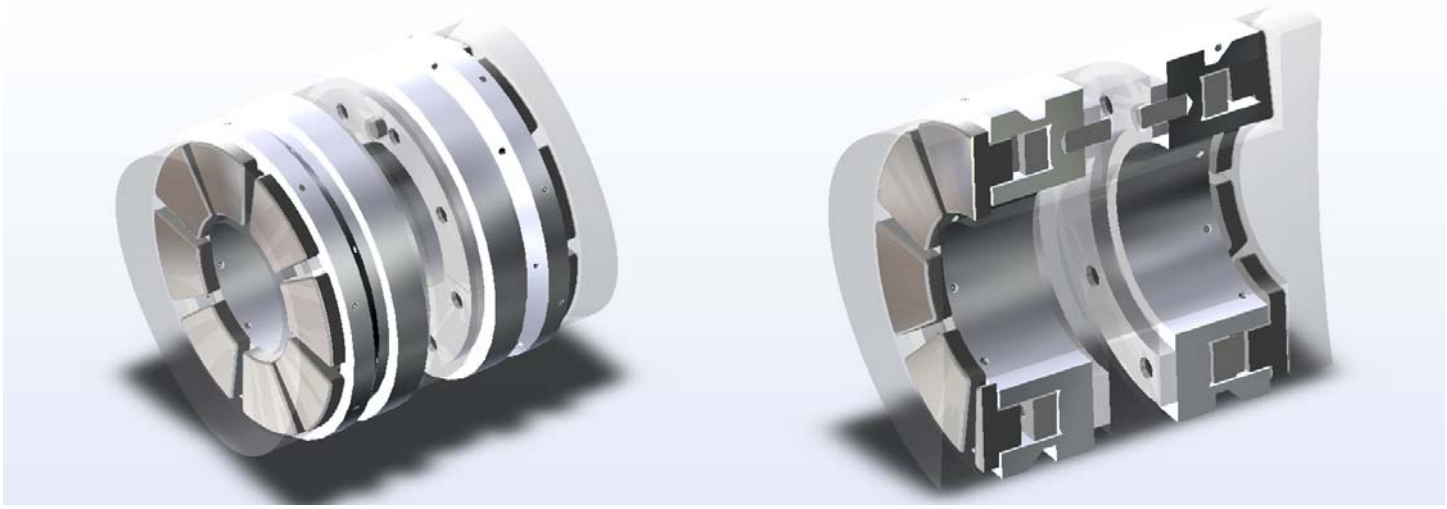
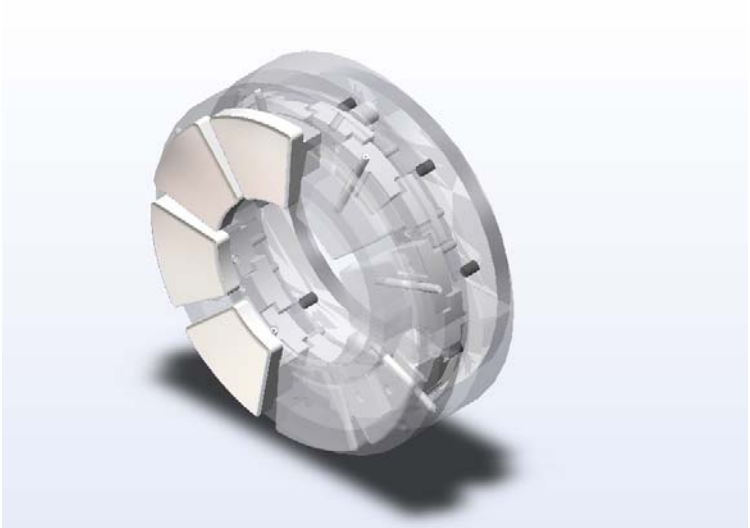
Osborne Engineering Ltd
Atley Way, North Nelson Industrial Estate
Cramlington, Northumberland
England NE23 1LL

