Air Bearing Technology

Hovair Systems: The Load Moving Specialists

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Introduction

The first thing that comes to your mind when you hear the word "bearing" is a ball bearing like a drive shaft which you will find on a car or the front wheel of a bike. In this kind of bearing, a fixed surface, as well as a moving surface, are separated by several lubricated balls which run in special tracks.

However, an air bearing is different; rather than the balls, you have a cushion of air. Probably, the closest type of application of air bearing is the hovercraft. The air bearing technology makes use of the same principle as the one used in the operation of the hovercraft.

Considering that air bearings have been in existence since 1966, it's no longer a new technology. For several years, big corporations such as NASA, Lockheed Martin, Boeing, Pilkington, and thousands of other corporations understand the importance of the air bearing system and make use of the technology. But despite the usefulness of the air bearing technology, the majority of industries around the world don't know about it.

The simplicity and value of the air bearing system stem from the fact that you can place a heavy load or machine on a set of air bearing modules, plug in an air line, then push the load to its destination effortlessly. This is usually the moment people realize that the concept is an amazing one and this is where people buy into the technology quickly.

If you have ever moved a 10-ton load with a forklift, then you will realize that it's often a nightmare. But with the air bearing system, it's a piece of cake! It saves you so much stress, and it is a safer way to move heavy objects. You will learn more about the features and benefits of the air bearing system as well as how it works in this book.

Chapter One

Understanding the Air Bearing Technology

Basically, it's a non-contacting system in which an air film serves as a lubricant which separates two surfaces that are in relative motion. An air bearing is a device made from a rubber-type fabric that is specifically designed to inflate with compressed air. This forms a floating action above the floor surface it's resting on. Incorporated into an air caster (bearing) load module, the air bearing is then utilized with others in a series of three or more to float heavy loads. All modules simultaneously lift away from the floor surface on a thin film of air, and this allows the load to be floated to a different location. Reducing the effective weight by 99.5%.

Air Casters Sometimes, spelled aircasters or air castors, is the alternative name for air bearings and is often used in Western European countries - mostly France and Great Britain. Air casters are identical products using the same technology. They are used precisely in the same way as air bearings; in a set of three or more, housed in load modules to form an air caster or air bearing system. So, they are just the same product but different name.

The Air Film Technology

The air film technology causes the presence of an invisible film of air between the surface it is standing on and an air bearing diaphragm. In the case of air bearing technology, this would be air bearings sitting beneath a load and the floor. Several physics and variables can be applied to the air film technology, however, for the sake of this book, it will be kept simple since our air bearing products operate almost the same way whenever they are used.

So, how is air film achieved? It's achieved when compressed air exhausting from a set of air bearings which comes in contact with the surface of the floor has sufficient pressure to repel against the floor causing the load to lift away from the floor. It's the resistance of the solid and non-porous floor that causes the compressed air to repel back against the bearing thereby forming a thin film of air between the surface of the floor and air bearings supporting the machine or heavy load.

You should understand that the forming of an air film will be dependent on the weight of the load bearing down on the floor as well as the amount of air pressure which is being applied to the floor by the air bearings.

Heavier loads require either larger size air bearings and or an increase in the number of air bearings used. Air bearings operate within the same low pressure range which only needs to be of sufficient pressure to cause enough down-force to form the air film and enable the air bearing to lift the load away from the surface of the floor. When the air pressure is insufficient, the air film won't be formed, and the load will remain at its position.

When air is first introduced the air bearing diaphragm inflates into a shape similar to a tire tube and the load is gradually lifted. This shape allows the diaphragm to first seal itself to the floor surface in order for air pressure to increase to the point of overcoming the weight of the load. Once internal air bearing pressure overcomes the load weight an exhausting film of air escapes along the outer edge of the air bearing diaphragm creating the flotation air film.

To attain a stage of perfect floatation, the air bearings are controlled by either flow or pressure regulation adjustment or a combination of the two types. As each air bearing typically is supporting a different load weight the adjustments are necessary to balance the load.

Understanding Air Bearing Construction

The heart and soul of the air bearing system are air bearings. We require the air bearings to cause the load to float off the ground while the modules are needed to house the air bearings and also support the weight of the load. The air bearing is a flexible diaphragm which comprises either a tough urethane fabric or rubber depending on the specific type of bearing. The diaphragm is molded to the perfect shape and fixed to a backing plate with rivets, industrial staples or glue. The backing plate is then affixed to the module which will form one unit of a load moving system.

Take a look at the picture below which shows a tough urethane fabric A-type air bearing which is stapled to a (concealed) round aluminum backing plate secured to the module via a center load pad.

When you look at the picture, the air bearing is the black and silver part of the image while the module is the yellow part.

The second picture below shows a urethane fabric B-type air bearing that has been vulcanized to a square backing plate and also secured to its module via four corner bolts.

