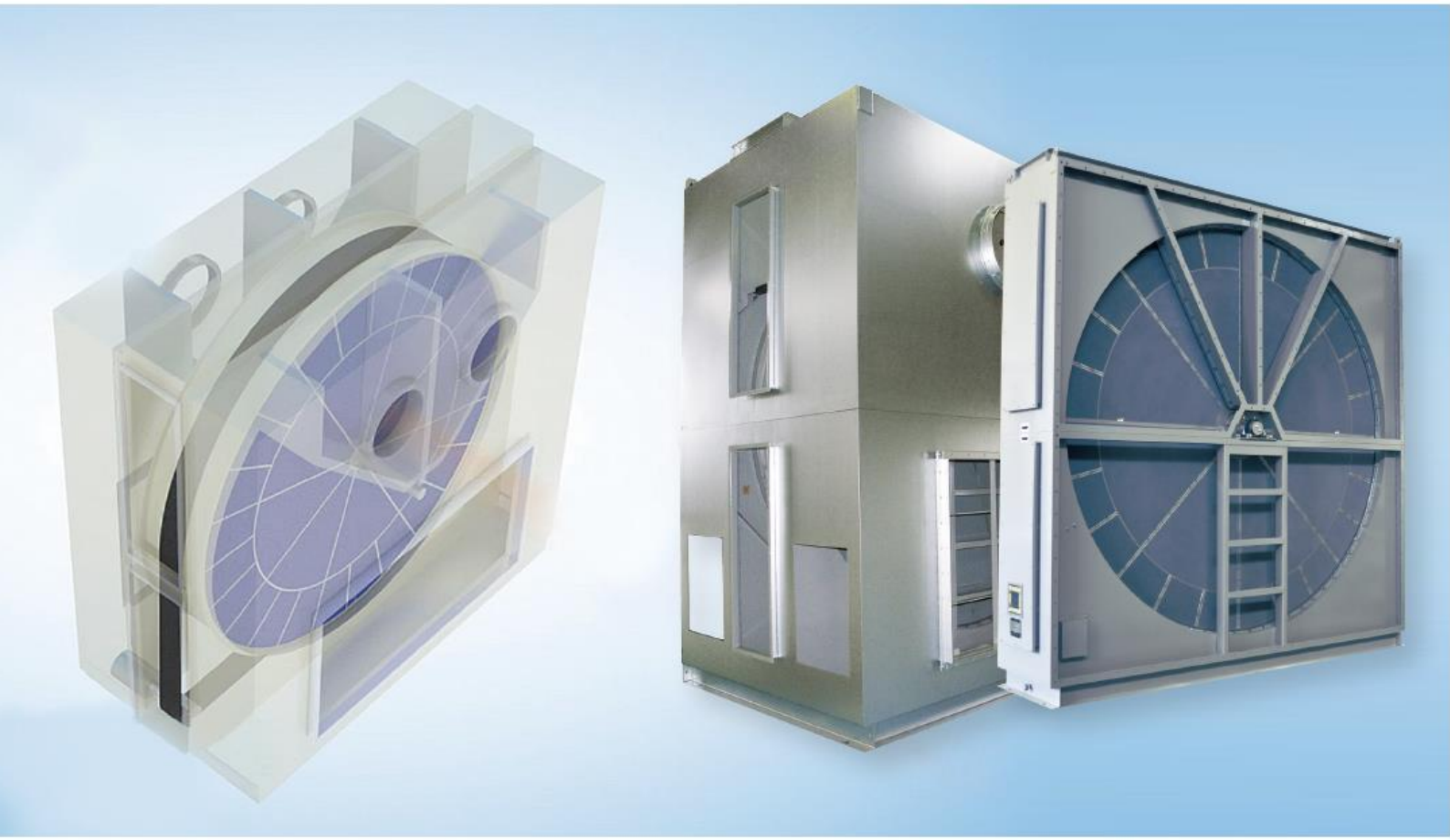
NICHIAS

Low-concentration organic compound concentrator

SOLVENTCLEAN™ Instruction Manual Jun 2024 Edition



Original Instructions

NICHIAS

Introduction

Thank you for choosing our TOMBO ™ No.8805-SC SOLVENTCLEAN ™ product (hereinafter referred to as **this equipment**).
This instruction manual (hereinafter referred to as **this manual**) has been created for those who will transport, set up, install, and adjust this equipment, as well as those who will operate the equipment or manage maintenance of the equipment.
Those who will use this equipment and those who will perform maintenance and inspection should read this manual carefully and sufficiently understand the content before performing operation or maintenance management.
Keep this manual at hand near this equipment so that you can carefully read it if you are unsure about any operating procedure, maintenance management, etc. before carrying out the operations.
Be sure to store this manual in a safe place where it can be readily accessed whenever necessary. Furthermore, please make sure that you are keeping the most updated version of this manual for as long as you are using the SOLVENTCLEAN ™ product. If you neglect to use the most updated manual, an accident or other problem may occur due to the information regarding this product not being up to date.

■ Remarks

Please keep this manual in a place where it can be readily accessed by anyone using or working on this equipment.

- This manual is subject to change without notice.
- If there is any difference between a description in this manual and this equipment, the difference specific to the equipment will take priority.
- ”TOMBO” is a registered trademark or trademark of NICHIAS Corporation.
- Product names with TM are trademarks of NICHIAS Corporation.
- All other company and product names are registered trademarks or trademarks of their respective companies.
- Reproduction or reprinting of this manual, in whole or in part, without permission is prohibited.

Every effort has been made to ensure the accuracy of the information in this manual but if you have any questions or notice any errors or omissions, please contact a NICHIAS Corporation authorized dealer or NICHIAS Corporation. See “■ Contact information” below for the contact information of NICHIAS Corporation.

■ **Contact information**

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■ Definition of Terms

Transporting and unloading
Transporting is the action of carrying this equipment to a place near the installation location using a vehicle or other means and unloading is the action to lower this equipment down near the installation location.

Installation
Installation is the action to set up this equipment, which was lowered down to a place near the installation location, in the designated position. It consists of "assembly," which is the action to fit together the parts, and "adjustment," which involves getting this equipment ready for operation.

Maintenance and inspection
Maintenance and inspection are the actions to determine the items necessary to maintain the performance of this equipment after the equipment is operational and periodic inspection of those items.

■ How to Read This Manual

This manual consists of the following sections. Be sure to read the necessary sections indicated by ○ for each work procedure.

	Description	Transporting and unloading	Installing and assembly	Adjustment	Operation	Maintenance and inspection
	Safety precautions	○	○	○	○	○
Chapter 1	Names of parts		○	○	○	○
Chapter 2	Checking the package contents		○	○		○
Chapter 3	Transporting and unloading	○	○			○
Chapter 4	Explanation of installation location	○	○			○
Chapter 5	Explanation of main points and procedures of installation and assembly		○	○		○
Chapter 6	Explanation of operating procedures				○	○
Chapter 7	Explanation of maintenance and inspection					○
Chapter 8	Explanation of repairs			○	○	○
Chapter 9	Explanation of disposal		○	○	○	○
Chapter 10	Explanation of warranty		○	○	○	○
Chapter 11	Specifications				○	○

■ Other Documents

In additions to this manual, carefully read and understand the information in the following documents before performing the work.

- Geared Motor Instruction Manual (for driving rotor)
  Tsubakimoto Chain Co.
- Manual for Magic Box Installation & Adjustment
  (when filter option is purchased)

- Filter Installation Manual (when filter option is purchased)
- Specifications specifically for your product

Safety Precautions

Explanation of Precaution Symbol

The precaution symbol on the left is used with this equipment and manual to indicate potential hazards. This symbol signifies a non-specific general danger, warning, or caution. Be sure to read all information included in areas that are marked with this symbol because it is information concerning safety.

Explanation of Signal Words

Three signal words are used with this equipment and manual. These signal words are classified into the following categories according to the degree (size) of potential personal injury or property damage.

⚠Danger	Improper operation or handling is extremely likely to lead to the death or serious injury of the worker.
⚠Warning	Improper operation or handling may lead to the death or serious injury of the worker.
⚠Caution	Improper operation or handling may lead to the injury of the worker or damage to the equipment.

Classification of degrees of injury or damage

The degrees of injury or damage in the above are classified as follows.

Serious injuries: Blindness, injuries, burns (high and low temperature burns), electric shock, broken bones, poisoning, infections, etc. that will have after effects and require hospitalization for treatment or long-term treatment as an outpatient.

Minor injuries: Other than the above that will not require hospitalization for treatment or long-term treatment as an outpatient.

Property damage: Damages such as extensive damage to the building, assets, equipment, and other property in the factory, research facility, or other place where this equipment is installed.

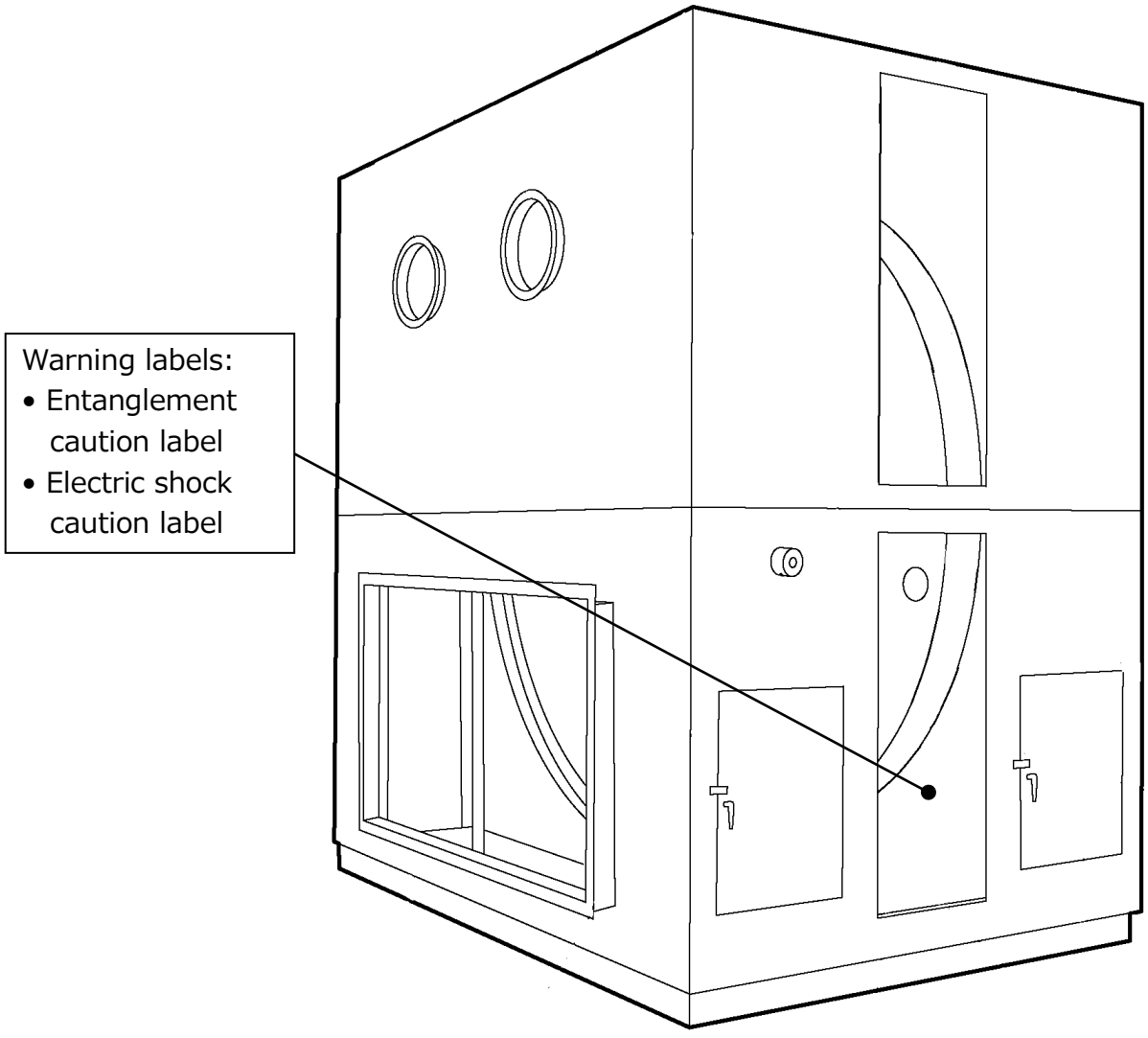
Explanation of “Warning Labels” Affixed to This Equipment

⚠Caution

Keep the “warning labels” in a state in which they can always be read.
If a label has peeled off, replace it immediately.

Never peel off or modify a “warning label”.

The following “warning labels” are affixed for the purpose of notifying those who operate the equipment and those who perform tasks such as maintenance management about potential danger.



Use Other Than Intended for the Specifications Is Prohibited

⚠Danger

Do not use the equipment in a way that is outside of the specifications.
The specifications of this equipment are described in Chapter 11. Never handle the equipment in a way that is outside of the specifications because doing so will lead to damage to the equipment and unexpected danger.

Modification Is Prohibited

⚠Danger

Do not modify this equipment.
To ensure the safety of the user and protect this equipment, observe the safety precautions in this manual when handling this equipment.
Furthermore, never modify this equipment.

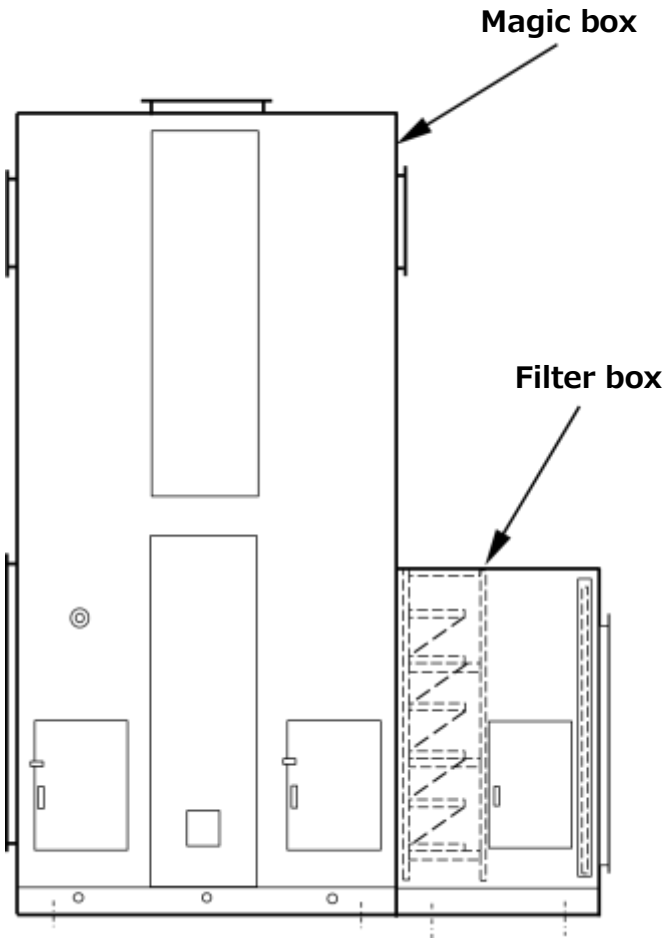
Table of Contents

<Memo>

Chapter 1 Names of Parts

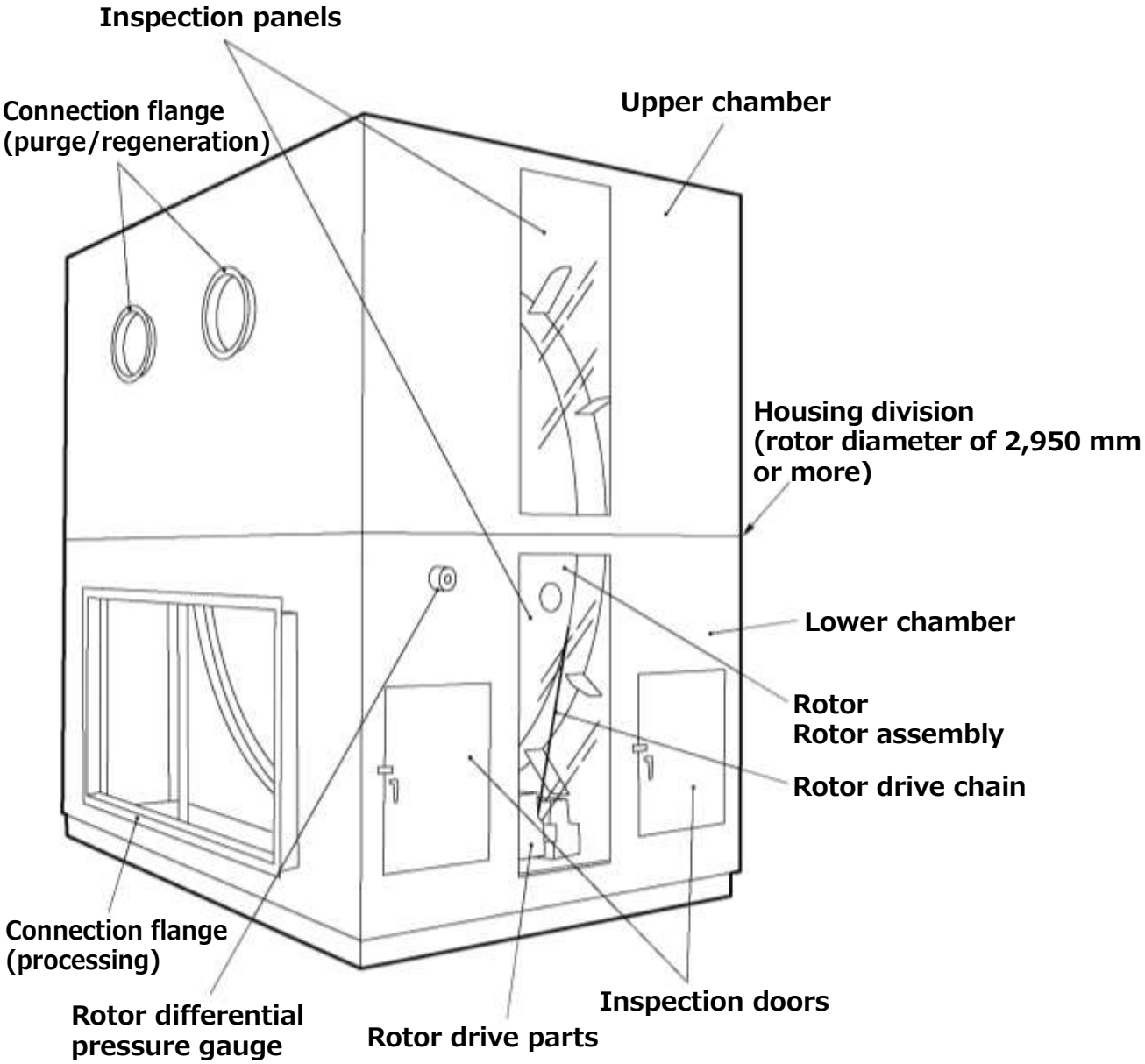
◎ System

This system consists of a magic box and filter box.
The magic box performs the thermal desorption process continuously after organic compounds contained in the raw exhaust gas have been adsorbed and concentrated using filters.
The filter box collects dust and mist (organic compounds) contained in the raw exhaust gas using filters to remove them at the stage prior to the magic box.



◎ Magic box

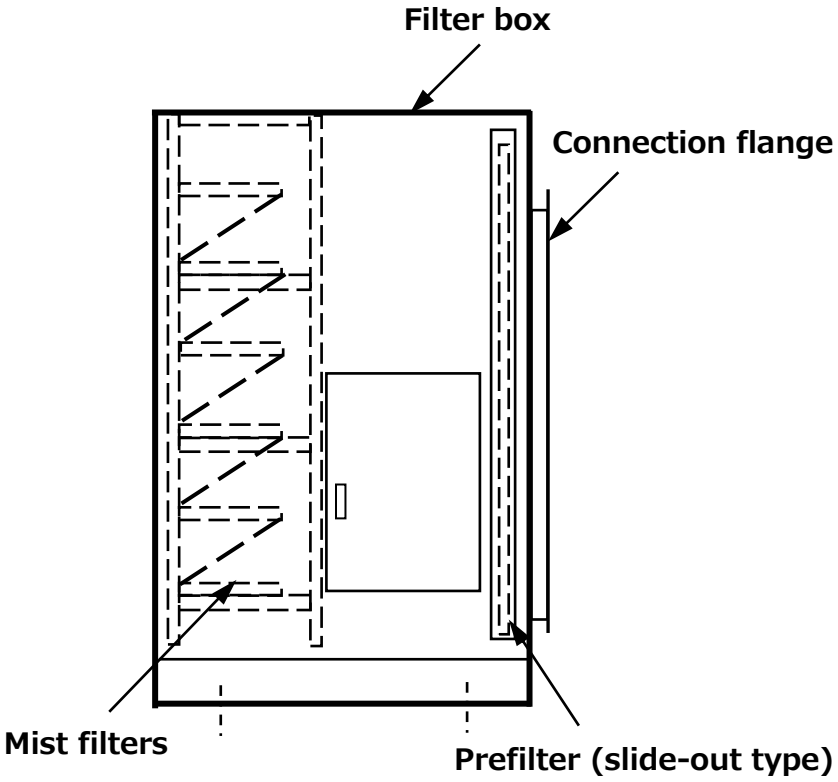
The magic box performs the thermal desorption process continuously after organic compounds contained in raw exhaust gas have been adsorbed and concentrated using filters. If the rotor diameter is 2,950 mm or more, the magic box is delivered divided into top and bottom halves (if it is 2,650 mm or less, the magic box is delivered undivided). The names of the parts of the magic box are as follows.



◎A magic box with top and bottom halves divided as shown in this illustration is a magic box with a rotor diameter of 2,950 mm or more (a magic box with a rotor diameter of 2,650 mm or less is delivered undivided).

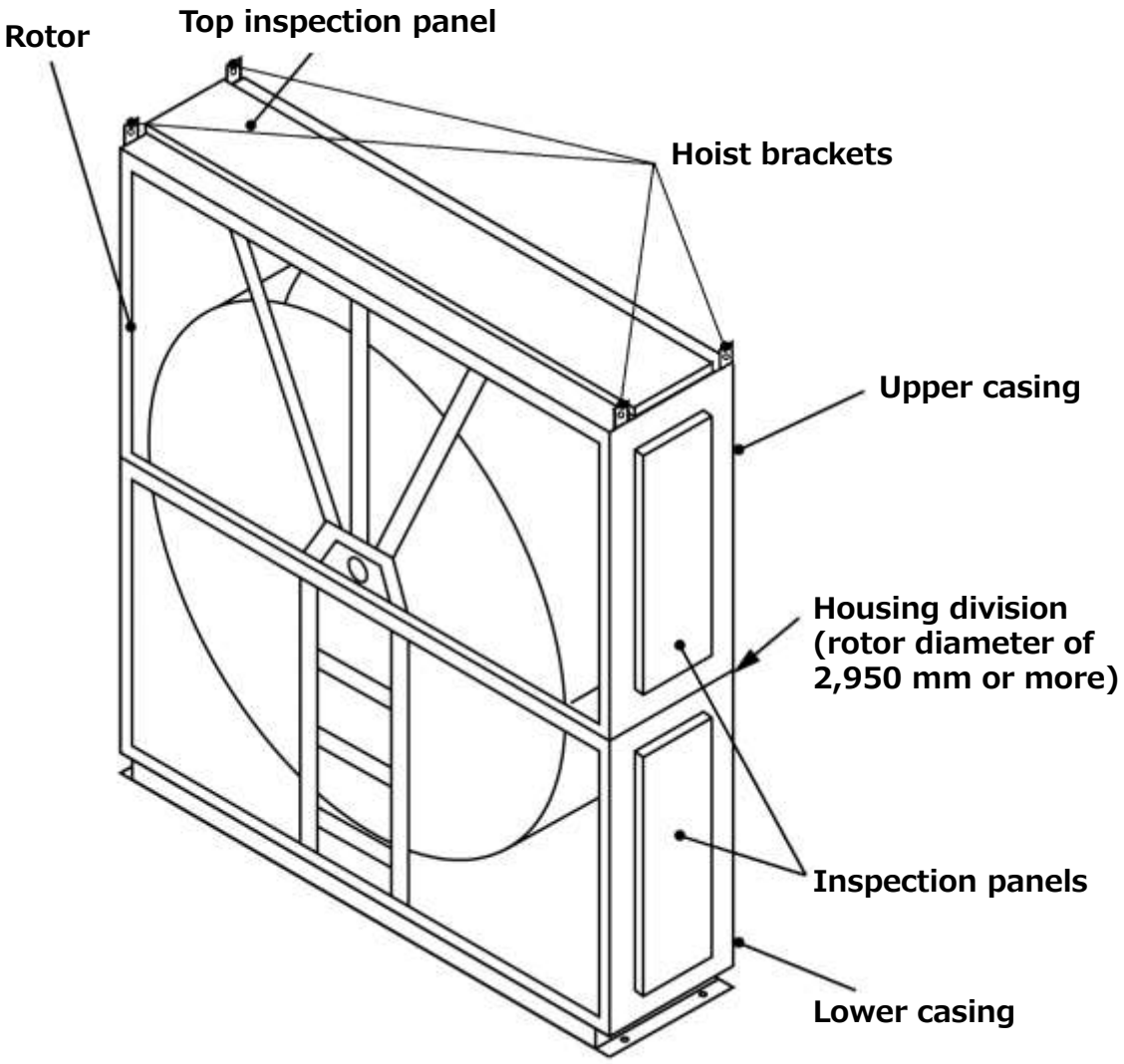
◎ Filter box

The filter box collects dust and mist (organic compounds) contained in raw exhaust gas using filters to remove them at the stage prior to the magic box.



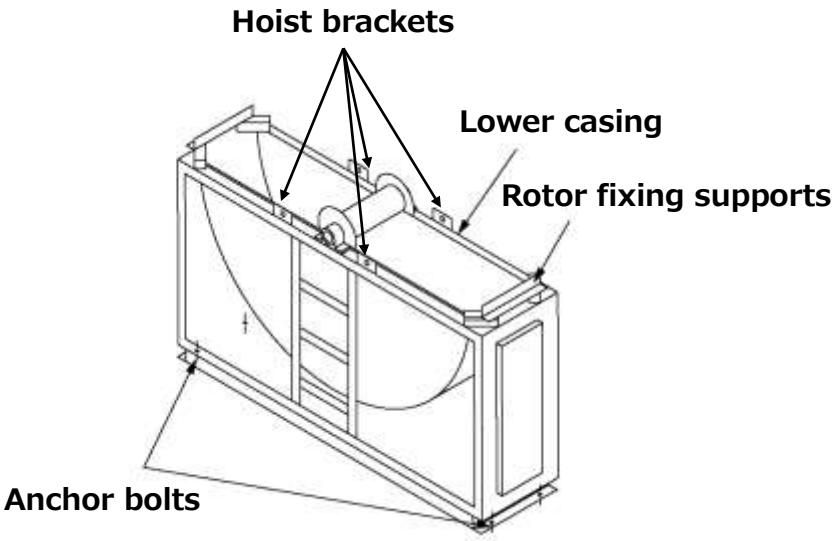
◎ Cassette

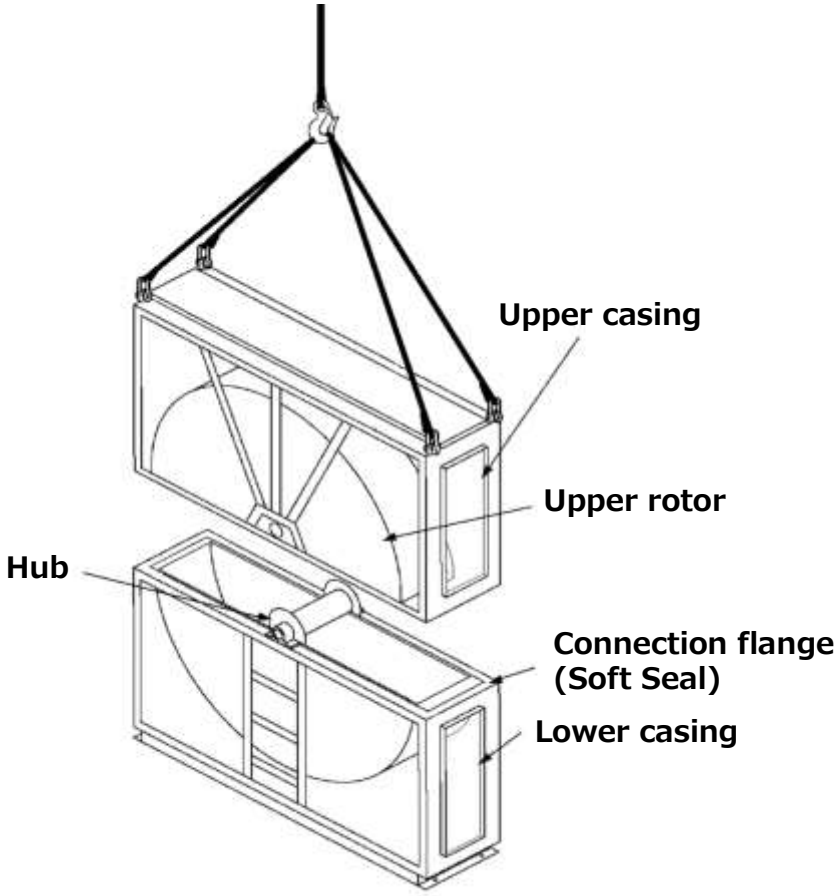
There are cases where only the filter segment (without full housing) will be delivered. This segment is called a cassette. The names of the parts of the cassette are as follows.