info@osborne-engineering.com
Tel: +44 (0)1670 737077
Fax: +44 (0)1670 736127

osborne engineering limited
total shaft solutions

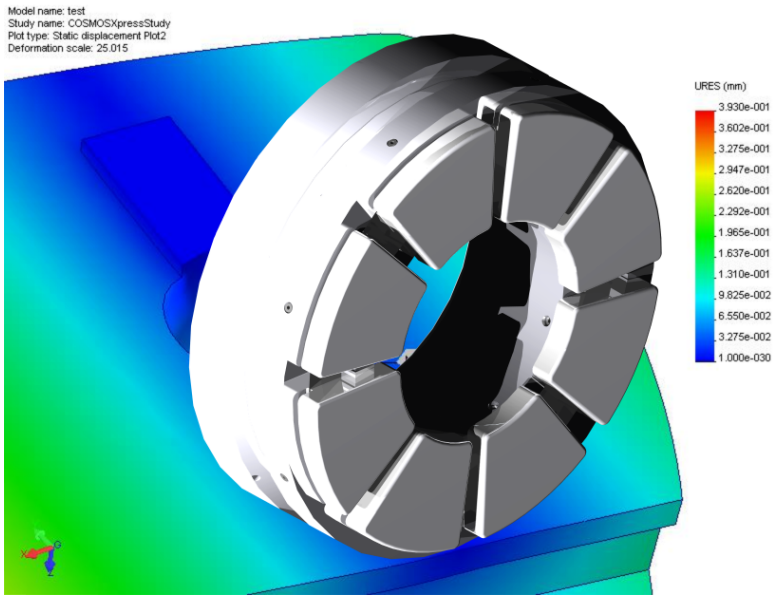




OSBORNE EQUALISED BEARING

OSBORNE EQUALISED BEARING

Pivot Design



The standard design of the OE bearing contains centre-pivoted thrust pads, due to the design of the bearings offset pads can easily be provided as an alternative.

The offset pivoted pad design is more reliable in performance of an equivalent centre pivoted pad due to the generation of thicker and cooler working oil film.

The Osborne pivoted thrust pads will operate under load in reverse rotation conditions, thus reducing the need for centre pivoted pads, please consult Osborne engineering if this is required, to establish working temperatures and film thickness.

Reduced Operating Temperatures

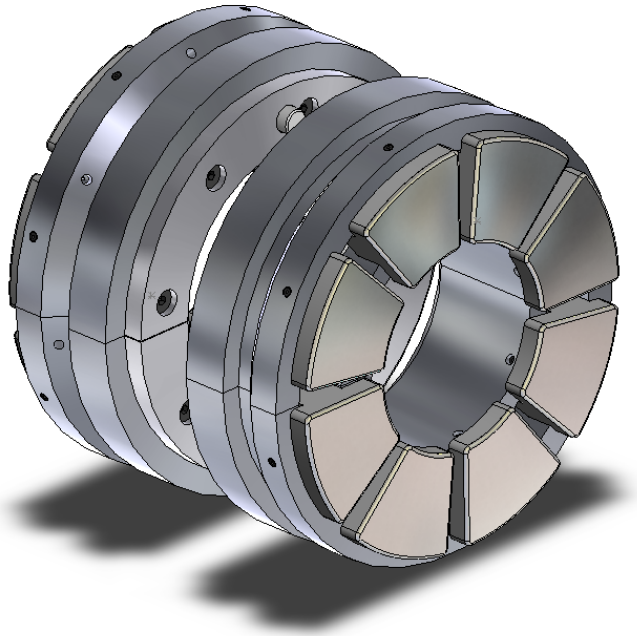
High working oil film temperatures have a detrimental effect on working life of the lubricating oil and the Whitemetal face of the thrust pad.

In the higher speeds of modern machinery, controlling these temperatures is one of the most critical factors of thrust bearing design.

By selecting The OE 8 pad design over an equivalent 6 pad design. These operating temperatures are reduced due to the face width of each pad, as the area that the oil is under shear in greatly reduced.

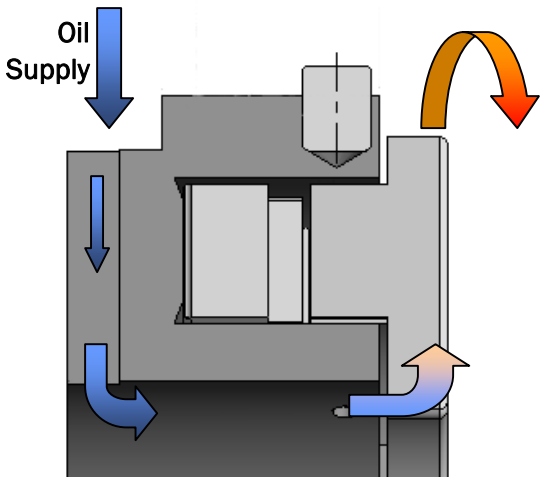
The offset pivot design, which is described above, also contributes to lower oil temperatures as thicker oil films allow s a greater cool oil quantity to pass over the working face.

In high speed machines churning of the oil within the bearing casing is the main cause of excessive power loss. This is reduced by using the low-loss lubricating system, which can be seen on the following sheet.

