

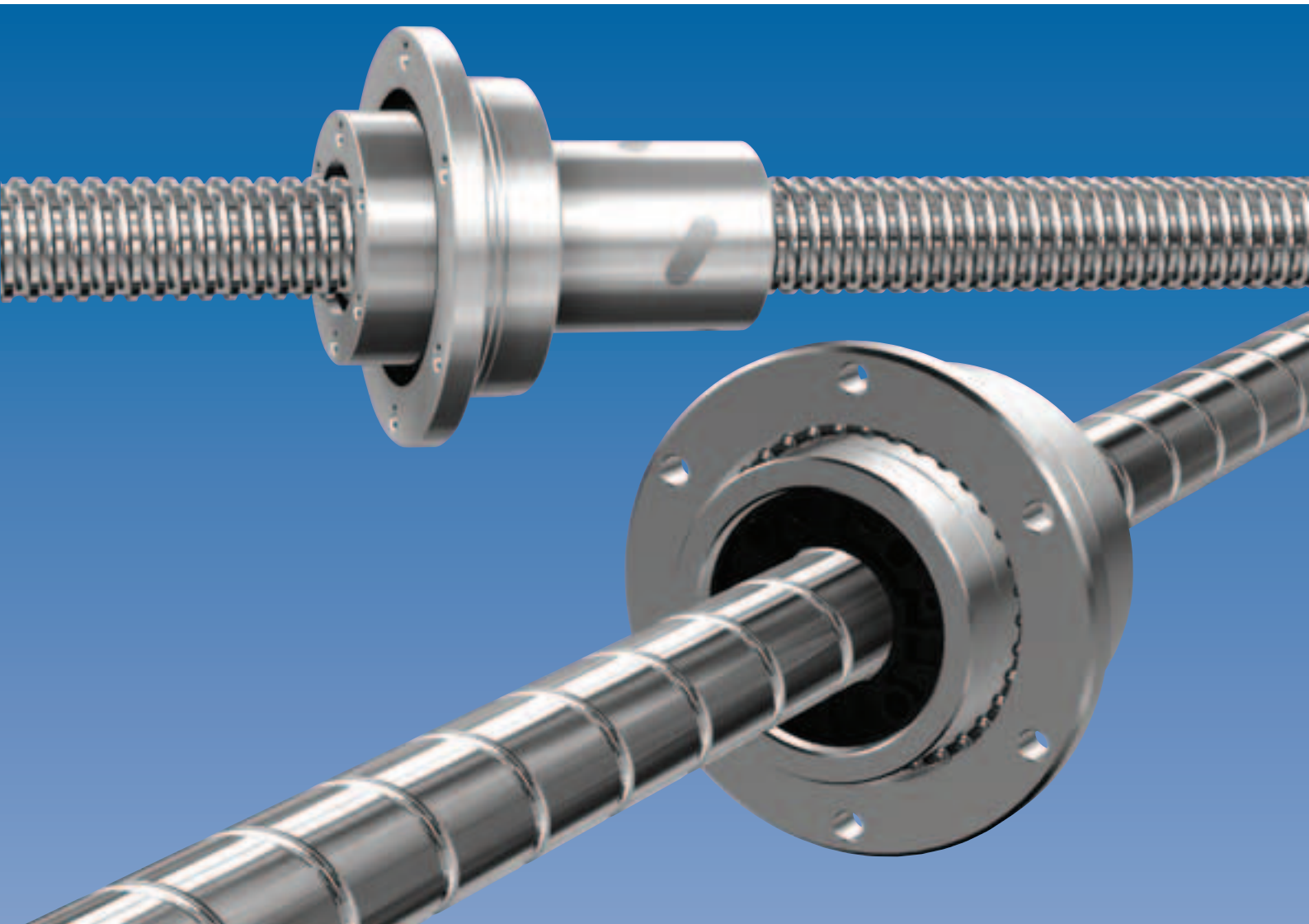


# Rotary Ball Screw

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Rotary-Nut Series

# BLR/DIR



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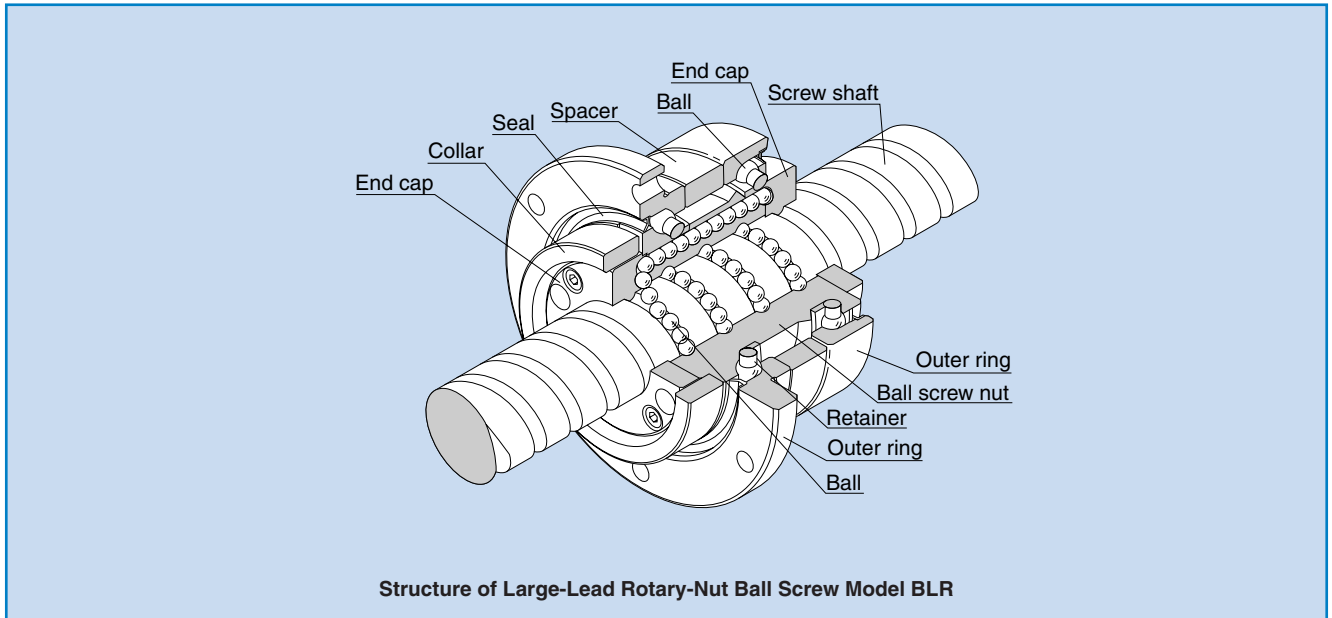
## ▼ Rotary Ball Screw Model DIR

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# Rotary-Nut Series Rotary Ball Screw

# BLR



## Structure and Features

The Rotary Ball Screw is a rotary-nut ball screw unit in which a ball screw nut is integrated with a support bearing. The support bearing is an angular bearing that has a contact angle of  $60^\circ$ , contains a large number of balls and achieves a large axial rigidity. Model BLR is divided into two types: Precision Ball Screw and Rolled Ball Screw.

