



SPHERICAL AIR BEARINGS HANDLING AND INSTALLATION INSTRUCTIONS

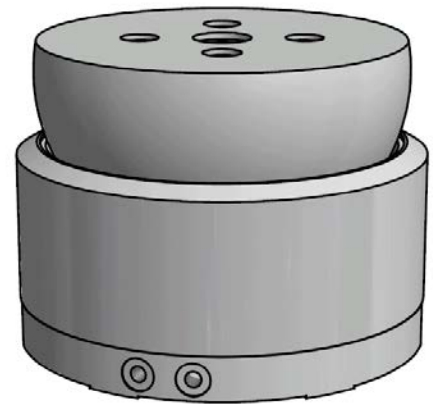
Air bearings require special handling and installation. Complete familiarization of these instructions will help ensure proper operation.

CAUTION: Prior to unpacking, allow the bearing to reach room temperature. This will help prevent water from condensing on the surfaces. During this time, please become familiar with the bearing by reading through these instructions.

SOME AIR BEARINGS REQUIRE HIGH PRESSURE GAS TO OPERATE. ALWAYS USE ADEQUATE PROTECTION WHEN HANDLING HIGH PRESSURE SOURCES.

DESCRIPTION :

Spherical air bearings of the SRAx series are designed for aerostatic, frictionless rotary motion in three axes while supporting multidirectional loads using either a porous carbon surface or an orifice fed surface. The roll and pitch angles are limited for this type of air bearing, however there is continuous 360° travel in the yaw axis. Anodized aluminum provides scratch resistance of the housing and spherical surface. A threaded hole located along the side or bottom of the assembly provides an inlet for externally pressurized air to reach the gap through either porous carbon or discrete orifices. If equipped, gap sensing¹ air bearings have a second hole to allow measurement of the air gap pressure. In addition, some bearings may have an inlet for vacuum preload. Load is imparted through the top surface of the sphere.



HANDLING:

Functionality is made possible by manufacturing the air bearing surface to precise sub-micron tolerances. Small injuries to the mating surfaces, including those invisible to the naked eye, can cause deformations that impede performance. Never leave the bearing exposed where they might be damaged and inform persons nearby of the delicate handling requirements. Store air bearings separately in a clean and dry environment between 50-110 °F.

SUPPLY AIR QUALITY REQUIREMENTS:

Air supplied to the bearing requires special filtration. Due to the small clearance gaps and small pores in the carbon or orifice, particles present in unfiltered air can accumulate and restrict the flow of air. Although a single particle large enough can clog an orifice type air bearing, multiple small particles over time can slowly clog a porous carbon air bearing.



NOTE: Contaminated air is one of the leading causes of air bearing failure.

Air quality standard 8573.1 has been developed by ISO. It describes the following specifications for compressed air:

Quality Class	SOLIDS – Maximum particle size (µm)	MOISTURE – Dew Point		OIL – Liquid and Gas	
		°C	°F	mg/m ³	ppm _{w/w}
2	1	-40	-40	0.1	0.08
3	5	-20	-4	1	0.8

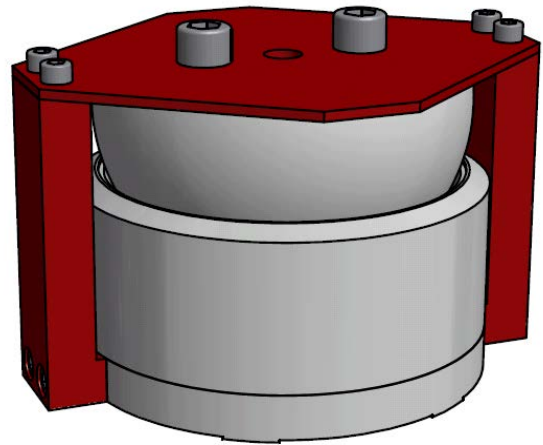
We recommend class 3 or better, however, in any case, the maximum particle size should be 1 µm. Air filtration systems are sold as an optional accessory.