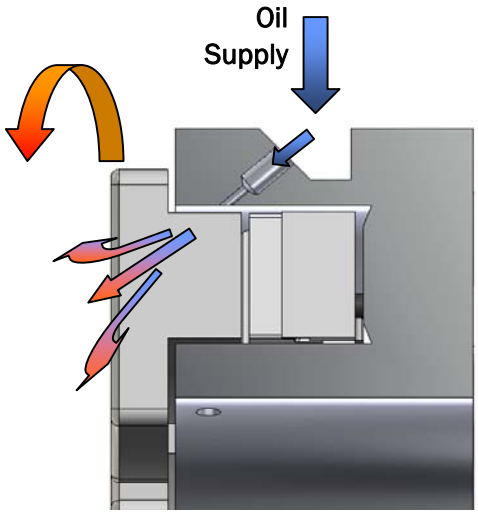


OSBORNE EQUALISED BEARING

Lubrication Methods



Flooded Lubrication



Low-Loss Lubrication

At high shaft velocities, the major source of power loss is from oil turbulence caused by the thrust collar rotating in a flooded housing. In a Low – Loss OE bearing the cool oil is fed directly into an annulus positioned on the pad carrier outside diameter, where angled jet holes direct a stream of oil direct to the leading edge of each individual thrust pad. This reduces the pad temperature and thereby increases the oil film thickness.

The hot oil from the trailing edge of the thrust pads is dispersed away from the working face by the centrifugal force produced by the rotating collar, to fall direct to drain.

This method of Lubrication has been used for many years by leading high speed machine manufacturers worldwide.

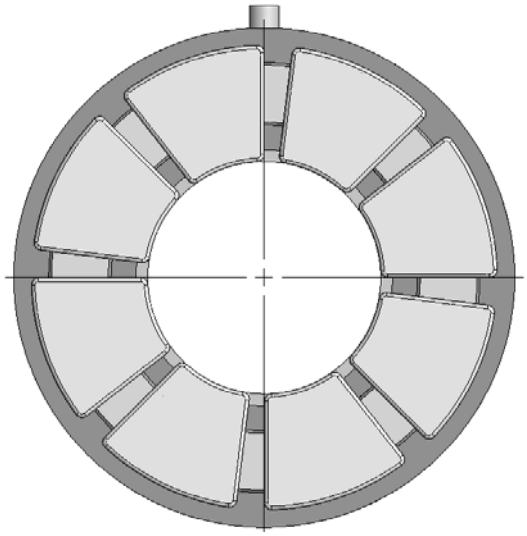
Simplified Construction

The OE bearing is simple to dismantle and re-assemble should thrust pad replacement ever be required. The uncomplicated construction is foolproof against incorrect assembly.

Ease of Handling

The thrust pads are individually held in the carrier ring, therefore allowing the individual half carrier rings to be handled without danger of the thrust pads falling out. Lifting holes are also provided on the larger ring assemblies

OSBORNE EQUALISED BEARING



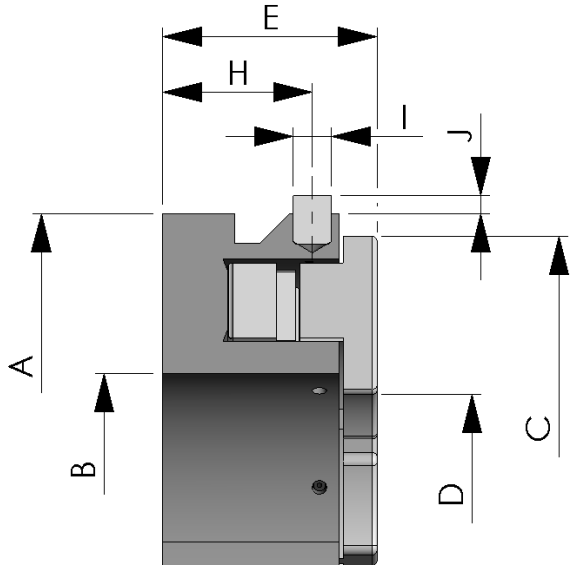
GENERAL DETAILS

Bearing Sizes	Max Shaft (Standard) (mm)	Max Shaft (Special) (mm)	Thrust Surface (mm^2)	Max Norm. Loads (Centre Pivot) (Kn)	Max Norm. Loads (Offset Pivot) (Kn)	M.P.D (mm)
OE.136	58	63.5	8023	27.7	29.74	100.4
OE.161	70	76.2	11553	42.0	44.8	120.48
OE.187	83	88.9	15537	58.6	63.6	140.06
OE.212	96	101.6	20835	76.7	85.4	160.96
OE.238	108	114.30	25995	99.2	109.7	180.72
OE.279	127	133.35	35380	136.0	149.2	210.84
OE.317	140	152.4	46.210	180.6	195.0	240.97
OE.355	159	171.45	58485	228.5	246.7	271.09
OE.393	178	190.5	72205	283.2	304.7	301.21
OE.447	200	215.9	92744	363.8	391.4	341.37

