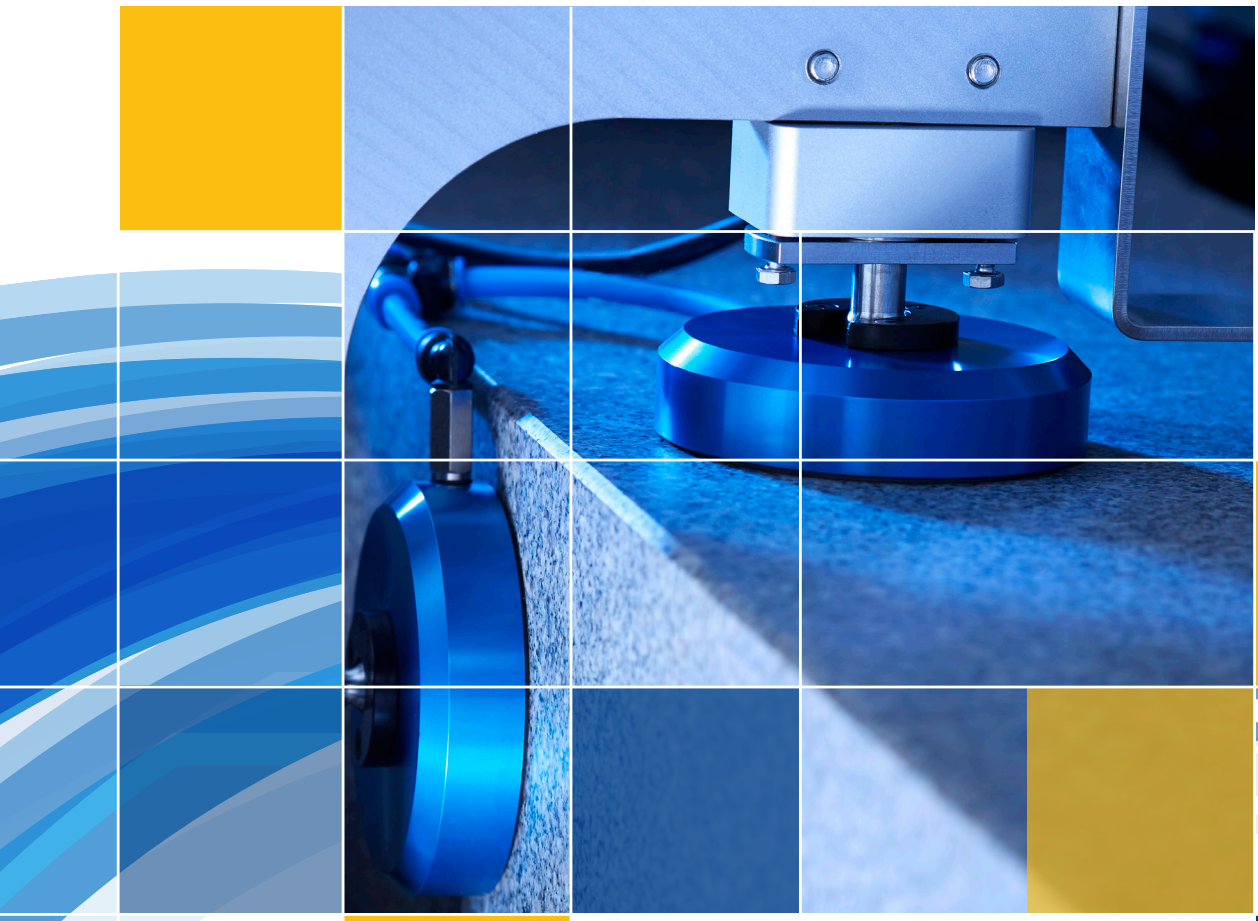
IBS Precision Engineering

Understanding the true meaning of **precision**



Porous Media Air Bearings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Contents

Benefits of Air Bearings

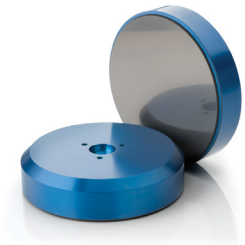
Applying the right bearing technology is a constant challenge for mechanical engineers and systems architects. Non-contact Air Bearings represent the next logical step in bearing design. The many technical advantages such as nearly zero friction and wear, high speed and high precision capabilities and no oil lubrication requirements provide significant benefits for today's machine designers.

Unlike contact roller bearings, Air Bearings utilize a thin film of pressurized air to provide a frictionless load bearing interface between surfaces that would otherwise be in contact with each other. An ideal Air Bearing supplies air pressure equally across the face of the bearing, while automatically restricting and damping airflow. Unlike orifice air bearings, Porous Media Air Bearings check all boxes.

Benefits at a glance

- Zero friction and wear; better crash resistance and damping
- Supports high speeds and acceleration
- Ensures straighter motion (unlike rolling element bearings insensitive to surface finishes & guide irregularities)
- Eliminates oil; positive air pressure self-cleaning in dusty environments
- Performs a silent and smooth operation
- Low air consumption
- Maintenance free
- Cleanroom compatible

Porous Media Air Bearings






NEWWAY® air bearings

Together we continue to help customers rethink the possible

IBS Precision Engineering partners with New Way Air Bearings for engineering solutions with non-contact Porous Media Air Bearings. The synergy of New Way's Air Bearings and the vast engineering capabilities of IBS offers proven best in class solutions for ultra-precision applications including:

- Precision motion and positioning (including high speed, load & repeatability)
- Precision transport & inspection
- Frictionless and silent motion for test systems

New Way's Air Bearings are constructed out of a porous carbon substrate. The millions of sub-micron passageways that wind through the material naturally restrict air flow leaving a uniform, stiff air cushion at the surface of the bearing. Since the holes are evenly distributed over the surface of the bearing, unlike orifice air bearings, pressure gradients never occur making crashes a thing of the past. Cleanroom compatible, they are low in air throughput and also filter the air via the porous media.

See p20 for specific application examples

Flat Round and Rectangular Air Bearings

Our Flat Air Bearings were the original standard, off the shelf, Porous Media Air Bearing product line. These versatile Air Bearings are available in round or rectangular configurations, ideal for a wide array of applications.

Flat Round Porous Media Air Bearings allow anyone to design and build their own custom Air Bearing assemblies. The round configuration makes the most efficient use of standard raw materials and ultra-precision manufacturing techniques, ensuring low cost standard product availability. In addition to the standard product line (shown), custom Flat Round Air Bearings are also available.

