Osborne Engineering Limited

OC Compact thrust internals

Total Shaft Solutions

General Description

The Osborne Compact thrust bearing assembly operates by generating and maintaining a substantial oil film between the working faces of the tilting thrust pads and rotating thrust collar. This oil film prevents any physical contact between the two parts which greatly increases resistance to wear. Only during startup and shutdown is there an increased risk of contact between the working faces.

Osborne Engineering understands that customers are occasionally reluctant to change bearing designs when existing bearings have operated successfully within their machinery. With this in mind OEL have designed the OC range as a fully interchangeable alternative to OEM bearings. Resulting in greater choice, whilst retaining confidence in bearing operation.

The Osborne Compact Thrust Bearing consists of at least one thrust pad carrier ring, tilting thrust pads, thrust pad stops, spacers and ring stops. Depending upon the type of lubrication configuration required the thrust pad stops shall be replaced with oil jets. In order to simplify manufacture and assembly each of the thrust pads are retained within the carrier ring by either the thrust pad stops or oil jets. Ring stops are provided to prevent the assembly rotating within the housing.

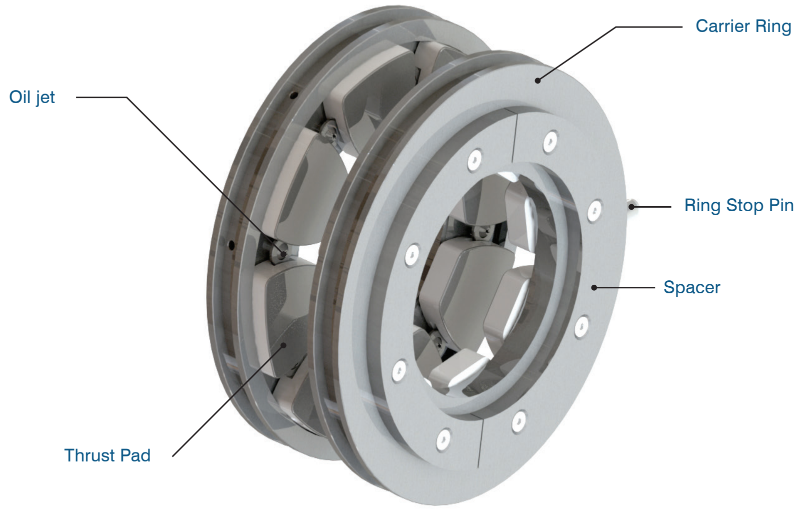


Table 1 – OC Standard Dimensions

SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M	N
OC 63	63.50	52.5	27.6	51	32	12.70	28	5.0	3.0	3	2.5	3.5	3.2	20.6
OC 73	73.03	62	33	60	38	14.29	34	6.5	3.0	4	2.5	4	4.0	24.6
OC 85	85.73	74.5	39	70	48	15.88	40.5	6.5	3.0	4	4	5	4.8	29.4
OC 101	101.60	87.5	45.8	81	56	17.46	48	7.0	4.0	5	4	5	4.8	34.1
OC 120	120.65	105	57.2	95	70	19.05	59	8.5	4.0	5	5.5	6	5.6	41.3
OC 130	130.18	114	60	105	73	20.64	63	9.5	4.0	6	5.5	7	6.4	44.5
OC 139	139.70	124	66	113	81	22.23	69	10.0	4.0	6	6.5	7	6.4	48.4
OC 152	152.40	137	74	125	87	23.81	78	10.5	4.5	6	6.5	7	6.4	53.2
OC 168	168.28	149	79.9	135	97	25.40	85	11.0	4.5	6	7.5	8	7.9	57.9
OC 180	180.96	162	86.6	149	105	26.99	92	11.0	5.5	6	7.5	8	7.9	63.5
OC 196	196.85	176	93.4	162	117	28.58	100	11.0	5.5	6	9.5	8	7.9	69.9
OC 215	215.90	192	101.3	178	127	31.75	109	12.0	5.5	7	9.5	8	9.5	76.2
OC 234	234.95	210	111.3	191	140	34.92	119	15.0	5.5	8	9.5	8	9.5	82.6
OC 254	254.00	229	122.1	206	149	38.10	130	15.0	6	10	11.5	8	11.1	88.9
OC 279	279.40	251	134.9	229	165	41.28	144	17.5	6	10	11.5	10	12.7	98.4
OC 301	301.63	273	147.6	244	181	44.45	157	17.5	7	11	13.5	10	12.7	106.4
OC 323	323.85	297	158.3	270	194	47.63	169	20.0	7	11	13.5	13	15.9	115.9
OC 355	355.60	324	172.1	292	216	50.80	182	21.0	8	11	13.5	13	15.9	127.0
OC 384	384.18	354	188.9	321	232	57.15	202	24.0	9	13	15	13	19.1	138.1
OC 415	415.93	384	202.6	346	257	60.33	216	27.0	9	13	15	13	19.1	150.8
OC 454	454.03	419	221.2	378	276	66.68	236	31.0	9	14	17	16	22.2	163.5
OC 495	495.30	457	241.9	416	302	73.03	258	35.0	10	16	18	16	22.2	179.4
OC 539	539.75	502	267.6	448	333	79.38	285	40.0	10	17	19	16	25.4	195.3
OC 548	584.20	546	290.1	489	362	85.73	308	43.0	10	17	22	16	25.4	212.7
OC 641	641.35	597	318.6	533	394	92.08	338	45.0	10	19	27	19	28.6	231.8

