Osborne Engineering Limited

OCE Compact equalised thrust internals

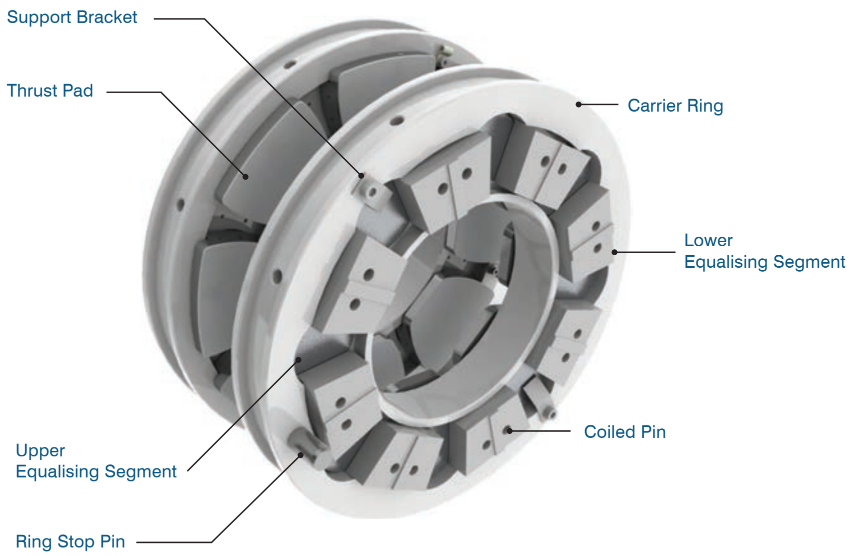
Total Shaft Solutions

General Description

The Osborne Compact Equalised 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 start-up and shut down 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 OCE range as a fully interchangeable alternative to OEM bearings. Resulting in greater choice, whilst retaining confidence in bearing operation.

The Osborne Compact Equalised Thrust Bearing consists of at least one thrust pad carrier ring, tilting thrust pads, upper and lower equalising segments, spacers and ring stops. Each of the thrust pads are retained within the carrier ring by means of a track and are held in position by the upper equalising segments which locate into the back of each pad. The lower equalising segments are held in position by a coiled pin. The equalising segments work in unison to allow each of the tilting thrust pads to move independently to ensure that each is subject to an equal amount of force. Ring stops are provided to prevent the assembly rotating within the housing.



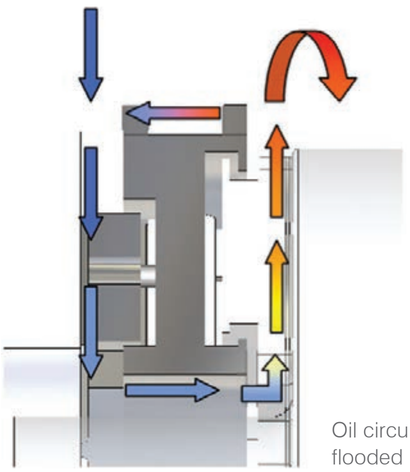
Reduced Operating Temperatures

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.

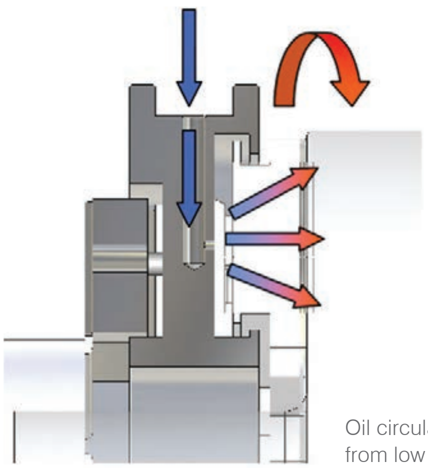
Reduced Power Loss

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.