Flat Rectangular Air Bearings are designed to carry high loads while maximizing the load bearing surface through a gimballed mounting system. These Air Bearings can be mounted on ball mounts, providing a self-levelling interface between the Air Bearing and the guide surface. For some linear applications, the rectangular profile provides a more efficient bearing surface alignment.

Product line specifications

Flat Round Air Bearings

Item #	Size (mm)	Ideal Load (N)	Stiffness (N/µm)	No load flow (NLPM)	Ball Socket Size (mm)	Bearing Height (mm)	Bearing Weight (g)
S102501	Ø25	80	18	0.56 - 0.69	13	13	14
S104001	Ø40	222	28	0.95 - 1.21	13	13	35
S105001	Ø50	355	58	0.86 - 1.38	13	13	60
S106501	Ø65	666	87	0.95 - 1.51	13	20	150
S108001	Ø80	1110	114	2.16 - 3.24	13	20	240
S1010001	Ø100	1776	175	1.73 - 2.94	20	25	440
S1012501	Ø125	2775	254	3.46 - 5.19	20	35	1030
S1015001	Ø150	4444	350	2.90 - 3.50	25	50	2100
S1020001	Ø200	7770	700	2.90 - 3.24	25	70	4800
S1025001	Ø250	12233	-	1.73 – 2.46	40	85	8350
S1030002	Ø300	17793	-	5.19 – 7.78	40	100	13000

Note: All performance data is at 0.41 MPa input pressure.

Product line specifications

Flat Rectangular Air Bearings

Item #	Size (mm)	Ideal Load (N)	Stiffness (N/µm)	No load flow (NLPM)	Ball Socket Size (mm)	Bearing Height (mm)	Bearing Weight (g)
S121201	12 x 24	36	5	0.17 - 0.26	6	10	6
S121501	15 x 30	62	7	0.43 - 0.86	6	10	8
S122001	20 x 40	111	14	0.65 - 1.08	6	13	26
S122501	25 x 50	187	22	0.86 - 1.08	6	17	48
S124001	40 x 50	356	35	1.04 - 1.73	13	13	56
S124002	40 x 80	623	58	1.73 - 2.94	13	20	145
S125001	50 x 100	1112	110	2.08 - 3.37	13	25	295
S127501	75 x 150	2580	150	1.82 - 2.94	25	50	1411
S1210001	100 x 200	4893	665	3.68 - 4.11	40	70	3628
S1212501	125 x 250	7784	1009	4.32 - 4.76	40	85	4597
S1215001	150 x 300	11121	1645	4.54 - 4.97	40	100	6693

Note: All performance data is at 0.41 MPa input pressure.

Mounting components for Flat Air Bearings

Standard mounting components for Flat Air Bearings are well thought out and precision engineered to make the integration of our standard product line easy.

Balls

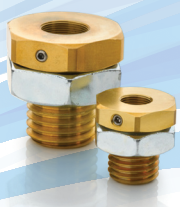
Made from Grade 25 stainless steel, these balls act as a self-levelling interface between our Flat Air Bearing and your application. These balls may be the simplest way of all to mount an Air Bearing.

Ball mounting screws

In round or flat end configurations, these 416 stainless steel ball mounting screws enable easy Air Bearing mounting. Their gimballed design helps to ensure that the bearing face remains parallel with your guide surface.

Nut housings

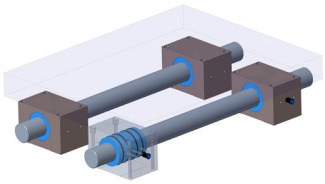
These common nut housings are an optional subcomponent used with our flat end ball mounting screws. For certain applications they can simplify installation.



Ball retaining clips

When mounting your Flat Round or Flat Rectangular Air Bearing using a round-end mounting screw or stainless steel ball, you can use this (optional) ball retaining clip to ensure a more secure application.

Air Bushings



Our Air Bushings are designed to make Air Bearing technology readily available to engineers with pre-existing designs based on round shaft guides. These components run on standard precision steel shafting.

Air Bushings are, essentially, a tube of Porous Media. Applying an air pressure of 0.41 MPa creates a 4 µm layer of air between the Air Bushing and a shaft. The Air Bushing is designed so that a self centering force is created by the air flow, allowing for true 360° non-contact motion on round shafting. The paralleling force over the length of the bushing centers the shaft naturally, creating precise, non-contact motion in one axis.

The resulting frictionless motion eliminates the heat and vibration commonly associated with roller contact or recirculating ball linear way arrangements. The self centering force also allows for higher than standard rotational speeds.

Product line specifications

Air Bushings

Item #	Size (mm)	Radial Load Max (N)	Stiffness (N/µm)	Pitch Moment Max (Nm)	Pitch Stiffness (Nm/mil rad)	Flowrate on Shaft (NLPM)	Recommended Shaft Outside Diameter* (mm)	Bushing Weight (g)
S301301	13	44	11	0.8	2.1	2.2 - 3.1	13	31
S302001	20	133	23	1.1	2.8	3.5 - 4.8	20	54
S302502	25	187	34	1.9	5.3	4.5 - 5.9	25	83
S304002	40	645	72	3.1	11	7.1 - 9.3	40	204
S305002	50	934	110	5.2	23	9.0 - 11.9	50	480
S307502	75	1245	175	7.1	31	13.2 -17.5	75	623

Note: All performance data is at 0.41 MPa input pressure.
* Tolerance: +0.000/-0.0076

Mounting Components for Air Bushings

Our standard Air Bushing mounting components are well thought out and precision engineered to make the integration of our standard product line easy.

End Mounts

Sold in pairs for easy parallel installation of our Air Bushing shafts, these clear anodized aluminium end mounts are manufactured to suit industry standard shaft sizing.

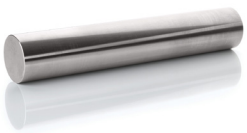
Mounting Blocks

Available in standard sizes, these black anodized aluminium mounting blocks enable the easy assembly of custom slides using our Air Bushings. Air Bushings are mounted inside on O-rings to allow self-alignment.

O-Rings

We offer replacement O-rings. These simple copolymer rings mount on the outside of the Air Bushing housing, creating a sealed air pressure chamber, while also positioning and aligning the Air Bushing.

Shafts



Our Air Bushings use solid steel cylindrical shaft guide ways. We offer shafts manufactured to industry standard sizes with surface finishes of 0.4 Ra or better for optimal performance.

