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Plain bearings — Hydrodynamic plain journal bearings under steady-state conditions —

Part 3: Functions for calculation of tilting pad journal bearings

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 8, *Calculation methods for plain bearings and their applications*.

A list of all parts in the ISO/TS 31657 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plain bearings — Hydrodynamic plain journal bearings under steady-state conditions —

Part 3: Functions for calculation of tilting pad journal bearings

1 Scope

This document specifies the characteristic values for selected tilting-pad journal bearings with four or five centrally or eccentrically supported tilting pads and with angular spans of pad sliding surfaces of Ω = 80°, 60° and 45°.

The functions plotted and listed in table form below are required for the operationally safe design of hydrodynamic tilting-pad journal bearings according to ISO/TS 31657-1. They are based on the presumptions and boundary conditions indicated there and only apply to stationary operating states. The symbols used are explained in ISO/TS 31657-1; calculation examples are also included there.

The calculation method described in ISO/TS 31657-1 can also be used for other tilting-pad journal bearing designs, if the numerical solutions of the basic equations are available in the same manner for these designs.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Functions for calculation of multi-lobed journal bearings

4.1 General

The characteristic values for symmetrically loaded tilting-pad journal bearings with four and five centrally (relative angular distance between leading edge and pivot position of pad Ω_F^* = 0,5) or eccentrically (Ω_F^* = 0,6) supported tilting pads are indicated below in table form.

The characteristic values were calculated for the geometrical parameters summarised in Figure 1 (angular spans of pad sliding surface Ω, angular coordinates of pivot position of pad $\varphi_{F,1}$, profile factors

K_P, bearing width ratios B^*) in the operating range 0,02 ≤ $h^*_{\min}$ ≤ 1. The following (dimensionless) characteristic values are individually listed in table form:

a) Static characteristic values

Sommerfeld number:

$$So = \frac{F \cdot \psi_{\text{eff}}^2}{B \cdot D \cdot \eta_{\text{eff}} \cdot \omega}$$

Relative eccentricity:

$$\varepsilon = \frac{e}{C_{R,\text{eff}}}$$

Attitude angle β in $\sphericalangle°$.

Product of maximum lubricant film pressure parameter and Sommerfeld number:

$$p^*_{\max} \cdot So = \frac{p_{\max} \cdot \psi_{\text{eff}}^2}{\eta_{\text{eff}} \cdot \omega}$$

Minimum relative lubricant film thickness:

$$h^*_{\min} = \frac{h_{\min}}{C_{R,\text{eff}}}$$

Friction force parameter:

$$F^*_f = \frac{f}{\psi_{\text{eff}}} \cdot So$$

Lubricant flow rate parameter due to hydrodynamic pressure build-up:

$$Q^*_3 = \frac{Q_3}{Q_0}$$

Lubricant flow rate parameter due to supply pressure:

$$Q^*_p = \frac{Q_p}{P^*_{\text{en}} \cdot Q_0}$$

Lubricant flow rate parameter at the exit of the lubricant gap:

$$Q^*_2 = \frac{Q_2}{Q_0}$$

Non-dimensional difference between maximum temperature of lubricant film and lubricant temperature in the lubricant pocket:

$$\Delta T^*_{\max} = \frac{\rho \cdot c_p \cdot \psi_{\text{eff}}}{\bar{p} \cdot f} \cdot \Delta T_{\max}$$

b) Dynamic characteristic values

Non-dimensional lubricant film stiffness coefficients:

$$c^*_{i,k} = \frac{\psi^3_{\text{eff}}}{2 \cdot B \cdot \eta_{\text{eff}} \cdot \omega} \cdot c_{i,k} \qquad (i, k = 1, 2)$$

Non-dimensional lubricant film damping coefficients:

$$d^*_{i,k} = \frac{\psi^3_{\text{eff}}}{2 \cdot B \cdot \eta_{\text{eff}} \cdot \omega} \cdot \omega \cdot d_{i,k} \quad (i, k = 1, 2)$$

For some selected tilting-pad journal bearings (Ω^*_F = 0,6, Ω = 45°, $\varphi_{F,1}$ = 36°), these characteristic values are shown graphically as a function of the Sommerfeld number *So* and the profile factor K_P in Annex A, Figures A.1 to A.11.

