IKO

C-Lube Linear Ball Spline

MAG

Maintenance free for 20,000 km or 5 years

CAT-57180
C-Lube Linear Ball Spline
MAG has launched.

IKO strives to be a leader in Technology. Our primary source for development is listening to the customer wants and needs. Our performance and work separate us from others by utilizing our creative thinking and original technologies. IKO is constantly developing and implementing new and advanced technologies in pursuit of excellent motion performance and service for your cost savings.

Maintenance free for
20,000km or 5 years

NEW

MAG(T) 4
MAGL(T) 4, 5, 6, 8

Size 4 and high rigidity long external cylinder are newly available.

The final answer to your lube requirement.
Releasing maintenance free type for **IKO** C-Lube Linear Ball Spline well-known for its original compact structure

**IKO** Maintenance Free Series
C-Lube Linear Ball Spline

MAG

Maintenance free type has been released for **IKO** C-Lube Linear Ball Spline MAG having an overwhelmingly high market share in the field of semiconductor and liquid crystal manufacturing systems that are forced to be operated in severe operating conditions of high acceleration/deceleration motion.

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**Maintenance free for 20,000 km or 5 years!!**

A large amount of lubricant is incorporated in the compact external cylinder.

Incorporating the lubricating component C-Lube in the steel ball circulating path of the external cylinder has achieved maintenance free operation for 5 years or 20,000 km. This lubrication effect lasts for a long time and can reduce the cost of the whole system as a result of the reduction in the lubrication mechanism of the system and in the running cost as the result of reduction in man-hours for lubricational maintenance.

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**High rigidity and high accuracy have been achieved in spite of the compact size**

A simple two-row four-point contact structure using large-diameter steel balls has achieved compactness, high rigidity, high accuracy and low cost.

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**Ultimate interchangeable system interchangeable specification**

The product conforms to the interchangeable specification in which the external cylinder and the spline shaft can be separately handled. This system allows us to meet customer requirements of short delivery term and selecting what is needed in desired quantity.

The existing type can be changed into the maintenance free type by replacing only the external cylinder.

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<table>
<thead>
<tr>
<th>The following requirements can also be satisfied.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No need of change in your structure</strong></td>
</tr>
<tr>
<td><strong>C-Lube Linear Ball Spline MAG</strong> can attain maintenance free operation without changing your design.</td>
</tr>
<tr>
<td>The external dimensions and stroke length of C-Lube Linear Ball Spline MAG that are designed in compact form and are not changed from 33831 Linear Ball Spline LSAB. By replacing existing 33831 Linear Ball Spline LSAB with C-Lube Linear Ball Spline MAG, you can attain maintenance free operation without changing the structure on your system.</td>
</tr>
</tbody>
</table>

| **To be operated in an environment in which ordinary lubricant cannot be used** |
| **C-Lube Linear Ball Spline MAG** can take different lubricants for different requirements. |
| The lubricant to be impregnated in the C-Lube can be freely selected. This is a good feature for applications such as food machines where the common lubricant cannot be used. Contact 33831 for necessary. |

| **Product considering the global environment** |
| **C-Lube Linear Ball Spline MAG** contributes to the eco-structure around the structure. |
| While the product is in operation, it consumes only a small amount of lubricant for lubrication, so that the product meets the ecological requirements controlling the total lubricant consumption. |
Features of C-Lube Linear Ball Spline MAG

Incorporating a large amount of lubricant in the compact spline external cylinder.

Maintenance free

The original lubricating component, C-Lube, is incorporated in the external cylinder and the end plate. Its effectiveness has been proven by endurance tests. This can reduce the cost of the whole system as a result of reduction in the lubrication mechanism in the system and also reduce the running cost as a result of reduction in the man-hours for lubrication maintenance.

Maintenance free operation has been achieved by the total number of reciprocating motions of more than 6 hundred million cycles.