Vacuum Preloaded Air Bearings

Our Vacuum Preloaded Air Bearings replace a portion of the surface area of our Flat Round Air Bearings with a region dedicated to vacuum pressure. This combination of vacuum and air pressure can be finely tuned to adjust the fly height and stiffness for superior damping. This means that only one flat guide surface is necessary instead of two parallel, flat guide surfaces as in opposed bearing preloading.

Incorporating vacuum increases positioning precision and enables high-speed linear motion. Stiffer air gaps combined with non-contact motion means you have higher load bearing capabilities while eliminating the possibility of production stopping crashes.

Product line specifications

Vacuum Preloaded Air Bearings

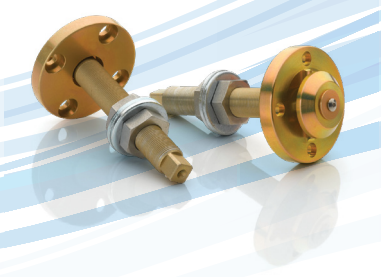
Item #	Size (mm)	Ideal Load (N)	Stiffness (N/µm)	Max. hold downforce at 50.7kPa (N)	Bearing height (mm)	Flow (NLPM)	Bearing Weight (g)
S205001	Ø50	45	13	73	22	0.97	73
S207501	Ø75	110	29	180	22	1.26	203
S209001	Ø90	150	43	260	22	1.36	306

Note: All performance data is at 0.41 MPa input pressure.

Mounting Components for Vacuum Preloaded Air Bearings

Standard mounting components for our Vacuum Preloaded Air Bearings are well thought out and precision engineered to make the integration of our standard product line easy.

The combination of air pressure and vacuum needs a different mounting methodology compared to our Flat Air Bearings. The conventional socket is not suitable for bidirectional stiffness due to the risk of the ball coming loose. Instead, a flexure mount is engineered to offer equal stiffness in both directions, while providing a low pivot point.



Flexure Mounts

Designed specifically for the mounting of our Vacuum Preloaded Air Bearings, these two-piece, aluminium flexure mounts provide bidirectional stiffness, a low pivot point and infinitesimal angular adjustment.

Radial Air Bearings **Concave & Convex**

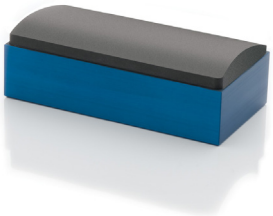
The ideal components for building frictionless rotary motion, our Radial Air Bearings provide a fast, made to order solution. In either Concave or Convex configurations, this product line gives you all the differential advantages of our standard Air Bearings.

Radial Air Bearings – Concave

Our Concave Radial Air Bearings are configured to ride along the outer diameter (OD) of your rotating artefact. Concave Air Bearings are designed to support the rotating artefact from the outside.

Radial Air Bearings – Convex

Like its Concave counterpart, our Convex Air Bearings are configured to ride on the inner diameter (ID) of your rotating artefact. The key difference is that Convex Air Bearings are designed to support the rotating artefact from the inside, as opposed to Concave Radial Air Bearings which support it from the outside.



W-Profile

Our W-Profile Radial Air Bearing profile features a Concave or Convex radius cut across the width of the Air Bearing.

L-Profile

The L-Profile Radial Air Bearing profile features a Concave or Convex radius cut across the length of the Air Bearing, to meet the needs of your application and the bearing-to-shaft ratio of your specific configuration.

Product line specifications

Radial Air Bearings

Concave configuration «W» and «L» series

W-Profile Item #	L-Profile Item #	Size (mm)	Bearing Height (mm)	Ideal Load (N)	Stiffness (N/µm)	Flow (NLPM)	Ball Socket (mm)	Bearing Weight (g)	Width Radius Min (mm)	Width Radius Max (mm)	Length Radius Min (mm)	Length Radius Max (mm)
S3212W XXX	S3212L XXX	12 x 24	6	22	5	0.18 - 0.28	6	6	12	60	24	120
S3215W XXX	S3215L XXX	15 x 30	10	44	7	1.73 - 2.16	6	8	15	75	30	150
S3220W XXX	S3220L XXX	20 x 40	13	89	14	0.65 - 1.08	6	24	20	100	40	200
S3225W XXX	S3225L XXX	25 x 50	17	156	22	1.95 - 2.38	6	48	25	125	50	250
S3240W XXX	S3240L XXX	40 x 80	20	445	58	2.59 - 3.89	13	145	40	200	80	400
S3250W XXX	S3250L XXX	50 x 100	25	801	110	2.59 - 3.46	13	295	50	250	100	500
S3275W XXX	S3275L XXX	75 x 150	50	1868	250	3.68 - 4.32	25	1372	75	375	150	750
S32100W XXX	S32100L XXX	100 x 200	70	4003	665	4.32 - 5.19	25	3628	100	500	200	1000
S32125W XXX	S32125L XXX	125 x 250	75	6672	1009	3.89 - 5.19	25	6937	125	625	250	1250
S32150W XXX	S32150L XXX	150 x 300	100	10,453	1645	11.24 - 12.97	25	11,822	150	750	300	1500

Note: All performance data is at 0.41 MPa input pressure.
XXX in item # is bearing Width (W) or Length (L) radius

Product line specifications

Radial Air Bearings

Convex configuration «W» and «L» series

W-Profile Item #	L-Profile Item #	Size (mm)	Bearing Height (mm)	Ideal Load (N)	Stiffness (N/µm)	Flow (NLPM)	Ball Socket (mm)	Bearing Weight (g)	Width Radius Min (mm)	Width Radius Max (mm)	Length Radius Min (mm)	Length Radius Max (mm)
S3312W XXX	S3312L XXX	12 x 24	6	22	5	0.18 - 0.28	6	6	12	60	24	120
S3315W XXX	S3315L XXX	15 x 30	10	44	7	1.73 - 2.16	6	8	15	75	30	150
S3320W XXX	S3320L XXX	20 x 40	13	89	14	0.65 - 1.08	6	24	20	100	40	200
S3325W XXX	S3325L XXX	25 x 50	17	156	22	1.95 - 2.38	6	48	25	125	50	250
S3340W XXX	S3340L XXX	40 x 80	20	445	58	2.59 - 3.89	13	145	40	200	80	400
S3350W XXX	S3350L XXX	50 x 100	25	801	110	2.59 - 3.46	13	295	50	250	100	500
S3375W XXX	S3375L XXX	75 x 150	50	1868	250	3.68 - 4.32	25	1372	75	375	150	750
S33100W XXX	S33100L XXX	100 x 200	70	4003	665	4.32 - 5.19	25	3628	100	500	200	1000
S33125W XXX	S33125L XXX	125 x 250	75	6672	1009	3.89 - 5.19	25	6937	125	625	250	1250
S33150W XXX	S33150L XXX	150 x 300	100	10,453	1645	11.24 - 12.97	25	11,822	150	750	300	1500

Note: All performance data is at 0.41 MPa input pressure.
XXX in item # is bearing Width (W) or Length (L) radius

Conveyor Air Bearings

Conveyor air bearings are the ideal component for transporting large substrates, such as glass or PET, with a precision unavailable to conventional or orifice-based designs. Substrates are transported on a thin but stiff layer of air, making no contact with the bearing surface.

