KMP

DESIGN & TECHNICAL HANDBOOK

CUSTOMIZED BEARING SOLUTIONS

At KMP, we understand the dynamic nature of challenges faced in bearing applications, and take great pride in providing customized solutions for the full range of fluid film bearings, in addition to our comprehensive catalogue range.

Our customized high performance bearings are designed for specific applications and operating conditions, with optimum profiles, relative radial and axial bearing clearances, best preload values, offset parameters, maximum permissible wearing limits, most compatible rotor shaft tolerances and tribological parameters.

The dynamic characteristics (stiffness & damping, power loss, maximum temperature rise etc.) of each KMP bearing are precisely worked out for it's full range of loads, speeds, and other variable operating conditions using a dedicated software. This data is provided to the customer for operating conditions, and any other specific values that may be required for rotor dynamic analysis.

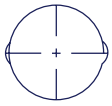
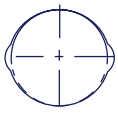
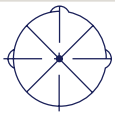
TECHNICAL SERVICES

1. **Customized design for critical applications**
2. **Modification & upgradation of old drawings**
3. **Import-substitution and indigenization of bearings**
4. **Troubleshooting and failure analysis**

CONSULTANCY

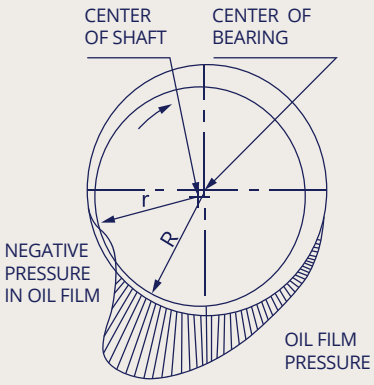
1. **Selection of bearing alloys and backing materials for specific applications**
2. **Optimization of performance and life of bearings**
3. **Tribology and Lubrication**
4. **Fitment, assembly & commissioning of bearings**
5. **Preventive maintenance**

GENERAL SELECTION CRITERIA

PROFILE RADIAL BEARINGS	SURFACE SPEEDS	SPECIFIC LOAD	STIFFNESS CHARACTERISTICS	DAMPING CHARACTERISTICS	COMPARATIVE COST SCALE 1-X
 CYLINDRICAL	0...30 (35) m/s	0.2...4.5 (5) MPa	★★	★★★	1 X
 LEMON BORE	25...65 (70) m/s	0.2...3.5 (4) MPa	★★	★★★★	2 X
 THREE LOBE	30...90 (95) m/s	0.1...3.0 (5) MPa	★★★	★★★	3 X
 OFFSET SPLIT	20...70 (90) m/s	0.2...3.5 (4.0) MPa	★★★	★★★★	3 X
 FOUR LOBE	30...100 m/s	0.1...2.0 (2.5) MPa	★★★	★★★	4 X
 FOUR SHOE (TILT PADS)	30...100 m/s	0...2.5 (3.0) MPa	★★★★	★★★★	4.5 X
 FIVE SHOE (TILT PADS)	30...100 (120) m/s	0...3.0 (3.5) MPa	★★★★	★★★★★	5 X
PLAIN THRUST FACE					
 AXIAL THRUST	0...30 m/s (mean)	up to 5.0 MPa	★★	★★	1 Y
 TAPER LAND THRUST FACE	20...70 m/s (mean)	up to 1.7 MPa	★★	★★★	2.5 Y
 TILT PADS (NON EQUALIZING)	30...100 m/s (mean)	up to 3.5 MPa	★★★	★★★	4 Y
 TILT PADS (PRESSURE EQUALIZING)	30...100 m/s (mean)	up to 4.5 MPa	★★★	★★★★	6 Y

