Lineup of Sumitomo'sRight Angle Series

A high-function and compact design Right angle gearmotor is available by selecting a mounting position and direction of your choice.

HYPONIC GEARMOTOR®

More compact right angle gearmotors.

- Capacity 15W~11kW
- Ratio 1/5-1/1440

15W

HYPONIC GEARMOTOR® is a product of Sumitomo Heavy Industries Gearmot

1.5kW

BEVEL BUDDYBOX® 5Series

Lineup dedicated to shaft mount series for small size range.

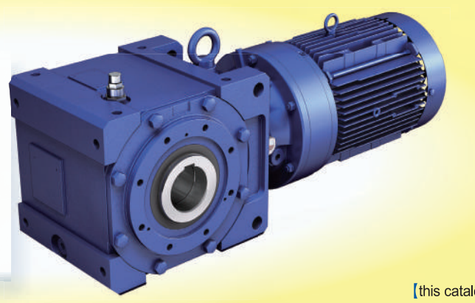
- Capacity 0.1kW-55kW
- Ratio 1/11-1/7228

BEVEL BUDDYBOX® 4Series

Right angle gearmotors equipped with a bevel gear added to the output stage by making use of superior characteristics of Cyclo® Reducer.

- Capacity 0.1kW~55kW
- Ratio 1/11-1/10658

55kW



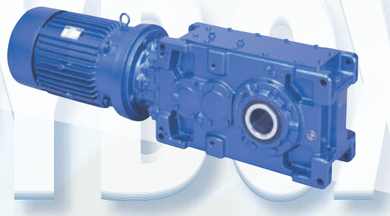
【this catalog】

PARAMAX®

Compact gearmotor type structure implementable by use of high mechanical strength, high-function right angle helical bevel reducer.

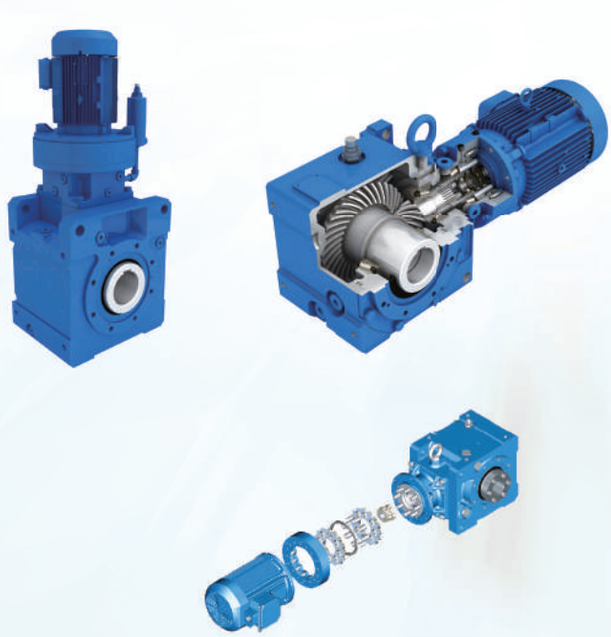
- Torque 2.6~552kN·m
- Ratio 1/6.3-1/450

3000kW



A1

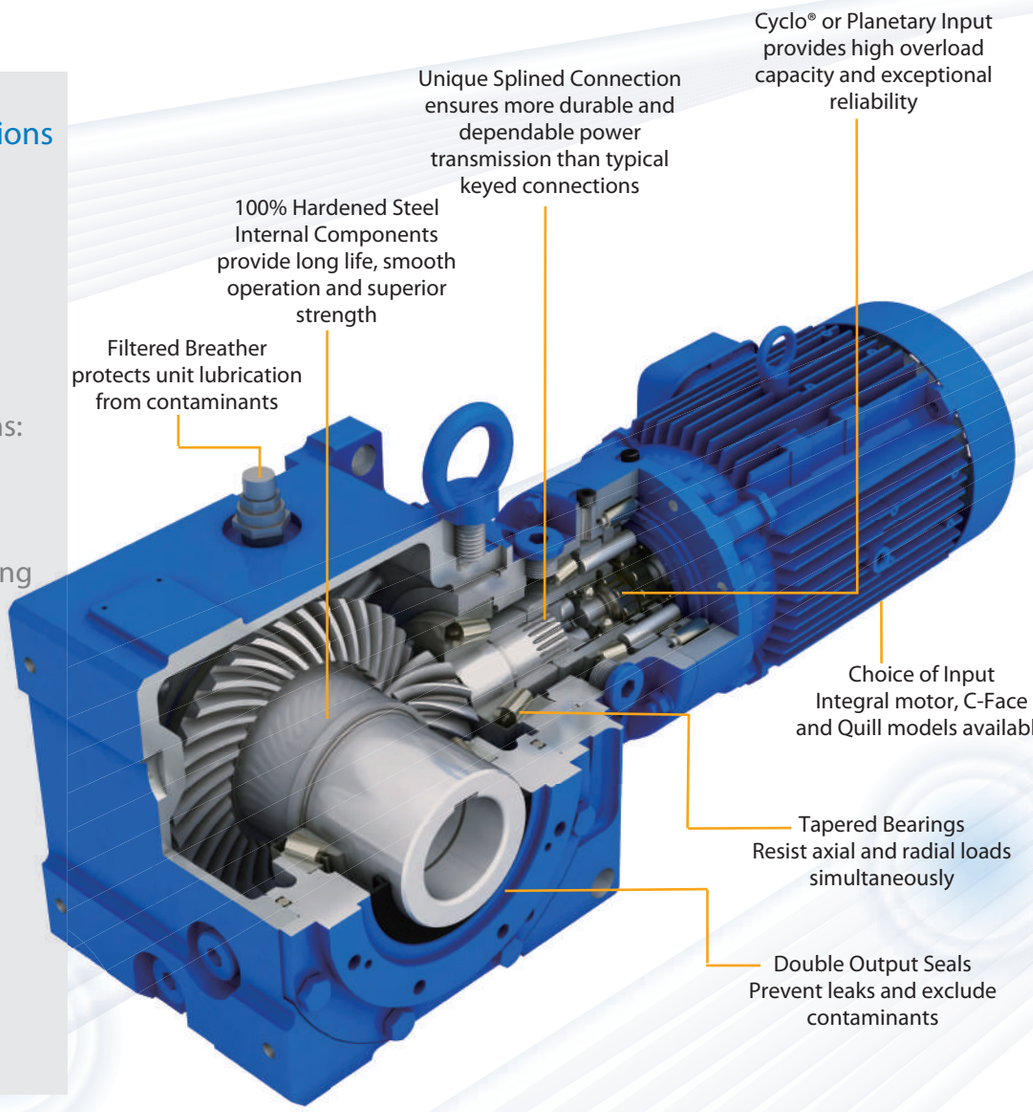
Table of Contents



Bevel BUDDYBOX® Reducers & Gearmotor

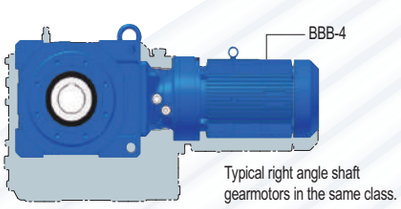
Flexible configurations

- Shaft Options:
  - Keyed Hollow
  - Shrink Disc
  - Solid Shaft
  - Keyless Taper
  - Grip® Bushing
- Mounting Options:
  - Flange
  - Foot
  - Shaft
  - Universal Housing



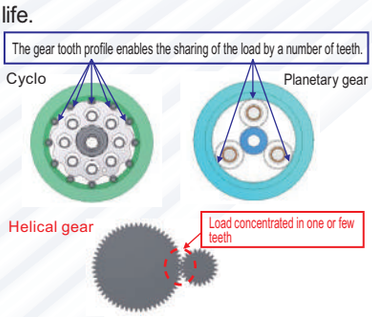
Compact but high radial load

More compact than a typical right angle shaft gearmotors in the same class. Also, the allowable radial load is significantly increased by use of an FCD housing.



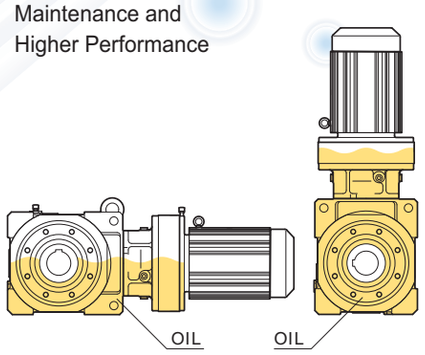
Long life and excellent shock resistance

The input stage uses our Cyclo® speed reducer or planetary gear which allows a greater shock resistance than helical gears and provides a longer operating life.



Single lubrication chamber

Simple, Single Reservoir Oil Lubrication for Easy Maintenance and Higher Performance



Wide Variety of Application Products and Options

Product Description

The Cyclo® Bevel Buddy Box 4 (Cyclo® BBB4) built by Sumitomo is a robust, state of the art mid-sized family of speed reducers and gearmotors. Building on more than 75 years of successful Cyclo® experience in virtually every application and industry, the result is an extremely compact, efficient and reliable unit in a very power-dense package. The Cyclo® BBB4 has a unique combination of features that results in a highly reliable, efficient and durable gearbox. The all-steel internal construction, in conjunction with the Cyclo® or planetary gear inputs, and ductile iron housing provide unmatched ruggedness.

In addition, the full array of input accessories and output mounting styles provides an amazing ability to customize the product to fit nearly any requirement. These options include solid shaft, hollow bore, shrink disc, free input shaft, integral motor, and C-Face adapter.

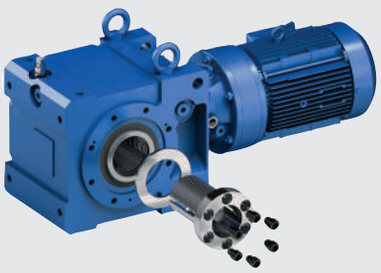
Features & Benefits

- 100% Hardened Steel Rotating Components
  - ~ Provide high efficiency, long life and exceptional reliability
- Cycloidal or Planetary Input
  - ~Unmatched capability to handle overloads
- Double Output Seals
  - ~Four seal lips on every unit virtually eliminates the possibility of leaks
- Dimensionally Interchangeable with proceding BBB-3 series
  - ~ Simple, economical retrofits
- Patented Taper-Grip® Bushing
  - ~ Simple, keyless shaft mounting

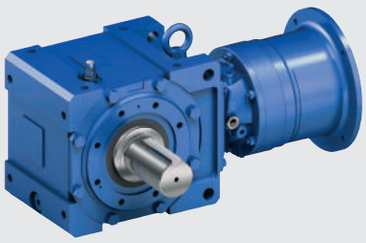
Specifications Summary

Ratios:	11:1 to 26,000:1 and greater
Torque Capacity:	17,400N•m
Motor Power:	0.1kW ~ 55kW
Mounting:	Keyed Hollow Shaft, Keyless TaperGrip® Bush, Foot, Flange, Face, Shrink Disc
Options:	Integral Gearmotor, Hollow Input, J-adaptor, Shrik Disc
Motor Standards:	IEC, CE, CCC, JIS, NEMA, UL, CSA, GOST-R, etc

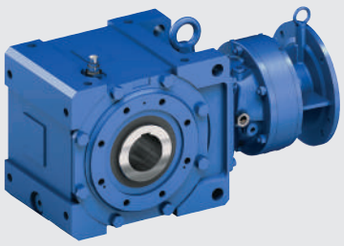
Popular Input and Output Options



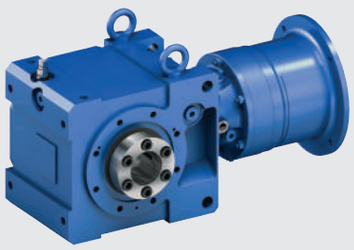
Taper-Grip® Bushing
Metric and Inch



Solid Output Shaft
Metric and Inch



Keyed Hollow Bore
Metric and Inch



Shrink Disc
Standard Metric Sizes

High Efficiency Motor available

IE2 high efficiency motors according to IEC60034-30 is available.
We also manufacture high efficiency motor standards of many other countries.

Easy maintenance

This construction uses the Cyclo® speed reducer for easy disassembly and repair, allowing for better serviceability.
This also makes service support at your local service center possible.

Worldwide availability

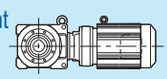
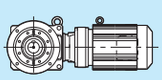
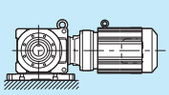
BBB4 reducers and gearmotors can be manufactured according to optimum specifications in the country and region of use.
With our global network, maintenance and a replacement can be supported locally.

UL Standards CSA Standards CCC Standards EC Directives GOST-R Standards

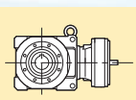
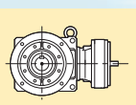
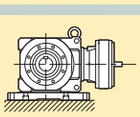
Quick Reference Guide

Standard Specifications

Gearmotors

	Three Phase Motors	AF Motors (V/f control; for constant torque inverter drive)	High-Efficiency Motor
	Selection table: B29	Selection table: B111	Selection table: B27
Shaft or Case Mount L□YM L□UM 	Dimensional drawing: B129	Dimensional drawing: B129	Dimensional drawing: B129
Flange L□FM 	Dimensional drawing: B165	Dimensional drawing: B165	Dimensional drawing: B165
Foot Mount L□HM 	Dimensional drawing: B201	Dimensional drawing: B201	Dimensional drawing: B201

Reducer Type

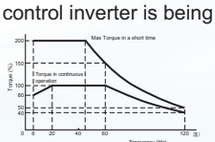
	Selection table: C13
Shaft or Case Mount L□Y L□U 	Dimensional drawing: C132
Flange L□F 	Dimensional drawing: C136
Foot Mount L□H 	Dimensional drawing: C140

Forinverter drive use

If the gearmotor is being used with inverter drive, it can be used separately by either sensorless vector or V/f control.*(Refer to Page B3-B4)

■If the gearmotor is being used with sensorless vector control:

If Sumitomo's HF-320α · HF-430 Series sensorless vector control inverter is being used:



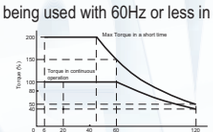
Three phase motor

(If a Sumitomo-made inverter SF-420 is being used, consult us.)

■If the gearmotor is being used with V/f control:

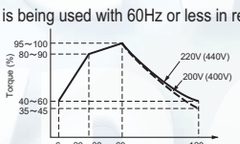
If a general-purpose inverter is being used:

[1] If it is being used with 60Hz or less in constant torque operation mode:



AF motor

[2] If it is being used with 60Hz or less in reduced torque operation mode:



Three phase motor

* The above graph is an example.

Optional Specifications

Ambient Conditions

Installation

Lubrication

Operation Conditions

Terminal Box

Brake

Overseas Specifications

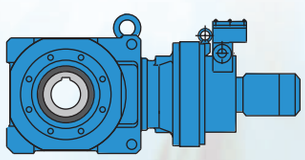
Coating

Application Products

With Torque Limiter

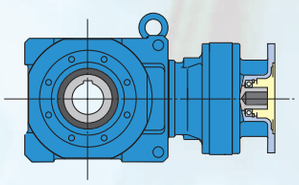
Prevents valued machines from overload.

* Consult us for product details.



Input Hollow Type

Available for a wide range of servo and IEC flange motors.



Refer to page 125 to 142 for dimensions table.

Relevant Products

Helical BUDDYBOX®

A Cyclo® reducer integrated with a hollow shaft type parallel shaft gear box.
Compatible with various specifications.

- Capacity: 0.1kW∽30kW
- Reduction ratio: 11∽4365

* Consult us for product details.

Product Range: Standard Motor and Reducer Combinations

■ Table 1 & 2 gives a quick overview of Power-Ratio-Speed for BBB-4

Table 1: Reduction Ratios 11 – 417

	Nominal Ratio	11	13	14	16	18	19	21	22	25	26	28	35	39	42	46	48	53	54	60
	Output Speed (50Hz)	138.1	113.3	103.6	90.7	82.9	75.6	69.1	64.8	59.2	56.7	51.8	41.2	37.7	34.9	31.9	30.3	27.7	26.7	24.4
	Output Speed (60Hz)	166.7	136.8	125	109.4	100	91.2	83.4	78.2	71.5	68.4	62.5	49.8	45.5	42.1	38.5	36.5	33.4	32.2	29.5
Motor Power	0.1 x 4P																			
	0.2 x 4P																			
	0.25 x 4P																			
	0.4 x 4P																			
	0.55 x 4P																			
	0.75 x 4P	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●
	1.1 x 4P	●	●	●	●	●	○	●	○	○	○	●	●	●	○	●	○	●	○	●
	1.5 x 4P	●	●	●	●	●	○	●	○	○	○	●	●	●	○	●	○	●	○	●
	2.2 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	3 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	3.7 x 4P	●	●	●	●	●	○	●	○	●	○	●	●	●	○	●	○	●	○	●
	5.5 x 4P	●	●	●	●	●	○	●	○	●	○	●	●	●	○	●	○	●	○	●
	7.5 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	11 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	15 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	18.5 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	22 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	30 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	37 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	45 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●
	55 x 4P	●	●	●	●	●	○	●	●	●	○	●	●	●	○	●	○	●	○	●

● Selection data table available in the selection tables of this catalogue.
O Selection data not available in the catalogue at the time of printing. Please consult Sumitomo representative for selection and technical details.

Table 2: Reduction Ratio: 364-10658

● : Product Range of Bevel BUDDYBOX ○: Available option

	Nominal ratio	364	424	501	578	683	809	956	1117	1320	1656	1957	2272
	Output Speed (50Hz)	3.99	3.43	2.9	2.52	2.13	1.8	1.52	1.3	1.1	0.88	0.75	0.64
	Output Speed (60Hz)	4.81	4.14	3.5	3.04	2.57	2.17	1.84	1.57	1.33	1.06	0.9	0.78
Motor Power	0.1 X 4P	○	○	○	○	●	●	●	●	●	●	●	●
	0.2 X 4P	●	●	●	●	●	●	●	●	●	●	●	●
	0.25 X 4P	○	●	●	●	●	●	●	●	●	●	●	●
	0.4 X 4P	●	●	●	●	●	●	●	●	●	●	●	●
	0.55 X 4P	●	●	●	●	●	●	●	●	●	●	●	●
	0.75 X 4P	●	●	●	●	●	●	●	●	●	●	●	●
	1.1 X 4P	●	●	●	●	●	●	●	●	●	●	●	●
	1.5 X 4P	●	●	●	●	●	●	●	●	●	●	●	●
	2.2 X 4P	●	●	●	●	●	●	●	●	●	●		
	3 X 4P	●	●	●	●	●	●	●	●				
	3.7 X 4P	●	●	●	●	●	●	●					
	5.5 X 4P	●	●	●	●								
	7.5 X 4P	●	●	●									
	11 X 4P												
	15 X 4P												
	18.5 X 4P												
	22 X 4P												
	30 X 4P												
	37 X 4P												
	45 X 4P												
	55 X 4P												

● Selection data table available in the selection tables of this catalogue.
O Selection data not available in the catalogue at the time of printing. Please consult Sumitomo representative for selection and technical details.

67	74	80	88	93	102	112	123	138	151	163	179	189	207	227	249	278	305	417	Nominal Ratio	
21.6	19.8	18.2	16.6	15.7	14.3	13	11.9	10.6	9.7	8.9	8.2	7.7	7.1	6.4	5.9	5.3	4.8	3.5	Output Speed (50Hz)	
26.1	23.9	21.9	20	18.9	17.3	15.7	14.3	12.8	11.7	10.8	9.9	9.3	8.5	7.8	7.1	6.3	5.8	4.3	Output Speed (60Hz)	
																			0.1 x 4P	Motor Power
											●	○	●	○	●	○	●	●	0.2 x 4P	
											●	○	●	○	●	○	●	●	0.25 x 4P	
						●	●	○	●	○	●	○	●	○	●	○	●		0.4 x 4P	
		●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		0.55 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		0.75 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		1.1 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		1.5 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		2.2 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		3 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		3.7 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		5.5 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		7.5 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●	○	●	○	●		11 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●	○	●						15 x 4P	
●	●	●	●	○	●	●	●	○	●	○	●								18.5 x 4P	
●	●	●	●	○	●	●	●	○	●										22 x 4P	
●	●	●	●	○	●	●													30 x 4P	
●	●	●	●																37 x 4P	
●	●	●																	45 x 4P	
●																			55 x 4P	

2559	2944	3511	4365	5177	6472	7228	8880	10658	Nominal ratio	
0.57	0.5	0.42	0.34	0.29	0.23	0.21	0.17	0.14	Output Speed (50Hz)	
0.69	0.6	0.5	0.41	0.34	0.28	0.25	0.2	0.17	Output Speed (60Hz)	
●	●	●	●	●	○	●	○	●	0.1 X 4P	Motor Power
●	●	●	●	●	○	●	○	●	0.2 X 4P	
●	●	●	●	●	○	●	○	●	0.25 X 4P	
●	●	●	●	●	○	●	○	●	0.4 X 4P	
●	●	●	●	●					0.55 X 4P	
●	●	●	●						0.75 X 4P	
●	●								1.1 X 4P	
									1.5 X 4P	
									2.2 X 4P	
									3 X 4P	
									3.7 X 4P	
									5.5 X 4P	
									7.5 X 4P	
									11 X 4P	
									15 X 4P	
									18.5 X 4P	
									22 X 4P	
									30 X 4P	
									37 X 4P	
									45 X 4P	
									55 X 4P	

Notes:
1. Calculation of output speed is based on the following input speeds.
   50Hz: 1450 r/min
   60Hz: 1750 r/min
2. Combination in these tables are guide only. Refer to selection tables for gearmotors (page xxx to page xxx) or reducers (page xxx to page xxx) for details.
3. Reduction ratios shown above are nominal ratios and output speeds are based on these ratios. Refer to pages 9 and 10 for actual reduction ratio.
4. ▭ Refer to Sumitomo Hydronic® Neo as alternative product for these range.
5. ▬ Refer to Sumitomo Paramax® as alternative product for these range.

Frame Size and Actual Reduction Ratios

Table 3: Frame Sizes

Bevel Single + Cyclo Single or Planetary Gear Single Reduction Type						Bevel Single + Cyclo Double Reduction Type					
4A100	4B120	4C140	4D160	4E170	4F180	4A10DA	4B12DA	4C14DA	4D16DA	4E17DA	4F18DA
4A105	4B125	4C145	4D165	4E175	4F185	4A12DA	4B12DB	4C14DB	4D16DB	4E17DB	4F18DB
4A110	4B140	4C160	4D170	4E180	4F190	4A12DB	4B14DA	4C14DC	4D17DA	4E17DC	4F19DA
4A115	4B145	4C165	4D175	4E185	4F195		4B14DB	4C16DA	4D17DB	4E18DA	4F19DB
4A120	4B160	4C170	4D180	4E190				4C16DB	4D17DC	4E18DB	
4A125	4B165	4C175	4D185	4E195					4D18DA	4E19DA	
4A140									4D18DB	4E19DB	
4A145											

Table 4: Bevel Single + Planetary Gear Single (Reduction Ratio: 11~18)

Nominal Ratio	Frame Size	4A10□	4A12□	4A14□ 4B14□	4B16□ 4C16□	4C17□ 4D17□	4D18□ 4E18□	4E19□ 4F19□
11	Actual Ratio	10.50	10.50	10.89	10.85	10.86	10.50	10.82
	Output Stage (Bevel)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	Input Stage (Planetary Gear)	3.000	3.000	3.110	3.100	3.103	3.000	3.091
13	Actual Ratio	12.99	12.80	12.95	12.80	13.09	13.09	13.01
	Output Stage (Bevel)	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	Input Stage (Planetary Gear)	4.059	4.000	4.047	4.000	4.091	4.091	4.067
14	Actual Ratio	14.21	14.00	14.16	14.00	14.32	14.32	14.23
	Output Stage (Bevel)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	Input Stage (Planetary Gear)	4.059	4.000	4.047	4.000	4.091	4.091	4.067
16	Actual Ratio	15.36	15.65	16.00	16.26	16.17	15.63	15.47
	Output Stage (Bevel)	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	Input Stage (Planetary Gear)	4.800	4.890	5.000	5.080	5.053	4.886	4.833
18	Actual Ratio	16.80	17.12	17.50	17.78	17.68	17.10	16.92
	Output Stage (Bevel)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	Input Stage (Planetary Gear)	4.800	4.890	5.000	5.080	5.053	4.886	4.833

Table 5: Bevel Single + Cyclo Reducer Single (Reduction Ratio: 19~305)

Nominal Ratio	19	21	22	25	26	28	35	39	42	46	48
Actual Ratio	19.2	21.0	22.4	24.5	25.6	28.0	35.2	38.5	41.6	45.5	48.0
Output Stage (Bevel)	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2
Input Stage (Cyclo)	6	6	7	7	8	8	11	11	13	13	15

Nominal Ratio	53	54	60	67	74	80	88	93	102	112	123
Actual Ratio	52.5	54.4	59.5	67.2	73.5	80.0	87.5	92.8	101.5	112.0	122.5
Output Stage (Bevel)	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5
Input Stage (Cyclo)	15	17	17	21	21	25	25	29	29	35	35

Nominal Ratio	138	151	163	179	189	207	227	249	278	305
Actual Ratio	137.6	150.5	163.2	178.5	188.8	206.5	227.2	248.5	278.4	304.5
Output Stage (Bevel)	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5	3.2	3.5
Input Stage (Cyclo)	43	43	51	51	59	59	71	71	87	87

Table 6: Bevel Single + Cyclo Reducer Double (Reduction Ratio: 364~10658)

Nominal Ratio	364	424	501	578	683	809	956	1117	1320	1656	1957
Actual Ratio	364.0	423.5	500.5	577.5	682.5	808.5	955.5	1116.5	1319.5	1655.5	1956.5
Output Stage	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Input Stage (Cyclo)	104	121	143	165	195	231	273	319	377	473	559
(Intermediate Part × Input Part)	(13×8)	(11×11)	(13×11)	(15×11)	(15×13)	(21×11)	(21×13)	(29×11)	(29×13)	(43×11)	(43×13)

Nominal Ratio	2272	2559	2944	3511	4365	5177	6472	7228	8880	10658
Actual Ratio	2271.5	2558.5	2943.5	3510.5	4364.5	5176.5	6471.5	7227.5	8879.5	10657.5
Output Stage	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Input Stage (Cyclo)	649	731	841	1003	1247	1479	1849	2065	2537	3045
(Intermediate Part × Input Part)	(59×11)	(43×17)	(29×29)	(59×17)	(43×29)	(87×17)	(43×43)	(59×35)	(59×43)	(87×35)

Notes: 1. Consult us for the other available reduction ratios.
2. Some ratios may not be available for certain frame sizes, consult us.

Frame Size and Actual Reduction Ratios

Table 7: Other available reduction ratios.