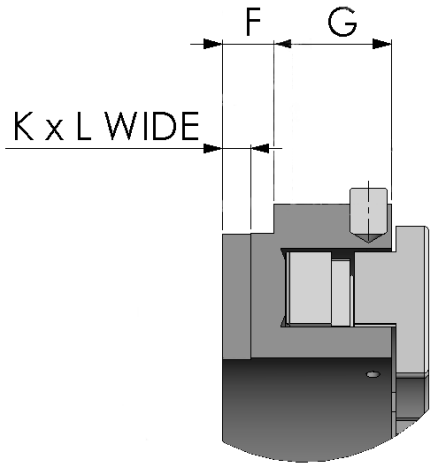
Notes:

- The Special max shaft diameter stated above incorporate non-standard pads, which have the same inside as the carrier ring, thus reducing the surface area, which will reduce the max, thrust load by approximately 6%.
- t is important to have you bearing selection checked by Osborne Engineering's bearing analysis program
- In certain instances (peak load, closed valve operation) the stated normal max thrust load may be exceeded – please consult Osborne Engineering

OSBORNE EQUALISED BEARING



Low-Loss Application

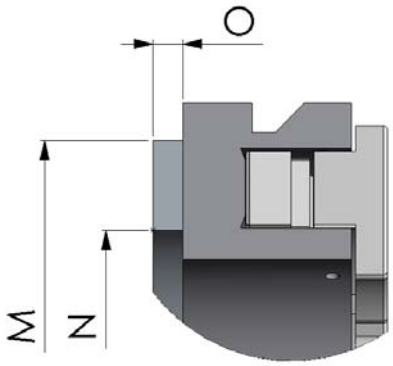


Flooded Application

GENERAL PROPORTIONS

Bearing Sizes	OE.136	OE.161	OE.187	OE.212	OE.238	OE.279	OE.317	OE.355	OE.393	OE.447
A	136.53 -0.05 -0.09	161.93 -0.05 -0.09	187.33 -0.05 -0.09	212.73 -0.05 -0.10	238.12 -0.05 -0.10	279.40 -0.05 -0.10	317.50 -0.05 -0.10	355.60 -0.05 -0.12	393.70 -0.05 -0.12	447.67 -0.05 -0.12
B	70	82.5	95.0	109.5	124.0	144.5	165.0	185.6	206.0	233.0
C	127.0	152.4	177.0	204.0	228.6	266.7	304.8	342.9	381.0	431.8
D	63.5	76.2	88.9	101.6	114.3	133.4	152.4	171.5	190.5	215.9
E	44.45	52.4	60.33	68.28	76.2	85.73	95.25	107.95	117.48	133.35
F	12.7	14.2	17.5	20.5	22.2	25.4	30.2	36.5	35.0	46.0
G	23.8	28.8	31.68	35.06	39.71	44.45	47.59	52.4	61.84	63.54
H	30.0	35.75	41.93	47.06	53.41	60.35	67.29	76.9	83.84	95.54
I	8.0	9.50	9.50	11.11	11.11	12.70	14.30	16.090	17.30	19.10
J	4.1	4.8	4.8	4.8	4.8	5.6	5.6	6.4	7.9	7.9
K	5.0	6.0	6.5	8.0	9.5	11.5	12.87	13.70	38.0	44.0
L	16.0	16.0	19.0	19.0	25.0	28.0	32.0	35.0	38.0	44.0
HOUSING BORE SIZE & TOLERANCES										
	136.53 +0.00 +0.03	161.93 +0.00 +0.03	187.33 +0.00 +0.04	212.73 +0.00 +0.05	238.12 +0.00 +0.05	279.40 +0.00 +0.05	317.50 +0.00 +0.05	355.60 +0.00 +0.08	393.70 +0.00 +0.08	447.67 +0.00 +0.08

OSBORNE EQUALISED BEARING



Adjusting Liners (Spacers)

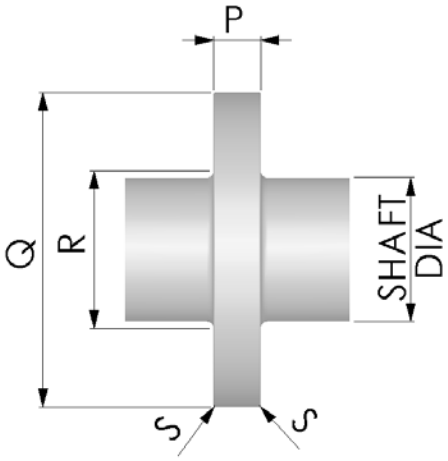
It is common practice in machine installations to provide axial adjustment to the bearings. Steel spacers secured to the back face of the carrier ring provide adjustment of the OE bearing.

These spacers are left thick for machining by the customer upon assembly of their machine.

These are supplied as on optional extra to the standard OE bearing, see table below for dimensions.