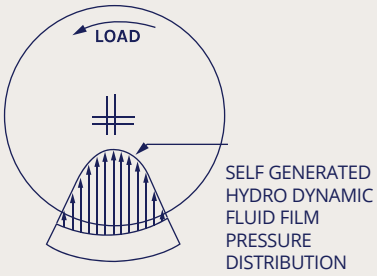
LUBRICATION

HYDRODYNAMIC LUBRICATION



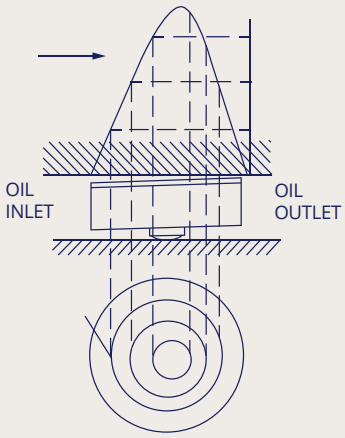
RADIAL BEARING

PEAK PRESSURE ZONE & PRESSURE HILL OF WEDGE FILM



AXIAL THRUST

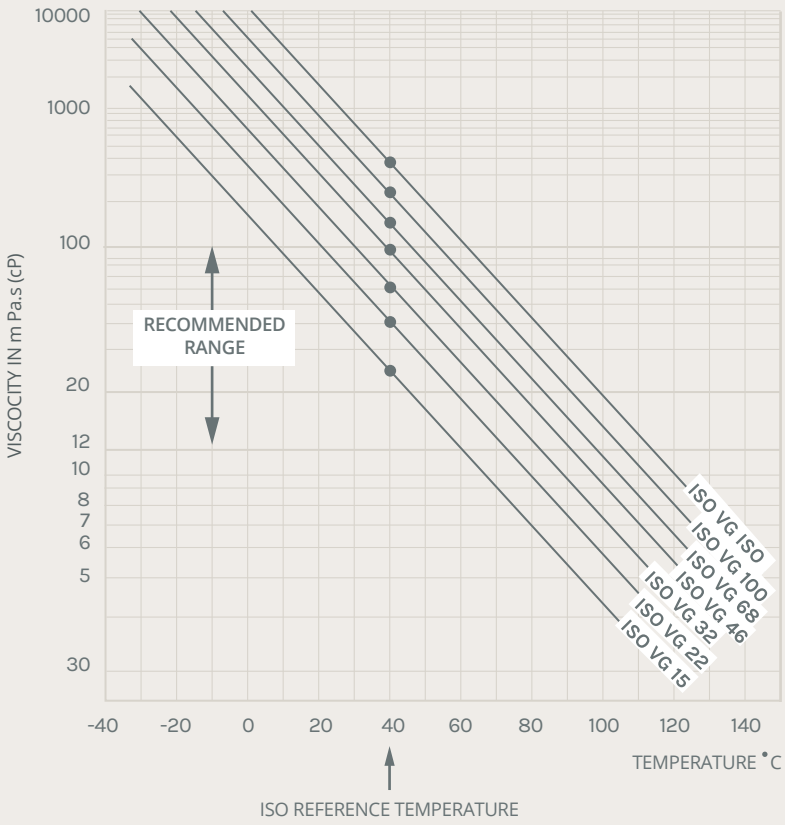
PRESSURE DISTRIBUTION IN SLIDING DIRECTION



NORMAL SELECTION

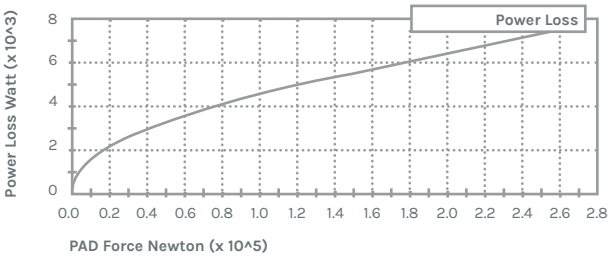
SPECIFIC LOAD (N/mm2)	RECOMMENDED ISO VG GRADE FOR SURFACE SPEED = (m/s)				
	...3	>3...10	>10...25	>25...50	> 50
...1.25	68	46	46	32	32
>1.25...2.5	100	68	46	46	32
>2.5	150	100	68	46	46

