ELCEE

INDUSTRIAL COMPONENTS & ASSEMBLIES

PLAIN BEARINGS

ELCEE

Your partner for engineered components and assemblies, including castings, forgings, welded constructions, and plain bearings.

Transforming your (ball) bearing application into a maintenance-free plain bearing solution is the strength of ELCEE. With over 35 years of experience, ELCEE assists you with expert advice in the engineering, calculation and manufacturing of a solution that is specifically tailored to your needs. Technical support, quality control and supply chain management are standard services for all our products.

Your specifications, in your project, are the focus, during close cooperation. At 18 locations around the world, local ELCEE specialists make sure to find the best and most efficient fit to your design.

"Transfer your plain bearing application into a maintenance-free solution."

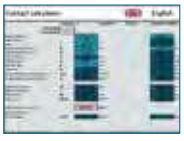
ENGINEERED PLAIN BEARINGS

In many situations, it is possible to transfer a lubricated bearing application, to lubricated bronze or a polymer plain bearing, resulting in a maintenance-free plain bearing solution.

ELCEE has the most complete assortment of composite bearings, bronze bearings and high alloy steel bearings. Knowledge and experience resulted in ELCEE brands: Tribo Top®, Tribo Steel®, Tribo Bronze®, Tribo Oiled® and Tribo Ball® plain bearings. In addition to engineered bearings, ELCEE is also the official distributor and knowledge partner for igus® and Wärtsilä® seals & bearings in the Benelux market.

PROCESS VISUALISATION

1 APPLICATION



2 CALCULATION

3 LAB VALIDATION

4 ENGINEERED DESIGN

5 FIELD VALIDATION

6 FINAL PRODUCT

Tribo Top®

Composite plain bearings

1. Self-lubricating
2. Ideal for eccentric loads
3. Shockproof
4. Maritime certifications
5. Standard dimensions + special design

Bronze

Bronze bearings

1. Good availability of basic material
2. High permissible PV
3. High admissible surface pressure
4. Minimum clearance
5. Special design

Tribo Steel®

Alloy steel bearings

1. Low maintenance
2. Very high loads and extreme conditions
3. Wear-resistant
4. Very high accuracy
5. Special design

Tribo Bronze®

Bronze bearings with permanent lubricants

1. Self-lubricating
2. High permissible PV value
3. High permissible surface pressure
4. Minimum clearance
5. Special design

Tribo Oiled®

Sintered bearings impregnated with oil

1. Self-lubricating
2. Suitable for high speeds
3. Low friction at high speeds
4. Minimum clearance
5. Standard dimensions + special design

iglidur®

Polymer plain bearings

1. Self-lubricating
2. High temperature resistance
3. Shockproof
4. Chemical resistant & FDA-compliant
5. Standard dimensions + special design