### ● Capable of Fast Feed

Since the ball screw nut rotates with the screw shaft being fixed, it can be fed at high speed despite a thin screw shaft. This allows a small driving motor to be used.

### ● Smooth Motion

It achieves smoother motion than rack-and-pinion based linear motion. In addition, since the screw shaft does not rotate because of the ball screw nut drive, this model does not show skipping, produces low noise and generates little heat.

### ● Low Noise Level even in High-speed Rotation

Model BLR produces very low noise when its balls are picked up along the end cap. In addition, the balls circulate by passing through the ball screw nut, allowing this model to produce minimum noise even in high-speed operation.

### ● High Rigidity

The support bearing of this model is larger than that of the rotary screw shaft type. Thus, its axial rigidity is significantly increased.

### ● Compact

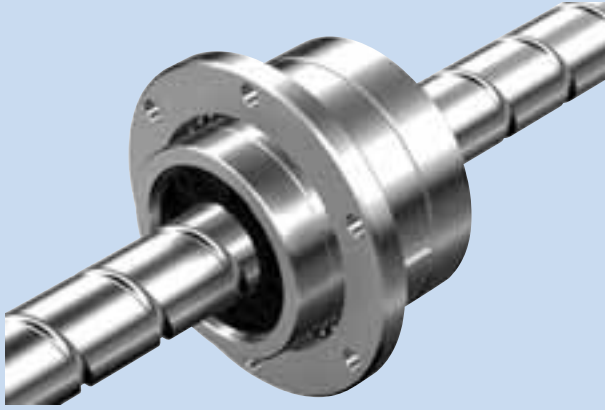
Since the nut and the support bearing are integrated, highly accurate and compact design is achieved.

### ● Easy Installation

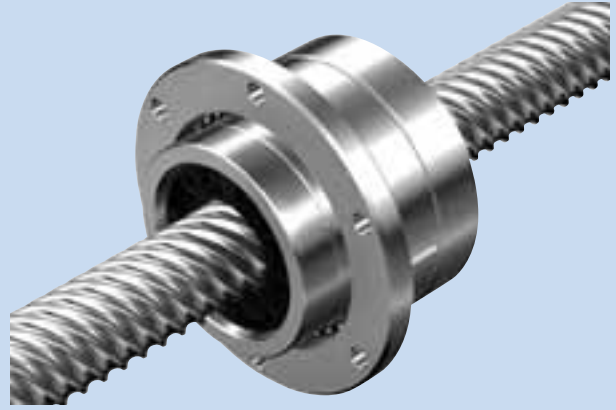
By simply mounting this model to the housing with bolts, a ball nut rotation mechanism is gained (for the housing's inner-diameter tolerance, H7 is recommended).

## Types

**Model BLR (Precision Type)** [Rotary Ball Screw]



**Model BLR (Rolled Type)** [Rotary Ball Screw]



## Static Safety Factor

It is necessary to take into account a static safety factor indicated in Table 1 against the axial load that is applied on the Ball Screw. When studying the static safety factor, a basic static load rating  $C_{0a}$  is required.

### [Basic Static Load Rating $C_{0a}$ ]

When a Ball Screw receives an excessive load or a large impact load while it is stationary or in motion, a local permanent deformation occurs between the raceway and the steel ball. If the permanent deformation exceeds a certain limit, it will prevent the Ball Screw from smoothly moving.

It is recognized that in general there will be no operational problem if the amount of permanent deformation is up to approximately 0.0001 of the steel ball diameter. The load present in such cases is called basic static load rating  $C_{0a}$ .

### [Static Safety Factor]

$$f_s \leq \frac{C_{0a}}{F_a}$$

$f_s$  : Static safety factor (see Table 1)

$C_{0a}$  : Basic static load rating (kN)

(see the dimensional table for model BLR on page 8)

$F_a$  : Axial load (kN)

**Table 1 Static Safety Factor**

| Machine using the Ball Screw | Load conditions              | Lower limit of $f_s$ |
|------------------------------|------------------------------|----------------------|
| General industrial machinery | Without vibrations or impact | 1.0 to 1.3           |
|                              | With vibrations or impact    | 2.0 to 3.0           |
| Machine tools                | Without vibrations or impact | 1.0 to 1.5           |
|                              | With vibrations or impact    | 2.5 to 7.0           |

## Rated Life and Service Life Time

### [Basic Dynamic Load Rating Ca]

Basic dynamic load rating Ca is used to calculate the service life of a Ball Screw in motion with its ball screw nut being under a load. The basic dynamic load rating Ca is an axial load under which the rated life of 90% of a group of the same Ball Screw units independently operating is 10<sup>6</sup> rev (1 million revolutions).

### [Rated Life]

The service life of a Ball Screw is obtained from the equation below using the basic dynamic load rating and the axial load.

$$L = \left( \frac{Ca}{fw \cdot Fa} \right)^3 \times 10^6$$

L : Rated life (rev)  
 Ca : Basic dynamic load rating (N) (see the dimensional table for model BLR on page 8)  
 Fa : Axial load (N)  
 fw : Load factor (see Table 2)

**Table 2 Load Factor**

| Vibrations/impact | Velocity (V)                  | fw         |
|-------------------|-------------------------------|------------|
| Faint             | Very low<br>V ≤ 0.25 m/s      | 1.0 to 1.2 |
| Weak              | Low<br>0.25 ≤ V ≤ 1.0 m/s     | 1.2 to 1.5 |
| Medium            | Moderate<br>1.0 ≤ V ≤ 2.0 m/s | 1.5 to 2.0 |
| Strong            | High<br>2.0 m/s < V           | 2.0 to 3.5 |

### [Service Life Time]

When the rated life (L) has been determined, the service life time is obtained from the following equation if the stroke length and the number of reciprocations are constant.

$$Lh = \frac{L \times \ell}{2 \times \ell s \times n_1 \times 60}$$

Lh : Service life time (h)  
 ℓ s : Stroke length (mm)  
 n<sub>1</sub> : Revolutions per minute (min<sup>-1</sup>)  
 ℓ : Lead (mm)

(For details, see the General Catalog.)

## Axial Clearance of Model BLR

### Axial Clearance of Model BLR (Precision Type)

Table 3 shows the axial clearance of model BLR (precision type). If the manufacturing length exceeds the corresponding value indicated in Table 4, the clearance may partially be negative (preloaded state).