For Vertical axis

Endurance test supposing a chip mounter

Test conditions

Model No. MAG8
Lubricating condition With C-Lube
Test method Vibration test machine
Mounting attitude Vertical shaft
Maximum speed 180 m/min
Acceleration 10G
Cycle 18,242
Stroke length 15 mm

Test result

<table>
<thead>
<tr>
<th>Test result</th>
<th>MAG 5</th>
<th>MAG 6</th>
<th>MAG 8</th>
<th>MAG 10</th>
<th>MAG 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cycle</td>
<td>720,000</td>
<td>740,000</td>
<td>2,400</td>
<td>740,000</td>
<td>740,000</td>
</tr>
<tr>
<td>Run abrasion</td>
<td>No abrasion</td>
<td>No abrasion</td>
<td>No abrasion</td>
<td>No abrasion</td>
<td>No abrasion</td>
</tr>
</tbody>
</table>

In these severe operating conditions, maintenance free operation has been achieved by the total number of reciprocating motions of more than 6 hundred million cycles.

Ecology

Regarding the prepacked lubricant in the C-Lube, only the amount of lubricant required to maintain the lubrication performance of the rolling guide is supplied, so that a small amount of lubricant is consumed even for a long-time running while keeping the lubrication performance.

Compact

C-Lube Linear Ball Spline MAG incorporates the lubricating component, C-Lube, in the external cylinder, so that the length of external cylinder stays unchanged unlike a type in which the lubricating component is mounted externally. This makes it possible to replace LSAG by MAG without any space and stroke length limitation.

Smooth

C-Lube Linear Ball Spline MAG does not generate sliding friction unlike the lubricating component that is mounted on the outer side of the external cylinder in contact with the spline shaft. The product provides good follow-up performance to driving force and contributes to energy saving as a result of the improvement of accuracy and reduction of wear loss.

Lubricant supply mechanism of C-Lube system

The circulation of the steel balls distributes lubricant.

Lubricant is supplied directly to the steel balls. As the steel balls circulate, the lubricant is distributed to the loading area along the spline shaft. This results in adequate lubrication being properly maintained in the loading area for a long time.

Lubricant is deposited directly to the surface of the steel balls.

The surface of C-Lube is always covered with the lubricant. Lubricant in continuously supplied to the surface of steel balls by surface tension in the contact of C-Lube and steel balls. New oil permeates automatically from the core of C-Lube to the internal surface that comes in contact with steel balls.

Capillary system. IKO has developed a new type lubrication. It is a porous resin Lub-body or plate with steel backing formed by extruding the resin powder and impregnating a large amount of lubrication oil in its open pores. Capillary system always supplies proper amount of lubrication oil to the cylinder roller and lubrication condition of the raceway can be kept well for long period of time.
Features of C-Lube Linear Ball Spline MAG

**In spite of its compact design, high rigidity and high accuracy have been achieved.**

**High rigidity and compactness**

Large-diameter steel balls are arranged in two rows and are in four-point contact with the raceways. With this structure, this is a high-rigidity and compact-sized Linear Ball Spline. C-Lube Linear Ball Spline MAG adopts a unique steel ball retaining method requiring no ball retainer, and has a small external diameter of external cylinder for the shaft diameter.

**Low-friction smooth motion**

The steel ball re-circulating routes are optimally designed through through analysis. High-speed operation can thus be achieved with low friction and smooth linear motion.

**Accurate positioning is possible**

By applying a proper preload, the clearance in the rotational direction can be eliminated ensuring accurate positioning.

**Easy handling**

This product has a unique structure that prevents steel balls from falling off from the external cylinder even if the external cylinder is removed from the spline shaft. It can also be easily mounted to machines or systems.

**High accuracy and a small number of potential errors**

The simple two-row four-point contact structure offers a small number of potential errors and enhances the dimensional accuracy between rows to the highest level. In Linear Ball Spline, the external cylinder and the spline shaft are put under strict dimensional control. Thus, the interchangeability specification has been achieved at a high level of interchangeability.

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Features of C-Lube Linear Ball Spline MAG

**Ultimate interchangeable system, interchangeable specification.**

1. The external cylinder and the spline shaft can be ordered separately and a single unit can be delivered.
2. The product type, accuracy, and preload type can be combined freely. This is a high-level interchangeable system product.
3. This is the product customer can order for the least quantity when needed, and its delivery time is short.