Nominal Ratio	387	403	420	435	441	458	476	525	528	538	541	557	588	598
Actual Ratio	387.2	403.2	420.0	435.2	441.0	457.6	476.0	525.0	528.0	537.6	540.8	556.8	588.0	598.4
Output Stage (Bevel)	3.2	3.2	3.5	3.2	3.5	3.2	3.5	3.5	3.2	3.2	3.2	3.2	3.5	3.2
Input Stage (Cyclo)	121	126	120	136	126	143	136	150	165	168	169	174	168	187
(Intermediate Part×Input Part)	(11×11)	(21×6)	(15×8)	(17×8)	(21×6)	(13×11)	(17×8)	(25×6)	(15×11)	(21×8)	(13×13)	(29×6)	(21×8)	(17×11)

Nominal Ratio	609	624	640	655	672	707	720	739	774	788	812	816	826	874
Actual Ratio	609.0	624.0	640.0	654.5	672.0	707.2	720.0	739.2	773.5	787.5	812.0	816.0	825.6	873.6
Output Stage (Bevel)	3.5	3.2	3.2	3.5	3.2	3.2	3.2	3.2	3.5	3.5	3.5	3.2	3.2	3.2
Input Stage (Cyclo)	174	195	200	187	210	221	225	231	221	225	232	255	258	273
(Intermediate Part×Input Part)	(29×6)	(15×13)	(25×8)	(17×11)	(35×6)	(17×13)	(15×15)	(21×11)	(17×13)	(15×15)	(29×8)	(17×15)	(43×6)	(21×13)

Nominal Ratio	893	896	903	925	963	980	1008	1012	1021	1040	1071	1103	1138	1142
Actual Ratio	892.5	896.0	903.0	924.8	962.5	980.0	1008.0	1011.5	1020.8	1040.0	1071.0	1102.5	1137.5	1142.4
Output Stage (Bevel)	3.5	3.2	3.5	3.2	3.5	3.5	3.2	3.5	3.2	3.2	3.5	3.5	3.5	3.2
Input Stage (Cyclo)	255	280	258	289	275	280	315	289	319	325	306	315	325	357
(Intermediate Part×Input Part)	(17×15)	(35×8)	(43×6)	(17×17)	(25×11)	(35×8)	(21×15)	(17×17)	(29×11)	(25×13)	(51×6)	(21×15)	(25×13)	(21×17)

Nominal Ratio	1200	1204	1206	1232	1239	1250	1306	1313	1348	1360	1392	1411	1428	1456
Actual Ratio	1200.0	1204.0	1206.4	1232.0	1239.0	1249.5	1305.6	1312.5	1347.5	1360.0	1392.0	1411.2	1428.0	1456.0
Output Stage (Bevel)	3.2	3.5	3.2	3.2	3.5	3.5	3.2	3.5	3.5	3.2	3.2	3.2	3.5	3.2
Input Stage (Cyclo)	375	344	377	385	354	357	408	375	385	425	435	441	408	455
(Intermediate Part×Input Part)	(25×15)	(43×8)	(29×13)	(35×11)	(59×6)	(21×17)	(51×8)	(25×15)	(35×11)	(25×17)	(29×15)	(21×21)	(51×8)	(35×13)

Nominal Ratio	1488	1510	1514	1523	1544	1578	1593	1652	1670	1680	1726	1789	1795	1818
Actual Ratio	1487.5	1510.4	1513.6	1522.5	1543.5	1577.6	1592.5	1652.0	1670.4	1680.0	1725.5	1788.8	1795.2	1817.6
Output Stage (Bevel)	3.5	3.2	3.2	3.5	3.5	3.2	3.5	3.5	3.2	3.2	3.5	3.2	3.2	3.2
Input Stage (Cyclo)	425	472	473	435	441	493	455	472	522	525	493	559	561	568
(Intermediate Part×Input Part)	(25×17)	(59×8)	(43×11)	(29×15)	(21×21)	(29×17)	(35×13)	(59×8)	(87×6)	(35×15)	(29×17)	(43×13)	(51×11)	(71×8)

Nominal Ratio	1827	1838	1904	1949	1964	1988	2000	2064	2077	2083	2132	2188	2227	2258
Actual Ratio	1827.0	1837.5	1904.0	1948.8	1963.5	1988.0	2000.0	2064.0	2076.8	2082.5	2131.5	2187.5	2227.2	2257.5
Output Stage (Bevel)	3.5	3.5	3.2	3.2	3.5	3.5	3.2	3.2	3.2	3.5	3.5	3.5	3.2	3.5
Input Stage (Cyclo)	522	525	595	609	561	568	625	645	649	595	609	625	696	645
(Intermediate Part×Input Part)	(87×6)	(35×15)	(35×17)	(29×21)	(51×11)	(71×8)	(25×25)	(43×15)	(59×11)	(35×17)	(29×21)	(25×25)	(87×8)	(43×15)

Nominal Ratio	2320	2339	2352	2436	2448	2454	2499	2538	2573	2678	2685	2691	2734	2774
Actual Ratio	2320.0	2339.2	2352.0	2436.0	2448.0	2454.4	2499.2	2537.5	2572.5	2677.5	2684.5	2691.2	2733.5	2774.4
Output Stage (Bevel)	3.2	3.2	3.2	3.5	3.2	3.2	3.2	3.5	3.5	3.5	3.5	3.2	3.5	3.2
Input Stage (Cyclo)	725	731	735	696	765	767	781	725	735	765	767	841	781	867
(Intermediate Part×Input Part)	(29×25)	(43×17)	(35×21)	(87×8)	(51×15)	(59×13)	(71×11)	(29×25)	(35×21)	(51×15)	(59×13)	(29×29)	(71×11)	(51×17)

Nominal Ratio	2800	2832	2890	2954	3035	3062	3063	3098	3161	3210	3231	3248	3350	3408
Actual Ratio	2800.0	2832.0	2889.6	2953.6	3034.5	3062.4	3062.5	3097.5	3160.5	3209.6	3230.5	3248.0	3349.5	3408.0
Output Stage (Bevel)	3.2	3.2	3.2	3.2	3.5	3.2	3.5	3.5	3.5	3.2	3.5	3.2	3.5	3.2
Input Stage (Cyclo)	875	885	903	923	867	957	875	885	903	1003	923	1015	957	1065
(Intermediate Part×Input Part)	(35×25)	(59×15)	(43×21)	(71×13)	(51×17)	(87×11)	(35×25)	(59×15)	(43×21)	(59×17)	(71×13)	(35×29)	(87×11)	(71×15)

Nominal Ratio	3427	3440	3553	3619	3728	3749	3763	3862	3920	3965	3990	4080	4176	4225
Actual Ratio	3427.2	3440.0	3552.5	3619.2	3727.5	3748.5	3762.5	3862.4	3920.0	3964.8	3990.4	4080.0	4176.0	4224.5
Output Stage (Bevel)	3.2	3.2	3.5	3.2	3.5	3.5	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.5
Input Stage (Cyclo)	1071	1075	1015	1131	1065	1071	1075	1207	1225	1239	1247	1275	1305	1207
(Intermediate Part×Input Part)	(51×21)	(43×25)	(35×29)	(87×13)	(71×15)	(51×21)	(43×25)	(71×17)	(35×35)	(59×21)	(43×29)	(51×25)	(87×15)	(71×17)

Nominal Ratio	4288	4337	4463	4568	4720	4771	4816	5163	5219	5268	5475	5680	5712	5846
Actual Ratio	4287.5	4336.5	4462.5	4567.5	4720.0	4771.2	4816.0	5162.5	5218.5	5267.5	5475.2	5680.0	5712.0	5846.4
Output Stage (Bevel)	3.5	3.5	3.5	3.5	3.2	3.2	3.2	3.5	3.5	3.5	3.2	3.2	3.2	3.2
Input Stage (Cyclo)	1225	1239	1275	1305	1475	1491	1505	1475	1491	1505	1711	1775	1785	1827
(Intermediate Part×Input Part)	(35×35)	(59×21)	(51×25)	(87×15)	(59×25)	(71×21)	(43×35)	(59×25)	(71×21)	(43×35)	(59×29)	(71×25)	(51×35)	(87×21)

Nominal Ratio	5917	5989	6213	6248	6395	6589	6608	6960	7018	7207	7613	7676	7952	8074
Actual Ratio	5916.8	5988.5	6212.5	6247.5	6394.5	6588.8	6608.0	6960.0	7017.6	7206.5	7612.5	7675.5	7952.0	8073.6
Output Stage (Bevel)	3.2	3.5	3.5	3.5	3.5	3.2	3.2	3.2	3.2	3.5	3.5	3.5	3.2	3.2
Input Stage (Cyclo)	1849	1711	1775	1785	1827	2059	2065	2175	2193	2059	2175	2193	2485	2523
(Intermediate Part×Input Part)	(43×43)	(59×29)	(71×25)	(51×35)	(87×21)	(71×29)	(59×35)	(87×25)	(51×43)	(71×29)	(87×25)	(51×43)	(71×35)	(87×29)

Nominal Ratio	8118	8323	8698	8831	9104	9629	9744	9770	10532	10686	11139	11587	11971	12184
Actual Ratio	8118.4	8323.2	8697.5	8830.5	9103.5	9628.8	9744.0	9769.6	10531.5	10685.5	11139.2	11587.2	11971.2	12183.5
Output Stage (Bevel)	3.2	3.2	3.5	3.5	3.5	3.2	3.2	3.2	3.5	3.5	3.2	3.2	3.2	3.5
Input Stage (Cyclo)	2537	2601	2485	2523	2601	3009	3045	3053	3009	3053	3481	3621	3741	3481
(Intermediate Part×Input Part)	(59×43)	(51×51)	(71×35)	(87×29)	(51×51)	(59×51)	(87×35)	(71×43)	(59×51)	(71×43)	(59×59)	(71×51)	(87×43)	(59×59)

Nominal Ratio	12674	13094	13405	14198	14662	15530	16131	16426	17644	17966	19766	21620	24221	26492
Actual Ratio	12673.5	13093.5	13404.8	14198.4	14661.5	15529.5	16131.2	16425.6	17643.5	17965.5	19766.4	21619.5	24220.8	26491.5
Output Stage (Bevel)	3.5	3.5	3.2	3.2	3.5	3.5	3.2	3.2	3.5	3.5	3.2	3.5	3.2	3.5
Input Stage (Cyclo)	3621	3741	4189	4437	4189	4437	5041	5133	5041	5133	6177	6177	7569	7569
(Intermediate Part×Input Part)	(71×51)	(87×43)	(71×59)	(87×51)	(71×59)	(87×51)	(71×71)	(87×59)	(71×71)	(87×59)	(87×71)	(87×71)	(87×87)	(87×87)

Notes: 1. Selection Tables for these ratios may not be available in the catalogue. Please consult us for availablity and technical details.
2. The available models or frame sizes may be limited.
3. Consult us for the rated and allowable values of the torque, radial load, and other technical information.
4. Consult us also higher reduction ratios and ratios that are not shown in these tables.

Product Range of Motor

Table 7: Specification Range of 3 Phase Induction Motors and Brake Motors ●: Standard ○: Available option

Output Power	IEC 3-Phase Induction Motors[1]									IEC 3-Phase Induction Motors with Built-In Brake[1]									
	Number of Poles			Protection	Insulation Class		Inverter Duty[5,6,7]		High Efficiency (IE2)[1,7]	Number of Poles			Protection		Insulation Class		Inverter Duty[5,6,7]		High Efficiency (IE2)[1,7]
KW	4P	6P	4/8P[4]	IP55	F	H	4P	6P	4P	4P	6P	4/8P[4]	IP54	IP55	F	H	4P	6P	4P
0.1	●			●	●	○	○			●			○	●	●	○	○		
0.2	●			●	●	○	○			●			○	●	●	○	○		
0.25	●			●	●	○				●			○	●	●	○			
0.4	●	○	○	●	●	○	○			●	○	○	○	●	●	○	○		
0.55	●	○		●	●	○				●	○		○	●	●	○			
0.75	●	○	○	●	●	○	○		○	●	○	○	○	●	●	○	○		○
1.1	●	○		●	●	○			○	●	○		○	●	●	○			○
1.5	●	○	○	●	●	○	○		○	●	○	○	○	●	●	○	○		○
2.2	●	○	○	●	●	○	○		○	●	○	○	○	●	●	○	○		○
3	●	○		●	●	○			○	●	○		○	●	●	○	○		○
3.7	●	○	○	●	●	○	○		○	●	○	○	○	●	●	○	○		○
5.5	●	○	○	●	●	○	○	○	○	●	○	○	○	●	●	○	○	○	○
7.5	●	○	○	●	●	○	○	○	○	●	○	○	○	●	●	○	○	○	○
11	●	○	○	●	●	○	○	○	○	●	○	○	○	●	●	○	○	○	○
15	●	○	○	●	●	○	○	○	○	●	○	○	●		●	○	○	○	○
18.5	●	○	○	●	●	○	○	○	○	●	○	○	●		●	○	○	○	○
22	●	○	○	●	●	○	○	○	○	●	○	○	●		●	○	○	○	○
30	●	○	○	●	●	○	○	○	○	●	○	○	●		●	○	○	○	○
37	●	○		●	●	○	○	○		●	○		●		●	○	○		
45	●	○		●	●	○				●			●		●	○			
55	●			●	●	○													

Output Power	3-Phase Increased Safety (eG3) Motors (JIS)[8]								3-Phase Flameproof (d2G4) Motors (JIS)[8]								
	Number of Poles		Protection			Insulation Class			Number of Poles		Protection			Insulation Class			Inverter Duty[9]
KW	4P	6P	IP44	IP54	IP55	B	F	H	4P	6P	IP44	IP54	IP55	B	F	H	4P
0.1	●		●	○	○	●	○	○	●		●	○	○	●	○	○	
0.2	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
0.25																	
0.4	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
0.55																	
0.75	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
1.1																	
1.5	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
2.2	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
3																	
3.7	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
5.5	●		●	○	○	●	○	○	●		●	○	○	●	○	○	○
7.5	●	○	●	○	○	●	○	○	●	○	●	○	○	●	○	○	○
11	●	○	●	○	○	●	○	○	●	○	●	○	○	●	○	○	○
15	●	○	●	○	○	●	○	○	●	○	●	○	○	●	○	○	○
18.5	●	○	●	○	○	●	○	○	●	○	●	○	○	●	○	○	○
22	●	○	●	○	○	●	○	○	●	○	●	○	○	●	○	○	○
30	●	○	●	○	○	●	○	○	●	○	●	○	○	●	○	○	○
37	●	○	●	○	○		●	○	●	○	●	○	○		●	○	○
45	●	○	●	○	○		●	○									
55		○	●	○	○		●	○									

Notes: 1. 3-Phase induction motors, High Efficiency (IE2) and brake motors are based on IEC standards, rated for continuous duty.
2. Motors confirming to CCC, NEMA, UL, CSA, JIS standards are also available. Please consult us.
3. Motors with output power (kW) or specifications other than those listed above are also available (eg: special voltage, single phase, dust-proof, high humidity, high temperature, marine duty, dual shaft, wash-down duty, splash-proof, explosion-proof etc). Please consult us for details.
4. Pole Change Motors are rated to constant output torque.
5. Inverter Duty Motors produce constant output torque for 6-60Hz. Options available for 50Hz base frequency.
6. For inverter drive use, consult us with ambient temperature, input speed, mounting method, load characteristics and other operating conditions. Start-up properties, lubrication, thermal rating, etc must be reviewed for proper selection.
7. When using standard induction motors or IE2 motors with inverter, please consult us if the carrier frequency is high (typical in IGBT), wiring distance is large or operating speed is lower than 50% to review the starting and lubrication abilities, thermal rating, withstand voltage etc.
8. 3-Phase safety increased (eG3) and Flameproof (d2G4) motors are based on Japanese specifications (JIS) only.
9. Flameproof (d2G4) motors are approved to be driven by Sumitomo Inverters only and authorised motor - inverter combination is 1:1. Inverter must be installed in area not exposed to explosive gas as inverters do not have explosionproof protection. Consult us for details.

Standard Specifications

Table 8: Standard Specifications of Motor

	Item	Specification	
	Motor Specification	Standard Motor	Motor with Built-In Brake
Three Phase Motor	Capacity	0.1kW×4P ~ 55kW×4P	0.1kW×4P~30kW×4P FB Brake 37kW×4P~45kW×4P ESB Brake
	Protection	IP55 (outdoor)	
	Enclosure	Totally enclosed fan cooled type (or totally enclosed non-ventilated type for 0.1kW×4P)	Totally enclosed fan cooled type (or totally enclosed non-ventilated type for 0.1kW×4P)
	Power Source	50Hz: 200V~240V / 380V~420V 60Hz: 220V / 440V	
	Thermal Class	F: 0.1KW~55kW (Brake section for 37 to 45 kW is class B.)	
	Time Rating	Continuous	
	Terminal Box Position and Lead Wire Direction	Refer to pages 25 to 34.	
	Lead Wires	6 wires: 0.1KW~55kW (人 - Δ startup for 5.5KW & above)	8 wires: 0.1KW~45kW (人 - Δ startup for 5.5KW & above)
	Standards	IEC	IEC
Inverter duty AF Motor	Capacity	0.1kW × 4P ~ 37kW×4P	0.1kW×4P~22kW×4P FB Brake 30kW×4P~37kW×4P ESB Brake
	Protection	IP55 (outdoor)	
	Enclosure	Totally enclosed fan cooled type	
	Power Source	200V 60Hz, 220V 60Hz	200V 60Hz, 220V 60Hz
	Thermal Class	F: 0.1KW~30kW (Brake section for 30 to 37 kW is class B.)	
	Time Rating	Continuous	
	Terminal Box Position and Lead Wire Direction	Refer to pages 25 to 34.	
	Lead Wires	6 wires: 0.1KW~55kW	8 wires: 0.1KW~45kW
	Standards	In accordance with JIS	In accordance with JIS
High-Efficiency Motor	Capacity	0.2kW × 4P ~ 30kW × 4P	0.2kW×4P~22kW×4P FB Brake 30kW×4P ESB Brake
	Protection	IP55 (outdoor)	
	Enclosure	Totally enclosed fan cooled type	
	Power Source	200V 50/60Hz, 220V 60Hz 400V 50/60Hz, 440V 60Hz	200V 50/60Hz, 220V 60Hz 400V 50/60Hz, 440V 60Hz
	Thermal Class	F: 0.12KW (Class B for brake section)	
	Time Rating	Continuous	
	Terminal Box Position and Lead Wire Direction	Refer to pages 25 to 34.	
	Lead Wires	6 wires: 0.1KW~55kW (人 - Δ startup for 5.5KW & above)	8 wires: 0.1KW~45kW (人 - Δ startup for 5.5KW & above)
	Standards	JIS C 4034-1, Efficiency: In accordance with JIS C 4212 and IEC60034-30 (0.75~30kW)	JIS C 4034-1, Efficiency: In accordance with JIS C 4212 and IEC60034-30 (0.75~30kW)

Notes: 1. For any non-standard motor specifications, refer to "Motor Section" in Technical Data on pages and later.
2. Consult us if the 人- Δ startup is necessary for non-standard voltage classes.
3. High-efficiency motors are manufactured in accordance with IEC60034-30 (IE2). However 0.2~0.4kW motors are manufactured in accordance with JIS C 4212 because they are not covered under IEC specification.

Table 9: Standard Specification of Reduction Section

Item	Specifications
Lubrication Method	Output gear section: Oil lubricated Input gear section (CYCLO Reducer): Oil or grease lubricated
Reduction Method	Output section: Bevel gear Input section: Internal planetary gear with trochoidal curved tooth profile (CYCLO Drive) or simple planetary tooth mechanism (* planetary for ratio 11~18 only)
Rotation direction	Refer to pages <TBA>.

Table 10: Common Specifications

Item		Specifications
Ambient Conditions	Installation Location	Outdoor (a little dust, not splashed with water). Vibration: 1G or less
	Ambient Temperature	-10~40°C
	Ambient Humidity	85% or less
	Elevation	1,000 m or less above sea level
	Atmosphere	Well ventilated location, free of dust, corrosive gases, explosive gases, vapors, and the like
Method of Mounting Note 4		Horizontal or vertical (to be designated at the time of order)
Method of Coupling with Driven Machine		Direct connection with driven shaft by hollow shaft, coupling, gear, chain sprocket, or pulley belt, etc.
Coating		Quality: Modified alkyd system Color: Munsell 6.5PB 3.6/8.2 or equivalent

Note: 4. Consult us if the mounting location contains a slope of 1 degree or more.

Selection Procedure: Gearmotors

The flowchart below is a guide for selection of BBB-4 Gearmotor. Consult us for any questions about the procedure.

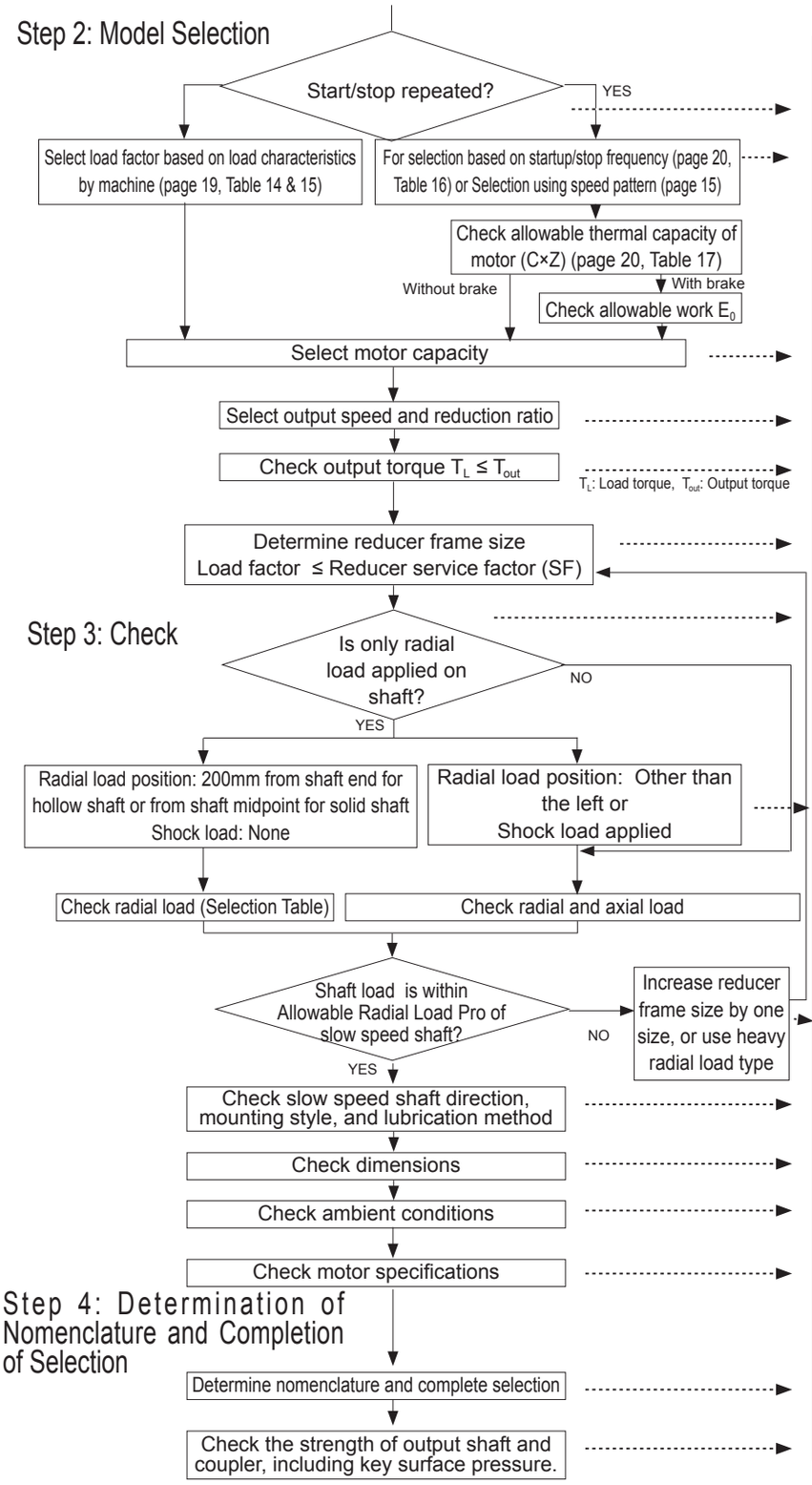
・Refer to page 15 for selection procedure of inverter driven gearmotors.
・Refer to page 17 for selection procedure of reducers.

Step 1: Determination of Operating Conditions

Determine the following parameters before starting selection:

- Application
- Continuous operation or operation with frequent start and stop
- Motor capacity (kW) and output speed or reduction ratio
- Radial load and axial load
- Operation hours per day
- Level of shock load
- Mounting direction (output shaft direction) and mounting configuration
- Specifications for motor (e.g., power supply frequency, voltage, and with/without brake)
- Other ambient conditions (temperature, humidity, indoor or outdoor, and others)

Step 2: Model Selection



Procedure

- From pages 19 and 20, select the load factor matching your application.
- For operation with repeated starts and stops, check the allowable thermal capacity of the motor on page 20. For a motor with brake, refer to page 21 to ensure that the braking work is within the allowable work E_0.
- Check the brake torque on pages 253 or 256.
- In the selection tables beginning page 54, go to the page that contains the selection table indicating your motor capacity.
- Select the cell that contains a value closest to the output speed or reduction ratio which you are looking for.
- Check whether the output torque is sufficient for your usage. If the output torque is not sufficient, select one size larger motor capacity.
- From the selection table, select the combination with a service factor (SF) larger than the load factor which you selected.
- Check whether only the radial load is applied on the slow speed shaft. If axial load is applicable, make calculation referring to pages 37 to 45.
- Refer to page 37 and make calculation, depending on where the radial load is applied, or whether any shock load is applied.
  *1. The allowable radial load for slow speed shaft in the selection table is the value obtained when the load position is at the midpoint of the shaft.
  *2. If the initial tension is applied by using the chain, V-belt, synchronous belt or the like, these tensions should be included in the radial load.
- Check whether the calculated radial load does not exceed the allowable radial load of the output shaft.
- Check whether the selected combination matches the output shaft direction, mounting style, and lubrication method you are looking for.
- Check the dimensions. Consult us if they do not match your requirement.
- Refer to page 12 for standard specification and ambient conditions. Consult us if your requirement is different.
- Check the motor specification on page 11 and 12. Consult us if your requirement is different.
- Determine the nomenclature for the selected model referring to "Nomenclature" on page 23. Now, the selection process is complete.
- Verify the maximum torque for startup and stop.

Selection Procedure: Gearmotors

. Below is an example of model selection that follows the selection procedure detailed on page 13

○ Operating Parameters:

- Application: Chain conveyor
- Operation pattern: Continuous operation
- Operation hours per day: 24 operation hours/day
- Load power: 1.3kW
- Output speed: 21.6r/min
- Method of connection with driven shaft: Chain sprocket
  Initial tension = 0
  Sprocket pitch circle radius: R = 70mm
  Load position: Midpoint of shaft
- Level of shock load : None
- Mounting direction (output shaft direction), mounting style
  : Horizontal, foot mount, and shaft direction left (seen from the motor)

- Motor specifications
  Power frequency : 50Hz
  Voltage : 415V
  Brake : None
  Others : Outdoor type
- Ambient conditions
  Ambient temperature 40°C, indoor

This example selects the model based on the above operation conditions.