The urethane fabric is the air bearing diaphragm that handles most of the work for you every time you're moving heavy loads. It has the most contact with the surface of the floor, and most of them possess what is called a load pad. The load pad comes in contact with the floor and helps the module to support the load as soon as the air bearings are deflated and out of use. Also, the load pads make sure that the air bearing diaphragms are not strained in any way or susceptible to damage while still under the load but not in action.

But one question that comes to mind here is; "why would the air bearing diaphragms still be under the load when they are not in action?" Actually, one of the benefits of switching to an air bearing system is that you will have the ability to bolt the modules directly to your heavy

Machinery, and loads and also leave them there permanently. So, whenever you need to move the load, all you have to do is simply plug in your air line and GO!

Obviously, this is simple and straightforward. Just imagine that you have a 20-ton machine you want to move from point A to point B on a daily basis, or multiple times a day during the production process. With the air bearing system, you can do it without stress. It's as simple as bolting an air bearing kit to it, plugging in an air-line, and a few employees will send it back up the line in a minute or two.

How Do Air Bearings Work?

As soon as an air bearing is fitted to a module, it is ready to work. You can introduce compressed air to the module via an air flow control valve/air inlet port which is fitted directly to the module. As soon as the air is turned on, the air bearing diaphragm inflates quickly to lift your load off the floor. The diaphragm will be in a lifeless state when deflated and protected by the air bearing load pad. But once air enters the system, the diaphragm starts to inflate.

Air Supply Hose with Factory-Fitted Quick-Disconnect Fittings

As it expands, it first makes initial contact with the floor surface, and it will eventually form a seal between itself and the floor. As soon as the seal has been formed, the diaphragm will continue to inflate until the compressed air starts to be forced out of the air exhaust holes in the diaphragm.

At this point, the compressed air will be forced against the floor surface, and it will have nowhere else to go – the floor surfaces will repel the air and send it back again.

This process builds up pressure, and the repelling action will finally cause a thin film of air to form, and the air bearing will gently lift away from the floor. As soon as it has lifted sufficiently off the floor, it will be ready to move to its destination.

The Components of an Air Bearing System

It's not possible for a single air bearing and module unit to work on its own. It needs to be connected to a series of similar modules to make up a complete load moving system. The air bearing systems required in regular industrial facilities mainly consist of four to six modules. A standard system of four square aluminum or round steel modules will comprise:

- Four bearings incorporated into modules
- Air flow control valves or inlets, depending on the specifications of the system
- A series of interconnecting air supply hoses to link the modules to the air supply
- Other valves and tee-pieces required to complete the system

Assembling the Air Bearing System

Assembling an air bearing system can be with a remote control or without remote control.

With Remote Control

Assembling an air bearing system is quite easy, and anyone can actually do it – it’s not rocket science! The first thing you need to do is to determine the rough outline size of your load's footprint. Then arrange your module units in a similar formation. Connect one end of an air supply hose to each module's inlet port using the pre-fitted quick-disconnect fittings.

All you need to do is slide them on the valve and pull back the locking cams, and that's it. Fit the other ends of the hoses onto the remote control air outlet ports. You can now connect your remote control unit to the main air supply at shop source, go ahead and turn the air on and you're ready to go – straightforward process!