**Interchangeability of external cylinder**

Two types of external cylinder shapes, standard type and flange type, are available. Both types can be mounted on one spline shaft.

**Interchangeability in accuracy classes**

Two classes of accuracy, common class and high class are prepared, which can be used for the applications requiring high running accuracy.

**Interchangeability in preload classes**

Highly accurate dimensional control owing to a simple structure has made it possible to realize the interchangeability in preloaded external cylinders. The product can be used for the applications requiring higher rigidity.
The specification of C-Lube Linear Ball Spline MAG is indicated by the identification number, consisting of a model code, a size, a part code, a preload symbol, a classification symbol, an interchangeable code, and any supplemental codes.

### Interchangeable specification

<table>
<thead>
<tr>
<th>External cylinder only</th>
<th>MAG</th>
<th>L</th>
<th>5</th>
<th>C1</th>
<th>T₁</th>
<th>H</th>
<th>S₁</th>
<th>/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spline shaft only (¹)</td>
<td>LSAG</td>
<td>T</td>
<td>5</td>
<td>R150</td>
<td>T₁</td>
<td>H</td>
<td>S₁</td>
<td>/N</td>
</tr>
<tr>
<td>Assembled set</td>
<td>MAG</td>
<td>L</td>
<td>5</td>
<td>C1</td>
<td>R150</td>
<td>T₁</td>
<td>H</td>
<td>S₁</td>
</tr>
</tbody>
</table>

### Non-interchangeable specification

| Assembled set          | MAG | L | 5 | C1 | R150| T₁ | H | /N |

### Series

<table>
<thead>
<tr>
<th>Model code</th>
<th>Size</th>
<th>Part code</th>
<th>Preload symbol</th>
<th>Classification symbol</th>
<th>Interchangeable code</th>
<th>Supplemental code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAG</td>
<td>4, 5, 6, 8, 10, 12</td>
<td>solid shaft</td>
<td>T₀</td>
<td>L</td>
<td>S₁</td>
<td>/N</td>
</tr>
</tbody>
</table>

### Length of external cylinder

<table>
<thead>
<tr>
<th>Model code</th>
<th>Size</th>
<th>Part code</th>
<th>Preload symbol</th>
<th>Classification symbol</th>
<th>Interchangeable code</th>
<th>Supplemental code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAG</td>
<td>4, 5, 6, 8, 10, 12</td>
<td>solid shaft</td>
<td>T₀</td>
<td>L</td>
<td>S₁</td>
<td>/N</td>
</tr>
</tbody>
</table>

### Shape of spline shaft

<table>
<thead>
<tr>
<th>Solid shaft</th>
<th>Hollow shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td>High rigidity long</td>
<td>T</td>
</tr>
</tbody>
</table>

### Size

<table>
<thead>
<tr>
<th>Model code</th>
<th>Size</th>
<th>Part code</th>
<th>Preload symbol</th>
<th>Classification symbol</th>
<th>Interchangeable code</th>
<th>Supplemental code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAG</td>
<td>4, 5, 6, 8, 10, 12</td>
<td>solid shaft</td>
<td>T₀</td>
<td>L</td>
<td>S₁</td>
<td>/N</td>
</tr>
</tbody>
</table>

### Table 1 Models and sizes of C-Lube Linear Ball Spline MAG

<table>
<thead>
<tr>
<th>Model code</th>
<th>Size</th>
<th>Part code</th>
<th>Preload symbol</th>
<th>Classification symbol</th>
<th>Interchangeable code</th>
<th>Supplemental code</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAG</td>
<td>4, 5, 6, 8, 10, 12</td>
<td>solid shaft</td>
<td>T₀</td>
<td>L</td>
<td>S₁</td>
<td>/N</td>
</tr>
</tbody>
</table>

### Optional specification

<table>
<thead>
<tr>
<th>/N</th>
<th>/S</th>
</tr>
</thead>
</table>

Note (¹): In case ordering spline shaft only, model code should be changed as LSAG (Solid shaft) or LSAGT (Hollow shaft).
### Table 2: Accuracy of C-Lube Linear Ball Spline MAG