Positive Air Series

The Positive Air Series of Conveyor Air Bearings are ideal for glass conveying systems and related substrate handling applications.

Designed to meet specifications of a glass floating height between 100-150µm and an air flow <50 L/m per meter of rail, the Positive Air Series of Conveyor Air Bearings requires lower air consumption. The use of Porous Media technology provides a secure and damage-free transportation process.

Transition Zone Series

The Transition Zone Series of Conveyor Air Bearings combines frictionless motion with vacuum pressure to reliably convey even the most delicate materials. A single groove with evenly distributed holes provides vacuum pressure that prevents materials such as glass from leaving the conveyor, while the Porous Media substrate creates a uniform air cushion between the two surfaces. This air cushion allows fly heights between 20 and 120 microns. These fly heights have a stability of ±5 microns, well within the focal range of most inspection cameras.

High Speed Series

The High Speed Series improves upon the Transition Zone Series through the use of four grooves of vacuum holes. Its excellent flattening ability ensures control of glass or PET at high speeds. The cutting edge Porous Media technology, infused with millions of sub-micron holes, creates robust air cushions, leading to lower fly heights and enhanced overall efficiency. The High Speed series is specially designed for handling flexible substrates, making it excellent for versatile material processing.

Precision Zone Series

The Precision Zone Series offers the highest level of precision for fly height and control range. Ideal for inspection of specific areas of materials that require high-level analysis for inconsistencies like solar glass manufacturing processes or automated optical inspection (AOI) stations. The design ensures the vacuum pressure and air gaps are the same across the entire bar. This superior stability enables analysis and inspection of a greater percentage of the entire glass sheet.

Conveyor Air Bearings specifications are available on our website www.ibspe.com/air-bearings

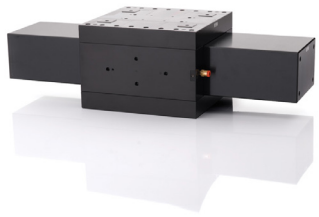
Air Slides

When you need improved precision and operational efficiencies, Air Slides provide a non-contact Air Bearing alternative to conventional bearing based slides. Packaged as an integrated system, our Air Slides consist of a Porous Media Air Bearing, an aluminium stage and housing and a precision ground aluminium guide rail.

The unique carbon air bearings ensures an even airflow, enhancing precision, operational efficiency and crash resistance. A key differentiator of our Air Slides is the use of vacuum replication to securely integrate the Porous Media Air Slide with the guide rail, eliminating vibration and harmonic noise. This results in superior stability, straightness and stiffness for precise motion without hysteresis error.

As a non-contact technology, Air Slides reduce maintenance time and costs to almost zero, as there is no wear on rolling elements. This eliminates the need for lubrication to prevent spalling in rolling element- and ball-bearing-based systems.

Our Air Slides provide a local straightness (in X and Z) of 250 nanometers (0.25 microns) per 25mm travel and a maximum error (global) of 2 microns per 1000mm travel.



End Supported Air Slides

The simplest of the linear motion assemblies, End Supported Air Slides provide a precise, integrated linear motion solution ready fit for installation. Designed specifically for situations where continuous support is impossible or impractical, the End Supported Air Slide is engineered to minimize guidebar sag and provide straightness of motion and dynamic response often an order of magnitude better than conventional rolling element bearings. The stage of these Air Sides wraps fully around the guide rail.

Dovetail Air Slides

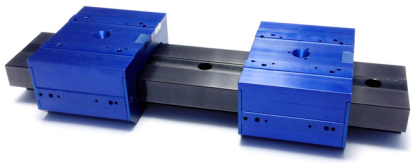
Dovetail Air Slides combine an accurate guide with an Air Slide ready fit for installation. Compared with End Supported Air Slides, the Dovetail Air Slides feature a constant support configuration, whereby the stage wraps around the sides but not underneath the guide rail, thus offering heavier load carrying capacity. Continually supported linear slides allow for high acceleration and zero hysteresis, delivering exceptional stiffness and damping.

The continual support configuration prevents guide bar sag, which can occur over a long span. The Dovetails also feature the lowest profile track, making them an ideal fit for space conscious linear motion applications. All of our Dovetail Air Slides are easily retrofitted to your current system and feature mounting points for your choice of encoders and non-contact linear motors.

Air Slides

Boxway Air Slides

The Boxway Air Slide is our original Air Slide. Designed to balance versatility, durability, precision and load-bearing performance. The Air Slide features a low-profile linear slide rail and a slightly wider stage than the Dovetail Air Slide. This gives the Boxway Air Slide our largest load carrying capacity, boasting an incredible 272 kg maximum weight. The wide track also provides precision guidance, delivering enhanced precision to any linear slide assembly application. The guide bar for the Boxway can be end supported, or continuously supported to prevent sag in longer span configurations.



Airway Linear Motion Guide Systems

The Airway Linear Motion Guide System is pre-engineered for simple swap-out with conventional rolling element bearing systems. With this Linear Air Slide assembly, customers can simply remove the existing rolling element truck and rail, replace them with Airway system, connect an air supply and immediately experience the benefits of frictionless motion. With reduced precision specifications on the guide rail, they offer an economic alternative when friction free is the goal. They can be simply configured with multiple stages for increased load capacity.