**Table 3 Axial Clearance of Model BLR (Precision Type)**

| Clearance symbol | G0         | GT         | G1        | G2        | G3        |
|------------------|------------|------------|-----------|-----------|-----------|
| Axial clearance  | 0 or below | 0 to 0.005 | 0 to 0.01 | 0 to 0.02 | 0 to 0.05 |

Unit: mm

**Table 4 Maximum Manufacturing Length of Model BLR (Precision Type) by Axial Clearance**

| Model No.                  | Overall screw length |      |              |      |              |      |      |
|----------------------------|----------------------|------|--------------|------|--------------|------|------|
|                            | Clearance GT         |      | Clearance G1 |      | Clearance G2 |      |      |
|                            | C0 to C3             | C5   | C0 to C3     | C5   | C0 to C3     | C5   | C7   |
| BLR1616-3.6                | 500                  | 400  | 500          | 500  | 700          | 600  | 500  |
| BLR2020-3.6<br>BLR2525-3.6 | 800                  | 700  | 800          | 700  | 1000         | 1000 | 1000 |
| BLR3232-3.6                | 900                  | 800  | 1100         | 900  | 1400         | 1200 | 1200 |
| BLR3636-3.6<br>BLR4040-3.6 | 1000                 | 800  | 1300         | 1000 | 2000         | 1500 | 1500 |
| BLR5050-3.6                | 1200                 | 1000 | 1600         | 1300 | 2500         | 2000 | 2000 |

Unit: mm

\* If the product is to be manufactured with accuracy grade C7 and clearance GT or G1, the clearance will partially be negative.

## Axial Clearance of Model BLR (Rolled Type)

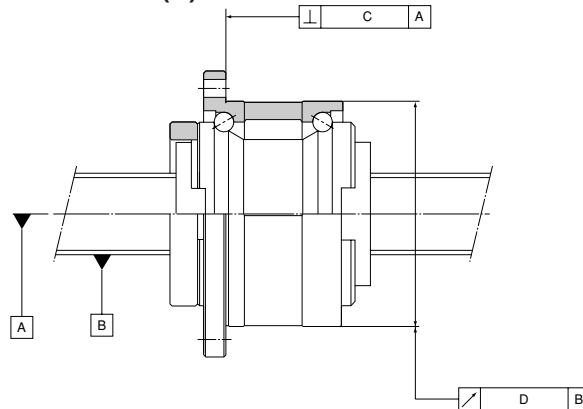
Table 5 shows the axial clearance of model BLR (rolled type).

**Table 5 Axial Clearance of Model BLR (Rolled Type)**  
Unit: mm

| Model No.                                 | Axial clearance (maximum) |
|---|---------------------------|
| BLR1616-3.6<br>BLR2020-3.6<br>BLR2525-3.6 | 0.1                       |
| BLR3232-3.6                               | 0.14                      |
| BLR3636-3.6<br>BLR4040-3.6                | 0.17                      |
| BLR5050-3.6                               | 0.2                       |

## Accuracy Standards for Model BLR

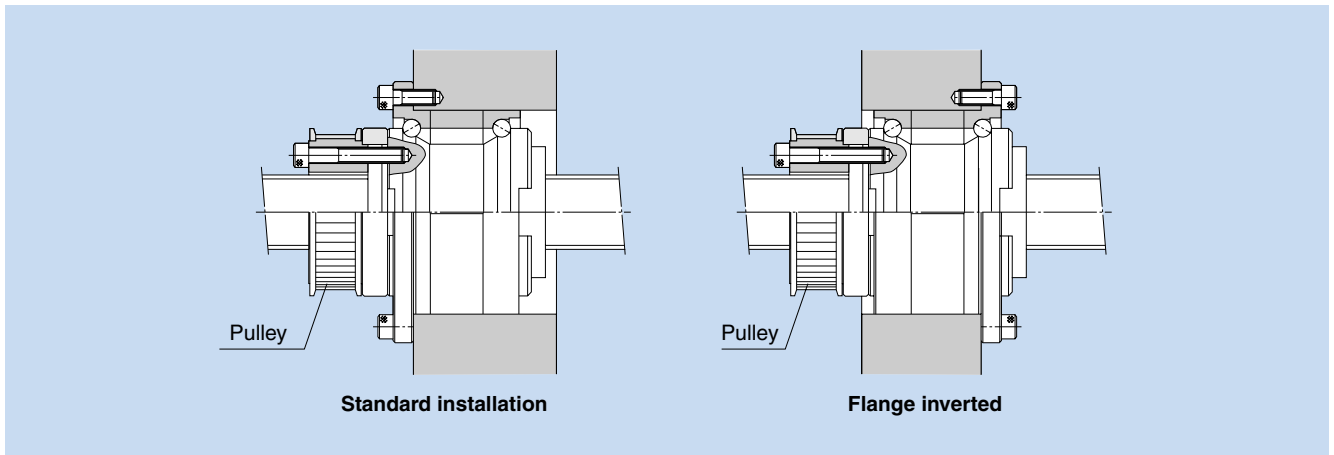
The accuracy of model BLR is compliant with a JIS standard (JIS B 1192) except for the radial run-out of the circumference of the ball screw nut from the screw axis (D) and the perpendicularity of the flange-mounting surface against the screw axis (C).



Unit: mm

| Lead accuracy  | Precision Ball Screw |       |       |       |       |       | Rolled Ball Screw |       |
|----------------|----------------------|-------|-------|-------|-------|-------|-------------------|-------|
|                | C3                   |       | C5    |       | C7    |       | C7, C8, C10       |       |
| Accuracy grade | C3                   |       | C5    |       | C7    |       | C10               |       |
| Model No.      | C                    | D     | C     | D     | C     | D     | C                 | D     |
| BLR 1616       | 0.013                | 0.017 | 0.016 | 0.020 | 0.023 | 0.035 | 0.035             | 0.065 |
| BLR 2020       | 0.013                | 0.017 | 0.016 | 0.020 | 0.023 | 0.035 | 0.035             | 0.065 |
| BLR 2525       | 0.015                | 0.020 | 0.018 | 0.024 | 0.023 | 0.035 | 0.035             | 0.065 |
| BLR 3232       | 0.015                | 0.020 | 0.018 | 0.024 | 0.023 | 0.035 | 0.035             | 0.065 |
| BLR 3636       | 0.016                | 0.021 | 0.019 | 0.025 | 0.024 | 0.036 | 0.036             | 0.066 |
| BLR 4040       | 0.018                | 0.026 | 0.021 | 0.033 | 0.026 | 0.046 | 0.046             | 0.086 |
| BLR 5050       | 0.018                | 0.026 | 0.021 | 0.033 | 0.026 | 0.046 | 0.046             | 0.086 |

## Example of Mounting the Ball Screw Nut for Model BLR



Note: If the flange is to be inverted, indicate “K” in the model number (applicable only to model BLR)