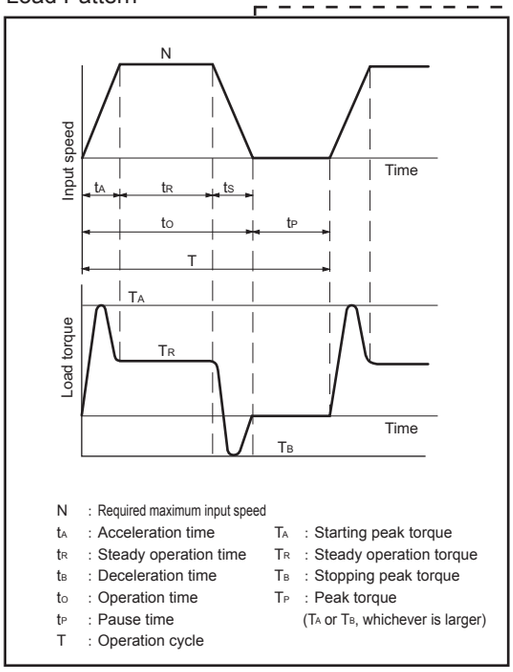
Operation conditions, selection, and calculation results	Reference pages in this catalog
○ Select the load factor Load characteristics for chain conveyor application→Uniform load (U) Load factor = 1.20 (U, 24 operation hours/day)	Pages 19 Table 15 Load Characteristic Table by Machine Table 14 Load Factor
○ Select the motor capacity Load factor = 1.3kW→Motor capacity = 1.5kW	Page 11 Product Range of Motors
○ Select the output speed Input speed 50Hz, output speed 21.6r/min→1450/21.6 = Reduction ratio 67	Page 69 Gearmotor Selection Table
○ Check the output torque $T_L = \frac{9550 \times 1.3\ (kW)}{1450} \times 67 = 574N \cdot m \leq 612N \cdot m \rightarrow OK$ T_L : Load torque	Page 69 Gearmotor Selection Table
○ Determine the reducer frame size Load factor = 1.2 ≤ 1.27 Reducer frame size and reduction ratio: 2-4A100-67	Page 69 Gearmotor Selection Table
○ Check the radial load Pr=TL / R ≤ Pro / Cf Pr=574(N·m) / 0.07(m)=8200(N) ≤ 25000(N) / 1=25000(N)→ OK	Page 37 Allowable Radial and Axial Load Page 69 Gearmotor Selection Table
○ Check the output shaft direction, mounting style, and lubrication method Output shaft direction: Horizontal; Mounting style: Foot mount→Type: LHHM	Page 23 Nomenclature
○ Check the dimensions Use the Dimension Tables.	Page 125 Dimension Table
○ Check the ambient conditions Ambient temperature: 20°C→OK	Page 12 Standard Specification
○ Check the motor specifications 415V 50Hz, outdoor type→OK as the standard	Page 11 Product Range of Motors
◎ Determine the nomenclature Determine the nomenclature as: LHHM2-4A100L-K1-67	Page 23 Nomenclature
Now the selection is complete.	

Selection Procedure: Inverter Driven Gearmotors

Flowchart and Formulas for Model Selection by Inverter Drive etc.

If a gearmotor or a gearmotor with brake is used, check the motor's allowable capacity, the brake's allowable work, and the brake torque (pages 20 and 21) too.

Load Pattern



N : Required maximum input speed
t_A : Acceleration time
t_R : Steady operation time
t_B : Deceleration time
t_O : Operation time
t_P : Pause time
T : Operation cycle
T_A : Starting peak torque
T_R : Steady operation torque
T_B : Stopping peak torque
T_P : Peak torque (T_A or T_B, whichever is larger)

Evaluate load characteristics

Determine load factor (Table 12)

Calculate average load torque (T_E)

Determine reduction ratio (Z)

Selection Tables (pages 144 and later)

$T_{R0} \geq T_E$
T_{R0}: Allowable output torque at required maximum input speed

NO
Select larger frame size or lower average output torque T_E.

Select tentative frame size

Evaluate input speed

Calculate %ED

Selection Tables (pages 54 and later)

Check allowable maximum input speed
Check duty rate

NO

Consult Sumitomo

Evaluate starting/stopping peak torque (T_P)

Allowable Maximum Output Torque Table (Pages 35 and 36)

Rated output torque ≥ $T_P \times F_n \times F_{SF}$

NO
Increase frame size or decrease peak torque T_P.

Evaluate radial and axial load

Allowable load ≥ Actual load

NO
(Increase frame size)

(Pages 37 to 45)

Determine Frame Size

Check the strength of output shaft and coupler, including key surface pressure.

Selection Procedure: Inverter Driven Gearmotors

Table 11 F_n startup frequency coefficient

Startup Frequency	Factor
1~2 times/min	1.0
3~5 times/min	1.1
6~9 times/min	1.2

* Consult us if the startup frequency is outside the above range.

Table 12 F_{SF} Load Factor

Load Conditions / Operation Time	U (Uniform load)	M (Light shock)	H (Heavy shock)
≤ 10 hours/day	1.0	1.2	1.5
24 hours/day	1.2	1.35	1.6

Table 13 Load Characteristic Table by Machine

Conveyors and Distribution Equipment	Metalworking machines
conveyors (uniform load)	tapping machines H
apron, assembly, belt, bucket, chain, open, screw — U	punch presses (gears driven) H
conveyors (heavy load, fluctuation load)	planers H
apron, assembly, belt, bucket — M	bending machines M
sorter M	ATC M
AGV M	other machine tools *
Robot Peripheral Equipment	Printing Machine *
slider M	Textile Industry
positioner M	batchers, calenders, carding machine, dry cans, driers, dyeing machines, mangles, knapping machine, pad slashers, soapers, winders, spinners, tenters, washers, cloth finishers — M
* Consult us for a machine marked with an asterisk (*) or not listed above.	(washing machines, pads, tenters, driers, calenders, etc.)

Average load torque $T_E = \left(\dfrac{\frac{1}{2} \cdot T_A^{10/3} \cdot t_A + T_R^{10/3} \cdot t_R + \frac{1}{2} \cdot T_B^{10/3} \cdot t_B}{\frac{1}{2} \cdot t_A + t_R + \frac{1}{2} \cdot t_B} \right)^{0.3}$ ····· (Formula 1)

Reduction ratio $Z = \left(\dfrac{\text{Required output speed}}{\text{Required maximum input speed}} \right)$ ····· (Formula 2)

%ED $\%ED = \dfrac{to}{T} \times 100$ ····· (Formula 3)

The maximum operation cycle used for calculation of %ED is 10 minutes. If the operation cycle exceeds 10 minutes, calculate %ED with T = 10 (minutes).

2. Selection Example

<Application> Electric cart

<Specifications>

T_A	:Starting peak torque	600Nm	n :Required output speed	29.5 rpm
T_R	:Steady operation torque	400Nm	t_A :Acceleration time	0.5 sec
T_B	:Stopping peak torque	500Nm	t_R :Steady operation time	6.5 sec
			t_B :Deceleration time	1.0 sec
			t_O :Operation time	8.0 sec
			t_P :Pause time	8.0 sec
			T :Operation cycle	16.0 sec

Radial load 6000N at midpoint of output shaft
Rated speed of motor 1750r/min, 10 operation hours/day

<Calculation>

- Determine the load factor — Fn=1.1 F_{SF}=1.0 (Tables 11 to 13)
- Calculate the average load torque — $T_E = \left(\dfrac{\frac{1}{2} \times 600^{10/3} \times 0.5 + 400^{10/3} \times 6.5 + \frac{1}{2} \times 500^{10/3} \times 1}{\frac{1}{2} \times 0.5 + 6.5 + \frac{1}{2} \times 1.0} \right)^{0.3} = 419.8 \text{N•m}$ (Formula 1)
- Determine the reduction ratio — $Z = \left(\dfrac{29.5}{1750} \right) = \dfrac{1}{59} \fallingdotseq \dfrac{1}{60}$ (Formula 2)
- Allowable output torque at the required maximum input speed — T_{RO}=594(N•m) > 419.8(N•m)→Assume the frame size to be 4A100-60 tentatively. (Page 145)
- Calculate %ED — $\%ED = \dfrac{8}{16} \times 100 = 50\%$ (Formula 3)
- Check the maximum input speed — 1750 rpm at 50% ED < 1750 rpm at 100% ED (Page 145)
- Check the starting and stopping peak torques — 600(N•m)×1.1×1.0=660(N•m) < 849(N•m) (Page 35~36)
- Slow-speed shaft allowable radial load determined taking the coefficient into account — Pro=26100(N)、Lf=1.0、Cf=1.25、Fs=1.2

$\dfrac{Pro}{Lf \times Cf \times Fs} = \dfrac{26100}{1.0 \times 1.25 \times 1.2} = 17400(N) > 6000(N)$ (Page 37)

4A100-60 is selected based on the above procedure.

Selection Procedure: Reducers

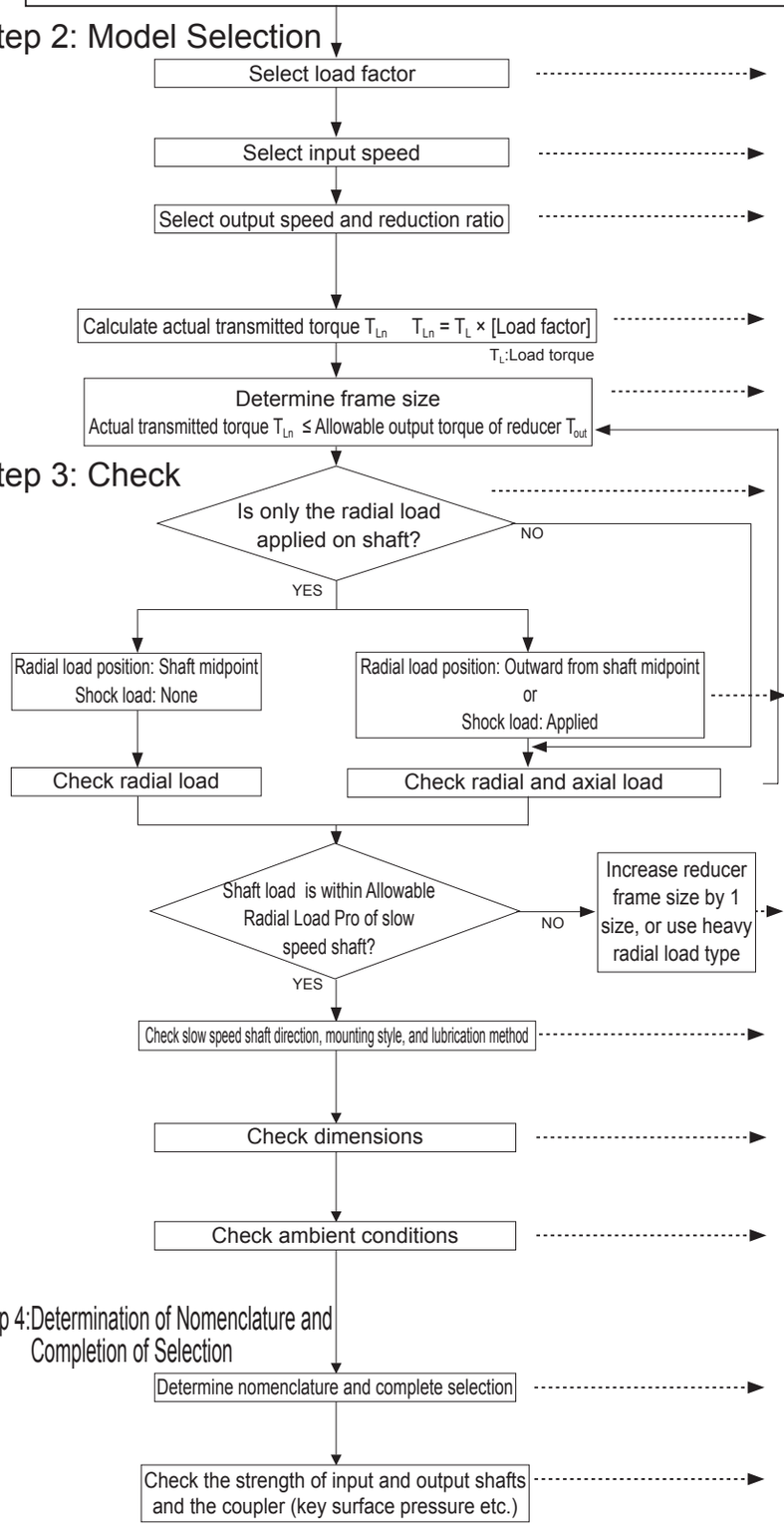
Select models using the flow chart below. Consult us for questions about the selection procedure.

Step 1: Determination of Operating Conditions

Determine the following conditions before starting selection:

- Application
- Continuous operation or operation with frequent startup and stop
- Load torque T_L
- Radial load and axial load
- Operation hours per day
- Level of shock load
- Mounting direction (direction of output shaft) and mounting configuration
- Other ambient conditions (temperature, humidity, indoor or outdoor, and other environments)

Step 2: Model Selection



Procedure

- From pages 19 and 20, select the load factor matching the application.
- On the reducer selection table section following page 144, refer to the page corresponding to the input speed you wish to select.
- Select the cell containing a value closest to the output speed or reduction ratio you are looking for.
  * Consult us if the input shaft is vertically downward, because the selection tables on page 144 and later are inapplicable in that case.
- Calculate the actual transmitted torque from the load torque and load factor.
- From the selection table, select the reduction ratio and frame size that the allowable output torque is larger than the actual transmitted torque.
- Check whether only the radial load is applied on the reducer's input and output shafts. If the axial load is also applied on them, make calculation referring to pages 37 to 45.
- Refer to the factor on page 37, depending on where the radial load is applied and whether shock load is applied or not, and convert the value.
  *1 The output shaft allowable radial load in the selection table is a value satisfied when the load position is at the midpoint of the shaft.
  *2 If the initial tension is applied using the chain, V-belt, synchronous belt, or the like, these tensions should be included in the radial load.
- Check whether the calculated radial load exceeds the allowable radial load of the output shaft.
- Check whether the selected combination matches the output shaft direction, mounting style, and lubrication method you are looking for.
- Check the dimensions. Consult us if they do not match your requirement.
- By referring to "Standard Specifications" on page 12 check whether the selected combination matches the ambient conditions, etc.
- Determine the nomenclature for the selected model referring to "Nomenclature" on page 23. Now, the selection process is complete.
- Check with the maximum torque for startup and stop.

Selection Procedure: Reducers

Below is an example of selection following the procedure on page 17.

○ Operation conditions

- Application: Chain conveyor
- Operation pattern: Continuous operation
- 24 operation hours/day
- Load torque: 700N·m
- Input speed: 1450 rpm
- Output speed: 16.5 rpm
- Connection with machine :
  Output side: Chain sprocket
  Sprocket pitch circle radius: R=80mm
  Load position: Midpoint of shaft; Initial tension = 0
  Input side: Coupling
- Level of shock load: None
- Mounting direction (output shaft direction), mounting style : Horizontal, foot mount, solid shaft; and shaft direction is left viewed from the motor.

This example selects the model based on the above operation conditions.

Operation conditions, selection, and calculation results	Reference page in this catalog
○ Select the load factor Load characteristics for chain conveyor application → Uniform load (U) Load factor = 1.20 (U, 24 operation hours/day)	Pages 19 and 20 Table 15 Load characteristics by machine Table 14 Reducer Load Factor
○ Select the input speed 1450rpm	
○ Select the output speed Input speed 1450rpm, output speed 16.5rpm → 1450/16.5 = Reduction ratio 88	
○ Calculate the actual transmitted torque T_{nL}=700 (N·m)×1.2=840 (N·m)	
○ Determine the reducer frame size $T_{nL} \leq T_{out}$→840 (N·m) ≤ 889 (N・m) Reducer frame size: 4A105	Page 166 Reducer selection table
○ Check the radial load Output side: Pr=TL / R ≤ Pro / Cf Pr=700(N·m) / 0.080(m) =8750(N) ≤ 22000(N) / 1=22000(N) → OK Input side: No radial load because of coupling connection.	Page 37 Allowable Radial and Axial Load Page 166 Reducer Selection Table
○ Check the output shaft direction, mounting style, and lubrication method Output shaft direction: Horizontal; Mounting style: Foot mount → Type: LHH	Page 23 Nomenclature
○ Check the dimensions Use the Dimension Tables.	Page 207 Dimension Tables
○ Check the ambient conditions Ambient temperature: 20°C	Page 12 Standard Specifications
◎ Determine the nomenclature Determine the nomenclature as: LHH-4A105L-K1-88	Page 23 Nomenclature
Now the selection is complete.	

Load Factor for Continuous Duty Operation

1. Please refer to Tables 14 & 15 for recommended load factor modifiers for continuous duty applications.
2. The values on the selection tables are based on an operation of 10 hours per day with uniform load.
3. For applications with start/stop operations, please refer to page 20.

■ Recommended Load Factor by Application.

[Load Factor] U: Uniform load M: Moderate shock H: Heavy shock

Table 14 Reducer Load Factor

Daily duty	~3 hours/day			~10 hours/day			~24 hours/day		
	U	M	H	U	M	H	U	M	H
Load Factor	0.80	1.00	1.35	1.00	1.20	1.50	1.20	1.35	1.60

Table 15 Recommended Load Classifications

Type of APPLICATION	Type of LOAD
*Aerator	
Agitators.	
pure liquids	U
liquids & solids	M
liquids-variable density	M
Blowers	
centrifugal	U
lobe	M
vane	U
Brewing & Distilling	
bottling machinery	U
brew kettles, cont. duty	U
cookers-cont. duty	U
mash tubs-cont. duty	U
scale hopper, frequent starts	M
Can Filling Machines	U
*Cane Knives	M
Car Dumpers	H
Car Pullers	M
Clarifiers	U
Classifiers	M
Clay Working Machinery	
brick press	H
briquette machine	H
clay working machinery	M
pug mill	M
Compressors	
centrifugal	U
lobe	M
reciprocating, multi-cylinder	M
reciprocating, single-cylinder	H
Conveyors-Uniformly Loaded or Fed	
apron	U
assembly	U
belt	U
bucket	U
chain	U
flight	U
oven	U
screw	U
Conveyors-Heavy Duty Not Uniformly Fed	
apron	M
assembly	M
belt	M
bucket	M
chain	M
flight	M
*live roll	
oven	M
reciprocating	H
screw	M
shaker	H
Cranes (Except for Dry Dock Cranes)	
main hoists	
*bridge travel	
*trolley travel	
Crusher	
ore	H
stone	H
**sugar	M
Dredges	
cable reels	M
conveyors	M
cutter head drives	H
jig drives	H
maneuvering winches	M
pumps	M
screen drive	H
stackers	M
utility winches	M
*Dry Dock Cranes	
Elevators	
bucket - uniform load	U
bucket - heavy load	M
bucket - cont.	U
centrifugal discharge	U
escalators	U
freight	M
gravity discharge	U
*man lifts	
*passenger	
**Extruders (Plastics)	
blow molders	M
coating	U
film	U
pipe	U
pre-plasticizers	M
rods	U
sheet	U
tubing	U
Fans	
centrifugal	U
*cooling towers	
induced draft	U
*forced draft	
induced draft	M
large (mine, etc.)	M
large (industrial)	M
light (small diameter)	U
Feeders	
apron	M
belt	M
disc	U
reciprocating	H
screw	M
Food industry	
beet slicer	M
cereal cooker	U
dough mixer	M
meat grinders	M
Generators (not welding)	U
Hammer mills	H
Hoists	
heavy duty	H
medium duty	M
skip hoist	M
Laundry Washers	
reversing	M
Laundry Tumblers	M
Line Shaft	
driving processing equipment	M
light	U
other line shafts	U
Lumber Industry	
barkers-hydraulic-mechanical	H
burner conveyor	M
chain saw & drag saw	H
chain transfer	H
craneway transfer	H
de-barking drum	H
edger feed	M
gang feed	H
green chain	M
live rolls	H
log haul-locline	H
log haul-well type	H
log turning device	H
main log conveyor	H
off bearing rolls	M
planer feed chains	M
planer floor chains	M
planer tilting hoist	M
re-saw merry- go-round conveyor	M
roll cases	H
slab conveyor	H
small waste-conveyor-belt	U
small waste-conveyor-chain	M
sorting table	M
tipple hoist conveyor	M
tipple hoist drive	M
transfer conveyors	M
transfer rolls	M
tray drive	M
trimmer feed	M
waste conveyor	M
Machine Tools	
bending roll	M
punch press-gear driven	H
*notching press-belt driven	
plate planers	H
tapping machine	H
other machine tools	
main drives	M
auxiliary drives	U
Metal Mills	
draw bench carriage & main drive	M
forming machines	H
*pinch, dryer & scrubber rolls, reversing	
slitters	M
table conveyors-non-reversing group drives	M
individual drives	H
*table conveyors-reversing	
wire drawing & flattening machine	M
wire winding machine	M
Mills, Rotary Type	
**ball	M
**cement kilns	M
**dryers & coolers	M
kilns	M
**pebble	M
**rod , plain & wedge bar	M
tumbling barrels	H
Mixers	
concrete mixers, cont.	M
concrete mixers, intermittent	M
constant density	U
variable density	M
Oil Industry	
chillers	M
*oil well pumping	
paraffin filter press	M
rotary kilns	M
Paper Mills	
agitators (mixers)	M
barker-auxiliaries-hydraulic	M
barker-mechanical	M
barking drum	H
beater & pulper	M
bleacher	U
calenders	M
calenders-super	H
converting machine, except cutters, platers	M
conveyors	U
couch	M
cutters-platers	H
cylinders	M
dryers	M
Paper Mills	
felt stretcher	M
felt whipper	H
jordans	H
log haul	H
presses	U
pulp machine reel	M
stock chests	M
suction roll	U
washers & thickeners	M
winders	U
*Printing Presses	
Pullers	
barge haul	H
Pumps	
centrifugal	U
proportioning	M
reciprocating single acting, 3 or more cylinders	M
double acting, 2 or more cylinders	M
*single acting, 1 or 2 cylinders	
*double acting, single cylinder	
rotary-gear type	U
rotary-lobe, vane	U
Rubber & Plastics Industries	
**crackers	H
laboratory equipment	M
**mixing mills	H
**refiners	M
**rubber calenders	M
**rubber mill (2 on line)	M
**rubber mill (3 on line)	U
**sheeter	M
*tire building machines	
*tire & tube press openers	
**tubers & strainers	M
**warming mills	M
Sand Muller	M
Screens	
air washing	U
rotary-stone or gravel	M
traveling water intake	U
Sewage Disposal Equipment	
bar screens	U
chemical feeders	U
collectors, circuline or straightline	U
dewatering screws	M
grit collectors	U
scum breakers	M
slow or rapid mixers	M
sludge collectors	U
thickeners	M
vacuum filters	M
Slab Pushers	M
*Steering Gear	
Stokers	U
Sugar Industry	
**cane knives	M
**crushers	M
**mills	H
Textile Industry	
batchers	M
calendars	M
cards	M
dry cans.	M
dryers	M
dyeing machinery	M
*knitting machines	
looms	M
mangles	M
nappers	M
pads	M
*range drives	
slashers	M
soapers	M
spinners	M
tenter frames	M
washers	M
winders	M
*Windlass	

Remarks: *Consult factory. **To be selected on basis of 24 hr. service only.
Note: Table above contains reference value. Names and mechanical characteristics of the actual machine may differ from the table above.

Load Factor for Start/Stop Operation

For recommended Load Factor Modifications for Frequent Start-Stop Operation, refer to tables 16 and 17.

Table 16 Number of Starts-Stops and Load Factor

Number of starts-stops [times/hour]	~3 hours/day			~10 hours/day			~24 hours/day		
	I	II	III	I	II	III	I	II	III
~10	0.80	1.00	1.20	1.00	1.10	1.35	1.20	1.25	1.50
~200	0.85	1.10	1.30	1.10	1.30	1.50	1.25	1.50	1.65
~500	0.90	1.20	1.40	1.15	1.45	1.60	1.30	1.60	1.75

$$\text{The ratio of Moment of Inertia (The ratio of } GD^2) = \frac{\text{Total Moment of Inertia } (GD^2) \text{ as seen from the motor shaft}}{\text{Moment of Inertia } (GD^2) \text{ of motor}}$$

Load Factor
I : Allowable ratio of Moment of Inertia (GD^2) ≤ 0.3
II : Allowable ratio of Moment of Inertia (GD^2) ≤ 3
III: Allowable ratio of Moment of Inertia (GD^2) ≤ 10

Note: 1. The number of starts-stops includes brake or clutch operation times.
2. Consult us when starting under loaded conditions.
3. Consult us if the start/stop frequency exceeds 500 times/hour, because brake for high frequency may be required.
4. In case of high efficiency motors, consult us if start/stop frequency exceeds 10 times/hour and the ratio of moment inertia exceeds 0.2, because the starting torque of high efficiency motors is large.

Table 17 Allowable Thermal Capacity of Motor (C×Z)

Motor Output [kW]	Allowable C×Z				Moment of Inertia of Motor [kg·m²]		GD^2 of Motor [kgf·m²]	
	(35%ED or less)	(35% ED over~ 50% ED or less)	(50% ED over~ 80% ED or less)	(80% ED over~ 100% ED or less)	Standard	With brake	Standard	With brake
0.1	3200	3000	2000	1200	0.00033	0.00035	0.0013	0.0014
0.2	2200	2800	2800	2500	0.00050	0.00055	0.002	0.0022
0.25	2200	2800	2800	2500	0.00050	0.00055	0.002	0.0022
0.4	1800	2200	1500	1500	0.00065	0.00068	0.0026	0.0027
0.55	1800	2200	1500	1500	0.00101	0.00111	0.00405	0.00445
0.75	1400	1400	800	500	0.00120	0.00130	0.0048	0.0052
1.1	1400	1400	800	500	0.00185	0.00208	0.0074	0.0083
1.5	1200	1200	500	400	0.00213	0.00235	0.0085	0.0094
2.2	1000	900	400	200	0.00333	0.00373	0.0133	0.0149
3.0	1000	900	400	200	0.00700	0.00810	0.0281	0.0325
3.7	800	800	800	700	0.00848	0.00958	0.0339	0.0383
5.5	300	300	200	150	0.01143	0.01253	0.0457	0.0501
7.5	400	350	300	300	0.02675	0.03025	0.1070	0.121
11	200	200	150	150	0.03750	0.04100	0.1500	0.164

Check that the C×Z value obtained in Steps [1] to [3] below is within the allowable CZ value in the appropriate motor capacity and %ED values in Table 17.

[1] Obtain C using following formulas:

[International System of Units] $C = \dfrac{J_M + J_L}{J_M}$

[Gravitational units] $C = \dfrac{GD_M^2 + GD_L^2}{GD_M^2}$

J_M : Moment of inertia of motor [kg·m²]
J_L : Converted value at motor shaft; total moment of inertia excluding motor [kg·m²]

GD_M^2 ; GD^2 of motor [kgf·m²]
GD_L^2 ; Total GD^2 at the motor shaft excluding motor [kgf·m²]

(To next page)

Load Factor for Start/Stop Operation

[2] Obtain the number of startup times per hour Z [times/hr].

(a) If the startup takes place n times for every cycle (i.e., n_r [times/cycle]), and the operation and pause times for one cycle are t_a [sec] and t_b [sec] respectively,

$$Z_r = \frac{3600 n_r}{t_a + t_b} \text{ [times/hr]}$$

(b) If inching takes place n_i times for every cycle (t_a+t_b) (i.e., n_i [times/cycle]), it is converted into the number of inching times Z_i per hour.

$$Z_i = \frac{3600 n_r}{t_a + t_b} \text{ [times/hr]}$$

(c) Obtain the number of times per hour Z [times/hr] from (a) and (b) above.

$$Z = Z_r + \frac{1}{2} Z_i = \frac{3600}{t_a + t_b} \cdot \left(n_r + \frac{1}{2} n_i\right) \text{ [times/hr]}$$

[3] Obtain C×Z.

Obtain the product of the C value obtained in Step [1] and the Z value obtained in Step [2], i.e., C×Z.

