

OAB (OILES Air Bearings) Instruction Manual

OILES air bearings are hydrostatic gas bearings featuring various advantages such as high speed, high accuracy, and ultra-low friction.

Read all the following operating instructions to prevent malfunctions caused by transportation, mounting, or air supply.

1. Transportation and Operating Environment

OILES air bearings are ultra-precise products. Avoid dropping or other impacts, and transportation or use under strong vibrations.

- When a transporter is used, special caution should be exercised not to damage the product with the transporter's metal claws.
- As a guideline for the operating environment, the temperature should be $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and humidity 70% or lower.
- Let the product stand at room temperature sufficiently in order to avoid condensation before opening the package.

2. Precautions for operation

- 1) During operation, wear rubber- or polyurethane-based gloves from which fibers do not come off and avoid handling air bearings with bare hands.
Pay attention not to touch the porous material (bearing surface) even when you are wearing gloves.
- 2) Do not allow any liquid such as water, oil, or organic solvent to adhere to the porous material (bearing surface). It may significantly deteriorate the performance of the bearing.
- 3) If a stain adheres to the porous material (bearing surface), thoroughly blow air on the stain and then wipe it with a dry wiper from which fibers do not easily come off.

3. How to Mount

1) Pad and Flange bushing

When screws are used to mount the product, set the target flatness of the mounting surface at $2\ \mu\text{m}$ or less in order to minimize the strain caused by stress. Polish the mounting surface with an oilstone briefly to remove burrs and scratches.

2) Straight bushing

Pay attention not to set the dimension of the housing bore too tight.

4. Control of Supply Air

Many of the malfunctions of air bearings are caused by insufficiently controlled air supply.

The air supply should be equivalent to JIS B 8392-1 (ISO8573-1) compressed-air purity class of 1.6.1 (clean, dry air through a filter of $0.3\ \mu\text{m}$ or smaller in a dry air).

- 1) Never move the air bearing and the mating material without supplying air.
- 2) The standard (recommended) supply air pressure is 0.5 MPa (gauge pressure).
- 3) Ensure that the discharge capacity flow rate of the supply air source is greater than or equal to twice the consumption flow rate.
- 4) The internal diameters of piping tubes should be $\phi 4$ or more, unless otherwise specified.

* Recommended equipment for air supply control

Condensation or drain condensate in the air supply is one of the causes of seizure of air bearings.

Especially in high-humidity environments, problems caused by condensation frequently occur. Therefore, it is recommended that the following pneumatic devices be installed in the air supply piping.



5. Interlock Setting

It is recommended that an interlock be set to prevent the bearings from moving without an air supply or under reduced supply air pressure.

6. Precautions for Operation

- 1) Before installing piping to an air bearing, blow air into the tubes thoroughly to confirm that no drain condensate, fine particles, or oil is trapped.
- 2) Before restarting operation after a long-term suspension, thoroughly blow air in the same way.
- 3) Supply clean, dry air to the air bearing for about 30 minutes before using it.
- 4) In using an air bearing for rotation, mounting of a greatly unbalanced rotating body may lead to contact between the shaft and the bearing during high-speed rotation, resulting in severe damage. In high-speed rotation, correct the dynamic balance in accordance with the rotation speed used. (recommended JIS B 0905 (ISO1940-1) balance quality grade: G0.4)
- 5) In high-speed rotation use, take risk prevention measures by installing a cover to prevent rotating bodies from shattering.
- 6) Take measures not to allow heat from heating bodies such as a motor (power source) to have an influence on the air bearing. Strain caused by expansion due to heat may become a cause for malfunction.

7. When Not in Use and Storage

- 1) The air supply to the air bearing may be stopped when it is not moving or not in use. For rust prevention, however, maintain or store it in an indoor environment where condensation due to high temperatures and humidity can be avoided.
- 2) When air bearings are not used for a long time, you are recommended to take measures against the occurrence of unexpected movement without air supply at the start of operation.
- 3) When air bearings are stored because they are not used for a long time, pay particular attention to rust prevention by sealing them in a plastic bag together with a desiccant, for example. However, do not apply anti-rust oil. If the oil enters the bearing clearance, it may cause a malfunction such as making the bearing unable to move smoothly.