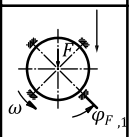
Z	Ω[°]	$\varphi_{F,1}$[°]	K_P	B^*	Load case
4	80	45	2, 3, 5	0,5, 0,75, 1	
		0	3	0,75	
	60	45	2, 3, 5	0,5, 0,75	
		0	3	0,5	
5	60	36	2, 3, 5	0,5, 0,75	
		0	3	0,5	
	45	36	2, 3, 5	0,5	
		0	3	0,5	

Figure 1 — Geometrical parameters of selected tilting-pad journal bearings (Ω^*_F = 0,5 and Ω^*_F = 0,6)

4.2 Tilting-pad journal bearings with four tilting pads

Characteristic values for tilting-pad journal bearings with four centrally or eccentrically supported tilting pads and angular spans of pad sliding surface of Ω = 80° or 60° are contained in Tables 1 to 34.

Table 1 — Characteristic values of a tilting-pad bearing with four centrally (Ω_F^* = 0,5) supported tilting pads (Ω = 80°, $\varphi_{F,1}$ = 45°, K_P = 2, B^* = 0,5)

So	ε	β [°]	$p_{max}^* \cdot So$	h_{min}^*	F_f^*	Q_3^*	Q_P^*	Q_2^*	ΔT_{max}^*	c_{11}^*	c_{12}^*	c_{21}^*	c_{22}^*	d_{11}^*	d_{12}^*	d_{21}^*	d_{22}^*
0,000	0,000	0,00	0,278	0,829	2,785	0,909	0,000	1,730	1,02	0,283	0,000	0,000	0,283	0,335	0,000	0,000	0,335
0,021	0,050	0,00	0,308	0,796	2,789	0,909	0,000	1,730	1,10	0,286	0,000	0,000	0,286	0,337	0,000	0,000	0,337
0,042	0,100	0,00	0,342	0,763	2,800	0,907	0,000	1,730	1,18	0,295	0,000	0,000	0,295	0,342	0,000	0,000	0,342
0,086	0,200	0,00	0,426	0,698	2,846	0,902	0,000	1,732	1,36	0,330	0,000	0,000	0,330	0,362	0,000	0,000	0,362
0,136	0,300	0,00	0,539	0,632	2,925	0,893	0,000	1,735	1,58	0,397	0,000	0,000	0,397	0,399	0,000	0,000	0,399
0,197	0,400	0,00	0,692	0,567	3,043	0,881	0,000	1,739	1,84	0,505	0,000	0,000	0,505	0,456	0,000	0,000	0,456
0,273	0,500	0,00	0,907	0,503	3,210	0,863	0,000	1,744	2,15	0,678	0,000	0,000	0,678	0,546	0,000	0,000	0,546
0,374	0,600	0,00	1,216	0,440	3,436	0,841	0,000	1,752	2,51	0,954	0,000	0,000	0,954	0,686	0,000	0,000	0,686
0,512	0,700	0,00	1,674	0,378	3,741	0,812	0,000	1,760	2,93	1,403	0,000	0,000	1,403	0,905	0,000	0,000	0,905
0,713	0,800	0,00	2,392	0,317	4,157	0,776	0,000	1,773	3,51	2,167	0,000	0,000	2,167	1,253	0,000	0,000	1,253
1,023	0,900	0,00	3,587	0,259	4,735	0,732	0,000	1,788	4,34	3,562	0,000	0,000	3,562	1,841	0,000	0,000	1,841
1,245	0,950	0,00	4,501	0,230	5,111	0,707	0,000	1,796	4,88	4,707	0,000	0,000	4,707	2,299	0,000	0,000	2,299
1,541	1,000	0,00	5,768	0,202	5,568	0,679	0,000	1,806	5,65	6,389	0,000	0,000	6,389	2,931	0,000	0,000	2,931
1,943	1,050	0,00	7,584	0,174	6,134	0,648	0,000	1,816	6,49	8,951	0,000	0,000	8,951	3,848	0,000	0,000	3,848
2,512	1,100	0,00	10,311	0,147	6,850	0,613	0,000	1,829	7,76	13,077	0,000	0,000	13,077	5,241	0,000	0,000	5,241
3,358	1,150	0,00	14,651	0,121	7,787	0,575	0,000	1,842	9,64	20,191	0,000	0,000	20,191	7,500	0,000	0,000	7,500
4,708	1,200	0,00	22,167	0,095	9,074	0,532	0,000	1,857	12,41	33,852	0,000	0,000	33,852	11,308	0,000	0,000	11,308
7,086	1,250	0,00	36,774	0,070	10,962	0,482	0,000	1,874	16,96	63,748	0,000	0,000	63,748	19,069	0,000	0,000	19,069
12,031	1,300	0,00	71,724	0,046	14,101	0,422	0,000	1,895	26,41	148,095	0,000	0,000	148,095	37,650	0,000	0,000	37,650
26,371	1,350	0,00	197,100	0,024	20,706	0,346	0,000	1,923	51,75	535,824	0,000	0,000	535,824	107,479	0,000	0,000	107,478
58,756	1,380	0,00	571,372	0,012	31,042	0,284	0,000	1,945	109,29	2 141,057	0,000	0,000	2 141,055	306,671	0,000	0,000	306,670