Without Remote Control

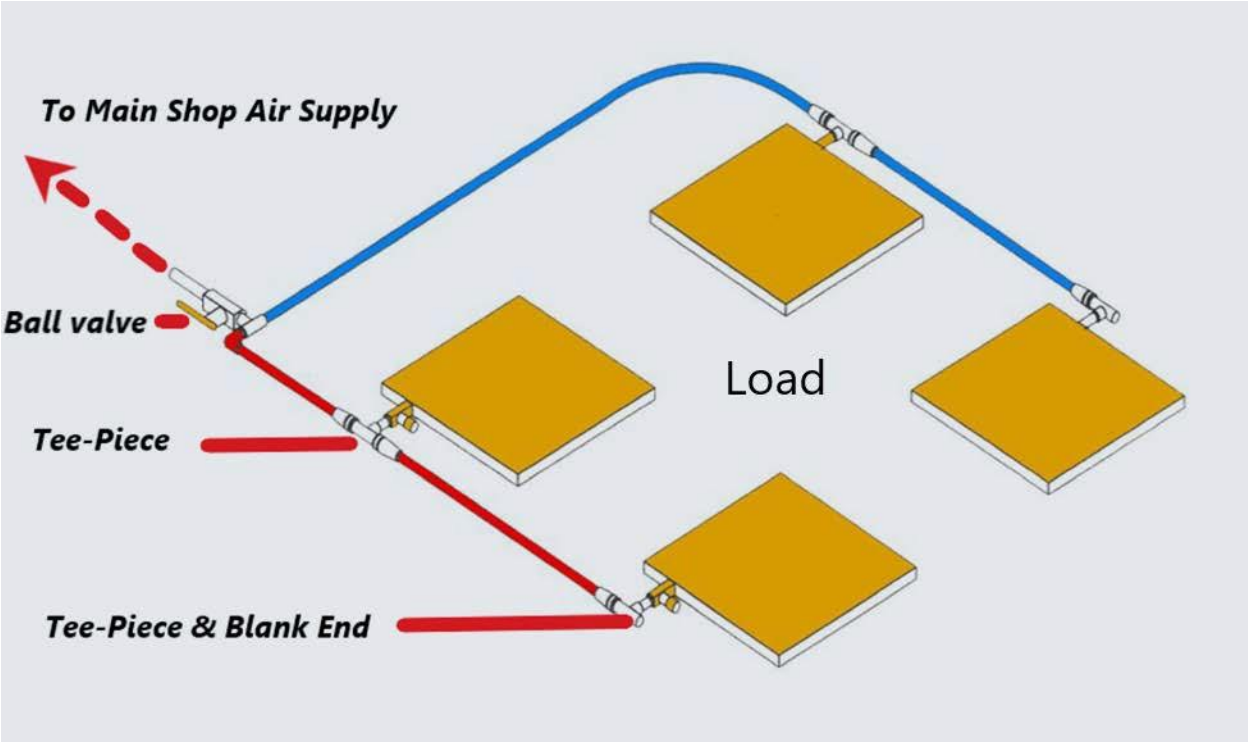
Just like the remote control assembly, you need to determine the load's footprint and arrange your modules accordingly. The air bearing systems that were supplied without remote control will alternatively have air flow control valves with quick-disconnect fittings. Also, you have to connect the end of each air supply hose to the proper module and lock the cams down. In

addition, you will need to connect the other ends of the air supply hoses to the tee-pieces and subsequently, to an On/Off ball valve which will control air supply to the system.

Chapter Two

Choosing the Right Bearing for the Job

Typical Air Bearing System Footprints



The diagram of typical air bearing system footprints

A square aluminum system with manual non-remote control - air flow control valves on modules

It's imperative that you choose the right air bearing for the job it's intended for. Also, while choosing one, you should consider the kinds of load you might have to move in the future so that you can select a system that can conveniently handle most loads in your facility.

At Hovair Systems, we offer different types of air bearings which you can incorporate into any kind of load moving system. The air bearings we offer have different characteristics and properties, and one of these air bearings will undoubtedly offer a solution to your load moving needs.

A-type Air Bearings

This type of air bearing generally offer the best solution for simple float, and they are ideal for moving applications that require movement from point A to B safely and cost-effectively. Also, the A-type system can adequately handle the repetitive movement of large loads or machines since you can optionally, permanently fit the modules to the load. As soon as the modules and air flow have been adjusted at the first time of use, you can simply plug an air-line into the control valve, and you're ready to go. It's not complicated at all.

But you must also note that the A-type air bearings don't require high lift; they just require sufficient air pressure to help them lift off the floor sufficiently to erase any possible friction that exists between the load and the floor. The moment you have attained floatation, you can steer the load to the desired destination with little effort.

The A-type air bearings are housed in standard steel or aluminum modules that have a profile height which is less than 3 inches. You can bolt them directly to the load or have the load placed directly onto the modules' footprint.

The A-type air bearings require little to no maintenance, and you can easily replace the parts whenever the need arises. It's available in Square Aluminum (lightweight) or Round Steel modules (suitable for extra durability and or permanent mounting). When it comes to durability and consumption, the A-type air bearings are the most cost-effective type of bearings. Their low-lift operation makes them very stable and the perfect choice when it comes to regular movements of large machine as well as similar loads.

The B-type Air Bearings

The B-type bearings also have similar properties of the A-type bearing, however, it has an added feature which is the Vertical Lift capability. The A-type bearing can lift loads only enough to kill the friction that exists between the floor and the air bearing before it floats the load away. But the B-type air bearing has a greater vertical lift capability, and this allows it to lift a load which is as much as 2½ inches vertically away from its base before floating away.

Air bearing systems that are fitted with B-type air bearings instantly offer another dimension to load moving facilities that require a load to be lifted and also dropped during the process. An example of such loads are loads that are dropped on blocks, stored on a customized pallet or similar platforms. They are available and mounted on standard square aluminum modules which give a profile height below three inches or on our low profile aluminum modules with a profile height of about 1½ inches.

You can also watch a free video on our website that highlights a small air pallet lifting a load vertically before floating away. If for any reason you need to lift your load or machine vertically, then consider the B-type as the best choice of air bearing. Also, remember that our experienced staff are available to help you determine the best air bearing for your needs.

