Technical Documentation

BEVEL GEARBOXES

Precautions for Selection

Items Required for Selection

Load torque, motor type, input speed, reduction ratio, operation time, connection method, frequency of startup/stop

Selection Process Steps

1. The performance tables in the catalog show bevel gear boxes that use a motor and are designed under the condition of operating for 10 hours/day under a uniform load.

Thus, when you use a bevel gearbox under a condition of longer operation time under a heavier load, correct the load torque based on the service factor shown in [Table-1].

Corrected load torque = Load torque applied to the gearbox × Service factor

Service Factor (Sf) [Table-1]

Load Condition	Service Factor (Sf)		
	Operating for less than 3 hours/day	Operating for 3 to 10 hours/day	Operating for more than 10 hours/day
Uniform load	1 (1)	1 (1.25)	1.25 (1.50)
Light shock load	1 (1.25)	1.25 (1.50)	1.50 (1.75)
Heavy shock load	1.25 (1.50)	1.50 (1.75)	1.75 (2.00)

Note 1: When the number of startups and stops is 10 times or more an hour, use the coefficient in parentheses.
Note 2: Use the coefficient in parentheses also for a motor other than an electric motor (engine etc.)

Be sure to make the corrected load torque at the speed used smaller than the allowable X/Y-axis torque or the allowable Y-axis torque shown in the performance table.

2. Select a shaft arrangement from the shaft arrangement diagrams of each model.

3. Checking the overhung load (O.H.L.)

An overhung load (O.H.L.) is a suspending load imposed on a shaft. When a chain, belt, gear, etc. is used to couple the gearbox shaft with the application, the resulting O.H.L. must be taken into consideration.

$$\text{O.H.L.} = \frac{T_{LE} \times K_1 \times K_2}{R} \text{ (N) \{kgf\}}$$

T_{LE} : Corrected load torque imposed on the gearbox shaft (N·m) {kgf·m}
R : Pitch Circle Radius (m) of sprocket, pulley, gear, etc. attached to the gearbox shaft
K_1 : Refer to the coefficient for the connection method [Table-2].
K_2 : Refer to the coefficient for the load point [Table-3].

* Be sure to make the O.H.L. value calculated from the equation shown above smaller than the allowable X-axis and Y-axis O.H.L. values listed in the performance table.

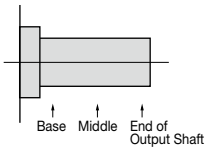
■ Coefficient K_1 [Table-2]

Connection method	K_1
Chain, timing belt	1.00
Gear	1.25
V belt	1.50

■ Coefficient K_2 [Table-3]

Load Point	K_2
Base of the shaft	0.75
Middle of the shaft	1.00
End of Output Shaft	1.50

● Load Point

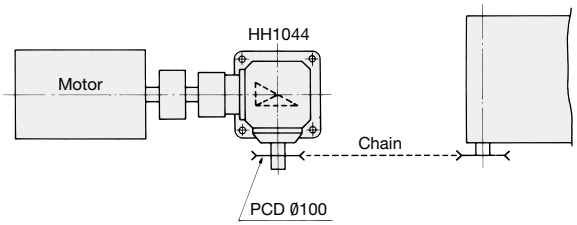


4. Select a model that meets all values specified in 1, 2, and 3 above.

Selection Process Steps and Examples

Selection Examples Selection Example 1

Application ····· Conveyor (uniform load)
Load Torque ····· 78.4 N·m {8 kgf·m}
X-axis Rotational Speed ·· 300 r/min
Reduction Ratio ····· 1 : 2
Shaft Arrangement ····· HH1044
Operation Time ····· 12 hours/day
Connection method ····· X-axis - Coupling
Y-axis - Chain (located on the center of the shaft)
Installation Method ····· Horizontal mounting
Installation Place ····· Indoors



1. Examining the torque

From [Table-1] on page 860, the service factor Sf in a loaded state is 1.25. Thus, the corrected load torque imposed on the Y-axis is:

$T_{LE} = 78.4 \times 1.25 = 98$ N·m {$T_{LE} = 8 \times 1.25 = 10$ kgf·m}

2. Examining the O.H.L.

The load O.H.L. of the Y-axis is:

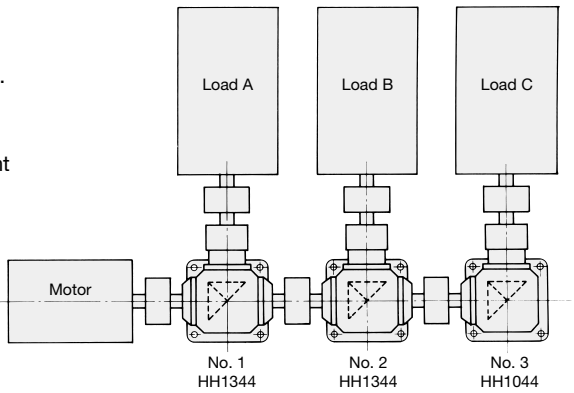
$$\text{O.H.L.} = \frac{T_{LE} \times K_1 \times K_2}{R} = \frac{98 \times 1 \times 1}{\frac{100}{2 \times 1000}} = 1960 \text{ N} \quad \{\text{O.H.L.} = \frac{T_{LE} \times K_1 \times K_2}{R} = \frac{10 \times 1 \times 1}{\frac{100}{2 \times 1000}} = 200 \text{ kgf}\}$$

3. Determining a model

Select a model that meets the conditions, the torque, and the O.H.L. That is KNB-322 HH1044.

Selection Examples Selection Example 2

Application ..... Line shaft drive
Load Torque ..... All of loads A, B, and C are 58.8 N·m {6 kgf·m} (uniform load).
Speed ..... 600 r/min
Reduction Ratio ..... 1 : 1
Shaft Arrangement ..... As shown in the figure on the right
Operation Time ..... 8 hours/day
Connection method ..... All couplings
Installation Method ..... Horizontal mounting
Installation Place ..... Indoors



In the case of a line shaft drive, the load imposed on the Y-axis differs depending on the position of the gearbox. For this reason, it is necessary to select a gearbox for each line shaft drive. From [Table-1] on page 860, the service factor Sf for all gear boxes based on the condition is 1.0.

1. Gearbox No. 1

Thus, since only load A is to be operated, the corrected load torque imposed on the X-axis is:
58.8 × 1.0 = 58.8 N·m {6×1.0 = 6 kgf·m}
Since loads A, B, and C are to be operated, the corrected load torque imposed on the Y-axis is:
(58.8 + 58.8 + 58.8) × 1.0 = 176.4 N·m
{(6 + 6 + 6) × 1.0 = 18 kgf·m}
From the performance table, select KNC-401 HH1344.

2. Gearbox No. 2

Since only load B is to be operated, the corrected load torque imposed on the X-axis is:
58.8 × 1.0 = 58.8 N·m {6×1.0 = 6 kgf·m}
Since loads B and C are to be operated, the corrected load torque imposed on the Y-axis is:
(58.8 + 58.8) × 1.0 = 117.6 N·m
{(6 + 6) × 1.0 = 12 kgf·m}
From the performance table, select KNC-321 HH1344.

3. Gearbox No. 3

Since only load C is to be operated, the corrected load torque imposed on the X-axis is:
58.8 × 1.0 = 58.8 N·m {6×1.0 = 6 kgf·m}
Since only load C is to be operated, the corrected load torque imposed on the Y-axis is:
58.8 × 1.0 = 58.8 N·m {6×1.0 = 6 kgf·m}
From the performance table, select KNB-251 HH1044.

4. Determining models

Gearbox No. 1 KNC-401 HH1344
Gearbox No. 2 KNC-321 HH1344
Gearbox No. 3 KNB-251 HH1044

Moment of Inertia of KOMPASS

■ Moment of Inertia of KOMPASS {GD²} (X-axis Equivalent)

● K Type

Reduction Ratio	Type Code	Moment of Inertia ($\times10^{-4}$kg·m²)	{GD² ($\times10^{-4}$kg·m²)}
1:1	KB-101	0.045	0.18
	KC-101	0.048	0.19
	KB-151	0.53	2.1
	KC-151	0.56	2.2
	KB-201	1.8	7.2
	KC-201	1.9	7.8
1:2	KB-102	0.022	0.086
	KC-102	0.022	0.089
	KB-152	0.37	1.5
	KC-152	0.37	1.5
	KB-202	0.79	3.1
	KC-202	0.82	3.3

● KN Type

Reduction Ratio	Type Code	Moment of Inertia ($\times10^{-4}$kg·m²)	{GD² ($\times10^{-4}$kg·m²)}
1:1	KNB-191	4.0	16.0
	KNC-191	4.1	16.2
	KNB-251	24.8	99.3
	KNC-251	25.0	100
	KNB-321	40.0	160
	KNC-321	40.8	163
	KNB-401	89.5	358
	KNC-401	92.0	368
1:2	KNB-192	1.9	7.4
	KNC-192	1.9	7.5
	KNB-252	10.3	41.3
	KNC-252	10.4	41.6
	KNB-322	12.9	51.7
	KNC-322	13.1	52.4
	KNB-402	38.3	153
	KNC-402	38.8	155

Precautions for Use

1. Installation Location

Ambient Temperature	–10 °C to 40 °C
Ambient Humidity	85 % max
Installation Environment	A place free from corrosive gas, explosive gas and/or vapor. Well ventilated place with no dust.
Installation Place	Indoors

2. Installation Surface

- Secure the bevel gearbox with bolts on a vibration-free and flat machine-processed surface.

