Vertical Bearings
AV, LV & V Series
About Us

As the inventor of the hydrodynamic bearing over 100 years ago, Michell Bearings has continued to develop its products to meet the changing needs of industry.

The company’s in-house design engineers work alongside its specialist manufacturing team in the UK to provide customers with high quality, innovative hydrodynamic white metal and PTFE lined bearings serving a range of industrial, commercial marine and naval markets.

In order to support critical applications in industries where products are required to meet stringent specifications and perform in demanding environments, Michell Bearings has developed a range of unique performance software tailored to its products. This provides more accurate and reliable performance predictions than with any other commercially available software. Results from the software, which are backed up by years of product research and development testing, give customers peace of mind and confidence in Michell Bearings ability to deliver safe and reliable bearing solutions.

Overview of Vertical Bearings

Michell Bearings’ vertical bearings (AV, LV and V Series) have been designed and developed as fully self-contained, general purpose, modular assemblies to meet customer’s requirements.

Applications

Typical applications for vertical bearings include:

- Vertical pumps
- Vertical motors and generators
- Hydro applications

Common end user applications include:

- Nuclear power generation
- Fossil power generation
- Hydro power generation
- Desalination
- Irrigation
- Oil and gas industry

For special applications, and where the preference is for the bearing internals to be positioned within the casing of the machine, Michell Bearings can offer bespoke bearing internal solutions and special self-contained bearing designs.

Technical Features of Vertical Bearings

Application of polytetrafluoroethylene (PTFE) material for AV and LV ranges

- Michell Bearings introduced PTFE lined bearing designs into its portfolio of products in 1995
- Since then the company has built up a sizeable reference list covering a wide variety of rotating machine applications
- The AV10 bearing and sizes upward, and also the complete LV range, can be supplied with PTFE lined thrust pads, allowing the bearing to operate with increased axial thrust capacity when compared with white metal pads
- The increased thrust capacity of PTFE bearings can allow a smaller bearing frame size to be used and therefore lower power losses due to reduced sliding speeds on smaller diameters
- The use of PTFE can also eliminate the need for high pressure oil lift (jacking) in the lower thrust face
- Both of these points have considerable cost benefits for both the OEM and the end user

Insulation

- Michell Bearings standard method of electrically insulating bearings is to insulate the baseplate, cooling connections and instrumentation
- If there is a special requirement, the bearings can also be insulated at the thrust collar (AV and LV Series only).

Sealing

The Vertical Bearing range can be provided with sealing suitable for prevention against the ingress of water, dust or foreign particles, to meet IP ratings and therefore making them suitable for outdoor applications.

There are various options available including:

- A flange and a felt seal arrangement can be fitted to the top and bottom of the bearing to give protection against the ingress of foreign matter
- Rubber sealed oil seals can also be fitted
- Where suction pressures at the machine side of the bearing are high, a separate seal assembly for pressure compensation is used

Cooling

The Vertical Bearing range offers three types of cooling methods:

- Water cooling using high performance cooling coils available in cupro nickel, stainless steel or titanium
- Circulating oil using an external lubrication system
- Pressure oil lift (jacking) in the lower thrust face

For the AV and V Series only

- Where conditions allow, air cooling can be considered, either natural air or fan cooled

The choice depends on a number of factors, such as water availability at site, water composition, operational duty and specification requirements.

Instrumentation

All instrumentation can be physically supplied or provision made in the design and can either be compliant to end user specification or our own standard design. Examples include:

- Temperature measurement – oil bath and whitemetal surfaces using a combination of the following methods:
  - Dial type thermometer for local measurement
  - Resistance temperature detector (RTD) or thermocouples for remote measurement
- Use of thermowells to facilitate the replacement of instruments without the need to dismantle the bearing
- Provision for vibration or shaft displacement measurement
- Oil level float switches for monitoring the bearing oil level

Load carrying components

- Downward thrust loads are normally supported with offset pivoted whitemetal (babbitt) lined thrust pads positioned below the bearing thrust collar for a principal direction of rotation
- For bi-directional operation, centre pivoted whitemetal (babbitt) lined thrust pads are used
- Radial loads are supported on eight centre pivoted whitemetal (babbitt) lined journal (guide) pads

Non-standard features

- Mechanical load equalisation of the lower thrust face
- Load measurement using load cells
- Any other customer or specification specific requirements