VL-type Air Bearings

These are specialized bearings that are incorporated into a low profile stainless steel module. It's mainly used for moving lighter loads and operate identically to the A-types because they only need to clear the friction and take off. One major difference is that they have a bolt-through access which allows them to be bolted directly to small machines. When it comes to moving smaller delicate machines like in the medical field or the applications in the "clean room" environment, then they are the ideal choice.

Types of Casters Modules

Fundamentally, the air caster of load module is a strong metal structure that houses an air bearing and air chambers to route the supply of compressed air to the air bearing. The caster modules are usually square lightweight aluminum or round steel. Also, we have a stainless steel alternative that's perfect for moving lightweight loads, delicate machinery or for cleanroom applications. There are several types of caster module you can use to house the air bearing of

your choice. Take a look at some of the options available when selecting your new load moving system.

Round Steel Modules

Typical round steel module with air flow control valve fitted

These modules generally incorporate only the A-type air bearing. They are the ideal machinery moving equipment. They are strong and robust structures capable of supporting the proportionate weight of loads weighing many tons. Their profile height is under three inches, and they are the most suitable equipment for lifting and moving heavy machinery; you can attach them permanently to a machinery that requires repetitive movements via an optional steel mounting plate.

Square Aluminum Modules

Typical square aluminum module with air inlet port fitted

You can fit the aluminum modules with either A-type or B-type air bearings. They are strong and robust structures that are capable of supporting the proportionate weight of loads weighing many tons. They have a profile height of a little over 2 inches and can slide under machines and loads with suitable heights which makes them the ideal solution as machine moving equipment.

Also, they are the most suitable module for you when you want your loads to be placed directly onto the modules. You can contact Hovair support for details. All that you need to inflate it is 90 psi air.

Low Profile Aluminum Modules

The low profile aluminum modules have a distinct advantage; they can easily slide under machinery or loads having very little clearance height, and this simplifies machinery moving. They have profile heights of 1-1/4 and 1-1/2 inches depending on the type of bearing on board. They are fast becoming the equipment of choice for the machinery moving equipment industry today.

The low profile aluminum caster modules are fitted with the B-type air bearing which offers you a vertical lift capability and also tremendous lifting power to sustain lateral movements across your floor surface. They also provide the perfect solution for application that requires a certain amount of vertical lift before moving the load off to its destination.

Please note that all low profile aluminum modules are equipped with B-type air bearings. So, the most cost-effective purchase option is to choose a kit system which includes all the things you will likely need to be set up and running quickly. This consists of all air supply hoses, quick-disconnect fittings, and an ARC remote control unit. Please make sure you ask your Hovair support contact for the full details of the air bearing kits.

VL-Type Stainless Steel Modules

The VL-type modules have the air bearing "rolled into" the module to make a single unit. These modules have a center-mount bolt fixing facility, and they are most suited to bolt-mounting directly to your load. The weight can be lightweight, delicate machinery working in a clean room style environment or other lightweight loads that range from 500 to 2000 pounds.

These modules are designed to secure directly to the application via a central mounting bolt. They are perfect for securing directly or other similar loads that require frequent or repetitive movements. When you attach the module to your load, you can easily and quickly connect and disconnect the air supply hoses which leaves the application free to operate where required.

You can also incorporate them to other Hovair Systems products. When used as lightweight machine moving equipment, these great tools offer great versatility, and they can easily handle delicate and fragile machinery with pinpoint precision and accuracy in positioning. These modules are environmentally friendly – fresh air in and fresh air out. They can also provide the

ideal solution for clean room operations. The VL-type air bearing systems are available in complete kits which include all the things you need to be up and running quickly, the kits include:

- Supply hoses
- Quick-disconnect fittings
- Valves
- Connecting hardware and
- Ball valve control

Why you need to Adjust Your Air Bearings

Adjusting the air bearings is essential for several reasons outlined below.

- With uneven load weight, certain areas of a load will require more air pressure than other areas.
- Having the ability to apply more air pressure to individual air bearings implies that you can have a more stable and smooth running load moving system.
- Even level-looking loads may still need to have different air pressures applied to different air bearings.
- Individual air pressure adjustment will ensure that your loads move efficiently and smoothly across the floor.
- When you have loads of uneven or irregular shape, it means that you need to place individual air bearings at strategic locations with more/less air pressure for balance purposes.
- Cracked or uneven floor surfaces usually cause the air bearings to operate less efficiently than when operated on smooth floors.
- You might encounter areas with small holes or cracks in the floor surface which might affect one air bearing as the load travels. When you're able to adjust/increase the air pressure to an individual air bearing, it will sometimes help in moving your load smoothly over the deviation

The Remote Control Units for Air Bearing Systems

Air Regulation Control Unit (ARC)

The ARC is designed to control Hovair Systems B-type and VL-type four station load moving systems. With the ARC, you can control all air flow from one location. Take a look at the features and benefits:

- It has large regulator control knobs for easy adjustment- with locking positions. Also, it has a built-in air supply pressure gauge
- It is lightweight, durable and has sturdy lifting handles
- Air flow ports have quick-disconnect fittings for easy system setup and maintenance
- The regulators have integral air pressure gauges for precise air flow control to modules. Also, it has a built-in main air supply pressure gauge.
- It has fitted caster wheels that allow the ARC to trail behind the load if needed- reducing operator fatigue. Can also be supplied without casters for permanent mounting.

