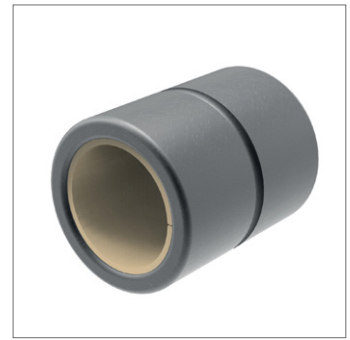
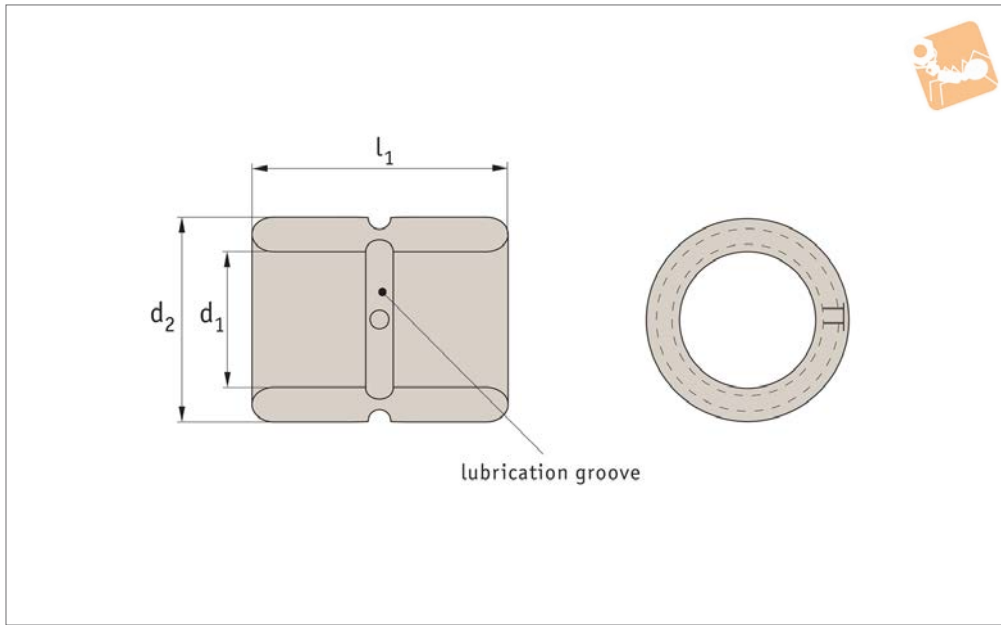




# Thin Wall Ceramic Linear Bearings

self-lubricating

## Linear Bearings



**L1769**

LINEAR BEARINGS

### Material

Aluminium with aluminium-oxide ceramic coating (4-7 $\mu$ ). Hardness >80 HRC. PTFE insert.

### Technical Notes

Concentricity is better than 15 $\mu$ . Available with or without seals, if seals are

required, please contact our sales team. Temperature range: -130°C to +200°C.

### Tips

Can be run on hardened or soft steel shafts, tolerance h6, all part no. L1770-L1776. Self lubricating versions can also be run on

ceramic coated aluminium shafts (see part no. L1788.)

### Bore tolerances where $d_1$ is:

6-16: +0,0, -0.04 to -0.07  
 20-30: +0.0, 0.05 to -0.07  
 40-50: +0.0, 0.05 to -0.09

Order No.	$d_1$	$d_2$ tol. H7	$l_1$ tol. h14	Dyn. load C kN max.	Static load $C_0$ kN max.
L1769.006	6	12	22	0.08	0.64
L1769.008	8	15	24	0.18	1.04
L1769.010	10	17	26	0.23	1.41
L1769.012	12	19	28	0.34	2.00
L1769.014	14	21	28	0.44	2.42
L1769.016	16	24	30	0.51	3.00
L1769.020	20	28	30	0.80	4.68
L1769.025	25	35	40	1.29	7.54
L1769.030	30	40	50	1.83	10.81
L1769.040	40	52	60	2.88	16.64
L1769.050	50	62	70	4.48	26.00



#### Self-lubricating

These ceramic coated linear bearings are lined with a self-lubricating composite which is bonded to the aluminium shell. This composite is a combination of Teflon® and non-abrasive, polyamide fillers for both load carrying capability and dynamic coefficient of friction.

As the self-liner is non-abrasive, it runs equally well on either hardened steel or on soft steel or stainless steel shafting (303 or 316).

