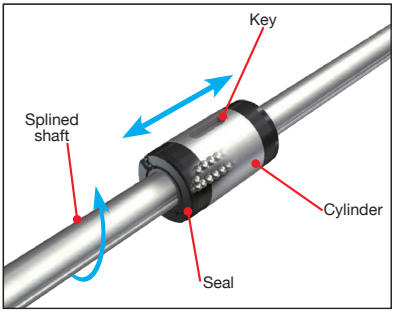
## Shafts and cylinders

# IKO LSAG
# LSAGC
# LSAGF-C




### Allows to transmit torque during linear linear movements

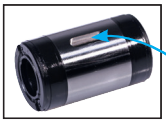
- The balls roll in the groove and prevent the rotation of the sleeve around the shaft.
- Very suitable for smooth travel and and precise angular positioning.

### Applications

- Industrial robots
- Measuring instruments
- Packing machines
- Presses

### Compose your guide by selecting the shaft and the number of cylinders you need

| Cylinder | | Splined shaft | | Full set |
|---|---|---|---|---|
|  | + |  | = |  |



**Cylinder LSAG-C**
Cylinder with keyway

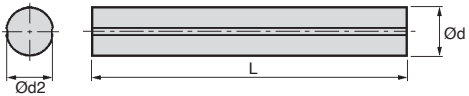


**Cylinder LSAGF-C**
Cylinder with flange

# LSAG IKO Dynamic loads from 558 N to 1862 N

- ***Shafts and cylindrical slides have separate part numbers, remember to order both***
- *2 rows of balls which prevent the cylinder from rotating*
- *Material: Steel*



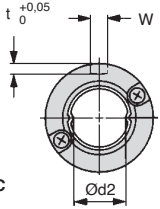




**DISCOUNTS**

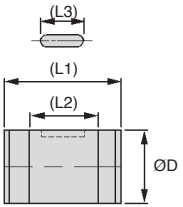
| Qty | 1+ | 4+ | 8+ |
|---|---|---|---|
| Disc. | List | -6% | On request |

| Part number | Ød | Ød2 | L | Max. length (mm) | Type of cylinder | Weight / 100mm (g) | Stock* | Price each 1 to 3 |
|---|---|---|---|---|---|---|---|---|
| LSAG5-100 | 5 0/-0,012 | 4,2 | 100 | 200 | - | 14,9 | ✔ | 68,46 € |
| LSAG5-150 | 5 0/-0,012 | 4,2 | 150 | 200 | - | 14,9 | - | 102,30 € |
| LSAG5-200 | 5 0/-0,012 | 4,2 | 200 | 200 | - | 14,9 | - | 139,63 € |
| LSAG5-C | 5 0/-0,012 | - | Cylinder | - | Standard | - | ✔ | 98,95 € |
| LSAG5F-C | 5 0/-0,012 | - | Cylinder | - | Flanged | - | - | 119,33 € |
| LSAG6-150 | 6 0/-0,012 | 5,2 | 150 | 300 | - | 19,0 | ✔ | 95,45 € |
| LSAG6-200 | 6 0/-0,012 | 5,2 | 200 | 300 | - | 19,0 | - | 133,00 € |
| LSAG6-250 | 6 0/-0,012 | 5,2 | 250 | 300 | - | 19,0 | - | 168,98 € |
| LSAG6-300 | 6 0/-0,012 | 5,2 | 300 | 300 | - | 19,0 | - | 204,39 € |
| LSAG6-C | 6 0/-0,012 | - | Cylinder | - | Standard | - | ✔ | 102,30 € |
| LSAG6F-C | 6 0/-0,012 | - | Cylinder | - | Flanged | - | - | 122,83 € |
| LSAG8-150 | 8 0/-0,015 | 7,0 | 150 | 500 | - | 39,0 | ✔ | 81,72 € |
| LSAG8-200 | 8 0/-0,015 | 7,0 | 200 | 500 | - | 39,0 | - | 102,30 € |
| LSAG8-250 | 8 0/-0,015 | 7,0 | 250 | 500 | - | 39,0 | - | 129,49 € |
| LSAG8-300 | 8 0/-0,015 | 7,0 | 300 | 500 | - | 39,0 | - | 155,70 € |
| LSAG8-400 | 8 0/-0,015 | 7,0 | 400 | 500 | - | 39,0 | - | 211,23 € |
| LSAG8-500 | 8 0/-0,015 | 7,0 | 500 | 500 | - | 39,0 | - | 272,63 € |
| LSAG8-C | 8 0/-0,015 | - | Cylinder | - | Standard | - | ✔ | 105,60 € |
| LSAG8F-C | 8 0/-0,015 | - | Cylinder | - | Flanged | - | - | 126,16 € |
| LSAG10-200 | 10 0/-0,015 | 8,9 | 200 | 600 | - | 60,5 | - | 68,46 € |
| LSAG10-300 | 10 0/-0,015 | 8,9 | 300 | 600 | - | 60,5 | - | 109,12 € |
| LSAG10-400 | 10 0/-0,015 | 8,9 | 400 | 600 | - | 60,5 | - | 149,80 € |
| LSAG10-500 | 10 0/-0,015 | 8,9 | 500 | 600 | - | 60,5 | - | 190,89 € |
| LSAG10-600 | 10 0/-0,015 | 8,9 | 600 | 600 | - | 60,5 | - | 231,96 € |
| LSAG10-C | 10 0/-0,015 | - | Cylinder | - | Standard | - | - | 112,66 € |
| LSAG10F-C | 10 0/-0,015 | - | Cylinder | - | Flanged | - | - | 133,74 € |