<table>
<thead>
<tr>
<th>Model number</th>
<th>Relative to axial line of supporting part of spline shaft</th>
<th>Perpendicularity of mounting surface of flange relative to axial line of spline shaft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Ordinary (No symbol) High (H) Precision (P))</td>
<td>(Ordinary (No symbol) High (H) Precision (P))</td>
</tr>
<tr>
<td>MAG 4</td>
<td>33 14 8</td>
<td>22 9 6</td>
</tr>
<tr>
<td>MAG 5</td>
<td>33 14 8</td>
<td>22 9 6</td>
</tr>
<tr>
<td>MAG 6</td>
<td>33 14 8</td>
<td>22 9 6</td>
</tr>
<tr>
<td>MAG 10</td>
<td>41 17 10</td>
<td>22 9 6</td>
</tr>
<tr>
<td>MAG 12</td>
<td>41 17 10</td>
<td>22 9 6</td>
</tr>
</tbody>
</table>

Note(1): Applicable when measured by using external cylinder for measurement.
(2): Applicable when the shaft ends are finished.
(3): Applicable to the flange type.
(4): Applicable to the non-interchangeable specification.

Remark: The values are applicable to any given length of 100 mm over the effective length of the spline shaft.

### Table 3: Twist of grooves with respect to effective length of the spline part

<table>
<thead>
<tr>
<th>Accuracy class</th>
<th>Ordinary (No symbol) High (H) Precision (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33 13 6</td>
</tr>
</tbody>
</table>

### Table 4: Total radial runout of axial line of spline shaft

<table>
<thead>
<tr>
<th>Overall length of spline shaft (mm)</th>
<th>MAG 4</th>
<th>MAG 6</th>
<th>MAG 10</th>
<th>MAG 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>over</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ordinary (No symbol) High (H) Precision (P)</td>
<td>Ordinary (No symbol) High (H) Precision (P)</td>
<td>Ordinary (No symbol) High (H) Precision (P)</td>
<td>Ordinary (No symbol) High (H) Precision (P)</td>
</tr>
<tr>
<td>200</td>
<td>20 46</td>
<td>26 59</td>
<td>36 20</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>315 89</td>
<td>57 54</td>
<td>32 32</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>315 89</td>
<td>57 54</td>
<td>32 32</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>315 89</td>
<td>57 54</td>
<td>32 32</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>315 89</td>
<td>57 54</td>
<td>32 32</td>
<td></td>
</tr>
</tbody>
</table>

Note(1): Applicable to non-interchangeable specification.

Remark: The values are applicable to any given length of 100 mm over the effective length of the spline shaft.

### Measuring method of accuracy

1. Radial runout of periphery of parts mounting part relative to axial line of supporting part of spline shaft. (See Table 2, 4)

   - While supporting the spline shaft at its supporting parts, place dial gage probes to the outer peripheral faces of the parts mounting part.
   - Measure the runout from one rotation of the spline shaft.

2. Perpendicularity of spline end face relative to axial line of spline shaft. (See Table 2, 3)

   - While supporting the spline shaft at its supporting parts at one spline shaft end, place a dial gage probe to the spline end face and measure runout from one rotation of the spline shaft.

3. Perpendicularity of spline shaft end face and spline end face relative to axial line of spline shaft. (See Table 2, 3)

   - While supporting the spline shaft at its supporting parts an at one spline shaft end, place a dial gage probe to the spline end face and measure runout from one rotation of the spline shaft.

4. Perpendicularity of mounting surface of flange relative to axial line of spline shaft. (See Table 2, 3)

   - While supporting the spline shaft at both center holes and at the outer peripheral face of the spline shaft, place a dial gauge probe to the mounting surface of the flange of the external cylinder and measure the perpendicularity from runout caused by one rotation of the spline shaft.