Technical documentation

With every order Michell Bearings will provide:

- A detailed arrangement drawing
- An Operating and Maintenance Instruction Manual
- A comprehensive bearing performance prediction including:
  - Oil viscosity grade
  - Thrust and journal pad geometry
  - Minimum oil film thickness
  - Maximum pad operating temperatures
  - Power losses
  - Bearing oil bath temperature
- Cooling requirement

Basic information required at enquiry stage:

- Project details
- Quantity of bearings
- Shaft diameter
- Axial loading data including shaft rotor weight
- Radial loading data
- Speed ranges, directions and durations
- Preferred cooling type
- Preferred oil type
- Water/oil inlet temperature

Non-standard features
**Advanced Vertical (AV) Bearings**

**Overview of the AV Bearing**

The Michell Bearings Advanced Vertical Bearing, known as the AV Series, has been designed and developed as a self-contained, general purpose, standard assembly range of vertical thrust and guide bearings. This standard economical range has been designed to meet the requirements of original equipment manufacturers (OEM).

**Key features:**
- Nine bearings frame sizes
- Shaft diameter range of 68mm to 411mm
- Axial load capacity up to 738kN
- Three standard configurations of shaft diameters (N, L and XL) are available in each frame size, which allows the most compact and cost-effective bearing to be selected for a given shaft diameter
- Available with water cooling, circulating oil cooling or fan/air cooling

**Selection Criteria**

Selecting one option from the following headings will provide Michell Bearings with an understanding of the product you require. However, we are more than happy to work with you on creating a bespoke product to meet your needs; if this is the case please contact us.

**Type of bearing**
- AV (advanced vertical)

**Frame size**
- From 6 to 14

**Shaft details**
- N – normal
- L – large
- XL – extra large

**Thrust surface**
- S – single thrust face for downward thrust loads only
- D – double thrust face for axial loads in either direction
- B – single downward thrust with an upward plain whitemetal location face for upward transient loads

**Cooling**
- T – water cooled (number of tubes)
- C – circulating oil
- F – fan cooled

**Example:**
- An AV with frame size 12 with a single thrust face, normal shaft and water cooled – AV12 SN/BN/DN

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**Technical Information**

**AV Series Capacity**

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**Notes:**
1. For straight through unstepped shafts the maximum shaft diameter should be taken from Column 'D'
2. Higher thrust loads can be accommodated. Please consult Michell Bearings for requirements such as API 610
3. High pressure lift (jacking) for whitemetal pads or PTPE can be provided for applications with starting loads higher than those in Column 'F'
4. Maximum closed valve loads are for guidance only and should be confirmed by Michell Bearings
5. Maximum radial load will vary, depending upon speed and oil viscosity
6. Upper thrust load can only be accommodated on bearings with optional surge or upper thrust face
7. The maximum speed varies with running thrust load, the grade of oil used and the water inlet temperature
8. All loads are based on whitemetal surfaced pads.
Large Vertical (LV) Bearings

Overview of the LV Bearing

The Michell Bearings Large Vertical Bearing, known as the LV Series, has been designed and developed as a fully self-contained, general purpose, standard assembly to meet customer's requirements. This series is a modular range of high capacity vertical shaft thrust and guide bearings, applicable where the thrust loads and shaft diameters exceed those covered by the Michell Bearings Advanced Vertical (AV) series.

Key features:
- Four bearing frame sizes
- Shaft diameter range from 300mm to 600mm
- Axial load capacity up to 2155kN
- Three standard configurations of shaft diameters (N, L and XL) are available in each frame size, which allows the most compact and cost effective bearing to be selected for a given shaft diameter
- Available with water cooling or circulating oil cooling

Selection Criteria

Selecting one option from the following headings will provide Michell Bearings with an understanding of the product you require. However, we are more than happy to work with you on creating a bespoke product to meet your needs; if this is the case please contact us.