Table 2 — Characteristic values of a tilting-pad bearing with four eccentrically (Ω_F^* = 0,6) supported tilting pads (Ω = 80°, $\varphi_{F,1}$ = 45°, K_P = 2, B^* = 0,5)

So	ε	β [°]	$p^*_{max} \cdot So$	h^*_{min}	F^*_f	Q^*_3	Q^*_P	Q^*_2	ΔT^*_{max}	c^*_{11}	c^*_{12}	c^*_{21}	c^*_{22}	d^*_{11}	d^*_{12}	d^*_{21}	d^*_{22}
0,000	0,000	0,00	0,443	0,664	2,789	1,572	0,000	1,542	1,07	0,473	0,000	0,000	0,473	0,459	0,000	0,000	0,459
0,025	0,050	0,00	0,481	0,643	2,792	1,572	0,000	1,542	1,14	0,477	0,000	0,000	0,477	0,461	0,000	0,000	0,461
0,051	0,100	0,00	0,522	0,622	2,803	1,570	0,000	1,544	1,23	0,486	0,000	0,000	0,486	0,468	0,000	0,000	0,468
0,106	0,200	0,00	0,623	0,582	2,844	1,567	0,000	1,545	1,42	0,528	0,000	0,000	0,528	0,496	0,000	0,000	0,496
0,166	0,300	0,00	0,752	0,540	2,916	1,561	0,000	1,546	1,64	0,605	0,000	0,000	0,605	0,545	0,000	0,000	0,545
0,234	0,400	0,00	0,925	0,496	3,016	1,544	0,000	1,553	1,91	0,728	0,000	0,000	0,728	0,621	0,000	0,000	0,621
0,320	0,500	0,00	1,159	0,450	3,164	1,533	0,000	1,556	2,25	0,920	0,000	0,000	0,920	0,735	0,000	0,000	0,735
0,440	0,600	0,00	1,491	0,402	3,381	1,527	0,000	1,556	2,65	1,222	0,000	0,000	1,222	0,902	0,000	0,000	0,902
0,595	0,700	0,00	1,982	0,352	3,666	1,512	0,000	1,560	3,14	1,707	0,000	0,000	1,707	1,150	0,000	0,000	1,150
0,819	0,800	0,00	2,751	0,300	4,066	1,494	0,000	1,564	3,77	2,533	0,000	0,000	2,533	1,529	0,000	0,000	1,529
1,164	0,900	0,00	4,056	0,246	4,649	1,474	0,000	1,567	4,81	4,052	0,000	0,000	4,052	2,134	0,000	0,000	2,134
1,412	0,950	0,00	5,059	0,219	5,042	1,463	0,000	1,568	5,45	5,296	0,000	0,000	5,296	2,623	0,000	0,000	2,623
1,737	1,000	0,00	6,449	0,192	5,527	1,449	0,000	1,571	6,18	7,103	0,000	0,000	7,103	3,316	0,000	0,000	3,316
2,175	1,050	0,00	8,424	0,166	6,132	1,434	0,000	1,573	7,14	9,848	0,000	0,000	9,848	4,311	0,000	0,000	4,311
2,791	1,100	0,00	11,376	0,140	6,905	1,416	0,000	1,576	8,33	14,237	0,000	0,000	14,237	5,801	0,000	0,000	5,801
3,700	1,150	0,00	16,040	0,115	7,920	1,395	0,000	1,580	10,23	21,778	0,000	0,000	21,778	8,167	0,000	0,000	8,167
5,133	1,200	0,00	24,049	0,091	9,305	1,372	0,000	1,583	13,00	36,003	0,000	0,000	36,003	12,305	0,000	0,000	12,305
7,634	1,250	0,00	39,539	0,067	11,327	1,343	0,000	1,588	17,56	67,340	0,000	0,000	67,340	20,207	0,000	0,000	20,207
12,774	1,300	0,00	76,100	0,045	14,616	1,308	0,000	1,594	27,05	154,291	0,000	0,000	154,291	39,597	0,000	0,000	39,597
27,474	1,350	0,00	205,321	0,024	21,403	1,264	0,000	1,601	52,69	555,053	0,000	0,000	555,052	109,234	0,000	0,000	109,234
60,147	1,380	0,00	584,387	0,012	31,725	1,228	0,000	1,607	107,13	2 152,788	0,000	0,000	2 152,785	321,212	0,000	0,000	321,212