TUBING:

Tubing which transmits the supply air to the bearing should have an adequate diameter to account for pressure loss over its length. The tubing should be flexible enough not to induce additional loads that might cause tilt or rotation of the bearing. A variety of materials are available and polyurethane with a durometer of about 85-95 works well in most applications using barbed fittings.

UNPACKING:

SRA series air bearings are shipped fully assembled with a bracket assembly which prevents separation and motion of the sphere during transportation (items shown in red). Depending on the model, this hardware will vary in appearance. Follow these steps to disassemble the bracket assembly.



1. Prepare a clean, well-lit work surface near the point of installation. Handle parts with clean gloves.
2. Open the shipping container or box and place the bearing on the work surface.
3. After the parts have reached room temperature, remove the plastic bag.

DO NOT REMOVE THE TRANSPORTATION HARDWARE AT THIS TIME.

4. Examine the bearing for damage.
5. Purge the air-line that will be connected to the bearing for 30 seconds.
6. Place and mount the bearing at the point of installation and connect the air-line.
7. Adjust air pressure to 80 psig and initiate airflow.
8. Remove the transportation hardware and/or securing screws. Do not discard.

Check for smooth, frictionless motion. The spherical rotor should pivot and rotate very smoothly. Do not force the rotor to move if you feel resistance. Do not exceed the specified limit for angular travel.



DO NOT ATTEMPT TO MOVE THE ROTOR WITHOUT AN ADEQUATE AIR SUPPLY. DAMAGE MAY OCCUR.
 At this point, gravity is the only force holding the rotor and stator together.
DO NOT LIFT THE ROTOR OUT FROM THE STATOR; this would allow contaminants to enter the air film.

When preparing the bearing for storage or shipping, secure the rotor by fastening it with the transportation hardware provided. ALWAYS SUPPLY AIR TO THE BEARING WHEN PERFORMING THIS STEP.

INSTALLATION and MOUNTING:

ENVIRONMENT:

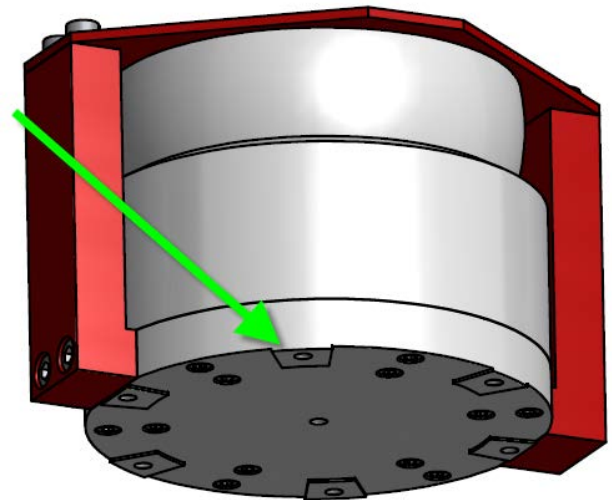
The surrounding environment of the bearing should be clean and free of flying debris. Adequate shielding should be provided if the bearing is not installed in a clean and debris-free area. The temperature and humidity of the surroundings should be regulated to such an extent that condensation does not occur on the bearing surfaces. Due to the high accuracy of the air bearing surfaces, any installation requirement that would deform the bearing surfaces beyond a few microns, will adversely affect the performance of the bearing.

BASE MOUNTING:

The bearing base must always be installed in the horizontal position unless otherwise specified. To minimize deformation, the stator base features three or more mounting pads points shown at right. At least three of these positions should be utilized for secure assembly.

Never attempt to drill or modify the shape of any feature of the bearing. Do not disturb any of the additional screws on the bottom side of the base. NOTE: NEVER DISASSEMBLE THE ROTOR FROM THE STATOR.

Any surface which mates with the base should have a flatness of less than 0.002" per inch. Use appropriate torque when fastening these threads.



