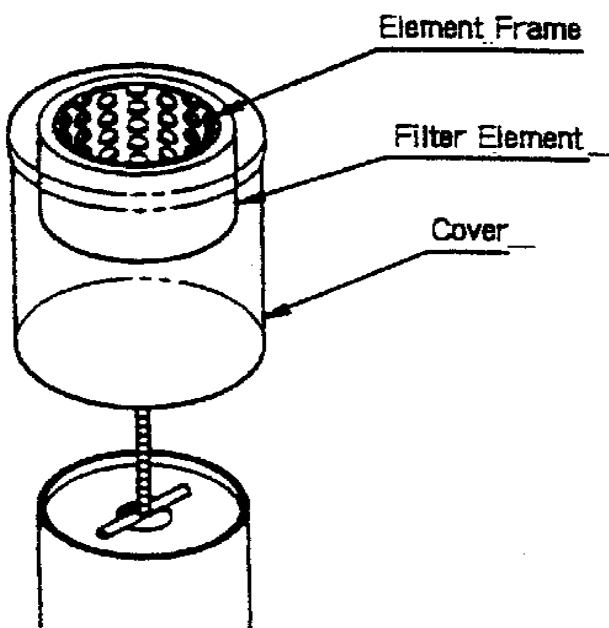
(2) Amount of Oil and Grease

Blower Type	Oil	Grease
TSA-40	0.22 L	7g/port
TSB-50,65	0.31 L	10g/port
TSC-80,100	0.75 L	15g/port
TSD-125,150	1.75 L	23g/port
TSE-200	3.20 L	30g/port

The oil/grease amount shown is for reference. Check it always by oil level gauge.

when the Blower is stop. There are two grease ports.

(3) Check of Filter Element



Remove the top cover of silencer. Take off the filter element from the filter frame fixed in the cover, and check and clean the element.

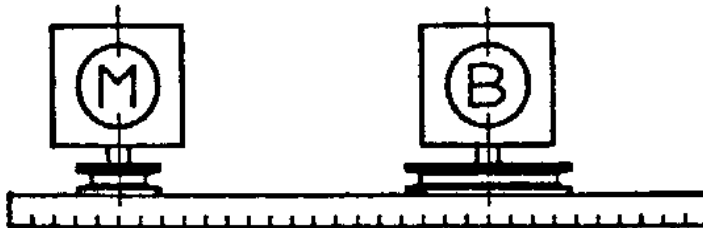
Type	I.D.×H
TSA-40	44 ϕ ×90
TSB-50	110 ϕ ×80
TSB-65	135 ϕ ×90
TSC-80	160 ϕ ×110
TSC-100	185 ϕ ×125
TSD-125	210 ϕ ×170
TSD-150	240 ϕ ×210
TSE-200	300 ϕ ×250

(4) Tensioning of V-belt

The belt will run in the pulley and become loose in two or three days after starting operation, although it was adjusted prior to Shipping. So, retensioning of V-belt is required.

〈 Tensioning Steps 〉

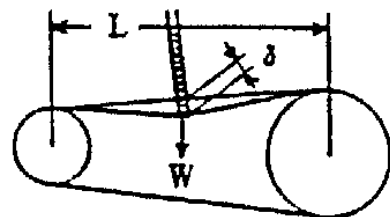
- 1) Loosen the bolts fixing the motor plate, and remove the belt.
- 2) Put the belt in place, and move the motor to have an acceptable tension of the belt, and mark that point. Then, take off the belt.
- 3) Apply a square on the pulleys on both sides of blower and motor to make sure that they are in equal levels.
- 4) Move the motor from the point marked in Step 2), where the belt is tighter. Then, retighten the bolts to fix the motor plate.
- 5) Tension the belt. Make sure by using a tension meter that the belt is properly tensioned.



- 6) Re-apply a square to make sure even levels. If there is a gap 1 mm between square and pulley, then adjust the pulley again.

