SPECIALTY COMPONENTS

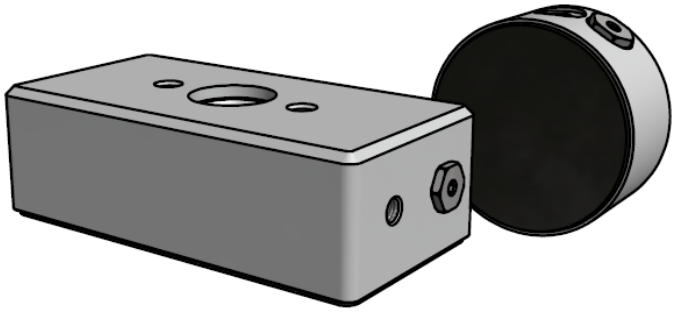
FLAT AIR BEARINGS HANDLING AND INSTALLATION INSTRUCTIONS

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:



Flat air bearings of the LRAx, LSAx and LRAVx series are designed for aerostatic, frictionless planar motion while supporting thrust loads using either a porous carbon surface or an orifice fed surface. Anodized aluminum provides scratch resistance of the housing and, if applicable, the air film surface. A threaded hole located along the side of the assembly provides an inlet for externally pressurized air to reach the gap through either porous carbon or discrete orifices. If equipped, gap sensing air bearings[1] have a second hole to allow measurement of the air gap pressure. Normally, load may only be imparted through the centrally located spherical or flexure mounting seat located on top of the bearing. Two threaded holes on the top surface allow assembly of a threaded ball stem and retainer; this is offered as an optional kit.

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

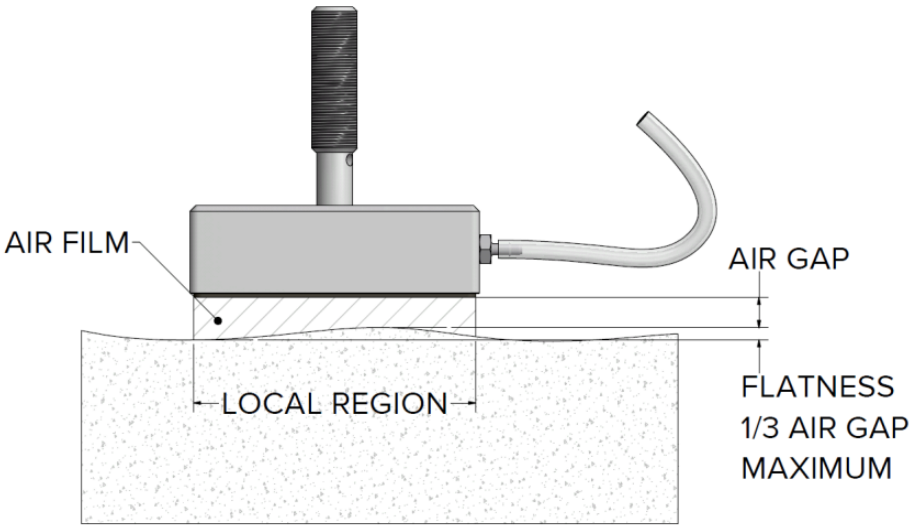
We recommend class 3 or better, however, in any case, the maximum particle size should be 1 µm. Air filtration systems are sold as an optional accessory.

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.

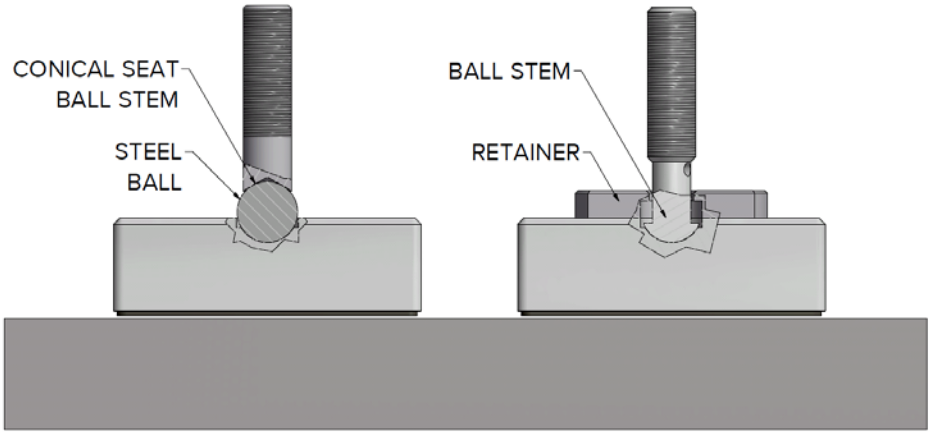
MATING SURFACE REQUIREMENTS:

The mating surface flatness and finish needs special consideration for use with an air bearing partly due to the small air gaps of 5 to 10 µm. Impervious materials like steel, ceramic, glass, silicon carbide and anodized aluminum as well as relatively more porous materials such as granite work well as a companion surface. Although large variations in form and finish will allow the bearing to ride without friction, to assure optimal performance, the flatness should be less than 1/3rd of the expected minimum air gap within the region local to the air bearing face and the finish should be less than 16 µinch Ra.



LOAD APPLICATION:

Flat air bearings should have the load centered within the air film to minimize tilt. The help achieve this; each bearing has a spherical seat located on the top side of the housing. The seat centers the load and allows the bearing to rotate and become coplanar with the mating surface during assembly. In some applications, a threaded ball stem and retainer plate is utilized for adjustment and capture of the bearing.



INSTALLATION:

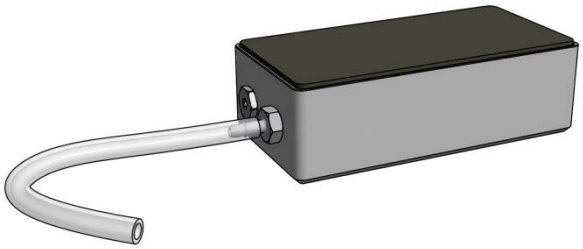
Prepare a clean and well-lit work surface near the point of installation for assembly of the mating parts. If necessary, obtain assistance from a second person to aid is positioning and handling; inform them of the delicate handling requirements.

NOTE: The environment MUST be clean, dry and free of any oils or resins. Avoid contact of liquids or oils with the air film surface of a porous carbon bearing due to the highly absorbent nature of the material.

If possible, handle all parts with clean gloves. We recommend latex or nitrile gloves, without talc powder; they provide cleanliness as well as a good grip. To minimize risk of injury of the critical bearing surfaces, reduce the amount of time handling the parts and once assembled, do not repeatedly take apart the mating components; the bearing is best protected when assembled with its mating surface.

NEVER attempt to intiate excessive relative motion of the mating parts without providing adequate air flow to the bearing. Mechanical and pressure interlocks are recommended as a preventative measure.

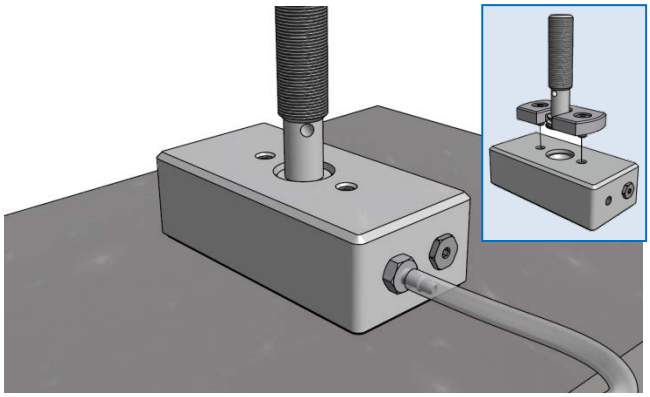
Inspect the air film surface of the bearing. Make sure the bearing surface is clean and free of debris or dirt. NOTE: Particles, dust and/or debris must be removed from the air bearing surface of the pad as well as the mating surface upon which the bearing is riding.



Connect the supply air hose to the fitting on the bearing and initiate air flow.