**Depending on availability - Dimensions in mm*

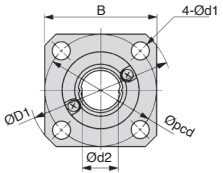


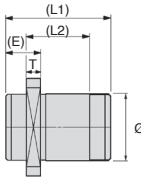

**LSAG-C**




| Part number | Weight (g) | ØD | Ø d2 | L1 | L2 | W | L3 | t | Basic dynamic load C (N) | Basic static load Co (N) | Dynamic torque T (Nm) | Static torque To (Nm) | Static moment Tx (Nm)(1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSAG5-C | 4,8 | 10 0/-0,09 | 5 | 18 | 9,4 | 2,0 | 6,0 | 1,2 | 588 | 637 | 1,76 | 1,96 | 1,08 | 7,84 |
| LSAG6-C | 8,9 | 12 0/-0,011 | 6 | 21 | 12,4 | 2,0 | 8,0 | 1,2 | 715 | 852 | 2,45 | 3,04 | 1,76 | 11,76 |
| LSAG8-C | 15,5 | 15 0/-0,013 | 8 | 35 | 14,6 | 2,5 | 8,5 | 1,5 | 1176 | 1372 | 5,49 | 6,17 | 3,23 | 21,56 |
| LSAG10-C | 31,5 | 19 0/-0,013 | 10 | 30 | 18,2 | 3,0 | 11,0 | 1,8 | 1862 | 2156 | 10,78 | 12,74 | 6,96 | 41,16 |

**LSAGF-C**




| Part number | Weight (g) | ØD | L1 | L2 | ØD1 | B | E | T | Øpcd | Ød1 |
|---|---|---|---|---|---|---|---|---|---|---|
| LSAG5F-C | 8,9 | 10 0/-0,09 | 18 | 9,4 | 23 | 18 | 7 | 2,7 | 17 | 3,4 |
| LSAG6F-C | 13,9 | 12 0/-0,011 | 21 | 12,4 | 25 | 20 | 7 | 2,7 | 19 | 3,4 |
| LSAG8F-C | 23,5 | 15 0/-0,013 | 25 | 14,6 | 28 | 22 | 9 | 3,8 | 22 | 3,4 |
| LSAG10F-C | 45,0 | 19 0/-0,013 | 30 | 18,2 | 36 | 28 | 10 | 4,1 | 28 | 4,5 |