Product line specifications

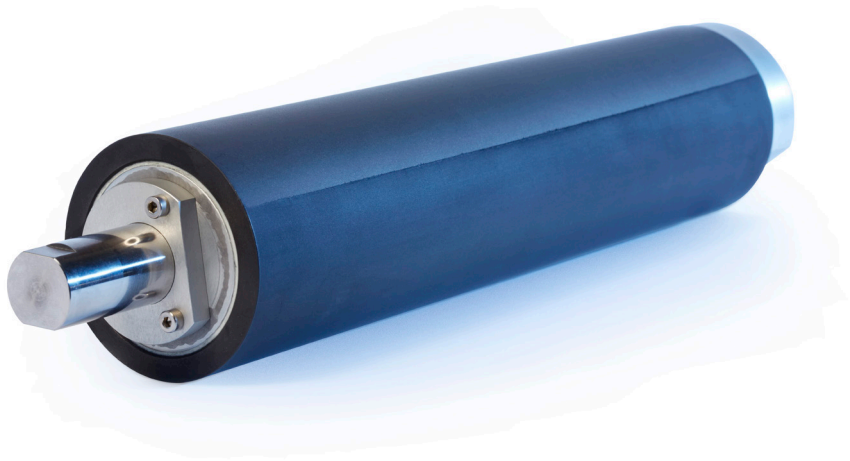
Dovetail Air Bearing Slides

Item #	Stage Length (mm)	Stage Width (mm)	Stage Height (mm)	Travel Length (mm)	Stage Weight (kg)	Total Weight (kg)
S41-06150-095254	152	152	64	102	2.177	3.538
S41-06150-095457	152	152	64	305	2.177	4.627
S41-06300-145406	305	203	75	102	5.942	9.494
S41-06300-145610	305	203	75	305	5.942	11.290

Note: All performance data is at 0.41 MPa input pressure.

Specifications of the other Air Slides are available on our website www.ibspe.com/air-bearings

Air Turns



Air Turns are a modern alternative to traditional contact rollers, using advanced Porous Media technology. They are perfect for industries that handle thin, flexible materials in roll-to-roll processes. Instead of metal rollers, the Air Turn system creates a cushion of air using tiny holes, allowing the material to move up to 180° without touching any rollers.

This non-contact technology finds applications in industries like printed electronics webs and paper conveyance, making it a smart choice for any company looking to improve material conveyance.

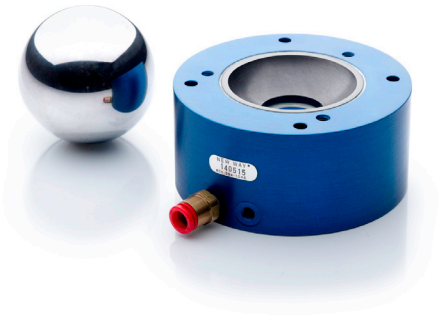
Product line specifications

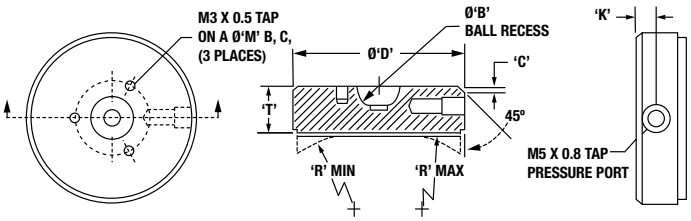
Air Turns

Item #	Outer Diameter (mm)	Wrap Angle	Max. Tension	Viable Pressure Range	Max. Allowable Pressure	Input Pressure
S38150XXX-***	150	110, 220, or 330 degrees	Surface Area x ½ input pressure	138-689 kPa	689 kPa	207 kPa
S38125XXX-***	125	110, 220, or 330 degrees	Surface Area x ½ input pressure	138-689 kPa	689 kPa	207 kPa
S38100XXX-***	100	110, 220, or 330 degrees	Surface Area x ½ input pressure	138-689 kPa	689 kPa	207 kPa
S38075XXX-***	75	110, 220, or 330 degrees	Surface Area x ½ input pressure	138-689 kPa	689 kPa	207 kPa

Note: All performance data 0.207 MPa input pressure
XXX in item # is porous carbon length
*** in item # is wrap angle

Spherical Air Bearings





Our Spherical Air Bearings are ideal for use in aerospace and defence applications and are able to support a sphere on a thin layer of air, providing all the benefits of frictionless motion.

These non-contact Air Bearings provide for infinite resolution, nanometer error motions, high speed, high stiffness, zero wear and smooth, silent operation without vibration.

Further, no lubrication is required. The Porous Media technology distributes air pressure uniformly across the entire bearing surface through millions of sub-micron sized holes, while simultaneously restricting and damping the air flow. A vacuum pre-load can also be added. The result is a whole new level of accuracy and control.

Military and aerospace applications:

- Zero-G Satellite Testing
- Attitude Control Testing
- Multi-Axis Control
- Flight Simulators

Industrial and laboratory applications:

- Laser Deflection
- Polhode Effect Studies
- Precision Spindles

Product line specifications

Spherical Air Bearings

Item #	'D' (mm)	'T' (mm)	'R' Min* (mm)	'R' Max* (mm)	'B' (mm)	'C' (mm)	'K' (mm)	'M' (mm)	'N' (mm)	Load at 5µm (N)	Stiffness (N/µm)	Flow (SLPM)	Bearing Weight (g)
S3625R***	25	13	25	125	13	1.50	6.6	-	-	49	18	1.04	14
S3640R***	40	13	40	200	13	1.50	5.3	21.59	3	178	28	1.79	35
S3650R***	50	13	50	250	13	1.50	5.3	21.59	3	289	58	2.00	62
S3665R***	65	20	65	325	13	4.60	12.3	21.59	3	489	87	2.20	151
S3680R***	80	20	80	400	13	4.60	12.3	21.59	3	801	114	4.80	235
S36100R***	100	25	100	500	20	6.35	15.9	31.75	3	1290	175	4.30	440
S36125R***	125	35	125	625	20	6.35	25.9	31.75	3	2046	254	7.60	1033
S36150R***	150	50	150	750	25	16.00	41.5	38.10	3	3692	350	5.10	2092
S36200R***	200	70	200	1000	25	31.75	60.7	38.10	3	6672	700	4.80	4906

Note: All performance data is at 0.41 MPa input pressure.
* Recommended
*** In Item # is bearing radius

Bonded Air Bearings

Bonded Air Bearings are low-profile versions of Flat Rectangular Air Bearings that can be attached in place using a vacuum replication process. These Air Bearings are a solution for space constrained linear applications.

Vacuum pressure is used to position the bearing accurately before it is bonded in place with epoxy. Once the Air Bearing is secured, airflow is used to create a film of air that makes the Air Bearing frictionless.