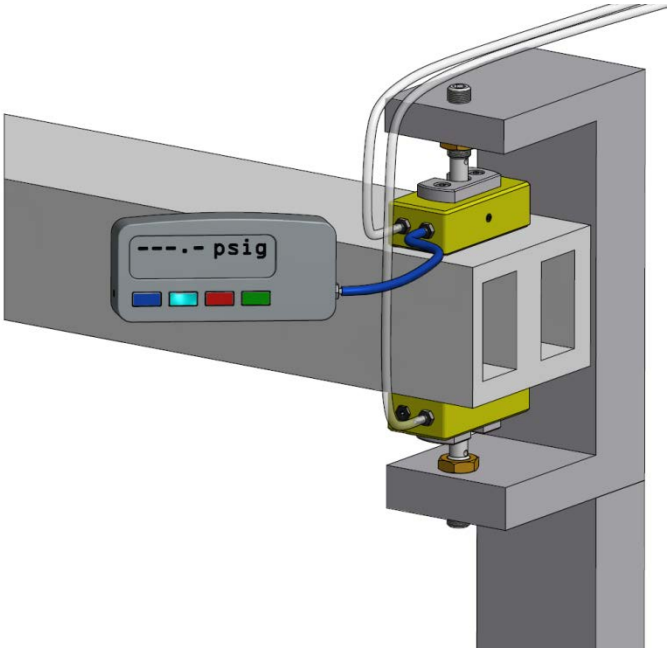
Clean the surface using a lint free cloth dampened with isopropyl alcohol (or other MILD solvent). Carefully wipe the intended area of both mating surfaces working from the center outwards if applicable. Allow the surfaces to dry prior to assembly.

Gently place the bearing on the mating surface. The bearing should slide smoothly without friction. If it does not, remove and inspect the surfaces. If necessary, attach and install the optional ball stem/flex kit. Assemble the bearing into the intended location and apply a light load via the spherical mounting seat located on the top side of the bearing. The spherical seat will allow the flat side of the bearing to rotate and become coplanar with the mating surface. At this point, full load may be applied according to the application. Verify the proper air gap by measuring with an indicator or by utilizing the gap sense port (see below).



The air bearing(s) assembly should slide very freely and smoothly. If it does not, make sure that the proper pressure and load is applied. Check the mating surface for oil or debris; re-clean if necessary. Remove/adjust any hardware within the machine tool assembly that might cause drag.

GAP SENSE BEARINGS:

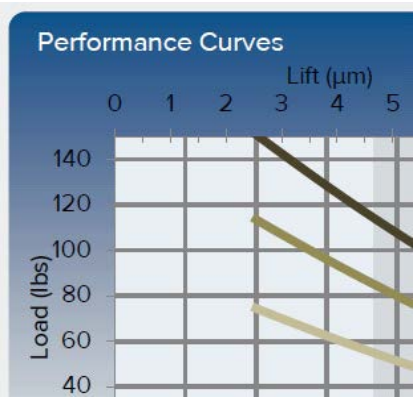


Some air bearings include gap sensing[1]. This allows for quick and reliable installation of the air bearing; no displacement sensor is required to know the air gap. Also, this feature also allows for real time flying height monitoring during operation which can help increase reliability of the machine tool. An additional port located next to the pressure inlet allows for correlation of the film pressure to the air gap.

Always supply air to the bearing when assembling or disassembling or when motion is desired and do not exceed the recommended pressure and load capacity.

To make preload adjustments of an air bearing equipped with gap sensing, replace the plug with an appropriate fitting and attach a length of tubing connected to a pressure gauge or sensor (blue tubing at left). Initiate air flow to the pressure inlet (clear tubing at left). Adjust the preload by rotating the ball stem or other appropriate method until the pressure gauge or sensor reads the correct value for the load applied.
Remove the sensor, tubing and fitting and replace the plug, if applicable.

The gap sense pressure to air gap is correlated on a graph per the specification of the air bearing. Additionally, customized gap sense curves can be supplied with each bearing upon request:



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 pressurized air to remove dust or debris from the outer surfaces of an air bearing. The high-pressure air may force dirt and debris into the small gap between the mating surfaces.

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. 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 handling, installation and operation, air bearings have an unlimited lifetime.