[4] Duty rate %ED

$$\%\,ED = \frac{t_a}{t_a + t_b} \times 100$$

Table 18 Allowable Work of Motor Brake E_0

Unit : E_0(J/min)

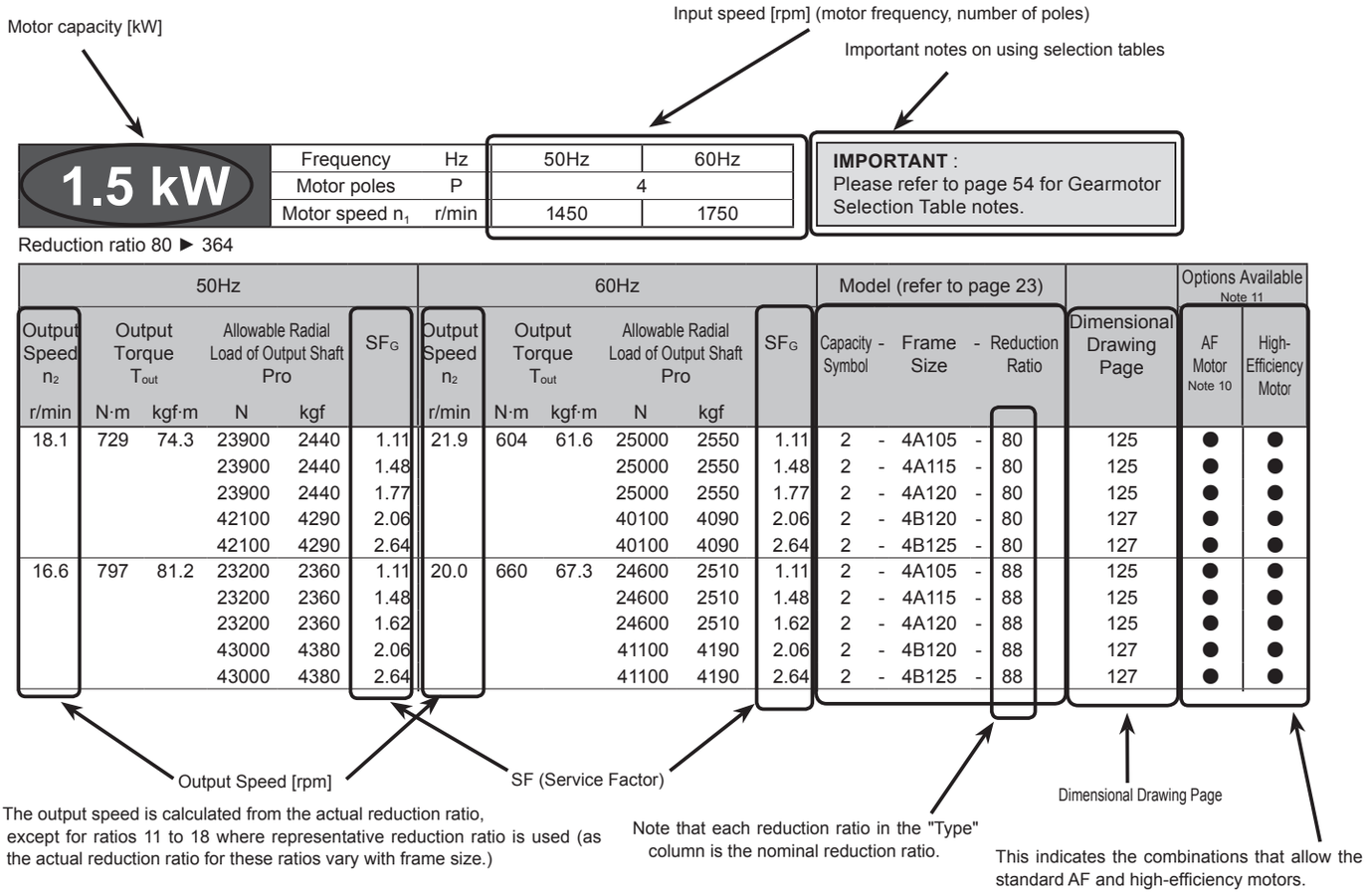
kW(4P)	0.1	0.2 / 0.25	0.4	0.55 / 0.75	1.1 / 1.5	2.2	3.0 / 3.7
Brake Type	FB-01A1	FB-02A1	FB-05A1	FB-1B	FB-2B	FB-3B	FB-5B
Allowable Work E_0	1080	1080	1080	1620	2580	3360	6900

kW(4P)	5.5	7.5	11	15	18.5 / 22 / 30	37 / 45
Brake Type	FB-8B	FB-10B	FB-15B	FB-20	FB-30	ESB-250
Allowable Work E_0	6900	10800	10800	22440	22440	30672

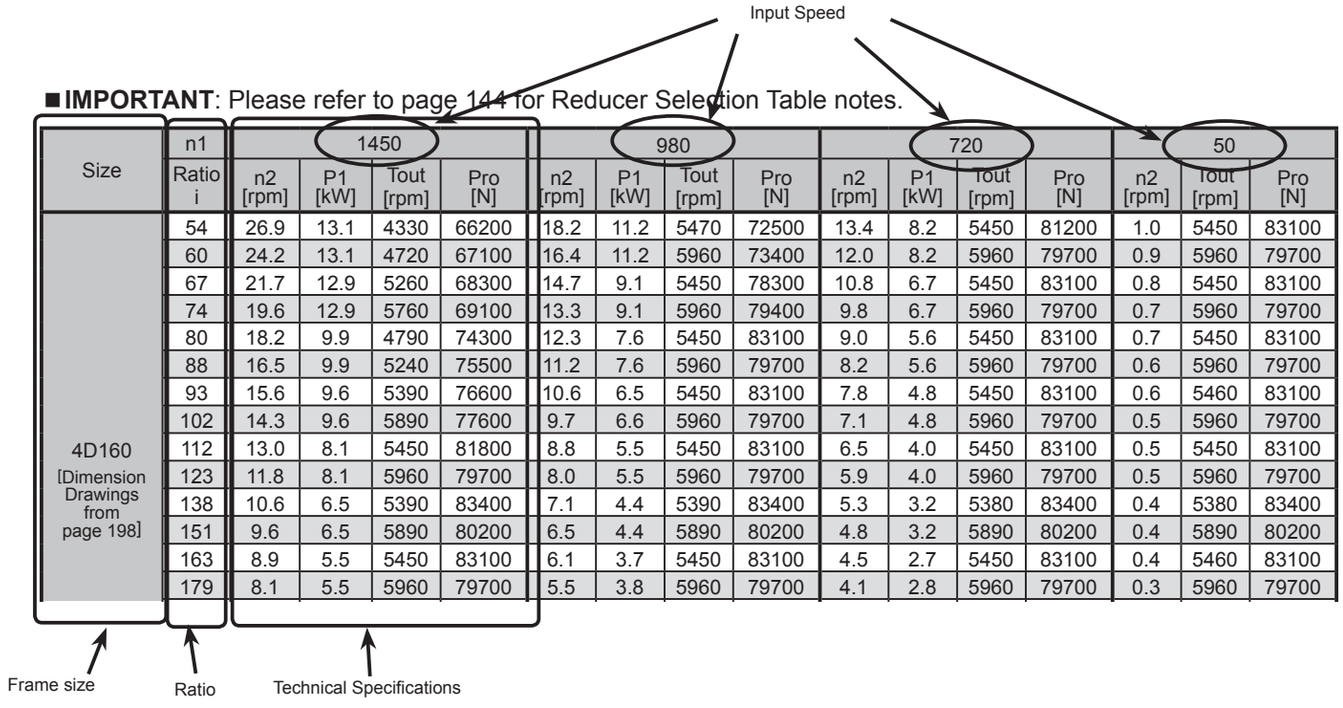
[5] Check the brake torque on pages 253 and 256.

Understanding Selection Tables

Gearmotor: Below illustration describes the main fields of each selection tables on page 54 onwards.



Reducer: Below illustration describes the main fields of each selection tables on page 144 onwards.



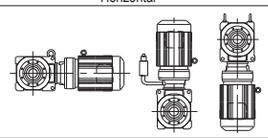
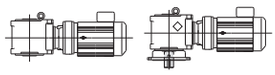
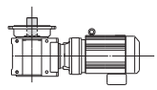
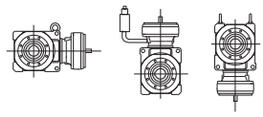
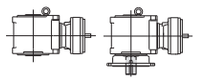
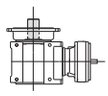
Nomenclature

L	H	Y	M		3	–	4A105		–		–		Y1	–	B	–	46
①	②	③	④	⑤	⑥		⑦	⑧		⑨		⑩	⑪		⑫		⑬

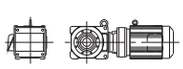
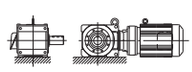
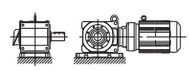
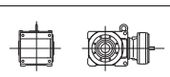
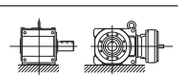
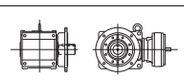
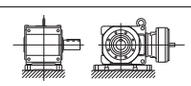
① Product Symbol

Bevel BUDDYBOX® Reducer: L

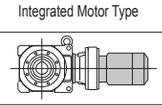
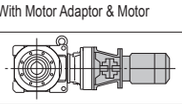
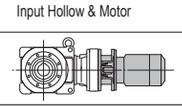
② Output Shaft Direction

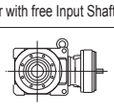
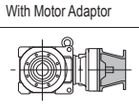
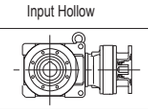
	Output shaft direction: Horizontal (H)	Output shaft direction: Vertical (hollow shaft) or vertically downward (solid) (V)	Output shaft direction: Vertically upward (solid shaft) (W)
Gearmotor			
Reducer			

③ Mounting Style

	Hollow Shaft Type (Y)	Solid Shaft Type, Case Mount (U)	Solid Shaft Type, Flange Mount (F)	Foot Mount (H)
Gearmotor				
Reducer				

④ Motor Input Method

	Integrated Motor Type (M)	With Motor Adaptor & Motor (JM)	Input Hollow & Motor (XM)
Gearmotor			

	Reducer with free Input Shaft (blank)	With Motor Adaptor (J)	Input Hollow (X)
Reducer			

⑤ Special Specifications

Standard Specification	(blank)
Special Specification	S

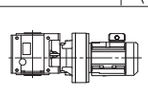
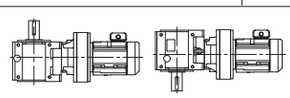
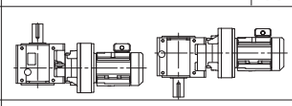
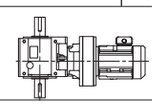
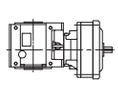
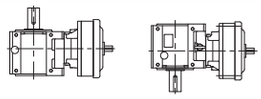
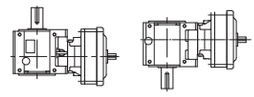
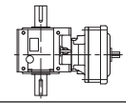
⑥ Motor Capacity Symbol

4-Pole	Capacity Symbol kW (HP)	01 0.1 (1/8)	02 0.2 (1/4)	03 0.25 (1/3)	05 0.4 (1/2)	08 0.55 (3/4)	1 0.75 (1)	1H 1.1 (1.5)
	Capacity Symbol kW (HP)	2 1.5 (2)	3 2.2 (3)	4 3.0 (4)	5 3.7 (5)	8 5.5 (7.5)	10 7.5 (10)	15 11 (15)
	Capacity Symbol kW (HP)	20 15 (20)	25 18.5 (25)	30 22 (30)	40 30 (40)	50 37 (50)	60 45 (60)	75 55 (75)

⑦ Frame Size

☞ Refer to Table 3, page 9

⑧ Output Shaft Projection

	(Hollow Bore) (blank)	Left Side Note (L)	Right Side Note (R)	Both Side (T)
Gearmotor				
Reducer				

⑨ Shaft Specification

Metric Size (Standard)	(blank)
Taper Grip Metric Size	M

⑩ Suffix

Standard Specification	(blank)	Servo Motor	SV
AF Motor	AV	With Torque Limiter	TL
High-Efficiency Motor	ES		

⑪ Mounting Position

☞ Refer to 24~33

⑫ With/Without Brake

Without brake	(blank)
With brake	B

⑬ Reduction Ratio

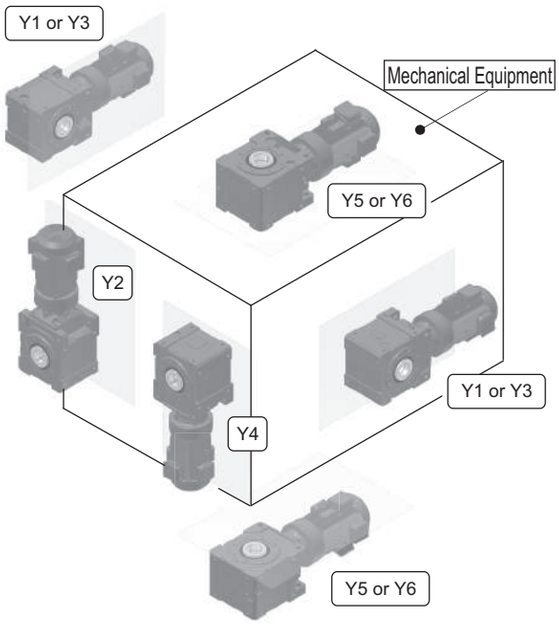
Nominal reduction ration (For the actual reduction ratio, refer to page 9 & 10)

Note: For Bevel BUDDYBOX, the centers of the motor and gear case are not aligned.
The shaft projection from the case surface near the input shaft center line is denoted as L, and that from the case surface away from the center line as R.
For details, refer to pages 25 to 33.

Mounting Positions

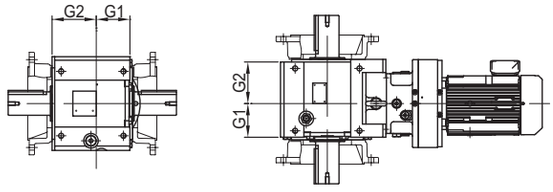
1. Mounting position and nomenclature

- Check the mounting configuration relative to the mechanical equipment.
- The mounting position symbol denotes the mounting surface and mounting style of the reducer. For details, refer to items 2 and 3 on this page and pages 25 to 34.
  (The figure below shows mounting positions of hollow shaft units as typical examples.)



2. Positional Relationship between the Motor Center and Gear Case

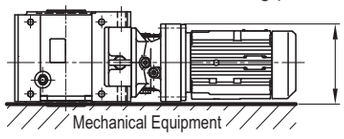
- The centers of the motor and gear case are not aligned.



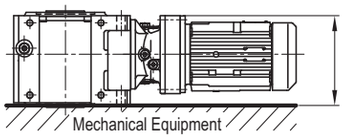
Positional Relationship between the motor center and gear case
(Dimension G2 > G1)

- Thus, the gearmotor can be mounted in two manners, except for some mounting styles. For example, mounting position Y3 against Y1 and mounting position Y6 against Y5 are installed with the gear case rotated 180 degrees relative to the motor; the relative position to the mechanical equipment can be changed.

Example: Differences between mounting positions Y5 and Y6



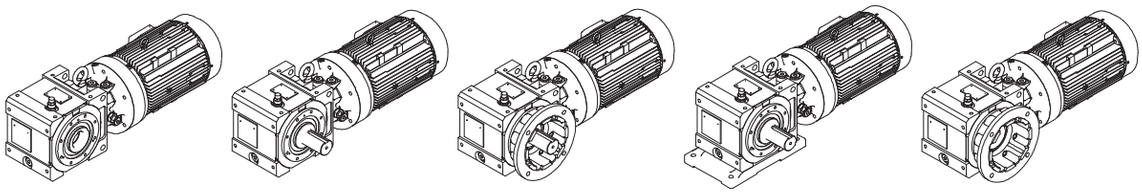
Y5 The center of motor is nearer to the mechanical equipment.



Y6 The center of motor is nearer to the opposite end of the mechanical equipment.

3. Mounting Styles

- Check the mounting style (The figures below show the mounting styles with mounting position symbols ○1. Foot mount, wall mount and ceiling mount are also available (pages 31 to 33).



LHYM-□—Y1	LHUM-□L—Y1	LHFM-□L—F1	LHHM-□L—K1	LHYM-□—F1
Hollow Shaft, Shaft Mount	Solid Shaft, Case Mount	Solid Shaft, Flange Mount	Solid Shaft, Foot Mount	Hollow Shaft, Flange Mount

Example of Nomenclatures

Example 1(Gearmotor):

LHYM2 - 4A105 - Y1 - 88

L	: Model	- Bevel BUDDYBOX®
H	: Output shaft direction	- Horizontal
Y	: Mounting style	- Hollow shaft, shaft mount
M2	: Motor equipped, Power : 2 HP (1.5kW)	
4A105	: Frame size	- 4A105
Y1	: Mounting position	- Y1
88	: Reduction ratio	- 88

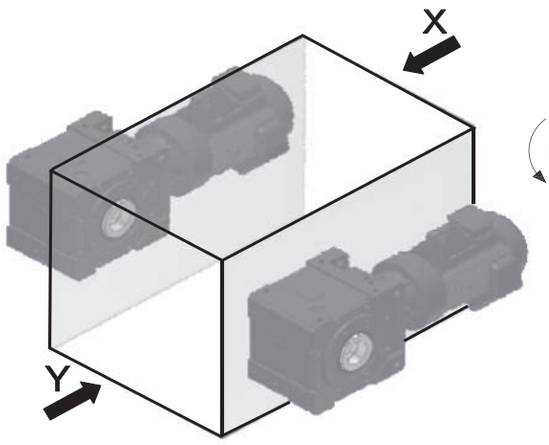
Example 2(Reducer):

LHF - 4C140L - F1 - 67

L	: Model	- Bevel BUDDYBOX®
H	: Output shaft direction	- Horizontal
F	: Mounting style	- Flange mount
4C140	: Frame size	- 4C140
L	: Output shaft projection	- L side (refer to page 23)
F1	: Mounting position	- F1
67	: Reduction ratio	- 67

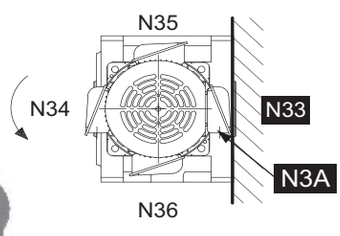
Mounting, Terminal Box Positions and Direction of Rotation

Mounting Positions Y1 F1 G1 K1

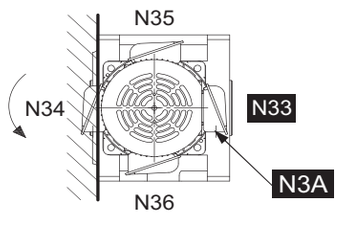


X～

Mounting Positions Y1,G1,K1



Mounting Positions Y1,F1,K1

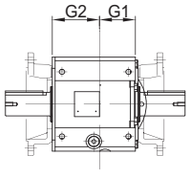


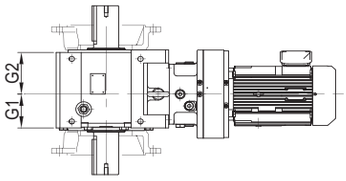
: Rotation direction of motor or input shaft Note 1, 2

: Standard terminal box position and cable port direction

●The standard terminal box position is N33, and the cable port direction is N3A.
The terminal box position and the cable port direction can be changed in 90-degree steps. Refer to page 34.

Y～

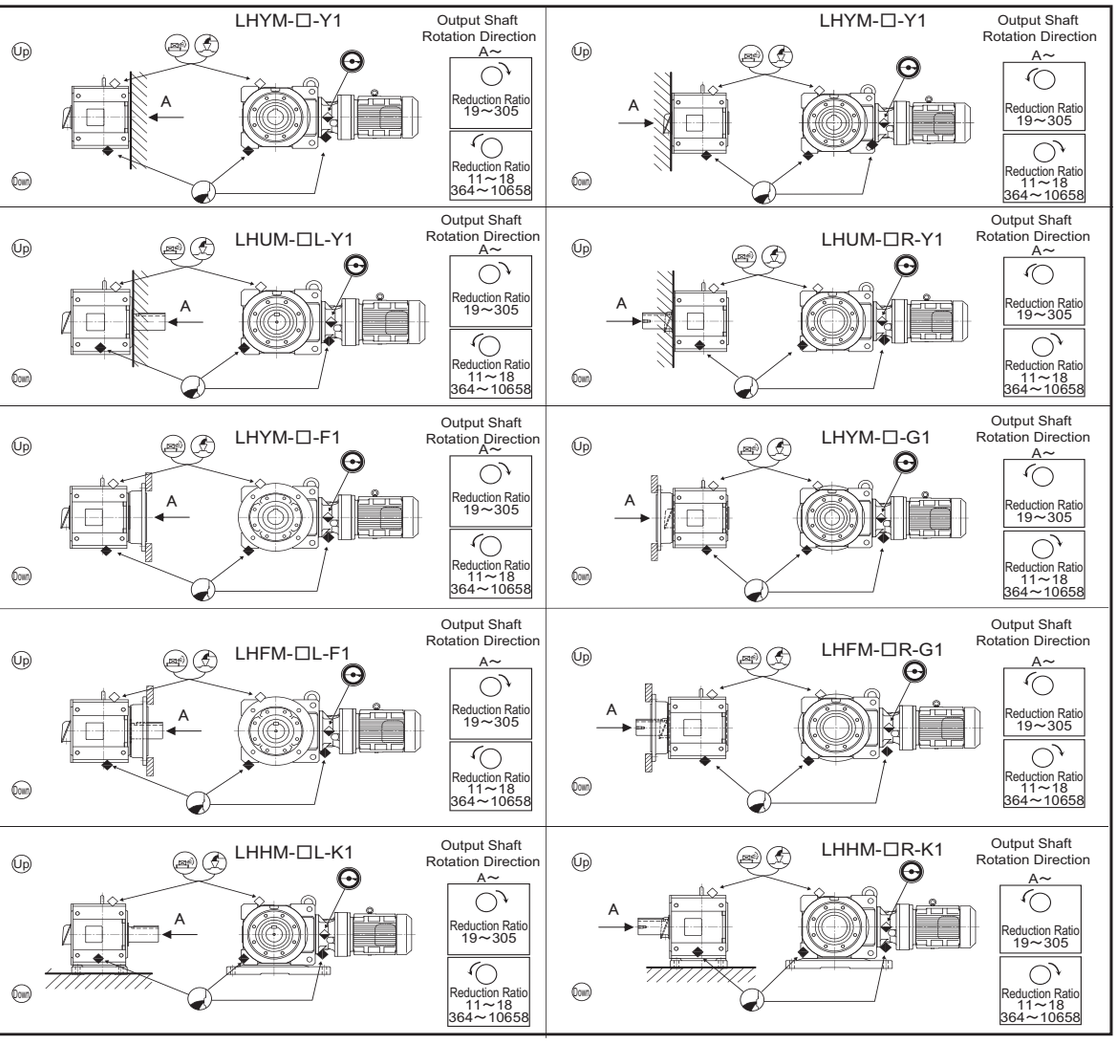




●The centers of the motor and gear case are not aligned (dimension G2 > G1).
●The reducer shape varies with the type. For some types, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension, etc.

[Reference]
In mounting positions Y3, F3, and G3, the gear case is assembled in a position inverted (i.e., rotated by 180 degrees) relative to the motor, thus the relative position to the mechanical equipment is different from Y1, F1, G1. This also changes the positions of the terminal box, oil filler, etc.
(Refer to page 27).

Hollow shaft Shaft Mount	LHYM-□-Y1	LHYM-□-Y1
Solid Shaft Case Mount	LHUM-□L-Y1	LHUM-□R-Y1
Hollow shaft Flange Mount	LHYM-□-F1	LHYM-□-G1
Solid Shaft Flange Mount	LHFM-□L-F1	LHFM-□R-G1
Solid Shaft Foot Mount	LHHM-□L-K1	LHHM-□R-K1

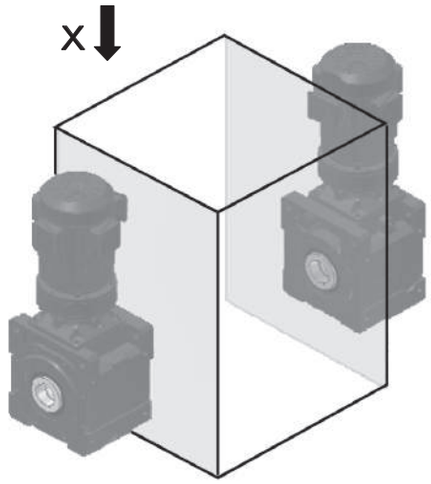


Notes: 1. The motor rotation direction shown here is for Sumitomo motors with the wiring as shown on pages 261 to 266.
2. The rotation direction of the output shaft (viewed from A) is shown assuming that the rotation direction of the motor or input shaft is counter clockwise when viewed from fan end. If the rotation direction of the motor or input shaft is clockwise, the rotation direction of the output shaft is reversed.
3. The oil gauge location is shown in the drawings above. Be sure to designate the location when making the order if the oil gauge needs to be located on opposite side or both sides.

Marks

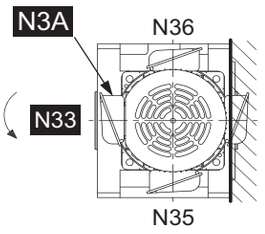
Mounting,Terminal Box Positions and Direction of Rotation

Mounting Positions Y2 F2 G2 V2

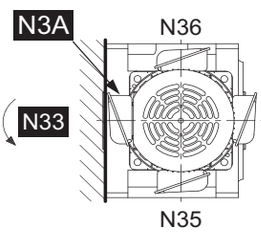


X~

Mounting Positions Y2,F2,V2



Mounting Positions Y2,G2,V2

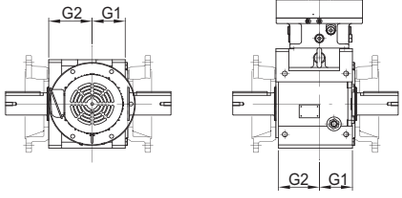


: Rotation direction of motor or input shaft Note 1, 2

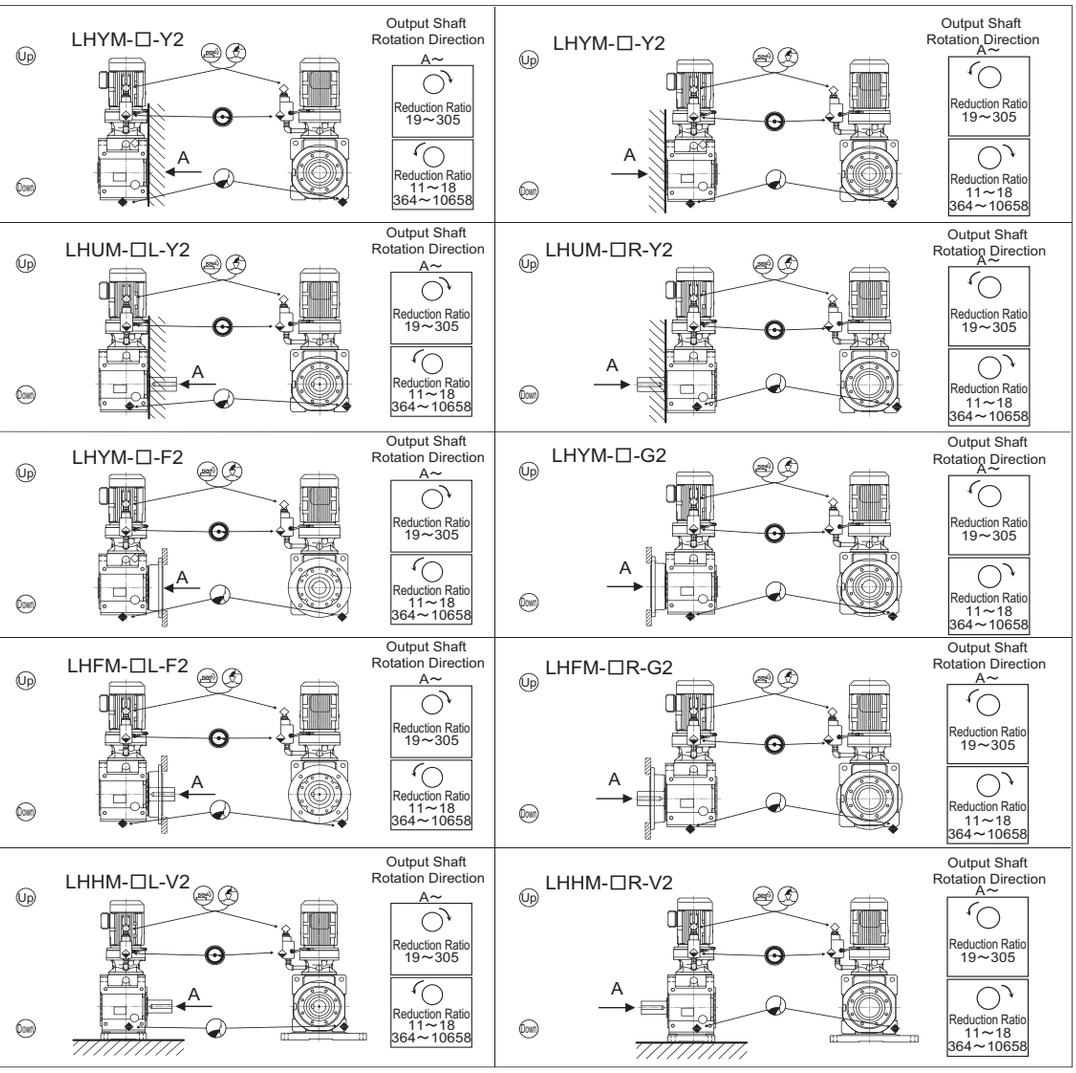
: Standard terminal box position and cable port direction

- The standard terminal box position is N33, and the cable port direction is N3A. The terminal box position and the cable port direction can be changed in 90-degree steps. Refer to page 34.