ENGINEERED PLAIN BEARINGS

Brand	Material name	Specific weight g/cm³	Static radial load MPa	Static axial load MPa	Dynamic radial load MPa	Dynamic axial load MPa	PV value, self-lubricating N/mm² * m/s	PV value, external lubrication N/mm² * m/s	Coefficient of friction, self-lubricating
Tribo Top®	Tribo Top® L7M	1.30	375	150	110	44	0.23	0.57	0.15 - 0.18
	Tribo Top® L7G	1.30	375	150	110	44	0.23	0.57	0.13 - 0.15
	Tribo Top® L15M	1.30	375	150	110	44	0.57	0.57	0.04
	Tribo Top® L2Marine	1.30	375	150	110	44	0.21	0.57	0.13 - 0.15
	Tribo Top® L10KG	1.30	510	200	127	50	0.23	0.57	0.18 - 0.20
	Tribo Top® OCS	1.58	117	93	34	17.50	n.a.	o.r.	n.a.
	Tribo Top® WCS-01	1.34	80	80	20	-	n.a.	o.r.	0.10
	H-Liner® M	1.30	350	-	80	-	1	o.r.	0.05 - 0.10
	H-Liner® S	1.60	400	-	140	-	1	o.r.	0.06 - 0.12
	H-Liner® S1	1.60	400	-	140	-	1	o.r.	0.03 - 0.09
	H-Liner® SHT	1.10	350	-	80	-	2.50	o.r.	0.02 - 0.06
Tribo Steel®	PEL®	7.84	300	300	100	100	n.a.	o.r.	n.a.
	PEL® BH	7.84	450	450	200	200	n.a.	o.r.	n.a.
	PEL® L	7.84	650	650	o.r.	o.r.	n.a.	n.a.	n.a.
	PEL® HP	7.84	300	300	120	120	n.a.	o.r.	n.a.
	PEL® NFG	7.84	300	300	100	100	n.a.	o.r.	n.a.
	PEL® T	7.84	200	200	100	100	n.a.	-	n.a.
	FAM	7.88	300	300	50	50	-	-	o.r.
Tribo Oiled®	Sintered bronze	6.40 - 6.80	20	20	10	10	2.50	n.a.	o.r.
	Sintered iron	5.80	45	45	8	8	2.50	n.a.	o.r.
Bronze	CuSn7Zn4Pb7	8.80	87	87	40	40	n.a.	3	n.a.
	CuSn12	8.70	93	93	50	50	n.a.	3	n.a.
	CuAl10Fe5Ni5	7.60	217	217	93	93	n.a.	3	n.a.
	CuAl11Fe6Ni6	7.60	250	250	127	127	n.a.	3	n.a.
	CuZn25Al5Mn4Fe3	8.20	250	250	160	160	n.a.	3	n.a.
Tribo Bronze®	Tribo Bronze® 172	8.80	250	250	130	130	1.50	o.r.	0.14 - 0.20
	Tribo Bronze® 105	8.80	230	230	115	115	1.50	o.r.	0.12 - 0.18
	Tribo Bronze® 701	8.80	80	80	50	50	0.50	o.r.	0.25 - 0.45
	Tribo Bronze® 125	8.80	110	110	55	55	0.80	o.r.	0.28 - 0.50
	CuAl10Fe5Ni5+SL4 Dots	7.60	215	215	93	93	2.05	o.r.	0.20
	CuZn25Al5Mn4Fe3+GR Dots	8.20	250	250	160	160	2.50	o.r.	0.20
iglidur®*	iglidur® G	1.46	80	80	o.r.	o.r.	0.42	o.r.	0.08 - 0.15
	iglidur® J	1.49	35	35	o.r.	o.r.	0.34	o.r.	0.06 - 0.18
	iglidur® M250	1.14	20	20	o.r.	o.r.	0.12	o.r.	0.18 - 0.40
	iglidur® W300	1.24	60	60	o.r.	o.r.	0.23	o.r.	0.08 - 0.23
	iglidur® X	1.44	150	150	o.r.	o.r.	1.32	o.r.	0.09 - 0.27

* Contact ELCEE for the complete range of iglidur® / ** High temperature on request

o.r. = on request / n.a. = not applicable / Low maint. grease = Low maintenance grease

The above values are nominal and intended to be used as a guide only.

Coefficient of friction, external lubrication	Min. operating temperature °C	Max. operating temperature °C	Max. operating temperature, short term °C	Thermal expansion coefficient (normal) x10-5 / °C	Thermal expansion coefficient (parallel) x10-5 / °C	Max. moisture absorbtion at saturation %	Hardness	System	Assortment
o.r.	-40	70	130	-	-	< 0.15	100Rockwell M	Solid Lubricants	Standard + special
o.r.	-40	70	130	-	-	< 0.15	100Rockwell M	Solid Lubricants	Special
o.r.	-40	70	130	-	-	< 0.15	100Rockwell M	Solid Lubricants	Special
o.r.	-40	70	130	-	-	< 0.15	100Rockwell M	Water lubricated	Special
o.r.	-40	150	200	-	-	< 0.5	100Rockwell M	Solid Lubricants	Special
o.r.	-40	100	120	2.60	1.70	1	48Rockwell M	Oil lubricated	Special
o.r.	-40	130	130	-	-	0.20	70Rockwell M	Water lubricated	Special
o.r.	-40	130	-	-	-	0.07	75 HRM	Solid Lubricants	Special
o.r.	-40	160	-	0.70	-	0.16	-	Solid Lubricants	Special
o.r.	-40	160	-	0.70	-	0.16	-	Solid Lubricants	Special
o.r.	-40	285	-	0.20	-	0.16	-	Solid Lubricants	Special
o.r.	-40	250	300	1.10	1.10	n.a.	-	Low maint. grease	Special
o.r.	-40	250	300	1.10	1.10	n.a.	-	Low maint. grease	Special
o.r.	-40	250	300	1.10	1.10	n.a.	-	Low maint. grease	Special
o.r.	-40	250	300	1.10	1.10	n.a.	-	Low maint. grease	Special
o.r.	-40	250	300	1.10	1.10	n.a.	-	Low maint. grease	Special
o.r.	-40	250	300	1.10	1.10	n.a.	-	Low maint. grease	Special
o.r.	-40	380	380	-	-	n.a.	-	Low maint. grease	Special
o.r.	-20	120	120	1.80	1.80	n.a.	35 HB	Oil lubricated	Standard + special
o.r.	-20	120	120	1.20	1.20	n.a.	40 HB	Oil lubricated	Standard + special
0.20	-20	130 **	130 **	1.85	1.85	n.a.	70 HB	Grease lubricated	Special
0.20	-20	130 **	130 **	1.85	1.85	n.a.	90 HB	Grease lubricated	Special
0.20	-20	130 **	130 **	1.70	1.70	n.a.	150 HB	Grease lubricated	Special
0.20	-20	130 **	130 **	1.70	1.70	n.a.	185 HB	Grease lubricated	Special
0.20	-20	130 **	130 **	2	2	n.a.	190 HB	Grease lubricated	Special
o.r.	-100	250	280	1.80	1.80	n.a.	50 HB	Solid Lubricants	Special
o.r.	-100	250	350	1.80	1.80	n.a.	65 HB	Solid Lubricants	Special
o.r.	-50	650	650	1.30	1.30	n.a.	80 HB	Solid Lubricants	Special
o.r.	-200	450	450	1.60	1.60	n.a.	40 HB	Solid Lubricants	Special
o.r.	-50	80	-	1.70	1.70	n.a.	150 HB	Solid Lubricants	Special
o.r.	-50	250	-	2	2	n.a.	190 HB	Solid Lubricants	Special
o.r.	-40	130	220	-	-	4	81 Shore D	Solid Lubricants	Standard + special
o.r.	-50	90	120	-	-	1.30	74 Shore D	Solid Lubricants	Standard + special
o.r.	-40	80	170	-	-	7.60	79 Shore D	Solid Lubricants	Standard + special
o.r.	-40	90	180	-	-	6.50	77 Shore D	Solid Lubricants	Standard + special
o.r.	-100	250	315	-	-	0.50	85 Shore D	Solid Lubricants	Standard + special