| Part number | Basic dynamic load C (N) | Basic static load Co (N) | Static torque T (Nm) | Static torque To (Nm) | Static moment Tx (Nm)(1) | |
|---|---|---|---|---|---|---|
| LSAG5F-C | 558 | 637 | 1,76 | 1,96 | 1,08 | 7,84 |
| LSAG6F-C | 715 | 852 | 2,45 | 3,04 | 1,76 | 11,76 |
| LSAG8F-C | 1176 | 1372 | 5,49 | 6,17 | 3,23 | 21,56 |
| LSAG10F-C | 1862 | 2156 | 10,78 | 12,74 | 6,96 | 41,16 |

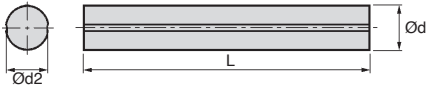
*(1) Tx: The values in the second column are for two cylinders in close contact*

LSAG IKO

# Dynamic loads from 2156 N to 15386 N

- ***Shafts and cylindrical slides have separate part numbers, remember to order both***
- *2 rows of balls which prevent the cylinder from rotating*
- *Material: Steel*



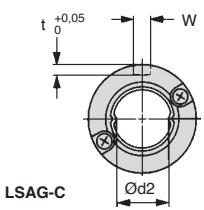




**DISCOUNTS**

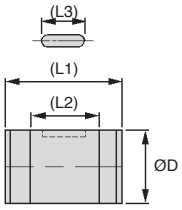
| Qty | 1+ | 4+ | 8+ |
|---|---|---|---|
| Disc. | List | -6% | On request |