- The centers of the motor and gear case are not aligned (dimension G2 > G1).
- The reducer shape varies with the type. For some types, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension part, etc.



Hollow shaft Shaft Mount	LHYM-☐-Y2	LHYM-☐-Y2
Solid Shaft Case Mount	LHUM-☐L-Y2	LHUM-☐R-Y2
Hollow shaft Flange Mount	LHYM-☐-F2	LHYM-☐-G2
Solid Shaft Flange Mount	LHFM-☐L-F2	LHFM-☐R-G2
Solid Shaft Foot Mount	LHHM-☐L-V2	LHHM-☐R-V2



Notes: 1. The motor rotation direction shown here is for Sumitomo motors with the wiring as shown on pages 261 to 266.

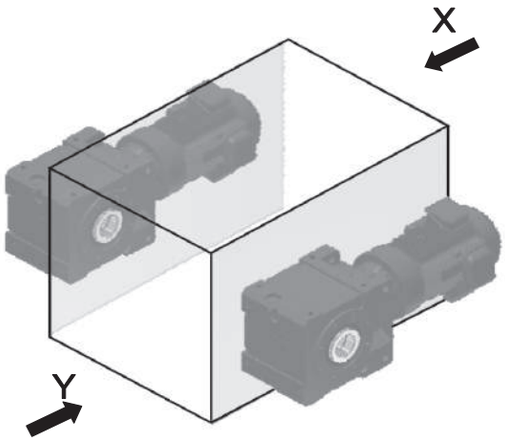
2. The rotation direction of the output shaft (viewed from A) is shown assuming that the rotation direction of the motor or input shaft is counter clockwise when viewed from fan end. If the rotation direction of the motor or input shaft is clockwise, the rotation direction of the output shaft is reversed.

3. The oil gauge location is shown in the drawings above. The oil gauge location can be changed in 90 degrees steps in a horizontal direction. In this case, the oil filler, air vent and piping are also changed, because the oil gauge, oil filler and air vent are put on the same piping. Be sure to designate the location when making the order if the oil gauge location needs to be changed.

Marks

Mounting, Terminal Box Positions and Direction of Rotation

Mounting Positions Y3 G3 F3

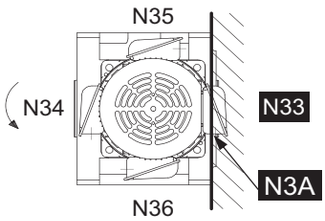


- The centers of the motor and gear case are not aligned (dimension G2 > G1).
- The reducer shape varies with the type. For some types, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension part, etc.

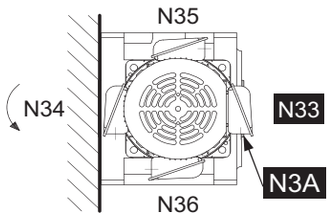
[Reference]
In mounting positions Y1, F1, and G1, the gear case is assembled in a position inverted (i.e., rotated by 180 degrees) relative to the motor, the relative position to the mechanical equipment is different from Y3, F3 and G3. This also changes the positions of the terminal box, oil filler, etc.
(Refer to page 25).

X~

Mounting Positions Y3,F3



Mounting Positions Y3,G3

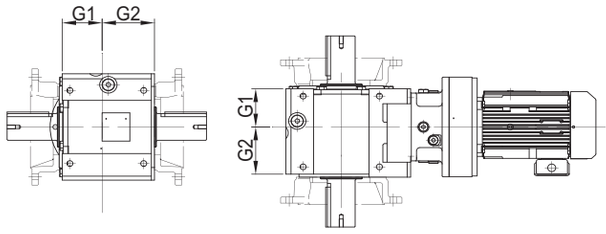


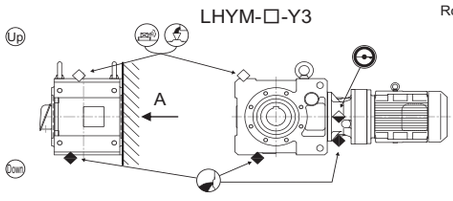
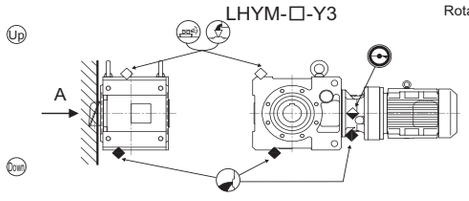
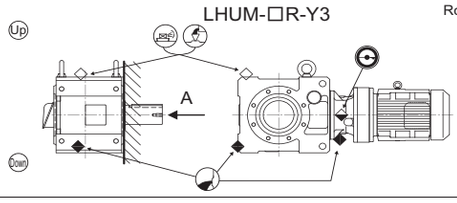
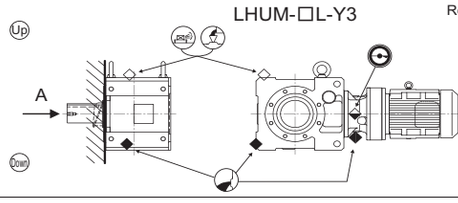
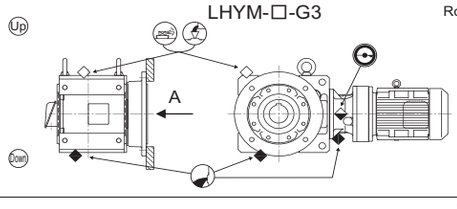
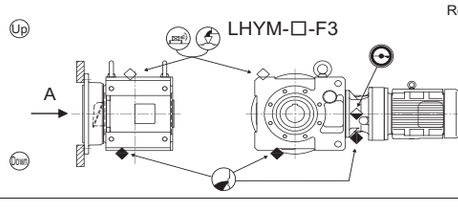
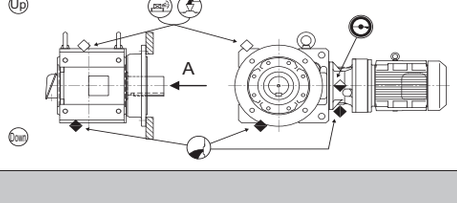
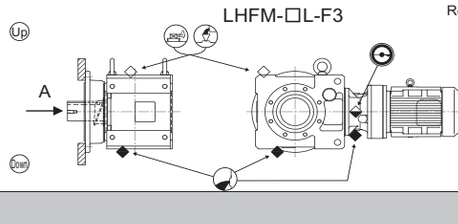
: Rotation direction of motor or input shaft Note 1, 2

: Standard terminal box position and cable port direction

- The standard terminal box position is N33, and the cable port direction is N3A.
  The terminal box position and the cable port direction can be changed in 90-degree steps. Refer to page 34.

Y~



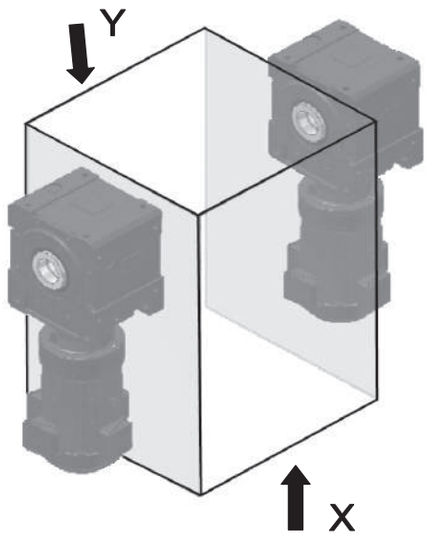
Hollow shaft Shaft Mount	LHYM-□-Y3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658	LHYM-□-Y3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658
Solid Shaft Case Mount	LHUM-□R-Y3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658	LHUM-□L-Y3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658
Hollow shaft Flange Mount	LHYM-□-G3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658	LHYM-□-F3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658
Solid Shaft Flange Mount	LHFM-□R-G3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658	LHFM-□L-F3  Output Shaft Rotation Direction A~ Reduction Ratio 19~305 Reduction Ratio 11~18 364~10658
Solid Shaft Foot Mount		

Notes: 1. The motor rotation direction shown here is for Sumitomo motors with the wiring as shown on pages 261 to 266.
2. The rotation direction of the output shaft (viewed from A) is shown assuming that the rotation direction of the motor or input shaft is counter clockwise when viewed from fan end. If the rotation direction of the motor or input shaft is clockwise, the rotation direction of the output shaft is reversed.
3. The oil gauge location is shown in the drawings above. Be sure to designate the location when making the order if the oil gauge needs to be located on opposite side or both sides.

Marks

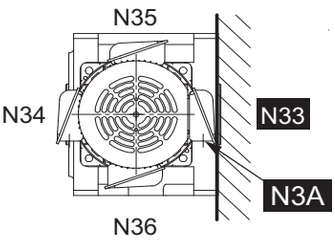
Mounting,Terminal Box Positions and Direction of Rotation

Mounting Positions Y4 G4 F4

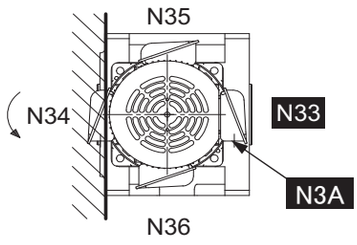


X~

Mounting Positions Y4,G4



Mounting Positions Y4,F4

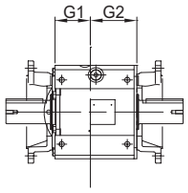


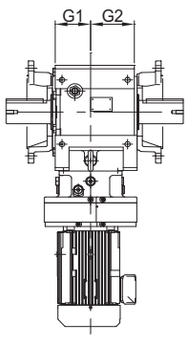
: Rotation direction of motor or input shaft Note 1, 2

: Standard terminal box position and cable port direction

●The standard terminal box position is N33, and the cable port direction is N3A.
The terminal box position and the cable port direction can be changed in 90-degree steps. Refer to page 34.

Y~



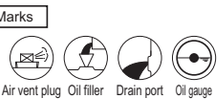


●The centers of the motor and gear case are not aligned (dimension G2 > G1).
●The reducer shape varies with the type. For some types, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension part, etc.

Hollow shaft Shaft Mount	LHYM-☐-Y4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LHYM-☐-Y4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658
Solid Shaft Case Mount	LHUM-☐R-Y4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LHUM-☐L-Y4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658
Hollow shaft Flange Mount	LHYM-☐-G4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LHYM-☐-F4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658
Solid Shaft Flange Mount	LHFM-☐R-G4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LHFM-☐L-F4 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658

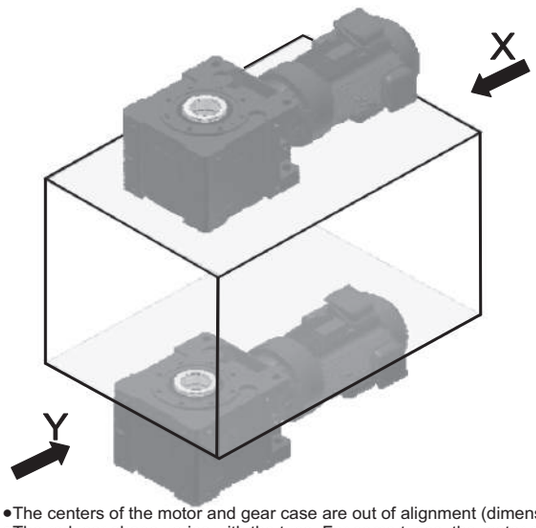
Notes: 1. The motor rotation direction shown here is for with the wiring as shown on pages 261 to 266.
2. The rotation direction of the output shaft (viewed from A) is shown assuming that the rotation direction of the motor or input shaft is counter clockwise when viewed from fan end. If the rotation direction of the motor or input shaft is clockwise, the rotation direction of the output shaft is reversed.
3. The oil gauge location is only as per the drawing above. The opposite side location is not available.

Marks



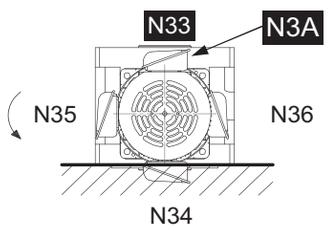
Mounting, Terminal Box Positions and Direction of Rotation

Mounting Positions Y5 F5 G5

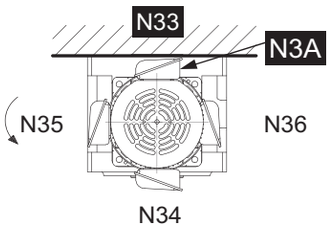


X~

Mounting Positions Y5,F5



Mounting Positions Y5,G5



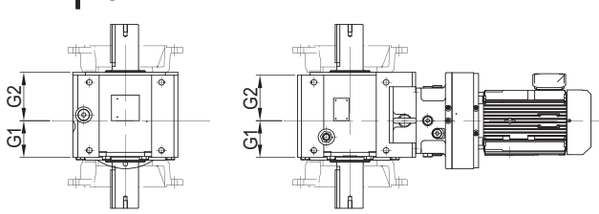
: Rotation direction of motor or input shaft Note 1, 2

: Standard terminal box position and cable port direction

- The standard terminal box position is N33, and the cable port direction is N3A.
  The terminal box position and the cable port direction can be changed in 90-degree steps. Refer to page 34.

- The centers of the motor and gear case are out of alignment (dimension G2 > G1).
- The reducer shape varies with the type. For some types, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension part, or any other component.

Y~



[Reference]
In mounting positions Y6, F6, and G6, the gear case is mounted in a position inverted (i.e., rotated by 180 degrees) relative to the motor, thus the relative position to the mechanical equipment is different from Y5, F5, and G5. This also changes the positions of the terminal box, oil filler, etc.
(Refer to page 30).

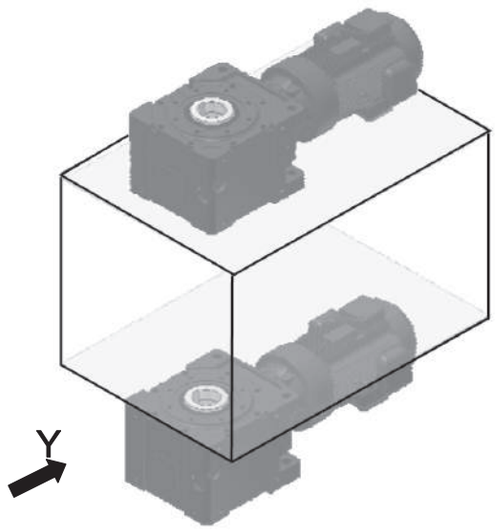
Hollow shaft Shaft Mount	LVYM-□-Y5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LVYM-□-Y5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658
Solid Shaft Case Mount	LVUM-□L-Y5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LWUM-□R-Y5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658
Hollow shaft Flange Mount	LVYM-□-F5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LVYM-□-G5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658
Solid Shaft Flange Mount	LVFM-□L-F5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658	LWFM-□R-G5 Output Shaft Rotation Direction A~ Reduction Ratio 19～305 Reduction Ratio 11～18 364～10658

Notes: 1. The motor rotation direction shown here is for Sumitomo motors with the wiring as shown on pages 261 to 266.
2. The rotation direction of the output shaft (viewed from A) is shown assuming that the rotation direction of the motor or input shaft is counter clockwise when viewed from fan end. If the rotation direction of the motor or input shaft is clockwise, the rotation direction of the output shaft is reversed.
3. The oil gauge location is shown in the drawings above. Be sure to designate the location when making the order if the oil gauge needs to be located on opposite side or both sides.

Marks

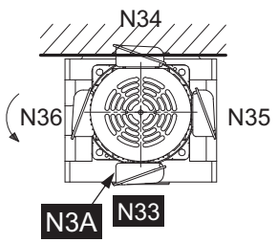
Mounting,Terminal box Positions and Direction of Rotation

Mounting Positions Y6 F6 G6

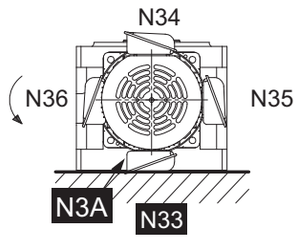


X~

Mounting Positions Y6,F6



Mounting Positions Y6,G6

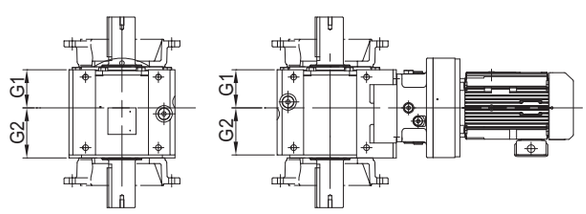


: Rotation direction of motor or input shaft Note 1, 2

: Standard terminal box position and cable port direction

●The standard terminal box position is N33, and the cable port direction is N3A.
The terminal box position and the cable port direction can be changed in 90-degree steps. Refer to page 34.

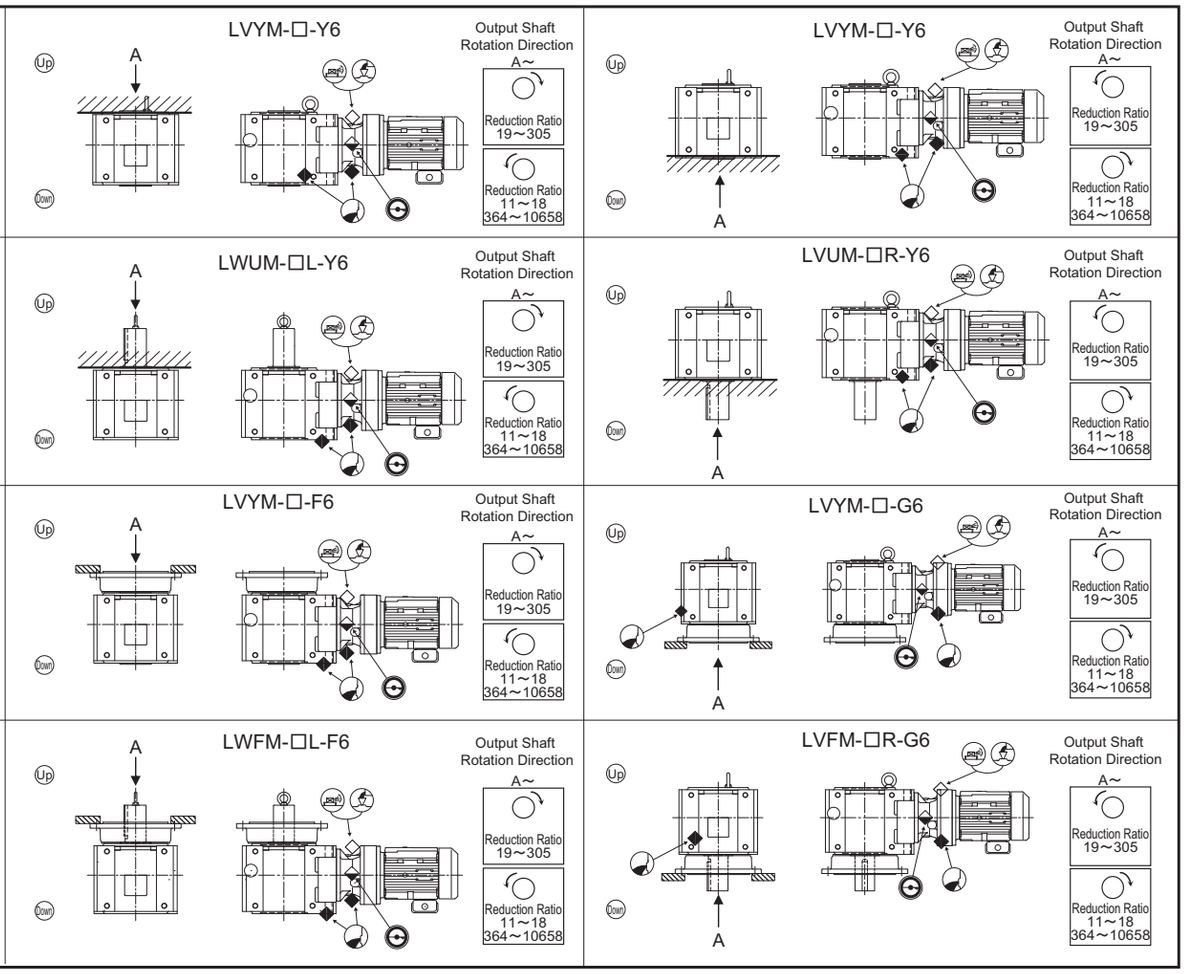
Y~



●The centers of the motor and gear case are out of alignment (dimension G2 > G1).
●The reducer shape varies with the type. For some types, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension, etc.

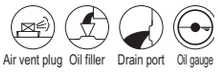
[Reference]
In mounting positions Y5, F5, and G5, the gear case is mounted in a position inverted (i.e., rotated by 180 degrees) relative to the motor, thus the relative position to the mechanical equipment is different from Y6, F6, and G6. This also changes the positions of the terminal box, oil filler, etc.
(Refer to page 29).

Hollow shaft Shaft Mount	LVYM-□-Y6	LVYM-□-Y6
Solid Shaft Case Mount	LWUM-□L-Y6	LVUM-□R-Y6
Hollow shaft Flange Mount	LVYM-□-F6	LVYM-□-G6
Solid Shaft Flange Mount	LWFM-□L-F6	LVFM-□R-G6



Notes: 1. The motor rotation direction shown here is for Sumitomo motors with the wiring as shown on pages 261 to 266.
2. The rotation direction of the output shaft (viewed from A) is shown assuming that the rotation direction of the motor or input shaft is counter clockwise when viewed from fan end. If the rotation direction of the motor or input shaft is clockwise, the rotation direction of the output shaft is reversed.
3. The oil gauge location is shown in the drawings above. Be sure to designate the location when making the order if the oil gauge needs to be located on opposite side or both sides.

Marks



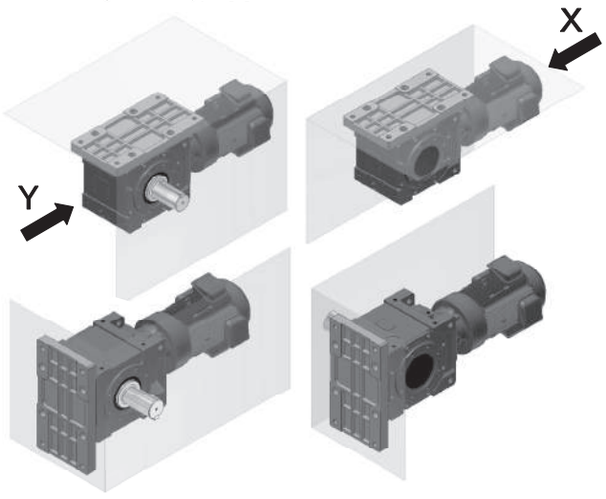
Mounting,Terminal box Positions and Direction of Rotation

Wall and Ceiling Mount Types (W3, V1, K3, V3,K2, W2, K4, W4)

These are wall mount type reducers which are mounted on wall or ceiling in horizontal or upside-down posture.
The positions of the lubrication-related parts are matched with each mount type. Consult us if you desire a reducer conforming to this specification.

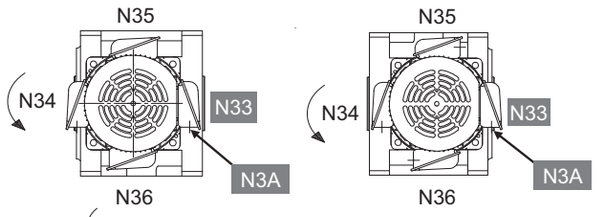
■ Applicable models

Wall/Ceiling Mount Type [1]



X～

Mounting Position W3,V1 Mounting Position K3,V3

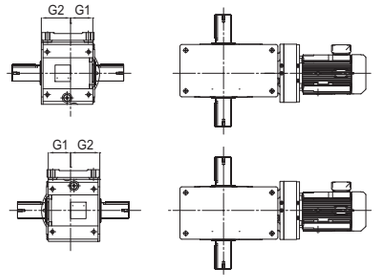


: Rotational direction of motor or input shaft (Notes 1 and 2)

: Standard terminal box position / cable port direction

- The terminal box position of the standard reducer is N33, and the cable port direction is N3A. Their directions can be changed in 90-degree steps. Refer to page 34.

Y～



- The centers of the motor and gear case are not aligned (dimension G2 > G1).
- The reducer shape varies with model. For some models, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension part, or any other component.

[Reference]
For mount positions K3 and V3, the gear case is assembled in the position rotated 180 degrees relative to W3 and V1, thus its relative position differs from that of the mechanical equipment. In addition, the positions of the terminal box, oil filler, etc. also differ from those of the mechanical equipment.

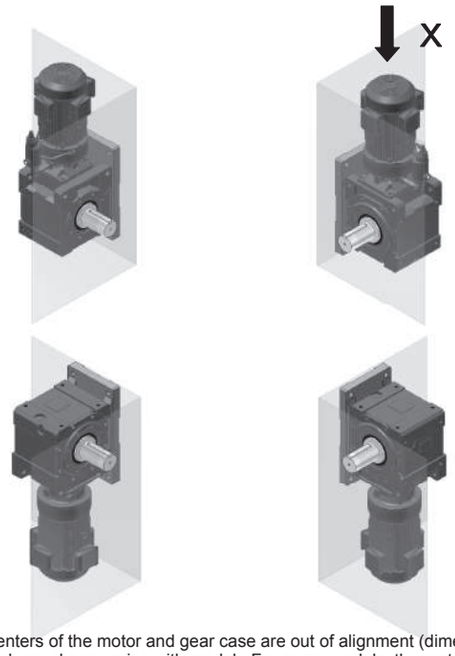
Solid shaft foot mount	LHHM-ML-W3 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658	LHHM-MR-W3 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658
	LHHM-MR-K3 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658	LHHM-ML-K3 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658
	LHHM-ML-V1 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658	LHHM-MR-V1 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658
	LHHM-MR-V3 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658	LHHM-ML-V3 Output Shaft Rotation Direction A～ Reduction ratio 19～305 Reduction ratio 11～18 364～10658

Note: 1. The motor's rotational direction is for those Sumitomo motors that have a wiring shown on pages 261 to 266.
2. Each of the above drawings shows the output shaft's rotational direction (viewed from A) assuming that the motor's or input shaft's rotational direction is counter clockwise when viewed from fan end.
If the motors or input shafts rotational direction is counterclockwise, the output shafts rotational direction is reversed.
3. The oil gauge location is shown in the drawings above. Be sure to designate the location when making the order if the oil gauge needs to be located on opposite side or both sides.