Table 3 — Characteristic values of a tilting-pad bearing with four centrally (Ω_F^* = 0,5) supported tilting pads (Ω = 80°, $\varphi_{F,1}$ = 45°, K_P = 3, B^* = 0,5)

So	ε	β [°]	$p_{max}^* \cdot So$	h_{min}^*	F_f^*	Q_3^*	Q_P^*	Q_2^*	ΔT_{max}^*	c_{11}^*	c_{12}^*	c_{21}^*	c_{22}^*	d_{11}^*	d_{12}^*	d_{21}^*	d_{22}^*
0,000	0,000	0,00	0,373	0,782	2,821	1,349	0,000	1,664	1,02	0,342	0,000	0,000	0,342	0,257	0,000	0,000	0,257
0,021	0,050	0,00	0,409	0,750	2,825	1,349	0,000	1,664	1,10	0,344	0,000	0,000	0,344	0,258	0,000	0,000	0,258
0,043	0,100	0,00	0,450	0,718	2,836	1,347	0,000	1,664	1,17	0,353	0,000	0,000	0,353	0,262	0,000	0,000	0,262
0,088	0,200	0,00	0,548	0,655	2,881	1,342	0,000	1,666	1,35	0,388	0,000	0,000	0,388	0,279	0,000	0,000	0,279
0,139	0,300	0,00	0,677	0,593	2,958	1,332	0,000	1,668	1,54	0,452	0,000	0,000	0,452	0,309	0,000	0,000	0,309
0,198	0,400	0,00	0,848	0,532	3,072	1,320	0,000	1,671	1,76	0,554	0,000	0,000	0,554	0,355	0,000	0,000	0,355
0,270	0,500	0,00	1,082	0,472	3,229	1,303	0,000	1,675	2,04	0,711	0,000	0,000	0,711	0,424	0,000	0,000	0,424
0,363	0,600	0,00	1,411	0,413	3,439	1,283	0,000	1,680	2,40	0,954	0,000	0,000	0,954	0,525	0,000	0,000	0,525
0,487	0,700	0,00	1,892	0,355	3,719	1,258	0,000	1,686	2,86	1,341	0,000	0,000	1,341	0,679	0,000	0,000	0,679
0,664	0,800	0,00	2,627	0,299	4,093	1,229	0,000	1,693	3,45	1,983	0,000	0,000	1,983	0,921	0,000	0,000	0,921
0,929	0,900	0,00	3,826	0,244	4,603	1,195	0,000	1,701	4,32	3,128	0,000	0,000	3,128	1,324	0,000	0,000	1,324
1,116	0,950	0,00	4,729	0,217	4,932	1,176	0,000	1,706	4,96	4,054	0,000	0,000	4,054	1,625	0,000	0,000	1,625
1,359	1,000	0,00	5,960	0,190	5,328	1,155	0,000	1,711	5,69	5,385	0,000	0,000	5,385	2,052	0,000	0,000	2,052
1,686	1,050	0,00	7,703	0,164	5,814	1,133	0,000	1,716	6,67	7,390	0,000	0,000	7,390	2,658	0,000	0,000	2,658
2,141	1,100	0,00	10,283	0,139	6,428	1,108	0,000	1,722	8,03	10,579	0,000	0,000	10,579	3,553	0,000	0,000	3,553
2,808	1,150	0,00	14,332	0,114	7,230	1,081	0,000	1,729	10,02	16,050	0,000	0,000	16,050	4,930	0,000	0,000	4,930
3,851	1,200	0,00	21,191	0,090	8,323	1,051	0,000	1,737	13,13	26,193	0,000	0,000	26,193	7,403	0,000	0,000	7,403
5,655	1,250	0,00	34,402	0,066	9,932	1,017	0,000	1,745	18,22	48,319	0,000	0,000	48,319	12,108	0,000	0,000	12,108
9,329	1,300	0,00	65,317	0,044	12,599	0,979	0,000	1,754	28,06	109,751	0,000	0,000	109,751	23,143	0,000	0,000	23,143
19,717	1,350	0,00	174,369	0,023	18,175	0,933	0,000	1,764	54,67	386,812	0,000	0,000	386,812	63,618	0,000	0,000	63,617
42,609	1,380	0,00	493,091	0,012	26,726	0,896	0,000	1,772	110,73	1 476,149	0,000	0,000	1 476,147	185,825	0,000	0,000	185,825