Liner Sizes

Bearing Sizes	OE.136	OE.161	OE.187	OE.212	OE.238	OE.279	OE.317	OE.355	OE.393	OE.447
M	120.65	142.88	165.10	190.50	212.73	247.65	282.58	317.50	352.43	400.05
N	82.55	98.43	114.30	130.18	149.23	174.63	200.02	225.43	250.83	282.58
O Nominal Finished Thickness	4.76	4.76	4.76	4.76	6.35	6.35	6.35	9.53	9.53	9.53
O Supplied Thickness	6.35	6.35	6.35	6.35	9.53	9.53	9.53	12.7	12.7	12.7



Fixed Axial Position of the shaft

Within the OE bearing the axial position of the shaft does not move forward under increasing thrust load or give machine problems associated with reduced axial stiffness unlike spring mounted thrust arrangements.

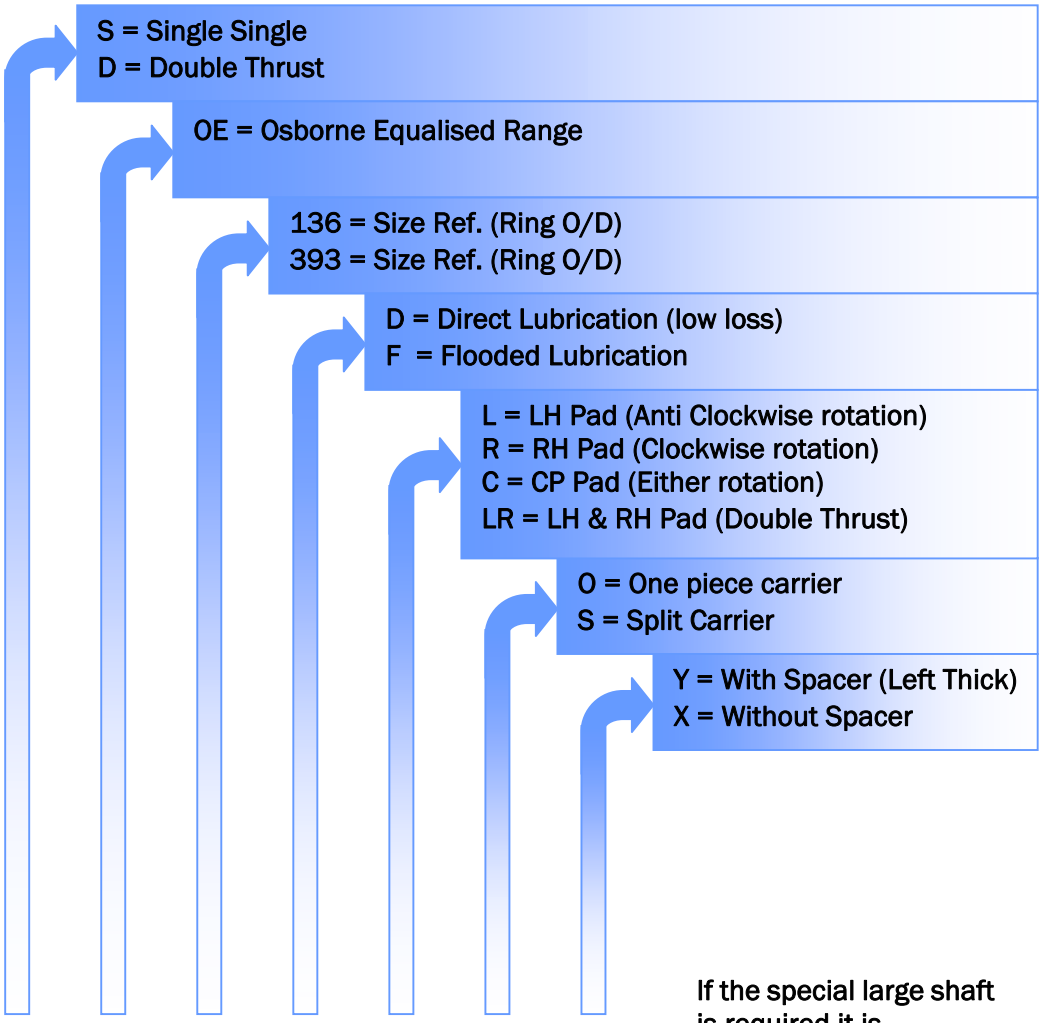
The assembled ring of equalising segments ensure a un-reactive and even distribution of the thrust load from pad face to seating of the machine

Shaft Details

Bearing Sizes	OE.136	OE.161	OE.187	OE.212	OE.238	OE.279	OE.317	OE.355	OE.393	OE.447
P	22.40	25.40	31.75	35.05	38.10	44.45	50.80	57.20	63.50	73.20
Q	130.00	155.50	180.85	206.25	231.65	271.50	309.60	347.70	385.80	438.15
R	60.30	73.00	85.70	98.40	111.10	130.20	149.20	168.30	187.30	212.7
S (max)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.0	1.0

OSBORNE EQUALISED BEARING

Ordering Code



Example 1.	S	OE	136	D	L	O	Y
Example 2.	D	OE	393	F	LR	S	X

If the special large shaft is required it is important to state this on your order as well as the quantity required.