PLAIN BEARINGS

BACKGROUND AND TECHNICAL INFORMATION

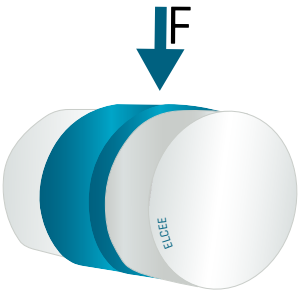
Choosing the correct material for your plain bearing, there are a few factors to consider.

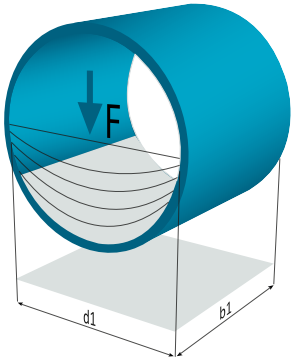
1. PLAIN BEARING LOAD (P)

The first step in selecting and choosing the right plain bearing for your application is to determine the plain bearing load (surface pressure). This is a ratio of the load to the projected surface and is expressed as surface pressure (P) in MPa (equal to N/mm²).

Radial load:
Calculate the forces acting at right angles to the shaft of the plain bearing:

$$P = \frac{F}{(d1 \times b1)}$$





Axial load:
Calculate the longitudinal forces acting on the pivot ring or the bearing flange:

$$P = \frac{F}{(d2^2 - d1^2) \times (\pi/4)}$$

F = load (N) d1 = bearing inner diameter (mm) b1 = bearing length (mm) d2 = bearing outer diameter (mm)

For more information about plain bearing calculations please contact ELCEE.

2. SPEED (V)

In addition to the plain bearing load, the surface speed between the two sliding surfaces is very important. Calculate all movements back to a value of metres per second. This results in the peripheral speed of the shaft.

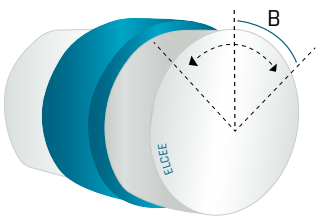
Rotary movement:
Convert a rotating movement from revolutions per minute (RPM) to metres per second:

$$v = \frac{(n \times d1 \times \pi)}{(60 \times 1000)} \left[\frac{m}{s}\right]$$