8. Troubleshooting

1) The movement of the air bearing is not smooth.

- Possible causes are decrease of supply air pressure and penetration of water droplets or drain condensate into the bearing clearance. Check the normal supply condition.
- In the event of penetration of water droplets or drain condensate, supply air for drying for 12 hours or longer.

2) In the use of a radial air bearing for rotational movement, the entire system or the rotating body vibrates significantly.

Lack in the dynamic balance of the rotating body may be the cause. Check the balance and correct if required.

3) Movement accuracy is not good.

Possible causes include dropping, impact, inferior installation, and overload operation. Contact us if repair is required.

• Glossary

Bearing flow rate A bearing flow rate is the flow rate when a mating material is set to the air bearing and air is supplied. The flow rate varies depending on the clearance, which is called consumption flow rate. NL/min indicates the flow rate per minute at the reference condition (0°C , 1 atmospheric pressure).

Stiffness A Stiffness indicates the displacement of the shaft against the load ($\text{N}/\mu\text{m}$) and the value varies depending on the load condition and the clearance setting.

Load capacity A load capacity is the allowable load at usual use.

Running cost reduction

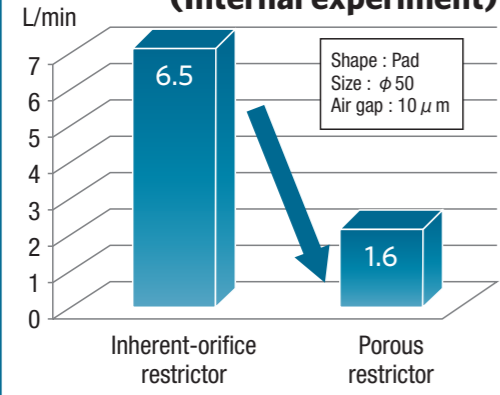
Oiles air bearings have a unique porous restrictor that reduces air consumption and reduces running cost.

Cost calculation

Running cost of air supply

$$= \text{operating time(h)} \times \text{number of equipment(pc)} \times \text{flow rate(m}^3\text{/h)} \times \text{air cost(¥/m}^3\text{)}$$

Flow rate Comparative test result (Internal experiment)



Operating time : 480,000min/year (8,000/year)

Flow rate : Porous 1.6L/min

Inherent-orifice 6.5L/min

Number of pad : 10pc

Air cost* : ¥0.002/L

*Reference value.

Approx. 1/4 reduction.

Result

Porous restrictor

¥16,000/Year

Inherent-orifice restrictor

¥64,000/Year

Difference of

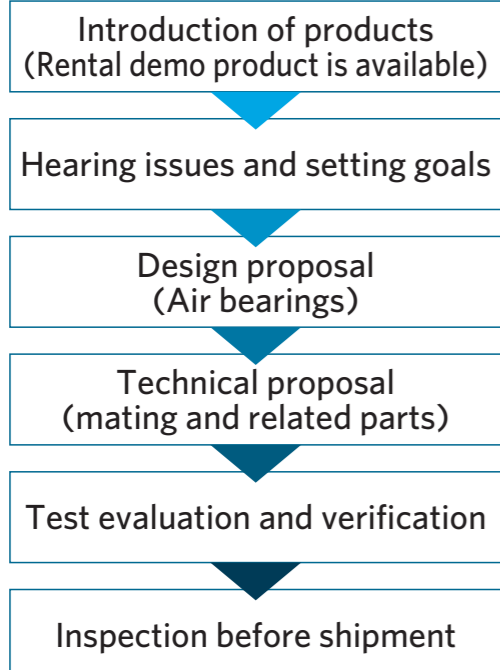
¥240,000

in 5 Years

Support

In order to ensure that you can use Oiles air bearings with peace of mind, we provide all kinds of support, from hearing issues to setting goals, technical proposals, performance verification, and delivery.

Workflow



- We have demo products available for rent. If is a simple test, you can try is on the demo products.
- Oiles air bearings are manufactured to customer specifications. We can propose dimensions, shapes, and performance that meet your needs. We also make design proposals for units including peripheral parts.
- Quality is guaranteed by measuring and managing the individual performance values of each product. It is also possible to submit a checklist of individual performance values.

As an expert, we will contribute to solving customer problems by proposing optimal technology.

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