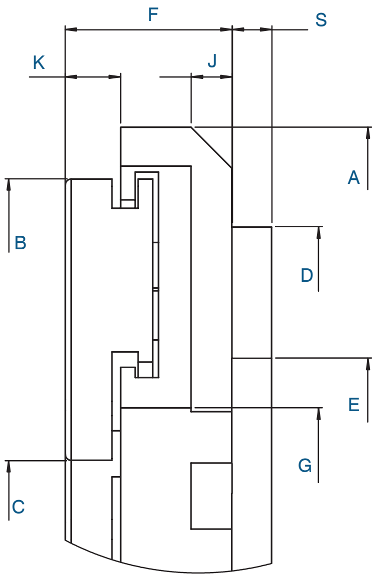
Reduced Operating Temperatures

High working oil film temperatures have a detrimental effect on the working life of the lubricating oil and babbit faces of the tilting thrust pads. An offset pivot thrust pad generates a thicker oil film than a centre pivot thrust pad and facilitates more efficient cooling of the lubricating oil and working faces. Therefore it is recommended that offset pads are used for high load application. Only when the shaft is able to rotate in the opposite direction with the thrust load acting constantly in one direction should centre pivot thrust pads be used.

Reduced Power Loss

At high shaft velocities the major source of power loss within the bearing is the oil turbulence caused by the thrust collar rotating in a flooded environment. Osborne Engineering are able to offer a low loss alternative whereby the lubricating oil is fed directly into an annulus positioned on the outside diameter of the carrier ring.

Jets then provide a stream of cool oil direct to the leading edge of each individual tilting thrust pad. This reduces pad temperature and therefore increases oil film thickness. The hot oil from the trailing edge of each pad is then dispersed via the rotating action of the thrust collar, falling to the oil drain.