Product line specifications

Bonded Air Bearings

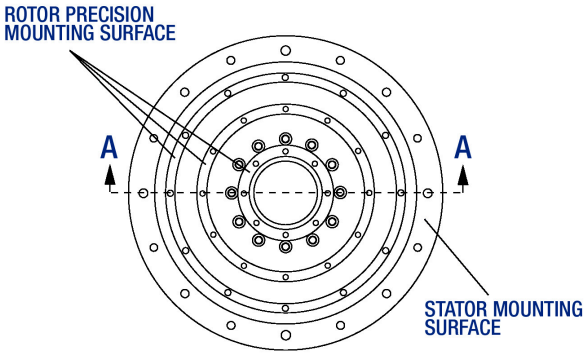
Nominal Bearing Width (mm)	Item #	Size (mm)	Ideal Load (N)	Flow (SLPM)	Weight (g)
12	S17012110	12mm x 12mm	18	0.1	3.1
	S17012210	12mm x 24mm	36	0.2	6.2
	S17012310	12mm x 36mm	53	0.3	9.3
	S17012410	12mm x 48mm	71	0.4	12.4
15	S17015110	15mm x 15mm	31	0.2	4.9
	S17015210	15mm x 30mm	62	0.5	9.8
	S17015310	15mm x 45mm	93	0.7	14.8
	S17015410	15mm x 60mm	125	0.9	19.7
18	S17018110	18mm x 18mm	56	0.4	6.9
	S17018210	18mm x 38mm	111	0.7	14.7
	S17018310	18mm x 58mm	167	1.1	22.6
	S17018410	18mm x 78mm	222	1.4	29.1
23	S17023110	23mm x 23mm	93	0.5	11.4
	S17023210	23mm x 48mm	187	0.9	23.9
	S17023310	23mm x 73mm	280	1.4	36.5
	S17023410	23mm x 98mm	374	1.9	49.0
38	S17038110	38mm x 38mm	311	0.9	29.3
	S17038210	38mm x 78mm	623	1.9	60.5
	S17038312.5	38mm x 118mm	934	2.8	96.6
	S17038412.5	38mm x 158mm	1246	3.8	129.5
48	S17048112.5	48mm x 48mm	556	1.1	58.6
	S17048212.5	48mm x 98mm	1112	2.1	120.3
	S17048312.5	48mm x 148mm	1668	3.2	182.1
	S17048412.5	48mm x 198mm	2224	4.2	243.8
72	S17072115	72mm x 72mm	1290	0.8	164.5
	S17072215	72mm x 147mm	2580	1.7	337.5
	S17072315	72mm x 222mm	3870	2.5	510.4
	S17072415	72mm x 297mm	5160	3.3	683.0
97	S17097115	97mm x 97mm	2447	0.9	312.2
	S17097215	97mm x 197mm	4893	1.9	635.0
	S17097315	97mm x 297mm	7340	2.8	1038.0
	S17097415	97mm x 397mm	9786	3.8	1280.7
122	S17122119	122mm x 122mm	3892	1.5	651.1
	S17122219	122mm x 247mm	7784	3.1	1320.0
	S17122319	122mm x 372mm	11677	4.6	1988.9
147	S17147119	147mm x 147mm	5560	2.1	947.5
	S17147219	147mm x 297mm	11121	4.2	1916.4

Note: All performance data is at 0.41 MPa input pressure.

Air Spindles

Air Spindles utilise Porous Media technology to establish a uniform air cushion between the rotor and stator. This facilitates faster rotational speeds and high-precision rotary motion with minimal interruptions or potential downtime due to the zero mechanical wear.

These Air Spindles provide a level of accuracy unachievable by conventional rolling element bearings. Featuring just a single moving part and absolutely non-contact, they offer standard sub-micron synchronous error motion, while almost completely eradicating asynchronous errors.



Air Spindles have minimal airflow requirements and do not consume anywhere near the volume of air that competing orifice air bearing technologies do. If there is any disturbance in the airflow, the gradual depressurisation of the Porous Media enables a gentle landing that avoids damaging the bearing or rotor surfaces. This sets them apart from orifice air bearing spindles, which frequently demand a full rebuild following such malfunctions.

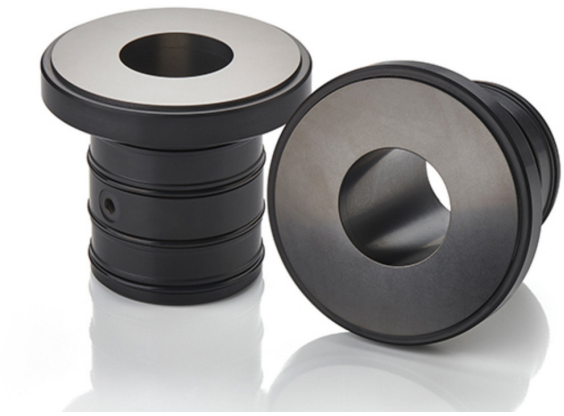
Product line specifications

Air Spindles

Item #	Size (mm)	Axial Load (N)	Radial Load (N)	Axial and Radial Error Motion (µm)	Max. Speed (RPM)	Average No Load Flow (NLPM)
SS-375	375	10554	2502	0.4	2616	47.2
SS-250	250	4233	1108	0.2	3979	28.3
SS-150	150	1387	396	0.1	6586	24.1
SS-100	100	585	216	0.1	9554	16.0
SS-75	75	286	117	0.1	13274	13.2
SS-55	55	91	41	0.1	21739	11.1

Note: All performance data is at 0.41 MPa input pressure.

Thrust Bushings



Thrust Bushings may be the solution if you need frictionless rotary motion without linear movement.

These Thrust Bushings are made of a hollow cylinder made with Porous Media Technology, enclosed in an aluminium housing. To prevent linear motion, a porous carbon thrust face is added. Thrust Bushings are used in many rotary applications, such as turbochargers in high-performance vehicles.

Product line specifications

Thrust Bushings metric

Item #	Size (mm)	Inside Diameter (ID)	Outside Diameter (mm)	Face Outside Diameter (mm)	Bushing Length (mm)	Bushing Weight (g)
S253502	35	35.020 +0.005/-0.000	53.3	76.2	66.7	181.4
S255002	50	50.020 +0.005/-0.000	74.0	99.6	93.5	635.0

Note: All performance data is at 0.41 MPa input pressure.