Lubrication Methods



Oil circulation path during flooded bearing operation



Oil circulation path resulting from low loss lubrication

Table 1 – OCE General Details

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

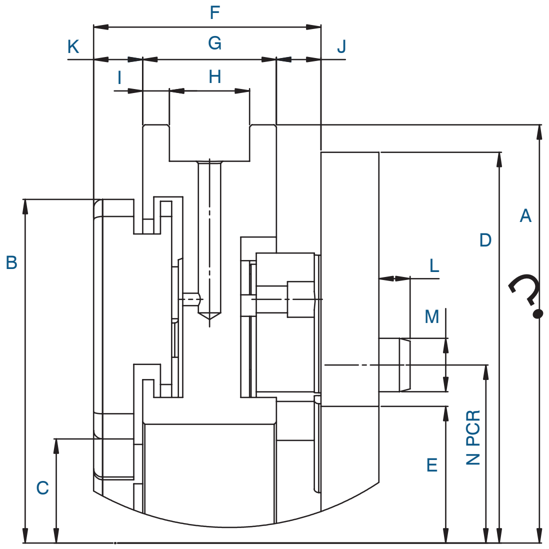
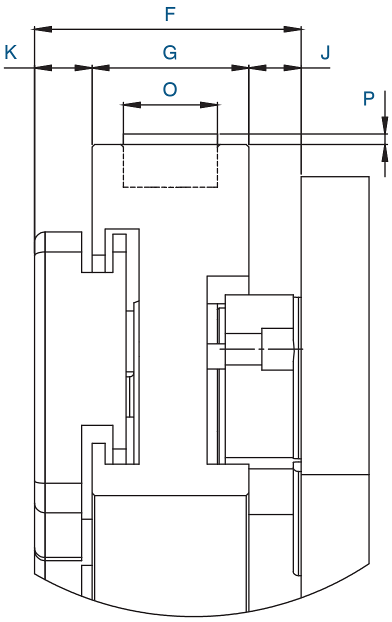


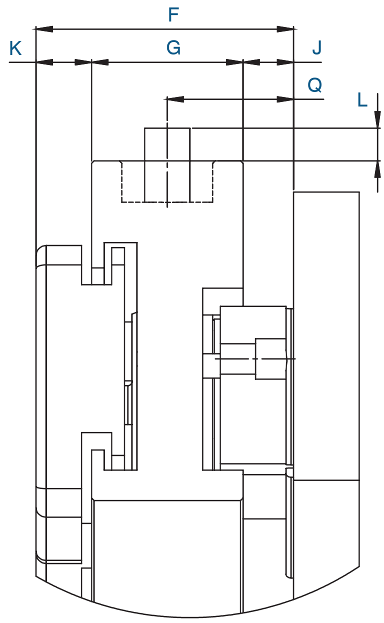
Table 2 – OCE Standard Dimensions

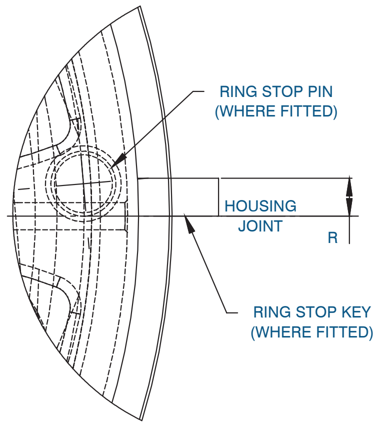
SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M	N
OCE 120	120.65	105	57.2	117	64	23.5	14	8	3	4	5.5	10	6	53.5
OCE 130	130.18	114	60	124	66.8	25.5	15	9	3	5	5.5	10	6	57
OCE 139	139.7	124	66	132	73.4	28	17	10	3.5	5	6	10	6	61
OCE 152	152.4	137	74	145	83.4	30	17.5	10.5	3.5	6.25	6.25	10	6	67.5
OCE 168	168.28	149	79.9	158	92.5	34	20.5	12.5	4	6.25	7.25	8	8	73
OCE 180	180.96	162	86.6	171	97.6	36	21.5	13.5	4	7.25	7.25	8	8	79.5
OCE 196	196.85	176	93.4	184	106.2	41	25	16	4.5	7.25	8.75	8	8	86
OCE 215	215.9	192	101.3	204	114.8	43	27	17	5	7	9	10	10	94
OCE 234	234.95	210	111.3	224	126.2	46	29	19	5	8	9	10	10	104
OCE 254	254	229	122.1	243	135.8	52	32	20	6	9	11	13	12	112.5
OCE 279	279.4	251	134.9	263	151.2	56	34	22	6	11	11	13	12	122.5
OCE 301	301.63	283	147.6	286	164.6	61	37	23	7	11.25	12.75	13	12	134
OCE 323	323.85	297	158.3	314	178	65	40	26	7	12.25	12.75	14	16	145
OCE 355	355.6	324	172.1	339	190.2	68	42	26	8	13	13	14	16	157.5
OCE 384	384.18	354	188.9	371	209.4	76	46	28	9	15.5	14.5	15	20	171.5
OCE 415	415.93	384	202.6	400	225.6	80	48	30	9	17.5	14.5	15	20	186
OCE 454	454.03	419	221.2	439	244.6	88	51	33	9	20.25	16.75	20	25	202
OCE 495	495.3	457	241.9	479	268.4	95	55	35	10	22	18	20	25	222
OCE 539	539.75	502	267.6	520	295.6	102	59	38	10	25	19	20	25	242.5
OCE 548	584.2	546	290.1	565	320.2	110	60	40	10	28	22	20	25	265
OCE 641	641.35	597	318.6	620	348	121	63	43	10	31	27	20	30	290

Within the OCE thrust bearing assembly the axial position of the shaft does not move forward under increasing thrust load. This prevents problems associated with reduced axial stiffness which occurs in spring mounted thrust arrangements. The assembled ring of equalising segments ensure an unreactive and even distribution of the thrust load from the working faces to the seating of the machine.