◎A cassette with the top and bottom halves divided as shown in this illustration is a cassette with a rotor diameter of 2,950 mm or more (a cassette with a rotor diameter of 2,650 mm or less is delivered undivided).

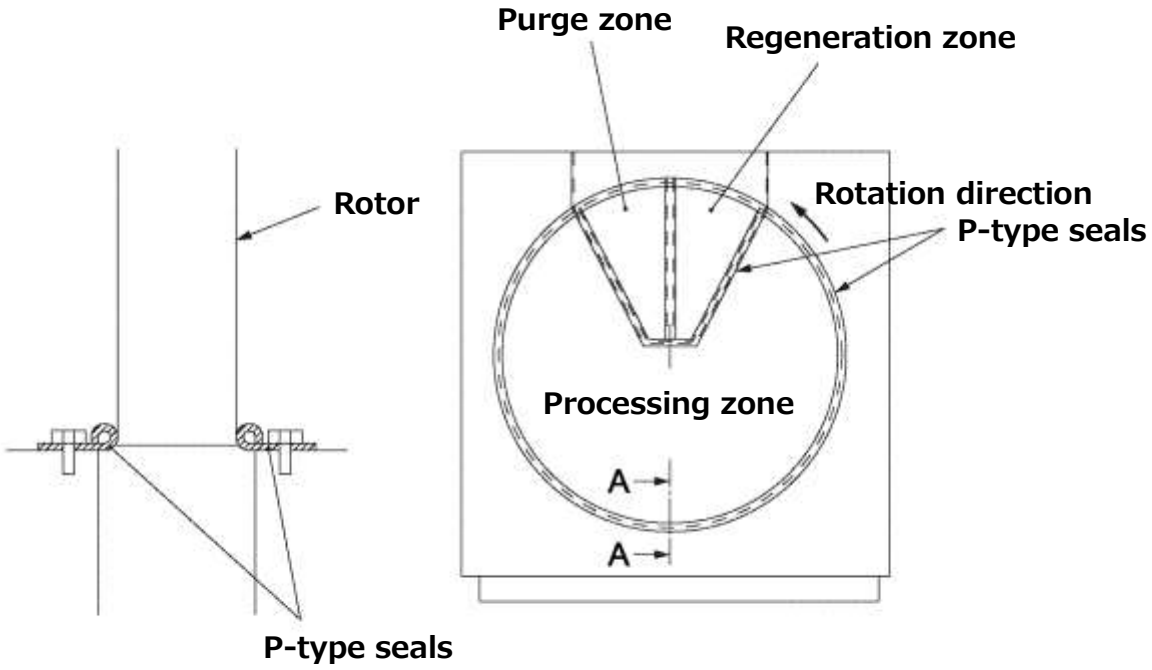
◎ Cassette (divided)



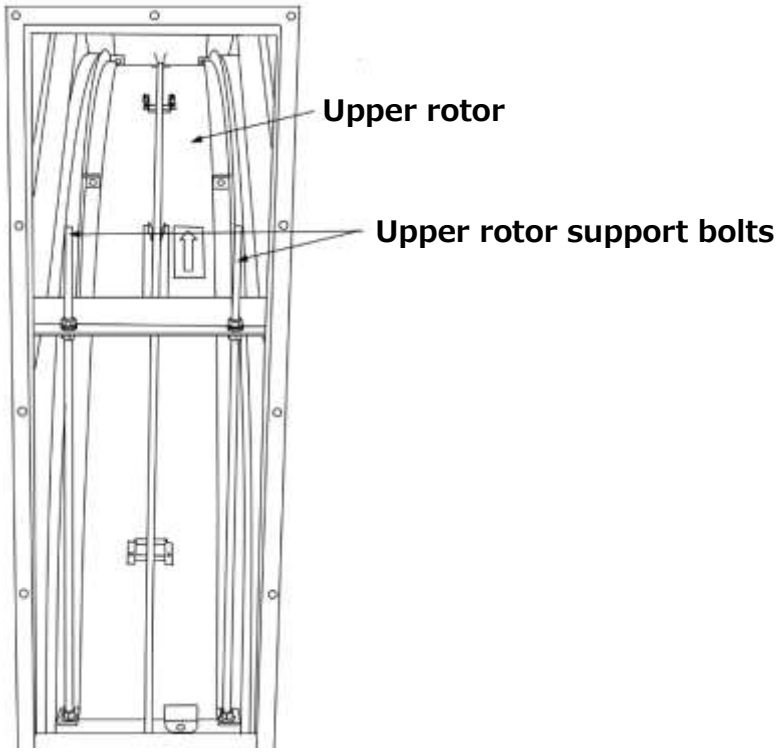


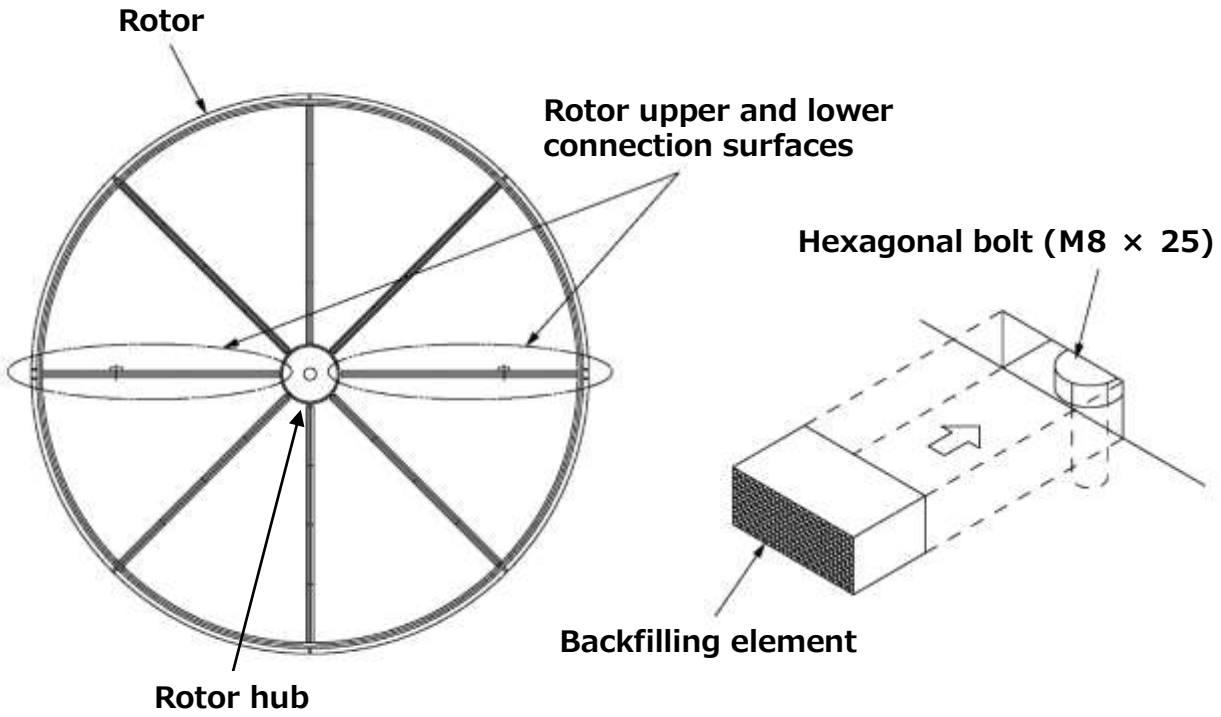
Names of parts (details)

◎ Rotor parts

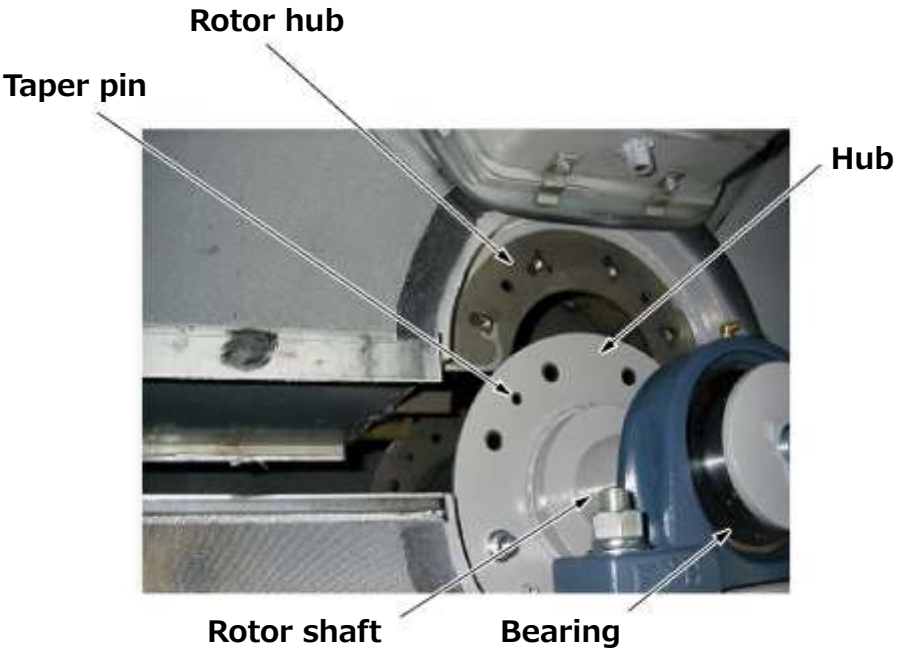


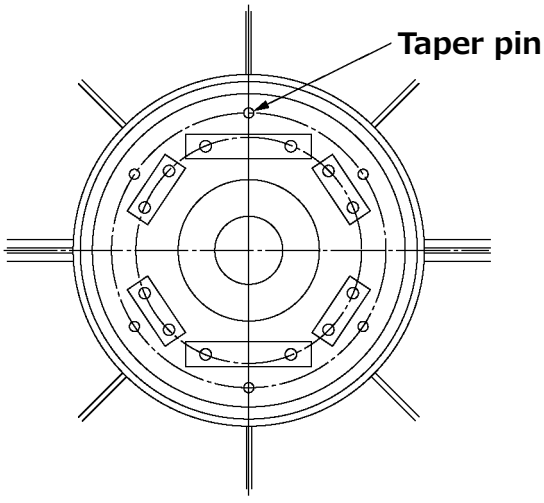
A-A cross section　　Rotor side surface

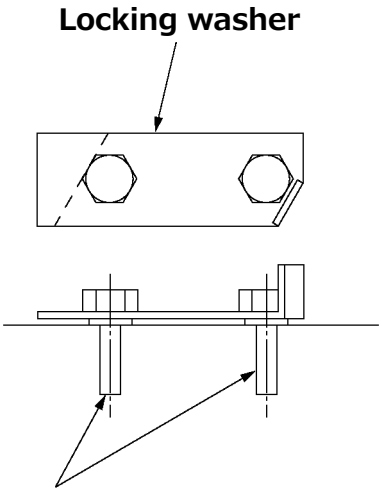



Rotor
Rotor upper and lower connection surfaces
Hexagonal bolt (M8 × 25)
Backfilling element
Rotor hub

◎ Rotor hub parts

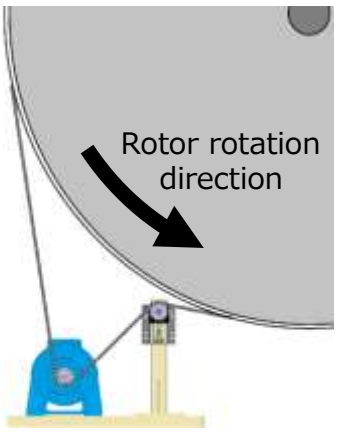




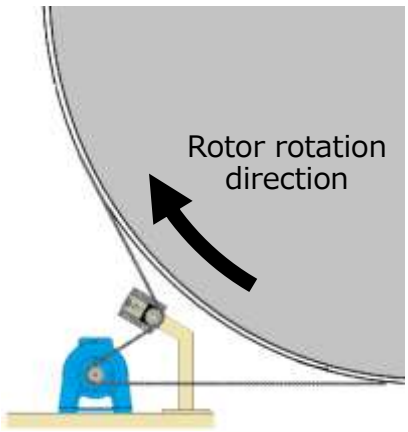


◎ Motor, tensioner, and chain

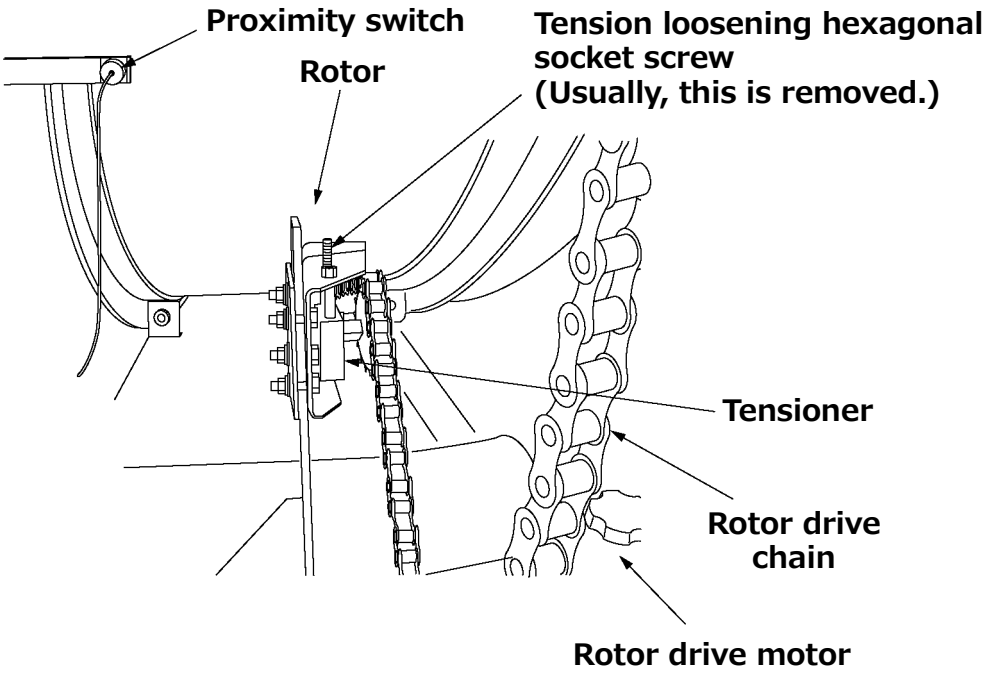
The positions of the motor, tensioner, and chain differ depending on the rotation direction of the rotor.



When the rotor rotates downward from above



When the rotor rotates upward from below



When the rotor rotates downward from above

<Memo>

Chapter 2 Checking the Package Contents

2.1 Checking the Product when Unpacking

(1) SOLVENTCLEAN™ Model Number

In this section, we will explain about the model number because the packages and packaging differ for each model number of SOLVENTCLEAN™.

SC①②–③–④⑤–⑥P
↳
SOLVENTCLEAN™ indication

① A: System (equipment), B: Magic box, C: Cassette, D: Canister, W: Assembly
② H: High Temperature Self-cleaning system (option)
③ Rotor diameter (12 diameters from Ø1,220 mm to Ø4,200 mm)
④ Rotor thickness (40 or 45, with 40 being 400 mm thick and 45 being 450 mm thick)
⑤ AL: HZ-AL, AM: HZ-AM, BL: HZ-BL, BM: HZ-BM, XM: HZ-XM
⑥ Number of parallel rotors

Example: SCBH-2950-40BL-2P
This model number indicates a magic box (with self-cleaning), rotor diameter of 2,950 mm, thickness of 400 mm, HZ-BL zeolite type, and 2 parallel rotors.

The system, magic box, or cassette is packaged undivided if the rotor diameter is 2,650 mm or less, and divided into two if the rotor diameter is 2,950 mm or more.

2.2 Number of Packages and Approximate Dimensions and Weight

(1) System

The dimensions and weight of the (1) system filter box differ depending on the specifications. Please contact us for details.
Since the number of packages differ depending on the model, the dimensions and weights for the (2) magic box and (4) cassette are approximate.

(2) Magic box

Dimensions in parentheses are maximum dimensions that could result from specification changes.

Model (SCB-)	No. of packages	Approximate dimensions (mm) L × W × H	Approximate weight (ton)	
1220-40	1	2118 × 1650 × 1708 (2300 × 1753 × 1710)	1.2	
1525-40		2118 × 1950 × 2037 (2300 × 2053 × 2037)	1.5	
1740-40		2118 × 2150 × 2237 (2300 × 2253 × 2237)	1.6	
1940-40		2118 × 2350 × 2437 (2300 × 2453 × 2437)	1.7	
2190-40		2118 × 2600 × 2687 (2300 × 2703 × 2687)	2.6	
2450-40		2118 × 2900 × 3012 (2300 × 3003 × 3025)	3.0	
2650-40		2118 × 3100 × 3212 (2300 × 3203 × 3225)	3.5	
2950-40	2	2118 × 3430 × 1817 (2300 × 3430 × 1830)	4.0	Upper: 2.0
		2300 × 3503 × 1916 (2300 × 3503 × 2015)		Lower: 2.0
3250-40		2118 × 3730 × 1967 (3200 × 3730 × 1980)	4.6	Upper: 2.3
		2300 × 3803 × 2091 (2300 × 3803 × 2190)		Lower: 2.3
3550-40		2118 × 4030 × 2137 (2300 × 4030 × 2450)	5.2	Upper: 2.6
		2300 × 4103 × 2221 (2300 × 4103 × 2320)		Lower: 2.6
3850-40		2118 × 4330 × 2287 (2300 × 4330 × 2290)	5.8	Upper: 2.9
		2300 × 4403 × 2444 (2300 × 4403 × 2480)		Lower: 2.9
4200-40		2118 × 4680 × 2462 (2300 × 4680 × 2465)	7.0	Upper: 3.5
		2300 × 4753 × 2631 (2300 × 4753 × 2655)		Lower: 3.5

(3) Filter box

The dimensions and weight of a filter box differ depending on the specifications. Please contact us for details.

(4) Cassette

Model (SCC-)	No. of packages	Approximate dimensions (mm) L × W × H	Approximate weight (ton)	
1220-40	1	1040 × 1695 × 1708 (1040 × 1695 × 1709)	0.8	
1525-40		840 × 1850 × 1950 (1040 × 1995 × 2037)	1.0	
1740-40		1040 × 2195 × 2245 (1040 × 2195 × 2245)	1.2	
1940-40		1040 × 2395 × 2445 (1040 × 2395 × 2445)	1.3	
2190-40		1040 × 2645 × 2720 (1040 × 2645 × 2720)	2.0	
2450-40		1040 × 2945 × 3020 (1040 × 2945 × 3020)	2.4	
2650-40		1065 × 3145 × 3220 (1065 × 3145 × 3220)	2.8	
2950-40	2	840 × 3430 × 1925 (1065 × 3430 × 1839)	3.3	Upper: 1.65
		1065 × 3445 × 1924 (1065 × 3445 × 2015)		Lower: 1.65
3250-40		840 × 3730 × 1975 (840 × 3730 × 1989)	3.6	Upper: 1.8
		1065 × 3745 × 2099 (1065 × 3745 × 2190)		Lower: 1.8
3550-40		840 × 4030 × 1245 (840 × 4030 × 2159)	4.3	Upper: 2.15
		1065 × 4045 × 2229 (1065 × 4045 × 2320)		Lower: 2.15
3850-40		840 × 4330 × 2285 (840 × 4330 × 2299)	5.1	Upper: 2.55
		1065 × 4345 × 2445 (1065 × 4345 × 2480)		Lower: 2.55
4200-40		840 × 4680 × 2460 (840 × 4680 × 2474)	5.7	Upper: 2.85
		1065 × 4695 × 2620 (1065 × 4695 × 2655)		Lower: 2.85

Chapter 3　Transporting and Unloading

This equipment is shipped with the top and bottom divided when the rotor diameter is 2,950 mm or more. The following considerations are required when transporting and unloading this equipment.

◎ About transporting and unloading

Rigging and slinging by a crane, etc. must be carried out by a person with the appropriate qualifications for the weight of the product (refer to “Chapter 2　Checking the Package Contents” for the weight of each package).

⚠Danger

This equipment may fall or drop when it is lifted for transporting. Never go under this equipment. Keep at least 2 meters away from this equipment.
You may be crushed by this equipment, resulting in death or serious injury.

Do not lift up the equipment using anything other than the hoist brackets. Do not lift up the equipment using the hoist brackets at the top of the equipment after the divided upper and bottom sections of the equipment are connected.
The equipment may fall or drop and the equipment, hoist brackets, etc. may be damaged.

Workers must always use protective gear when carrying out the work.
Not using correctly worn protective gear (safety helmet, safety belt, and safety boots) during the work may result in death or serious injury.

⚠Warning

Transport the equipment with the hoist hooks attached to the hoist brackets or hoist positions specified by NICHIAS Corporation.
Otherwise, the equipment may fall or drop, resulting in damage to the equipment, etc.

Rigging and slinging by a crane, etc. must be carried out by a person who is legally qualified.

Crane work must be carried out by a person who is legally qualified.

Check that the hoist brackets are not loose before using the hoist hooks.
The equipment may fall or drop and the equipment or bolts may be damaged.

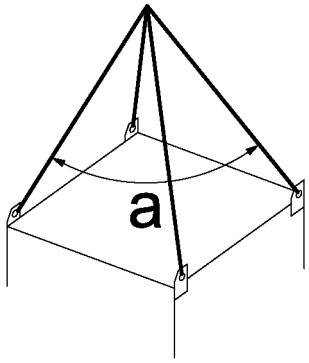
⚠Caution

Secure this equipment so that an external force is not applied to it during transporting.
Place padding material between equipments so that they do not touch each other.

Loading of the equipment onto a truck or ship should be carried out by trained specialist.
Weight transfer due to vibration and shaking may cause unexpected damage to the equipment (also give consideration to movement on the cargo deck or within the container).

When selecting the slinging equipment, confirm the product weight to ensure the required safety factor before use.

Ensure that suspension angle (a) is within 90 degrees as shown in the following figure.



When attaching the wire ropes to the suspension brackets, pass the shackles through the eyes of the suspension brackets and pass the shackle bolts through the eyes of the wire ropes.

Make sure the wire ropes do not overlap at the top or sides of the hoist hook of the crane, etc.

Do not directly touch the suspended load or slinging equipment during operation of the crane, etc.

When removing the wire ropes and slinging equipment, do not pull them off by hoisting up the hook of the crane, etc.

Chapter 4 Explanation of Installation Environment, Electric Power, G as Quantity, and Other Factors

Select a place such as the following for the installation location of this equipment.
Selecting an improper installation location may lead to not only damage to this equipment but also personal injury.

4.1 Installation Conditions

⚠Danger

Ground the earth terminal properly.
Electric shock may occur.

⚠Warning

Install this equipment in a location where the ground has been made level.
If the ground has not been made level, this equipment may fall or tip over, resulting in injury or equipment damage.

Do not install the equipment in an explosive atmosphere.
Explosion, ignition, fire, electric shock, injury, or equipment damage may occur.

Be sure to use a power supply with the capacity indicated on the nameplate.
Motor burnout or fire may occur.

Use electric wires suitable for the power supply capacity.
If the electric wires are not rated for the power supply capacity or higher, the insulation coating may melt and an insulation failure may occur, resulting in electric shock or fire.

Observe the "Installation conditions" described on the next page when installing the product.
Neglecting to do so may result in a loss of safety and performance, a fire, and the rotor falling off or rotating abnormally.

⚠Caution

If this equipment is installed on the roof of a building, check that the actual building will be able to withstand the weight of the installation before installing the equipment.
The equipment may be damaged or fall.

Be sure to check that there is maintenance space before installing this equipment.
Sufficient space to replace the rotor is required for the maintenance space. As a rough guide, the rotor diameter plus space to lift up the rotor with a crane, etc. is required.

◎ Installation conditions

Conditions such as the composition, concentration, and quantity of process gas are as specified in the design & specification documents of your individual product.

Chapter 5 Explanation of Main Points and Procedures of Installation and Assembly

Refer to “Chapter 4 Explanation of Installation Environment, Electric Power, Gas Quantity, and Other Factors” for details on the installation location of this equipment before installing the equipment. Sufficient performance may not be attainable after improper installation methods. Fully understand the following information before installation.

5.1 Magic Box

⚠Danger

Do not carry out the work in an explosive atmosphere.
Explosion, fire due to ignition, electric shock, etc. may occur, resulting in death or serious injury.
Furthermore, equipment damage may occur.

Be sure to turn “OFF” all power before carrying out the work.
Electric shock may occur.

⚠Warning

Transporting, grounding, piping, wiring, running, and operation work must be carried out by qualified persons or the administrator.
Fire, electric shock, injury, etc. may occur.

Be careful not to touch rotating parts.
Injury from entanglement may occur.

Never place combustibles in or around this equipment.
Fire may occur.

This equipment does not handle “mist” well. Be sure to install preprocessing equipment to remove “mist” (0.1 mg / Nm^3 or less).
Using this equipment without removing “mist” may cause fire or deterioration in performance.

When attaching this equipment to columns or a wall of a building, sufficiently inspect the structure, strength, etc. and securely fix the equipment using angles and channels.
The equipment may fall, resulting in injury or damage.

⚠Caution

Be sure to use a helmet when carrying out the work inside the equipment.

To avoid the risk of falling, do not bring the cutter or accessory tool inside the equipment.

This equipment has an upper section and lower section. Attach the upper and lower sections correctly.
If the equipment is assembled with the orientation of the top and bottom or left and right incorrectly, the equipment may be damaged.

Use the appropriate torque for attachment of this equipment's base or flange faces to ensure the bolts are not loose.
If the bolts are loose, injury or equipment damage may occur.

If the assembly of this equipment is not stable, abnormal vibration and noise may be generated.
If the foundation is not strong, bearing, gear, and shaft damage may occur.

When attaching this equipment to another machine, check the structure and strength of the other machine.
If the structure or strength is inappropriate, vibration may occur resulting in an accident.

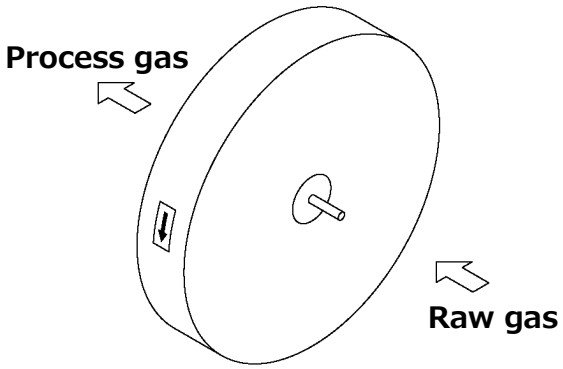
Tighten the mounting bolts to the appropriate torque to ensure they do not come loose.
If unnecessary force is applied to the product due to, for example, uneven fastening, equipment damage may occur.

When connecting the upper and lower sections of the rotor, check the tension of the chain, tensioner, shims, etc. When attaching the chain, adjust the tension. Also, adjust the tensioner and shims and tighten the bolts properly before operation.
A part may break and pieces of it may scatter and cause injury or equipment damage.

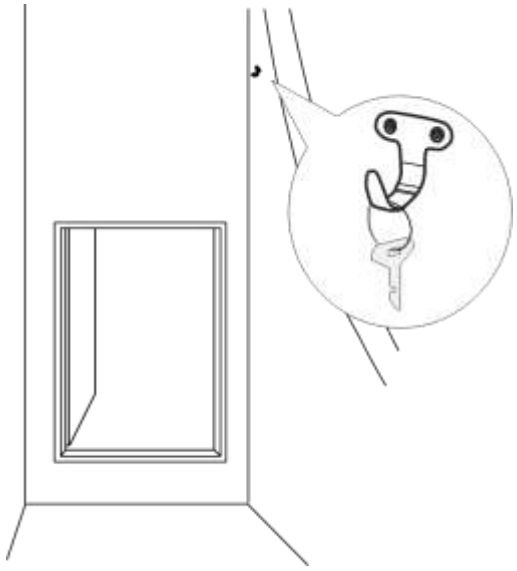
When coupling the equipment with a load or motor, attach the chain, sprockets, gears, etc. so that an impact is not applied to the bearings.
The equipment may be damaged.

It is recommended to use ladders and scaffolds in order to work on the aerial platform.