Table 4 — Characteristic values of a tilting-pad bearing with four eccentrically (Ω_F^* = 0,6) supported tilting pads (Ω = 80°, $\varphi_{F,1}$ = 45°, K_P = 3, B^* = 0,5)

So	ε	β [°]	$p_{max}^* \cdot So$	h_{min}^*	F_f^*	Q_3^*	Q_P^*	Q_2^*	ΔT_{max}^*	c_{11}^*	c_{12}^*	c_{21}^*	c_{22}^*	d_{11}^*	d_{12}^*	d_{21}^*	d_{22}^*
0,000	0,000	0,00	0,482	0,695	2,767	2,044	0,000	1,530	1,07	0,448	0,000	0,000	0,448	0,345	0,000	0,000	0,345
0,024	0,050	0,00	0,521	0,671	2,770	2,044	0,000	1,530	1,15	0,450	0,000	0,000	0,450	0,347	0,000	0,000	0,347
0,049	0,100	0,00	0,565	0,648	2,780	2,043	0,000	1,530	1,24	0,459	0,000	0,000	0,459	0,351	0,000	0,000	0,351
0,100	0,200	0,00	0,671	0,599	2,822	2,041	0,000	1,530	1,43	0,497	0,000	0,000	0,497	0,370	0,000	0,000	0,370
0,157	0,300	0,00	0,809	0,549	2,895	2,037	0,000	1,530	1,66	0,564	0,000	0,000	0,564	0,402	0,000	0,000	0,402
0,223	0,400	0,00	0,993	0,498	3,004	2,032	0,000	1,531	1,90	0,673	0,000	0,000	0,673	0,451	0,000	0,000	0,451
0,304	0,500	0,00	1,243	0,446	3,158	2,025	0,000	1,530	2,19	0,841	0,000	0,000	0,841	0,523	0,000	0,000	0,523
0,408	0,600	0,00	1,603	0,392	3,371	2,018	0,000	1,529	2,63	1,105	0,000	0,000	1,105	0,626	0,000	0,000	0,626
0,547	0,700	0,00	2,130	0,338	3,664	2,009	0,000	1,528	3,16	1,524	0,000	0,000	1,524	0,786	0,000	0,000	0,786
0,742	0,800	0,00	2,937	0,284	4,063	1,995	0,000	1,528	3,83	2,215	0,000	0,000	2,215	1,048	0,000	0,000	1,048
1,031	0,900	0,00	4,239	0,232	4,614	1,975	0,000	1,528	4,74	3,438	0,000	0,000	3,438	1,482	0,000	0,000	1,482
1,233	0,950	0,00	5,214	0,207	4,970	1,962	0,000	1,529	5,32	4,420	0,000	0,000	4,420	1,805	0,000	0,000	1,805
1,495	1,000	0,00	6,535	0,182	5,400	1,949	0,000	1,530	6,06	5,828	0,000	0,000	5,828	2,256	0,000	0,000	2,256
1,844	1,050	0,00	8,399	0,157	5,927	1,932	0,000	1,531	7,05	7,933	0,000	0,000	7,933	2,902	0,000	0,000	2,902
2,327	1,100	0,00	11,149	0,133	6,589	1,914	0,000	1,533	8,41	11,266	0,000	0,000	11,266	3,846	0,000	0,000	3,846
3,029	1,150	0,00	15,432	0,109	7,446	1,892	0,000	1,535	10,41	16,930	0,000	0,000	16,930	5,320	0,000	0,000	5,320
4,119	1,200	0,00	22,653	0,086	8,603	1,867	0,000	1,538	13,28	27,451	0,000	0,000	27,451	7,877	0,000	0,000	7,876
5,988	1,250	0,00	36,430	0,064	10,283	1,837	0,000	1,541	18,27	50,254	0,000	0,000	50,254	12,726	0,000	0,000	12,726
9,759	1,300	0,00	68,399	0,043	13,015	1,801	0,000	1,545	27,87	112,309	0,000	0,000	112,309	24,491	0,000	0,000	24,491
20,316	1,350	0,00	179,949	0,023	18,692	1,755	0,000	1,550	55,61	397,952	0,000	0,000	397,952	64,243	0,000	0,000	64,243
43,289	1,380	0,00	498,175	0,012	27,286	1,715	0,000	1,555	112,94	1 521,926	0,000	0,000	1 521,923	182,322	0,000	0,000	182,322