| Part number | Ød | Ød2 | L | Max. length (mm) | Type of cylinder | Weight / 100mm (g) | Stock* | Price each 1 to 3 |
|---|---|---|---|---|---|---|---|---|
| LSAG12-200 | 12,0 0/-0,018 | 10,9 | 200 | 800 | - | 87,5 | ✔ | 68,46 € |
| LSAG12-300 | 12,0 0/-0,018 | 10,9 | 300 | 800 | - | 87,5 | - | 105,60 € |
| LSAG12-400 | 12,0 0/-0,018 | 10,9 | 400 | 800 | - | 87,5 | ✔ | 150,21 € |
| LSAG12-800 | 12,0 0/-0,018 | 10,9 | 800 | 800 | - | 87,5 | - | 333,67 € |
| LSAG12-C | 12,0 0/-0,018 | - | Cylinder | - | Standard | - | ✔ | 122,83 € |
| LSAG12F-C | 12,0 0/-0,018 | - | Cylinder | - | Flanged | - | - | 140,42 € |
| LSAG15-200 | 13,6 0/-0,018 | 11,6 | 200 | 1000 | - | 111,0 | ✔ | 68,46 € |
| LSAG15-300 | 13,6 0/-0,018 | 11,6 | 300 | 1000 | - | 111,0 | - | 109,12 € |
| LSAG15-400 | 13,6 0/-0,018 | 11,6 | 400 | 1000 | - | 111,0 | ✔ | 156,63 € |
| LSAG15-C | 13,6 0/-0,018 | - | Cylinder | - | Standard | - | ✔ | 136,49 € |
| LSAG15F-C | 13,6 0/-0,018 | - | Cylinder | - | Flanged | - | ✔ | 161,56 € |
| LSAG20-300 | 18,2 0/-0,021 | 15,7 | 300 | 1000 | - | 202,0 | - | 102,30 € |
| LSAG20-400 | 18,2 0/-0,021 | 15,7 | 400 | 1000 | - | 202,0 | ✔ | 143,15 € |
| LSAG20-500 | 18,2 0/-0,021 | 15,7 | 500 | 1000 | - | 202,0 | - | 190,89 € |
| LSAG20-600 | 18,2 0/-0,021 | 15,7 | 600 | 1000 | - | 202,0 | - | 238,43 € |
| LSAG20-1000 | 18,2 0/-0,021 | 15,7 | 1000 | 1000 | - | 202,0 | - | 456,30 € |
| LSAG20-C | 18,2 0/-0,021 | - | Cylinder | - | Standard | - | - | 156,63 € |
| LSAG20F-C | 18,2 0/-0,021 | - | Cylinder | - | Flanged | - | ✔ | 203,80 € |
| LSAG25-300 | 22,6 0/-0,021 | 19,4 | 300 | 1200 | - | 310,0 | - | 115,76 € |
| LSAG25-400 | 22,6 0/-0,021 | 19,4 | 400 | 1200 | - | 310,0 | - | 136,33 € |
| LSAG25-500 | 22,6 0/-0,021 | 19,4 | 500 | 1200 | - | 310,0 | - | 224,93 € |
| LSAG25-600 | 22,6 0/-0,021 | 19,4 | 600 | 1200 | - | 310,0 | - | 252,09 € |
| LSAG25-800 | 22,6 0/-0,021 | 19,4 | 800 | 1200 | - | 310,0 | - | 323,67 € |
| LSAG25-1100 | 22,6 0/-0,021 | 19,4 | 1100 | 1200 | - | 310,0 | - | 543,55 € |
| LSAG25-1200 | 22,6 0/-0,021 | 19,4 | 1200 | 1200 | - | 310,0 | - | 616,28 € |
| LSAG25-C | 22,6 0/-0,021 | - | Cylinder | - | Standard | - | - | 180,54 € |
| LSAG25F-C | 22,6 0/-0,021 | - | Cylinder | - | Flanged | - | - | 238,43 € |
| LSAG30-400 | 27,2 0/-0,021 | 23,5 | 400 | 1200 | - | 450,0 | - | 204,39 € |
| LSAG30-500 | 27,2 0/-0,021 | 23,5 | 500 | 1200 | - | 450,0 | - | 245,27 € |
| LSAG30-600 | 27,2 0/-0,021 | 23,5 | 600 | 1200 | - | 450,0 | - | 292,97 € |
| LSAG30-700 | 27,2 0/-0,021 | 23,5 | 700 | 1200 | - | 450,0 | - | 347,36 € |
| LSAG30-800 | 27,2 0/-0,021 | 23,5 | 800 | 1200 | - | 450,0 | - | 401,33 € |
| LSAG30-1100 | 27,2 0/-0,021 | 23,5 | 1100 | 1200 | - | 450,0 | - | 599,24 € |
| LSAG30-1200 | 27,2 0/-0,021 | 23,5 | 1200 | 1200 | - | 450,0 | - | 667,32 € |
| LSAG30-C | 27,2 0/-0,021 | - | Cylinder | - | Standard | - | - | 204,39 € |
| LSAG30F-C | 27,2 0/-0,021 | - | Cylinder | - | Flanged | - | - | 280,66 € |

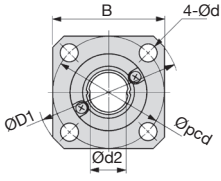
**Depending on availability - Dimensions in mm*