To enable Osborne engineering to carry out performance predictions on the selected bearing the following information is required

- Maximum shaft diameter through each thrust ring
- RPM & direction of rotation
- Thrust load – full details (normal, starting and maximum)
- Proposed application and any special requirements
- Oil grade and Inlet temperature / pressure
- A part drawing or sketch of bearing housing and shaft if appropriate

OSBORNE EQUALISED BEARING

Oil Inlets, outlets and drains – Flooded bearings

The positions of oil inlets & oil outlets in flooded bearings can vary greatly, however there are some rules that must be observed when deciding this.

- The oil outlet should be positioned directly in the top of the bearing housing ensuring that the bearing is fully submerged and that there is no air trapped.
- Adequate sealing is to be provided at either end of the shaft to maintain a full head of oil
- The oil inlet should be positioned so that the oil is fed to the inside diameter of the thrust pads to allow the pumping action of the collar face to force this cool oil over the pad face.
- Position the oil inlet so that when the machine is shut down the oil will not drain back out of the bearing housing, the oil should be maintained at least up to the underside of the shaft.
- On high speed arrangements each thrust assembly should have its own inlet and outlet, as the oil is not require to pass the collar o/d oil seal rings are to be fitted to maintain 2 separate lubricating compartments, this reduces power losses due to reduced oil churn.

Oil restrictors

It is advised that restrictors should be fitted at the oil outlet form the bearing casing to create a positive oil pressure that prevents air being pulled through the end seals. Use the graph on the following page to select the required hole size for these holes using the velocities stated.

- With sealing ring all oil passing though restriction hole = 9.15 to 10.7m/s
- With sealing ring oil passing through restriction hole & seal clearance = 2.4 to 4.6 m/s
- Without sealing rings fitted = 4.9 to 6.1 m/s

Inlet restrictors should only be fitted to reduce a high pressure of oil delivery down to about 0.35 – 1.4 bars (5 – 20 psi) into the bearing housing.

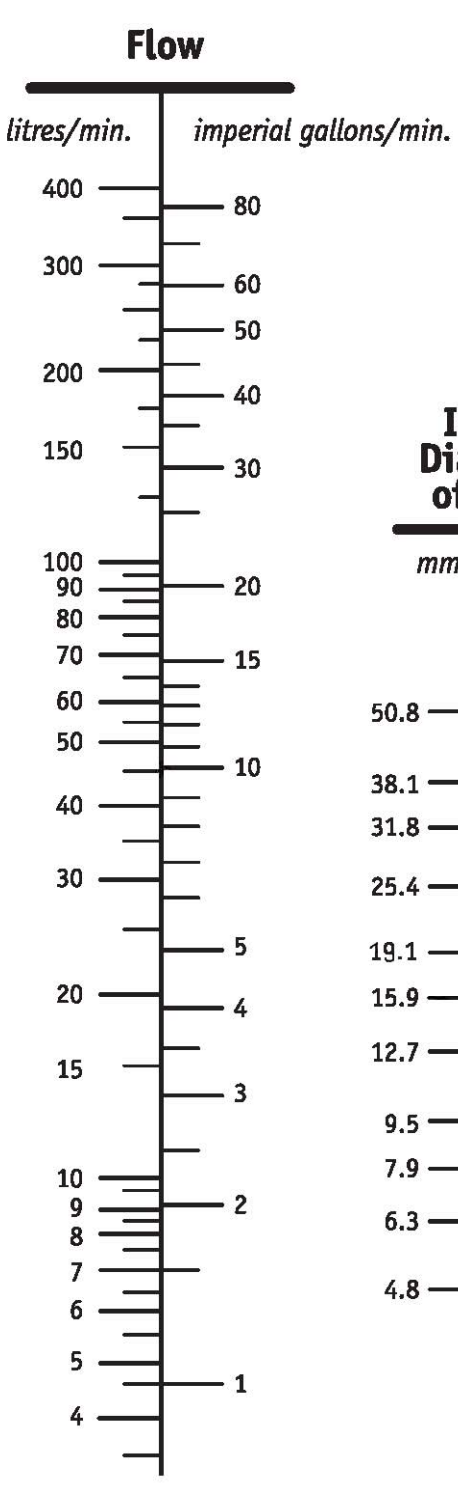
Restrictors should not be less than 2.4mm