5. Twist of grooves with respect to effective length of the spline part. (See Table 3)

   - Fix and support the spline shaft.
   - Then apply a unidirectional torsion moment on the external cylinder (for measurement purpose), before placing a dial gauge probe to the side face of the sunk key attached on the external cylinder. Measure runout when the external cylinder and the gage probe have traveled together 100 mm on any effective part of the spline shaft. However, the gage probe should be applied as near as possible to the outer periphery of the external cylinder.

### Table 5: Measuring method of accuracy

<table>
<thead>
<tr>
<th>Measuring item</th>
<th>Measuring method</th>
<th>Illustration of measuring method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note(1): This accuracy is applicable when special machining is done to the shaft ends.
Preload

The average amount of preload for C-Lube Linear Ball Spline MAG is shown in Table 6.

Table 6 Preload

<table>
<thead>
<tr>
<th>Name</th>
<th>Symbol</th>
<th>Preload amount (N)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearance</td>
<td>T₀</td>
<td>0.02 C₀</td>
<td>Very smooth motion</td>
</tr>
<tr>
<td>Standard (No symbol)</td>
<td>T₁</td>
<td>0.02 C₀</td>
<td>Smooth and precise motion</td>
</tr>
<tr>
<td>Light preload</td>
<td>T₁</td>
<td>0.02 C₀</td>
<td>Minimum vibration</td>
</tr>
</tbody>
</table>

Remarks:
1. Clearance T₀ is only applicable for size 4.
2. Light preload T₁ is not applicable for size 4.
3. C₀ means basic static load rating.

Optional specification

In C-Lube Linear Ball Spline MAG, optional specifications in Table 7 are available. When an optional specification is required, add the applicable supplemental codes to the end of the identification number. If a combination of special specifications (N and S) is necessary, arrange supplemental codes in alphabetical order. (Ex : N5S3)

Table 7 Special specifications

<table>
<thead>
<tr>
<th>Special specifications</th>
<th>Supplement code</th>
<th>Applicable size</th>
</tr>
</thead>
<tbody>
<tr>
<td>No end seal</td>
<td>/N</td>
<td>5–12</td>
</tr>
<tr>
<td>Stainless steel spline shaft</td>
<td>/S</td>
<td>5–12</td>
</tr>
</tbody>
</table>

Note:
1. Applicable to interchangeable external cylinder and assembled set.
2. Applicable to non-interchangeable specification.
3. Not applicable to the hollow shaft.

Application Example

Direct Drive Electric Cylinder

Stainless steel spline shaft

The material of the solid spline shaft is changed to stainless steel. The load rating will be a value obtained by multiplying the load rating for the high carbon steel spline shaft by a factor of 0.8.

Figure 1 Load direction

Table 8 Conversion factor by load direction

<table>
<thead>
<tr>
<th>Size</th>
<th>Load direction</th>
<th>Load rating X</th>
<th>Load rating Y</th>
<th>Load rating Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–12</td>
<td>Upward and downward load</td>
<td>Basic dynamic load rating</td>
<td>Basic static load rating</td>
<td>Basic dynamic load rating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C₀</td>
<td>C₀</td>
<td>C₀</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.47</td>
<td>1.47</td>
<td>1.47</td>
</tr>
</tbody>
</table>

Load Rating and Life

Basic dynamic load rating C

The basic dynamic load rating is defined as a constant load both in direction and magnitude under which a group of identical C-Lube Linear Ball Spline MAG is individually operated and 90% of those in the group can travel 50×10⁶m free from material damage due to rolling contact fatigue.

Basic static load rating C₀

The basic static load rating is defined as a static load that gives a prescribed constant contact stress at the center of the contact area between rolling elements and raceways receiving the maximum load. Generally, the basic static load rating is used in combination with the static safety factor.

Dynamic rated torque T

The dynamic rated torque is defined as a rotational torque (See Fig.2) constant both in magnitude and direction under which 90% of a group of the same C-Lube Linear Ball Spline MAG can travel 50×10⁶m without suffering from material damage due to rolling contact fatigue when they are individually operated.

Static rated torque and Static rated moment T₀, Tₓ, Tᵧ

The static rated torque and static rated moment are defined as a static torque or static moment which gives a prescribed constant contact stress at the center of the contact area between the steel ball and raceway receiving the maximum load when a torque or moment (See Fig.2) is loaded. They are the allowable limit torque or moment that permits normal rolling motion. Generally, they are used in combination with the static safety factor.