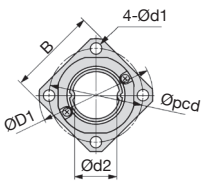


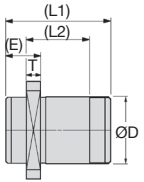

LSAG-C




| Part number | Weight (g) | ØD | Ø d2 | L1 | L2 | W | t | L3 | Basic dynamic load C (N) | Basic static load Co (N) | Dynamic torque T (Nm) | Static torque To (Nm) | Static moment Tx (Nm)(1) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LSAG12-C | 44,0 | 21 0/-0,013 | 12,0 | 35 | 23,0 | 3,0 | 1,8 | 15 | 2180 | 2690 | 14,8 | 18,3 | 10,6 | 59,1 |
| LSAG15-C | 59,5 | 23 0/-0,013 | 13,6 | 40 | 27,0 | 3,5 | 2,0 | 20 | 4180 | 6070 | 31,3 | 45,6 | 27,8 | 152,0 |
| LSAG20-C | 130,0 | 30 0/-0,016 | 18,2 | 50 | 33,0 | 4,0 | 2,5 | 26 | 6600 | 9040 | 66,0 | 90,4 | 48,6 | 288,0 |
| LSAG25-C | 220,0 | 37 0/-0,016 | 22,6 | 60 | 39,2 | 5,0 | 3,0 | 29 | 11200 | 14300 | 139,0 | 178,0 | 92,8 | 551,0 |
| LSAG30-C | 430,0 | 45 0/-0,016 | 27,2 | 70 | 43,0 | 7,0 | 4,0 | 35 | 15400 | 19400 | 231,0 | 292,0 | 147,0 | 874,0 |




LSAGF-C

| Part number | Weight (g) | ØD | L1 | L2 | ØD1 | B | E | T | Øpcd | Ød1 |
|---|---|---|---|---|---|---|---|---|---|---|
| LSAG12F-C | 59 | 21 0/-0,013 | 35 | 23,0 | 38 | 30 | 10 | 4,0 | 30 | 4,5 |
| LSAG15F-C | 77 | 23 0/-0,013 | 40 | 27,0 | 40 | 31 | 11 | 4,5 | 32 | 4,5 |
| LSAG20F-C | 150 | 30 0/-0,016 | 50 | 33,0 | 46 | 35 | 14 | 5,5 | 38 | 4,5 |
| LSAG25F-C | 255 | 37 0/-0,016 | 60 | 39,2 | 57 | 43 | 17 | 6,6 | 47 | 5,5 |
| LSAG30F-C | 476 | 45 0/-0,016 | 70 | 43,0 | 65 | 50 | 21 | 7,5 | 54 | 6,6 |

| Part number | Basic dynamic load C (N) | Basic static load Co (N) | Dynamic torque T (Nm) | Static torque To (Nm) | Static moment Tx (Nm)(1) | |
|---|---|---|---|---|---|---|
| LSAG12F-C | 2156 | 2646 | 14,7 | 18,6 | 10,78 | 58,8 |
| LSAG15F-C | 4214 | 6076 | 31,4 | 45,0 | 27,44 | 152,0 |
| LSAG20F-C | 6566 | 9016 | 65,7 | 90,0 | 49,00 | 287,0 |
| LSAG25F-C | 11172 | 14308 | 139,0 | 178,0 | 93,00 | 550,0 |
| LSAG30F-C | 15386 | 19404 | 231,0 | 291,0 | 147,00 | 873,0 |

(1) Tx: *The values in the second column are for two cylinders in close contact*

## User safety

The normal continuous operating temperature of the LWL linear slides is 100°C with occasional use at up to 120°C. If your application will exceed 100°C, please contact us for advice.
When mounting two or more cylinders on to one shaft, we recommend only attaching one cylinder with a key, with the proviso that the moment of rotation could be supported by a single cylinder Where it is necessary to use two (or more) keys to attach two (or more) cylinders or to assemble two cylinders end-to-end, please consult us.

## Adjusting the cylinder

Generally, a transition fit (J7) is required between the external cylinder of and the housing bore. When high accuracy and rigidity are not required, a clearance fit (H7) may also be acceptable

## Load capacity and life expectancy

**Basic dynamic load**

The basic dynamic load rating is defined as a constant load, both in direction and magnitude to which a group of identical LSAG linear splines are subjected individually and where 90% of the slides in that group can travel for 50km without suffering material damage due to rolling contact fatigue.

**Basic static load capacity**

The basic static load rating (Figure 1) is defined as a static load that gives a prescribed constant stress at the centre of the contact area between the rolling element and track whilst receiving the maximum load.