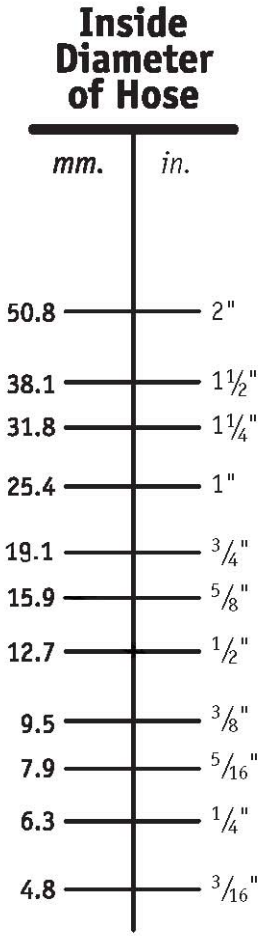
Restrictors & Drains

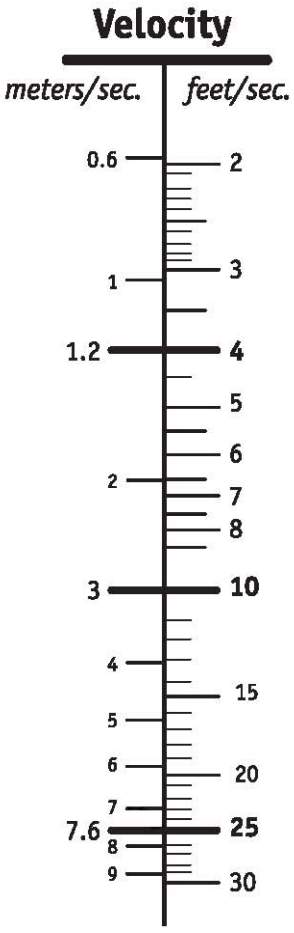
To find the correct diameter / area of oil inlets and outlets for your particular application refer to the graph on the following sheet using an inlet velocity of 1.2 – 1.8 m/s or a outlet velocity of 1.8 – 2.4 m/s. On high-speed applications it may be necessary to provide additional inlets to deliver the required amount of cool oil.

Drains should be sized to keep the maximum oil flow speed below0.15 m/s. It is very important in the b bearing housing design to ensure that the outgoing oil can fall freely away from the oil outlet without the risk of oil build up back to the bearing.