Marks

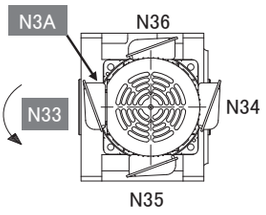
Mounting,Terminal box Positions and Direction of Rotation

Wall Mount Type [2]

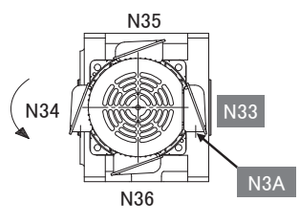


X～

Mounting Position K2,W4



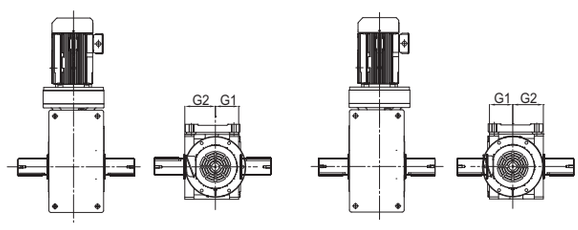
Mounting Position W2,K4



: Rotational direction of motor or input shaft (Notes 1 and 2)

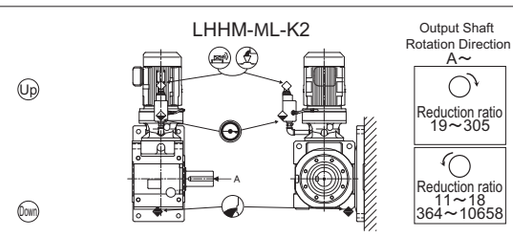
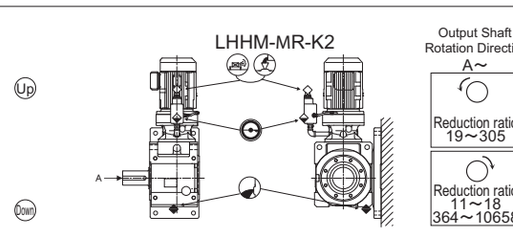
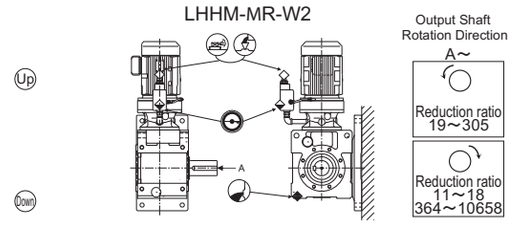
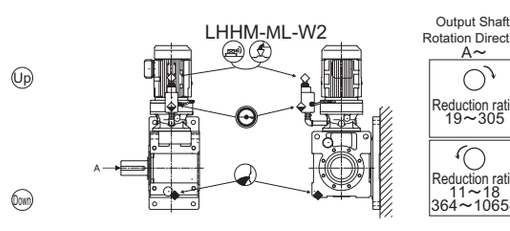
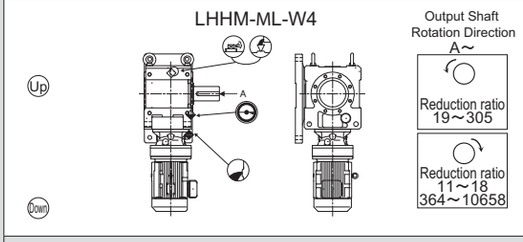
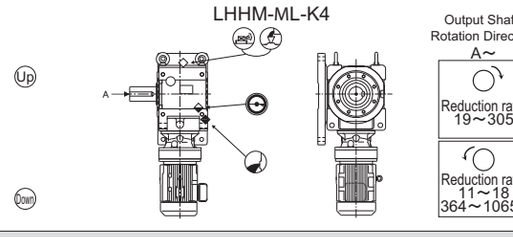
: Standard terminal box position / cable port direction

- The terminal box position of the standard reducer is N33, and the cable port direction is N3A. Their directions can be changed in 90-degree steps. Refer to page 34.



- The centers of the motor and gear case are out of alignment (dimension G2 > G1).
- The reducer shape varies with model. For some models, the motor diameter is larger than the gear case. Be sure to check that there is no interference with mounting surface caused by the terminal box, motor, DC dimension part, or any other component.

[Reference]
For mount positions W2 and K4, the gear case is assembled in the position rotated 180 degrees relative to K2 and W4, thus its relative position differs from that of the mechanical equipment. In addition, the positions of the terminal box, oil filler, etc. also differ from those of the mechanical equipment.

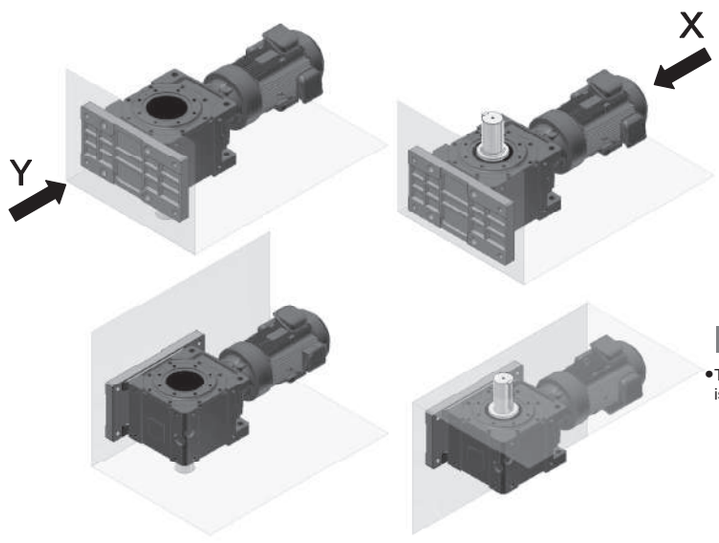
Solid shaft foot mount	LHHM-ML-K2  	LHHM-MR-K2 
	LHHM-MR-W2  	LHHM-ML-W2 
	LHHM-ML-W4  	LHHM-ML-K4 

Note: 1. The motor's rotational direction is for those Sumitomo motors that have a wiring shown on pages 261 to 266.
2. Each of the above drawings shows the output shaft's rotational direction (viewed from A) assuming that the motor's or input shaft's rotational direction is counter clockwise when viewed from fan end.
If the motor's or input shaft's rotational direction is clockwise, the output shaft's rotational direction is reversed.
3. The oil gauge location is shown in the drawings above. The oil gauge location can be changed in 90 degrees steps in a horizontal direction in case of mounting position K2 and W2. In this case, the oil filler, air vent and piping are also changed, because the oil gauge, oil filler and air vent are put on the same piping. Be sure to designate the location when making the order if the oil gauge location needs to be changed. In case of mounting position W4 and K4, the oil gauge location can not be changed.

Marks

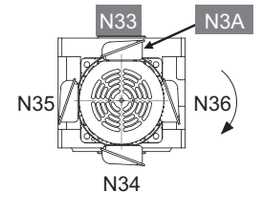
Mounting, Terminal box Positions and Direction of Rotation

Wall Mount Type [3]

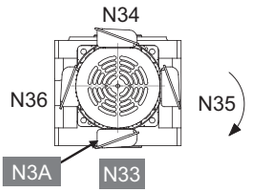


X~

Mounting Position V5,K5



Mounting Position V6,K6

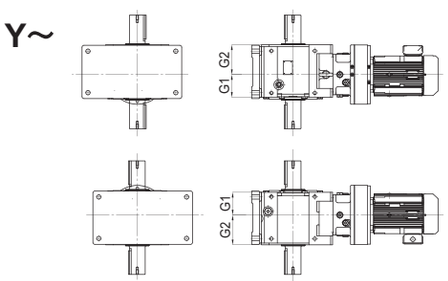


: Rotational direction of motor or input shaft (Notes 1 and 2)

: Standard terminal box position / cable port direction

- The terminal box position of the standard reducer is N33, and the cable port direction is N3A. Their directions can be changed in 90-degree steps. Refer to page 34.

Y~

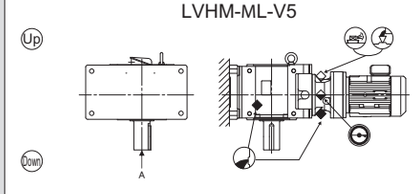


- The centers of the motor and gear case are not aligned (dimension G2 > G1).
- The reducer shape varies with model. For some models, the motor diameter is larger than the gear case. Be sure to check that there is not any interference with mounting surface caused by the terminal box, motor, DC dimension part, or any other component.

[Reference]
For mount positions V6 and K6, the gear case is assembled in the position rotated 180 degrees relative to V5 and K5, thus its relative position differs from that of the mechanical equipment. In addition, the positions of the terminal box, oil filler, etc. also differ from those of the mechanical equipment.

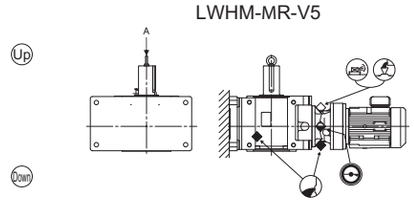
Solid shaft foot mount

LVHM-ML-V5



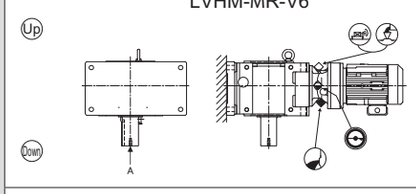
Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

LWHM-MR-V5



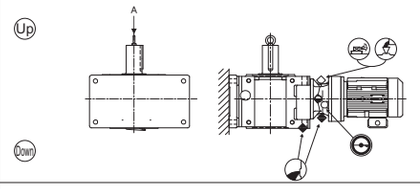
Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

LVHM-MR-V6



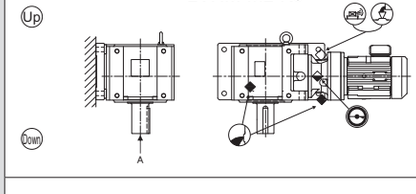
Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

LWHM-ML-V6



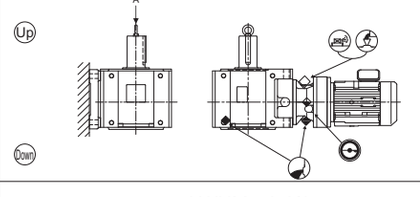
Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

LVHM-ML-K5



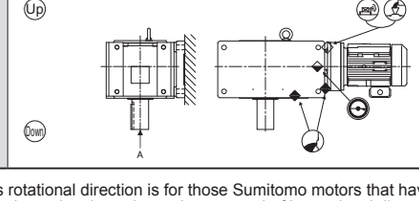
Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

LWHM-MR-K5



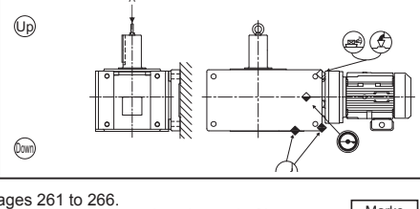
Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

LVHM-MR-K6



Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

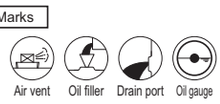
LWHM-ML-K6



Output Shaft Rotation Direction A~
Reduction ratio 19~305
Reduction ratio 11~18 364~10658

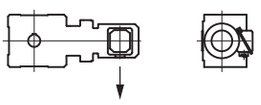
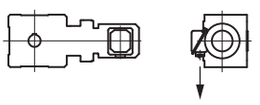
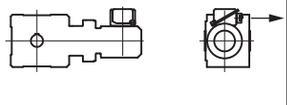
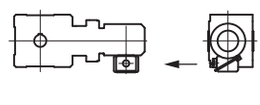
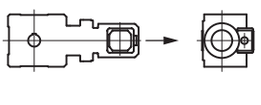
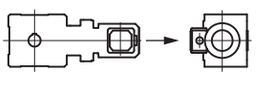
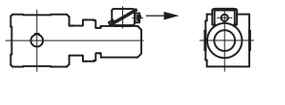
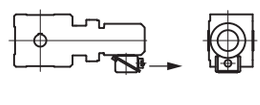
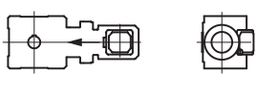
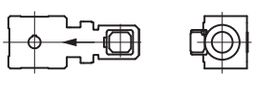
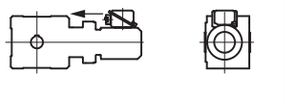
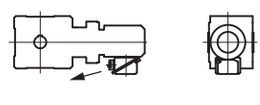
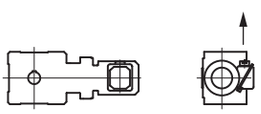
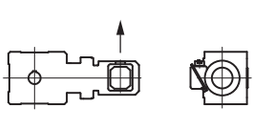
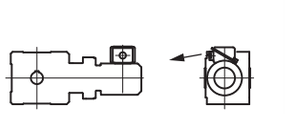
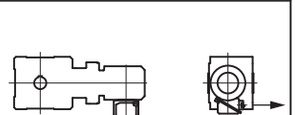
Note: 1. The motor's rotational direction is for those Sumitomo motors that have a wiring shown on pages 261 to 266.
2. Each of the above drawings shows the output shaft's rotational direction (viewed from A) assuming that the motor's or input shaft's rotational direction is counter clockwise.
If the motor's or input shaft's rotational direction is clockwise, the output shaft's rotational direction is reversed.
3. The oil gauge location is shown in the drawings above. Be sure to designate the location when making the order if the oil gauge needs to be located on opposite side or both sides.

Marks



Terminal Box and Cable Port

The terminal box position or cable port direction of the motor can be selected in 90-degree steps relative to the standard position or direction. Designate the position or direction when making the order.
(The terminal box position cannot be changed after shipment. Be sure to designate it when making the order.)

Symbol		Terminal box position (viewed from the output shaft when the motor is horizontally located)			
		N33	N34	N35	N36
Cable Port Direction	N3A				
	N3B				
	N3C				
	N3D				

● ↓ indicates the cable port direction.

Combinations of Terminal Box Positions and Cable Port Directions

Item to Designate \ Mounting Position	○ 1	○ 2	○ 3	○ 4	○ 5	○ 6
Mounting Position	N33	N33	N33	N33	N33	N33
Cable Port Direction	N3A	N3A	N3A	N3A	N3A	N3A
Mounting Position	N34	N34	N34	N34	N34	N34
Cable Port Direction	N3A	N3A	N3A	N3A	N3A	N3A
Mounting Position	N35	N35	N35	N35	N35	N35
Cable Port Direction	N3A	N3A	N3A	N3A	N3D	N3A
Mounting Position	N36	N36	N36	N36	N36	N36
Cable Port Direction	N3A	N3A	N3A	N3A	N3A	N3D

: Standard terminal box position or cable port direction
: Semi-standard terminal box position or cable port direction

Although the semi-standard combinations are defined as above, other combinations of terminal box positions and cable port directions are also available.

Allowable Maximum Output Torque

Frame size \ Reduction Ratio	11	13	14	16	18	21	22	25	28	35	39	46	53	60
4A100	290	353	386	442	483	580			849	776	849	849	849	849
	29.6	36.0	39.3	45.1	49.2	59.1			86.5	79.1	86.5	86.5	86.5	86.5
4A105	290	353	386	442	483	580			938	955	1050	1020	1020	1020
	29.6	36.0	39.3	45.1	49.2	59.1			95.6	97.3	107	104	104	104
4A110						657			1220	1120	1220	1220	1220	1220
						67.0			124	114	124	124	124	124
4A115						657			1290	1290	1290	1290	1290	1290
						67.0			131	131	131	131	131	131
4A120	934	1140	1250	1290	1290	1240	1290	1290	1290	1290	1290	1290	1290	1290
	95.2	116	127	131	131	126	131	131	131	131	131	131	131	131
4A125	934	1140	1250	1290	1290	1240	1290	1290	1290	1290	1290	1290	1290	1290
	95.2	116	127	131	131	126	131	131	131	131	131	131	131	131
4A140	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131	131	131
4A145	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131	131	131
4B120	934	1140	1250	1420	1560	1240	1610	1760	1780	1630	1780	1780	1780	1770
	95.2	116	127	145	159	126	164	179	181	166	181	181	181	180
4B125	934	1140	1250	1420	1560	1240	1610	1760	1950	1930	2110	2140	2140	2140
	95.2	116	127	145	159	126	164	179	199	197	215	218	218	218
4B140	1460	1780	1950	2230	2440	2440	2570	2570	2570	2570	2570	2570	2570	2570
	149	181	199	227	249	249	262	262	262	262	262	262	262	262
4B145	1460	1780	1950	2230	2440	2440	2570	2570	2570	2570	2570	2570	2570	2570
	149	181	199	227	249	249	262	262	262	262	262	262	262	262
4B160	1850	2250	2470	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570
	189	229	252	262	262	262	262	262	262	262	262	262	262	262
4B165	1850	2250	2470	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570
	189	229	252	262	262	262	262	262	262	262	262	262	262	262
4C140	1460	1780	1950	2230	2440	2440	3120	3140	3900	3800	4160	4160	4160	4160
	149	181	199	227	249	249	318	348	398	387	424	424	424	424
4C145	1460	1780	1950	2230	2440	2440	3120	3410	3900	4010	4390	4650	4610	4650
	149	181	199	227	249	249	318	348	398	409	448	474	470	474
4C160	3260	3980	4350	4970	5140	4500	4900	5140	5140	5140	5140	5140	5140	5140
	332	406	443	507	524	459	499	524	524	524	524	524	524	524
4C165	3260	3980	4350	4970	5140	4500	4900	5140	5140	5140	5140	5140	5140	5140
	332	406	443	507	524	459	499	524	524	524	524	524	524	524
4C170	3980	4850	4900	5140	4960	4590	4900	5140	5140	5140	5140	5140	5140	5140
	406	494	499	524	506	468	499	524	524	524	524	524	524	524
4C175	3980	4850	4900	5140	4960	4590	4900	5140	5140	5140	5140	5140	5140	5140
	406	494	499	524	506	468	499	524	524	524	524	524	524	524
4D160	3260	3980	4350	4970	5440	4500	5450	5960	5960	5450	5960	5960	5960	5960
	332	406	443	507	555	459	556	608	608	556	608	608	608	608
4D165	3260	3980	4350	4970	5440	4500	5610	6140	6340	6520	7130	7130	7130	7130
	332	406	443	507	555	459	572	626	646	665	727	727	727	727
4D170	3980	4850	5300	6060	6630	6310	7860	8590	8590	7860	8590	8580	8590	8590
	406	494	540	618	676	643	801	876	876	801	876	875	876	876
4D175	3980	4850	4900	5140	4960	4590	4900	5140	5140	5140	5140	5140	5140	5140
	406	494	499	524	506	468	499	524	524	524	524	524	524	524
4D180	5270	6420	7030	8030	8780	7950	7530	8240	8380	8720	8720	8720	8720	8720
	537	654	717	819	895	810	768	840	854	889	889	889	889	889
4D185	5270	6420	7030	8030	8780	8060	7650	8370	8480	8720	8720	8720	8720	8720
	537	654	717	819	895	822	780	853	864	889	889	889	889	889
4E170	3980	4850	5300	6060	6630	6310	7860	8590	8590	7860	8590	8580	8590	8590
	406	494	540	618	676	643	801	876	876	801	876	875	876	876
4E175	3980	4850	5300	6060	6630	6310	8470	9260	8840	9780	9830	9830	9830	9830
	406	494	540	618	676	643	863	944	901	997	1000	1000	1000	1000
4E180	5270	6420	7030	8030	8780	7950	7530	8240	8380	9830	9830	9830	9830	9830
	537	654	717	819	895	810	768	840	854	1000	1000	1000	1000	1000
4E185	5270	6420	7030	8030	8780	8060	7650	8370	8480	9830	9830	9830	9830	9830
	537	654	717	819	895	822	780	853	864	1000	1000	1000	1000	1000
4E190	9830	9830	9830	12300	12200	9830	9350	9830	9830	9830	9830	9830	9830	9830
	1000	1000	1000	1250	1240	1000	953	1000	1000	1000	1000	1000	1000	1000
4E195	9830	9830	9830	12300	12200	9830	9550	9830	9830	9830	9830	9830	9830	9830
	1000	1000	1000	1250	1240	1000	973	1000	1000	1000	1000	1000	1000	1000
4F180	5270	6420	7030	8030	8780	7950	7530	8240	8380	12600	13800	13800	13800	13800
	537	654	717	819	895	810	768	840	854	1280	1410	1410	1410	1410
4F185	5270	6420	7030	8030	8780	8060	7650	8370	8480	14900	16300	16700	16700	17000
	537	654	717	819	895	822	780	853	864	1520	1660	1700	1700	1730
4F190	11000	12500	14300	15600	17000	9950	9350	10200	10400	18000	17400	17400	17400	17400
	1120	1270	1460	1590	1730	1010	953	1040	1060	1830	1770	1770	1770	1770
4F195	11000	12500	14300	15600	17000	10100	9550	10400	10600	18000	17400	17400	17400	17400
	1120	1270	1460	1590	1730	1030	973	1060	1080	1830	1770	1770	1770	1770

Notes: 1. This table lists the mechanical rated torque of Bevel BUDDYBOX, i.e., the allowable values of the peak torque that is applied to the output shaft, for example during startup, stop etc. For torque values during normal operation, please refer to the selection tables.

2. Consult us for the values for reduction ratio not shown in the above table and for ratio more than 305.

Allowable Maximum Output Torque

Unit:Upper row: N · m
Lower row: kgf · m

Frame size \ Reduction Ratio	67	74	80	88	102	112	123	151	179	207	249	305
4A100	776	849	776	849	849	776	849	849	849	849	849	849
	79.1	86.5	79.1	86.5	86.5	79.1	86.5	86.5	86.5	86.5	86.5	86.5
4A105	932	1020	932	1020	1020	932	1020	1020	1010	1010	897	1020
	95	104	95	104	104	95	104	104	103	103	91.4	104
4A110	1120	1220	1120	1220	1220	1120	1220	1220	1220	1220	1220	1220
	114	124	114	124	124	114	124	124	124	124	124	124
4A115	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131
4A120	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131
4A125	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131
4A140	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131
4A145	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290	1290
	131	131	131	131	131	131	131	131	131	131	131	131
4B120	1620	1770	1630	1780	1770	1630	1780	1780	1780	1780	1780	1780
	165	180	166	181	180	166	181	181	181	181	181	181
4B125	1960	2140	1960	2140	2140	1960	2140	2140	2140	2140	2010	2140
	200	218	200	218	218	200	218	218	218	218	205	218
4B140	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570
	262	262	262	262	262	262	262	262	262	262	262	262
4B145	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570
	262	262	262	262	262	262	262	262	262	262	262	262
4B160	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570
	262	262	262	262	262	262	262	262	262	262	262	262
4B165	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570	2570
	262	262	262	262	262	262	262	262	262	262	262	262
4C140	3800	4160	3800	4160	4160	3800	4160	4160	4160	4160	4160	4160
	387	424	387	424	424	387	424	424	424	424	424	424
4C145	4160	4550	4250	4650	4650	4250	4650	4650	4650	4650	4500	4240
	424	464	433	474	474	433	474	474	474	474	459	432
4C160	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140
	524	524	524	524	524	524	524	524	524	524	524	524
4C165	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140
	524	524	524	524	524	524	524	524	524	524	524	524
4C170	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140
	524	524	524	524	524	524	524	524	524	524	524	524
4C175	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140
	524	524	524	524	524	524	524	524	524	524	524	524
4D160	5450	5960	5450	5960	5960	5450	5960	5890	5960	5960	5960	5960
	556	608	556	608	608	556	608	600	608	608	608	608
4D165	6520	7130	6520	7130	7130	6520	7130	7130	7130	7130	7130	6970
	665	727	665	727	727	665	727	727	727	727	727	710
4D170	7860	8590	7860	8590	8590	7860	8590	8590	8590	8590	8590	8590
	801	876	801	876	876	801	876	876	876	876	876	876
4D175	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140	5140
	524	524	524	524	524	524	524	524	524	524	524	524
4D180	8720	8720	8720	8720	8720	8720	8720	8720	8720	8720	8720	8720
	889	889	889	889	889	889	889	889	889	889	889	889
4D185	8720	8720	8720	8720	8720	8720	8720	8720	8720	8720	8720	8720
	889	889	889	889	889	889	889	889	889	889	889	889
4E170	7860	8590	7860	8590	8590	7860	8590	8590	8590	8590	8590	8590
	801	876	801	876	876	801	876	876	876	876	876	876
4E175	9780	9830	9780	9830	9830	9780	10700	10700	10700	10700	10700	10700
	997	1000	997	1000	1000	997	1090	1090	1090	1090	1090	1090
4E180	9830	9830	9830	9830	9830	11600	11600	11600	11600	11600	11600	11600
	1000	1000	1000	1000	1000	1180	1180	1180	1180	1180	1180	1180
4E185	9830	9830	9830	9830	9830	11600	11600	11600	11600	11600	11600	11600
	1000	1000	1000	1000	1000	1180	1180	1180	1180	1180	1180	1180
4E190	9830	9830	9830	9830	9830	11600	11600	11600	11600	11600	11600	11600
	1000	1000	1000	1000	1000	1180	1180	1180	1180	1180	1180	1180
4E195	9830	9830	9830	9830	9830	11600	11600	11600	11600	11600	11600	11600
	1000	1000	1000	1000	1000	1180	1180	1180	1180	1180	1180	1180
4F180	12500	13700	12600	13800	13800	12600	13800	13800	13800	13700	13700	13800
	1270	1400	1280	1410	1410	1280	1410	1410	1410	1400	1400	1410
4F185	15500	17000	15500	16900	17000	15500	17000	17000	17000	17000	15300	17000
	1580	1730	1580	1720	1730	1580	1730	1730	1730	1730	1560	1730
4F190	18000	17400	18000	17400	17400	18000	17400	17400	17400	17400	17400	17400
	1830	1770	1830	1770	1770	1830	1770	1770	1770	1770	1770	1770
4F195	18000	17400	18000	17400	17400	18000	17400	17400	17400	17400	17400	17400
	1830	1770	1830	1770	1770	1830	1770	1770	1770	1770	1770	1770

Notes: 1. This table lists the mechanical rated torque of Bevel BUDDYBOX, i.e., the allowable values of the peak torque that is applied to the output shaft, for example during startup, stop etc. For torque values during normal operation, please refer to the selection tables.
2. Consult us for the values for reduction ratio not shown in the above table and for ratio more than 305.

Allowable Radial and Axial Load

Neither the radial nor axial load must exceed the allowable range when a gear or pulley is coupled with Bevel BUDDYBOX® reducer.

1. Output Shaft Radial and Axial Load

Check the radial and axial load on the output shaft using formulas 1 to 3 below:

1 Radial load Pr

$$Pr = \frac{T\ell}{R} \leqq \frac{Pro}{Cf \cdot Fs} \quad [N, kgf]$$

2 Axial load Pa

$$Pa \leqq \frac{Pao}{Cf \cdot Fs} \quad [N, kgf]$$

3 When radial and axial load co-exist:

$$\left(\frac{Pr}{Pro} + \frac{Pa}{Pao} \right) \cdot Cf \cdot Fs \leqq 1$$

Pr : Actual radial load [N, kgf]
Tℓ : Actual transmitted torque [N·m, kgf·m] on the output shaft of the reducer
R : Pitch circle radius [m] of sprocket, gear, pulley, etc.
Pro : Allowable radial load [N, kgf] (refer to Selection Table or Tables 20 and 21)
Pa : Actual axial load [N, kgf]
Pao: Allowable axial load [N, kgf] (Table 22)
Cf : Coupling factor (Table 18)
Fs : Shock factor (Table 19)

- When the radial load exceeds the allowable value, reselect with a larger frame size.
- Consult us when using for application with extremely high startup frequency.