Example: BLR 2020-3.6 K UU

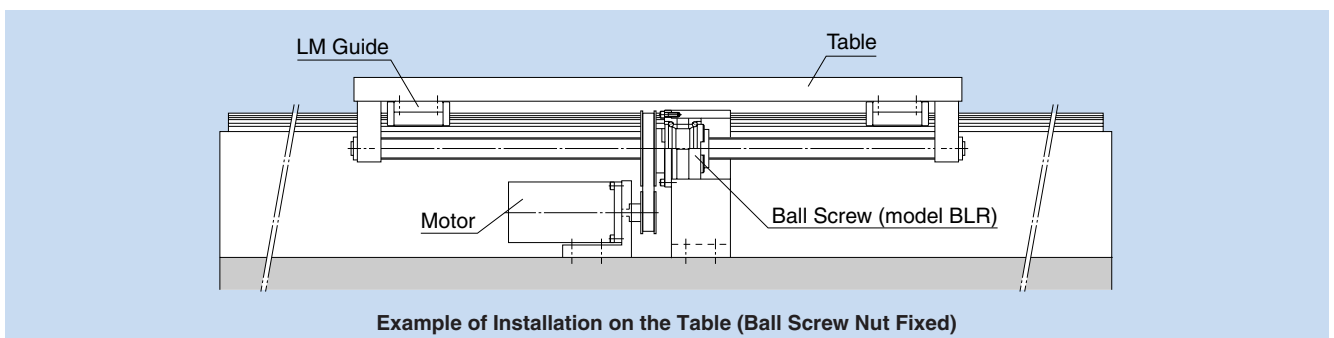
Symbol for inverted flange

(No symbol for standard flange orientation)

## Examples of Mounting Model BLR on the Table

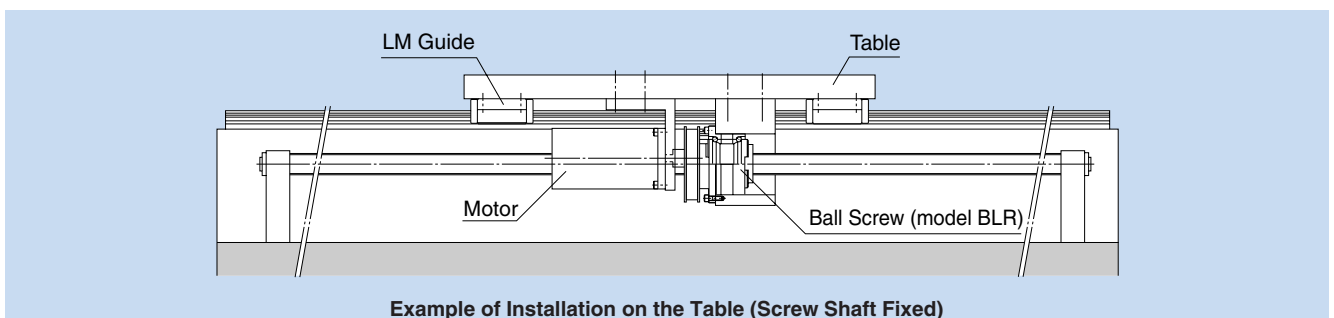
### Screw Shaft Free, Ball Screw Nut Fixed

(Suitable for a long table)



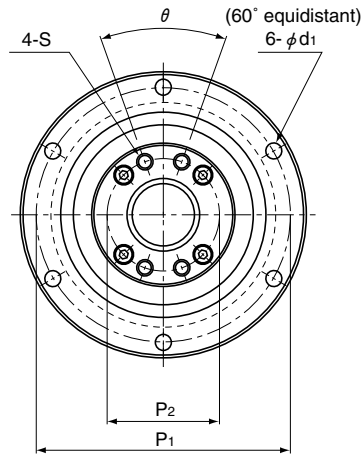
### Ball Screw Nut Free, Screw Shaft Fixed

(Suitable for a short table and a long stroke)



# BLR TYPE

## Dimensional Table for Model BLR Large-Lead Rotary-Nut Precision Ball Screw Large-Lead Rotary-Nut Rolled Ball Screw



| Model No.    | Screw shaft outer diameter d | Thread minor diameter dc | Lead Ph | Ball center-to-center diameter dp | Basic load rating |        |                    |        | Outer diameter D                   | Flange diameter D <sub>1</sub> | Overall length L <sub>1</sub> |
|--------------|------------------------------|--------------------------|---------|-----------------------------------|-------------------|--------|--------------------|--------|------------------------------------|--------------------------------|-------------------------------|
|              |                              |                          |         |                                   | C <sub>a</sub> kN |        | C <sub>0a</sub> kN |        |                                    |                                |                               |
|              |                              |                          |         |                                   | Precision         | Rolled | Precision          | Rolled |                                    |                                |                               |
| BLR 1616-3.6 | 16                           | 13.7                     | 16      | 16.65                             | 7.1               | 5.8    | 14.3               | 12.9   | 52 <sup>0</sup> <sub>-0.007</sub>  | 68                             | 43.5                          |
| BLR 2020-3.6 | 20                           | 17.5                     | 20      | 20.75                             | 11.1              | 7.7    | 24.7               | 22.3   | 62 <sup>0</sup> <sub>-0.007</sub>  | 78                             | 54                            |
| BLR 2525-3.6 | 25                           | 22                       | 25      | 26                                | 16.6              | 12.1   | 38.7               | 35     | 72 <sup>0</sup> <sub>-0.007</sub>  | 92                             | 65                            |
| BLR 3232-3.6 | 32                           | 28.3                     | 32      | 33.25                             | 23.7              | 17.3   | 59.5               | 53.9   | 80 <sup>0</sup> <sub>-0.007</sub>  | 105                            | 80                            |
| BLR 3636-3.6 | 36                           | 31.7                     | 36      | 37.4                              | 30.8              | 22.4   | 78                 | 70.5   | 100 <sup>0</sup> <sub>-0.008</sub> | 130                            | 93                            |
| BLR 4040-3.6 | 40                           | 35.2                     | 40      | 41.75                             | 38.7              | 28.1   | 99.2               | 89.8   | 110 <sup>0</sup> <sub>-0.008</sub> | 140                            | 98                            |
| BLR 5050-3.6 | 50                           | 44.1                     | 50      | 52.2                              | 57.8              | 42.1   | 155                | 140.4  | 120 <sup>0</sup> <sub>-0.008</sub> | 156                            | 126                           |

### Example of model number coding

Precision Ball Screw

**BLR2020-3.6 K UU G1 +1000L C5**

Model number

Flange orientation symbol (see page 6)  
K : flange inverted  
No symbol : standard

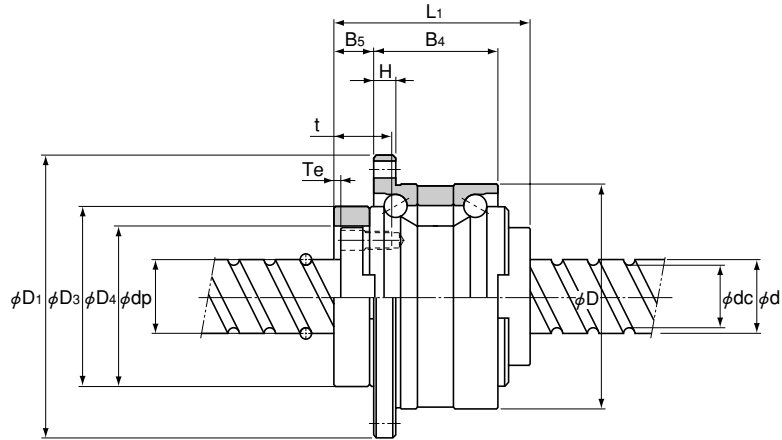
Symbol for axial clearance (see page 4)