The Remote Control Systems (RC)

The remote control systems are designed to control Hovair Systems A-type four and six station load moving systems. The RC helps to make your job easier and also allows the operator to have full control over the load moving process. This process gives you the ability to increase or decrease air pressure to the load modules as necessary which might be the case when you're moving a load of unequal weight distribution or when switching to loads of different uneven weights. The remote has several features and benefits such as:

- It's s hand-held pendant with 15ft umbilical line
- Four pilot air regulators on a hand-held pendant controlling a second set of “high-volume” regulators within the main control box
- Four "air out" pressure gauges and main air supply pressure
- All the modules are individually controlled from the pendant- it’s convenient for increasing single module pressures to overcome floor deviations

Chapter 3

Basic Facts about Air Bearing - Products and Applications

If you're hearing about the air bearing systems for the first time, then you will have several questions about how to use them. In this chapter, we shall be taking a look at some facts about Hovair Systems products and how it applies to your industry.

Impact on Your Floor Surfaces

This is perhaps the best place to start from. You must understand that the Hovair Systems products will in no way cause any damage to your floor surface. However, this will only be possible if you set them up correctly and if they are in good working order. Once they are properly set up, then rest assured because they are completely safe.

But when it comes to the surface, it's imperative for you to know that air bearings require a non-porous and smooth floor surface to operate at optimum performance. It's essential that the down-forced air does not penetrate the surface of the floor else it will cause the formation of the air film and lifting process to falter.

The best recommended surfaces for the smooth operation of the system are smooth concrete surfaces, though other surfaces such as smooth metal plate and hardwood floors will still work for you. So, make sure that the floor surface is hard, smooth and non-porous.

Operating the Hovair Systems products over Holes, Gaps, Cracks, and Cavities

Generally, the air bearing system can move over minor cracks without problems. But if it must perform optimally, then you will need to fill in all cavities, cracks and holes and gaps, especially when you intend to use the floor surface regularly to move your loads across. You can cover the floor deformities with heavy non-porous tape if you intend using the surface occasionally, however, this is just a temporary measure. Filling the cavities and cracks makes economic sense.

Moving from Building to Building on Rough Surface

Does your company move heavy machines from one building to another – both buildings have suitable surfaces – but the floor surface between the two buildings is not very good? Well, it's a common issue that some of our clients have, but you can solve this problem in various ways. For instance, you can consider applying a concrete skim over the rough surface so that you can bring the rough surface to be in line with the other surface.

You shouldn't worry about the cost because it will be easily offset by several benefits of the air bearing system such as the decrease in personnel requirements, the time it takes to move the load, the safety as well as the improved efficiency of the process. Some clients also improvise by simply laying a thin hardwood or metal sheeting in the load's pathway. Apart from these common solutions, you can contact our customer support, and they will advise you appropriately.

Must the Floor Surface be Even or Flat?

Ideally, the answer is yes! But, air bearings can still operate on less than perfect floors. You have to understand that the air bearing systems don't have brakes, so they will operate like water via gravity. If your floor surface is not flat and has some gradient to it, then you have to station key personnel around the load and also control the movements. Despite the uneven surface of your floors, you can still move your loads safely especially by applying a little forethought and being safety savvy.

The air bearing systems are assembled using three or more air caster load modules suited for the size and shape of the loads you need to move. The air bearing systems are flexible, and this implies that you can use load modules at various points under a load and not necessarily at the corner points. This is an important feature especially for odd-shaped loads that might have some levels that require support or loads that have disproportionate weight distribution.

What are the Load Capacities of Air Bearing system?

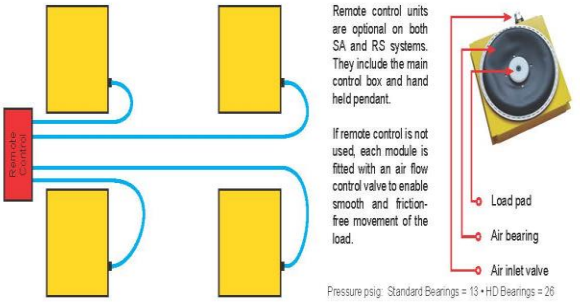
At Hovair Systems, we have air bearing and air caster systems that are capable of lifting loads that are as light as 200 pounds and as high as 100 tons or more. In fact, a standard single 12-inch air bearing can lift around 1000 pounds (½ ton) by itself. But this capacity will increase to 4000 pounds (2 tons) when used in a normal system of four linked caster modules. Also, a heavy

duty 48-inch air bearing can conveniently lift 30 tons on its own, and when it's coupled with a system of four, its lifting capacity will increase to over 120 tons.