Load direction and Load rating

Since the load ratings of C-Lube Linear Ball Spline MAG given in the dimension table are for upward/downward load, they must be corrected for the load direction for lateral load. The corrected basic load ratings and basic static load ratings are shown in Table 8.
Load Rating and Life

The static safety factor, \( f_s \), can be obtained from the following formula.

\[
L = \frac{P}{N} = \frac{P}{M} \quad \text{(1)}
\]

\[
L = \frac{P}{N} = \frac{P}{M} \quad \text{(2)}
\]

where, \( L \) : Rating life, \( 10^6 \)m
\( C \) : Basic dynamic load rating, N
\( T \) : Dynamic rated torque, N-m
\( P \) : Theoretically calculated radial load, N
\( M \) : Theoretically calculated torque, N-m

If the stroke length and the number of strokes per minute are given, the life in hours can be obtained from the following formula.

\[
L = \frac{10^6}{25m \times 60} \quad \text{(3)}
\]

where, \( L \) : Rating life in hours, hours
\( S \) : Stroke length, mm
\( n \) : Number of strokes per minute, cpm

Static safety factor

When excessive large or heavy loads are applied on C-Lube Linear Ball Spline MAG, local permanent deformation will be caused on the cylinder of C-Lube Linear Ball Spline MAG. Therefore, the actual load on each rating guide becomes greater in many cases than the theoretically calculated load. The applied load is generally calculated by multiplying the theoretically calculated load by the load factor shown in Table 10.

Table 10 Load factor

<table>
<thead>
<tr>
<th>Operating conditions</th>
<th>( f_s )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock operation with vibration and/or shock</td>
<td>1.0 ~ 1.2</td>
</tr>
<tr>
<td>Normal operation</td>
<td>1.2 ~ 1.5</td>
</tr>
<tr>
<td>Operation with vibration and/or shock</td>
<td>1.5 ~ 3</td>
</tr>
</tbody>
</table>

Spline Shaft

Moment of inertia of sectional area and section modulus of the spline shaft are shown in Table 11.

Table 11 Moment of inertia of sectional area and section modulus

<table>
<thead>
<tr>
<th>Model number</th>
<th>Moment of inertia of sectional area mm(^4)</th>
<th>Sectional modulus mm(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid shaft</td>
<td>Hollow shaft</td>
<td>Solid shaft</td>
</tr>
<tr>
<td>MAG 4</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>MAG 5</td>
<td>29</td>
<td>12</td>
</tr>
<tr>
<td>MAG 6</td>
<td>61</td>
<td>21</td>
</tr>
<tr>
<td>MAG 8</td>
<td>190</td>
<td>49</td>
</tr>
<tr>
<td>MAG10</td>
<td>470</td>
<td>95</td>
</tr>
<tr>
<td>MAG12</td>
<td>990</td>
<td>170</td>
</tr>
</tbody>
</table>

Remark: The table shows representative model numbers only but is applicable to all models of the same size.

Load factor

Due to vibration and/or shocks during machine operation, the actual load on each rating guide becomes greater in many cases than the theoretically calculated load. The applied load is generally calculated by multiplying the theoretically calculated load by the load factor shown in Table 10.

Lubrication and Dust Protection

Quality lithium-soap base grease containing extreme pressure additive [ALVANIA EP grease 2 - Shell] is pre-packed in the spline shaft. The high carbon steel spline shaft is hardened by induction hardening. When additional machining on the shaft end is needed, make sure that the maximum diameter of the shaft and machining part does not exceed the dimension of shown in the dimension tables. Spline shafts with special end shapes can be prepared upon request. Consult the IKD for further information.