Symbol for support bearing seal  
UU : seal attached on both sides  
No symbol : without seal

Overall screw shaft length (in mm)

Accuracy symbol (see page 5)





Unit: mm

| Ball screw dimensions |                   |    |       |       |       |       |       |     |    |       |                |          | Support bearing basic load rating |                      | Nut inertial moment |
|-----------------------|-------------------|----|-------|-------|-------|-------|-------|-----|----|-------|----------------|----------|-----------------------------------|----------------------|---------------------|
| $D_3$                 | $D_4$             | H  | $B_4$ | $B_5$ | $T_e$ | $P_1$ | $P_2$ | S   | t  | $d_1$ | $\theta^\circ$ | Ca<br>kN | $C_{0a}$<br>kN                    | kg · cm <sup>2</sup> |                     |
| 40<br>0<br>-0.025     | 32<br>+0.025<br>0 | 5  | 27.5  | 9     | 2     | 60    | 25    | M4  | 12 | 4.5   | 40             | 19.4     | 19.2                              | 0.48                 |                     |
| 50<br>0<br>-0.025     | 39<br>+0.025<br>0 | 6  | 34    | 11    | 2     | 70    | 31    | M5  | 16 | 4.5   | 40             | 26.8     | 29.3                              | 1.44                 |                     |
| 58<br>0<br>-0.03      | 47<br>+0.025<br>0 | 8  | 43    | 12.5  | 3     | 81    | 38    | M6  | 19 | 5.5   | 40             | 28.2     | 33.3                              | 3.23                 |                     |
| 66<br>0<br>-0.03      | 58<br>+0.03<br>0  | 9  | 55    | 14    | 3     | 91    | 48    | M6  | 19 | 6.6   | 40             | 30       | 39                                | 6.74                 |                     |
| 80<br>0<br>-0.03      | 66<br>+0.03<br>0  | 11 | 62    | 17    | 3     | 113   | 54    | M8  | 22 | 9     | 40             | 56.4     | 65.2                              | 16.8                 |                     |
| 90<br>0<br>-0.035     | 73<br>+0.03<br>0  | 11 | 68    | 16.5  | 3     | 123   | 61    | M8  | 22 | 9     | 50             | 59.3     | 74.1                              | 27.9                 |                     |
| 100<br>0<br>-0.035    | 90<br>+0.035<br>0 | 12 | 80    | 25    | 4     | 136   | 75    | M10 | 28 | 11    | 50             | 62.2     | 83                                | 58.2                 |                     |

**Example of model number coding**

Rolled Ball Screw

**BLR2020-3.6 K UU +1000L C7 T**

Model number

Flange orientation symbol (see page 6)

K : flange inverted  
No symbol : standard

Overall screw shaft length (in mm)

Rolled Ball Screw symbol

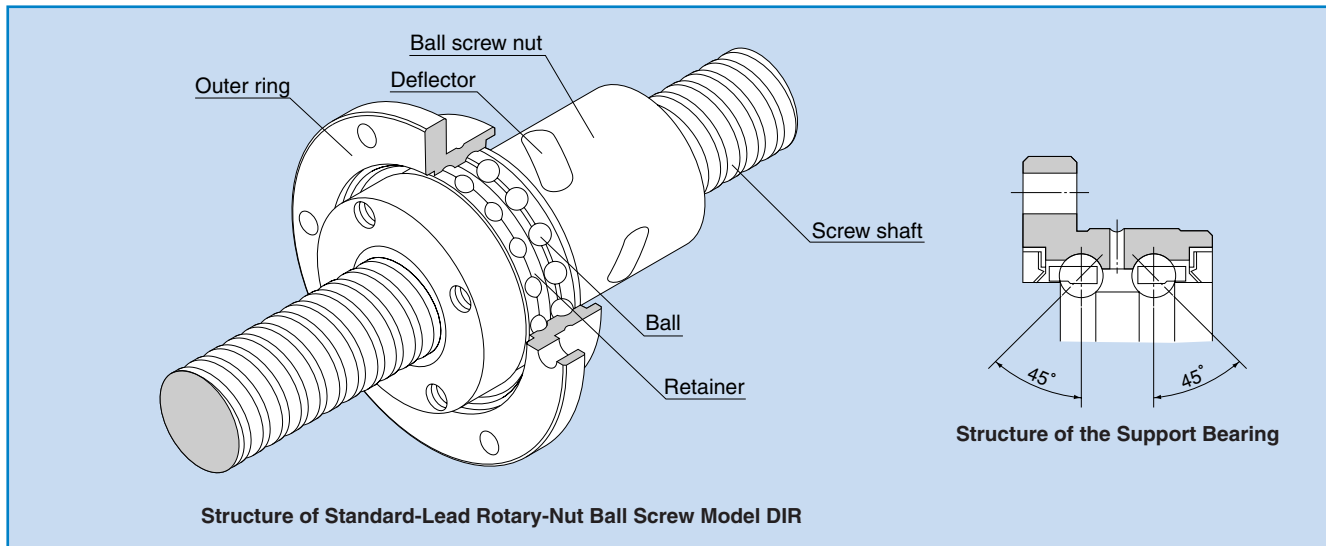
Accuracy symbol (see page 5)  
(no symbol for grade C10)

Symbol for support bearing seal  
UU : seal attached on both sides  
No symbol : without seal

**Note** For the axial clearance, see page 4.

# Rotary-Nut Series Rotary Ball Screw

# DIR



## Structure and Features

Standard-Lead Rotary-Nut Ball Screw model DIR is a rotary-nut Ball Screw that has a structure where a simple-nut Ball Screw is integrated with a support bearing.

Its ball screw nut serves as a ball circulation mechanism using deflectors. Balls travel along the groove of the deflector, mounted in the ball screw nut, to the adjacent raceway, and then circulate back to the loaded area to complete infinite rolling motion. Being a nut under an offset preload, the single ball screw nut provides different phases to the right and left thread in the middle of the nut, thus to set the axial clearance below zero (preloaded state). This allows more compact, smoother motion to be achieved than the conventional double-nut type (a spacer is inserted between two nuts).

The support bearing comprises two rows of DB type angular bearings with a contact angle of  $45^\circ$  to provide a preload. The collar, previously used to mount a pulley, is integrated with the ball screw nut.

### ● Compact

Because of the internal circulation mechanism using a deflector, the outer diameter is only 70 to 80%, and the overall length is 60 to 80%, of that of the Returned-Pipe Nut, thus reduce the weight and decrease the inertia during acceleration. Since the ball screw nut is integrated with the support bearing, highly accurate and compact design is allowed. In addition, small inertia through the lightweight ball screw nut ensures high responsiveness.

### ● Capable of High-Speed Rotation

Since the screw shaft is fixed and the ball screw nut is free, the Ball Screw is capable of rotating at high speed even if the shaft diameter is small. It allows a small driving motor to be used.

### ● Capable of Fine Positioning

Being a Standard-Lead Ball Screw, this model is capable of fine positioning even when the ball screw nut rotates.