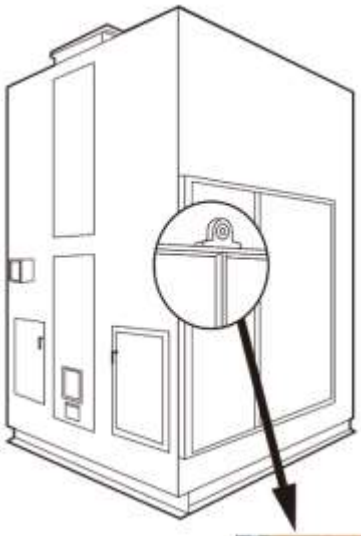
Check the rotation direction before actual operation.
If the rotation direction is incorrect, injury or equipment damage may occur. An arrow label indicating the rotation direction is affixed to the rotor side surface.



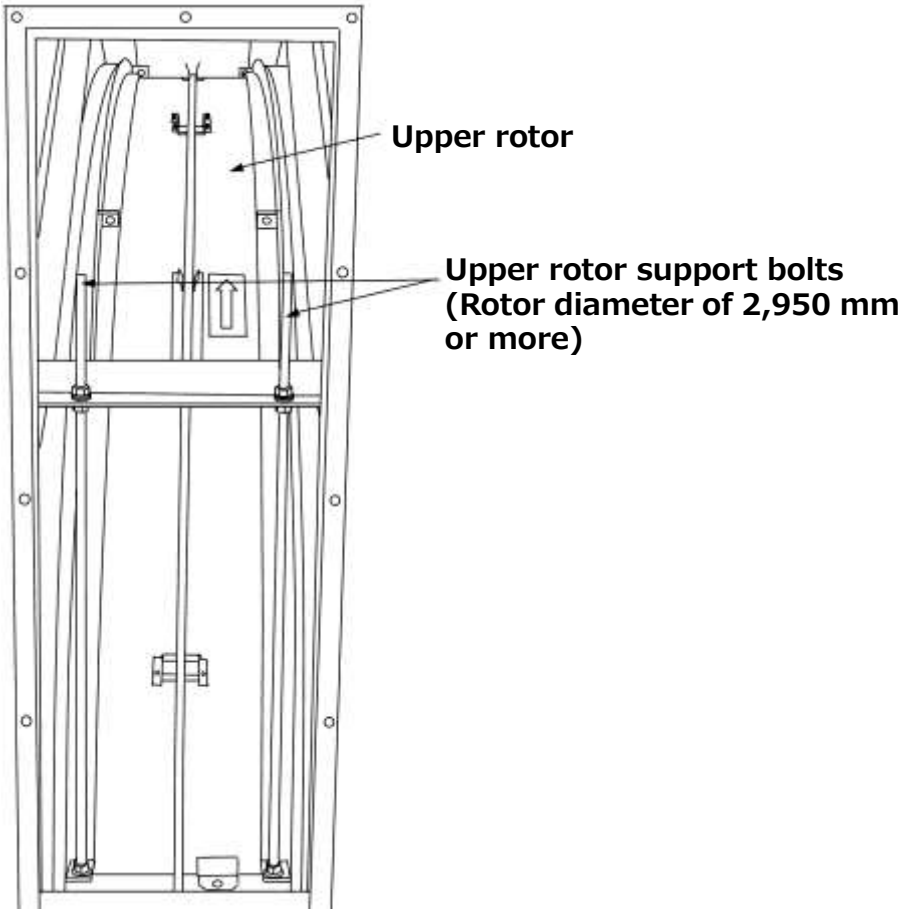
After unlocking the key of inspection door and when the door was opened, be sure to store the key in the hook in the equipment.



To rotate the rotor alone, remove the four rotor support bolts of the rotor with a diameter of 2,950 mm or more, and the rotor end face fixing polystyrene for a rotor with a diameter of 2,650 mm or less.
If the rotor is rotated without removing the rotor end face fixing polystyrene, injury or equipment damage may occur.



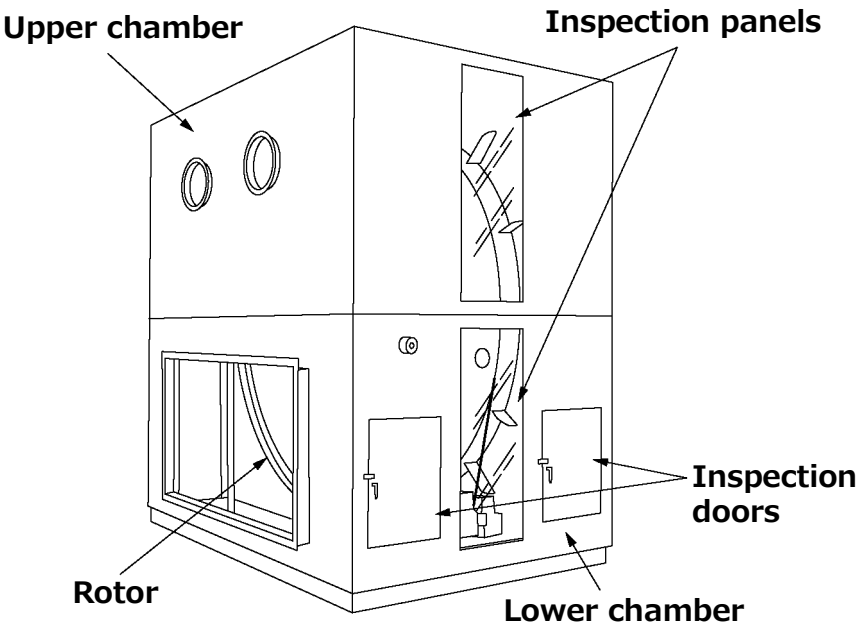
End face fixing polystyrene (rotor diameter of 2,650 mm or less)


Upper rotor
Upper rotor support bolts
(Rotor diameter of 2,950 mm
or more)

◎ For rotor diameter of 2,950 mm or more

The main unit is shipped and transported with the top and bottom divided. The rotor assembly is also shipped with the top and bottom divided in the same way and incorporated into each casing respectively.

The side inspection panels are shipped loosely fixed with several bolts.



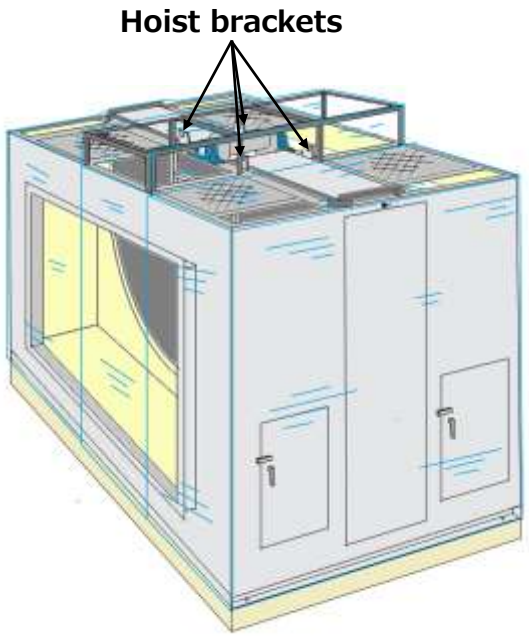
(1) Preparation

1) Prepare anchor bolts, assembly tools (general tools), heavy machinery (crane, etc.), and caulking material (Shin-Etsu Chemical Co., Ltd. Silicone Sealant KE-45 (clear)).
2) Check that the accessories are included with the product. Refer to the supplied list sheet for the accessory parts.
   * The list sheet is included at the end of the table.
3) Remove the side inspection panels (two panels on upper section and two panels on lower section) and the top inspection panel in (one panel) before beginning the work.

(2) Assembly

Installing the lower chamber

1 Attach hoist hooks to the hoist brackets in four places on the lower chamber and then pass the wires through them.

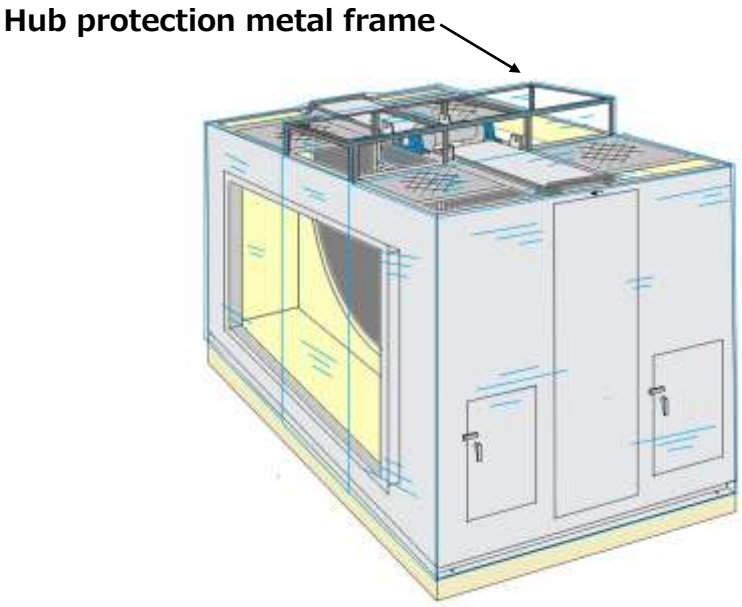


2 Lift up the lower chamber with a crane, etc. and place it in the designated position. The lower chamber has a designated front and back so take care not to mistake the orientation when positioning it.

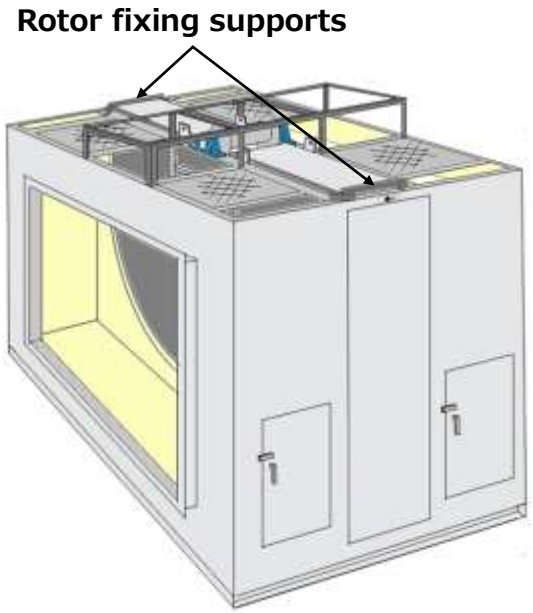
3 Remove the hoist hooks and wires attached to the lower chamber.

4 Fix the lower chamber to four places of the base with the anchor bolts.

5 Remove the hub protection metal frame at the top of the lower chamber with a wrench or spanner (M12).



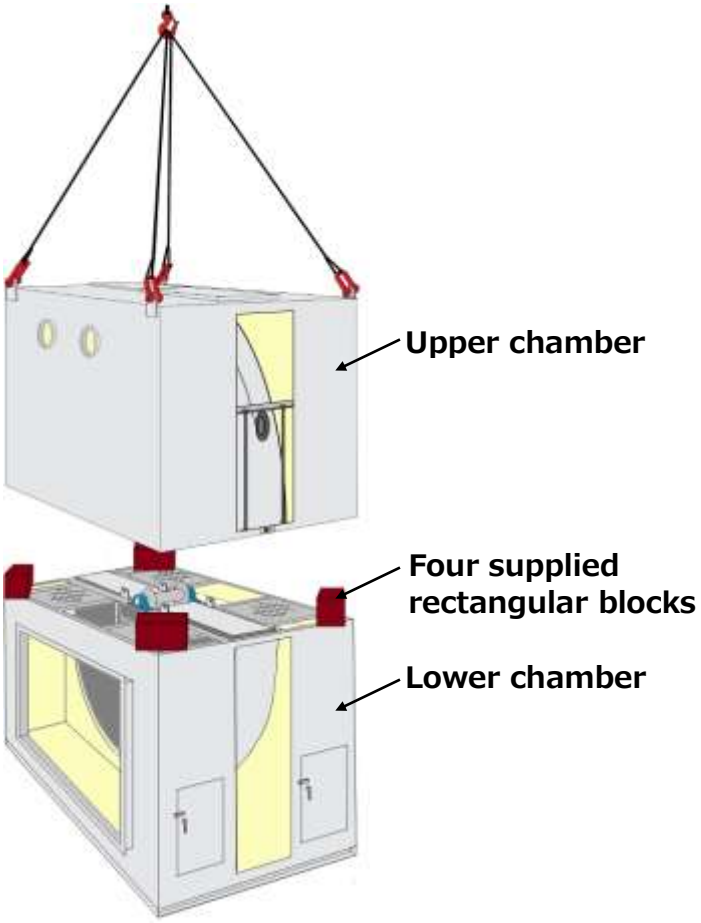
6 Remove the rotor fixing supports in two places at the top of the lower chamber with a wrench or spanner (M12).



7 Affix the supplied seal material (NICHIAS SOFT SEAL™) to the surfaces that connect with the upper casing at the top of the lower chamber. To confirm which areas to apply the seal material and the detailed application procedure, refer to "5.6 Affixing Seal Material".

Attaching the upper chamber

8 Put the four supplied rectangular blocks (□200 x 500L) lifting by crane at the four corners of the lower plenum.

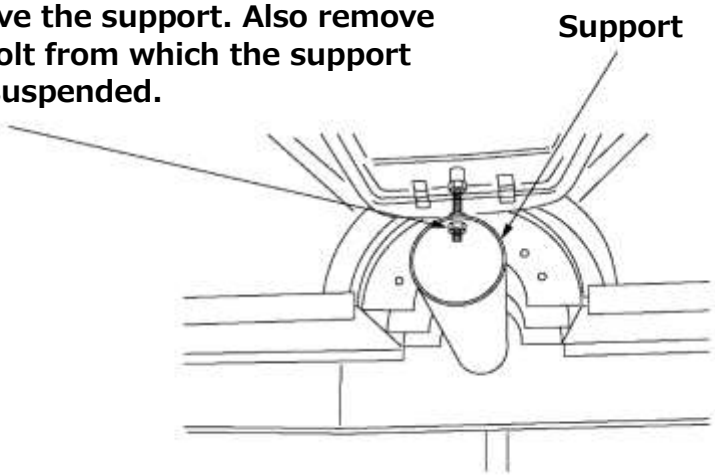


9 Attach hoist hooks to the hoist brackets in four places on the upper chamber and then pass the wires through them.

10 Lift up the upper chamber with a crane, etc. and temporarily place it on the rectangular blocks that you placed at the four corners of the lower chamber. The upper chamber has a designated front and back so take care not to mistake the orientation when positioning it.

11 Remove the cylindrical support at the rotor shaft inside the upper chamber. First, remove the hexagonal nut fixing the support in place. Then, remove the support. Finally, remove the bolt to which the hexagonal nut was fastened.

Remove the hexagonal nut and remove the support. Also remove the bolt from which the support was suspended.



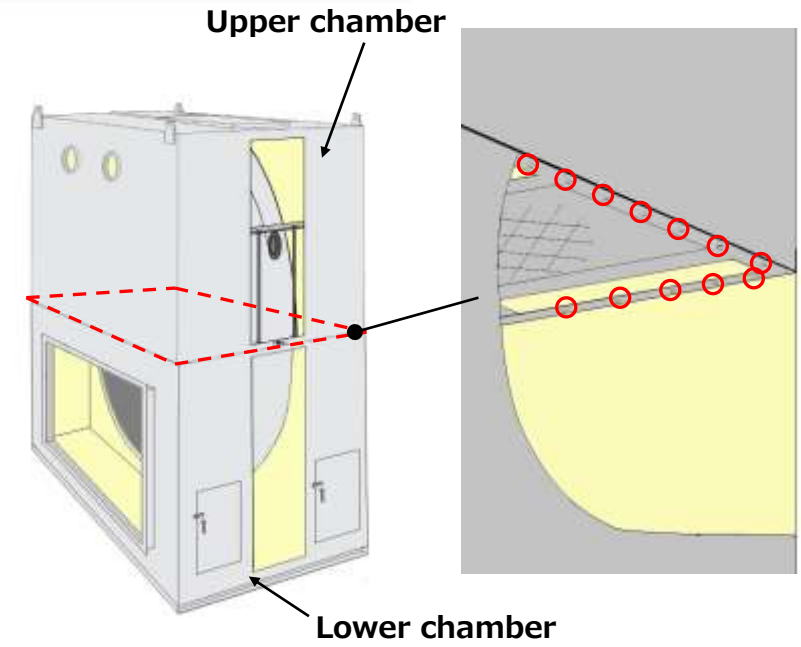
12 Lift up the upper chamber enough to remove the rectangular blocks in four places.

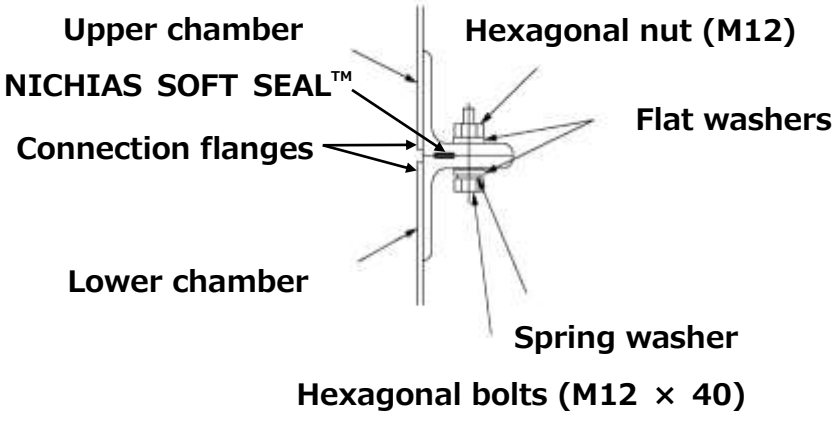
13 Slowly lower down the upper chamber so that the lower chamber connection holes are aligned. When lowering it, take care that the hub parts at the center of the upper and lower chambers do not interfere with each other.

14 Remove the hoist hooks and wires attached to the upper chamber.

Fixing the upper and lower chambers together

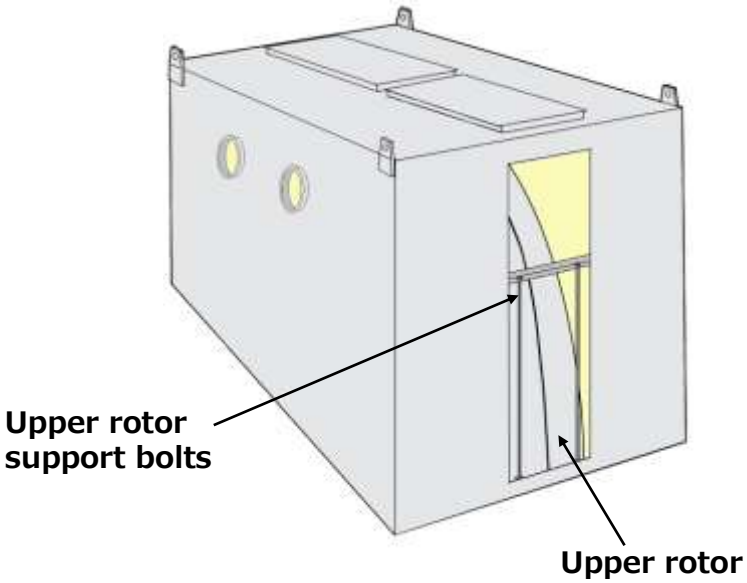
15 Fix the upper and lower chambers together. Firmly fasten the connection holes in the connection flange area using a hexagonal bolt (M12 × 40), hexagonal nut (M12), spring washer, and two flat washers in each of the 58 holes for a rotor with a 2,950 mm diameter, 56 holes for a rotor with a 3,250 mm diameter, 60 holes for a rotor with a 3,550 mm diameter, and 70 holes for a rotor with a 4,200 mm diameter. The tightening torques is 42 N·m. For details, refer to the figure below.



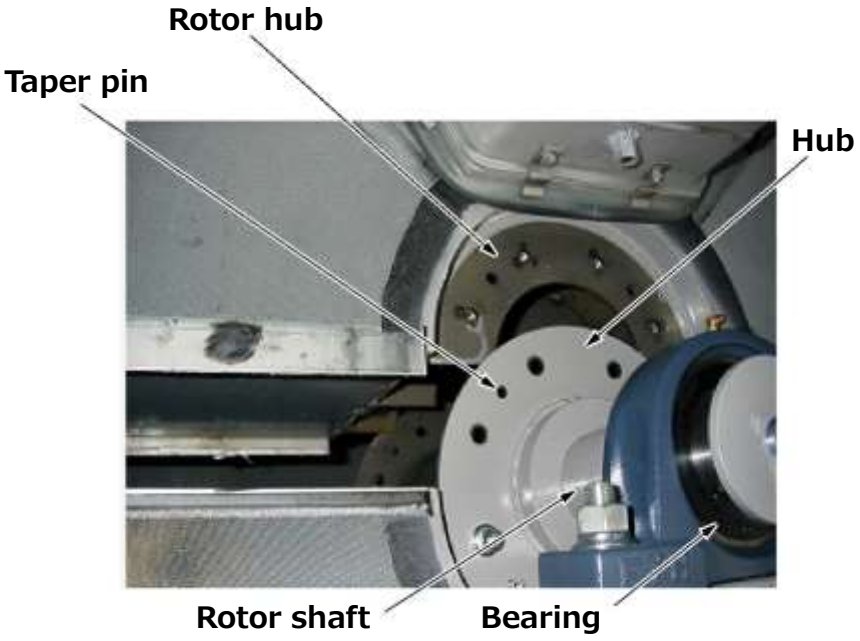


Fixing the upper and lower rotors together

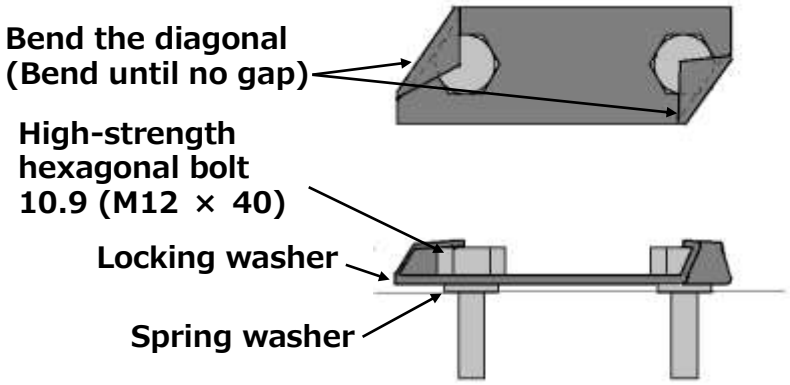
16 The rotor stored inside the upper chamber is temporarily secured in place with the four support bolts located on the left and right. Lower the upper rotor by evenly and slowly loosening the four bolts (two on each side) from the inspection openings on the left and right, and align the holes in the hub of the lower chamber and the rotor hub of the upper chamber.



17 Use a hammer to tap the taper pins into the hub (four on one side and total of eight on both sides for a rotor with a 2,650 to 3,550 mm diameter, and six on one side and total of 12 on both sides for a rotor with a 3,850 to 4,200 mm diameter).

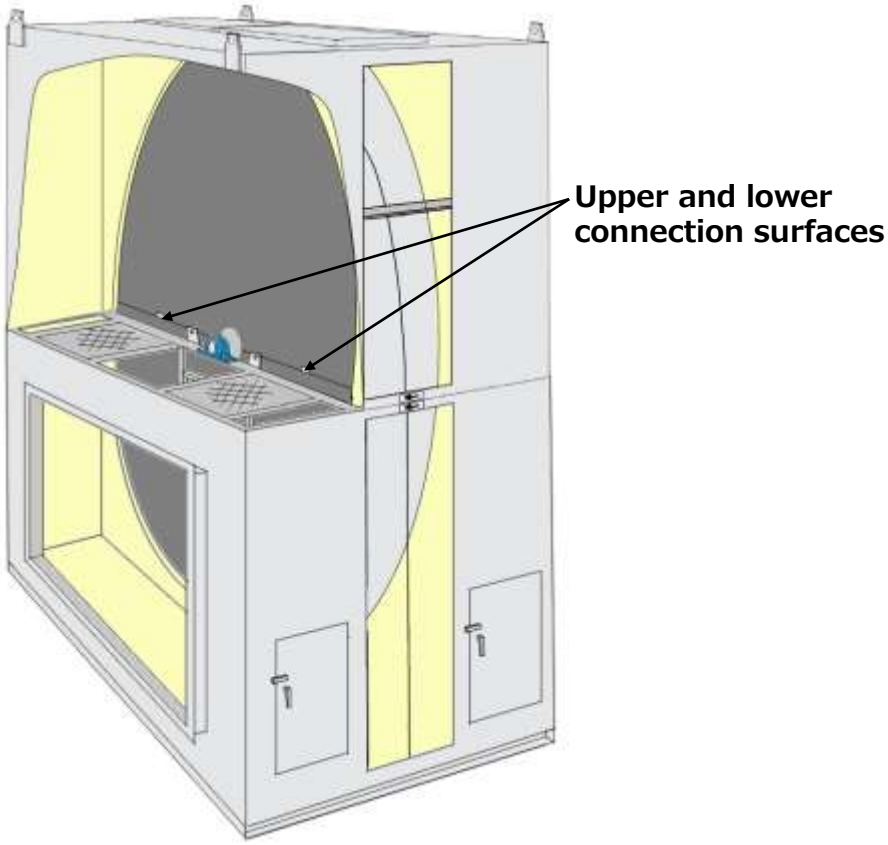


18 Fix with high-strength hexagonal bolts 10.9 (M12 × 40). There are 12 bolts for fixing on one side, and a total of 24 on both sides. Use the bolts together with locking washers and spring washers. For details, refer to the figure.

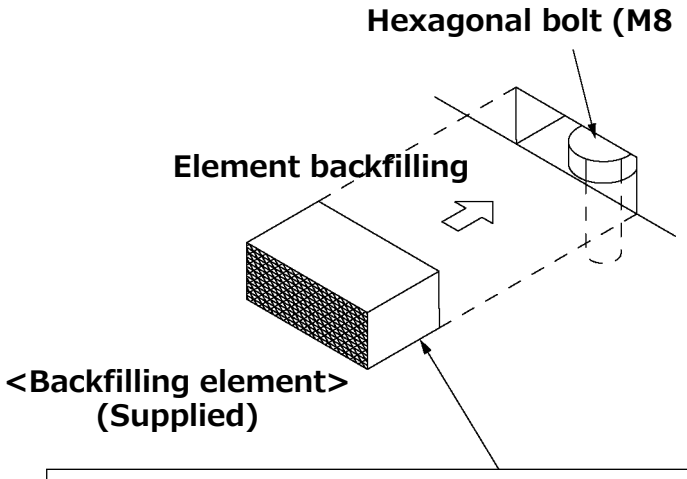


19 After tightening the high-strength hexagonal bolts, use pliers to bend the corner of the locking washers to prevent turning. At that time, make sure there is no gap between the heads of the hexagonal bolts and bent washers.

20 Fix the upper and lower halves of the rotor together. Fasten the connection points (two on one side, total of four on both sides) with hexagonal bolts (M8 × 25).



21 Back fill the cutouts at the connection points described above using the backfilling elements. Cut the backfilling elements to the size of the openings, apply silicone to the surfaces to which they are to be affixed, and push into the opening. Finish the process by removing any excess silicone so that silicone does not protrude from the rotor surfaces.