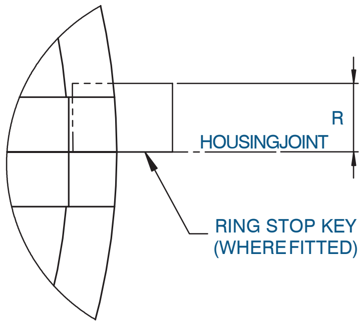


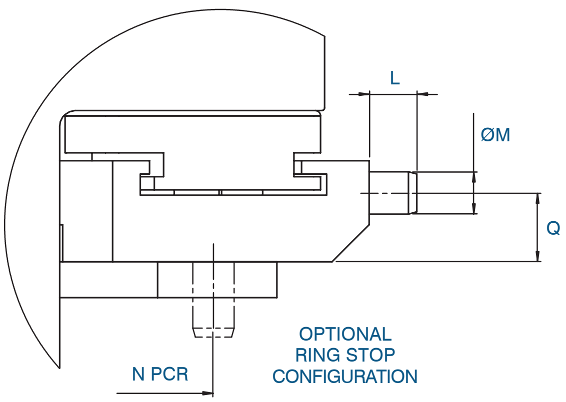
FLOODED LUBRICATION CONFIGURATION

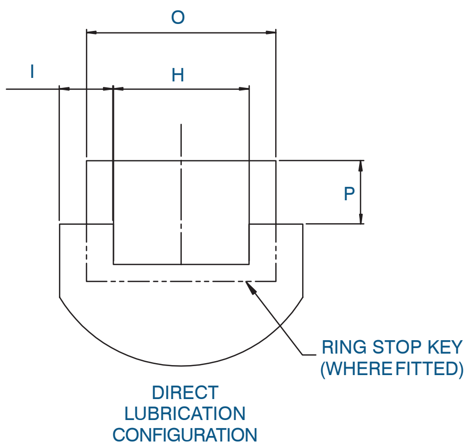
SIZE	O	P	Q	R	S	U	V	W	X	PIN OR KEY
OC 63	-	-	6	-	3.2	54	7	26.5	0.4	PIN
OC 73	-	-	7	-	3.2	64	9	32	0.4	PIN
OC 85	-	-	8	-	3.2	76	10	38	0.4	PIN
OC 101	-	-	9	-	3.2	90	13	43	0.8	PIN
OC 120	-	-	9.5	-	3.2	108	16	54	0.8	PIN
OC 130	-	-	10	-	4.8	117	17	58	0.8	PIN
OC 139	-	-	10	-	4.8	127	19	64	0.8	PIN
OC 152	-	-	11	-	4.8	140	21	70	0.8	PIN
OC 168	-	-	13	-	4.8	152	22	76	0.8	PIN
OC 180	-	-	13	-	4.8	165	25	84	0.8	PIN
OC 196	-	-	13	-	4.8	179	27	92	0.8	PIN
OC 215	-	-	14	-	4.8	195	30	100	0.8	PIN
OC 234	-	-	17	-	6.4	213	32	110	0.8	PIN
OC 254	-	-	17	-	6.4	232	35	119	0.8	PIN
OC 279	-	-	19	-	6.4	254	38	132	0.8	PIN
OC 301	25.4	5.6	-	15.9	6.4	276	43	141	0.8	KEY
OC 323	28.6	5.6	-	15.9	6.4	300	48	156	0.8	KEY
OC 355	28.6	5.6	-	15.9	9.5	327	51	170	0.8	KEY
OC 384	31.8	5.6	-	15.9	9.5	357	56	187	0.8	KEY
OC 415	31.8	6.4	-	19.1	9.5	391	60	200	1.5	KEY
OC 454	38.2	6.4	-	19.1	9.5	425	67	219	1.5	KEY
OC 495	38.1	6.4	-	19.1	9.5	464	73	240	1.5	KEY
OC 539	44.5	8	-	22.2	12.7	508	79	264	1.5	KEY
OC 548	44.5	8	-	22.2	12.7	552	86	287	1.5	KEY
OC 641	50.8	8	-	22.2	12.7	603	95	314	1.5	KEY

Table 2 – OC General Details

SIZE	MAX SHAFT (SEPERABLE)	THRUST SURFACE (MM³)	MAX LOAD OFFSET (kN)	MAX LOAD CENTRE (kN)	THRUST PAD MPD	TOTAL AXIAL CLEARANCE (MM)
OC 63	25	1120	2.8	2.4	41.9	0.20
OC 73	29	1568	4.2	3.8	49.7	0.20
OC 85	35	2256	6.5	6.1	59.5	0.20
OC 101	41	3232	10.0	9.4	69.4	0.25
OC 120	49	4680	15.8	14.7	84.6	0.25
OC 130	54	5520	19.8	18.5	91.1	0.30
OC 139	58	6560	23.8	22.3	99.3	0.30
OC 152	64	7760	28.6	26.7	101.1	0.30
OC 168	70	9280	35.2	32.9	119.6	0.35
OC 180	76	11248	43.4	40.7	129.9	0.35
OC 196	82	13360	52.5	49.3	140.9	0.35
OC 215	90	16160	65.1	60.0	153.5	0.40
OC 234	98	19040	78.8	70.8	168.1	0.40
OC 254	107	22560	94.8	84.0	183.5	0.40
OC 279	118	26800	112.6	102.0	201.5	0.50
OC 301	128	32000	134.4	122.5	219.5	0.50
OC 323	138	38640	162.3	149.0	238.0	0.50
OC 355	152	46160	193.9	179.0	259.4	0.50
OC 384	166	54960	231.0	213.0	283.7	0.60
OC 415	180	64800	272.0	253.0	307.0	0.60
OC 454	196	79200	333.0	309.0	335.0	0.60
OC 495	215	92800	390.0	362.0	365.6	0.60
OC 539	235	111200	467.0	434.0	402.3	0.70
OC 548	252	130720	549.0	510.0	437.2	0.70
OC 641	280	157600	662.0	615.0	478.5	0.70