Ring Stop Details – Flooded Application





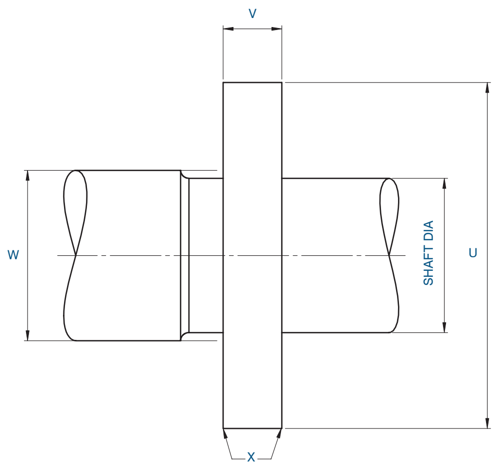


Adjusting Liners

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 maching during assembly.

Table 3 – OCE 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



SIZE	O	P	Q	R	S	T	U	V	W	X	PIN OR KEY
OCE 120	-	-	11	-	3.2	4.5	108	16	54	0.8	PIN
OCE 130	-	-	12.5	-	4.8	6.5	117	17	58	0.8	PIN
OCE 139	-	-	13.5	-	4.8	6.5	127	19	64	0.8	PIN
OCE 152	-	-	15	-	4.8	6.5	140	21	70	0.8	PIN
OCE 168	-	-	16.5	-	4.8	6.5	152	22	76	0.8	PIN
OCE 180	-	-	17	-	4.8	6.5	165	25	84	0.8	PIN
OCE 196	-	-	19.75	-	4.8	6.5	179	27	92	0.8	PIN
OCE 215	-	-	20.5	-	4.8	6.5	195	30	100	0.8	PIN
OCE 234	-	-	22.5	-	6.4	9.5	213	32	110	0.8	PIN
OCE 254	-	-	25	-	6.4	9.5	232	35	119	0.8	PIN
OCE 279	-	-	28	-	6.4	9.5	254	38	132	0.8	PIN
OCE 301	-	-	29.25	-	6.4	9.5	276	43	141	0.8	PIN
OCE 323	-	-	31.75	-	6.4	9.5	300	48	156	0.8	PIN
OCE 355	30	6	-	16	9.5	12.5	327	51	170	0.8	KEY
OCE 384	32	6	-	16	9.5	12.5	357	56	187	0.8	KEY
OCE 415	32	6	-	20	9.5	12.5	391	60	200	1.5	KEY
OCE 454	38	6	-	20	9.5	12.5	425	67	219	1.5	KEY
OCE 495	38	6	-	20	9.5	12.5	464	73	240	1.5	KEY
OCE 539	45	8	-	25	12.7	16.5	508	79	264	1.5	KEY
OCE 548	45	8	-	25	12.7	16.5	552	86	287	1.5	KEY
OCE 641	50	8	-	25	12.7	16.5	603	95	314	1.5	KEY

Temperature Measurement

Temperature measurement is the preferred condition monitoring tool for most bearing assemblies. OCE 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