By making use of sets of different air bearing sizes and air pressures, we can supply systems that can conveniently lift more than 200 tons.

Hovair Systems *The Load Moving Specialists*

Square Aluminum Module Technical Specifications



Remote control units are optional on both SA and RS systems. They include the main control box and hand held pendant.

If remote control is not used, each module is fitted with an air flow control valve to enable smooth and friction-free movement of the load.

Pressure psig: Standard Bearings = 13 • HD Bearings = 26

American Imperial Sizes

MODULE	BEARING	CAPACITY	DIMENSIONS IN INCHES				FLOW - SCFM		LOAD PAD	WEIGHT POUNDS	HOSE SIZE
Model Number	Model Number	Pounds	Width	Length	Height Air Off	Height Air On	Half Load	Full Load	Square Inches	Module & Bearing	Minimum Size Req
SA9	9NSG	600	9.0	9.0	2.0	2.3	2.5	3	3.1	10	¾"
SA12	12NSG	1000	12.6	12.6	2.0	2.4	3	4	7.1	12	¾"
SA12-HD	12NSG-HD	2000	12.6	12.6	2.0	2.3	5	6	7.1	12	¾"
SA16	16NSG	2000	16.8	16.8	2.0	2.5	6	7	19.6	18	¾"
SA16-HD	16NSG-HD	4000	16.8	16.8	2.0	2.4	8	10	19.6	18	¾"
SA18	18NSG	2500	18.8	18.8	2.0	2.7	7	9	19.6	20	¾"
SA18-HD	18NSG-HD	5000	18.8	18.8	2.0	2.5	10	12	19.6	20	¾"
SA22	22NSG	4000	24.8	24.0	2.0	2.8	10	12	38.5	32	1"
SA22-HD	22NSG-HD	8000	24.8	24.0	2.0	2.7	13	16	38.5	32	1"
SA28	28NSG	6000	30.3	30.0	2.3	3.3	12	15	45.6	53	1¼"
SA28-HD	28NSG-HD	12000	30.3	30.0	2.3	2.9	16	18	45.6	53	1¼"
SA34	34NSG	10000	36.0	36.0	2.3	3.5	14	18	55.0	73	1¼"
SA34-HD	34NSG-HD	20000	36.0	36.0	2.3	3.2	19	24	55.0	73	1½"
SA40	40NSG	14000	42.0	42.0	2.3	3.7	18	22	64.0	94	1½"
SA40-HD	40NSG-HD	28000	42.0	42.0	2.3	3.3	21	30	64.0	94	1½"
SA44	44NSG	18000	46.0	46.0	2.3	3.8	17	26	69.0	121	1½"
SA44-HD	44NDGE-HD	36000	46.0	46.0	2.3	3.3	27	34	69.0	121	1½"
SA-4870	4468NDGE	30000	48.0	70.0	2.3	3.8	28	35	172.0	200	1½"

Please Note: The hose sizes shown in the chart are the absolute minimum you should use. If a lesser hose size is used, the system may not operate correctly and could cause problems with the air bearings. Such problems could cause damage to the air bearings for which Hovair Systems will not be responsible. Replacement charges will apply. Using a slightly higher size hose will not affect the operation of your system.

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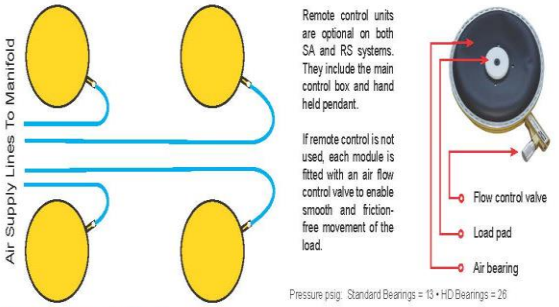
Round Steel Module Technical Specifications