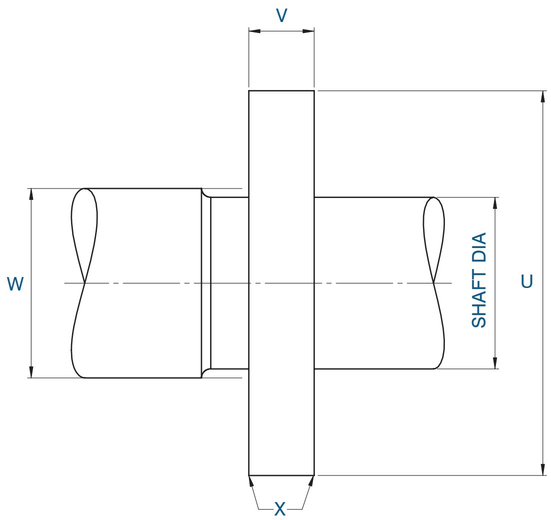


Adjusting Liners

It is common practice in machine installations to provide axial adjustment for the bearings. Steel spacers can be provided as an option and are secured to the back of the carrier rings. These can be supplied finished or left thick for final machining during assembly.

Table 3 – OC General Tolerances

RING O/D (MM)		FLOODED RING TOLERANCE (MM)		LOW LOSS RING TOLERANCE (MM)	
OVER	UPTO	RING O/D	HOUSING BORE	RING O/D	HOUSING BORE
50	80	-0.100 / -0.174	0.074 / 0.000	-0.025 / -0.040	0.030 / 0.000
80	120	-0.120 / -0.207	0.087 / 0.000	-0.025 / -0.047	0.035 / 0.000
120	180	-0.145 / -0.245	0.100 / 0.000	-0.025 / -0.054	0.040 / 0.000
180	250	-0.170 / -0.285	0.115 / 0.000	-0.025 / -0.061	0.046 / 0.000
250	315	-0.190 / -0.320	0.130 / 0.000	-0.025 / -0.069	0.052 / 0.000
315	400	-0.210 / -0.350	0.140 / 0.000	-0.025 / 0.075	0.057 / 0.000
400	500	-0.230 / -0.385	0.155 / 0.000	-0.025 / -0.083	0.063 / 0.000
500	630	-0.260 / -0.435	0.175 / 0.000	-0.025 / -0.092	0.070 / 0.000
630	800	-0.290 / -0.490	0.200 / 0.000	-0.025 / -0.104	0.080 / 0.000
800	1000	-0.320 / -0.550	0.230 / 0.000	-0.025 / -0.116	0.090 / 0.000



Temperature Measurement

Temperature measurement is the preferred condition monitoring tool for most bearing assemblies. OC bearing assemblies can be supplied with RTD's for accurate measurement of the thrust pad temperature. If such instrumentation is required OEL engineering require the primary direction of rotation to ensure the probes are mounted in the correct area of the thrust pad to provide the most accurate temperature reading.

Generally alarm and trip settings are based upon predicted bearing performance. It is recommended that the alarm and trip levels should be set at 8°c and 15°c respectively above the predicted bearing operating temperature. However babbit temperatures should never exceed 120°c. If this maximum permitted temperature is exceeded, then copper alloy or offset pivoted pads should be considered.

Customer preferred instruments can be incorporated into our designs or details of our preferred standard instruments can be provided upon request.

Recommendations

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.

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 flat, parallel and normal to the shaft axis. This can be checked during manufacture and if the collar is integral to the shaft no additional checks should be required. Separate thrust collars should always be re-checked after final assembly onto the shaft.

Thrust Collars

OEL recommend that thrust collars are manufactured from plain carbon steel. High alloy steels can cause operational problems, also do not use plate material. Suggested thrust collar sizes are given in the shaft details section earlier in this catalogue. To avoid expensive forgings and ease of replacement it is sometimes preferred to use a separate collar keyed onto the shaft and held in position with a shaft nut. It is essential to ensure that the thrust collar is normal to the shaft axis.