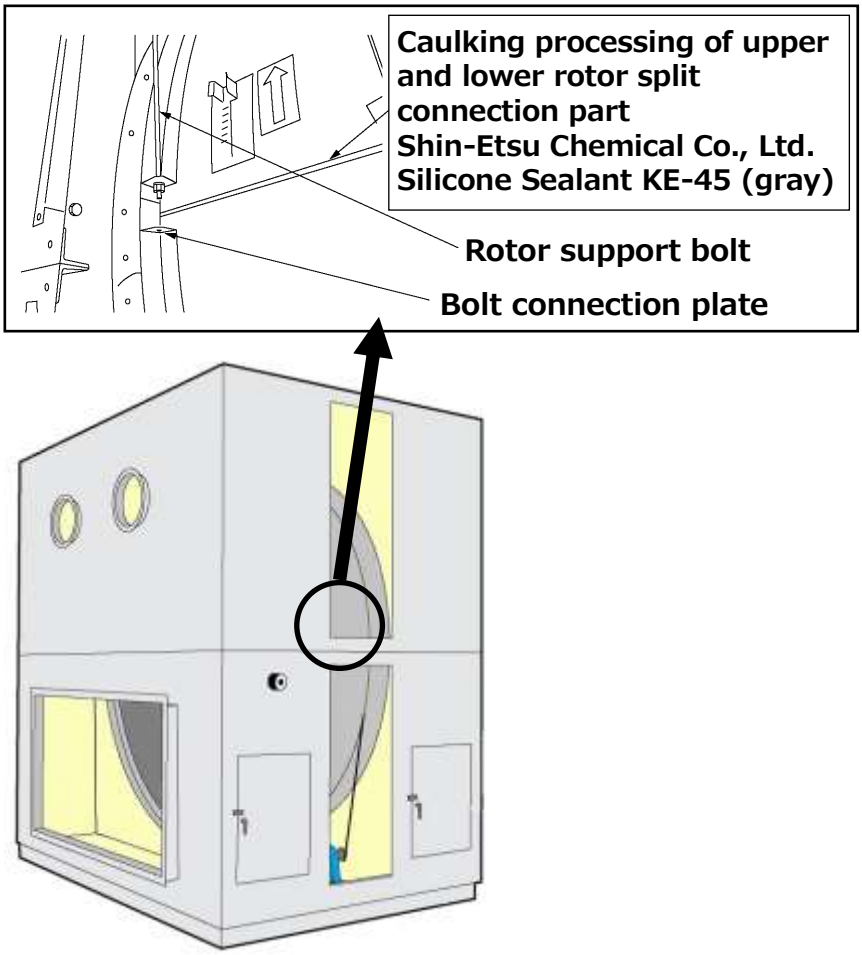


Apply silicone (supplied) around the element. Shin-Etsu Chemical Co., Ltd. Silicone Sealant KE-45 (gray)

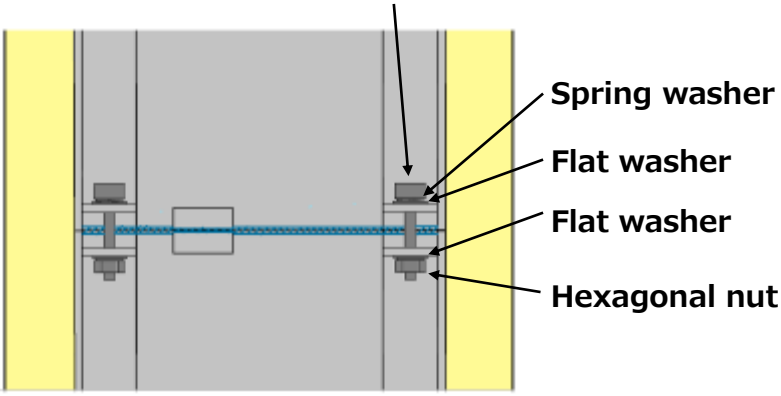
For high temperature regeneration specification, apply Shin-Etsu Chemical One-component RTV rubber KE-3418 (black) to the backfilling elements on the processing outlet side.

22 Remove the four support bolts you loosened in step **16**.

23 Join the plates to which the support bolts were attached in step **22** and the bolt connection plates pre-installed to the lower rotor. They are located in a total of four places on the rotor side surfaces. Use a hexagonal bolt and nut, two flat washers, and a spring washer for each hole. For the bolts and nuts, use M12 × 100 (tightening torque: 42 N·m) for a rotor with a 2,450 to 2,650 mm diameter, M16 × 100 (tightening torque: 106 N·m) for a rotor with a 2,950 to 3,550 mm diameter, and M20 × 100 (tightening torque: 204 N·m) for a rotor with a 3,850 to 4,200 mm diameter. For details, refer to the figure.



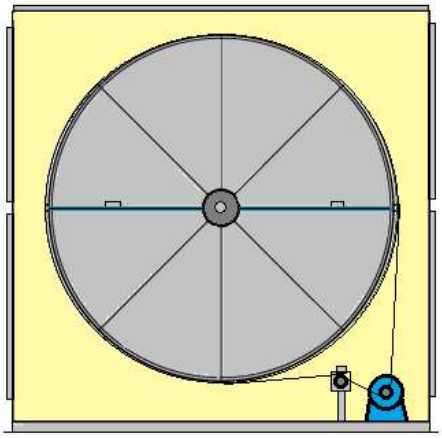
Hexagonal socket bolts M16 × 100 (for rotor diameter of 2,950 to 3,550 mm; tightening torque 106 N·m)
Hexagonal socket bolts M20 × 100 (for rotor diameter of 3,850 to 4,200mm; tightening torque 204 N·m)



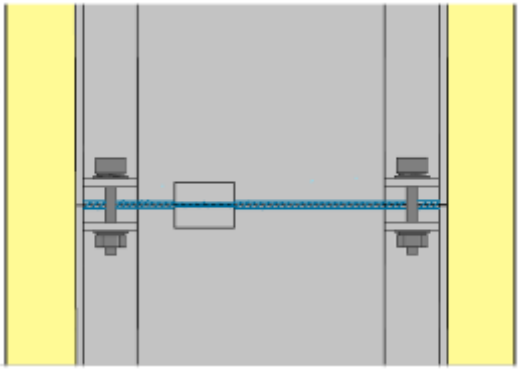
<Rotor connection parts (side surface)>

24 Fill the gap between the upper and lower rotors with silicone caulking material. Use a spatula or similar tool to fill the gap and remove any protruding silicone caulking material. This process needs to be performed in two areas on the rotor front surface and two areas on the rotor side surface (see the figures below).

<Rotor front surface>

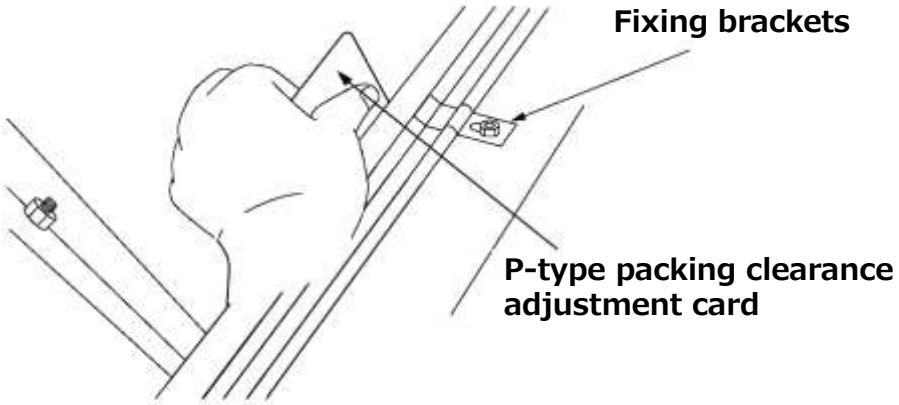


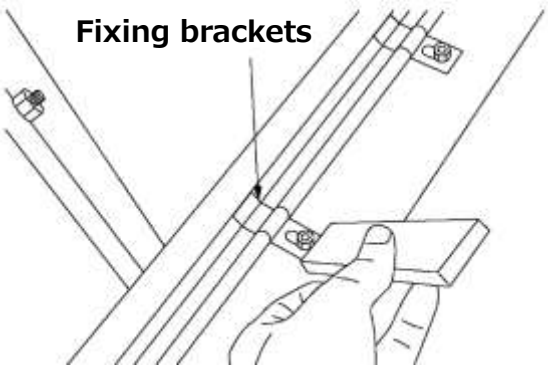
<Rotor side surface>



P-type packing adjustment

25 P-type packing is pre-attached to the main unit sides to prevent air leaking from the outer periphery of the rotor while in use. This packing needs to be adjusted. Insert a P-type packing clearance adjustment gauge (0.3 mm thickness) into the gap between the rotor outer periphery and P-type packing and make adjustments to the extent that the gauge does not drop when you let go of it. Adjust the packing by using a wrench to gently loosen the brackets attaching the P-type packing and then tighten the fittings at the appropriate positions. Slowly rotate the rotor by hand after adjustment and check that the clearance is appropriate.



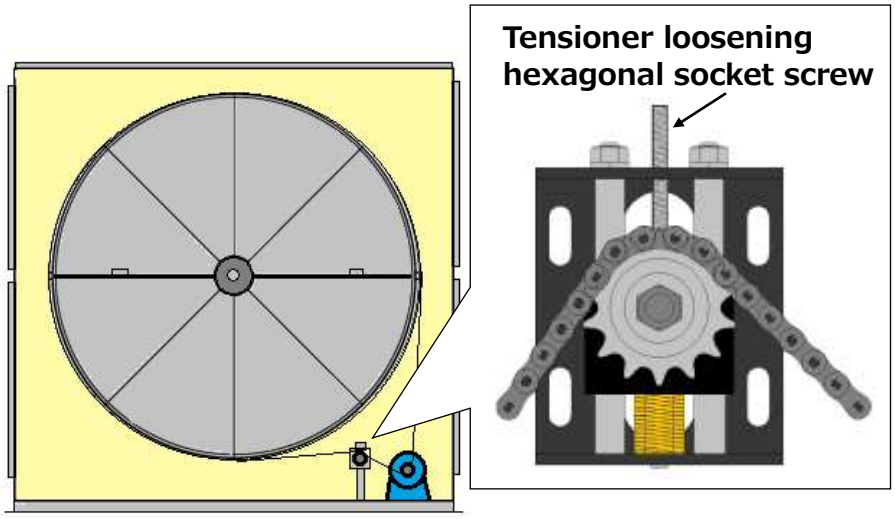


Drive part assembly adjustment

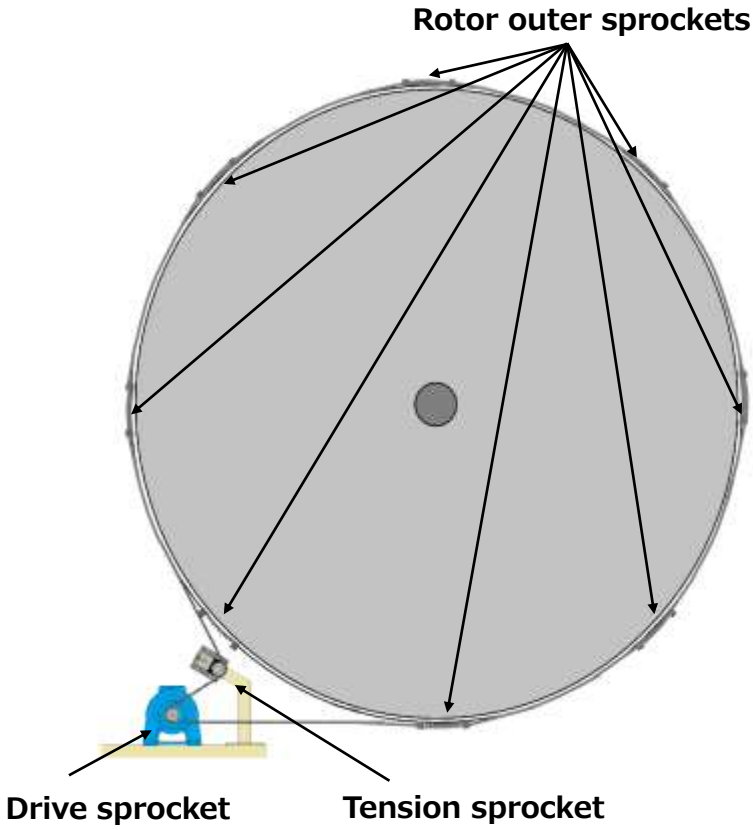
Wear work gloves or cut resistant gloves for protection during the work because oil is applied to the chain

<Procedure>

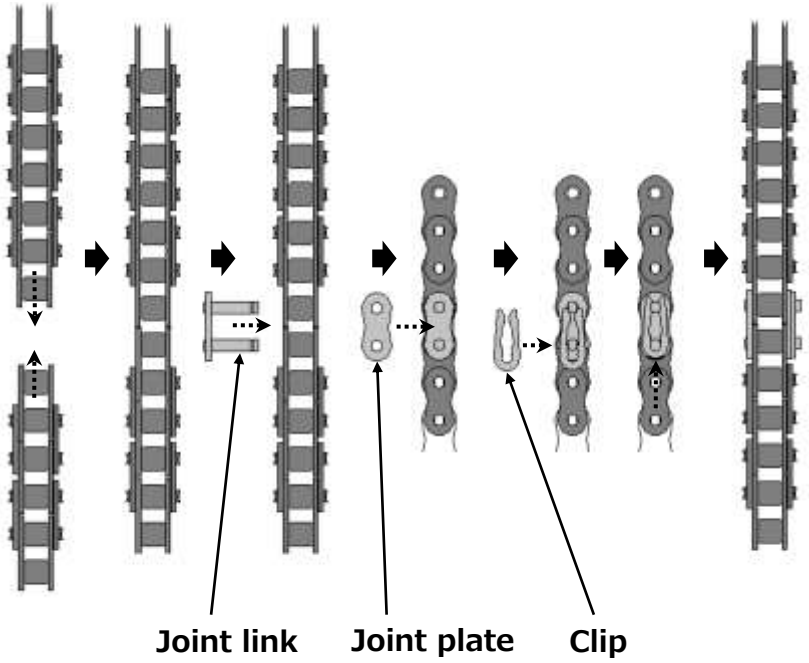
1 Loosen the hexagonal socket screw at the top of the tensioner to lower the tension to the very bottom point.



2 Attach the chain in the order of the rotor outer sprockets (1st), drive sprocket (2nd), and tension sprocket (3rd).



3 Connect both ends of the chain with the joint link, joint plate, and clip.



4 Loosen the hexagonal socket screw at the top of the tensioner and then remove it. This enables the tensioner to move up and down to adjust the chain slack. (Be careful not to forget to remove the hexagonal socket screw because it will cause the chain to loosen and come off.)

◎ For rotor diameter of 2,650 mm or less

The rotor is delivered undivided.

1 Attach hoist hooks to the hoist brackets in four places at the top of the upper chamber and then pass the wires through them.

2 Lift up the chamber with a crane, etc. and place it in the designated position. This part has a designated front and back so take care not to mistake the orientation when positioning it.

3 Remove the hoist hooks and wires attached to the chamber.

4 Fix the lower chamber to four places of the base with the anchor bolts.

5 Fixing polystyrene is inserted between the structural frame and rotor to hold the rotor surface in place (three places on one side, total of six places on both sides). Remove it before rotating the rotor.

6 The chain and other parts are delivered in the adjusted state. Perform only the procedure in “P-type packing adjustment” above.

5.2 Cassette

⚠Danger

Do not carry out the work in an explosive atmosphere.
Explosion, fire due to ignition, electric shock, etc. may occur, resulting in death or serious injury.
Furthermore, equipment damage may occur.

Be sure to turn "OFF" all power before carrying out the work.
Electric shock may occur.

⚠Warning

Transporting, grounding, piping, wiring, running, and operation work must be carried out by qualified persons or the administrator.
Fire, electric shock, injury, etc. may occur.

Be careful not to touch rotating parts.
Injury from may occur.

Never place combustibles in or around this equipment.
Fire may occur.

This equipment does not handle "mist" well. Be sure to install preprocessing equipment to remove "mist" (0.1 mg / Nm^3 or less).
Using this equipment without removing "mist" may cause fire or deterioration in performance.

When attaching this equipment to columns or a wall of a building, sufficiently inspect the structure, strength, etc. and securely fix the equipment using angles and channels.
The equipment may fall, resulting in injury or damage.

⚠Caution

This equipment has an upper section and lower section. Attach the upper and lower sections correctly.
If the equipment is assembled with the orientation of the top and bottom or left and right incorrect, the equipment may be damaged.

Use the appropriate torque for attachment to this equipment base or flange faces to ensure the bolts are not loose.
If the bolts are loose, injury or equipment damage may occur.

If the assembly state of this equipment is not stable, abnormal vibration and noise may be generated.
If the foundation is not strong, bearing, gear, and shaft damage may occur.

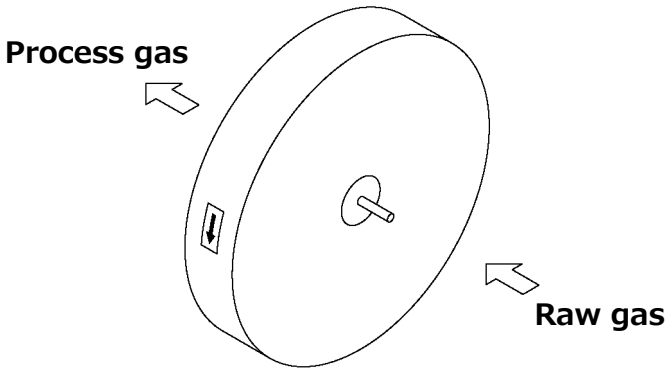
When attaching this equipment to another machine, check the structure and strength of the other machine.
If the structure or strength is inappropriate, vibration may occur resulting in an accident.

Tighten the mounting bolts to the appropriate torque to ensure they do not come loose.
If unnecessary force is applied to the product due to, for example, uneven fastening, equipment damage may occur.

When connecting the upper and lower sections of the rotor, check the tension of the chain, tensioner, etc. When attaching the chain, adjust the tension. Also, adjust the tensioner and shims and tighten the bolts properly before operation.
A part may break and pieces of it may scatter and cause injury or equipment damage.

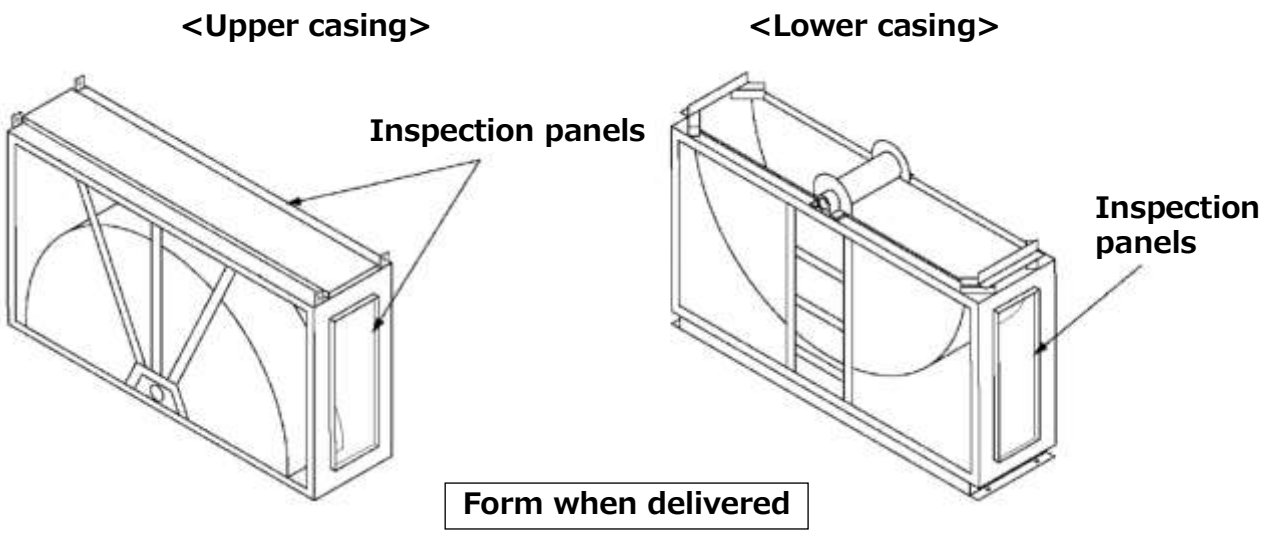
When coupling the equipment with a load or motor, attach the chain, sprockets, gears, etc. so that an impact is not applied to the bearings.
The equipment may be damaged.

Check the rotation direction before actual operation.
If the rotation direction is incorrect, injury or equipment damage may occur. An arrow label indicating the rotation direction is affixed to the rotor side surface.



◎ For rotor diameter of 2,950 mm or more

The main unit is shipped and transported with the top and bottom divided. The rotor assembly is also shipped with the top and bottom divided in the same way and incorporated into each casing respectively.
The side inspection panels are shipped loosely fixed with bolts.



(1) Preparation

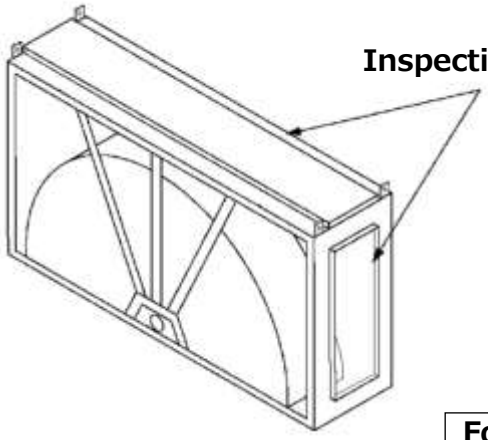
1) Prepare anchor bolts, assembly tools (general tools), heavy machinery (crane, etc.), and caulking material (Shin-Etsu Chemical Co., Ltd. Silicone Sealant KE-45 (clear)).
2) Check that the accessory parts are included with the product.
   Refer to the supplied list sheet for the accessory parts.
   * The list sheet is included at the end of the table.
3) Remove the side inspection panels (two panels on upper section and two panels on lower section) and the top inspection panel (one panel) before beginning the work.

(2) Assembly

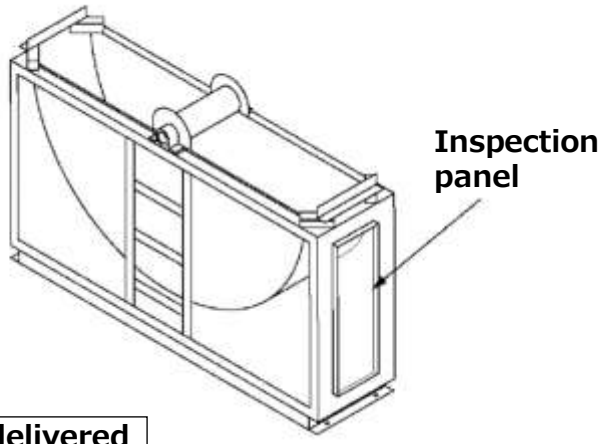
Installing the lower casing

1 Attach hoist hooks to the hoist brackets in four places on the lower casing and then pass the wires through them.

<Upper casing>



<Lower casing>



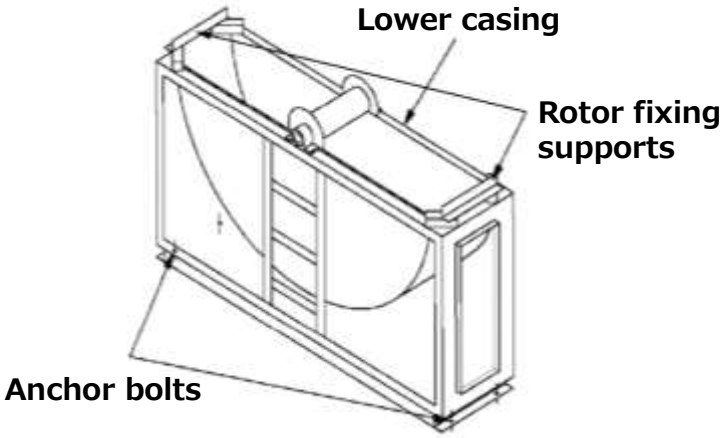
Form when delivered

2 Lift the lower casing with a crane, etc. and place it in the designated position. There is a designated front and back so do not to mistake the orientation when positioning it.

3 Remove the hoist hooks and wires attached to the lower casing.

4 Fix the lower casing to four places of the base with the anchor bolts.

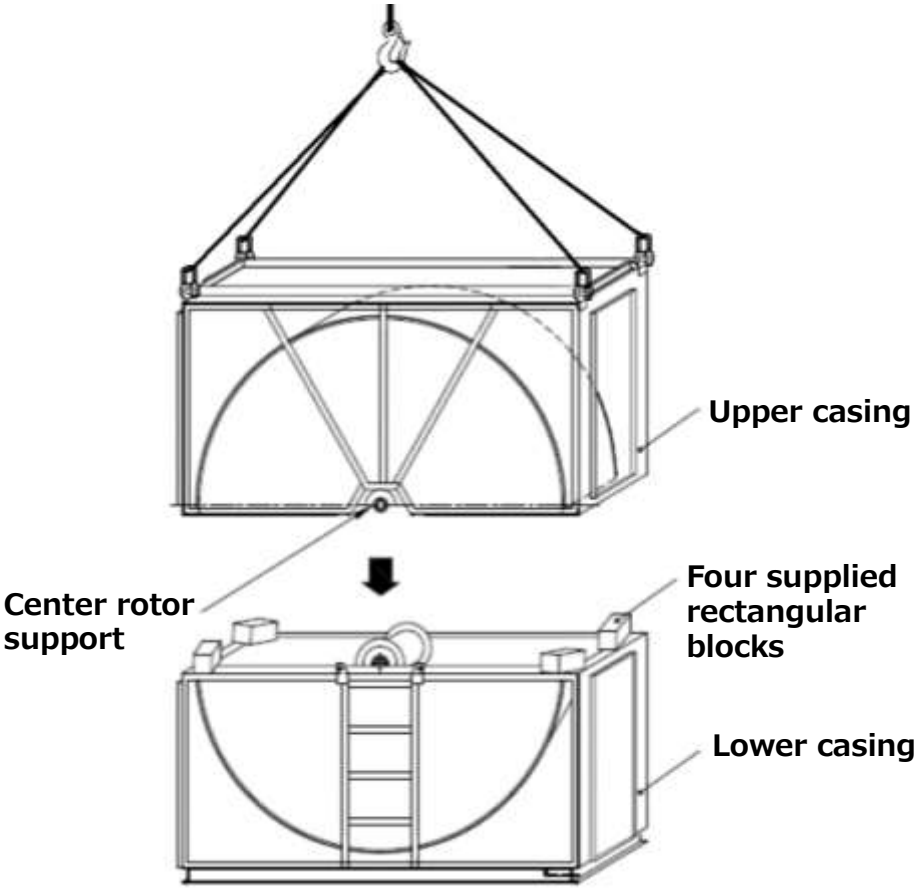
5 Remove the rotor fixing supports in two places at the top of the lower casing with a wrench or spanner (M12).



6 Affix the supplied seal material (NICHIAS SOFT DEAL™) to the surface that connects the upper casing to the top of the lower chamber. For the area to apply the seal material and the detailed application procedure, refer to section 5-39.

Attaching the upper casing

7 Place the four supplied rectangular blocks (□200 × 500L) at the four corners of the lower casing.

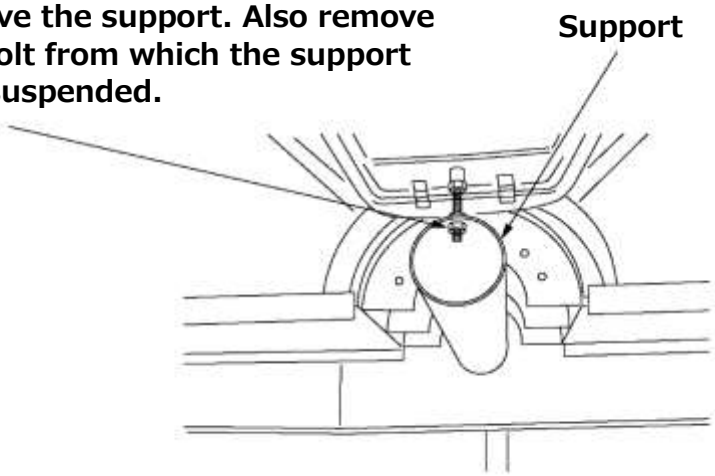


8 Attach hoist hooks to the hoist brackets in four places on the upper casing and then pass the wires through them.

9 Lift up the upper casing with a crane, etc. and temporarily place it on the rectangular blocks that you placed at the four corners of the lower casing. The upper casing has a designated front and back so take care not to mistake the orientation when positioning it.

10 Remove the cylindrical support at the rotor shaft inside the upper casing. First, remove the hexagonal nut fixing the support in place. Then, remove the support. Finally, remove the bolt to which the hexagonal nut was fastened.

Remove the hexagonal nut and remove the support. Also remove the bolt from which the support was suspended.



11 Lift up the upper casing enough to remove the rectangular blocks in four places.

12 Slowly lower the upper casing so that lower casing connection holes are aligned. When lowering it, take care that the hub parts at the center of the upper and lower casings do not interfere with each other.

13 Remove the hoist hooks and wires attached to the upper casing.

- Fix the upper and lower chambers together
- Fix the upper and lower rotors together
- Adjust the P-type packing
- Adjust the drive part assembly

Perform the work procedures in reference to sections 5-11 to 5-20, reading “chamber” as “casing”.

◎ For rotor diameter of 2,650 mm or less

The rotor is delivered integrated undivided.

1 Attach hoist hooks to the hoist brackets in four places at the top of the casing and then pass the wires through them.

2 Lift up the casing with a crane, etc. and place it in the designated position. There is a designated front and back so do not to mistake the orientation when positioning it.

3 Remove the hoist hooks and wires attached to the casing.

4 Fix the casing to four places of the base with the anchor bolts.

5 Fixing polystyrene is inserted between the structural frame and rotor to hold the rotor surface in place (three places on one side, total of six places on both sides). Remove it before rotating the rotor.

6 The chain and other parts are delivered in the adjusted state. Perform only the procedure in “P-type packing adjustment” above.

<Memo>

5.3 Filter Box

⚠Danger

Be sure to turn "OFF" all power before carrying out the work.
Electric shock may occur.

⚠Warning

Transporting, grounding, piping, wiring, running, and operation work must be carried out by qualified persons or the administrator.
Fire, electric shock, injury, etc. may occur.

Never place combustibles in or around this equipment.
Fire may occur.

When attaching this equipment to another machine, check the structure and strength of the other machine.
If the structure or strength is inappropriate, vibration may occur resulting in an accident.