Precautions for use

1. When mounting multiple sets at the same time
   When in interchangeable specification, assemble an external cylinder and a spline shaft with the same interchangeable code. In non-interchangeable product, use an assembly of external cylinder and spline shaft as delivered without changing the combination.
   - Assembling an external cylinder and spline shaft
     When assembling the external cylinder on the spline shaft, correctly re-fit the raceways of the external cylinder to that of the spline shaft and move the external cylinder gently in parallel direction. Rough handling may cause damaging seals or dropping steel balls. Non-interchangeable specification products are already assembled so as to provide the best accuracy when the IKD marks of external cylinder and spline shaft face the same direction. (see Fig. 4)

2. Mounting the external cylinder
   When press-fitting the external cylinder to the housing, assemble them correctly by using a press and a suitable jig fixture, etc. (See Fig. 5)

3. Attached keys for the external cylinder
   The sirk keys shown in Table 12 are provided with the external cylinder.

Table 12 Dimensions and tolerance of attached key

<table>
<thead>
<tr>
<th>Model number</th>
<th>b Tolerance</th>
<th>h Tolerance</th>
<th>f Tolerance</th>
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</thead>
<tbody>
<tr>
<td>MAG 5</td>
<td>2.00 ±0.006</td>
<td>0.025 1.25</td>
<td>3.8 1</td>
</tr>
<tr>
<td>MAG 8</td>
<td>2.5 0.025</td>
<td>0.025 1.25</td>
<td>5.9 1.25</td>
</tr>
<tr>
<td>MAG10</td>
<td>3.0 0.025</td>
<td>0.025 1.25</td>
<td>7.5 1.5</td>
</tr>
<tr>
<td>MAG12</td>
<td>3.0 0.025</td>
<td>0.025 1.25</td>
<td>11.0 1.5</td>
</tr>
</tbody>
</table>

Remark: The table shows representative model numbers only but is applicable to all other models in the same size.
C-Lube Linear Ball Spine MAG

Standard type
MAG • MAGT

Bore dia. of hollow shaft of MAG (L), T

<table>
<thead>
<tr>
<th>Model number</th>
<th>Mass (Ref.) g</th>
<th>Bore dia. of hollow shaft of MAG (L), T</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAG 4(L)</td>
<td>2.5</td>
<td>9.6</td>
</tr>
<tr>
<td>MAGT 4(L)</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>MAGL 4(L)</td>
<td>9.6</td>
<td></td>
</tr>
<tr>
<td>MAGT(L) 4(L)</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>MAG 5</td>
<td>4.8</td>
<td>14.9</td>
</tr>
<tr>
<td>MAGT 5</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>MAGL 5</td>
<td>14.9</td>
<td></td>
</tr>
<tr>
<td>MAGT(L) 5</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td>MAG 6</td>
<td>8.9</td>
<td>19</td>
</tr>
<tr>
<td>MAGT 6</td>
<td>16.5</td>
<td></td>
</tr>
<tr>
<td>MAGL 6</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>MAGT(L) 6</td>
<td>16.5</td>
<td></td>
</tr>
<tr>
<td>MAG 7</td>
<td>15.9</td>
<td>39</td>
</tr>
<tr>
<td>MAGT 7</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>MAGL 7</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>MAGT(L) 7</td>
<td>33</td>
<td></td>
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<tr>
<td>MAG 8</td>
<td>31.5</td>
<td>60.5</td>
</tr>
<tr>
<td>MAGT 8</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>MAGL 8</td>
<td>51</td>
<td></td>
</tr>
<tr>
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<td>51</td>
<td></td>
</tr>
<tr>
<td>MAG 10</td>
<td>44</td>
<td>66</td>
</tr>
<tr>
<td>MAGT 10</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>MAGL 10</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>MAGT(L) 10</td>
<td>66</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Seals are not prepared.
2. Dimension d indicates the maximum diameter when machining is done at the shaft ends.
3. Lengths indicated are standard length. Spline shafts in different lengths are also available. Simply indicate the necessary length of spline shaft (mm) in the identification number.
4. The directions of dynamic load rating (C), basic static load rating (C0), dynamic torque rating (T) and static torque/moment rating (Tn, Ts and T1) are shown in the skitches below. The upper values in the Tn and Ts columns apply to one external cylinder, and the lower values apply to two external cylinders in close contact.