Correct Handing of Thrust Pads

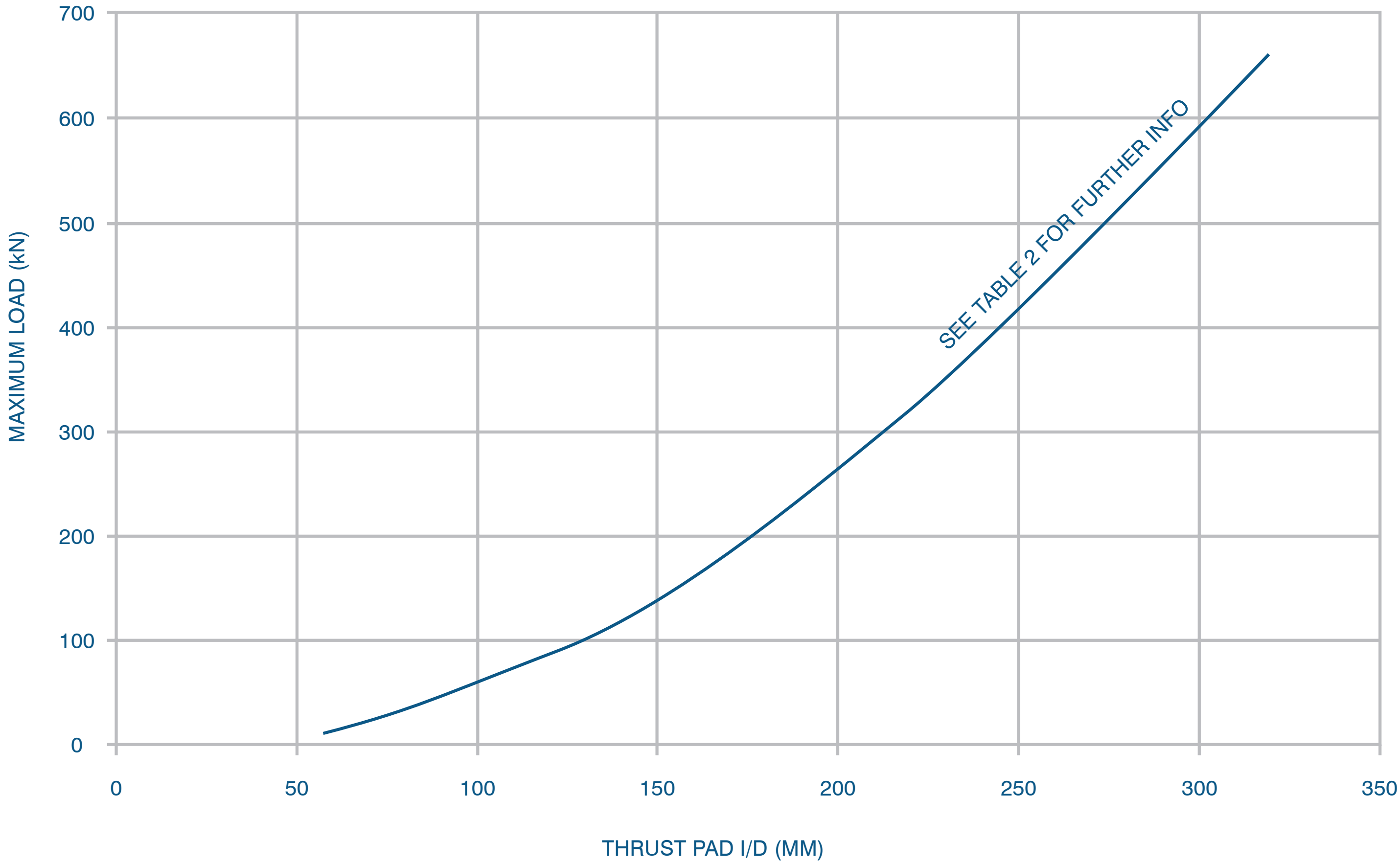
When offset pivot thrust pads are used within the bearing assembly it is essential to ensure that the correct hand pads are assembled on the correct side of the thrust collar. In a double thrust bearing, if the load is reversed when the shaft rotation is also reversed, then the same hand pads are required on each side of the thrust collar. If the rotation of the shaft is in one direction only and the axial load is able to act in either direction then opposite hand pads are required on each side of the thrust collar.

Technical Documentation

With every order OEL engineers will provide a detailed arrangement drawing, operating and maintenance instruction manual and comprehensive bearing performance prediction calculation providing the following information;

- Bearing temperature
- Required oil viscosity grade
- Bearing power loss
- Maximum operating pressure
- Minimum film thickness

Bearing Selection – Offset Pivot Thrust Pads



Ordering Code

Thrust requirement - Style - Size - Lubrication method - Handing - Carrier - Spacer

S = Single thrust, D = Double thrust
Style = OC
D = Direct Lubrication (low loss), F = Flooded Lubrication
L = Left Hand (anti-clockwise), R = Right Hand (clockwise),
C = Centre (bi-directional), LR = Left and right hand (double thrust)
O = One piece carrier, S = Split carrier
X = No spacer, Y = Supplied with spacer

Example 1 = DOC-279-F-LR-S-X

Example denotes a double thrust OC style flooded bearing assembly, size 279, split carrier and no spacer

Example 2 = SOC-127-D-C-O-Y

Example denotes a single thrust OC style low loss bearing assembly, size 127, one piece carrier with spacer

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