VISCOSITY

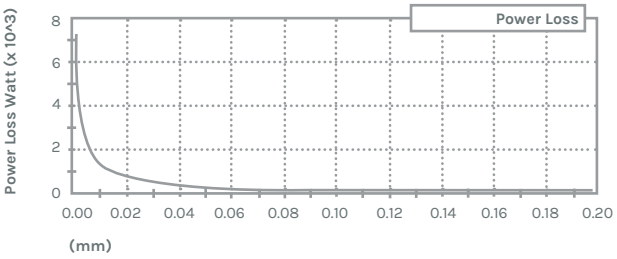


MATRICES

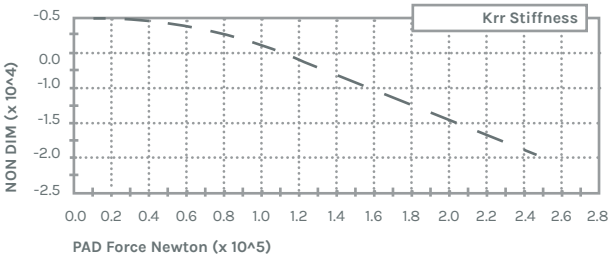
PAD FORCE VS POWER LOSS



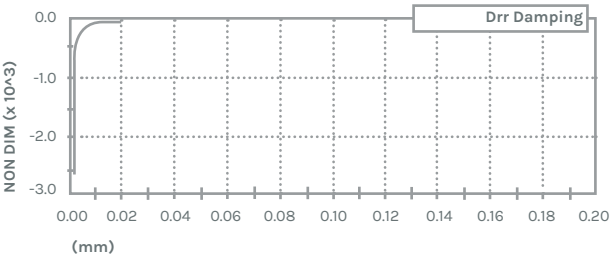
MIN FILM THICKNESS VS POWER LOSS



LOAD VS STIFFNESS



MIN. FILM VS DAMPING



Heading

5-PAD TILTING PAD BEARING MODELED with 60 Deg. Pad Arc CENTRALLY PIVOTED
LOAD-ON-PAD WITH PAD PIVOT LOCATION AT 270 DEGREE FROM +X AXIS.
Input: 1 - Diameter, 2-LENGTH, 3-SPEED, 4-CLEARANCE, 5-Pad Thickness

Diameter:	1.000000E +002	Length:	4.000000E +001	# Pivot Clearances:	50
Pad Angle:	6.000000E +001	Piv. Angle:	3.000000E +001	Rens:	6.894758E-003
Clearance:	2.000000E -001	Rotational:	8.000000E +003		

Ort Angle:	0.000000E +00	Grv. Angle:	1.200000E +001	Load Angle:	2.700000E +002
Clearance:	2.000000E -001	Load:	5.000000E +002	Preload:	1.000000E -001
Speed:	8.000000E +003	Vis.Rens:	0.000000E +000	Gamma:	0.000000E +000

Case 1 of 5 No. of pads: 5 Full Matrix 3-D View

< > + - Lubricant Run OK Cancel Help

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       *** INCOMPRESSIBLE  HYDRODYNAMIC  THRUST  BEARING ANALYSIS ***
           Interpolation Routine      *** THR-POST ***   [V6.0G1]
           ========================================================
 Operating C ------>  0.029934  (mm)   | Min.Film Thick.-->  0.017444  (mm)
 Load Capacity --->  3.000E+04 (N)     | Power-Loss   ---->  8.247E+03 (Watt)
 Max. Pressure --->  7.409E+06 Pascal | Side-Leakage QF ->  4.556E+00 (L/min)
|-------------------------------------|      through ID ->  1.137E+00 (L/min)
                                      |      through OD ->  3.419E+00 (L/min)
 Supply-Oil Temp.>     49.997 (Deg.C) | Inlet-Flow   QI -> -1.366E+01 (L/min)
 Supply Flow Rate>  2.500E+01 (L/min) |>Max. Reynolds # ->  2.000E+02
 Film-Temp ------>     70.900 (Deg.C) |-------------------------------------|
 Viscosity ------>  1.180E-02 (Pa-Sec)|> A  X  I  A  L
 Groove Temp. --->     58.806 (Deg.C) |  Stiffness (Newton/m)   = 3.099E+09
 Max. Temp. ----->     82.994 (Deg.C) |  Damping (Newton-Sec/m) = 1.940E+06
|-------------------------------------|-------------------------------------|
 Max.Shear Stress=  3.376E+04 (Pascal)|  Sommerfeld Number =  9.753E+00
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BUILD YOUR OWN BEARING

DESIGN DATASHEET

1. Application .....

2. Preferred Type/Design of Bearing .....

3. Shaft size .....

4. Any constraint of L/D Ratio .....

5. Thrust Faces and Thrust Collar size .....

6. Housing Detail or constraint for overall size .....

7. Operating Data:

    Radial & Axial Loads .....

    Load Vectors .....

    Speeds Normal, MCS and Maximum .....

    Ambient Temperature .....

    Working Environment of Bearing .....

8. Lubrication Detail

    Flooded or Directed .....

    Oil Flow Pressure, Volume (rate), Inlet Temp .....

    Oil Grade (constraint if any) .....

9. Material of Shaft & Housing .....

10. Any other information the Customer may like to share .....

* Kindly send all duly filled forms to metal@kmpbearings.com
  for our specialized solutions

INFORMATION FOR FAILURE ANALYSIS

Machine Identification	Name, model Functional details Other relevant data/description
Operating Speed	Normal Speed Runaway Speed Variable Speed
Load	Value/Nature of Load
Vibration	Level/frequency of vibrations
Alignment	X, Y, Z Axes
Bearing Temperatures	Temp vs speed Temp vs time Temp vs load
Corrosive Influence	Chemical, environmental, electrical
Mechanical Connections	Connected equipment Mode of connection
Failure Symptoms	Smoke Rapid temp rise Change in noise level Vibrations
Bearing Life	Actual vs estimated
Maintenance	Preventive or corrective Maintenance before failure
Lubricant	Grade, temp, pressure, quantity/flow rate condition, filtration details, impurity level
Bearing Environment	Ambient temp. & other bearing environment conditions
History	History of earlier or similar failures, if available.

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