⚠Caution

Use the appropriate torque for attachment to this equipment base or flange faces to ensure the bolts are not loose.
If the bolts are loose, injury or equipment damage may occur.

Do not place an object that will block ventilation inside this equipment.
The performance may deteriorate.

Tighten the mounting bolts to the appropriate torque to ensure they do not come loose.
If unnecessary force is applied to the product due to, for example, uneven fastening, equipment damage may occur.

5.3.1 Overview

The filter box is installed at the stage prior to this equipment to remove dust and similar matter contained in the incoming raw exhaust gas that will be used for processing by this equipment.

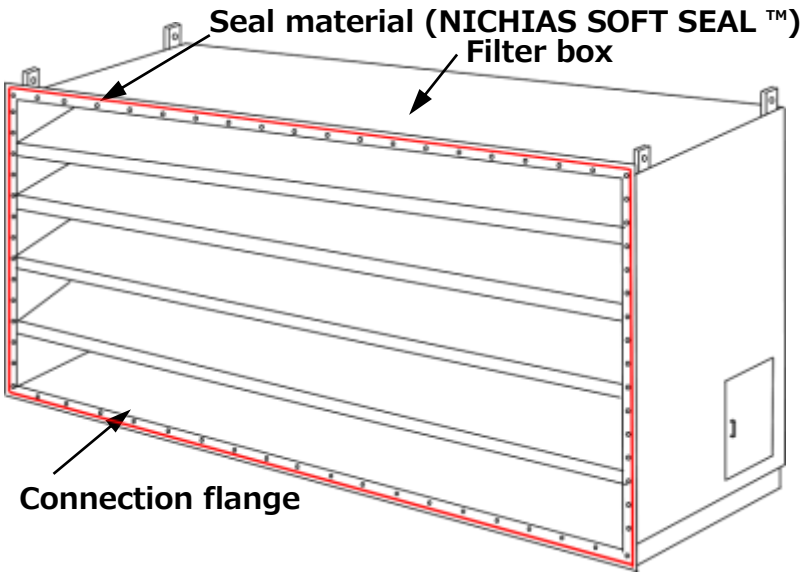
(1) Preparation

1) Prepare anchor bolts, tools, heavy machinery (crane, etc.), silicone caulking gun, and silicone caulking material (Shin-Etsu Chemical Co., Ltd. Silicone Sealant KE-45 (clear).
2) Check that the accessories are included with the product.
   * The accessories differ depending on the individual specifications. The details are affixed to the accessories of the shipped equipment.
   The details are appended to “Accessory List” so please refer to them.

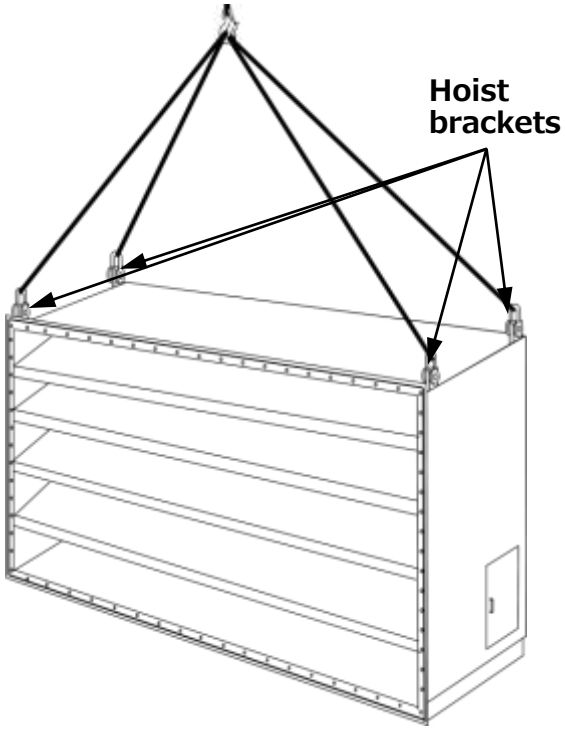
(2) Assembly

1 Check that installation of the magic box is completed.

2 Affix the supplied seal material (NICHIAS SOFT SEAL ™) to the connection flange surface on the side of the filter box that will be joined with the magic box. For the area for which to apply the seal material and the detailed application procedure, refer to section 5-40.



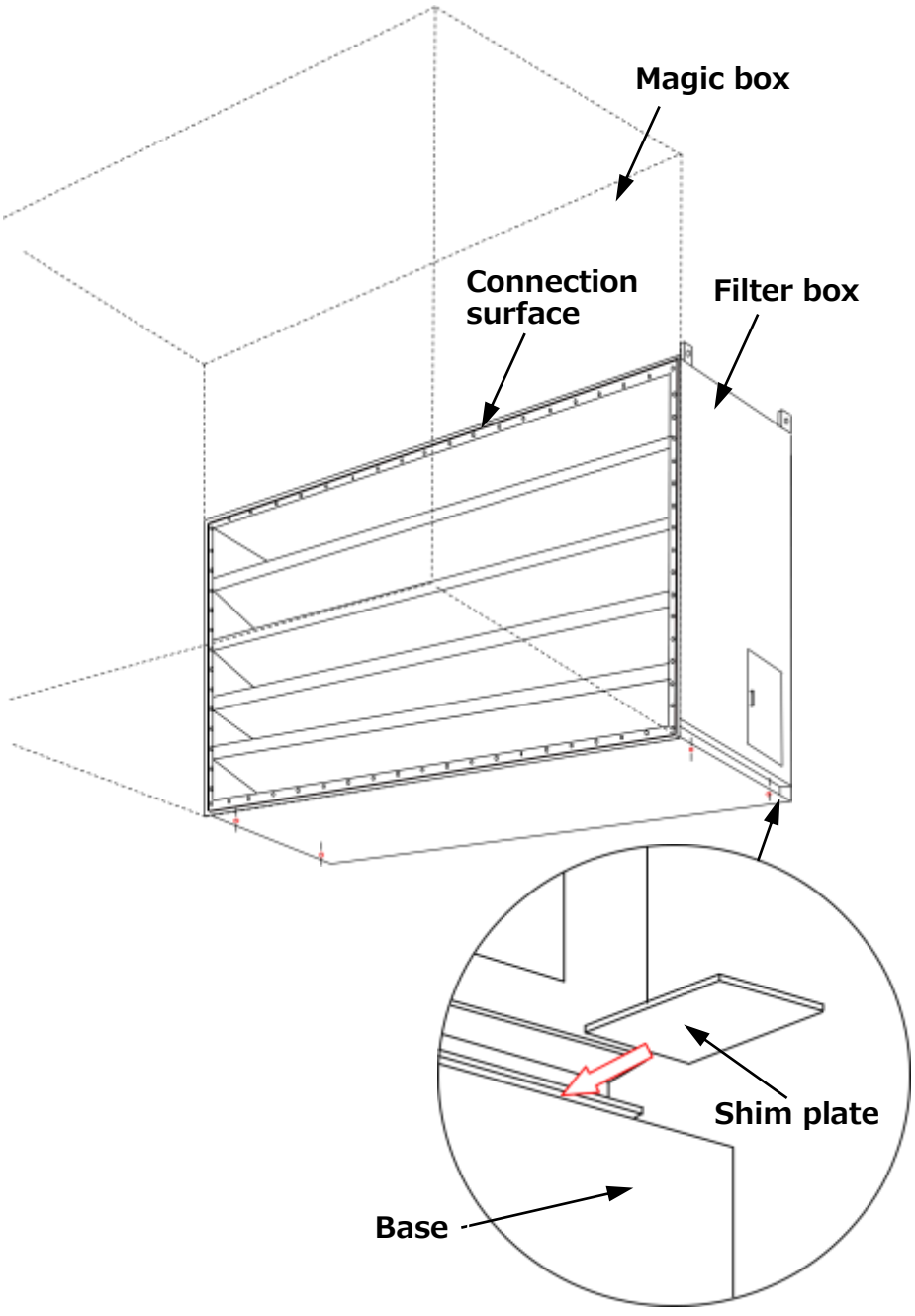
3 Attach hoist hooks to the hoist brackets in four places at the top of the filter box and then pass the wires through them.



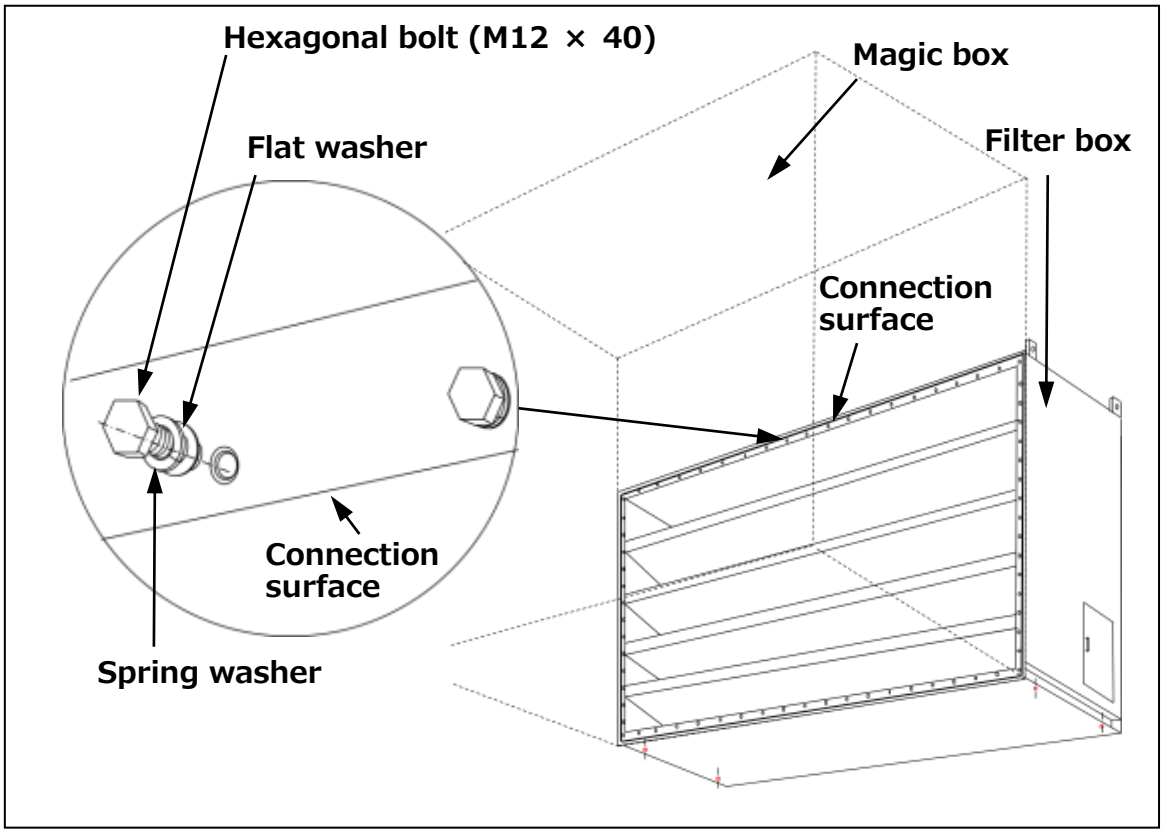
4 Lift the filter box with a crane, etc. and place it in the designated position. There is a designated front and back so do not to mistake the orientation when positioning it.

5 Remove the hoist hooks and wires attached to the filter box.

6 Insert the shim plates between the filter box and base surface on which it is to be installed to align the filter box with the position of the connection surface of the magic box.

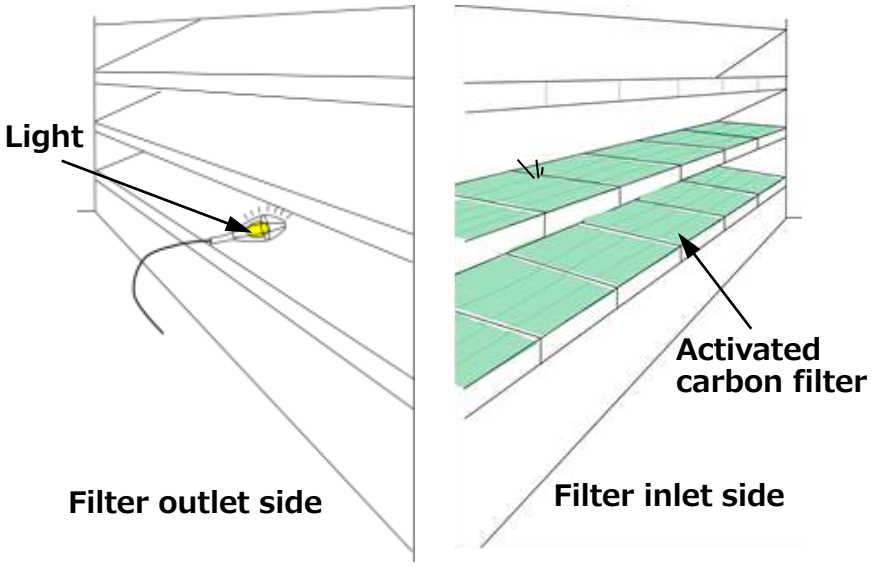


7 Install hexagonal bolts (M12 × 40), flat washers, and spring washers in the connection holes (Ø14) of the filter box and magic box and connect the boxes together. (Tightening torque: 42 N·m)



8 Fix the filter box to the base with the anchor bolts.

9 Check the activated carbon filters (2 kg) inside the filter box to make sure four bags are laid out without gaps on each 1,000 × 500 mm shelf and shine a light from beneath the shelves to confirm that light does not leak out from above the shelves. If the light leaks out, gently press the filters from above with the palm of your hand to flatten the activated carbon.



(3) Caulking work

10 Fill the gap between the connected parts of the magic box and filter box with caulking.

5.4 Electrical Wiring

⚠Danger

Be sure to turn “OFF” all power before carrying out the wiring checks.
Electric shock may occur.

Be sure to turn “OFF” all power before measuring the insulation resistance. Do not touch a connector when performing the work.
Electric shock may occur.

⚠Warning

Be sure to use a power supply with the capacity indicated on the nameplate.
Motor burnout or fire may occur.

Use electric wires suitable for the power supply capacity.
If the electric wires are not rated for the power supply capacity or higher, the insulation coating may melt and an insulation failure may occur, resulting in electric shock or fire.

Carry out the work to connect the power cable in accordance with the wiring diagram inside the external terminal box and the instruction manual.
Carrying out the work without observing the information in the instruction manual may cause electric shock or fire.
Be sure to insulate the connection part properly for a type without a terminal box.

Do not unnecessarily bend, pull, or trap the power cable or lead wires.
Electric shock may occur.

Ground the earth terminal properly.
Electric shock may occur.

Be sure to reattach the terminal box cover after the wiring is finished.
Electric shock may occur.

The motor is not supplied with a protection equipment. The installation of an overload protection equipment is mandatory as stipulated in electrical equipment technical standards. We recommend also installing other protection equipments (earth leakage circuit breaker, etc.) in addition to an overload protection equipment.
Damage, electric shock, fire, or injury may occur.

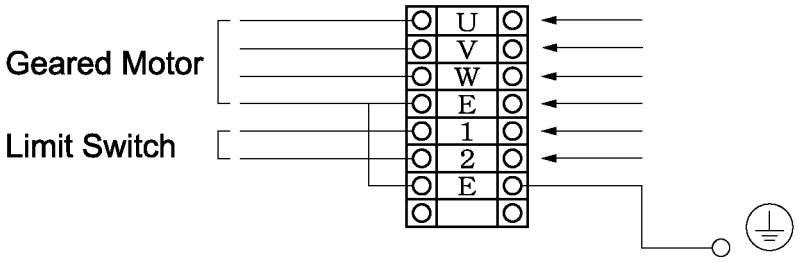
⚠Caution

Wiring must be carried out by a person qualified to perform electrical work.

Perform the wiring in accordance with electrical equipment technical standards, indoor wiring rules and regulations, and regulations of the electrical power company.
Damage, electric shock, fire, or injury may occur.

◎ If there is an external terminal box

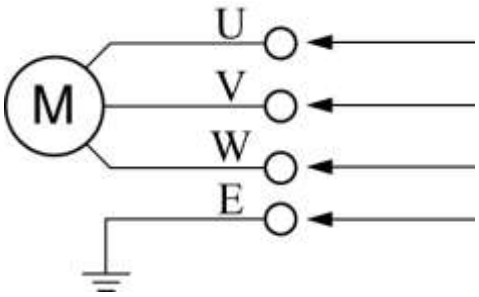
- The wiring from the rotor drive geared motor and rotor rotation detection proximity switch to the external terminal box of the equipment main unit has been performed as shown in the following figure. Connect the wires according to the following figure. If the wiring is performed incorrectly, the rotor may rotate in the opposite direction and cause performance deterioration due to seal material or rotor damage, fire, or electric shock.



- Connect the wires so that the rotor rotates in the same direction as that indicated in the “rotation direction label” displayed on the rotor rim. If the rotor rotates in the opposite direction, swap one of the “U”, “V”, and “W” sets of wires. Then, confirm the rotor rotation direction again.

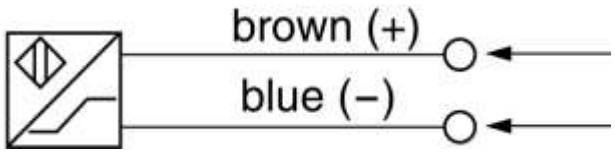
◎ If there is no external terminal box

- Connect the wires to the rotor drive geared motor of the equipment main unit as shown in the following figure. If the wiring is performed incorrectly, the rotor may rotate in the opposite direction and cause performance deterioration due to seal material or rotor damage, fire, or electric shock.



Furthermore, connect the wires according to the following figure for the rotor rotation detection proximity switch.

Proximity switch



5.5 Connecting the Ducts

⚠Danger

Be sure to turn "OFF" all power before carrying out the work.
Electric shock may occur.

⚠Warning

Transporting, grounding, piping, running, and operation work must be carried out by qualified persons or the administrator.
Fire, injury, etc. may occur.

Never place combustibles in or around this equipment.
Fire may occur.

When attaching this equipment to another machine, check the structure and strength of the other machine.
If the structure or strength is inappropriate, vibration may occur resulting in an accident.

⚠Caution

Use the appropriate torque for attachment to the equipment base or flange faces to ensure the bolts are not loose.
If the bolts are loose, injury or equipment damage may occur.

Do not place an object that will block ventilation inside this equipment.
The performance may deteriorate.

Tighten the mounting bolts to the appropriate torque to ensure they do not come loose.
If unnecessary force is applied to the product due to, for example, uneven fastening, equipment damage may occur.

5.5.1 Overview

- ○ Use PTFE Soft Seal or equivalent for the sealing material for the processing inlet and outlet flange connections.
- ○ Heated gas from 50 to 300°C passes through the regeneration outlet and inlet and purge outlet. Use textile glass yarn or equivalent for the seal material for the flange connections. The seal material that is used must be able to withstand 300°C or higher.
- ○ Tighten the mounting bolts to the appropriate torque to ensure they do not come loose. If unnecessary force is applied to the product due to, for example, uneven fastening, equipment damage may occur.

5.6 Applying Seal Material

See below for directions for applying the seal material to the upper surface of the lower box. (Upper/lower split type only)

5.6.1 Applying seal material to the outer periphery

⚠Danger

Applying seal material requires working at height. Take measures to prevent falling when working.

⚠Caution

When using a knife, take care not to accidentally cut your hand.

(1) Required parts and tools

1) Seal material (accessory) type: TOMBO™ No. 9096 SOFT SEAL™ (width: 9 mm)
2) Knife or scissors

(2) Work procedure

1 Apply the seal material (type: TOMBO™ No. 9096, name: SOFT SEAL™) supplied with the equipment starting diagonally from the inner side to outer side at an appropriate location on the upper surface of the equipment lower box, and then along the outer sides at a distance 5 mm inside of the outer edge without cutting it and keeping it parallel with the equipment.

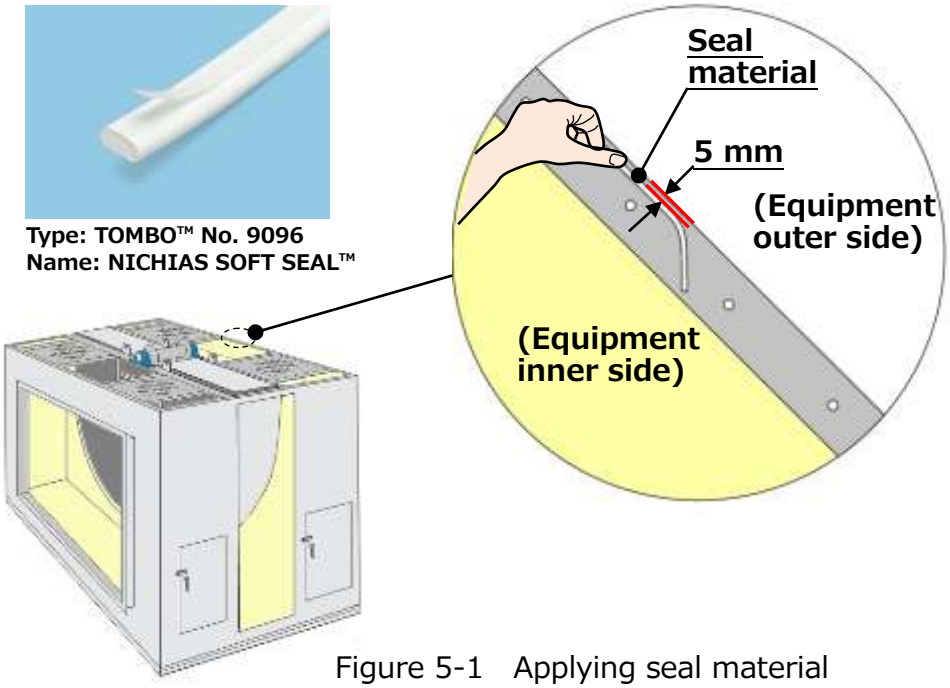


Figure 5-1 Applying seal material

2 Affix the seal material continuously around the whole circumference of the equipment without cutting it and while keeping it 5 mm inside from the outer side.

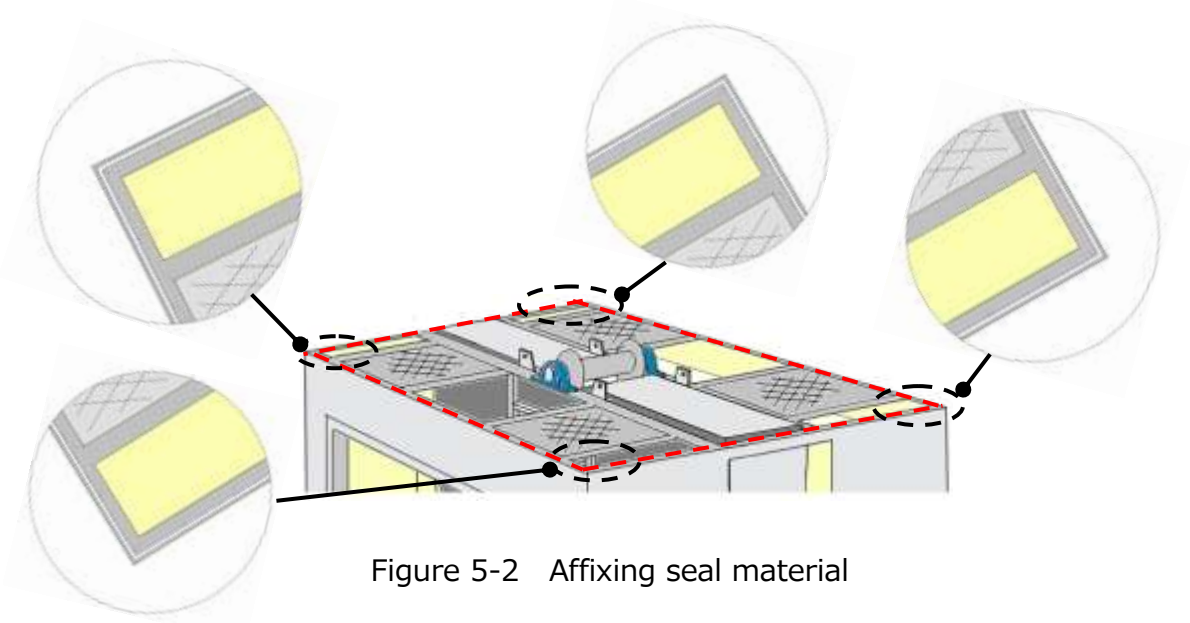


Figure 5-2 Affixing seal material

3 Apply the seal material so that its beginning and end cross each other toward the inner side of the equipment. If new additional seal material needs to be applied during the process because there is not enough seal material, finish the process by crossing the beginning and end in the same way.

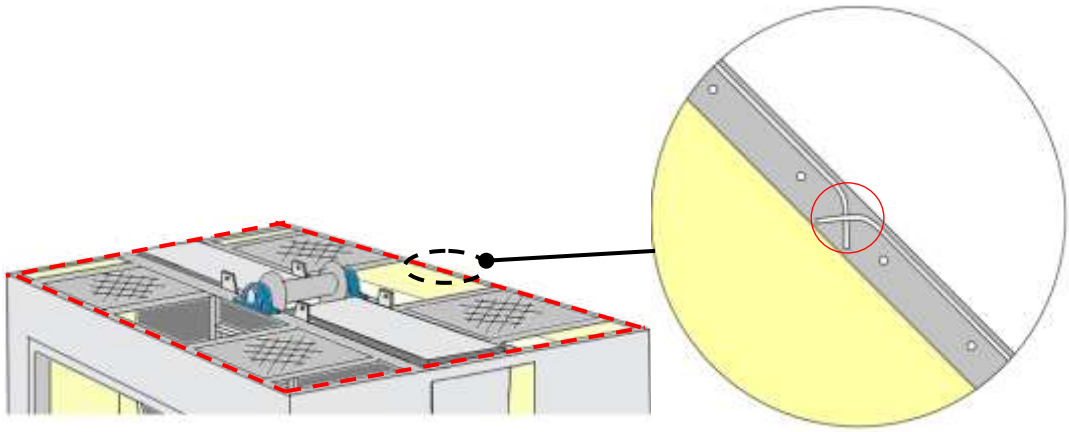


Figure 5-3 Seal material end process

5.6.2 Applying seal material to other areas

⚠Danger **Applying seal material requires working at height. Take measures to prevent falling when working.**

⚠Caution **When using a knife, take care not to accidentally cut your hand.**

1 Apply seal material to four places near the upper part of the lower rotor that is located in the lower housing. Apply this material 3 to 4 mm past the seal material on the periphery.

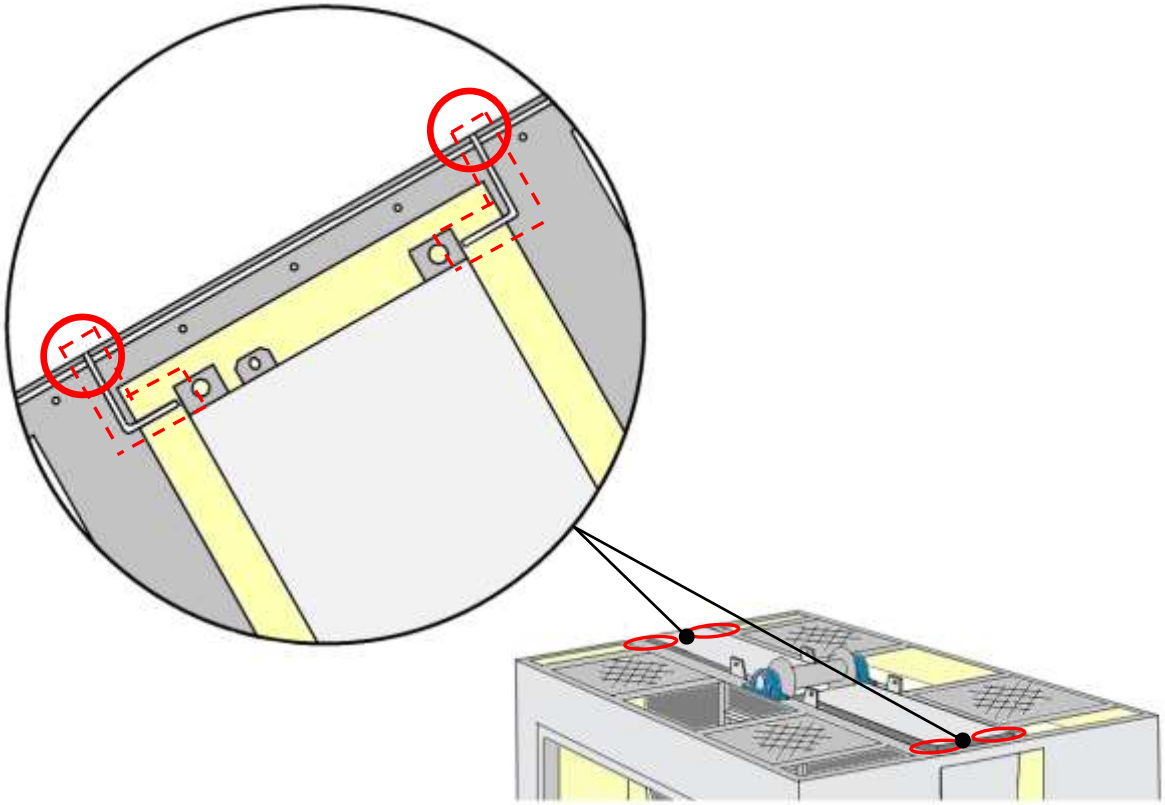


Figure 5-4 Affixing seal material

<Memo>

Chapter 6 Operation

Be sure to check that installation has been completed according to “Chapter 5 Explanation of Main Points and Procedures of Installation and Assembly” in this manual before starting operation with the procedure described in “6.1 Trial Operation”.
When the procedure of “6.1 Trial Operation” is completed, perform the procedure of “6.2 Normal Operation”.