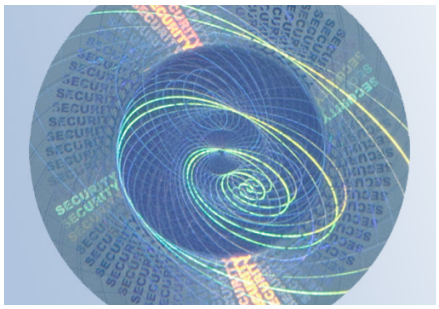
Product line specifications

Thrust Bushings imperial

Item #	Size (Inch)	Inside Diameter (mm)	Outside Diameter (mm)	Face Outside Diameter (mm)	Bushing Length (mm)	Bushing Weight (g)
S251601	0.625	15.888 +0.005/-0.000	31.8	38.1	36.8	51.0
S253201	1.25	31.770 +0.005/-0.000	50.0	76.2	66.7	238.0
S253801	1.50	38.120 +0.005/-0.000	58.0	85.0	81.0	363.0
S255001	2.00	50.820 +0.005/-0.000	74.0	100.0	93.5	-
S257501	3.00	76.220 +0.005/-0.000	99.0	152.4	110.5	-

Note: All performance data is at 0.41 MPa input pressure.

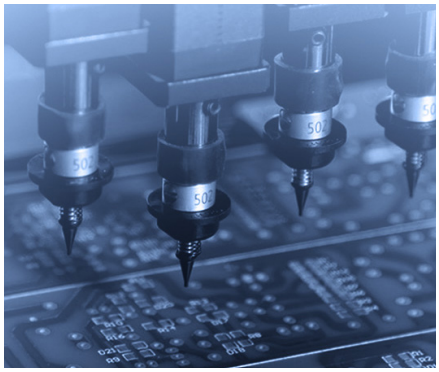
Application Examples - Air Bearings



Direct laser writing systems – photolithography

High-resolution direct laser writing is a powerful technology for creating micron to sub-micrometer resolution structures in photo sensitive layers. The laser beam systems (optical lithography) that create the optical patterning are guided with ultra-precision by frictionless Air Slides; to guarantee a nano-precise control of the laser beam in the production process.

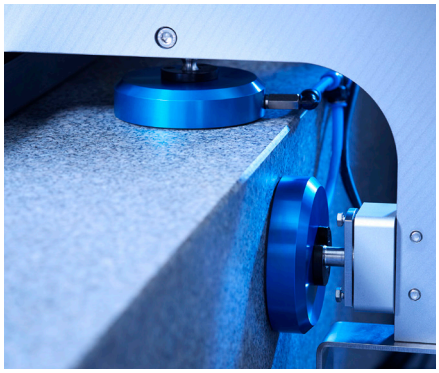
Products: Air Slides, Air Bushings



SMT pick & place systems – micro electronics

The latest generation of surface mount pick and place machines set new records in speed, floorspace performance and accuracy for high volume production applications. Smart factory solutions in the electronics manufacturing industry require improved efficiency of production. High speed and acceleration plus high accuracy positioning of the placement heads is increasingly performed with the use of frictionless, maintenance free Air Bushings.

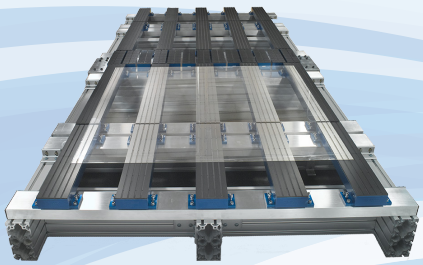
Products: Air Bushings



Large scale metrology machines – printing industry

Printing has required precision for many decades as the human eye is very sensitive to accurate registration of colours. Today however, large cylindrical printing equipment parts must achieve sub-micron ($<10^{-6}$ m) level accuracy over ~5 meters. Qualifying these parts requires advanced coordinate metrology machines. Air Bearing technology allows frictionless linear and rotation movements to support micron level accuracy and repeatability during inspection in these machines.

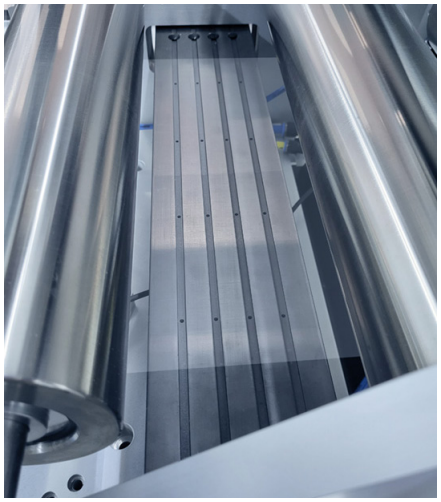
Products: Flat Air Bearings



Semi-flexible substrate handling and processing - flat panel display (FPD) manufacturing

The Flat Panel Display (FPD) manufacturing industry has stringent requirements for the handling, processing and inspection of glass; where glass can be considered a semi-flexible substrate. Precision, non-contact handling of the glass is required for both optical inspection and for LCD printing. Vacuum preloaded Air Bearings control the vertical height of the glass within < 5 µm for inspection. Vacuum grooves, distributed within the bearing, are used to improve vertical stiffness during printing. This also allows high speed transport at fixed height while avoiding take-off. Similar techniques are also used in photovoltaic solar panel processing.

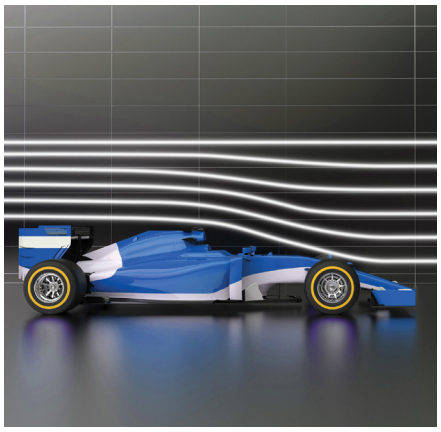
Products: Precision Zone Conveyor Air Bearings



Contactless web handling and web stabilisation

In the electronics industry high throughput printing on rolls replaces batch processing for larger scale substrate fabrication. Air Turns, using Porous Media, create an air cushion supporting substrate movement. Air pushed through micron-scale holes enables a 180° web turn without roller contact, reducing friction, wear, defects in roll-to-roll production. This eliminates mechanical contact, reducing contamination and vibration issues, enhancing stability. In printed electronics production lines, vertical web vibrations surpass 300 microns; stabilising below 10 microns is crucial for in-line operations. Vacuum pre-load air tables suction the web, minimising vibrations to micron-level stability, enabling nanometer precision in high-velocity foil inspections (10 m/min).