Type of bearing
LV (large vertical)

Frame size
From 1t to 4

Thrust surface
S – single thrust face for downward thrust loads only
D – double thrust face for axial loads in either direction
B – single downward thrust with an upward thrust face for upward transient loads

Shaft details
N – normal
L – large
XL – extra-large

Cooling
T – water cooled (number of tubes)
C – circulating oil

Example:
An LV with frame size 1 with a single thrust face, normal shaft and water cooled – LV1 SNT2
### Technical Information

#### LV Series Capacity

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#### Notes:

1. For straight through unstepped shafts the maximum shaft diameter should be taken from column D.
2. Higher thrust loads can be accommodated; please consult Michell Bearings for requirements such as API 610.
3. High pressure lift (jacking) for whitemetal pads or PTFE can be provided for applications with starting loads higher than those in Column ‘F’.
4. Maximum closed valve loads are for guidance only and should be confirmed by Michell Bearings.
5. Maximum radial load will vary, depending upon speed and oil viscosity.
6. Upper thrust load can only be accommodated on bearings with optional surge or upper thrust face.
7. The maximum speed varies with running thrust load, the grade of oil used and the water inlet temperature.
8. All loads are based on whitemetal surfaced pads.

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#### LV Series Dimensions

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#### LV Series Dimensions

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DNT/BNT

Double thrust, normal shaft, water cooled for transient (BNT) or continuous (DNT) upward thrust loads.
**Vertical (V) Guide Bearings**

**Overview of the V Guide Bearing**

The Michell Bearings Vertical Guide Bearing, known as the V Series, has been designed and developed as a fully self-contained, general-purpose, standard assembly range of vertical guide bearings. This standard economic range has been designed to meet the requirements of original equipment manufacturers (OEM).

**Key features:**
- Ten bearing frame sizes
- Shaft diameter range of 96mm to 480mm
- Radial load capacity up to 68kN
- Available with water cooling, circulating oil or air cooling

The Michell Bearings Vertical Guide Bearing, known as the V Series, has been designed and developed as a fully self-contained, general purpose, standard assembly range of vertical guide bearings. This standard economic range has been designed to meet the requirements of original equipment manufacturers (OEM).

**Selection Criteria**

Selecting one option from the following headings will provide Michell Bearings with an understanding of the product you require. However, we are more than happy to work with you on creating a bespoke product to meet your needs; if this is the case, please contact us.

**Type of bearing**
- G (Vertical Guide)

**Frame size**
- From 5 to 14

**Cooling**
- T – water cooled (number of tubes)
- C – circulating oil
- A – air cooled

**Example:**
V with frame size 11 arranged for air cooling – 11GA

**Technical Information**

**V Series Capacity**

<table>
<thead>
<tr>
<th>STANDARD FRAME SIZE</th>
<th>Mean Surface Projected (mm²)</th>
<th>Maximum Radial Load kN</th>
<th>Axial Journa Length (mm)</th>
<th>Nominal Diameter Clearance CD (mm)</th>
<th>Guided Bearing Max. Shaft Sleeve Dia (mm)</th>
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Notes:
- The maximum radial load can vary, and is dependent upon the viscosity of oil used in the bearing and the speed of the rotating collar journal. Therefore the above figures are for your guidance only - based on a unit load of 1723 kN/m² (250 lbs/in²).

**Example:**
- V with frame size 11 arranged for air cooling – 11GA

**V Series Dimensions**

**Technical Information**

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**Example:**
- V with frame size 11 arranged for air cooling – 11GA

**V Series Dimensions**

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<th>D</th>
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Notes:
- 1/2" and 3/4" entry coolers are supplied by the customer.
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**Example:**
- V with frame size 11 arranged for air cooling – 11GA
Our Total Customer Support Model

The Michell Bearings customer support model ensures our customers have peace of mind throughout the lifetime of our products and the solutions we engineer for them.

We know that bearing failure is serious; that downtime is expensive and with this in mind, exacting maintenance and servicing is key. If the worst happens speed of response is critical to ensure repair of existing parts or availability of replacement and spare parts.

Our global network and 24 hour manufacturing capability ensures Michell Bearings can react quickly and efficiently to the requirements of our customers. We have the in-house technical expertise to undertake virtually any whitemetal bearing repair, whether on an original Michell Bearings product or any other manufacturer’s product.

However, service is the key to preventing bearing failure. Our dedicated service team, all highly trained engineers, travel all over the world to carry out both installation and routine service work in both the marine and industrial sectors.

Michell Bearings offers tailored, structured maintenance programmes to ensure bearing reliability. Whether scheduled or unplanned our diagnostic and corrective maintenance is vital to the continued smooth running of your operations and the satisfaction of your customers.