6.1 Trial Operation

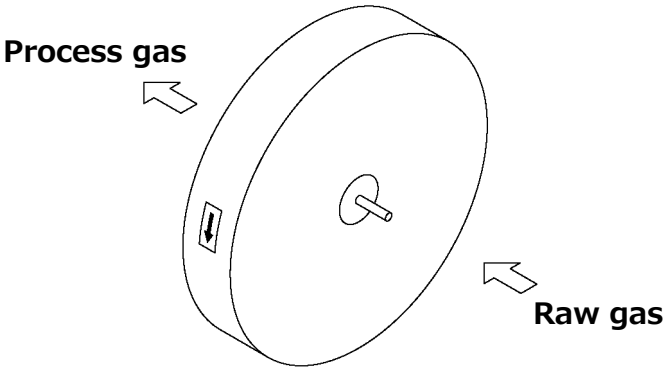
◎ General

⚠Warning

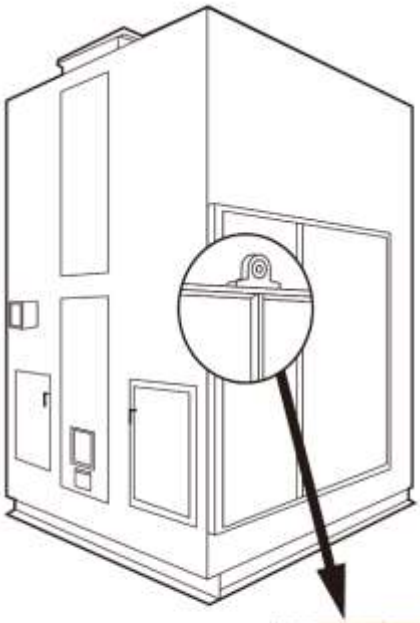
Never place combustibles in or around this equipment.
Fire may occur.

⚠Caution

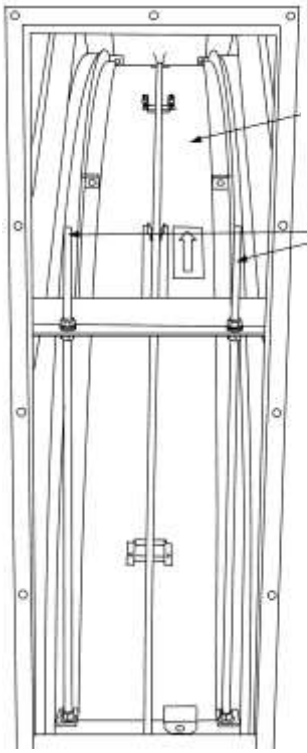
Check the rotation direction before actual operation.
If the rotation direction is incorrect, injury or equipment damage may occur. An arrow label indicating the rotation direction is affixed to the rotor side surface.



To rotate the rotor alone, remove the four rotor support bolts for a rotor with a diameter of 2,950 mm or more, and the rotor end face fixing polystyrene for a rotor with a diameter of 2,650 mm or less.
If the rotor is rotated without removing the rotor end face fixing polystyrene, injury or equipment damage may occur.



End face fixing polystyrene (rotor diameter of 2,650 mm or less)



◎ Checking the wiring

⚠Danger

Be sure to turn "OFF" all power before carrying out the wiring checks.
Electric shock may occur.

Do not touch a connector when measuring the insulation resistance.
Electric shock may occur.

Ground the earth terminal properly.
Electric shock may occur.

⚠Warning

Be sure to use a power supply with the capacity indicated on the nameplate.
Motor burnout or fire may occur.

Use electric wires suitable for the power supply capacity.
If the electric wires are not for the power supply capacity or higher, the insulation coating may melt and an insulation failure may occur, resulting in electric shock or fire.

Carry out the work to connect the power cable in accordance with the wiring diagram inside the external terminal box and the manual.
Carrying out the work without observing the information in the instruction manual may cause electric shock or fire.
Be sure to insulate the connection part properly for a type without a terminal box.

Do not unnecessarily bend, pull, or trap the power cable or lead wires.
Electric shock may occur.

Be sure to reattach the terminal box cover after the wiring is finished.
Electric shock may occur.

Perform the wiring in accordance with electrical equipment technical standards, indoor wiring rules and regulations, and regulations of the electrical power company.
Damage, electric shock, fire, or injury may occur.

The motor is not supplied with a protection equipment. The installation of an overload protection equipment is mandatory as stipulated in electrical equipment technical standards. We recommend also installing other protection equipments (earth leakage circuit breaker, etc.) in addition to an overload protection equipment.
Damage, electric shock, fire, or injury may occur.

⚠Caution

Perform the wiring in accordance with electrical equipment technical standards, indoor wiring rules and regulations, and regulations of the electrical power company.
Damage, electric shock, fire, or injury may occur.

Before changing rotor rotation to the opposite direction, be sure to first halt rotation completely and then start reverse rotation.

Manage the regeneration temperature by an overheating detector or other means to ensure that abnormal heating does not occur.

◎ Inspection list

The inspection items for trial operation are shown below.

Trial operation checklist			
	Check item	Description	Rating / measurement value (judgment)
Checks before operation	Seal material attachment check	Visually check attachment	OK / Not OK
		Check for gaps	OK / Not OK
	Mist filter attachment check	Visually check	OK / Not OK
	Differential pressure gauge indicator setting check	Processing zone differential pressure	Pa
		Regeneration zone differential pressure	Pa
Rotor operation checks	Rotor rotation direction check (Processing zone → regeneration zone → cooling zone)	Check for energization and visually check	OK / Not OK
	Rotor operation checks	Visually check	OK / Not OK
	Rotor speed check	Measure number of rotations/time period	rph
		Check frequency	Hz
	Rotor rotation detector operation check	Check operation	OK / Not OK
Concentrator operation checks	Rotor differential pressure checks	Processing zone differential pressure	Pa
		Regeneration zone differential pressure	Pa
	Temperature checks	Processing inlet gas	°C
		Processing outlet gas	°C
		Cooling outlet gas	°C
		Regeneration inlet gas	°C
		Regeneration outlet gas	°C

<Rotor operation check procedure>

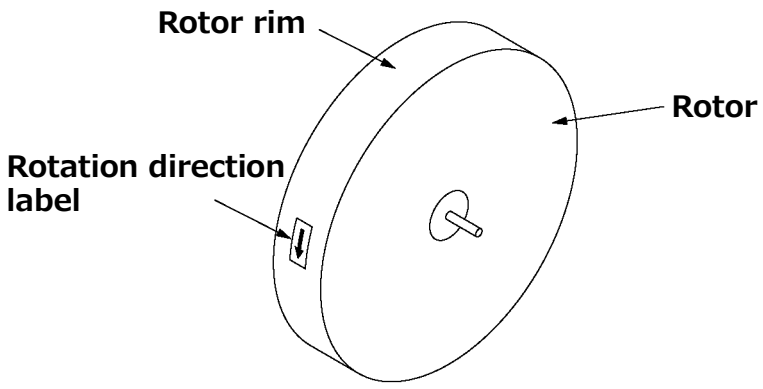
1 Turn “OFF” all power.

2 Open all four inspection doors and secure them with a rope or otherwise to prevent them from closing.

⚠Warning

Securely fix the inspection doors so that they cannot move or fall.
If a door comes free, the equipment may be damaged or a worker may be locked inside and injured.

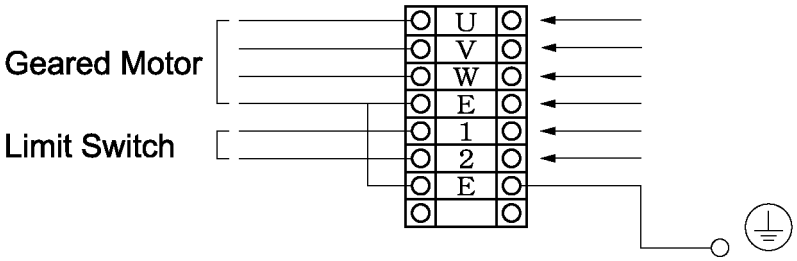
3 Check the delivery drawings to confirm whether or not the rotation direction of the rotor is the same as that on the “rotation direction label” on the rotor side surface.



⚠Caution

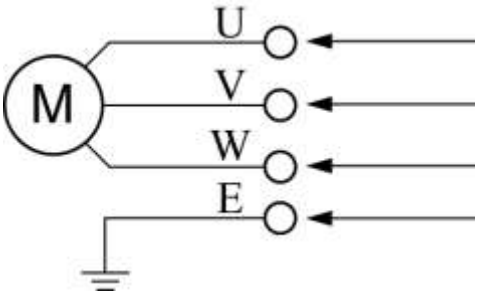
Rotating the rotor in the opposite direction may cause performance deterioration due to seal material or rotor damage, fire, or electric shock.

If the rotor rotates in the opposite direction, change the direction in the following way.
◎ When there is an external terminal box
The wiring from the rotor drive geared motor and rotor rotation detection proximity switch to the external terminal box of the equipment main unit has been performed as shown in the following figure.
Connect the wires according to the figure.
If the wiring is performed incorrectly, the rotor may rotate in the opposite direction and cause performance deterioration due to seal material entanglement or rotor damage, fire, or electric shock.



◎ **When there is no external terminal box**

Connect the wires to the rotor drive geared motor of the equipment main unit as shown in the following figure. If the wiring is performed incorrectly, the rotor may rotate in the opposite direction and cause performance deterioration due to seal material entanglement or rotor damage, fire, or electric shock.



⚠Caution

Connect the wires so that the rotor rotates in the same direction as that indicated in the "rotation direction label" displayed on the rotor side surface.

If the rotor rotates in the opposite direction, swap one of the "U", "V", and "W" sets of wires. Then, confirm the rotor rotation direction again.

4 Close the inspection doors, turn "ON" all power, and perform trial operation.

⚠Warning

Before closing the inspection doors, make sure there is nobody inside.

A worker may be locked inside.

If there is no problem or variance in the "Trial Operation", proceed to "6.2 Normal Operation".

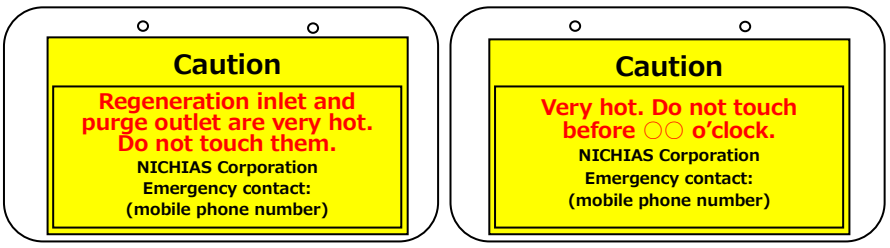
6.2 Normal Operation

⚠Warning

Never operate this equipment while the inspection panels on the roof (top surface) and sides of this equipment are removed from the equipment main unit or the inspection doors are open.
Injury may occur from contact with the rotor.

In the case of a type with an external terminal box, do not operate the equipment with the cover of the external terminal box removed.
Attach the terminal box cover in its original position.
Electric shock may occur.

The regeneration inlet and purge outlet parts of the equipment will be at a temperature of approximately 180°C during operation and immediately after stopping operation of this equipment. Do not come in contact with these areas in any way.
Burn injury may occur. Do not touch them until approximately eight hours have elapsed after stopping the equipment.
This should be clearly indicated using a label or tag to ensure that those in the vicinity observe caution.

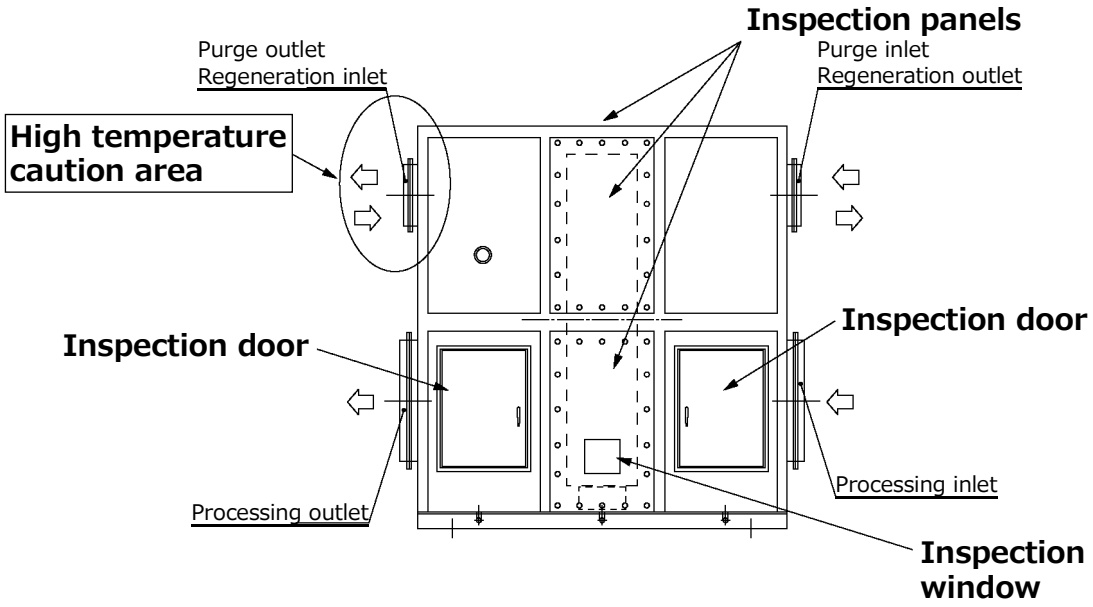


Display examples

Look through the inspection window and inspection doors, and if the rotor is tilted or has fallen off, immediately stop the operation.
Electric shock, injury, fire, etc. may occur.

If there is smoke or flames coming from inside the equipment, immediately stop the operation and contact NICHIAS Corporation.
See "■ Contact information" in "Introduction" for the contact information of NICHIAS Corporation. If the equipment is left as is, electric shock, injury, fire, etc. may occur.

Regeneration inlet and cooling outlet



⚠Caution

If there is an abnormal noise (metal on metal sound or sound of chain abrasion) or abnormal odor (burning smell) coming from inside the equipment, immediately stop the equipment and contact NICHIAS Corporation.

See "■ Contact information" in "Introduction" for the contact information of NICHIAS Corporation. If the equipment is left as is, electric shock, injury, fire, etc. may occur.

<Memo>

Chapter 7 Maintenance and Inspection

Maintenance management work is carried out for the purpose of preventing accidents and extending the lifetime of this equipment.
Maintenance management work consists of the procedures listed in “7.1 High-temperature Regeneration Operation,” 7.2 Daily Inspection,” and “7.3 Periodic Inspection” as well as “7.2.4 Abnormality measures,” and “7.2.5 Recovery operation of the equipment,” which describes the measures to take if there is an abnormality.

7.1 High-temperature Regeneration Operation

(1) Overview

This equipment is designed for a regeneration temperature between 180 to 200°C. However, a volatile organic compound (VOC) with a boiling point above 200°C will not be regenerated and will gradually accumulate. If the equipment is operated with such a VOC remaining on the rotor, performance may deteriorate and issues such as ignition of the accumulated VOC could occur. This section specifies the necessary operation conditions for performing the “high-temperature regeneration” operation properly and safely. Read through this manual, take measures with respect to these points to pay attention to the precautions, and devise an adequate work plan before starting the work. The work includes operations that involve risk so in particular be careful with regard to the checks prior to work which serve as safety measures.

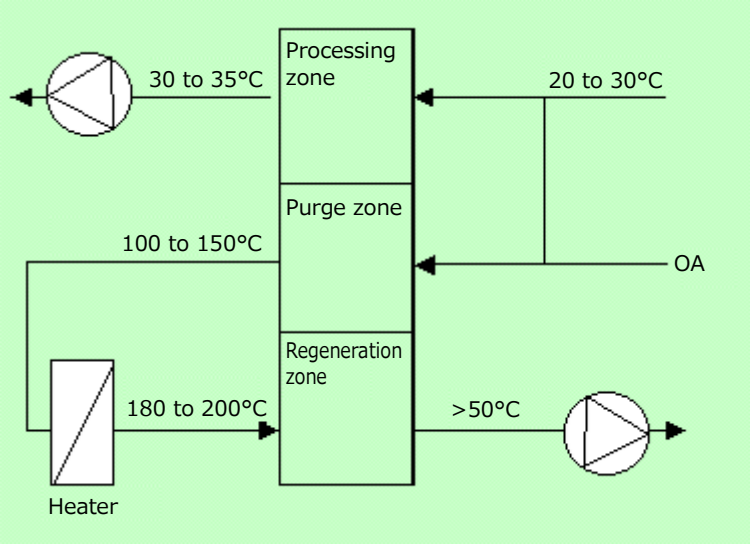
(2) Specification check items

Check the following specifications before beginning the work.

- Regeneration heat source of 300°C can be supplied.
- Regeneration fan with heat resistance of 160 to 200°C is required.
- Ducts with heat resistance of 300°C from the purge outlet to regeneration inlet are required.

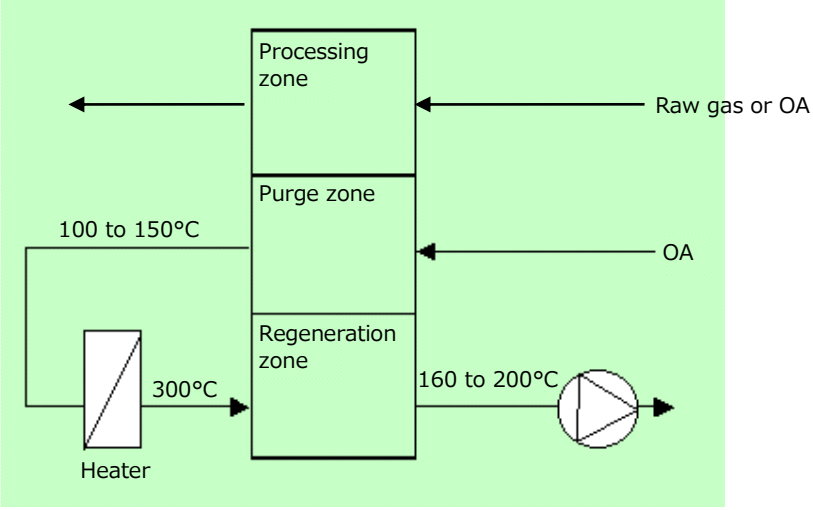
(3) Heat balance

The heat balance of this equipment is shown in the following figure (normal flow). For a normal flow, the rotor rotation speed is set to 2 to 8 rph and the regeneration inlet temperature is set to 180 to 200°C. The outlet temperature decreases to approximately 50°C. The purge airflow rises in temperature and exceeds 100°C due to regenerative heat recovery while passing through the rotor.



Normal flow

The following figure (high-temperature regeneration flow) shows the state when the regeneration operation is performed.
The rotor rotation speed is set to 2 rph or less and the regeneration temperature is set to 300°C.
The regeneration outlet temperature rises to 160 to 200°C for the new heat balance.



High-temperature regeneration flow

(4) Regeneration operation

Strictly observe the operation conditions as follows.

1) Step by step temperature increases

Increase the regeneration inlet temperature in the steps below by adjusting the regeneration temperature controller to reach the heat balance in the figure (high-temperature regeneration flow) on the previous page.

Step 1: Ordinary temperature to 180°C
Varies depending on heating source

Step 2: 180 to 300°C
Temperature rise rate = 1.2 min / °C
3 hours are required for step 2.

Step 3: Keep temperature at 300°C.
Temperature of 300°C must be maintained for at least 5 hours.

⚠Warning

In the event that the rotor is contaminated by accumulated volatile organic compounds (VOC) in excess of 10% of the rotor weight due to an organic substance in, for example, a solid, liquid, or polymerized state, ignition may occur depending on the degree of contamination.
Sampling element analysis is available upon request (paid service).

In the event that the temperature at the regeneration outlet side increases suddenly, ignition may occur. If this happens, turn off the heater immediately and then continuously operate the regeneration fan so that the rotor can cool.
We recommend permanently installing an excessive temperature rise detector, etc.

2) Rotor rotation speed

Rotation speed = 2 rph or minimum rotation speed

⚠Warning

In the event that the rotor stops rotating during the regeneration operation, rotor ignition may occur.

We recommend providing a backup power source for the geared motor in case of a power failure.

⚠Caution

In the event that the rotation speed becomes faster than 2 rph, the heat balance will change and the following will tend to occur, so strictly observe the maximum rotation speed of 2 rph (regulation speed).

(a) The purge outlet temperature will increase.

(b) The regeneration outlet temperature will decrease.
The cleaning efficiency will deteriorate.

3) Regeneration passage air speed

Passage air speed 1.5 N･m/s

⚠Warning

In the event that the regeneration air stops during the regeneration operation, rotor ignition may occur.

Take proper measures to ensure a power source.

(5) Rotor cooling

Perform the rotor cooling procedure after the "high- temperature regeneration" operation is complete.

<Procedure>

1 Turn off the heater and increase the rotor rotation speed to the normal operation mode value.

2 Check that the regeneration inlet temperature has dropped to 90°C or less and then stop the rotor and regeneration fan.

⚠Warning

Check that the entire equipment has cooled, finish the work, and remove the warning signs, etc.
If any parts remain hot, workers may burn themselves, combustibles may ignite, etc.

(6) System recovery

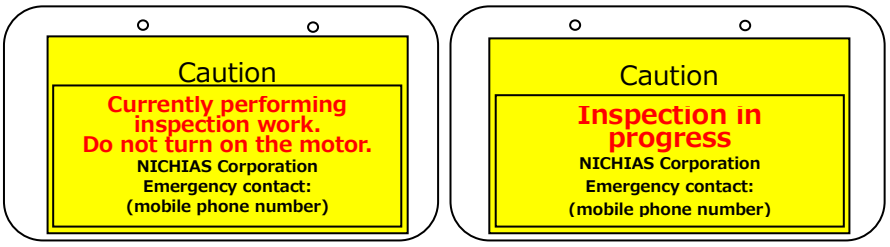
After the work is finished, make sure the system returns to “normal flow”.

7.2 Daily Inspection

Danger

Be sure to turn “OFF” all power before carrying out maintenance and inspection work.
Electric shock or entanglement in fan may occur.

When performing inspection, be sure to clearly indicate that you are working using a label or tag that describes the fact that you are performing inspection to ensure that those in the vicinity observe caution. Display a clearly visible indication on the motor control panel so that the power is not accidentally turned on.



Display examples

When entering inside the equipment, measure the VOC concentration using a volatile organic compound (VOC) personal exposure monitor to check that the VOC has not exceeded the exposure limit.
Symptoms of poisoning may occur.

When entering inside the equipment, stop the equipment and measure the oxygen concentration using an O_2 concentration meter to check that the oxygen concentration is at least 21%. Also, always measure the oxygen concentration during the work so that you can confirm the oxygen concentration is 21% or more while performing the work.
There may be an oxygen deficiency if the oxygen concentration becomes 18% or less.

When entering inside the equipment, wear “safety glasses”, a “volatile organic compound (VOC) gas mask”, and “protective clothing”.

Do not touch the electric connection terminals during insulation resistance test, dielectric strength test, or protective installation continuity test.

Electric shock may occur.

⚠Warning

When entering inside the equipment, be sure to wear a volatile organic compound (VOC) gas mask and make sure the mask filter has a sufficient breakthrough time for your task.

Make sure all tools and lighting used inside the equipment are explosion proof.
Fire may occur.

When entering inside the equipment, perform the work with at least two workers, one inside and one outside the equipment, and have the worker outside periodically check the condition of the worker inside.

When entering inside the equipment, wear antistatic clothing.
Fire may occur.

The inside of the equipment is very hot immediately after the equipment is stopped. When entering inside the equipment, allow the entire equipment to completely cool and then check the temperature before entering.
Burn injury may occur.

⚠Caution

Always wear a helmet whenever working inside the equipment.

To avoid the risk of falling, do not bring the cutter or sharp end tools inside the equipment

Before changing the direction of rotor rotation, be sure to first halt rotation completely before starting reverse rotation.

Perform daily inspection in accordance with the items and details in “7.2.1 Inspection items”.

It is recommended to use ladders and scaffolds when working on the aerial stage for maintenance or inspection.

7.2.1 Inspection items

(1) Rotor differential pressure checks

(2) Rotor rotation direction check

7.2.2 Inspection details

(1) Rotor differential pressure checks

Confirm that rotor differential pressure in the deisign & specifications of your product +10% is not exceeded by checking the red indicator on the differential pressure gauge attached to the equipment.

⚠Caution

If the setting value in the specifications for your product +10% is exceeded, dust or other foreign matter may adhered to the rotor and performance deterioration or fire may occur.

A maintenance service for removing dust and other foreign matter is available upon request (paid service).
The rotor differential pressure is as follows.

<Rotor differential pressure>

The details are as specified in the Design & Specification documents for your product.

(2) Rotor rotation direction check

Check that the rotor rotates in the correct direction (same direction as indicated in the “rotation direction label” displayed on the rotor side surface).

⚠Caution

If the rotor does not rotate in the correct direction, the performance will deteriorate and the rotor may be damaged or fall.
The rotation of the concentration rotor is detected by the proximity switch, and if the rotor stops rotating during operation, there is probably an abnormality with a drive part.

A maintenance service for the rotor, sprockets, chain, and geared motor is available upon request (paid service).

7.2.3 Inspection procedures

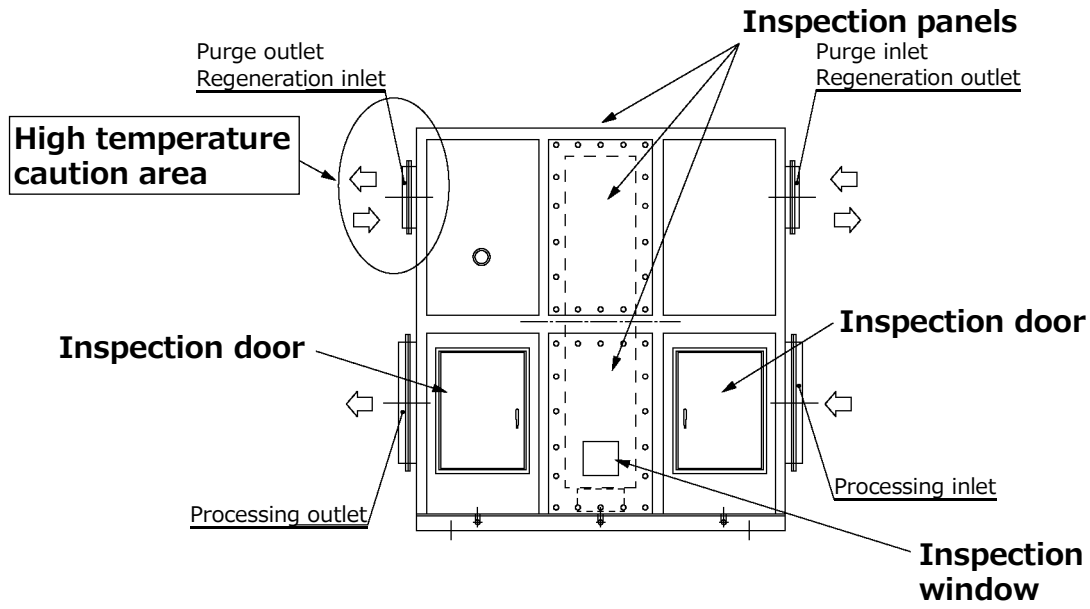
(1) Rotor differential pressure check

<Procedure>

1 Turn “ON” all power.

2 Check the differential pressure gauge attached to the side of the equipment.

Regeneration inlet and cooling outlet



[If rotor differential pressure exceeds the upper limit]

② : Dust may adhere to the rotor and clogging may occur.

② : If the process gas contains mist, acid, alkali, etc. that differs from the design conditions, the concentration rotor may deteriorate.

⚠Warning

When entering inside the equipment to perform work, leave the inspection doors open.
Poisoning or deterioration in your physical condition may occur due to volatile organic compound (VOC) remaining inside the equipment.

⚠Caution

When cleaning the equipment, carry out the work while taking care not to damage the rotor surface.
The performance may deteriorate and the rotor or other parts may be damaged or degraded.