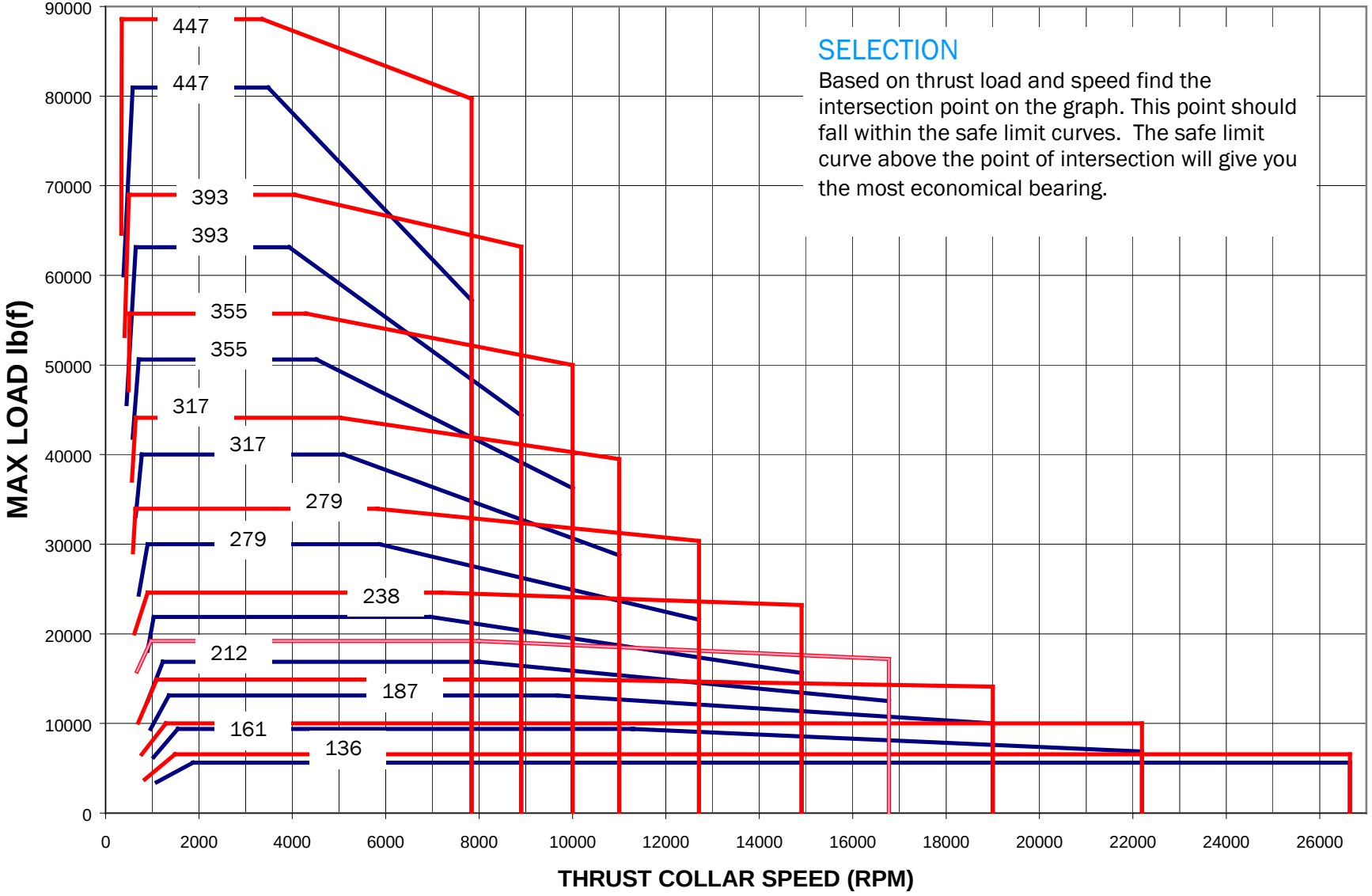
OSBORNE EQUALISED BEARING







OSBORNE EQUALISED BEARING SELECTION GRAPH (ISO VG46 @ 40°C)



SELECTION

Based on thrust load and speed find the intersection point on the graph. This point should fall within the safe limit curves. The safe limit curve above the point of intersection will give you the most economical bearing.

OSBORNE EQUALISED BEARING

OSBORNE EQUALISED BEARING

Cleanliness

It is important that the oil supply pipes and bearing housing are perfectly clean, free from dirt or metal particles. It is advised that cotton waste should not be used for cleaning of any parts mentioned.

Apply a liberal amount of lubricating oil to the housing, shaft, collar and bearing parts when fitting and ensure that the housing is closed as soon as possible to ensure that the interior remains clean.

Handing

When Offset pads are being used it is essential that the correct hand pads are assembled on the correct sides of the thrust collar, refer to handing of double thrust bearing at the front of this catalogue.

Axial Clearance

Always ensure on double thrust arrangements that the axial clearance is correct. This is done by moving the collar hard against one of the thrust faces then using feeler gauges measure behind the thrust ring of the opposite thrust ring – **do not measure between the collar and thrust face in case damage occurs**.

Alignment

It is essential to obtain correct bearing alignment to maximise the operation safety margin. The working faces of the thrust collar must be plat and parallel and at true right angles to the shaft axis.

This can be checked during manufacture and if the collar is combined with the shaft no additional checks should be required. Separate thrust collars should always be re-checked after final assembly onto the shaft.

With the Collar in alignment with the shaft the alignment of the thrust housing should now be checked, gauged reading are to be taken between the thrust collar faces and the thrust bearing seating faces. If required adjust the thrust housing until all the readings are the same. For accuracy the alignments should be checked when all rotating parts are assembled in operational position. In certain machines the shaft and collar can take up different attitude when running; the static alignment must take this into account.

Thrust Collars

We recommend that collars be manufactured from plain carbon steel. Do not use high alloy steel as this could cause problems - do not use plate material

Suggested collar sizes are given for every standard bearing in shaft detail section on previous pages. To avoid expensive forgings and ease of replacement it is sometime preferred to use a separate collar keyed into position on the shaft and held in position by a shaft nut if this method is used it is important to ensure that the collar is normal to the shaft axis, see alignment section above.

Materials used in Standard Manufacture

British Standard Materials			Equivalents	
Part	**Material**	**Standard**	**German Standard**	**American Standard**
Thrust pad Carrier Ring Spacers	Steel	BS 4360 – Grade 43A BS EN 10025 – Fe430A BS 970 – 1070 M20	DIN 17100 – St 44/2	ASTM A516 Grade 55
Segments	Alloy Steel	BS970 – 0709 M 40 BS 970 – 0817 M40	Werkstoff No. 1.7225 Werkstoff No. 1.6582	SAE/AISI 4140 SAE/AISI 4340
Carrier stop	Steel	BS 970 –0 214 M15	Werkstoff No. 1.0721	SAE/AISI a1118
Lining	Whitemetal	Tegostar 738	-	-

Note. Alternative materials can be used if required, please state on enquiries / purchase orders

Total Shaft Solutions

Osborne Engineering Limited
Atley Way,
North Nelson Industrial
Estate Cramlington,
Northumberland
England, NE23 1LL

T: +44 (0) 1670 737077
F: +44 (0) 1670 736127