Table 5 — Characteristic values of a tilting-pad bearing with four centrally ($\Omega_F{}^*$ = 0,5) supported tilting pads (Ω = 80°, $\varphi_{F,1}$ = 45°, K_P = 5, B^* = 0,5)

So	ε	β [°]	$p^*_{max} \cdot So$	h^*_{min}	F^*_f	Q^*_3	Q^*_P	Q^*_2	ΔT^*_{max}	c^*_{11}	c^*_{12}	c^*_{21}	c^*_{22}	d^*_{11}	d^*_{12}	d^*_{21}	d^*_{22}
0,000	0,000	0,00	0,463	0,722	2,837	2,019	0,000	1,582	0,97	0,348	0,000	0,000	0,348	0,184	0,000	0,000	0,184
0,019	0,050	0,00	0,502	0,693	2,840	2,018	0,000	1,582	1,03	0,350	0,000	0,000	0,350	0,186	0,000	0,000	0,186
0,039	0,100	0,00	0,546	0,663	2,849	2,017	0,000	1,582	1,12	0,357	0,000	0,000	0,357	0,188	0,000	0,000	0,188
0,079	0,200	0,00	0,652	0,606	2,887	2,012	0,000	1,584	1,27	0,384	0,000	0,000	0,384	0,198	0,000	0,000	0,198
0,124	0,300	0,00	0,787	0,549	2,952	2,003	0,000	1,586	1,48	0,435	0,000	0,000	0,435	0,216	0,000	0,000	0,216
0,175	0,400	0,00	0,965	0,493	3,047	1,990	0,000	1,589	1,70	0,515	0,000	0,000	0,515	0,245	0,000	0,000	0,245
0,236	0,500	0,00	1,204	0,437	3,177	1,974	0,000	1,593	2,02	0,638	0,000	0,000	0,638	0,287	0,000	0,000	0,287
0,313	0,600	0,00	1,532	0,383	3,350	1,953	0,000	1,597	2,39	0,825	0,000	0,000	0,825	0,349	0,000	0,000	0,349
0,414	0,700	0,00	2,004	0,329	3,580	1,928	0,000	1,603	2,88	1,117	0,000	0,000	1,117	0,441	0,000	0,000	0,441
0,552	0,800	0,00	2,710	0,277	3,885	1,898	0,000	1,610	3,56	1,592	0,000	0,000	1,592	0,584	0,000	0,000	0,584
0,755	0,900	0,00	3,835	0,226	4,300	1,863	0,000	1,618	4,50	2,423	0,000	0,000	2,423	0,816	0,000	0,000	0,816
0,895	0,950	0,00	4,666	0,201	4,567	1,843	0,000	1,623	5,19	3,085	0,000	0,000	3,085	0,988	0,000	0,000	0,988
1,075	1,000	0,00	5,785	0,177	4,888	1,822	0,000	1,628	5,97	4,025	0,000	0,000	4,025	1,228	0,000	0,000	1,228
1,313	1,050	0,00	7,356	0,153	5,286	1,799	0,000	1,634	7,14	5,441	0,000	0,000	5,441	1,549	0,000	0,000	1,549
1,639	1,100	0,00	9,647	0,129	5,783	1,773	0,000	1,640	8,59	7,634	0,000	0,000	7,634	2,043	0,000	0,000	2,043
2,110	1,150	0,00	13,188	0,106	6,433	1,746	0,000	1,646	10,68	11,328	0,000	0,000	11,328	2,807	0,000	0,000	2,807
2,833	1,200	0,00	19,100	0,084	7,323	1,715	0,000	1,653	13,92	18,208	0,000	0,000	18,208	4,077	0,000	0,000	4,077
4,063	1,250	0,00	30,378	0,062	8,632	1,679	0,000	1,661	19,50	32,932	0,000	0,000	32,932	6,504	0,000	0,000	6,504
6,516	1,300	0,00	56,299	0,041	10,786	1,639	0,000	1,669	30,08	73,179	0,000	0,000	73,179	12,099	0,000	0,000	12,099
12,626	1,350	0,00	146,038	0,022	14,877	1,584	0,000	1,680	59,35	246,790	0,000	0,000	246,790	32,334	0,000	0,000	32,334
27,843	1,380	0,00	402,270	0,011	21,987	1,547	0,000	1,686	116,92	941,968	0,000	0,000	941,967	90,403	0,000	0,000	90,403