$$\delta = 0.016 \times L \text{ mm}$$

TYPE	A	B	C	5V
Min	1.0	1.8	4.0	7.8
Max	1.3	2.5	5.5	10.4



(5) Safety Valve

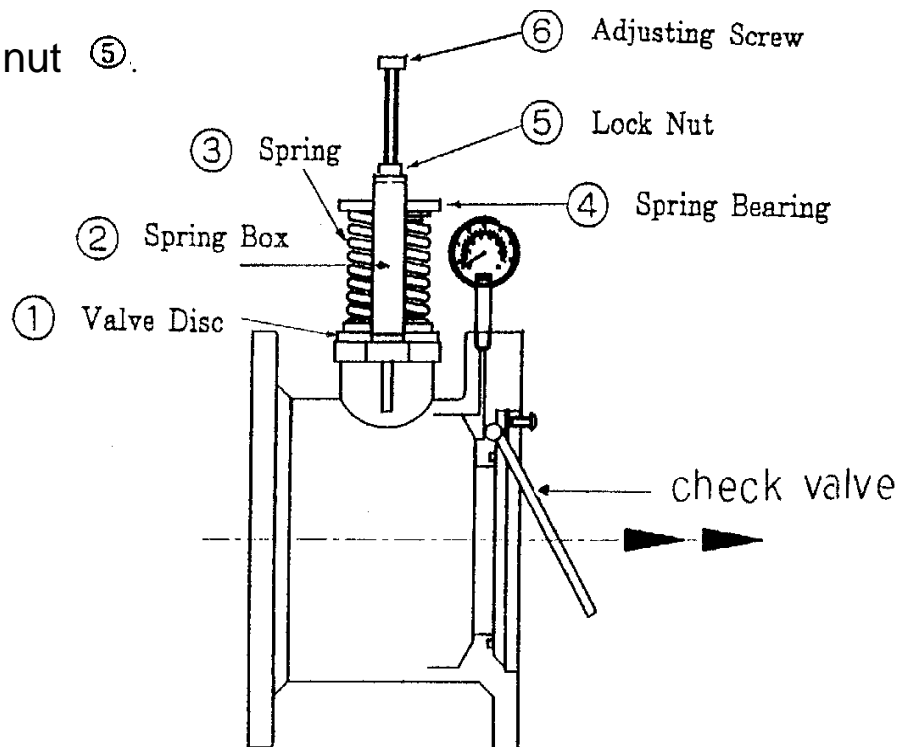
Safety valves are required to work at lower pressures, and so the Valve seating surface and valve disc contact surface have been precision-finished. Therefore, if foreign substances are stuck on the surface, while the valve is working, which can cause leakage when the valve is stopped.

Also, a strong impact applied from outside could make the valve work unstably. So, transport requires utmost care not to drop or apply impact.

< Pressure Adjustment >

The pressure for valve was adjusted to work at specified pressure, Prior to shipping. Should the discharge pressure be found to have an error, readjust it as follows.

- 1) Loosen the lock nut ⑤.
- 2) Turn the adjusting screw ⑥ to adjust the pressure as specified.
Turning of adjusting screw clockwise will make the discharge Pressure higher, while turning it counterclockwise will make it Lower.
- 3) Tighten the lock nut ⑤.



In some cases, a safety valve of special type which is different from the above shown may be installed, but the basic construction is the same as above. So, adjust it in the same procedure.

10. TROUBLESHOOTING

Troubles		Sources	Actions	
Blower	Not Turned	Can turn by hand in either direction.	Motor is failed.	Repair or replace the motor.
		Cannot turn even by hand.	Rotor is sticked.	Disassemble and repair.
			Foreign substances Are in the casing.	Disassemble and repair.
	Turned	Abnormal noise or viration.	V-belt is slipped or Too much tensioned.	Disassemble and repair.
			Pulley is out-of-center	Re-center the pulley.
			Belt cover interferes With the belt.	Reform the belt cover correctly.
			Bearing grease is deteri- orated or running shortl	Re-grease.
			Gear oil is deteriorated, running short, or inappr- opriate.	Re-supply gear oil.
			Safety valve is blown off	Regulate safety valve
			Strength of foundation is not enough.	Reinforce the founda- tion.
			Resonance of piping.	Provide silencer, sup- prt, etc.
			Discharge pressure is abnormally increased.	* See the column with
			Tightening is incomplete.	Re-tighten.
			Rotor interferes.	Disassemble and repair.
Foreign substances are In cluded in the casing.	Disassemble and repair.			
Check valve is failed.	Replace the valve.			

Troubles		Sources	Actions	
Blower	Turned	Abnormal heat	Discharge pressure is abnormally increased.	* See the column with
			Internal temperature of Blower chamber is raised (higher than 40°C)	Increase ventilation.
			Suction silencer is blocked.	Clean/replace the filter element.
		Shortage of air flow.	Piping is leaked.	Re-tighten connections.
			Safety valve is blown off.	Regulate safety valve.
			Suction silencer is blocked.	Clean/replace the filter element.
			Belt is slipped.	Re-adjust belt tension.
			Discharge pressure is abnormally increased.	* See the column with
		* Abnormal increase of discharge pressure.	Valve is shut off.	Open the valve fully.
			Water depth is increased.	Adjust water depth.
			Diffuser pipe is blocked.	Clean.
			Piping is blocked.	Clean.
			Check valve is failed, or Set in a reverse direction.	Replace, or make direction opposite.
			Air flow is excessive.	Reduce rotation speed, or escape air.
		Oil leak.	Gear oil is excessive.	Adjust it up to level of Gauge center (at stop.)
	Motor	Not Turned	Can turn by hand in either direction.	Contact of switches or wirings is failed.
Fuse or a single cable is disconnected.				Check, repair or replace.
Power supply is abnormal				Re-work the power supply Installation.
Motor is failed.				Repair or replace motor

Troubles		Sources	Actions	
Motor	Cannot turn even by hand.	Bearing is defective.	Replace bearing.	
		Motor is failed.	Repair or replace motor.	
	Turned	Reversing.	Connection is incorrect	Check connections.
		Abnormal heat	Overloaded.	Re-adjust discharge pressure.
			Power supply is abnormal	Re-work the power supply installation.
			Internal temperature or Blower chamber is raised (higher than 40°C)	Increase ventilation.
		Rotation speed not increased.	Power supply is abnormal	Re-work the power Supply installation.
			Over loaded.	Re-adjust discharge pressure.
		Excessive high current.	Discharge pressure is abnormally increased.	* See the column with
			Suction silencer is blocked.	Clean or replace the filter element.
			Power supply is abnormal	Rework the power Supply installation.