**Dynamic torque**

The dynamic torque rating is defined as the moment of rotation at constant load, both in direction and magnitude to which a group of identical LSAG linear splines are subjected individually and where 90% of the slides in that group can travel for 50km without suffering material damage due to rolling contact fatigue

**Static moment of torsion and static moment**

The static torque (figure 1) and the static moment (figure 2) are defined as exerting a constant contact at the centre of the contact zone of the moving parts and the tracks where the maximum load is exerted. The Tx values in the tables apply to one cylinder or to two cylinders placed end-to-end

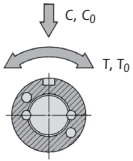



**Figure 1 Load direction and torque**

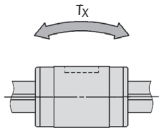



**Figure 2 Moment direction**

## Life expectancy

*The life expectancy of LSAG linear rotary ball splines can be calculated using the following formula:*

$$L = 50 \left(\frac{C}{fwFr}\right)^3 \quad (1)$$

$$L = 50 \left(\frac{T}{fwFr}\right)^3 \quad (2)$$

*where:*

**L** : *Life expectancy in kilometres (or $10^3$m)*
**C** : *Basic Dynamic load capacity* (**N**)
**T** : *Dynamic load* (**N**)
**Fr** : *calculated radial load*
**Ft** : *moment of torsion*
**fw** : *load factor (see table 1)*

*In applications where the stroke length and the number of strokes per minute are known, the life expectancy in hours can be calculated as follows:*

$$L^h = \frac{10^6 L}{2Sn_1 x60} \quad (3)$$

Lh : *Life expectancy in hours* (**h**).....**S** : *Stroke length* (***mm***)
n1 : *Number of strokes per minute* (***spm***)

**Table 1 Load factor**

| Operating condition | fw |
|---|---|
| Smooth working without vibrations and/or shocks | 1,0 ~ 1,2 |
| Normal working | 1,2 ~ 1,5 |
| Working with vibrations and/or shocks | 1,5 ~ 3,0 |

***Static security factor***

*Excessively heavy loads or violent shocks can cause permanent damage to the balls or tracks, causing the overall performance to suffer. The acceptable load will depend on the working conditions and the application, the factor of safety will be determined based on these requirements.*
*The static safety factor of the LSAG series splined cylindrical linear ball guidance models is calculated using the formula below. Common values are given in table 2.*
fs : *static safety factor*
$C_o$ : *basic static load capacity*

$$fs = \frac{C_0}{P_0} \quad (4)$$

**Po** : *static load*
**To** : *static torque*
**Pro** : *static radial load*
**Pto** : *static moment*

**Table 2 Static safety factor**

| Operating conditions | fs |
|---|---|
| Smooth working without vibrations and/or shocks | 3 ~ 5 |
| Normal working | 2 ~ 4 |
| Working with vibrations and/or shocks | 1 ~ 3 |



***Splined shaft***

*The geometrical moment of inertia of the section and the shaft section modules are given in table 3.*

**Table 3 Geometrical moment of inertia of the section and shaft section modulus**

| Part number | Geometrical moment of inertia (mm4) | | Section modulus ($mm^3$) | |
|---|---|---|---|---|
| | Compact shaft | Hollow shaft | Compact shaft | Hollow shaft |
| LSAG(T) 5 R | 29 | 29 | 12 | 12 |
| LSAG(T) 6 R | 61 | 61 | 21 | 21 |
| LSAG(T) 8 R | 190 | 190 | 49 | 49 |
| LSAG(T) 10 R | 470 | 460 | 95 | 94 |
| LSAG(T) 12 R | 990 | 960 | 170 | 160 |

## *Lubrication and dust protection*

***LSAG*** *splined slides are supplied lubricated with a Lithium soap based grease containing extreme pressure additives.*

***LSAG*** *series precision linear rotary ball splines are protected from dust by special rubber seals. In a particularly polluted atmosphere, for example where sand or swarf can fall on to the shaft, we recommend you install protection for the whole shaft.*