Table 18 Coupling Factor Cf

Coupling Method	Cf
Chain	1
Gears	1.25
V-Belt	1.5

Table 19 Shock Factor Fs

Degree of Shock	Fs
Practically no shock	1
Light shock	1~1.2
Severe shock	1.4~1.6

Calculate the detailed intermediate values listed in Tables 20 to 21 by using the interpolation method.

[Example of Calculating the Intermediate Values by Interpolation]

Allowable radial load

For the conditions of hollow shaft type, frame size 4A100, output speed 30r/min, L=28mm, the allowable radial load in the output shaft radial load position is calculated as follows:

$$25000 - \frac{25000-24300}{30-25} \times (28-25) = 24580 \text{ [N]}$$

Allowable axial load

For the conditions of frame size 4B125 and output speed 36r/min, the allowable axial load on the output shaft is calculated as follows:

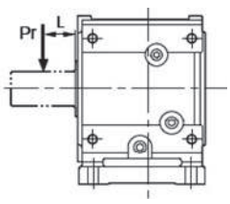
$$18900 - \frac{18900-16500}{45-35} \times (36-35) = 18660 \text{ [N]}$$

Allowable Radial and Axial Load

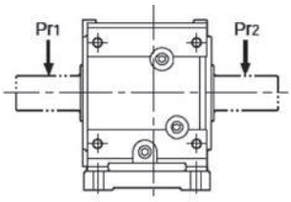
2. Allowable Radial Load - Hollow Shaft

[Conditions]

- No axial load is acting.
- The flange is mounted in the same direction as the shaft direction. Consult us if it is mounted in the reverse direction.
- For foot mount, the foot mount plate is mounted to the ground or ceiling. Consult us if wall mount is used.
- The strength class of mounting bolts is 12.9.



"L" indicates the distance from the hollow shaft end to the point of radial load.



If the output shaft is a both-end shaft:
If Pr1 and Pr2 are in the same direction, select a model so that
Pro ≥ Pr1 and
Pro ≥ Pr2.
Consult us if the Pr1 and Pr2 are in different directions.

Table 20-A: Hollow Shaft Type, Allowable Radial Load Pro (Sizes A and B) [Units] Upper line: N; lower line: kgf

Frame Size	L mm	Output Shaft Speed r/min									
		5	10	20	30	35	45	50	60	75	90
4A10 □ 4A11 □ 4A12 □ 4A14 □	20	33,500	33,500	30,100	25,800	24,300	22,000	21,100	19,500	17,800	16,500
		3,400	3,400	3,100	2,600	2,500	2,200	2,200	2,000	1,800	1,700
	25	32,800	32,800	29,200	25,000	23,600	21,300	20,400	19,000	17,300	16,000
		3,300	3,300	3,000	2,500	2,400	2,200	2,100	1,900	1,800	1,600
	30	32,000	32,000	28,300	24,300	22,900	20,700	19,800	18,400	16,800	15,500
		3,300	3,300	2,900	2,500	2,300	2,100	2,000	1,900	1,700	1,600
	35	31,400	31,400	27,500	23,600	22,200	20,100	19,300	17,900	16,300	15,100
		3,200	3,200	2,800	2,400	2,300	2,000	2,000	1,800	1,700	1,500
	40	30,700	30,700	26,800	23,000	21,600	19,600	18,800	17,400	15,900	14,700
		3,100	3,100	2,700	2,300	2,200	2,000	1,900	1,800	1,600	1,500
	45	30,100	30,100	26,100	22,400	21,100	19,100	18,300	17,000	15,500	14,300
		3,100	3,100	2,700	2,300	2,200	1,900	1,900	1,700	1,600	1,500
	50	29,500	29,500	25,400	21,800	20,500	18,600	17,800	16,500	15,100	13,900
		3,000	3,000	2,600	2,200	2,100	1,900	1,800	1,700	1,500	1,400
	60	28,300	28,300	24,200	20,700	19,500	17,700	16,900	15,700	14,300	13,200
		2,900	2,900	2,500	2,100	2,000	1,800	1,700	1,600	1,500	1,300
	70	27,300	27,300	23,100	19,800	18,600	16,900	16,200	15,000	13,700	12,600
		2,800	2,800	2,400	2,000	1,900	1,700	1,700	1,500	1,400	1,300
	80	26,300	26,300	22,000	18,900	17,800	16,100	15,400	14,300	13,000	12,100
		2,700	2,700	2,200	1,900	1,800	1,600	1,600	1,500	1,300	1,200
	90	25,200	25,200	21,100	18,100	17,000	15,400	14,800	13,700	12,500	11,600
		2,600	2,600	2,200	1,800	1,700	1,600	1,500	1,400	1,300	1,200
4B12 □ 4B14 □ 4B16 □	20	55,100	52,100	40,100	34,100	32,000	28,800	27,600	25,500	23,000	21,200
		5,600	5,300	4,100	3,500	3,300	2,900	2,800	2,600	2,300	2,200
	25	54,100	50,800	39,100	33,300	31,200	28,100	26,900	24,800	22,500	20,700
		5,500	5,200	4,000	3,400	3,200	2,900	2,700	2,500	2,300	2,100
	30	52,200	49,600	38,200	32,500	30,500	27,500	26,300	24,300	22,000	20,200
		5,300	5,100	3,900	3,300	3,100	2,800	2,700	2,500	2,200	2,100
	35	49,900	48,500	37,300	31,700	29,800	26,800	25,700	23,700	21,400	19,700
		5,100	4,900	3,800	3,200	3,000	2,700	2,600	2,400	2,200	2,000
	40	47,700	47,400	36,500	31,000	29,100	26,200	25,100	23,200	21,000	19,300
		4,900	4,800	3,700	3,200	3,000	2,700	2,600	2,400	2,100	2,000
	45	45,800	45,800	35,700	30,400	28,500	25,700	24,500	22,700	20,500	18,800
		4,700	4,700	3,600	3,100	2,900	2,600	2,500	2,300	2,100	1,900
	50	44,000	44,000	34,900	29,700	27,900	25,100	24,000	22,200	20,100	18,400
		4,500	4,500	3,600	3,000	2,800	2,600	2,400	2,300	2,000	1,900
	60	40,700	40,700	33,400	28,500	26,700	24,100	23,000	21,300	19,200	17,700
		4,100	4,100	3,400	2,900	2,700	2,500	2,300	2,200	2,000	1,800
	70	38,000	38,000	32,100	27,300	25,700	23,100	22,100	20,400	18,500	17,000
		3,900	3,900	3,300	2,800	2,600	2,400	2,300	2,100	1,900	1,700
	80	35,500	35,500	30,900	26,300	24,700	22,200	21,300	19,600	17,800	16,300
		3,600	3,600	3,100	2,700	2,500	2,300	2,200	2,000	1,800	1,700
	90	33,400	33,400	29,800	25,300	23,800	21,400	20,500	18,900	17,100	15,700
		3,400	3,400	3,000	2,600	2,400	2,200	2,100	1,900	1,700	1,600
	100	31,500	31,500	28,700	24,400	23,000	20,700	19,800	18,200	16,500	15,200
		3,200	3,200	2,900	2,500	2,300	2,100	2,000	1,900	1,700	1,500
	120	28,300	28,300	26,800	22,800	21,400	19,300	18,400	17,000	15,400	14,200
		2,900	2,900	2,700	2,300	2,200	2,000	1,900	1,700	1,600	1,400

* The □ mark of each frame size represents 0, 5, DA, DB, or DC.

Allowable Radial and Axial Load

Table 20-B: Hollow Shaft Type, Allowable Radial Load Pro (Sizes C and D) [Units] Upper line: N; lower line: kgf

Frame Size	L mm	Output Shaft Speed r/min									
		5	10	20	30	35	45	50	60	75	90
4C14 □ 4C16 □ 4C17 □	20	78,300	70,000	52,700	44,200	41,200	36,600	34,800	31,800	28,300	25,600
		8,000	7,100	5,400	4,500	4,200	3,700	3,500	3,200	2,900	2,600
	25	76,900	68,400	51,600	43,200	40,300	35,800	34,000	31,100	27,700	25,100
		7,800	7,000	5,300	4,400	4,100	3,600	3,500	3,200	2,800	2,600
	30	75,600	67,000	50,500	42,300	39,400	35,000	33,300	30,400	27,100	24,500
		7,700	6,800	5,100	4,300	4,000	3,600	3,400	3,100	2,800	2,500
	35	74,400	65,500	49,400	41,400	38,600	34,300	32,600	29,800	26,500	24,000
		7,600	6,700	5,000	4,200	3,900	3,500	3,300	3,000	2,700	2,400
	40	73,200	64,200	48,400	40,500	37,800	33,600	31,900	29,100	26,000	23,500
		7,500	6,500	4,900	4,100	3,900	3,400	3,300	3,000	2,700	2,400
	45	72,000	62,900	47,400	39,700	37,000	32,900	31,300	28,500	25,400	23,000
		7,300	6,400	4,800	4,000	3,800	3,400	3,200	2,900	2,600	2,300
	50	70,800	61,600	46,400	38,900	36,300	32,200	30,600	28,000	24,900	22,600
		7,200	6,300	4,700	4,000	3,700	3,300	3,100	2,900	2,500	2,300
	60	68,400	59,200	44,600	37,400	34,900	31,000	29,500	26,900	24,000	21,700
		7,000	6,000	4,500	3,800	3,600	3,200	3,000	2,700	2,400	2,200
	70	63,900	57,100	43,000	36,000	33,600	29,900	28,400	25,900	23,100	20,900
		6,500	5,800	4,400	3,700	3,400	3,000	2,900	2,600	2,400	2,100
	80	60,000	55,000	41,500	34,700	32,400	28,800	27,400	25,000	22,300	20,200
		6,100	5,600	4,200	3,500	3,300	2,900	2,800	2,500	2,300	2,100
	90	56,600	53,100	40,000	33,500	31,300	27,800	26,400	24,100	21,500	19,500
		5,800	5,400	4,100	3,400	3,200	2,800	2,700	2,500	2,200	2,000
	100	53,500	51,400	38,700	32,400	30,200	26,900	25,500	23,300	20,800	18,800
		5,500	5,200	3,900	3,300	3,100	2,700	2,600	2,400	2,100	1,900
	120	48,300	48,200	36,300	30,400	28,300	25,200	23,900	21,900	19,500	17,600
		4,900	4,900	3,700	3,100	2,900	2,600	2,400	2,200	2,000	1,800
	140	44,000	44,000	34,200	28,600	26,700	23,700	22,500	20,600	18,300	16,600
		4,500	4,500	3,500	2,900	2,700	2,400	2,300	2,100	1,900	1,700
4D16 □ 4D17 □ 4D18 □	20	102,000	102,000	76,700	64,300	59,900	53,300	50,600	46,300	41,200	37,300
		10,400	10,400	7,800	6,600	6,100	5,400	5,200	4,700	4,200	3,800
	25	101,000	99,900	75,300	63,100	58,800	52,300	49,700	45,400	40,400	36,600
		10,300	10,200	7,700	6,400	6,000	5,300	5,100	4,600	4,100	3,700
	30	99,200	98,100	73,900	61,900	57,800	51,300	48,800	44,600	39,700	36,000
		10,100	10,000	7,500	6,300	5,900	5,200	5,000	4,500	4,000	3,700
	35	97,800	96,300	72,600	60,800	56,700	50,400	47,900	43,800	39,000	35,300
		10,000	9,800	7,400	6,200	5,800	5,100	4,900	4,500	4,000	3,600
	40	96,400	94,600	71,300	59,800	55,700	49,500	47,100	43,000	38,300	34,700
		9,800	9,600	7,300	6,100	5,700	5,000	4,800	4,400	3,900	3,500
	45	95,100	93,000	70,100	58,700	54,800	48,700	46,300	42,300	37,600	34,100
		9,700	9,500	7,100	6,000	5,600	5,000	4,700	4,300	3,800	3,500
	50	93,800	91,400	68,900	57,700	53,800	47,900	45,500	41,500	37,000	33,500
		9,600	9,300	7,000	5,900	5,500	4,900	4,600	4,200	3,800	3,400
	60	91,300	88,400	66,600	55,800	52,100	46,300	44,000	40,200	35,800	32,400
		9,300	9,000	6,800	5,700	5,300	4,700	4,500	4,100	3,600	3,300
	70	88,900	85,600	64,500	54,100	50,400	44,800	42,600	38,900	34,600	31,400
		9,100	8,700	6,600	5,500	5,100	4,600	4,300	4,000	3,500	3,200
	80	86,700	82,900	62,500	52,400	48,800	43,400	41,300	37,700	33,600	30,400
		8,800	8,500	6,400	5,300	5,000	4,400	4,200	3,800	3,400	3,100
	90	84,600	80,400	60,600	50,800	47,400	42,100	40,000	36,600	32,600	29,500
		8,600	8,200	6,200	5,200	4,800	4,300	4,100	3,700	3,300	3,000
	100	81,500	78,100	58,900	49,300	46,000	40,900	38,900	35,500	31,600	28,600
		8,300	8,000	6,000	5,000	4,700	4,200	4,000	3,600	3,200	2,900
	120	73,900	73,800	55,600	46,600	43,500	38,600	36,700	33,600	29,900	27,100
		7,500	7,500	5,700	4,800	4,400	3,900	3,700	3,400	3,000	2,800
	140	67,600	67,600	52,700	44,200	41,200	36,600	34,800	31,800	28,300	25,700
		6,900	6,900	5,400	4,500	4,200	3,700	3,500	3,200	2,900	2,600
	160	62,300	62,300	50,100	42,000	39,200	34,800	33,100	30,200	26,900	24,400
		6,400	6,400	5,100	4,300	4,000	3,500	3,400	3,100	2,700	2,500

* The □ mark of each frame size represents 0, 5, DA, DB, or DC.

Allowable Radial and Axial Load

Table 20-C: Hollow Shaft Type, Allowable Radial Load Pro (Sizes E and F) [Units] Upper line: N; lower line: kgf

Frame Size	L mm	Output Shaft Speed r/min									
		5	10	20	30	35	45	50	60	75	90
4E17 □ 4E18 □ 4E19 □	20	103,000	103,000	103,000	86,900	81,200	72,500	69,000	63,200	56,600	51,400
		10,500	10,500	10,500	8,900	8,300	7,400	7,000	6,400	5,800	5,200
	25	102,000	102,000	102,000	85,500	79,800	71,200	67,800	62,100	55,600	50,600
		10,400	10,400	10,400	8,700	8,100	7,300	6,900	6,300	5,700	5,200
	30	100,000	100,000	99,800	84,000	78,500	70,000	66,700	61,100	54,700	49,700
		10,200	10,200	10,200	8,600	8,000	7,100	6,800	6,200	5,600	5,100
	35	98,900	98,900	98,200	82,600	77,200	68,900	65,600	60,100	53,800	48,900
		10,100	10,100	10,000	8,400	7,900	7,000	6,700	6,100	5,500	5,000
	40	97,600	97,600	96,600	81,300	75,900	67,700	64,500	59,100	52,900	48,100
		9,900	9,900	9,800	8,300	7,700	6,900	6,600	6,000	5,400	4,900
	45	96,400	96,400	95,000	80,000	74,700	66,700	63,500	58,100	52,000	47,300
		9,800	9,800	9,700	8,200	7,600	6,800	6,500	5,900	5,300	4,800
	50	95,100	95,100	93,500	78,700	73,600	65,600	62,500	57,200	51,200	46,600
		9,700	9,700	9,500	8,000	7,500	6,700	6,400	5,800	5,200	4,800
	60	92,800	92,800	90,700	76,300	71,300	63,600	60,600	55,500	49,700	45,200
		9,500	9,500	9,200	7,800	7,300	6,500	6,200	5,700	5,100	4,600
	70	90,500	90,500	88,000	74,100	69,200	61,700	58,800	53,800	48,200	43,800
		9,200	9,200	9,000	7,600	7,100	6,300	6,000	5,500	4,900	4,500
	80	88,400	88,400	85,500	71,900	67,200	59,900	57,100	52,300	46,800	42,600
		9,000	9,000	8,700	7,300	6,900	6,100	5,800	5,300	4,800	4,300
	90	86,300	86,300	83,100	69,900	65,300	58,300	55,500	50,800	45,500	41,400
		8,800	8,800	8,500	7,100	6,700	5,900	5,700	5,200	4,600	4,200
	100	84,400	84,400	80,800	68,000	63,500	56,700	54,000	49,400	44,200	40,200
		8,600	8,600	8,200	6,900	6,500	5,800	5,500	5,000	4,500	4,100
	120	80,700	80,700	76,600	64,500	60,300	53,800	51,200	46,900	42,000	38,200
		8,200	8,200	7,800	6,600	6,100	5,500	5,200	4,800	4,300	3,900
	140	77,400	77,400	72,900	61,300	57,300	51,100	48,700	44,600	39,900	36,300
		7,900	7,900	7,400	6,200	5,800	5,200	5,000	4,500	4,100	3,700
	160	74,300	74,300	69,500	58,500	54,600	48,700	46,400	42,500	38,000	34,600
		7,600	7,600	7,100	6,000	5,600	5,000	4,700	4,300	3,900	3,500
4F18 □ 4F19 □	20	134,000	134,000	134,000	134,000	132,000	118,000	113,000	103,000	92,700	84,500
		13,700	13,700	13,700	13,700	13,500	12,000	11,500	10,500	9,400	8,600
	25	133,000	133,000	133,000	133,000	130,000	117,000	111,000	102,000	91,400	83,300
		13,600	13,600	13,600	13,600	13,300	11,900	11,300	10,400	9,300	8,500
	30	131,000	131,000	131,000	131,000	129,000	115,000	109,000	100,000	90,100	82,100
		13,400	13,400	13,400	13,400	13,100	11,700	11,100	10,200	9,200	8,400
	35	130,000	130,000	130,000	130,000	127,000	113,000	108,000	99,100	88,800	81,000
		13,300	13,300	13,300	13,300	12,900	11,500	11,000	10,100	9,100	8,300
	40	128,000	128,000	128,000	128,000	125,000	112,000	106,000	97,700	87,600	79,900
		13,000	13,000	13,000	13,000	12,700	11,400	10,800	10,000	8,900	8,100
	45	127,000	127,000	127,000	127,000	123,000	110,000	105,000	96,400	86,400	78,800
		12,900	12,900	12,900	12,900	12,500	11,200	10,700	9,800	8,800	8,000
	50	126,000	126,000	126,000	126,000	122,000	109,000	104,000	95,100	85,200	77,700
		12,800	12,800	12,800	12,800	12,400	11,100	10,600	9,700	8,700	7,900
	60	123,000	123,000	123,000	123,000	118,000	106,000	101,000	92,600	83,000	75,700
		12,500	12,500	12,500	12,500	12,000	10,800	10,300	9,400	8,500	7,700
	70	121,000	121,000	121,000	121,000	115,000	103,000	98,300	90,200	80,900	73,700
		12,300	12,300	12,300	12,300	11,700	10,500	10,000	9,200	8,200	7,500
	80	118,000	118,000	118,000	118,000	113,000	101,000	95,800	88,000	78,900	71,900
		12,000	12,000	12,000	12,000	11,500	10,300	9,800	9,000	8,000	7,300
	90	116,000	116,000	116,000	116,000	110,000	98,100	93,500	85,800	77,000	70,100
		11,800	11,800	11,800	11,800	11,200	10,000	9,500	8,700	7,800	7,100
	100	116,000	116,000	116,000	115,000	107,000	95,800	91,300	83,800	75,100	68,500
		11,800	11,800	11,800	11,700	10,900	9,800	9,300	8,500	7,700	7,000
	120	114,000	114,000	114,000	109,000	102,000	91,500	87,100	80,000	71,700	65,400
		11,600	11,600	11,600	11,100	10,400	9,300	8,900	8,200	7,300	6,700
	140	105,000	105,000	105,000	105,000	97,900	87,500	83,400	76,500	68,600	62,500
		10,700	10,700	10,700	10,700	10,000	8,900	8,500	7,800	7,000	6,400
	160	102,000	102,000	102,000	100,000	93,900	83,900	79,900	73,300	65,800	59,900
		10,400	10,400	10,400	10,200	9,600	8,600	8,100	7,500	6,700	6,100

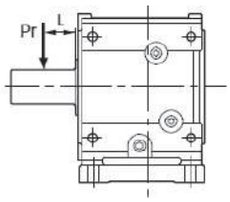
* The □ mark of each frame size represents 0, 5, DA, DB, or DC.

Allowable Radial and Axial Load

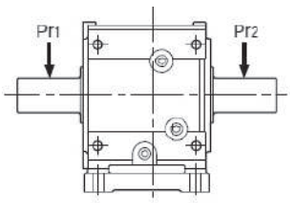
3. Allowable Radial Load - Solid Shaft

[Conditions]

- No axial load is acting.
- The flange is mounted in the same direction as the shaft direction. Consult us if it is mounted in the reverse direction.
- For foot mount, the foot mount plate is mounted to the ground or ceiling. Consult us if wall mount is used.
- The strength class of mounting bolts is 12.9.



"L" indicates the distance from the output shaft end to the point of radial load.



If the output shaft is a both-end shaft:

If Pr1 and Pr2 are in the same direction, select a model so that
Pro ≥ Pr1 and
Pro ≥ Pr2.

Consult us if Pr1 and Pr2 are in different directions.

Table 21-A: Solid Shaft Type, Allowable Radial Load Pro (Sizes A and B) [Units] Upper line: N; lower line: kgf

Frame Size	L mm	Output Shaft Speed r/min									
		5	10	20	30	35	45	50	60	75	90
4A10 □ 4A11 □ 4A12 □ 4A14 □	20	33500	33500	28800	24500	23000	20700	19800	18300	16500	15200
		3400	3400	2900	2500	2300	2100	2000	1900	1700	1500
	25	30000	30000	27900	23800	22300	20100	19200	17700	16000	14700
		3100	3100	2800	2400	2300	2000	2000	1800	1600	1500
	30	25000	25000	25000	23100	21700	19500	18600	17200	15600	14300
		2500	2500	2500	2400	2200	2000	1900	1800	1600	1500
	35	21400	21400	21400	21400	21100	19000	18100	16700	15100	13900
		2200	2200	2200	2200	2200	1900	1800	1700	1500	1400
	40	18700	18700	18700	18700	18700	18400	17600	16300	14700	13500
		1900	1900	1900	1900	1900	1900	1800	1700	1500	1400
	45	16700	16700	16700	16700	16700	16700	16700	15900	14300	13200
		1700	1700	1700	1700	1700	1700	1700	1600	1500	1300
	50	15000	15000	15000	15000	15000	15000	15000	15000	14000	12800
		1500	1500	1500	1500	1500	1500	1500	1500	1400	1300
	60	12500	12500	12500	12500	12500	12500	12500	12500	12500	12200
		1300	1300	1300	1300	1300	1300	1300	1300	1300	1200
	70	10700	10700	10700	10700	10700	10700	10700	10700	10700	10700
		1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
	80	9370	9370	9370	9370	9370	9370	9370	9370	9370	9370
		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	90	8330	8330	8330	8330	8330	8330	8330	8330	8330	8330
		800	800	800	800	800	800	800	800	800	800
4B12 □ 4B14 □ 4B16 □	20	55100	47400	35300	29400	27300	24100	22800	20700	18300	16500
		5600	4800	3600	3000	2800	2500	2300	2100	1900	1700
	25	54100	46200	34500	28700	26700	23500	22300	20200	17900	16100
		5500	4700	3500	2900	2700	2400	2300	2100	1800	1600
	30	53100	45100	33700	28000	26000	23000	21800	19800	17500	15700
		5400	4600	3400	2900	2700	2300	2200	2000	1800	1600
	35	47900	44100	32900	27400	25400	22500	21300	19300	17100	15300
		4900	4500	3400	2800	2600	2300	2200	2000	1700	1600
	40	41900	41900	32200	26700	24900	21900	20800	18900	16700	15000
		4300	4300	3300	2700	2500	2200	2100	1900	1700	1500
	45	37300	37300	31500	26200	24300	21500	20300	18500	16300	14700
		3800	3800	3200	2700	2500	2200	2100	1900	1700	1500
	50	33500	33500	30800	25600	23800	21000	19900	18100	16000	14300
		3400	3400	3100	2600	2400	2100	2000	1800	1600	1500
	60	28000	28000	28000	24500	22800	20100	19100	17300	15300	13700
		2900	2900	2900	2500	2300	2000	1900	1800	1600	1400
	70	24000	24000	24000	23600	21900	19300	18300	16600	14700	13200
		2400	2400	2400	2400	2200	2000	1900	1700	1500	1300
	80	21000	21000	21000	21000	21000	18600	17600	16000	14100	12700
		2100	2100	2100	2100	2100	1900	1800	1600	1400	1300
	90	18600	18600	18600	18600	18600	17900	17000	15400	13600	12200
		1900	1900	1900	1900	1900	1800	1700	1600	1400	1200
	100	16800	16800	16800	16800	16800	16800	16400	14900	13100	11800
		1700	1700	1700	1700	1700	1700	1700	1500	1300	1200
	120	14000	14000	14000	14000	14000	14000	14000	13900	12300	11000
		1400	1400	1400	1400	1400	1400	1400	1400	1300	1100

* The □ mark of each frame size represents 0, 5, DA, DB, or DC.