Table 6 — Characteristic values of a tilting-pad bearing with four eccentrically ($\Omega_F^* = 0,6$) supported tilting pads ($\Omega = 80°$, $\varphi_{F,1} = 45°$, $K_P = 5$, $B^* = 0,5$)

So	ε	β [°]	$p^*_{max} \cdot So$	h^*_{min}	F^*_f	Q^*_3	Q^*_P	Q^*_2	ΔT^*_{max}	c^*_{11}	c^*_{12}	c^*_{21}	c^*_{22}	d^*_{11}	d^*_{12}	d^*_{21}	d^*_{22}
0,000	0,000	0,00	0,527	0,684	2,755	2,901	0,000	1,505	1,06	0,395	0,000	0,000	0,395	0,219	0,000	0,000	0,219
0,021	0,050	0,00	0,570	0,657	2,758	2,901	0,000	1,505	1,14	0,398	0,000	0,000	0,398	0,219	0,000	0,000	0,219
0,043	0,100	0,00	0,618	0,630	2,769	2,901	0,000	1,505	1,23	0,405	0,000	0,000	0,405	0,222	0,000	0,000	0,222
0,088	0,200	0,00	0,734	0,576	2,813	2,899	0,000	1,503	1,42	0,435	0,000	0,000	0,435	0,233	0,000	0,000	0,233
0,137	0,300	0,00	0,884	0,522	2,887	2,896	0,000	1,502	1,64	0,490	0,000	0,000	0,490	0,253	0,000	0,000	0,253
0,193	0,400	0,00	1,078	0,469	2,995	2,889	0,000	1,500	1,91	0,577	0,000	0,000	0,577	0,282	0,000	0,000	0,282
0,260	0,500	0,00	1,337	0,417	3,141	2,879	0,000	1,500	2,21	0,707	0,000	0,000	0,707	0,329	0,000	0,000	0,329
0,344	0,600	0,00	1,693	0,365	3,335	2,865	0,000	1,499	2,59	0,906	0,000	0,000	0,906	0,395	0,000	0,000	0,395
0,452	0,700	0,00	2,201	0,315	3,590	2,847	0,000	1,499	3,10	1,214	0,000	0,000	1,214	0,493	0,000	0,000	0,493
0,601	0,800	0,00	2,956	0,265	3,926	2,824	0,000	1,500	3,73	1,713	0,000	0,000	1,713	0,646	0,000	0,000	0,646
0,816	0,900	0,00	4,156	0,217	4,380	2,796	0,000	1,501	4,74	2,585	0,000	0,000	2,585	0,887	0,000	0,000	0,887
0,964	0,950	0,00	5,037	0,193	4,668	2,780	0,000	1,502	5,44	3,273	0,000	0,000	3,273	1,068	0,000	0,000	1,068
1,153	1,000	0,00	6,221	0,170	5,013	2,761	0,000	1,504	6,23	4,259	0,000	0,000	4,259	1,309	0,000	0,000	1,309
1,401	1,050	0,00	7,864	0,147	5,432	2,740	0,000	1,505	7,26	5,693	0,000	0,000	5,693	1,670	0,000	0,000	1,670
1,741	1,100	0,00	10,277	0,125	5,960	2,717	0,000	1,507	8,87	7,999	0,000	0,000	7,999	2,150	0,000	0,000	2,150
2,227	1,150	0,00	13,952	0,103	6,637	2,690	0,000	1,509	10,98	11,797	0,000	0,000	11,797	2,942	0,000	0,000	2,942
2,971	1,200	0,00	20,108	0,081	7,553	2,659	0,000	1,513	14,25	18,798	0,000	0,000	18,798	4,276	0,000	0,000	4,276
4,227	1,250	0,00	31,629	0,061	8,883	2,622	0,000	1,516	19,39	33,785	0,000	0,000	33,785	6,773	0,000	0,000	6,773
6,713	1,300	0,00	58,147	0,041	11,053	2,579	0,000	1,520	29,68	74,071	0,000	0,000	74,071	12,692	0,000	0,000	12,692
13,511	1,350	0,00	148,407	0,022	15,499	2,520	0,000	1,526	56,63	249,869	0,000	0,000	249,868	33,964	0,000	0,000	33,964
27,982	1,380	0,00	403,229	0,011	22,181	2,472	0,000	1,529	113,12	929,177	0,000	0,000	929,176	95,057	0,000	0,000	95,057