### ● Accuracy Can Easily Be Established

As the support bearing is integrated with the outer ring, the bearing can be assembled with the nut housing on the end face of the outer ring flange. This makes it easy to center the ball screw nut and establish accuracy.

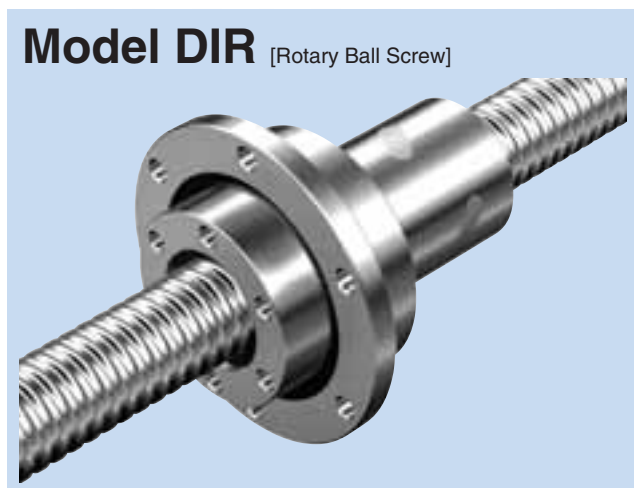
### ● Well Balanced

Since the deflectors are evenly placed on the circumference, superb balance is ensured while the ball screw nut is rotating.

### ● Stable in the Low-speed Range

Traditionally, motors tend to have uneven torque and speed in the low-speed range due to external causes. With model DIR, motors can be connected independently with the screw shaft and the ball screw nut, thus allow fine feed within the motors' stable rotation ranges.

## Type



## Static Safety Factor

It is necessary to take into account a static safety factor indicated in Table 6 against the axial load that is applied on the Ball Screw. When studying the static safety factor, a basic static load rating  $C_{0a}$  is required.

### [Basic Static Load Rating $C_{0a}$ ]

When a Ball Screw receives an excessive load or a large impact load while it is stationary or in motion, a local permanent deformation occurs between the raceway and the steel ball. If the permanent deformation exceeds a certain limit, it will prevent the Ball Screw from smoothly moving.

It is recognized that in general there will be no operational problem if the amount of permanent deformation is up to approximately 0.0001 of the steel ball diameter. The load present in such cases is called basic static load rating  $C_{0a}$ .

### [Static Safety Factor]

$$f_s \geq \frac{C_{0a}}{F_a}$$

$f_s$  : Static safety factor (see Table 6)

$C_{0a}$  : Basic static load rating (kN)  
(see the dimensional table for model DIR on page 14)

$F_a$  : Axial load (kN)

**Table 6 Static Safety Factor**

| Machine using the Ball Screw | Load conditions              | Lower limit of $f_s$ |
|------------------------------|------------------------------|----------------------|
| General industrial machinery | Without vibrations or impact | 1.0 to 1.3           |
|                              | With vibrations or impact    | 2.0 to 3.0           |
| Machine tools                | Without vibrations or impact | 1.0 to 1.5           |
|                              | With vibrations or impact    | 2.5 to 7.0           |

# Rated Life and Service Life Time

## [Basic Dynamic Load Rating Ca]

Basic dynamic load rating Ca is used to calculate the service life of a Ball Screw in motion with its ball screw nut being under a load. The basic dynamic load rating Ca is an axial load under which the rated life of 90% of a group of the same Ball Screw units independently operating is 10<sup>6</sup> rev (1 million revolutions).

## [Rated Life]

The service life of a Ball Screw is obtained from the equation below using the basic dynamic load rating and the axial load.

$$L = \left( \frac{C_a}{f_w \cdot F_a} \right)^3 \times 10^6$$

- L : Rated life (rev)  
 Ca : Basic dynamic load rating (N) (see the dimensional table for model DIR on page 14)  
 Fa : Axial load (N)  
 fw : Load factor (see Table 7)

Table 7 Load Factor

| Vibrations/impact | Velocity (V)                  | fw         |
|-------------------|-------------------------------|------------|
| Faint             | Very low<br>V ≤ 0.25 m/s      | 1.0 to 1.2 |
| Weak              | Low<br>0.25 ≤ V ≤ 1.0 m/s     | 1.2 to 1.5 |
| Medium            | Moderate<br>1.0 ≤ V ≤ 2.0 m/s | 1.5 to 2.0 |
| Strong            | High<br>2.0 m/s < V           | 2.0 to 3.5 |

## [Service Life Time]

When the rated life (L) has been determined, the service life time is obtained from the following equation if the stroke length and the number of reciprocations are constant.

$$L_h = \frac{L \times l}{2 \times l_s \times n_r \times 60}$$

Lh : Service life time (h)  
 ls : Stroke length (mm)  
 nr : Revolutions per minute (min<sup>-1</sup>)  
 l : Lead (mm)

(For details, see the General Catalog.)

# Axial Clearance of Model DIR

Table 8 shows the axial clearance of model DIR (precision type). If the manufacturing length exceeds the corresponding value indicated in Table 9, the clearance may partially be negative (preloaded state).

Table 8 Axial Clearance of Model DIR

| Clearance symbol | G0         | GT         | G1        | G2        | G3        |
|------------------|------------|------------|-----------|-----------|-----------|
| Axial clearance  | 0 or below | 0 to 0.005 | 0 to 0.01 | 0 to 0.02 | 0 to 0.05 |

Unit: mm

Table 9 Maximum Manufacturing Length of Model DIR by Axial Clearance

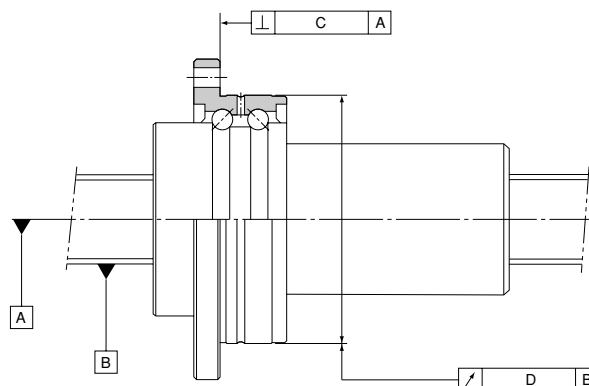
| Model No.          | Overall screw length |     |              |      |              |      |      |
|--------------------|----------------------|-----|--------------|------|--------------|------|------|
|                    | Clearance GT         |     | Clearance G1 |      | Clearance G2 |      |      |
|                    | C0 to C3             | C5  | C0 to C3     | C5   | C0 to C3     | C5   | C7   |
| DIR16□□            | 500                  | 400 | 500          | 500  | 700          | 600  | 500  |
| DIR20□□<br>DIR25□□ | 800                  | 700 | 800          | 700  | 1000         | 1000 | 1000 |
| DIR32□□            | 900                  | 800 | 1100         | 900  | 1400         | 1200 | 1200 |
| DIR36□□<br>DIR40□□ | 1000                 | 800 | 1300         | 1000 | 2000         | 1500 | 1500 |

Unit: mm

\* If the product is to be manufactured with accuracy grade C7 and clearance GT or G1, the clearance will partially be negative.