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MODULE	BEARING	CAPACITY	DIMENSIONS IN INCHES			FLOW - SCFM		LOAD PAD	WEIGHT POUNDS	HOSE SIZE
Model Number	Model Number	Pounds	Diam.	Height Air Off	Height Air On	Half Load	Full Load	Square Inches	Module & Bearing	Minimum Size Req
RS12	12NSG	1000	12	2.5	2.9	3	4	7.1	10	¾"
RS12-HD	12NSG-HD	2000	12	2.5	2.9	5	6	7.1	12	¾"
RS16	16NSG	2000	16	2.5	3.0	6	7	19.6	12	¾"
RS16-HD	16NSG-HD	4000	16	2.5	2.9	8	10	19.6	18	¾"
RS18	18NSG	2500	18	2.5	3.1	7	9	19.6	18	¾"
RS18-HD	18NSG-HD	5000	18	2.5	3.0	10	12	19.6	20	¾"
RS22	22NSG	4000	22	2.5	3.3	10	12	38.5	20	¾"
RS22-HD	22NSG-HD	8000	22	2.5	3.1	13	16	38.5	32	1"
RS28	28NSG	6000	30	3.1	4.1	12	15	45.6	32	1"
RS28-HD	28NSG-HD	12000	30	3.1	3.9	16	18	45.6	53	1¼"
RS34	34NSG	10000	36	3.4	4.6	14	18	55.0	53	1¼"
RS34-HD	34NSG-HD	20000	36	3.4	4.0	19	24	55.0	73	1¼"
RS40	40NSG	14000	42	3.4	4.8	18	22	64.0	73	1¼"
RS40-HD	40NSG-HD	28000	42	3.4	4.3	21	30	64.0	94	1¼"
RS44	44NSG	18000	46	3.4	4.9	17	26	69.0	94	1¼"
RS44-HD	44NSG-HD	36000	46	3.4	4.4	27	34	69.0	121	1½"
RS4870	4468NDGE	30000	48 x 70	4.0	5.5	28	35	172.0	121	1½"
RS4870-HD	4468NDGE-HD	60000	48 x 70	4.0	5.0	37	46	172.0	200	1½"

Please Note: The hose sizes shown in the chart are the absolute minimum you should use. If a lesser hose size is used, the system may not operate correctly and could cause problems with the air bearings. Such problems could cause damage to the air bearings for which Hovair Systems will not be responsible. Replacement charges will apply. Using a slightly higher size hose will not affect the operation of your system.

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Chapter 4

Major Benefits of Air Bearing Systems

The pneumatic powered air bearing, as well as caster equipment, have made an outstanding impact on load moving systems in the material handling industry for the past 50 years. Although they perform different functions than overhead cranes or forklift trucks, they can provide a suitable economical alternative in many cases. In this section, we shall be taking a look at the features and benefits of the air bearing systems.

1. **First, all you need in most cases to operate the systems is compressed air**

The Hovair Systems' standard load moving equipment like air pallets, air bearing kits, lifting jacks, aluminum transporters and several others just requires a supply of compressed air to operate. Other sources of power are not essential for them to operate.

2. **No overnight charges or gas bottle changes**

Since you don't need other sources of power, there won't be a need for overnight charging as well as gas bottle changes. One of the exciting features of the Hovair Systems pneumatic powered systems is their power source which is pneumatic-compressed air. All you have to do is to keep your shop compressor in tip-top running order, and you're in business.

3. **The systems are built with safety in mind**

Hovair Systems are conscious of the need for safety in the workplace. When designing our load moving equipment, the safety of the users of our equipment is our top priority. Since the only power source will be compressed air and few moving parts that are associated with our load moving equipment, safety factors are greatly enhanced. Provided you adhere to the safety rules associated with the compressed air, you shouldn't have any real safety concerns. All the

product that leaves our factory has their Operator Manual which instruct users on the safe operation of our equipment.

4. **Heavy load moving capacity**

Another benefit of using Hovair Systems Air Bearings is that our equipment can lift and move loads of weights over 400 tons or more like giant transformers, or lightweight, delicate machinery that are as light as 800 pounds.

5. **Do you want to move loads that have awkward shapes and sizes?**

That's not a problem. One of the most significant benefits of Hovair Systems load moving equipment is their extraordinary versatility. You're not required to set your equipment out and use it based on the standard four-sided rectangular format. When using an air bearing system, you are free to place your caster modules anywhere you want to.

One of their greatest strength is their flexibility. If you want to move the most awkward-shaped load, Air Bearings will definitely move it for you. All you have to do is place the caster modules at the most important places of the load - the points that need the most support. You'll be amazed at how versatile these air bearing and caster load moving system are in moving loads.

6. **What about carrying loads that have uneven and disproportionate weight distribution?**

That's also not a problem. This is one of the most popular requests we have at Hovair Systems. Many clients often ask; *"how can we move a heavy load or machine that's 4 tons at one end and 2 tons at the other end?"* When you attempt to move such a load with a forklift, it may be difficult. With our tremendously versatile air bearing and caster system, this task will be the proverbial piece of cake! Regardless of how uneven the weight of your load or machine is distributed, Hovair Systems has a perfect solution for you.