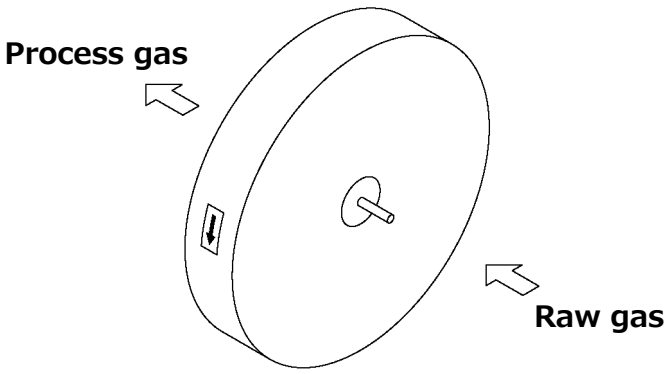
3 Perform cleaning using a vacuum cleaner or air blower (compressed air) while rotating the rotator (recommended timing: every 6 months to 1 year). If the rotor differential pressure does not decrease after cleaning, contact NICHIAS Corporation. See "■ Contact information" in "Introduction" of this manual for the contact information of NICHIAS Corporation.

(2) Rotor rotation direction check

<Procedure>

1 Turn "ON" all power.

2 Check that the rotation direction of the rotor is the same as that in the "rotation direction label" on the rotor side surface through the inspection window.



(3) Rotor drive part inspection

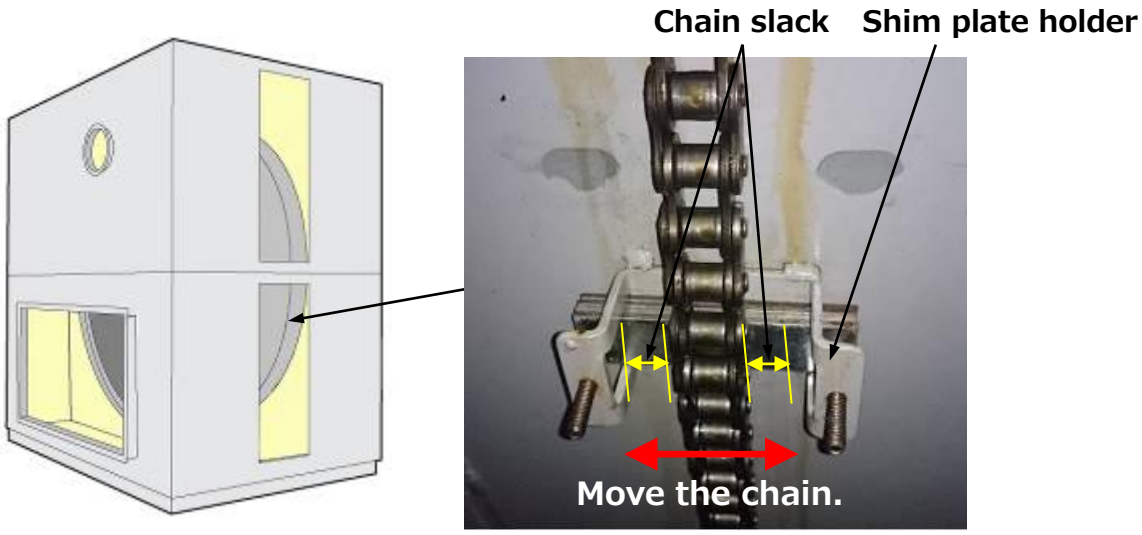
<Procedure>

1 Check that no abnormal noise is coming from the motor, chain, tensioner, and sprockets when the rotor is rotating. If you notice any abnormal sound from the equipment during rotor rotation, follow the procedure in "(2) Rotor drive part inspection" of 7.3.3.

2 Check that the chain slack when the chain is moved left and right in the shim plate holder of the rotor outer periphery is within the range indicated in the table.

⚠Warning

Perform the chain slack inspection of the outer periphery after stopping the rotor.
Entanglement or catching in the chain may occur.

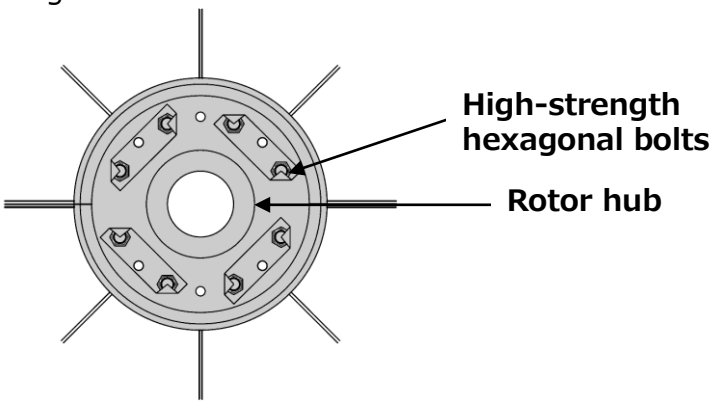


Chain model	Rotor diameter	Chain slack
RS40	2,650 mm or less	5 to 10 mm
RS50	2,950 to 3,550 mm	5 to 8 mm
RS60	3,850 mm or more	5 to 8 mm

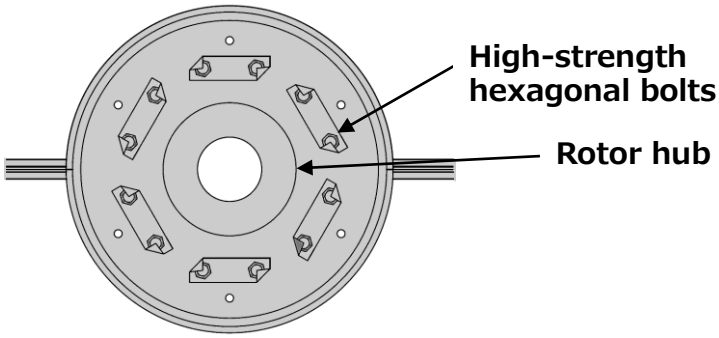
Chain slack

If the chain slack is not in the range indicated in the table, follow the procedure in "(2) Rotor drive part inspection" of 7.3.3.

3 Check that the rotor hub high-strength hexagonal bolts, pillow block fixing bolts, motor fixing bolts, and tensioner fixing bolts are not loose.

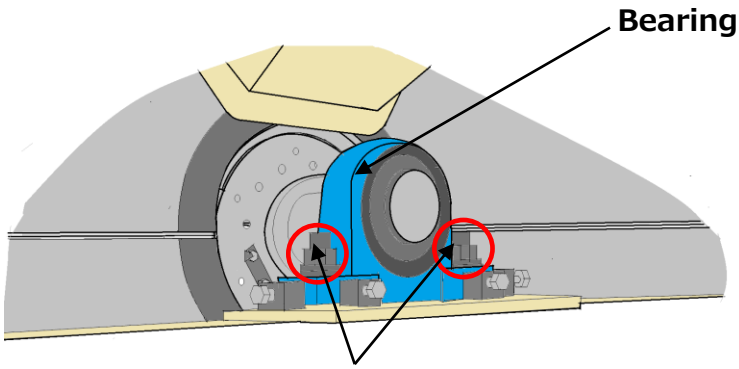


High-strength hexagonal socket bolts 10.9, M12 × 40 (for rotor diameter of 3,550 mm or less, tightening torque: 114 N·m)



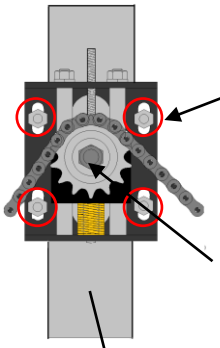
High-strength hexagonal socket bolts 10.9, M12 × 40 (for rotor diameter of 3,850 mm or more, tightening torque: 114 N·m)

Rotor hub mounting bolts



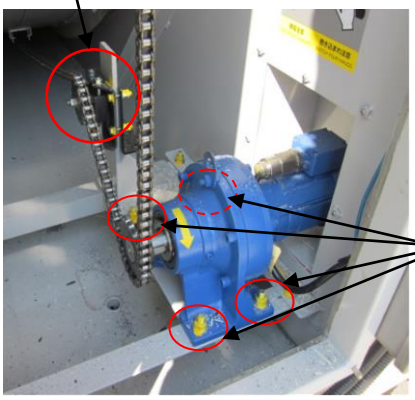
Bearing fixing bolts
M14 × 60 (for rotor diameter of 1,220 to 1,940 mm, tightening torque: 61 N·m)
M20 × 90 (for rotor diameter of 2,190 to 4,200 mm; tightening torque: 186 N·m)

Bearing fixing bolts



Tensioner mounting bolts M5 × 25 (for rotor diameter of 1,220 to 1,950 mm; tightening torque: 3 N·m)
Tensioner mounting bolts M6 × 25 (for rotor diameter of 2,190 to 4,200 mm; tightening torque: 5.2 N·m)

Idler mounting nuts M10 (for rotor diameter of 1,220 to 2,650 mm; tightening torque: 24.5 N·m)
Idler mounting nuts M12 (for rotor diameter of 2,950 to 4,200 mm; tightening torque: 42 N·m)

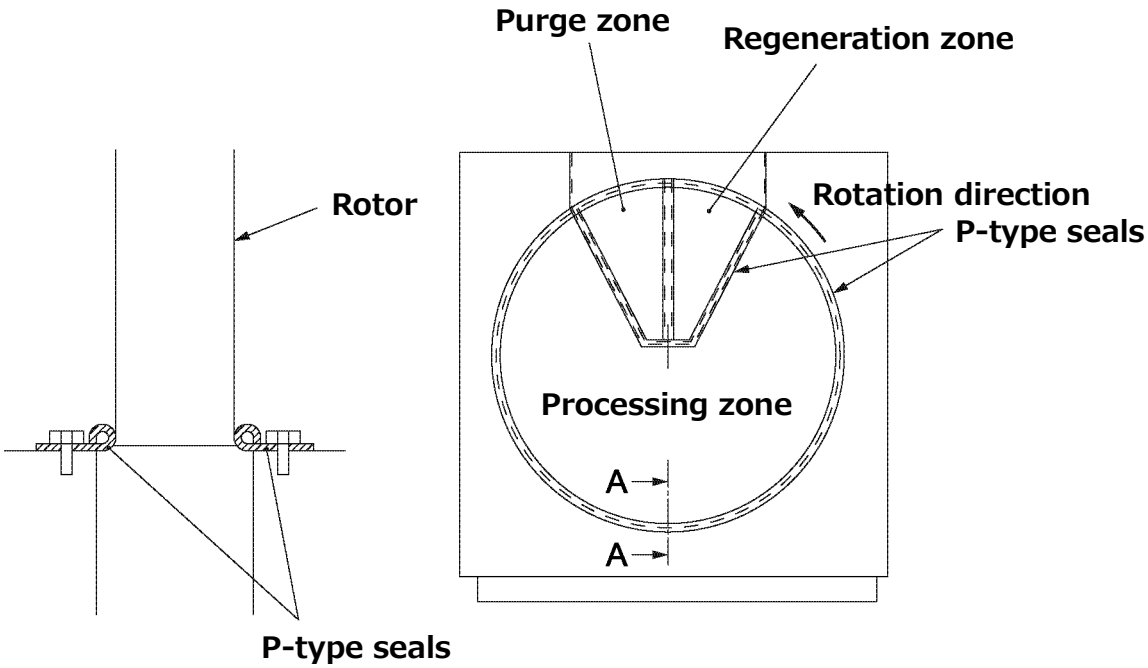


Motor fixing bolts M8 × 30 (for rotor diameter of 1,220 to 2,650 mm, tightening torque: 12.5 N·m)
Motor fixing bolts M12 × 30 (for rotor diameter of 2,950 to 4,200 mm, tightening torque: 42 N·m)

Motor drive part

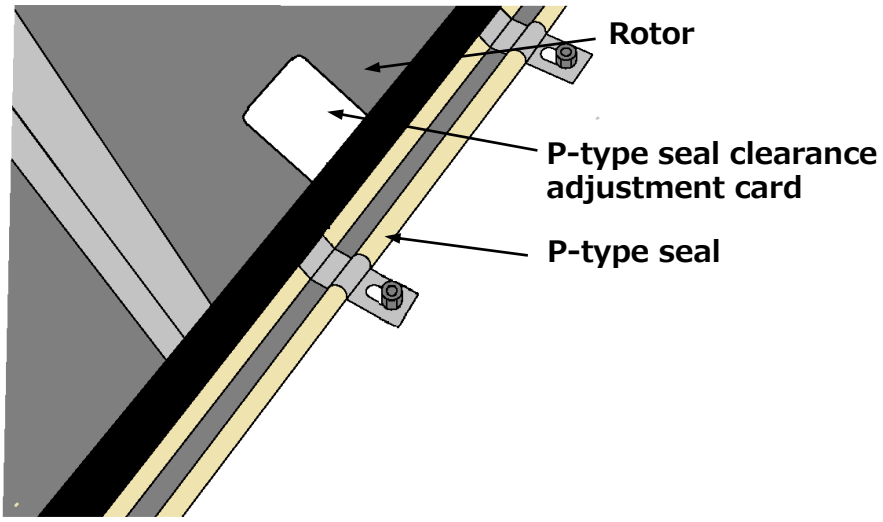
(4) P-type seal inspection

The P-type seals are split into the inlet side and outlet side process zone of the rotor and the regeneration and purge zones of the upper casing.



- P-type seal daily inspection

  Insert the P-type seal clearance adjustment card (thickness 0.3 mm) between the P-type seals and rotor and then let go of it and check that it does not drop under its own weight. If you notice an abnormality, follow the procedure in “(3) P-type seal inspection” of 7.3.3.



(5) Casing inspection

Inspection door packing state check

Visually check the “inspection door packing” when this equipment is operating. If you notice an abnormality such as peeling, damage, or deterioration of the packing, follow the procedure in “(4) Casing inspection” of 7.3.3.

(6) Filter inspection

Visually check the filters when the equipment is operating. If you notice an abnormality, follow the procedure in “(5) Filter inspection” of 7.3.3.

7.2.4 Abnormality measures

If you notice any abnormality with this equipment, immediately stop operation and identify the cause.

Danger

If you notice any abnormality with this equipment, be sure to turn “OFF” all power and then contact NICHIAS Corporation.

See “■ Contact information” in “Introduction” of this manual for the contact information of NICHIAS Corporation.

7.2.5 Recovery operation of the equipment

Danger

If you notice any abnormality with this equipment, be sure to turn “OFF” all power and then contact NICHIAS Corporation.

See “■ Contact information” in “Introduction” of this manual for the contact information of NICHIAS Corporation.

After this equipment is stopped due to some abnormality, do not start the rotor normally and regeneration it to run again.

There is a risk of ignition due to abnormally concentrated gas in the rotor.

・If the concentrator components could not be stopped properly for any reason,
there would be a possibility that the process inlet gas was air flowed to the rotor without desorption heat for rotor regeneration and the rotor adsorption capacity was saturated. When desorption heat is applied to the rotor under such an above unusual condition, extremely higher concentration of desorbed gas would be left from the rotor, and it results in the fire accident at worst.

Proper operation stop for concentrator component should be the following procedure.

1) Process inlet air is stopped.

2) Standard desorption air at 180 - 200 degree C is supplied to the rotor for Min. 30 minutes or longer.

3) After 30 mins operation, desorption heater is stopped.

4) Desorption air fan blower is stopped when desorption inlet temperature is 90 degree C or lower.

5) After confirmation that desorption outlet temperature was cooled down, rotor shall be stopped.

・If this VOC concentrator component cannot be stopped properly for any reason, recovery procedure must be carried out under the following procedure condition in order to return to standard operation stop mode for concentrator component.

1) Heating rate from 90 degree C to 200 degree C for desorption temperature is 120 degree C per 3 hours, and the rotation speed is a normal designated speed during heating-up. After reaching 200 degree C,

maintain the desorption temperature and turn the rotor for 2 rotations or more.

2) **Desorption face velocity for rotor shall be 1.5m/s or faster. Please check in advance whether designated desorption face velocity can be secured before recovery operation.**

3) **Outside air is used for process inlet air and its face velocity is 1m/s or faster shall be secured.**

4) **Desorption outlet temperature may be over 200°C or higher. Pay attention to the setting of alarm, etc.**

5) **If RTO temperature might be increased, please pay attention to the setting of alarm. Particularly, in several rotations after starting up recovery operation, higher concentrated air from the desorption outlet would left from the rotor. So, please be careful of overheat in RTO operation.**

6) **Always please monitor the concentration of VOCs at the desorption outlet.**

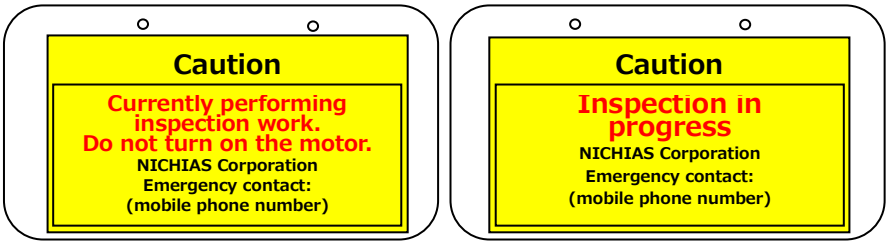
7.3 Periodic Inspection

The timing for periodic inspection is every 6 months, 1 year, 20,000 hours, or 3 years depending on the item.

⚠Danger

Be sure to turn "OFF" all power before carrying out maintenance and inspection work.
Electric shock or fan entanglement may occur.

When performing inspection, be sure to clearly indicate that you are working using a label or tag that describes the fact that you are performing inspection to ensure that those in the vicinity observe caution. Display a clearly visible indication on the motor control panel so that the power is not accidentally turned on.



Display examples

When entering inside the equipment, measure the VOC concentration using a volatile organic compound (VOC) personal exposure monitor to check that the VOC has not exceeded the exposure limit.
Symptoms of poisoning may occur.

When entering inside the equipment, stop the equipment and measure the oxygen concentration using an O_2 concentration meter to check that the oxygen concentration is at least 21%. Also, always measure the oxygen concentration during the work so that you can confirm the oxygen concentration is 21% or more while performing the work.
There may be an oxygen deficiency if the oxygen concentration becomes 18% or less.

When entering inside the equipment, wear "safety glasses", "volatile organic compound (VOC) gas mask", and "protective clothing".

Do not touch the electric connection terminals during insulation resistance test, dielectric strength test, or protective installation continuity test.
Electric shock may occur.

⚠Warning

When entering inside the equipment, be sure to wear a volatile organic compound (VOC) gas mask and make sure the mask filter has a sufficient breakthrough time for your task.

Make sure all tools and lighting used inside the equipment are explosion proof.
Fire may occur.

When entering inside the equipment, perform the work with at least two workers, one inside and one outside the equipment, and have the worker outside periodically check the condition of the worker inside.

When entering inside the equipment, wear antistatic clothing.
Fire may occur.

The inside of the equipment is very hot immediately after the equipment is stopped. When entering inside the equipment, allow the entire equipment to completely cool and then check the temperature.
Burn injury may occur.

⚠Caution

Before changing the direction of rotor rotation, be sure to first halt rotation completely before starting reverse rotation.

7.3.1 Inspection items

(1) Geared motor for driving rotor

(2) Rotor inspection and cleaning

(3) Rotor drive chain

(4) Rotor rotation bearing

(5) Overall inspection and cleaning

Item	Location	First inspection	Second and subsequent inspections	
		Description	Description	Timing
1	Geared motor for driving rotor	——	Overhaul and parts replacement	20,000 hours (approximation)
2	Concentration rotor	Inspection and cleaning	Inspection and cleaning	6 months to 1 year
		——	Rotor replacement	3 years (approximation)
3	Rotor drive chain	Inspection, adjustment, and lubrication	Inspection, adjustment, and lubrication	6 months to 1 year
		——	Chain replacement	When worn
4	Rotor rotation bearing	Lubrication	Lubrication	6 months to 1 year
5	Rotor P-type seals	——	P-type seal replacement	When worn or when replacing rotor

7.3.2 Inspection details

No.	Location and details	Procedure	Timing
1	Geared motor for driving rotor	Greasing and replacement are not necessary because this is basically a maintenance-free type. However, the lifespan can be extended by performing an overhaul and parts replacement after approximately 20,000 hours. Recommended grease: BEN10-No.2 Manufacturer: NIPPECO LTD.	20,000 hours (approximation) * Timing recommended by manufacturer.
2	Rotor inspection and cleaning	If dust or other foreign matter is adhered to the rotor surfaces, perform cleaning using a vacuum cleaner or air blower (compressed air) while rotating the rotator.	6 months to 1 year
3	Rotor drive chain	If there is an abnormal sound from the chain, apply new lubricating oil to the entire chain. Recommended oil: Tellus Oil C32 (Manufacturer: Idemitsu Kosan Co., Ltd.)	6 months
4	Rotor rotation bearing	Perform greasing with a low-pressure grease gun until enough grease is pumped into the bearing. Recommended grease: FYH Lithium Bearing Grease <lithium complex soap> (Manufacturer: FYH INC.)	6 months to 1 year
5	Overall inspection and cleaning	Check that dust and other foreign matter has not accumulated inside the equipment and perform cleaning.	1 year

⚠Warning

If the rotor stops rotating due to motor failure, performance deterioration, electric shock, or fire may occur.
Handle the geared motor for driving the rotor in accordance with the geared motor instruction manual included with the equipment at the time of delivery.

If dust and mist have adhered on the rotor, fire due to the regeneration heat may occur. If the rotor surface is scratched, the performance will deteriorate and the element may fall out.

If a rotor rotation problem such as the chain slipping occurs, performance deterioration or fire may occur. If the chain continues to slip, it may lead to damage to the rotor and the rotor falling.

If a rotor rotation problem occurs, performance deterioration, drive part (chain, sprocket, tensioner, or motor) damage, and rotor falling due to damage may occur.

If dust and combustibles accumulate inside the equipment, a fire may occur.

7.3.3 Inspection procedures

(1) Rotor inspection

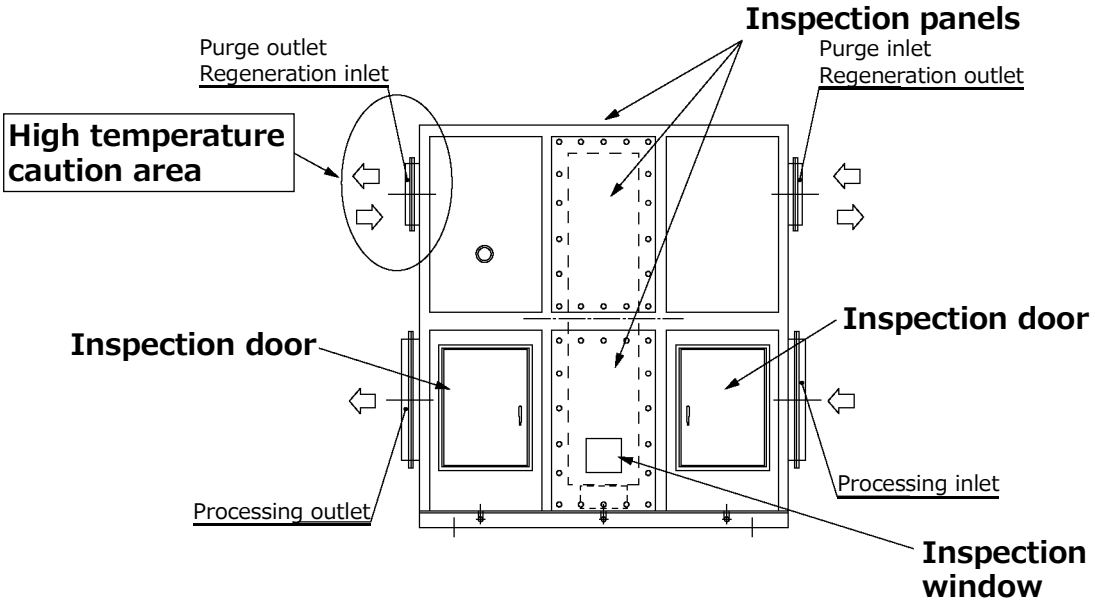
◎ **Rotor differential pressure and rotor surface state**

<Procedure>

1 Turn “ON” the power.

2 Read the differential pressure of the red indicator and index pointer on the differential pressure gauge.

Regeneration inlet and cooling outlet



[If rotor differential pressure exceeds the upper limit]

①: Dust may adhere to the rotor and clogging may occur.

②: If the process gas contains mist, acid, alkali, etc. that differs from the specification conditions, the concentration rotor may deteriorate.

⚠Caution

When cleaning the equipment, carry out the work while taking care not to damage the rotor surface.
The performance may deteriorate and the rotor or other parts may be damaged or degraded.

3 Performing cleaning using a vacuum cleaner or air blower (compressed air) while rotating the rotator (recommended timing: every 6 months to 1 year). If the rotor differential pressure does not decrease after cleaning, contact NICHIAS Corporation.
See "■ Contact information" in "Introduction" of this manual for the contact information of NICHIAS Corporation.

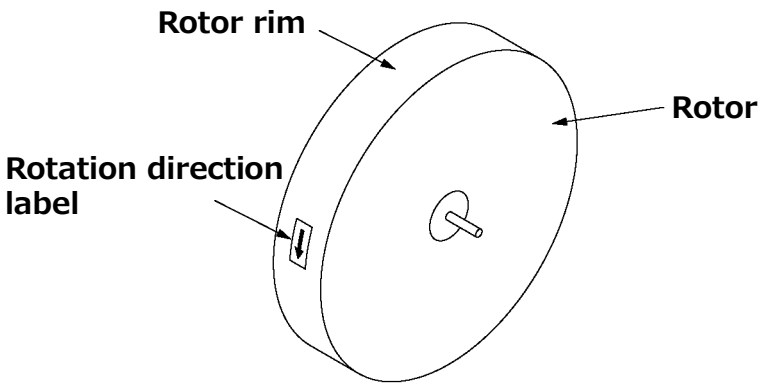
[If is contamination, clogging, or damage of rotor surface]
If the process gas contains mist, acid, alkali, etc. that differs from the specification conditions, the concentration rotor may deteriorate.

⚠Warning

If clogging in the honeycomb occurs together with an organic substance accumulating on the rotor, ventilation during regeneration will not be possible, so heat may build up and fire may occur.
Use 10 wt% of organic substance deposits as maximum as a guideline (NICHIAS's reference value).

4 Stop this equipment and then check that the temperature inside the equipment has decreased enough to allow work to be carried out inside the equipment.

- ○ Check for contamination, clogging, and damage of the rotor surface.
- ○ Check both the process inlet side and process outlet side.



5 If there is clogging, take a sample for analysis.

Sampling element analysis is available upon request (paid service).

(2) Rotor drive part inspection

◎Rotor rotation abnormal noise check (motor, chain, tensioner, and sprockets)

<Procedure>

1 Stop this equipment and then check that the temperature inside the equipment has decreased enough to allow work to be carried out inside the equipment.

2 Be sure to turn “ON” all power and then rotate the rotor and check that no abnormal noise is generated from the inside or outside of the equipment.

⚠Warning

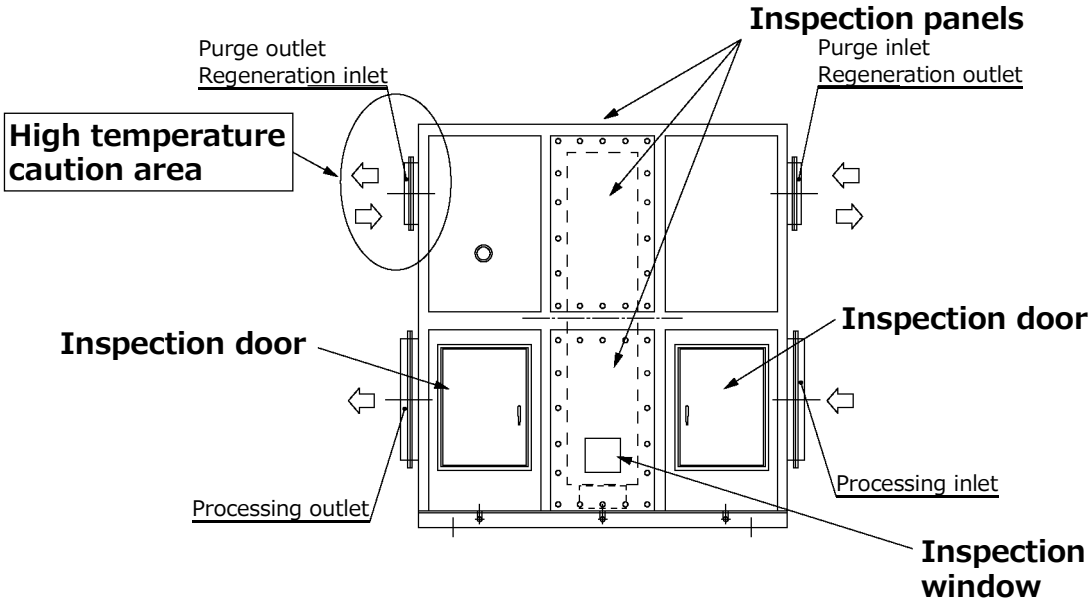
Before rotating the rotor, ensure someone is positioned where they can stop rotation immediately.