Table 7 — Characteristic values of a tilting-pad bearing with four centrally (Ω_F^* = 0,5) supported tilting pads (Ω = 80°, $\varphi_{F,1}$ = 45°, K_P = 2, B^* = 0,75)

So	ε	β [°]	$p^*_{max} \cdot So$	h^*_{min}	F^*_f	Q^*_3	Q^*_P	Q^*_2	ΔT^*_{max}	c^*_{11}	c^*_{12}	c^*_{21}	c^*_{22}	d^*_{11}	d^*_{12}	d^*_{21}	d^*_{22}
0,000	0,000	0,00	0,385	0,847	2,804	0,941	0,000	2,708	1,02	0,381	0,000	0,000	0,381	0,499	0,000	0,000	0,499
0,028	0,050	0,00	0,425	0,814	2,807	0,941	0,000	2,708	1,09	0,385	0,000	0,000	0,385	0,502	0,000	0,000	0,502
0,057	0,100	0,00	0,469	0,780	2,819	0,939	0,000	2,708	1,18	0,396	0,000	0,000	0,396	0,509	0,000	0,000	0,509
0,118	0,200	0,00	0,579	0,714	2,865	0,933	0,000	2,709	1,37	0,442	0,000	0,000	0,442	0,537	0,000	0,000	0,537
0,186	0,300	0,00	0,722	0,648	2,946	0,924	0,000	2,712	1,60	0,526	0,000	0,000	0,526	0,588	0,000	0,000	0,588
0,268	0,400	0,00	0,916	0,581	3,067	0,910	0,000	2,715	1,87	0,663	0,000	0,000	0,663	0,668	0,000	0,000	0,668
0,369	0,500	0,00	1,184	0,515	3,238	0,891	0,000	2,720	2,22	0,878	0,000	0,000	0,878	0,785	0,000	0,000	0,785
0,501	0,600	0,00	1,566	0,450	3,474	0,870	0,000	2,724	2,64	1,221	0,000	0,000	1,221	0,967	0,000	0,000	0,967
0,681	0,700	0,00	2,124	0,386	3,794	0,840	0,000	2,732	3,12	1,777	0,000	0,000	1,777	1,255	0,000	0,000	1,255
0,938	0,800	0,00	2,979	0,323	4,231	0,803	0,000	2,742	3,78	2,709	0,000	0,000	2,709	1,710	0,000	0,000	1,710
1,326	0,900	0,00	4,373	0,262	4,840	0,757	0,000	2,756	4,73	4,381	0,000	0,000	4,381	2,457	0,000	0,000	2,457
1,601	0,950	0,00	5,421	0,233	5,238	0,731	0,000	2,765	5,36	5,737	0,000	0,000	5,737	3,029	0,000	0,000	3,029
1,961	1,000	0,00	6,853	0,204	5,723	0,702	0,000	2,775	6,16	7,700	0,000	0,000	7,700	3,825	0,000	0,000	3,825
2,445	1,050	0,00	8,880	0,175	6,323	0,669	0,000	2,786	7,23	10,678	0,000	0,000	10,678	4,942	0,000	0,000	4,942
3,121	1,100	0,00	11,878	0,148	7,082	0,633	0,000	2,799	8,60	15,410	0,000	0,000	15,410	6,615	0,000	0,000	6,615
4,112	1,150	0,00	16,578	0,121	8,073	0,593	0,000	2,814	10,58	23,452	0,000	0,000	23,452	9,314	0,000	0,000	9,314
5,669	1,200	0,00	24,584	0,095	9,430	0,547	0,000	2,832	13,68	38,646	0,000	0,000	38,646	13,883	0,000	0,000	13,883
8,368	1,250	0,00	39,980	0,069	11,425	0,495	0,000	2,852	19,08	71,831	0,000	0,000	71,831	22,600	0,000	0,000	22,600
13,879	1,300	0,00	76,266	0,046	14,707	0,432	0,000	2,877	29,20	163,463	0,000	0,000	163,463	43,668	0,000	0,000	43,668
27,847	1,350	0,00	206,016	0,024	20,802	0,348	0,000	2,913	60,47	571,280	0,000	0,000	571,279	119,574	0,000	0,000	119,574
64,154	1,380	0,00	591,907	0,012	32,223	0,288	0,000	2,937	118,29	2 276,467	0,000	0,000	2 276,464	332,605	0,000	0,000	332,605