7. **Tremendous versatility and flexibility**

More about air bearing placement and air intake. Another thing that stands out with our product line is the versatility as well as the flexibility of our air bearing and caster systems. The only format is the footprint of your load. So, it’s your load that determines where the caster modules are placed, and our casters will perform exceptionally well wherever you put them.

You're free to add more or reduce the number of casters as your load moving needs dictate; adding more when you have a bigger and heavier load or taking some away if the load is small. Assembling all the hardware is easy with air supply hoses easily snapping into the casters modules and other valves and tee-pieces. It's even possible to run two air supply lines to two air inlet ball-valves and run two systems simultaneously under the same load.

8. **Pinpoint accuracy and load positioning**

Since the load moving system will be floating on air, there won't be any restriction on how it can move. Your load will simply float just above the floor surface meaning that its travel path has truly become omnidirectional. Once floated, you can spin it on a dime. Just imagine, you don't have to push and shove to line up your load again.

You don't have to drop it to change direction; you don't have to struggle to get your load in place. With its tremendous air power, you can easily adjust the load's travel at any point during the operation. Stop, start and carry on in the most effortless way you can imagine. As soon as you get to where you want to drop your load, just push it into place with pinpoint accuracy – first time, every time.

9. **Anyone can use our systems**

You no longer need to use your company's muscle-men when moving your heavy loads. This is because when moving your load, it is always in a state of floatation. It doesn't require a tremendous amount of effort and energy for the load to move. In fact, in the air bearing industry, it's often said that *"it takes only one pound of physical human force to move 1000 pounds of load."*

Any employee regardless of weight and size can easily operate air bearings. It also helps to increase worker productivity.

10. **You don't need special training**

Due to their inherent low safety risk, air bearing powered load moving equipment doesn't require any specialized training for its operators. Crane and forklift truck drivers require some

specialized training, but when using our air bearing and caster systems, you don't need any specialized training to attain a level of competence to make use of our products. All you require is just a little common sense as well as a good working knowledge of basic compressed air safety and other rules and regulations within your workplace.

11. It's perfect for repetitive movements

We receive lots of inquiries about repetitive movements of heavy machinery as well as other similar loads. This is the ideal equipment for clients that need repetitive machine movements. You can just bolt the caster modules directly to your load or machine and pretty much forget about it. Mounting plates are available, built explicitly for this purpose with our Round Steel systems and they make permanent attachment to your loads a straightforward process. So, how does it work?

- Just attach the caster modules to the machine at the correct place
- Add the connecting air supply hoses to the air flow control valves and tuck them out of the way
- Connect air supply hoses to your air inlet ball-valve, and that's it, you're done!

From this point; it is simply a case of snapping your compressed air supply hose onto the ball-valve, turning on the supply and moving your machine. You will need to adjust the air flow control valves the first time you move the machine to best support the machine's weight and also get an even floating load.

Also, considering the omnidirectional and pinpoint positioning properties of these flexible systems, you can be assured of moving your machine or load into the same position time after time. How easy could it get?

Points to Consider

Despite the benefits of air bearing systems, there are some things it will not do for you. The air bearing systems don't operate on surfaces such as; porous, rough and badly damaged floor surfaces. It won't operate when you don't provide a constant supply of compressed air, and it won't lift vertically like a forklift. Its maximum lift height is about 2½ inches, and it's not designed to move loads that are under 200 pounds.

About Hovair Systems- Air Bearing and Air Caster Manufacturer

Hovair Systems, Inc. of Seattle, Washington, formerly known as Rolair has been a leading air bearing and air caster manufacturer to the material handling industry for over 50 years. We are the original licensees of the General Motors Air Bearing Patent, so you can be assured that we really know our business, and have a firm understanding of the movement of heavy loads by harnessing the power and energy of simple compressed air within our air bearings and casters to offer excellent load moving systems to industry.

We are well known for our quality designs, innovative thinking, and know-how for moving loads of all shapes, sizes, and weights with our proven load moving systems. We manufacture air bearings (aka air casters), air handling systems, and air film products for a wide variety of applications, with particular emphasis on the movement of heavy loads, machinery and equipment within today's industrial environment.

All you need is a little compressed air to take advantage of these excellent air handling systems. All our products are powered by compressed air and are among the most cost- effective load moving systems on the market today. We are also well known throughout the industry for our design and manufacture of turntables.

Currently, we are specializing in specialty turntables for light industrial use, and also vehicle turntables for residential properties. As an air bearing and caster manufacturer, we are proud to supply companies like Lockheed Martin, Boeing, Hewlett Packard, Pilkington, Siemens, Goodrich Aerospace, Amazon, M.I.T., University of Arizona, U.S.Navy, Tesla, Ford, GM, 3M, Dow, Sony, Caterpillar, Toyota, Honda and other fine corporations. Contact us today at info@hovair.com or 1-800-237-4518 to discuss your load moving requirements.,