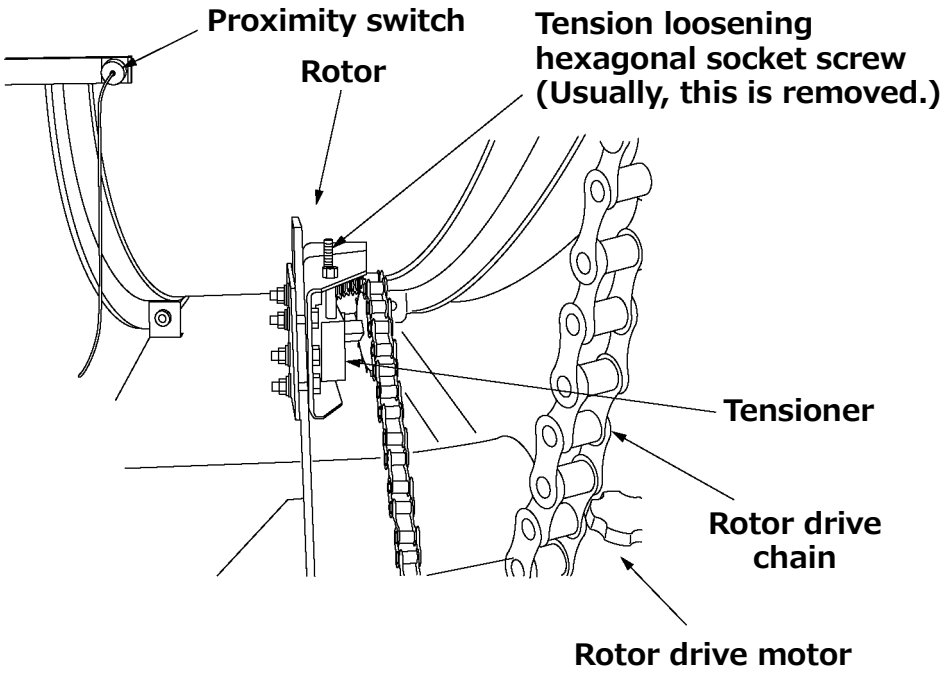
[When an abnormal noise is generated]

3 Be sure to turn “OFF” all power that was turned “ON” in step 2.

4-1 If any metal on metal sound is generated, remove the inspection panels (upper and lower) and check if the chain and sprockets are worn and whether the position of the tensioner has shifted, causing the chain to slip.

Regeneration inlet and cooling outlet





4-2 If any abnormal sound is generated from the chain and rotor bearing continuously, there may not be enough grease.

5-1 Check that the chain is not slipping. If it slips, contact NICHIAS Corporation.
See "■ Contact information" in "Introduction" of this manual for the contact information of NICHIAS Corporation.

5-2-1 If there is any abnormal sound from the chain, apply new lubricating oil to the entire chain.
(Recommended timing: every 6 months)
Recommended oil: Daphne Mechanic Oil 68 (Idemitsu Kosan Co., Ltd.)
<Rotor diameter of 3,550 mm or less>
Daphne Mechanic Oil 100
(Idemitsu Kosan Co., Ltd.)
<Rotor diameter of 3,850 mm or more>
Operating temperature: 0 to 40°C

5-2-2 If there is sound coming from the rotor bearing, perform greasing with a low-pressure grease gun until enough grease is pumped into the bearing.
(Recommended timing: every 6 months to 1 year)
Recommended grease: FYH Lithium Bearing Grease <lithium complex soap> (Manufacturer: FYH INC.)
Operating temperature range: -20 to 100°C

6 Turn “ON” all power and then reattach the removed inspection panels to complete the “rotor drive part inspection”.

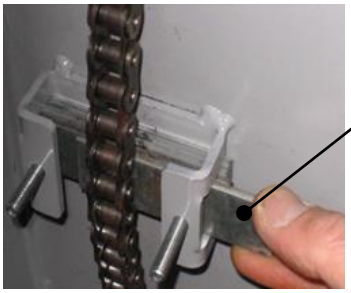
◎ **Chain slack check**

<Procedure>

1 Check that the chain slack when the chain is moved left and right in the shim plate holder of the rotor outer periphery is within the range indicated in the table of “(3) Rotor drive part inspection” of 7.2.3.

[When chain slack is outside of range]

2 Loosen the M6 screws on both sides of the shim plate holder with a hexagonal wrench and add a shim plate (thickness: 1.6 t, 2.3 t, or 3.2 t) as shown in the photo to adjust the slack so that it comes within the range. After adjustment, tighten the M6 screws of the shim plate holder with a hexagonal wrench.

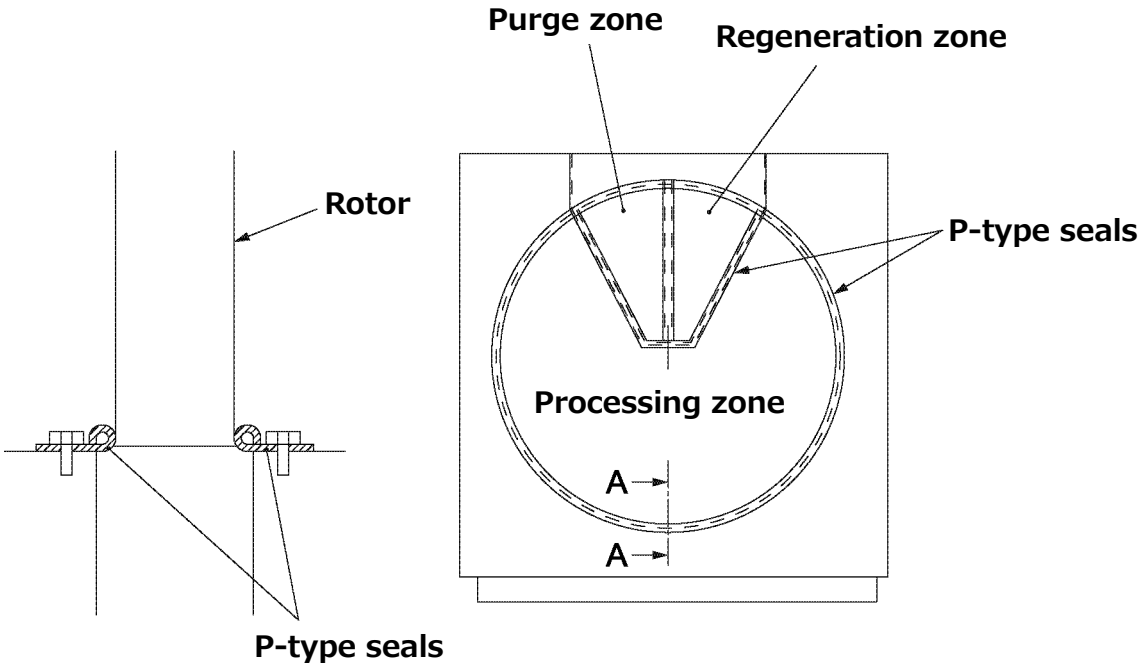


If adjustment cannot be achieved by adding a shim plate, replace the chain.

3 After adjustment, be sure to rotate the rotor and check that no abnormal noise is generated from the chain and sprockets.

(3) P-type seal inspection

The P-type seals are split into the inlet side and outlet side process zone of the rotor and the regeneration and purge zones of the upper casing.



◎ P-type seal mounting screw looseness check

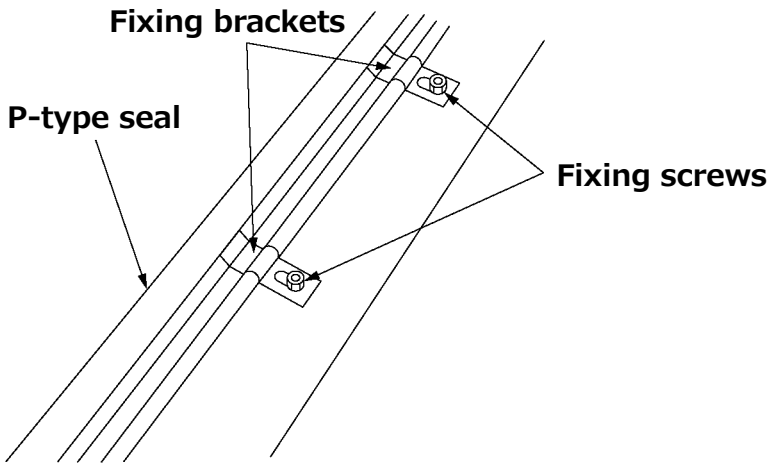
Danger

Never make repairs or modifications to this equipment that are outside of scope of this manual without consulting NICHIAS Corporation.
The equipment may be damaged and a serious life-threatening accident may occur.

<Procedure>

1 Stop this equipment and then check that the temperature inside the equipment has decreased enough to allow work to be carried out inside the equipment.

2 Enter the equipment from an inspection door and check that the P-type seal fixing screws of the inlet side and outlet side of the process zone of the rotor and the regeneration and purge zones of the upper casing are not loose, rattling, corroded, etc.



[When the screws are loose and rattling]

3-1 If the screws are loose, rattling, etc., tighten them again.

Cause of screw looseness and rattling: Looseness and rattling are attributed to slight vibrations caused by the rotor rotating, blower fan, etc. during operation of the equipment.

[When the screws are corroded]

3-2 If the screws are corroded, replace them when you carry out the next inspection (recommended timing for routine maintenance: 6 months to 1 year).

Cause of screw corrosion: Corrosion of the fixing screws is attributed to process gas containing mist, acid, alkali, etc. that differs from the specification conditions.

(4) Casing inspection

◎ **Casing interior paint check**

⚠Warning

Never make repairs or modifications to this equipment that are outside of scope of this manual without consulting NICHIAS Corporation.
The equipment may be damaged and a serious life-threatening accident may occur.

<Procedure>

1 Stop this equipment and then check that the temperature inside the equipment has decreased enough to allow work to be carried out inside the equipment.

2 Enter the equipment from an inspection door and check that there is no paint peeling, corrosion, or liquid pooling, etc. on the casing interior of the process inlet and outlet sides.

Rust on floor surface

Sludge on floor surface

Liquid on floor surface

[When there is paint peeling, corrosion, or liquid pooling on the casing interior]

3 Contact NICHIAS Corporation.
See "■ Contact information" in "Introduction" of this manual for the contact information of NICHIAS Corporation.

Cause: Paint peeling and corrosion on the casing interior are attributed to process gas containing mist, acid, alkali, etc. that differs from the specification conditions. Furthermore, the pooling of a large amount of liquid is attributed to drain pipe clogging.

Measure: If there is only a small amount of paint peeling or corrosion and there is no leak to the outside, fix the problem when the next inspection is carried out (recommended timing: 6 months to 1 year).

◎ **Warning label check**

⚠Caution

Keep the "warning labels" in a state in which they can always be read.
If a label has peeled off, replace it immediately.

Never peel off or modify a "warning label".

<Procedure>

1 Check that the affixed warning labels have not become difficult to read due to peeling, dirt, damage, colors fading, etc.

[When a warning label is peeling, dirty, etc.]

2 Replace immediately.

◎ **Inspection door packing state check**

Danger

Never make repairs or modifications to this equipment that are outside of scope of this manual without consulting NICHIAS Corporation.
The equipment may be damaged and a serious life-threatening accident may occur.

<Procedure>

1 Stop the equipment and then check that the temperature inside the equipment has decreased enough to allow work to be carried out inside the equipment.

2 Check the inner and outer packing of the inspection doors for peeling, damage, and corrosion.

[When the packing of the inspection doors is peeling, damaged, or corroded]

3 Contact NICHIAS Corporation.
See "■ Contact information" in "Introduction" of this manual for the contact information of NICHIAS Corporation.

Cause: Peeling, damage, and corrosion of the packing are attributed to process gas containing mist, acid, alkali, etc. that differs from the specification conditions.

Measure: Contact NICHIAS Corporation. If there is only a small amount of peeling, damage, or corrosion and there is no leak to the outside, fix the problem when the next inspection is carried out (recommended timing: 6 months to 1 year).

(5) Filter inspection

⚠Danger

Be sure to turn "OFF" all power before carrying out the work.
Electric shock may occur.

⚠Warning

Never place combustibles in or around this equipment.
Fire may occur.

When attaching this equipment to another machine, check the structure and strength of the other machine.
If the structure or strength is inappropriate, vibration may occur resulting in an accident.

⚠Caution

Do not place an object that will block ventilation inside this equipment.
The performance may deteriorate.

Tighten the mounting bolts to the appropriate torque to ensure they do not come loose.
If inadequate force is applied to the product due to, for example, uneven fastening, equipment damage may occur.

5.1) Overview

The filter box is installed at the stage prior to the concentrator to remove dust and other similar matter contained in raw exhaust gas used for processing by this equipment.

◎ Preparation

Observe the following before beginning periodic inspections to ensure a worker is not injured and the equipment is not damaged.

a Completely stop the equipment

There is normally processing air flowing into and out of this equipment due to the process fan.
The inflow route is the filter box inlet flange → prefilter → mist filters → concentrator processing inlet → HZ zeolite rotor → concentrator processing outlet → process fan → stack.

◎ Turn “OFF” all power.
Check that the processing airflow is completely stopped before beginning filter inspection and replacement work and that it will not be resumed during the work. Turn “OFF” all power sources related to rotor rotation and processing air.

b When performing inspection work

There is no lighting inside the filter box. Prepare lighting.
Check whether safe inspection work is possible in the environment inside the filter box in advance by using an O_2 meter to measure the oxygen concentration and the LEL meter to measure the volatile organic compound (VOC) concentration inside the filter box.
If the VOC concentration is high, open the inspection openings of the magic box and filter box and take measures to sufficiently decrease the VOC concentration inside. When inspecting or replacing the filters, be sure to wear “safety glasses”, “VOC gas mask”, and “protective clothing” for safety.

c Filter replacement work

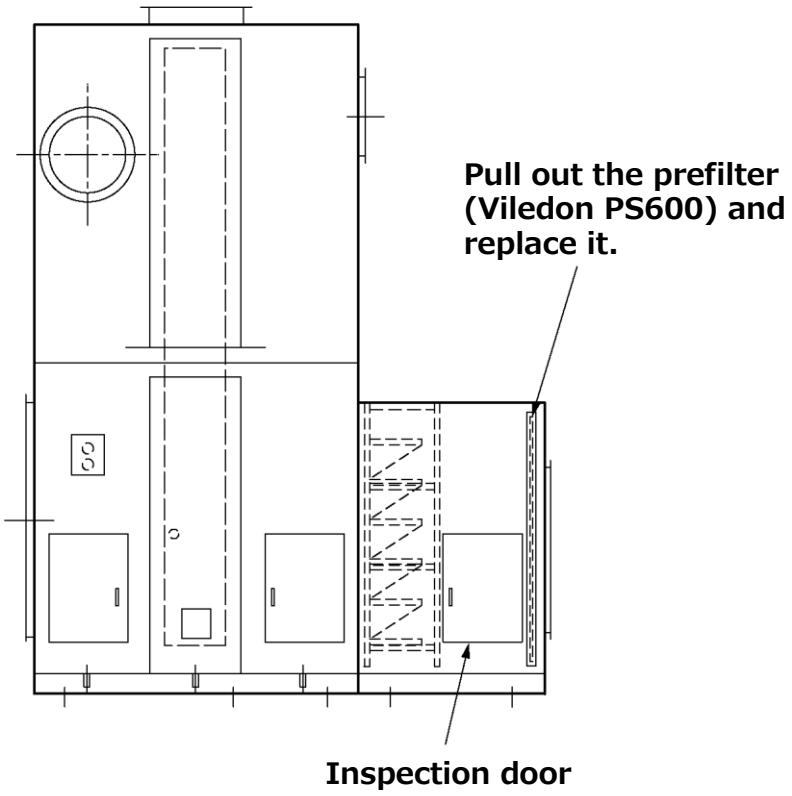
When carrying out filter replacement work, perform the same procedure as the inspection work. For the replacement filters, prepare granulated active carbon 2 kg / bag mist filters and Viledon PS600 prefilter (Japan Vilene Company, Ltd.).

◎ If different filters are used
The frame in which the filters are inserted is specifically for the designated filters (granulated active carbon 2 kg / bag mist filters and Viledon PS600 prefilter (Japan Vilene Company, Ltd.)), so the frame may break or the specified performance may not be achieved if different filters are used.
Furthermore, the rotor may be contaminated due to the filters not functioning properly.

5.2) Filter replacement work

(1) Prefilter replacement work

The prefilter is inserted in the slide-out frame of the filter box. Replace the prefilter by sliding out the “Viledon PS600” (Japan Vilene Company, Ltd.) from the frame of the filter box and then inserting a new “prefilter”.



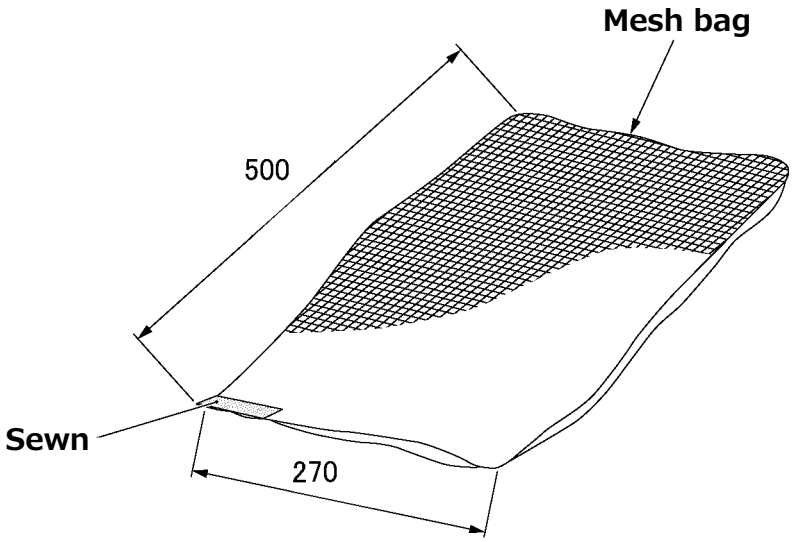
(2) Mist filter replacement work

⚠Warning

When entering inside the equipment to perform work, leave the inspection doors open.
You may get locked inside or VOCs remaining inside the equipment may cause harm to your body.

<Procedure>

1 Prepare the same quantity of mist filters (granulated active carbon 2 kg / bag) as the existing filters. Normally, four bags (8 kg) are installed on each 1000 × 500 shelf.



2 Open the filter box inspection door and use a rope or other measure to make sure you do not get locked in during the work.

3 Turn “OFF” all power, check that the temperature has sufficiently decreased since turning off the equipment power, and enter the equipment wearing “safety glasses”, “VOC gas mask”, and “protective clothing”.
Replace the old mist filters on each shelf with new ones.

4 Take out the designated quantity of replaced old mist filters from the equipment.

5.3) Filter differential pressure measurement tube inspection

Inspect the tubes attached to the filter inlet and outlets sides for problems such as clogging and detachment.

5.4) Tidying up

Clean the floor and inner wall surfaces of the filter box. Check that no tools and foreign matter remain inside the box and then close the inspection door.

7.4 Maintenance Items

Item	Location	First maintenance	Second and subsequent maintenance	
		Description	Description	Timing
1	Geared motor for driving rotor	——	Overhaul and parts replacement	20,000 hours (approximation)
2	Concentration rotor	Inspection and cleaning	Inspection and cleaning	6 months to 1 year
		——	Rotor replacement	3 years (approximation)
3	Rotor drive chain	Inspection, adjustment, and lubrication	Inspection, adjustment, and lubrication	6 months to 1 year
		——	Chain replacement	When worn
4	Rotor rotation bearing	Lubrication	Lubrication	6 months to 1 year
5	Rotor P-type seals	——	P-type seal replacement	When worn or when replacing rotor

* We recommend periodic sampling analysis to determine the life of the rotor (paid service).

7.5 Consumable Parts List

Parts	Specifications	Quantity	Manufacturer
Concentration rotor	HONEYCLE™ HZ	1	NICHIAS Corporation
Rotor P-type seals	Silicone + PTFE	1 set	NICHIAS Corporation
Rotor drive chain	Roller	1 set	TSUBAKIMOTO CHAIN CO. (Or manufacturer of equivalent product)

* For the replacement timing, refer to “7.4 Maintenance Items”.
Spare parts are not supplied with the product.

Chapter 8 Repair

Please consult NICHIAS Corporation regarding repair, assembly, adjustment, and relocation of this equipment.

8.1 Repair, Disassembly, and Modification

⚠Danger

Never disassemble or modify this equipment yourself.
NICHIAS Corporation bears no responsibility whatsoever for such actions as they are outside the scope of our warranty. Electric shock, injury, fire, etc. may occur.

Never disassemble, repair, adjust, or modify the equipment yourself.
This equipment may be damaged and a serious life-threatening accident may occur.

<Memo>

Chapter 9 Disposal

This equipment and its parts

With regards to collection and transportation when disposing of this equipment and its parts, request disposal by the respective specialists of industrial waste for your region.

Packing film

Stretch film is wrapped around this equipment periphery as packing to protect the equipment. Low-density polyethylene film is use for this film. Chlorine gas is not generated when it is incinerated.

<Memo>

Chapter 10 Warranty

10.1 Warranty

(1) Warranty period

This warranty covers the items in section (2) below for a period of one year (however, up to a maximum of 14 months after delivery) from the completion of the on-site trial operation.

(2) Warranty items

① Performance warranty

- The items in the table below are covered by the warranty on condition that usage is in accordance with the design conditions (from your specific inquiry) described in Chapter 3 of the Delivery Specification issued individually for each customer as well as the design specifications in Chapters 4 to 6 of the same specification.
- If performance is not achieved within the warranty period, please notify NICHIAS Corporation in writing explaining the operating conditions, usage, and details of the issue within two weeks. If the results of the investigation attributes the cause of non-performance to NICHIAS Corporation, we will deliver a repaired or substitute product free of charge. However, the warranty period of a substitute product will be the remaining balance of the original warranty period.
- Compensation will not be made for any secondary damages including damage to surrounding facilities, equipment, equipments, etc. and stoppage of a production line.
- Compensation will not be made for any damages to a third party due to incorporating your own products into this product.

Cleaning efficiency	The performance warranty values differ on an individual basis. For details, refer to section (2) Performance warranty column in Chapter 11 of Delivery Specification.
Concentration after cleaning (concentration at processing outlet)	
Concentration rate	

- Usage of a process gas or the equipment differently than described in the design conditions is outside the scope of this warranty.
- Be sure to refer to the separate “Precautions for SOLVENTCLEAN™ Installation and Operation (HF110039r1)”.
- Use when the gas contains a solvent outside of the design specifications is excluded from the scope of the cleaning performance warranty.

Scope of cleaning efficiency warranty

- The cleaning efficiency warranty differs on an individual basis. For details, refer to the section (2) Warranty item performance column in Chapter 11 of Delivery Specification.

Items other than the above are outside the scope of this warranty.

② Equipment warranty

- If a mechanical defect occurs within the warranty period, please notify NICHIAS Corporation in writing explaining the conditions within two weeks. If the results of the investigation attribute the cause of the product defect to NICHIAS Corporation, we will deliver a repaired or substitute product free of charge. However, the warranty period of a substitute product will be the remaining balance of the original warranty period.
- Compensation will not be made for any secondary damage including damage to surrounding facilities, equipment, equipments, etc. and stoppage of a production line.
- Compensation will not be made for any damages to a third party due to incorporating your products into this product.
- * Trouble occurring after the equipment is operational that is due to the installation environment, such as high humidity and cold, is outside the scope of this warranty.

(3) Disclaimer

If any of ① to ③ applies, the damages are excluded from the scope of this warranty.

① Cause of the damage is handling under incorrect conditions

② Cause of the damage is modification or repair other than that performed by NICHIAS Corporation.

③ Cause of the damage is a natural disaster or other force majeure

10.2 Acceptance Inspection

You are requested to check the appearance, etc. and adherence to the specifications soon after delivery, and acceptance inspection is considered to be completed at that point in time.

Chapter 11 Specifications

The specifications of this equipment are as follows.

11.1 Scope

These specifications show the general scope of the TOMBO No. 8805-SC SOLVENTCLEAN ™ (low-concentration organic compound concentrator).
The details are provided in your contract and “Specification.”

11.2 Basic Structure

Solvent Clean is a equipment for concentrating air containing volatile organic compounds (VOCs), which employs a concentration rotor made of TOMBO No. 8800-HZ HONEYCLE™ HZ carrying zeolite as adsorbent in combination with a drive equipment, air seal, and casing.

11.3 Design Requirements

The details are as specified in the design & specification documents for your product.

11.4 Equipment Specifications

The details are as specified in the design & specification documents for your product.

11.5 Concentrator Conditions

(1) Process gas

Process gas containing mist, acid, alkali, resin, dust, etc. have an adverse effect on the concentrator by causing rotor clogging and rotor adsorbent (zeolite) deterioration.
Be sure to conform to the following conditions regarding mist, dust, and humidity.

Mist	< 0.1 mg / Nm^3
Dust	< 1 mg / Nm^3
Humidity	< 80% RH

* If the process gas contains mist, perform preprocessing (mist filter, etc.) in order to conform to the above value. If mist exceeding the above value is contained, it will easily accumulate on the rotor and may cause the adsorption performance of the rotor to deteriorate in a short period of time.
* Fine particles may cause clogging and rotor damage.
* If the humidity condition exceeds the above, the rotor will contain a large volume of moisture. The adsorbent will not deteriorate because we use hydrophobic zeolite as the adsorbent, but performance will be adversely affected because the adsorption of VOCs will be physically impeded.

(2) Operating conditions

1) Be sure to control the operation with the airflow based on our design flow sheet.
   * Controlling the operation with the pressure causes the process gas fan and regeneration gas fan to destroy the airflow balance inside the concentrator (inlet and outlet of process zone, inlet and outlet of regeneration zone, and inlet and outlet of purge zone), and gas regeneration becomes no longer possible.
2) The adsorption performance differs depending on the VOC type and temperature but the process gas temperature is within the range of 0 to 50°C.
   * If a substance with a low boiling point is contained in the

VOC and the process gas temperature increases too high, that VOC will become difficult to be adsorbed by the rotor.

* If the temperature becomes lower than 0°C, it will cause frost to adhere to the rotor and impede adsorption.

3) Be sure to observe the regeneration (inlet and outlet) temperature based on our design flow sheet.
   * The regeneration outlet temperature can be changed and adjusted by adjusting the rotation speed of the rotor.
4) Independent traps are provided for the drain pipes of the processing inlet, rotor chamber, and processing outlet chamber in case mist accumulates inside the casing. Make sure they are functioning during operation. It is acceptable to install a valve for each drain pipe, but make sure the valves are always set to “OPEN” during operation.

(3) Maintenance

Implement (1) and (2) above and then carry out the following inspection and maintenance management to prevent problems.

Clean the rotor. We recommend the high-temperature regeneration cleaning method. Determine the cleaning frequency by checking the concentration of the residual organic compound by performing element sampling in advance. For the element sampling service, contact NICHIAS Corporation.

* Never wash the rotor with water as doing so will damage it.

11.6 EU Directives Standards

This device is not a finished product but is a semi-finished component that complies with EU directive standards.

(1) Movable guard with interlock

It is necessary to provide Interlocking movable guards for safety in door closing.

And the guard must;

— as far as possible remain attached to the machinery when

open,

— be designed and constructed in such a way that they can be adjusted only by means of an intentional action.

Interlocking movable guards must be associated with an interlocking device that;

— prevents the start of hazardous machinery functions until they are closed and

— gives a stop command whenever they are no longer closed.

Where it is possible for an operator to reach the danger zone before the risk due to the hazardous machinery functions has ceased, movable guards must be associated with a guard locking device in addition to an interlocking device that;

— prevents the start of hazardous machinery functions until the guard is closed and locked, and

— keeps the guard closed and locked until the risk of injury from the hazardous machinery functions has ceased.

Interlocking movable guards must be designed in such a way that the absence or failure of one of their components prevents starting or stops the hazardous machinery functions.

＊This document is at the request of Document DIRECTIVE 2006/42 / EC of the European Machinery Directive.

(2) Noise

It is necessary to measure the sound pressure level in the finished product.

Wear hearing protection in noisy environment.

(3) Error

Error details and repair procedures that occur in the finished product must be described in the operating instruction manual by customer.

(4) Emergency stop

The contents of emergency stops and remediation methods that occur in the final product state must be described in the customer's instruction manual.

(5) Battery

When using a battery as end product, dispose the battery properly in accordance with the applicable national directives and standards.

(6) Electrical Wiring

For electrical wiring, confirm that the wiring distance, fixing method, and protection class wiring must meet the criteria in the requirements of IEC standards. ＊IEC EN60204-1

<Memo>

■ **Instruction Manual Revision History**

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