Example of identification number of assembled set
### C-Lube Linear Ball Spine MAG

**Flange type**

<table>
<thead>
<tr>
<th>Model number</th>
<th>Mass (Ref.) g</th>
<th>External cylinder (spine shaft per 100mm)</th>
<th>Dimension and tolerance of external cylinder mm</th>
<th>Dimension of spline shaft mm</th>
<th>Basic dynamic load rating</th>
<th>Basic static load rating</th>
<th>Dynamic torque rating</th>
<th>Static torque rating</th>
<th>Static moment rating</th>
<th>Model number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGF 5</td>
<td>8.9</td>
<td>14.9</td>
<td>10 -0.029</td>
<td>5 0</td>
<td>4.2</td>
<td>100 150</td>
<td>200 220</td>
<td>51 60 75</td>
<td>85 90 97</td>
<td>MAGF 5</td>
</tr>
<tr>
<td>MAGF 5</td>
<td>12.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MAGF 5</td>
</tr>
<tr>
<td>MAGF 6</td>
<td>13.9</td>
<td>19</td>
<td>12 -0.011</td>
<td>6 0</td>
<td>5.2</td>
<td>150 200</td>
<td>300 350</td>
<td>90 100 110</td>
<td>110 125 130</td>
<td>MAGF 6</td>
</tr>
<tr>
<td>MAGF 6</td>
<td>16.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>MAGF 6</td>
</tr>
<tr>
<td>MAGF 8</td>
<td>23.5</td>
<td>22</td>
<td>15 -0.011</td>
<td>8 0</td>
<td>7</td>
<td>150 200</td>
<td>300 350</td>
<td>100 110 120</td>
<td>150 160 170</td>
<td>MAGF 8</td>
</tr>
<tr>
<td>MAGF 8</td>
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<td>MAGF 8</td>
</tr>
<tr>
<td>MAGF 10</td>
<td>45</td>
<td>60.5</td>
<td>19 -0.013</td>
<td>10 0</td>
<td>8.9</td>
<td>200 300</td>
<td>600 700</td>
<td>140 150 160</td>
<td>160 180 190</td>
<td>MAGF 10</td>
</tr>
<tr>
<td>MAGF 10</td>
<td>51</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>MAGF 10</td>
</tr>
<tr>
<td>MAGF 12</td>
<td>59</td>
<td>87.5</td>
<td>21 -0.013</td>
<td>12 0</td>
<td>10.9</td>
<td>200 300</td>
<td>800 900</td>
<td>190 210 230</td>
<td>240 270 300</td>
<td>MAGF 12</td>
</tr>
<tr>
<td>MAGF 12</td>
<td>66</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MAGF 12</td>
</tr>
</tbody>
</table>

Note: (1) Dimension of indicates the maximum diameter when machining is done at the shaft ends.
(2) Lengths indicated are standard lengths. Spline shafts in different lengths are also available. Simply indicate the necessary length of spline shaft (mm) in the identification number.
(3) The directions of dynamic load rating (C), basic static load rating (C2), dynamic torque rating (T), and static torque/moment rating (Tt, Tc, and Tc) are shown in the sketches below. The upper values in the Tt and Tc columns apply to two external cylinders, and the lower values apply to two external cylinders in close contact.

![Diagram of MAGF](image)

### Example of identification number of assembled set

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>MAGF</td>
<td>T</td>
<td>5</td>
<td>C2</td>
<td>R150</td>
<td>Tt</td>
<td>H</td>
<td>S2</td>
<td>N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Model code**: Refers to the model code of the product.
- **Code**: Refers to the code indicating the type of product.
- **Reference Code**: Refers to the code indicating the reference for the product.

### Specifications

- **Accuracy class**
  - H: High
  - P: Precision
- **Preload amount**
  - No symbol: Standard
  - E: Light preload
- **Number of external cylinder (two cylinders)**
  - 5, 6, 10, 12
- **External cylinder**
  - Hollow shaft (H): 0.2248lbs.
  - Solid shaft (P): 0.102kgf
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ISO 9001 & 14001 Quality system registration certificate