#### Ceramic coated

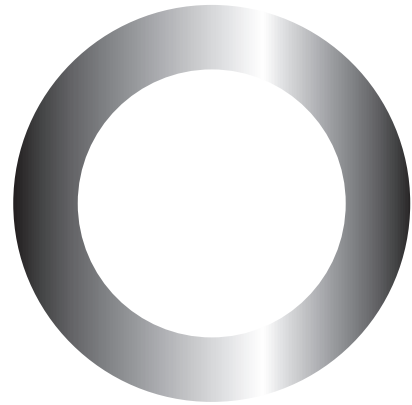
Ceramic coated linear bearings are a one piece construction, employing a file-hard ceramic coating over an aluminium shell. Our ceramic coating is not an anodised or surface coating that can fracture, flake, chip or wash-off in corrosive environments. The ceramic coating is FDA compliant.

These bearings require lubrication (grease or light oil is sufficient - no silicone based lubricants).

#### Ceramic bearings



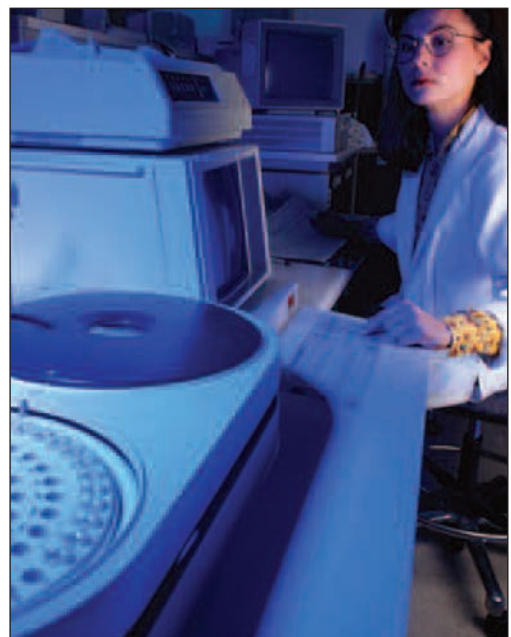
Self-lubricating with teflon liner



Ceramic coated

#### Applications

- Automated assembly.
- Packaging machines.
- Food processing equipment.
- Pharmaceutical equipment.
- Medical equipment.
- Wash-down systems.





### Ceramic coated bearings

These are manufactured from a special grade of aluminium, then ceramic coated. Surface hardness is 85HRC, which is why the bearings have extremely long wear life. Their extreme hardness prevents particles from entering into the surface of the shafting, (this is the primary cause of bearing and shaft failure).

The ceramic series must be lubricated with a thin film of oil in order to perform correctly.

- Lasting precision alignment.
- Abrasion resistance.
- Elimination of noise.
- Interchangeable with ball bushings.
- Minimal lubrication is required.
- Design economies.
- Rotary/linear motion capabilities.
- Zero shake or play.
- Elimination of galvanic action.
- High operation speeds.
- Excellent electrical insulating abilities.
- Oscillatory motion & rapid directional change.
- Unaffected by salt water or corrosion.
- Cleanliness.
- Vacuum applications.
- No catastrophic failure.
- Low friction.
- Food machinery (FDA approved materials available).

### Self-lubricating bearings

- Tough
- Resource free
- Quiet
- Cost-effective

These are maintenance free bearings, manufactured to the same standards as our ceramic coated series, but the inside diameter is lined with a special blended Teflon-material; eliminating the need for lubrication. It also allows the use of soft shaft materials such as unhardened steel, 300 series stainless steel or aluminium.

### Parallel shafting and edge loading

Sleeve-type linear motion bearings, more so than ball bushings, require parallel shafting to be aligned as closely as possible to avoid edge loading. Edge loading can cause higher than expected friction and subsequent wear.

To combat shaft misalignment, we offer two options:

1. Self-aligning bearings: a subtle o/d radius allows the bearing to pivot on the bearing crown
2. Bearings can be supplied with self-aligning O-rings to provide for a "full float bearing". Unlike our self-aligning bearings, floating bearings on O-rings result in changes between shaft centreline to housing tolerances due to deflection and possible mechanical sets

Breakaway force requirements - static	
Self lube PTFE dry	Ceramic coated lubricated
30% of static load	10% of static load

#### Example

For a linear slide employing 2 rails and 4 self lubricating PTFE pillow block assemblies and supporting a horizontal, centred load of 250N

Static self-lubricating linear bearings 30% of system load to get the system moving

$$250N \times 0.3 = 75N$$

Dynamic self-lubricating linear bearings (in motion) 10% of system load

$$250N \times 0.1 = 25N$$



#### Comparison between ceramic coated and self-lubricating bearings

Linear bearing categories	Self-lubricating bearings	Ceramic coated bearings
Max PV (continuous) N/mm <sup>2</sup> x m/s	63,05	84,06
Max. pressure N/mm <sup>2</sup>	34,47	34,47
Max. speed (no load) m/s	2	Unlimited
Shaft hardness (minimum)	25HRB	35HRB
Coefficient of friction	0,09 - 0,12	0,04 - 0,08
Temperature range - Typical limits	-240°C to +190°C	-125°C to +200°C

#### Pressure velocity (PV) calculations

The load factor PV has a considerable influence on determining the bearing's useful operating life. PV is determined by multiplying the specific bearing load or pressure (P) by the sliding speed (V).