3. Connection with application

- Some gearbox models have a shaft without a step. Thus, when attaching a coupling, sprocket, pulley, gear, etc. to such a shaft, take care not to allow them to interfere with the oil seal or case surface. In addition, H7 fit is recommended for a hole.
- In direct coupling, accurately align the center of the gearbox shaft from the mating shaft.
- In chain, belt, or gear engagement, keep the gearbox shaft and the mating shaft parallel to each other accurately, and install the device so that the line connecting the centers of both shafts is perpendicular to the shafts.

4. Precautions for Operation

- Be sure to operate the bevel gearbox with the load torque and the O.H.L. kept within the tolerances.
- CW and CCW rotations by plucking adversely affect the gearbox and the application. To prevent this, temporarily stop the gearbox, and then start it in the reverse direction.

About the Machining

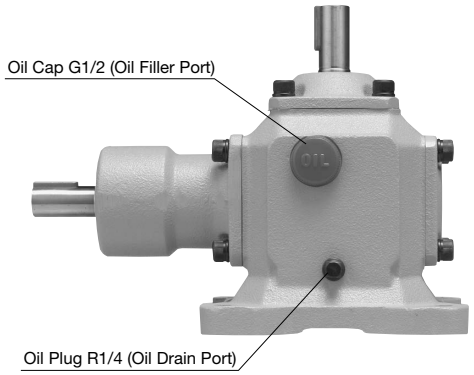
■ When machining for adding an oil plug R1/4 to a standard specification is required

The designs the positions of oil filler ports and oil drain ports assuming horizontal surface mounting (floor mounting) as a standard specification.

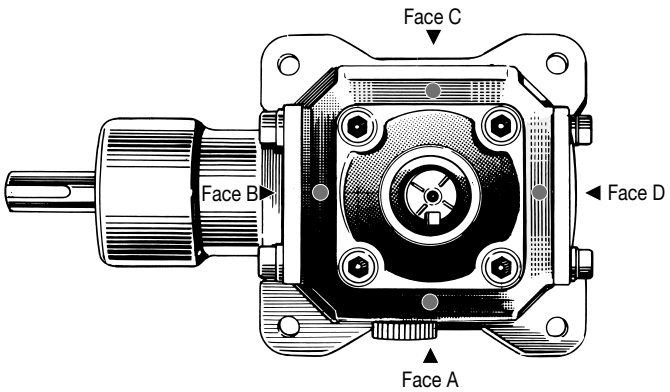
Our bevel gear boxes can be mounted not only on horizontal surfaces but also on ceiling surfaces, wall surfaces, etc. When you intend to use and mount a bevel gearbox on a surface other than a horizontal surface, an oil plug R1/4 can be added to any of faces A, B, C, and D shown in [Figure-1] as a special order. When placing an order for an oil plug R1/4, designate face A, B, C, or D.

* For machine work of adding an oil plug, please contact your nearest Sales Office or the CS Center.

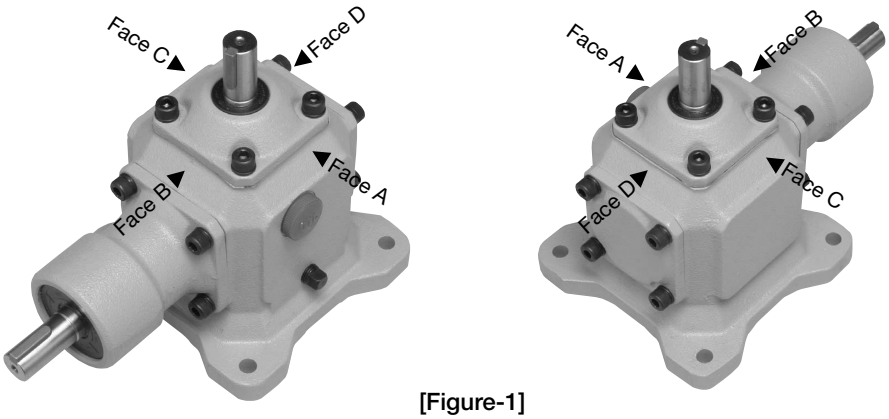
● Standard Specification



● Positions for adding an oil plug R1/4



An oil plug PT1/4 can be added to the positions marked with ●.



[Figure-1]

* The face of the standard specification provided with an oil cap is assumed to be face A, and the faces clockwise from face A are B, C, and D when viewed from the top.