SPHERE MOUNTING:

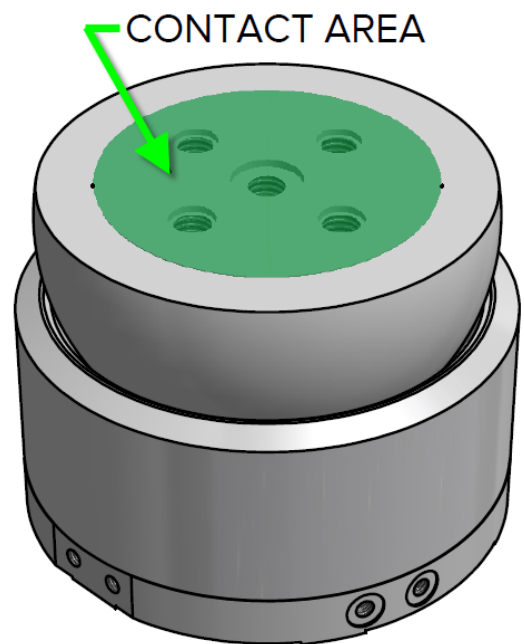
After the transportation hardware has been removed, the intended payload may be attached. SRA series bearings have large load capacities and as such, care should be taken when lifting and placing a load on the bearing.



ALWAYS PROVIDE THE CORRECT AIR SUPPLY PRESSURE TO THE BEARING WHEN ADDING OR REMOVING LOAD.

We recommend providing a contact zone similar to the one shown in the shaded area. Use all screw holes to fasten the load and tighten in a diametrically opposing sequence.

The center of gravity for the hemisphere is located below the axis of rotation and therefore, in its unloaded state, a stable position is maintained. When fastening a load, or table to the top of the rotor, it is important to consider that the center of gravity of the entire assembly should be at or below the point of rotation (refer to the assembly drawing for the rotational



center position). It may be necessary to add counterweights to compensate for the offset load to achieve a naturally stable system.



To prevent overtravel, it is imperative to incorporate hardstops into the application assembly. A travel that exceeds the rated angle is not allowed and will damage the bearing.

Pressure interlocks should be installed such that the bearing cannot be rotated without an adequate supply of air.

OPERATION:

Most air bearings float on an air film that is only a few ten thousandths of an inch in thickness. The surface form tolerances are approximately a few millionths of an inch.

Without an adequate supply of air to the bearing, surface-to-surface contact is made. This grounded state is a normal state of operation and will not damage the bearing provided that the sphere is not allowed to rotate.



NEVER SHUT DOWN THE AIR SUPPLY WHILE THE BEARING IS IN MOTION.

PRESSURE ADJUSTMENT (FOR STANDARD SRA SERIES ONLY):

To maximize performance of air consumption and ensure longevity of the bearing, the line pressure should be adjusted for the intended load. Refer to the bearing specifications for the rated load and pressure values. Contact the factory for vacuum preloaded air bearings. The maximum load capacities are rated at 80 psig and are directly proportional. Use the following formula to approximate the pressure:

$$P_{line} = \frac{80}{W_{rated}} \times W_{desired}$$

where:
P_{line} = desired line pressure in psig
W_{rated} = maximum load capacity taken from chart
W_{desired} = desired load capacity in lbf

For example:

An SRA series 300 bearing has a maximum load capacity of about 748 lbf. If the desired operating load is 400 lbf, then the required line pressure is about 43 psig

CARE AND MAINTENANCE:

Never clean the bearing without the airflow initiated. The bearing is best protected when the air is flowing. The inherent positive pressure forces particles and contaminants out of the bearing.

Never use an air gun to clean the bearing. The high-pressure air will force dirt and debris into the small gap between the stator and rotor.

To clean the housing, **initiate airflow** and wipe the surfaces using a lint free cloth lightly dampened with a mild solvent such as isopropyl alcohol. It may be necessary to clean the exposed spherical surface of the rotor. In this case, carefully avoid introducing liquid or particles into the air gap.

The bearing should always run very smoothly without any friction. Periodically disconnect the actuation system, if applicable, and test for frictionless motion.

Also, check the air filtration/conditioning system in accordance with the manufacturer specifications and replace filters and/or desiccant whenever required.

With proper care, the SRA series air bearings have an unlimited lifetime.