## Accuracy Standards for Model DIR

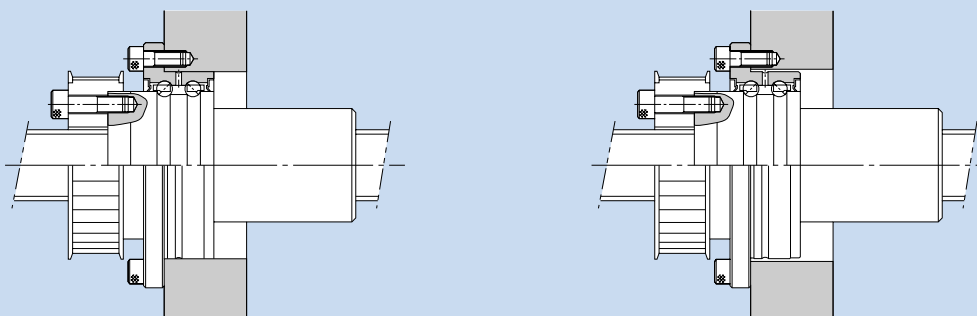
The accuracy of model DIR is compliant with a JIS standard (JIS B 1192) except for the radial run-out of the circumference of the ball screw nut from the screw axis (D) and the perpendicularity of the flange-mounting surface against the screw axis (C).



Unit: mm

| Accuracy grade | C3    |       | C5    |       | C7    |       |
|----------------|-------|-------|-------|-------|-------|-------|
| Model No.      | C     | D     | C     | D     | C     | D     |
| DIR 16□□       | 0.013 | 0.017 | 0.016 | 0.020 | 0.023 | 0.035 |
| DIR 20□□       | 0.013 | 0.017 | 0.016 | 0.020 | 0.023 | 0.035 |
| DIR 25□□       | 0.015 | 0.020 | 0.018 | 0.024 | 0.023 | 0.035 |
| DIR 32□□       | 0.015 | 0.020 | 0.018 | 0.024 | 0.023 | 0.035 |
| DIR 36□□       | 0.016 | 0.021 | 0.019 | 0.025 | 0.024 | 0.036 |
| DIR 40□□       | 0.018 | 0.026 | 0.021 | 0.033 | 0.026 | 0.036 |

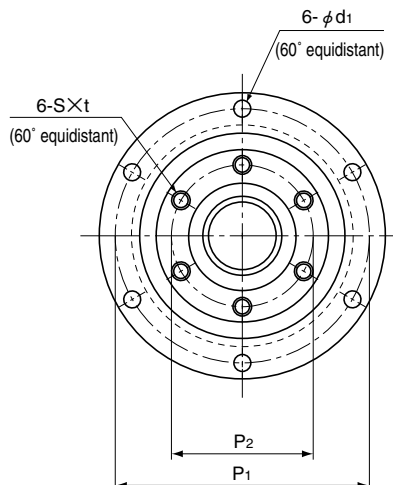
## Example of Mounting the Ball Screw Nut for Model DIR



Installation to the housing can be performed on the end face of the outer ring flange.

# DIR TYPE

## Dimensional Table for Model DIR Standard-Lead Rotary-Nut Ball Screw



| Model No.  | Screw shaft outer diameter<br>d | Thread minor diameter<br>dc | Lead<br>Ph | Ball center-to-center diameter<br>dp | Basic load rating |                       | Rigidity<br>K<br>N/μm | Outer diameter<br>D | Flange diameter<br>D <sub>1</sub> | Overall length<br>L <sub>1</sub> | D <sub>3</sub><br>h7 |
|------------|---------------------------------|-----------------------------|------------|--------------------------------------|-------------------|-----------------------|-----------------------|---------------------|-----------------------------------|----------------------------------|----------------------|
|            |                                 |                             |            |                                      | Ca<br>kN          | C <sub>0a</sub><br>kN |                       |                     |                                   |                                  |                      |
| DIR 1605-6 | 16                              | 13.2                        | 5          | 16.75                                | 7.4               | 13                    | 310                   | 48                  | 64                                | 79                               | 36                   |
| DIR 2005-6 | 20                              | 17.2                        | 5          | 20.75                                | 8.5               | 17.3                  | 310                   | 56                  | 72                                | 80                               | 43.5                 |
| DIR 2505-6 | 25                              | 22.2                        | 5          | 25.75                                | 9.7               | 22.6                  | 490                   | 66                  | 86                                | 88                               | 52                   |
| DIR 2510-4 |                                 | 21.6                        | 10         | 26                                   | 9                 | 18                    | 330                   | 66                  | 86                                | 106                              | 52                   |
| DIR 3205-6 | 32                              | 29.2                        | 5          | 32.75                                | 11.1              | 30.2                  | 620                   | 78                  | 103                               | 86                               | 63                   |
| DIR 3206-6 |                                 | 28.4                        | 6          | 33                                   | 14.9              | 37.1                  | 630                   | 78                  | 103                               | 97                               | 63                   |
| DIR 3210-6 |                                 | 26.4                        | 10         | 33.75                                | 25.7              | 52.2                  | 600                   | 78                  | 103                               | 131                              | 63                   |
| DIR 3610-6 | 36                              | 30.5                        | 10         | 37.75                                | 28.8              | 63.8                  | 710                   | 92                  | 122                               | 151                              | 72                   |
| DIR 4010-6 | 40                              | 34.7                        | 10         | 41.75                                | 29.8              | 69.3                  | 750                   | 100                 | 130                               | 142                              | 79.5                 |
| DIR 4012-6 |                                 | 34.4                        | 12         | 41.75                                | 30.6              | 72.3                  | 790                   | 100                 | 130                               | 167                              | 79.5                 |

### Example of model number coding

**DIR2005-6 RR G0 +520L C1**

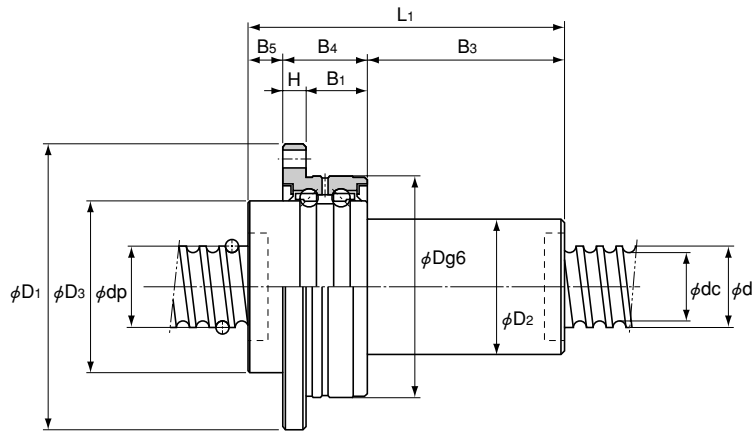
Model number

Seal symbol  
RR: labyrinth seal attached on both ends of the ball screw nut

Overall screw shaft length (in mm)