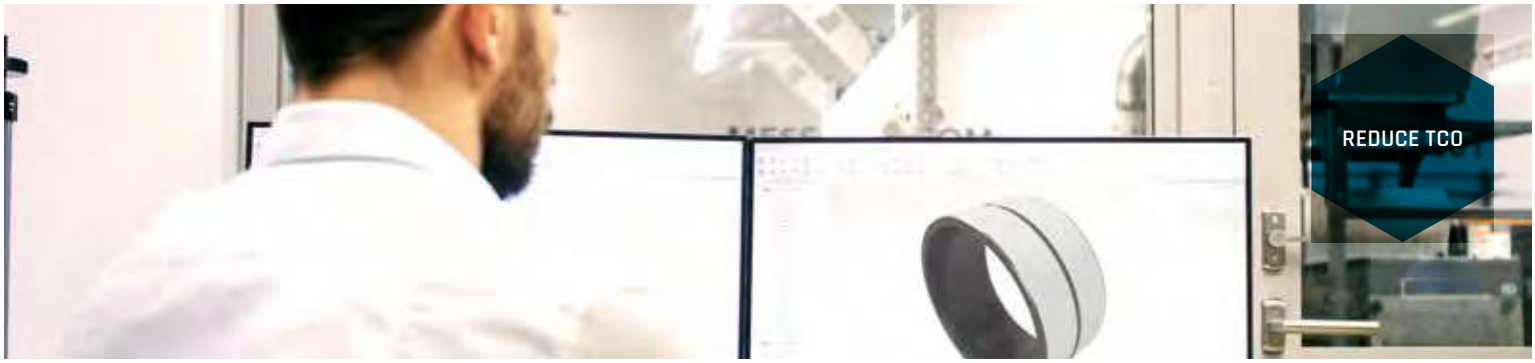
n = rotational speed (rpm) d1 = shaft diameter (mm)

Swivel motion:
For swivel motion the average speed is decisive.

$$v = d1 \times \pi \times \frac{(2 \times ß)}{360} \times \frac{f}{1.000} \left[\frac{m}{s}\right]$$

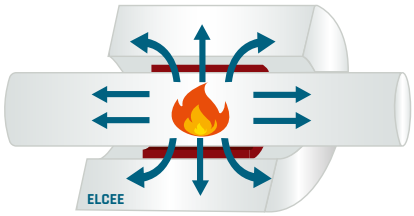


d1 = shaft diameter (mm) ß = swivel angle (°) f = frequency per second



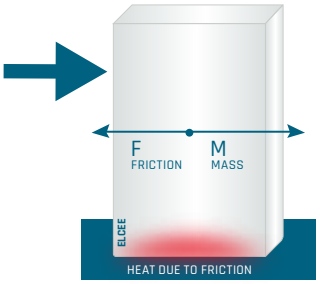
3. PV VALUE

The product of surface pressure (P) and speed (V) results in the PV value of the application. This is an indication of the heat development through friction in the bearing and is therefore an important parameter in selecting a suitable bearing material.



When selecting the material combination, the actual PV value in the plain bearing system must be compared with the permissible PV value for the selected material combination. The permissible PV value is derived from a combination of:

1. **Materials applied**
   The hardness, surface roughness and the thermal conductivity of the bearing, housing and shaft material have a direct influence on the friction and wear of the plain bearing and are therefore of great importance for the proper functioning of the plain bearing system.
2. **Coefficient of friction (friction value)**
   The coefficient of friction is a dimensionless number that expresses the relationship between a load and the force (energy) required to move the load.
3. **Permissible temperature**
   The difference between the maximum temperature and the ambient temperature is decisive.
4. **Operating time**
   If the system is not in continuous operation, the ratio of the operating time to downtime can positively influence the permissible PV value.



4. PLAIN BEARING SYSTEMS

Once the PV value has been determined, a number of suitable materials remain for the plain bearing, which can be divided into one of the following plain bearing systems. Which material you ultimately choose depends on the system you prefer.

Self-lubricating systems
These plain bearings function without the addition of external lubricants.
1. Solid lubricants: plain bearings incorporating solid lubricants such as graphite or molybdenum. Here the lubricants are spread homogeneously through the material or added by means of lubricating plugs.
2. Oil-lubricated: in these plain bearings, oil is integrated in the porous material of the bearing. The oil is released when the shaft reaches a certain speed. At standstill, the oil draws back into the material.

Lubricated systems
Plain bearings that only function with the addition of external lubricants.
3. Grease lubricated: plain bearings equipped with lubrication grooves which distribute lubricant evenly over the running surface. The external lubricant is introduced through lubrication points in the housing or via the shaft.
4. Grease lubricated low-maintenance: these are plain bearings that are optimised in holding the externally added lubricant through lubrication pockets in the running surface. As a result, the lubrication interval can be significantly reduced.
5. Water/oil lubricated: with these plain bearings, running in water or oil, a lubricating film is formed between the running surfac and the shaft. This has a friction-reducing and cooling effect. These plain bearings are suitable for higher shaft speeds.

GET IN TOUCH

Reach out to your local contact person. We are pleased to supply you with best-cost components and assemblies to optimise your production process.

www.elcee.com

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