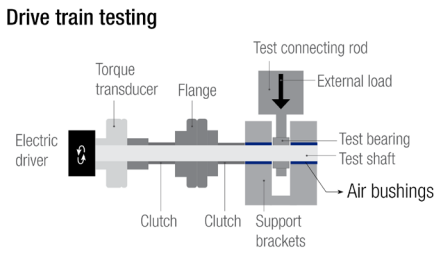
Products: Air Turns, Precision Zone Conveyor Air Bearings



Aerodynamic and tyre testing applications – wind tunnel, dynamics and tyre resistance testing

In aerodynamic testing, wind tunnels simulate high-speed on-road conditions for (race) car aerodynamics. High pressure Air Bearings in moving ground systems prevent belt suction and ensure zero friction, stabilising and cooling the belt to reduce power needed. For tyre testing, understanding tyre behaviour is vital for ride, handling and safety of sport cars and commercial vehicles. Ultra-high pressure Air Bearings in test setups, up to 25 bar, enable friction-free testing with high forces, meeting regulations and enhancing tyre performance.

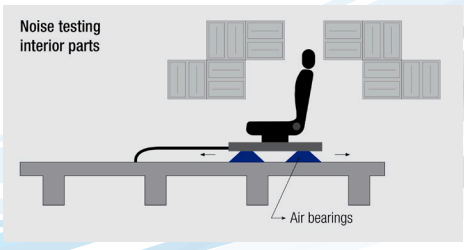
Products: Flat Rectangular Air Bearings, Conveyor Air Bearings



Drive train test applications - torsion, torque and bearings measurement

From R&D to manufacturing and compliance testing, measurement and optimisation of powertrain performance not only requires progressively greater accuracies but also consistency in measurement over the specified ranges and conditions. Non-contact Air Bearings guarantee friction free rotational motion for torque test systems and bearing & seal measurements.

Products: Air Bushings, Radial Air Bearings



Acoustic test applications - noise testing of interior parts, fuel tanks, etc.

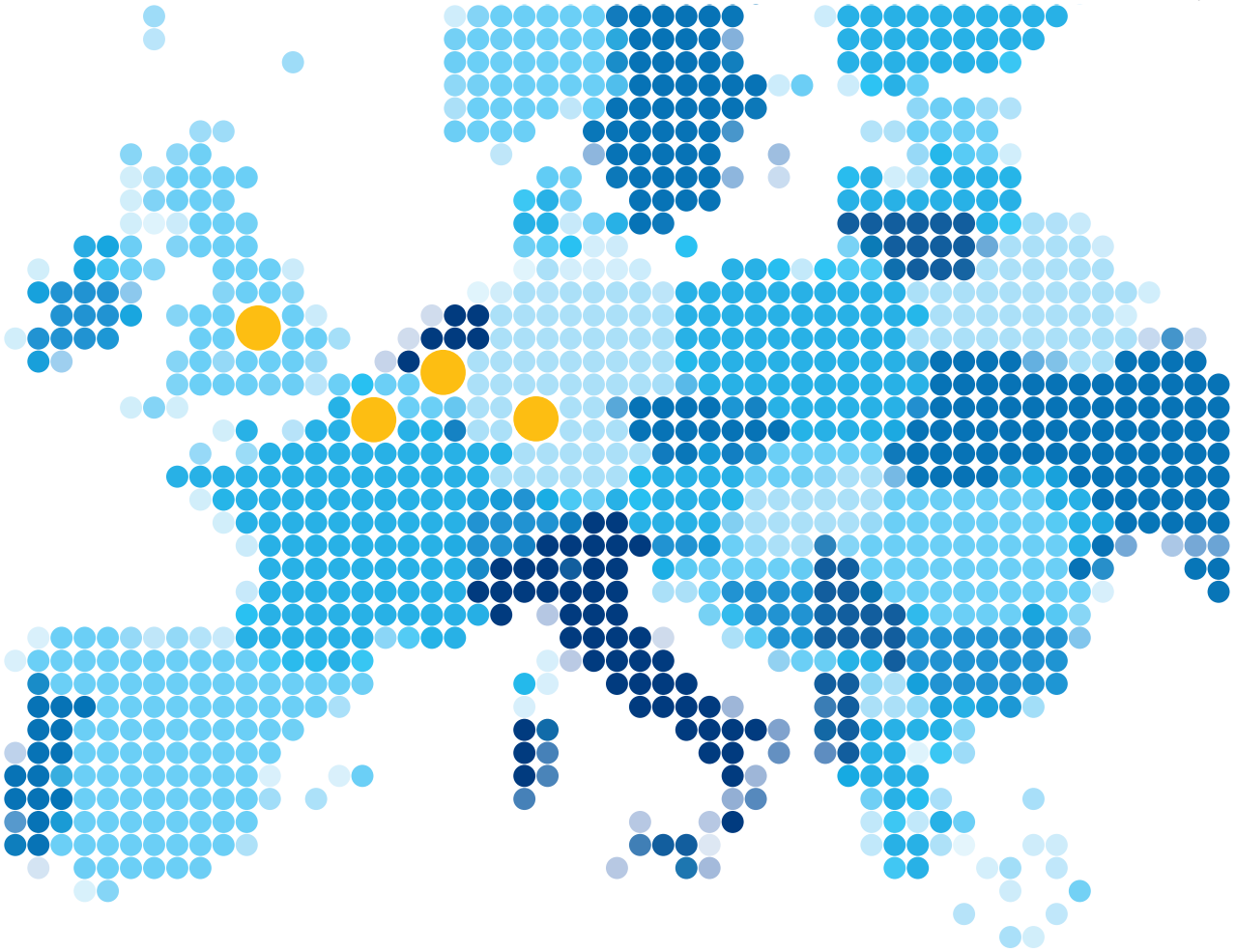
The noises emitted by assembled vehicles are the result of complex interactions. They vary during different movements in different conditions. Tuning out unwanted noise, vibration and harshness requires sophisticated test equipment. Noise emitted by Air Bearings is close to zero, making them ideal as silent motion systems in sound proof chambers for vehicle testing.

Products: Flat Round Air Bearings, Flat Rectangular Air Bearings

Do you want to know more about our Air Bearings, the different types available and the advantages?

Visit our website to see the range of Air Bearings we offer: **www.ibspe.com/air-bearings**

For more detailed information about air bearings, how to choose the right type for your application and how to design with them, scan the QR code and download our Air Bearing application and design guide from our online Technical Resources.



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