Accuracy symbol (see page 12)

Symbol for axial clearance (see page 11)



Unit: mm

| Ball screw dimensions |       |       |       |       |       |     |       |     |     |       |             | Support bearing<br>basic load rating |                 | Nut inertial<br>moment |
|-----------------------|-------|-------|-------|-------|-------|-----|-------|-----|-----|-------|-------------|--------------------------------------|-----------------|------------------------|
| $D_2$                 | $B_5$ | $B_4$ | $B_3$ | $P_1$ | $P_2$ | $H$ | $B_1$ | $S$ | $t$ | $d_1$ | $C_a$<br>kN | $C_{0a}$<br>kN                       | $kg \cdot cm^2$ |                        |
| 30                    | 8     | 21    | 50    | 56    | 30    | 6   | 15    | M4  | 6   | 4.5   | 8.7         | 10.5                                 | 0.61            |                        |
| 34                    | 9     | 21    | 50    | 64    | 36    | 6   | 15    | M5  | 8   | 4.5   | 9.7         | 13.4                                 | 1.18            |                        |
| 40                    | 13    | 25    | 50    | 75    | 43    | 7   | 18    | M6  | 10  | 5.5   | 12.7        | 18.2                                 | 2.65            |                        |
| 40                    | 11    | 25    | 70    | 75    | 43    | 7   | 18    | M6  | 10  | 5.5   | 12.7        | 18.2                                 | 2.84            |                        |
| 46                    | 11    | 25    | 50    | 89    | 53    | 8   | 17    | M6  | 10  | 6.6   | 13.6        | 22.3                                 | 5.1             |                        |
| 48                    | 11    | 25    | 61    | 89    | 53    | 8   | 17    | M6  | 10  | 6.6   | 13.6        | 22.3                                 | 5.68            |                        |
| 54                    | 11    | 25    | 95    | 89    | 53    | 8   | 17    | M6  | 10  | 6.6   | 13.6        | 22.3                                 | 8.13            |                        |
| 58                    | 14    | 33    | 104   | 105   | 61    | 10  | 23    | M8  | 12  | 9     | 20.4        | 32.3                                 | 14.7            |                        |
| 62                    | 14    | 33    | 95    | 113   | 67    | 10  | 23    | M8  | 12  | 9     | 21.5        | 36.8                                 | 20.6            |                        |
| 62                    | 14    | 33    | 120   | 113   | 67    | 10  | 23    | M8  | 12  | 9     | 21.5        | 36.8                                 | 22.5            |                        |

**Note** The rigidity values in the table represent spring constants each obtained from the load and the elastic displacement when providing a preload 10% of the basic dynamic load rating ( $C_a$ ) and applying an axial load three times greater than the preload. These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to assume roughly 80% of the value in the table to be the actual value. If the applied preload ( $F_{a0}$ ) is not equal to 0.1  $C_a$ , the rigidity value ( $K_N$ ) is obtained from the following equation.

$$K_N = K \left( \frac{F_{a0}}{0.1C_a} \right)^{\frac{1}{3}}$$

$K$ : rigidity value in the dimensional table

## Precautions on Use

### ● Precautions on Handling

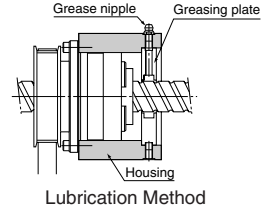
- Disassembling components may cause dust to enter the system or degrade the mounting accuracy of the parts. Do not disassemble the product.
- Tilting the screw shaft and the ball screw nut may cause them to fall by their own weight.
- Dropping or hitting the Ball Screw may damage the ball circulation component, which may cause functional loss. Giving an impact to the product could also cause damage to its function even if the product looks intact.

### ● Dust Prevention

- For the outer ring of the support bearing, a special synthetic resin rubber seal with high wear resistance is available (BLR...UU) in order to prevent foreign material from entering the bearing and the lubricant from leaking.  
Each THK Precision Ball Screw is attached with a labyrinth seal on both ends of the ball screw nut to prevent entry of foreign material such as cutting chips. Since a slight clearance is provided between the labyrinth seal and the screw shaft, the efficiency of the product will not be affected.  
For a bellows and a screw cover, contact THK.

### ● Lubrication

- Thoroughly remove anti-corrosion oil and feed a lubricant before using the product.
- Do not mix lubricants of different physical properties.
- In locations exposed to constant vibrations or in special environments, such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
- When planning to use a special lubricant, contact THK before using it.
- Lubrication interval varies according to the service conditions. Contact THK for details.
- When lubricating the Rotary Ball Screw, attach a greasing plate to the housing in advance (see the figure on the right).
- Each THK Precision Ball Screw requires appropriate lubrication when efficiency, service life, temperature rise and accuracy maintenance are taken into account. In particular, if the generation of heat in the ball screw section will likely affect the accuracy during high-speed rotation or under a heavy load, it is necessary to consider selecting a lubricant or cooling the product with forced lubrication.



### ● Precautions on Use

- Do not remove the ball screw nut from the ball screw shaft. Doing so may cause the balls or the nut to fall off.
- Entry of foreign material to the ball screw nut may cause damage to the ball circulation component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
- If foreign material adheres to the product, replenish the lubricant after cleaning the product. For the type of the detergent, contact THK.
- When planning to use the product in an environment where the coolant penetrates the ball screw nut, it may cause trouble to product functions depending on the type of the coolant. Contact THK for details.
- Do not use the product at temperature of 80°C or higher. When desiring to use the system at temperature of 80°C or higher, contact THK in advance.
- If using the product with vertical mount, the ball screw nut may fall by its own weight. Attach a mechanism to prevent it from falling.
- Using the product at speed exceeding the permissible rotation speed may cause breakage of a component or accident. Be sure to use the product within the specification range designated by THK.
- Forcibly driving in the ball screw shaft or the ball screw nut may cause an indentation on the raceway. Use care when mounting components.
- If an offset or skewing occurs with the ball screw shaft support and the ball screw nut, it may substantially shorten the service life. Pay much attention to components to be mounted and to the mounting accuracy.
- When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
- Letting the ball screw nut overshoot will cause balls to fall off or the ball-circulating component to be damaged. Be sure not to let it overshoot.

### ● Storage

- When storing the Ball Screw, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

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## THK CO., LTD.

HEAD OFFICE 3-11-6, NISHI-GOTANDA, SHINAGAWA-KU, TOKYO 141-8503 JAPAN

ASIA PACIFIC SALES DEPARTMENT PHONE:(03)5434-0351 FAX:(03)5434-0353

### NORTH AMERICA

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PHONE:(847)310-1111 FAX:(847)310-1182  
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THK FRANCE S. A. S.  
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### CHINA

THK (SHANGHAI) CO.,LTD.  
PHONE:(21)6334-5131 FAX:(21)6334-5137  
BEIJING  
PHONE:(10)6590-3259 FAX:(10)6590-3557  
THK SHOUZAN CO.,LTD.  
PHONE:2376-1091 FAX:2376-0749

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