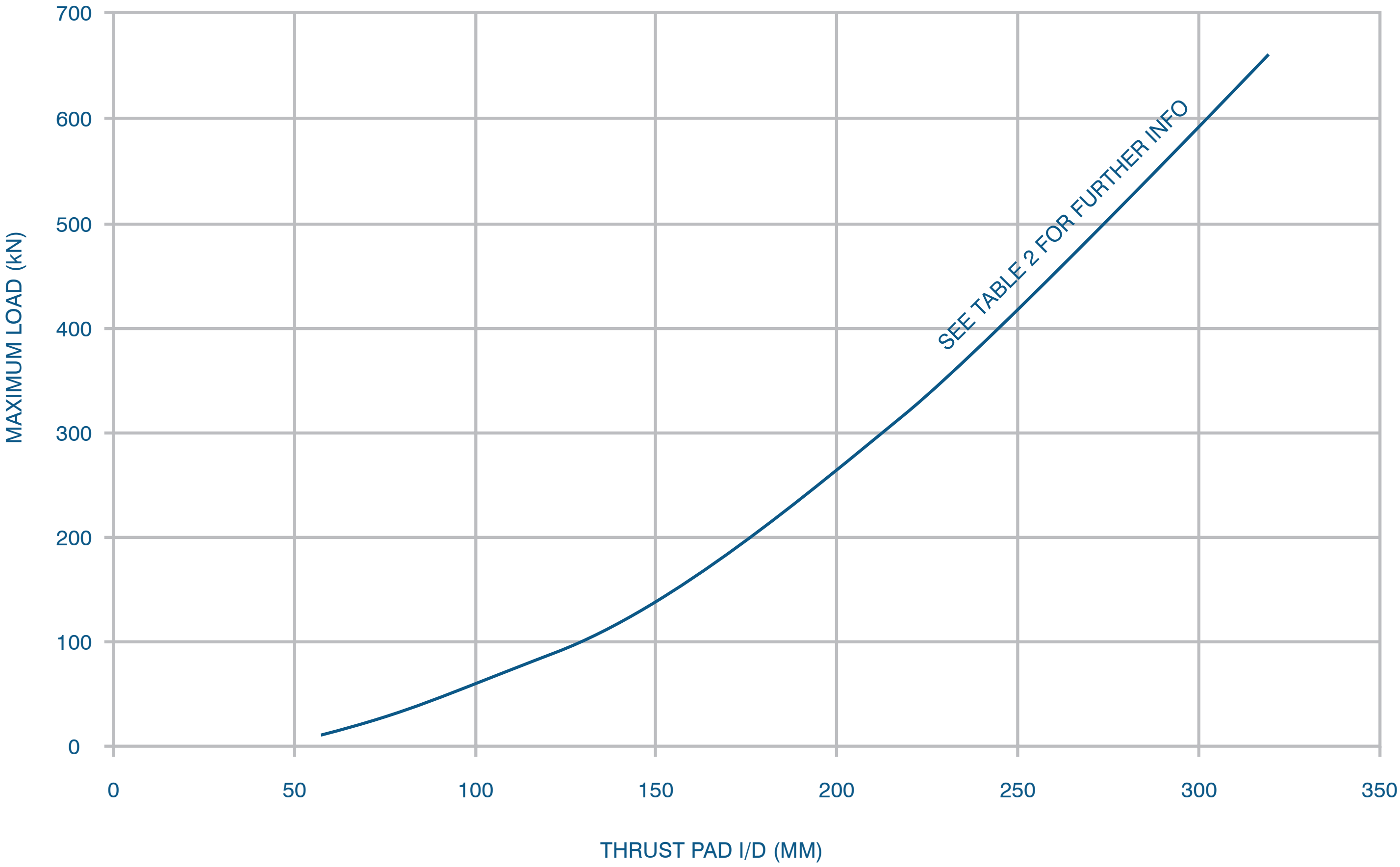
When offset pivot thrust pads are used within the bearing assembly it is essential to ensure that the correct hand pads are assembled on the correct side of the thrust collar. In a double thrust bearing, if the load is reversed when the shaft rotation is also reversed, then the same hand pads are required 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 = OCE
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 = DOCE-393-F-LR-S-X

Example denotes a double thrust OCE style flooded bearing assembly, size 393, split carrier and no spacer

Example 2 = SOCE-136-Y-D-L-O-Y

Example denotes a single thrust OCE style low loss bearing assembly, size 136, one piece carrier with spacer

Osborne Engineering Ltd

Atley Way, North Nelson Industrial Estate, Cramlington, Northumberland, England NE23 1WA

T: +44 (0) 1670 737 077
F: +44 (0) 1670 736 127
E: info@oel-group.com
www.osborne-engineering.com

Osborne Engineering LLC

Oilfield Supply Centre, Unit 37 & 38, PO BOX 30703, Jebel Ali, Dubai, U.A.E.

T: +971 (4) 883 3310
F: +971 (4) 883 3538
E: info@osborne-engineering.ae
www.osborne-engineering.com

Osborne Engineering Sp. z.o.o.

ul.Rogowska 117a, 54-440 Wroclaw, Poland

T: (+48) 71 795 50 00
F: (+48) 71 796 31 77
E: info@osborne-engineering.com.pl
www.osborne-engineering.com.pl

Osborne Bearing Technologies LLC

8525 West Monroe Rd, Houston, TX 77061

T: (+001) 713 904 1234
F: (+001) 713 492 2126
E: info@oel-group.com
www.osborne-engineering.com