Bearing materials are rated by a PV limit, with the PV limit representing the highest combination of load and speed under which the bearing material will operate. The PV unit of measure is N/mm<sup>2</sup> x m/s.

To determine P in an application: the specific bearing load (P) is found by dividing the bearing load by the pressure supporting area of the bearing. The units for P are N/mm<sup>2</sup>.

The pressure supporting area depends on the the specific geometry of the bearing.

The following are formulae for the most common types of bearing geometry.

# Ceramic Linear Bearings from Automation Components

LINEAR BEARINGS

#### Specific bearing load P (N/mm<sup>2</sup>)

$$P = \frac{Wr}{d_1 \times l_1}$$

#### Sliding speed V (m/s) rotation

$$V = \frac{z}{60 \times 10^3} \pi \times d_1 \times N$$

Where;

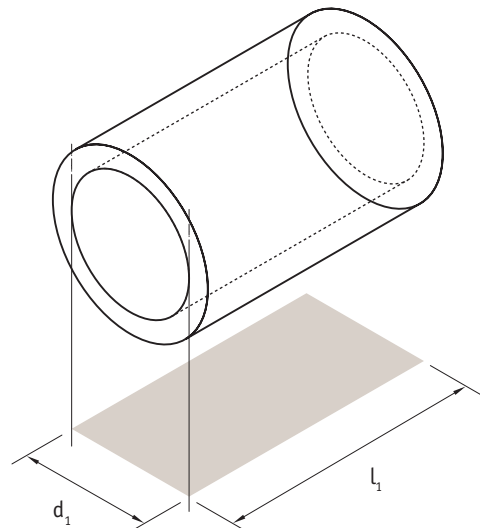
P = Specific bearing load (N/mm<sup>2</sup>)

Wr = Load on bushing (N)

d<sub>1</sub> = Bearing inside diameter (mm)

N = Speed of rotation (rpm)

l<sub>1</sub> = Bearing length





### Open bearing load capacity

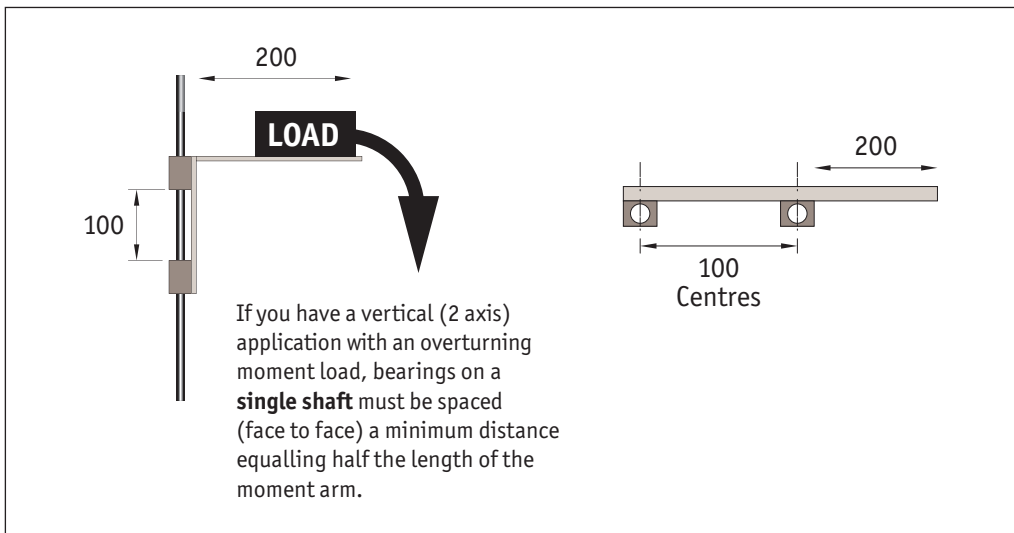
Inverting (hanging upside down) open style sleeve bearings is not an optimal design configuration. System load is forced into the bearing slot - the weakest part of the bearing. Depending on the load and possible moments, point loading on the edges of the slot can result in hot spots, liner cold flow and excessive wear. If the bearings are being used in this way the percentage of the load stated in the data table they can take is shown below.

Straight downward compressive	Side mounted	Inverted (upside down)
100%	70%	30%

### Cantilevered loading

When you have a cantilevered load **you must observe the 2:1 ratio rule**. Moment loading can result in edge loading of sleeve-type linear bearings, so the correct spacing between bearings on a single shaft (vertical or Z axes) and spacing between shafting on horizontal applications (X,Y axes) must meet the 2:1 ratio rule.

If this rule is not observed the friction will increase, the system will bind and the bearings will ultimately fail.



### Coefficient of friction