Allowable Radial and Axial Load

Table 21-B: Solid Shaft Type, Allowable Radial Load Pro (Sizes C and D) [Units] Upper line: N; lower line: kgf

Frame Size	L mm	Output Shaft Speed r/min									
		5	10	20	30	35	45	50	60	75	90
4C14 □ 4C16 □ 4C17 □	20	78300	66700	49400	40800	37900	33300	31500	28400	25000	22300
		8000	6800	5000	4200	3900	3400	3200	2900	2500	2300
	25	76900	65200	48300	39900	37000	32500	30800	27800	24400	21800
		7800	6600	4900	4100	3800	3300	3100	2800	2500	2200
	30	75600	63800	47300	39100	36200	31800	30100	27200	23900	21300
		7700	6500	4800	4000	3700	3200	3100	2800	2400	2200
	35	74400	62400	46200	38200	35400	31200	29500	26600	23400	20900
		7600	6400	4700	3900	3600	3200	3000	2700	2400	2100
	40	73200	61100	45300	37400	34700	30500	28800	26100	22900	20400
		7500	6200	4600	3800	3500	3100	2900	2700	2300	2100
	45	72000	59900	44400	36700	34000	29900	28300	25500	22400	20000
		7300	6100	4500	3700	3500	3000	2900	2600	2300	2000
	50	69100	58700	43500	36000	33300	29300	27700	25000	22000	19600
		7000	6000	4400	3700	3400	3000	2800	2500	2200	2000
	60	57600	56400	41800	34600	32000	28200	26600	24100	21100	18900
		5900	5700	4300	3500	3300	2900	2700	2500	2200	1900
	70	49400	49400	40300	33300	30900	27100	25600	23200	20300	18200
		5000	5000	4100	3400	3100	2800	2600	2400	2100	1900
	80	43200	43200	38800	32100	29800	26200	24700	22400	19600	17500
		4400	4400	4000	3300	3000	2700	2500	2300	2000	1800
	90	38400	38400	37500	31000	28700	25300	23900	21600	18900	16900
		3900	3900	3800	3200	2900	2600	2400	2200	1900	1700
	100	34500	34500	34500	30000	27800	24400	23100	20900	18300	16400
		3500	3500	3500	3100	2800	2500	2400	2100	1900	1700
	120	28800	28800	28800	28100	26000	22900	21600	19600	17200	15300
		2900	2900	2900	2900	2700	2300	2200	2000	1800	1600
	140	24700	24700	24700	24700	24500	21500	20400	18400	16200	14400
		2500	2500	2500	2500	2500	2200	2100	1900	1700	1500
4D16 □ 4D17 □ 4D18 □	20	102000	96000	71000	58600	54200	47600	44900	40500	35500	31600
		10400	9800	7200	6000	5500	4900	4600	4100	3600	3200
	25	101000	94300	69700	57500	53200	46700	44100	39800	34800	31000
		10300	9600	7100	5900	5400	4800	4500	4100	3500	3200
	30	99200	92500	68400	56400	52200	45800	43300	39000	34200	30400
		10100	9400	7000	5700	5300	4700	4400	4000	3500	3100
	35	97800	90900	67200	55400	51300	45000	42500	38300	33600	29900
		10000	9300	6900	5600	5200	4600	4300	3900	3400	3000
	40	96400	89300	66000	54400	50400	44200	41700	37700	33000	29400
		9800	9100	6700	5500	5100	4500	4300	3800	3400	3000
	45	95100	87700	64800	53500	49500	43400	41000	37000	32400	28900
		9700	8900	6600	5500	5000	4400	4200	3800	3300	2900
	50	93800	86200	63700	52600	48700	42700	40300	36400	31900	28400
		9600	8800	6500	5400	5000	4400	4100	3700	3300	2900
	60	85400	83400	61600	50800	47100	41300	39000	35200	30800	27400
		8700	8500	6300	5200	4800	4200	4000	3600	3100	2800
	70	73200	73200	59700	49200	45600	40000	37800	34100	29800	26600
		7500	7500	6100	5000	4600	4100	3900	3500	3000	2700
	80	64100	64100	57800	47700	44200	38700	36600	33000	28900	25700
		6500	6500	5900	4900	4500	3900	3700	3400	2900	2600
	90	56900	56900	56100	46300	42800	37600	35500	32000	28000	25000
		5800	5800	5700	4700	4400	3800	3600	3300	2900	2500
	100	51300	51300	51300	44900	41600	36500	34500	31100	27200	24200
		5200	5200	5200	4600	4200	3700	3500	3200	2800	2500
	120	42700	42700	42700	42500	39300	34500	32600	29400	25700	22900
		4400	4400	4400	4300	4000	3500	3300	3000	2600	2300
	140	36600	36600	36600	36600	36600	32700	30900	27900	24400	21700
		3700	3700	3700	3700	3700	3300	3100	2800	2500	2200
	160	32000	32000	32000	32000	32000	31100	29300	26500	23200	20600
		3300	3300	3300	3300	3300	3200	3000	2700	2400	2100

* The □ mark of each frame size represents 0, 5, DA, DB, or DC.

Allowable Radial and Axial Load

Table 21-C: Solid Shaft Type, Allowable Radial Load Pro (Sizes E and F) [Units] Upper line: N; lower line: kgf

Frame Size	L mm	Output Shaft Speed r/min									
		5	10	20	30	35	45	50	60	75	90
4E17 □ 4E18 □ 4E19 □	20	103000	103000	100000	84000	78300	69500	66000	60200	53600	48500
		10500	10500	10200	8600	8000	7100	6700	6100	5500	4900
	25	102000	102000	98600	82500	76900	68300	64900	59200	52700	47600
		10400	10400	10100	8400	7800	7000	6600	6000	5400	4900
	30	100000	100000	96900	81100	75600	67200	63800	58200	51800	46800
		10200	10200	9900	8300	7700	6900	6500	5900	5300	4800
	35	98900	98900	95300	79800	74400	66000	62700	57200	50900	46100
		10100	10100	9700	8100	7600	6700	6400	5800	5200	4700
	40	97600	97600	93800	78500	73200	65000	61700	56300	50100	45300
		9900	9900	9600	8000	7500	6600	6300	5700	5100	4600
	45	96400	96400	92300	77200	72000	63900	60700	55400	49300	44600
		9800	9800	9400	7900	7300	6500	6200	5600	5000	4500
	50	95100	95100	90800	76000	70900	62900	59800	54500	48500	43900
		9700	9700	9300	7700	7200	6400	6100	5600	4900	4500
	60	92800	92800	88100	73700	68700	61000	57900	52900	47000	42600
		9500	9500	9000	7500	7000	6200	5900	5400	4800	4300
	70	90500	90500	85500	71500	66700	59200	56200	51300	45600	41300
		9200	9200	8700	7300	6800	6000	5700	5200	4600	4200
	80	88400	88400	83000	69500	64700	57500	54600	49800	44300	40100
		9000	9000	8500	7100	6600	5900	5600	5100	4500	4100
	90	86300	86300	80700	67500	62900	55900	53100	48400	43100	39000
		8800	8800	8200	6900	6400	5700	5400	4900	4400	4000
	100	84400	84400	78500	65700	61200	54400	51600	47100	41900	37900
		8600	8600	8000	6700	6200	5500	5300	4800	4300	3900
	120	74900	74900	74400	62300	58100	51600	49000	44700	39800	36000
		7600	7600	7600	6400	5900	5300	5000	4600	4100	3700
	140	64200	64200	64200	59200	55200	49000	46600	42500	37800	34200
		6500	6500	6500	6000	5600	5000	4800	4300	3900	3500
	160	56200	56200	56200	56200	52600	46700	44400	40500	36000	32600
		5700	5700	5700	5700	5400	4800	4500	4100	3700	3300
4F18 □ 4F19 □	20	134,000	134,000	134,000	134,000	133,000	119,000	114,000	104,000	93,400	85,200
		13,700	13,700	13,700	13,700	13,600	12,100	11,600	10,600	9,500	8,700
	25	133,000	133,000	133,000	133,000	131,000	117,000	112,000	103,000	92,100	83,900
		13,600	13,600	13,600	13,600	13,400	11,900	11,400	10,500	9,400	8,600
	30	131,000	131,000	131,000	131,000	130,000	116,000	110,000	101,000	90,700	82,700
		13,400	13,400	13,400	13,400	13,300	11,800	11,200	10,300	9,200	8,400
	35	130,000	130,000	130,000	130,000	128,000	114,000	109,000	99,800	89,500	81,500
		13,300	13,300	13,300	13,300	13,000	11,600	11,100	10,200	9,100	8,300
	40	128,000	128,000	128,000	128,000	126,000	113,000	107,000	98,400	88,200	80,400
		13,000	13,000	13,000	13,000	12,800	11,500	10,900	10,000	9,000	8,200
	45	127,000	127,000	127,000	127,000	124,000	111,000	106,000	97,000	87,000	79,300
		12,900	12,900	12,900	12,900	12,600	11,300	10,800	9,900	8,900	8,100
	50	126,000	126,000	126,000	126,000	122,000	109,000	104,000	95,700	85,800	78,200
		12,800	12,800	12,800	12,800	12,400	11,100	10,600	9,800	8,700	8,000
	60	123,000	123,000	123,000	123,000	119,000	107,000	102,000	93,200	83,600	76,200
		12,500	12,500	12,500	12,500	12,100	10,900	10,400	9,500	8,500	7,800
	70	121,000	121,000	121,000	121,000	116,000	104,000	98,900	90,800	81,400	74,200
		12,300	12,300	12,300	12,300	11,800	10,600	10,100	9,300	8,300	7,600
	80	118,000	118,000	118,000	118,000	113,000	101,000	96,400	88,500	79,400	72,300
		12,000	12,000	12,000	12,000	11,500	10,300	9,800	9,000	8,100	7,400
	90	116,000	116,000	116,000	116,000	111,000	98,700	94,100	86,300	77,400	70,600
		11,800	11,800	11,800	11,800	11,300	10,100	9,600	8,800	7,900	7,200
	100	116,000	116,000	116,000	115,000	108,000	96,400	91,800	84,300	75,600	68,900
		11,800	11,800	11,800	11,700	11,000	9,800	9,400	8,600	7,700	7,000
	120	114,000	114,000	114,000	110,000	103,000	92,000	87,600	80,400	72,100	65,700
		11,600	11,600	11,600	11,200	10,500	9,400	8,900	8,200	7,300	6,700
	140	105,000	105,000	105,000	105,000	98,500	88,000	83,800	76,900	69,000	62,900
		10,700	10,700	10,700	10,700	10,000	9,000	8,500	7,800	7,000	6,400
	160	95,700	95,700	95,700	95,700	94,300	84,300	80,300	73,700	66,100	60,200
		9,800	9,800	9,800	9,800	9,600	8,600	8,200	7,500	6,700	6,100

* The □ mark of each frame size represents 0, 5, DA, DB, or DC.

Allowable Radial and Axial Load

4. Allowable Axial Load

- No radial load must be acting.
- The strength class of mounting bolts must be 12.9.

Table 22: Allowable Axial Load (Common to Hollow and Solid Shafts) [Units] Upper line: N; lower line: kgf

Frame Size	Output Shaft Speed r/min									
	5	10	20	30	35	45	50	60	75	90
4A10 □, 4A11 □	22100	22100	22100	20400	18900	16500	15600	14000	12200	10800
4A12 □, 4A14 □	2300	2300	2300	2100	1900	1700	1600	1400	1200	1100
4B12 □, 4B14 □	41500	39300	27700	21900	19900	16700	15400	13300	10900	9010
4B16 □	4200	4000	2800	2200	2000	1700	1600	1400	1100	900
4C14 □, 4C16 □	64800	48500	32800	25000	22200	17900	16200	13300	10000	7450
4C17 □	6600	4900	3300	2500	2300	1800	1700	1400	1000	800
4D16 □, 4D17 □	92600	66100	44400	33500	29700	23700	21400	17400	12800	9210
4D18 □	9400	6700	4500	3400	3000	2400	2200	1800	1300	900
4E17 □, 4E18 □	93300	91500	63600	49600	44700	37100	34100	29100	23200	18700
4E19 □	9500	9300	6500	5100	4600	3800	3500	3000	2400	1900
4F18 □, 4F19 □	150000	150000	109000	87500	79900	68200	63600	55800	46800	39800
	15300	15300	11100	8900	8100	7000	6500	5700	4800	4100

* The □ mark of each frame size represents 0, 5, DA, DB, or DC. -

5. Input Shaft Radial Load

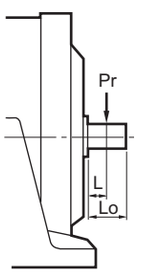
Check the input shaft radial load using the following formula:

$$Pr \leqq \frac{Pro}{Lf \cdot Cf \cdot Fs} \text{ [N, kgf]}$$

Pr : Actual radial load [N, kgf]
Pro : Allowable radial load [N, kgf]
Lf : Load location factor (Table 23)
Cf : Coupling factor (Table 18)
Fs : Shock factor (Table 19)

Table 23: Radial Load Location Factors for Input Shaft Lf

Frame Size	Load location L mm														
	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100
4A10DA, 4A12DA, 4B12DA, 4B14DA, 4C14DA	0.73	0.91	1.20	1.60	2.00	-	-	-	-	-	-	-	-	-	-
4A12DB, 4B12DB, 4B14DB, 4C14DB, 4C16DA, 4D16DA, 4D17DA, 4E17DA	0.88	0.96	1.20	1.59	2.00	2.38	-	-	-	-	-	-	-	-	-
4A100, 4A105, 4C14DC, 4D16DB, 4D17DB, 4D18DA, 4E17DB, 4E18DA, 4F18DA	0.91	0.97	1.20	1.59	2.00	2.38	-	-	-	-	-	-	-	-	-
4A110, 4A115	0.91	0.97	1.20	1.59	2.00	2.38	-	-	-	-	-	-	-	-	-
4A120, 4A125, 4B120, 4B125, 4D17DC, 4E17DC, 4E19DA, 4F19DA	-	0.81	0.93	1.14	1.41	1.67	1.96	2.22	-	-	-	-	-	-	-
4A140, 4A145, 4B140, 4B145, 4C140, 4C145, 4D18DB, 4E18DB, 4E19DB, 4F18DB, 4F19DB	-	0.78	0.89	1.00	1.23	1.45	1.69	1.92	2.13	-	-	-	-	-	-
4B160, 4B165, 4C160, 4C165, 4D160, 4D165	-	0.92	0.95	0.98	1.05	1.18	1.28	1.41	1.52	1.64	1.85	-	-	-	-
4C170, 4C175, 4D170, 4D175, 4E170, 4E175	-	-	0.93	0.96	0.99	1.05	1.16	1.28	1.39	1.49	1.72	1.92	2.17	-	-
4D180, 4D185, 4E180, 4E185, 4F180, 4F185	-	-	-	0.93	0.96	0.99	1.05	1.15	1.25	1.35	1.56	1.75	1.96	2.17	-
4E190, 4E195, 4F190, 4F195	-	-	-	0.93	0.95	0.98	1.00	1.09	1.16	1.25	1.41	1.59	1.75	1.92	2.08



If L = Lo/2,
Lf = 1.

Allowable Radial and Axial Load

Table 24: Allowable Radial load for Input Shaft Pro (Units: Upper line: N; lower line: kgf)

(Cf, Lf, Fs = 1)

Frame Size	Reduction Ratio	Input Speed r/min						
		1750	1450	1165	980	870	720	580
4A10DA, 4A12DA, 4B12DA, 4B14DA, 4C14DA	364 - 5177, 7228, 10658	196 20	147 15	147 15	196 20	196 20	196 20	196 20
	1849, 2537	49.1 5	49.1 5	49.1 5	49.1 5	49.1 5	147 15	196 20
4A12DB, 4B12DB, 4B14DB, 4C14DB, 4C16DA, 4D16DA, 4D17DA, 4E17DA	All	294 30 196 20	294 30 196 20	294 30 196 20	294 30 196 20	294 30 245 25	294 30 245 25	294 30 294 30
4A100, 4A105, 4C14DC, 4D16DB, 4D17DB, 4D18DA, 4E17DB, 4E18DA, 4F18DA	11 - 39 , 54 - 578 , 809, 1117 1656 , 2272 - 10658	441 45	441 45	491 50	540 55	589 60	589 60	589 60
	42, 46, 48, 53, 683, 956, 1320, 1957	441 45	343 35	441 45	491 50	491 50	540 55	589 60
4A110, 4A115	19 - 28 , 67 - 305	441 45	343 35	441 45	491 50	491 50	540 55	589 60
	35 - 60	196 20	196 20	196 20	196 20	245 25	245 25	294 30
4A120, 4A125, 4B120, 4B125, 4D17DC, 4E17DC, 4E19DA, 4F19DA	11 - 60 , 364 - 2559 , 3511 , 5177	590 60	690 70	740 75	780 80	880 90	880 90	880 90
	67 - 305 , 2944 , 4365 , 6472 - 10658	540 55	440 45	490 50	540 55	590 60	880 90	880 90
4D18DB, 4E18DB, 4E19DB, 4F18DB, 4F19DB	11 - 74	1370 140	1370 140	1370 140	1520 155	1620 165	1720 175	1860 190
	80 - 305	1280 130	1280 130	1280 130	1370 140	1470 150	1570 160	1770 180
4A140, 4A145, 4B140, 4B145, 4C140, 4C145	11 - 28	1370 140	1370 140	1370 140	1520 155	1620 165	1720 175	1860 190
	35 - 74	1230 125	980 100	1080 110	1180 120	1230 125	1320 135	1470 150
	80 , 88	1080 110	1130 115	1180 120	1280 130	1320 135	1370 140	1470 150
	93 - 305	540 55	590 60	590 60	690 70	690 70	690 70	1080 110
4B160, 4B165, 4C160, 4C165, 4D160, 4D165	11 - 88 , 163 - 207	1770 180	1770 180	1960 200	2060 210	2160 220	2160 220	2160 220
	93 - 151 , 227 - 305	1080 110	1180 120	1280 130	1370 140	1370 140	1570 160	1770 180
4C170, 4C175, 4D170, 4D175, 4E170, 4E175	All	2060 210	2060 210	2260 230	2260 230	2350 240	2450 250	2650 270
4D180, 4D185, 4E180, 4E185, 4F180, 4F185	All	2750 280	2550 260	2750 280	2940 300	3040 310	3340 340	3430 350
4E190, 4E195, 4F190, 4F195	35 - 88	3040 310	3040 310	3240 330	3530 360	3630 370	3920 400	3920 400
	93 - 305	2650 270	2550 260	2840 290	2940 300	3140 320	3340 340	3630 370

1. Moment of Inertia / GD² and starting time

For successful starting of a driven machine, the starting torque must be sufficiently larger than the load torque and the motor torque must consistently be greater than the load torque, including the period from the start of operation to reaching the full load speed).
The difference between the motor torque and load torque in starting operation is referred to as the accelerating torque. If the average accelerating torque is taken as $\overline{T}a$ [N·m, kgf·m], the starting time to the rotating speed n [r/min], i.e., ts(s), is calculated with the moment of inertia or GD² by using the following formulas:

$$ts = \frac{(J_M + J_C + J_L) \cdot n}{9.55 \cdot \overline{T}a} \text{ (S)} \qquad ts = \frac{(GD_M^2 + GD_C^2 + GD_L^2) \cdot n}{375 \cdot \overline{T}a} \text{ (S)}$$

Where, J_M: Motor's moment of inertia, including brake drum [kg·m²]
J_C: Cyclo reducer's moment of inertia [kg·m²]
J_L: Driven machine's moment of inertia (including coupling and pulley) converted to the value at the motor shaft [kg·m²]
GD_M^2: GD² of motor, including brake drum [kgf·m²]
GD_C^2: GD² of Cyclo reducer [kgf·m²]
GD_L^2: Driven machine's GD² (including coupling and pulley) converted to the value at the motor shaft [kgf·m²]

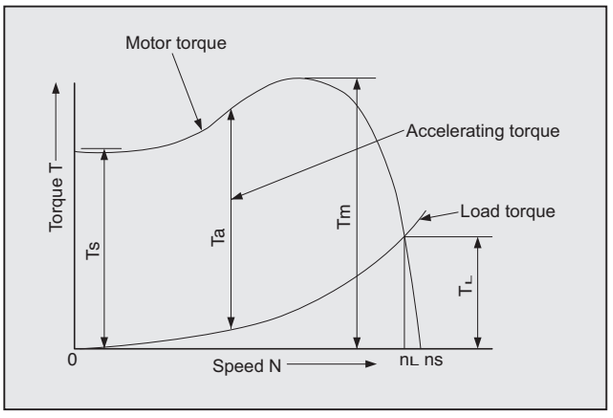
Average Accelerating Torque $\overline{T}a$

The average accelerating torque refers to the average of the difference between the motor and load torque as shown in the right graph, that is, the average of the actual torque required to accelerate the load. For determining the starting time, both the motor torque and load torque curves are necessary. However, because it is extremely difficult to determine the average accelerating torque, the average accelerating torque at the actual load torque is calculated as below.
For starting with the full voltage, the average load torque over the starting period, Ta [N·m, kgf·m] is calculated approximately.

$$\overline{T}a \fallingdotseq 0.8 \left(\frac{Ts+Tm}{2}\right) - \overline{T}_L \text{ (N·m, kgf·m)}$$

Furthermore, the average load torque over the starting period, $\overline{T}_L$ [N·m, kgf·m] is approximately expressed as follows if the full load torque is T_L [N·m, kgf·m]:

For constant torque load·····$\overline{T}_L \fallingdotseq T_L$ (N·m, kgf·m)
For square of reduced torque load·····$\overline{T}_L \fallingdotseq 0.34 T_L$ (N·m, kgf·m)

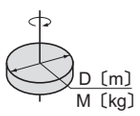
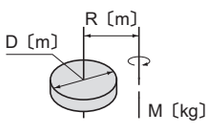
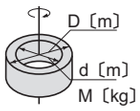
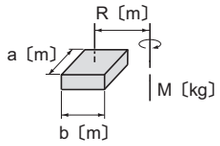
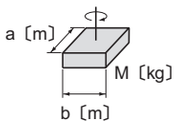
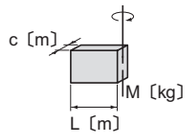


Torque Curve Ts : Starting torque
Tm: Maximum torque (Stalling Torque)
Ta : Accelerating torque
T_L : Full load torque
ns : Synchronous rotating speed
n_L : Full load rotating speed

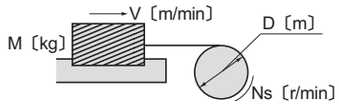
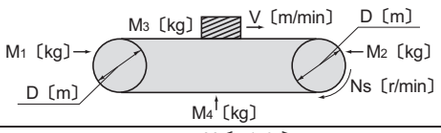
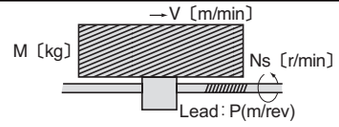
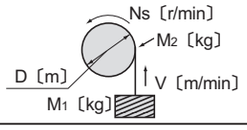
Moment of Inertia / GD²

2. Calculation of Moment of Inertia J

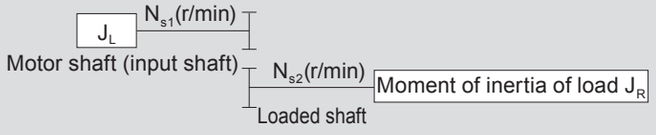
(1) Moment of Inertia of Rotating Motion

If the axis of rotation passes through the center of gravity:		If the axis of rotation does not pass through the center of gravity:	
	$J=\frac{1}{8}MD^2$ [kg·m²]		$J=\frac{M}{4}\left(\frac{1}{2}D^2+4R^2\right)$ [kg·m²]
	$J=\frac{1}{8}M\,(D^2+d^2)$ [kg·m²]		$J=\frac{M}{4}\left(\frac{a^2+b^2}{3}+4R^2\right)$ [kg·m²]
	$J=\frac{1}{12}M\,(a^2+b^2)$ [kg·m²]		$J=\frac{1}{12}M\,(4L^2+C^2)$ [kg·m²]

(2) Moment of Inertia of Rectilinear Motion (at Loaded Shaft)

General application		$J=\frac{M}{4}\left(\frac{V}{\pi\cdot Ns}\right)^2=\frac{M}{4}D^2$	[kg·m²]
Horizontal motion by conveyor		$J=\frac{1}{4}\left(\frac{M_1+M_2}{2}+M_3+M_4\right)\times D^2$	[kg·m²]
Horizontal motion by lead screw		$J=\frac{M}{4}\left(\frac{V}{\pi\cdot Ns}\right)^2=\frac{M}{4}\left(\frac{P}{\pi}\right)^2$	[kg·m²]
Vertical motion by hoist		$J=\frac{M_1D^2}{4}+\frac{1}{8}M_2D^2$	[kg·m²]

(3) Conversion to the value at Motor Shaft (Input Shaft)

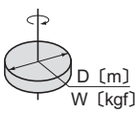
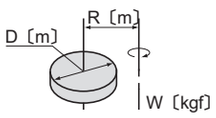
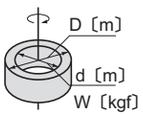
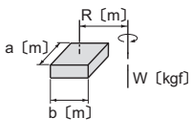
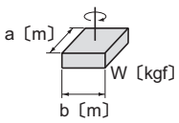
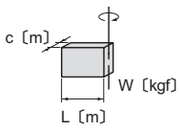


$$J_L=\left(\frac{N_{s2}}{N_{s1}}\right)^2J_R=\left(\frac{1}{Z}\right)^2J_R$$

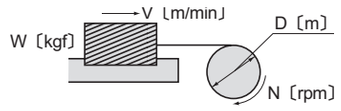
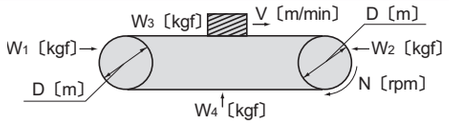
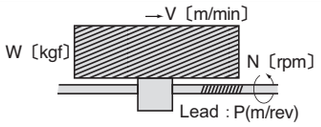
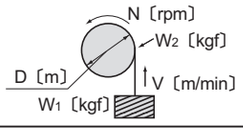
Z: Total reduction ratio

3. Calculation of GD²

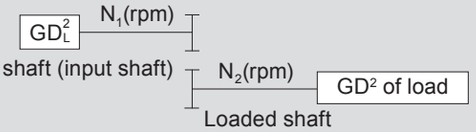
(1) GD² of Rotating Motion

If the axis of rotation passes through the center of gravity:		If the axis of rotation does not pass through the center of gravity:	
	$GD^2=\frac{1}{2}WD^2$ [kgf·m²]		$GD^2=W\left(\frac{1}{2}D^2+4R^2\right)$ [kgf·m²]
	$GD^2=\frac{1}{2}W(D^2+d^2)$ [kgf·m²]		$GD^2=W\left(\frac{a^2+b^2}{3}+4R^2\right)$ [kgf·m²]
	$GD^2=\frac{1}{3}W(a^2+b^2)$ [kgf·m²]		$GD^2=\frac{1}{3}W(4L^2+C^2)$ [kgf·m²]

(2) GD² of Rectilinear Motion (at Loaded Shaft)

General application		$GD^2=W\left(\frac{V}{\pi\cdot N}\right)^2=WD^2$ [kgf·m²]
Horizontal motion by conveyor		$GD^2=\left(\frac{W_1+W_2}{2}+W_3+W_4\right)\times D^2$ [kgf·m²]
Horizontal motion by lead screw		$GD^2=W\left(\frac{V}{\pi\cdot N}\right)^2=W\left(\frac{P}{\pi}\right)^2$ [kgf·m²]
Vertical motion by hoist		$GD^2=W_1D^2+\frac{1}{2}W_2D^2$ [kgf·m²]

(3) Conversion to the value at Motor Shaft (Input Shaft)



$GD_L^2=\left(\frac{N_2}{N_1}\right)^2GD^2=\left(\frac{1}{Z}\right)^2GD^2$

Z: Total reduction ratio

Moment of Inertia / GD²

4. Moment of Inertia / GD² of Bevel BUDDYBOX®

The tables below list the values of the moment of inertia and GD² at input shaft of Bevel BUDDYBOX.
These tables are for reduction ratios 11~305. Consult us for reduction ratios of 364 or more.

J (moment of inertia) [× 10^{-4} kg-m^2]
GD² [× 10^{-4} kgf-m^2]

Table 25-A Moment of Inertia / GD² of Bevel BUDDYBOX® (Hollow Shaft Type)

Frame size	Reduction ratio																	
	11		13		14		16		18		21		22		25		28	
	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²
4A10 □	4.60	18.4	2.86	11.4	2.64	10.6	1.78	7.12	1.72	6.86	1.35	5.41	-	-	-	-	0.884	3.54
4A11 □	-	-	-	-	-	-	-	-	-	-	2.08	8.31	-	-	-	-	1.44	5.74
4A12 □	11.3	45.2	6.89	27.6	6.67	26.7	4.99	20.0	4.84	19.4	3.74	15.0	4.21	16.9	4.14	16.6	2.89	11.5
4A14 □	24.4	97.4	15.5	62.0	15.3	61.1	11.0	44.1	10.9	43.5	9.87	39.5	10.2	40.7	10.1	40.4	6.65	26.6
4B12 □	15.3	61.3	9.48	37.9	8.93	35.7	6.72	26.9	4.31	17.3	4.75	19.0	5.06	20.2	4.88	19.5	3.45	13.8
4B14 □	28.4	113	18.2	72.8	17.7	70.6	12.8	51.2	12.4	49.8	11.0	43.9	11.1	44.3	10.9	43.6	7.27	29.1
4B16 □	81.0	324	52.1	208	51.6	206	35.5	142	35.1	141	26.1	105	29.5	118	29.3	117	18.0	72.2
4C14 □	40.1	160	26.4	105	24.6	98.3	18.1	72.6	11.6	46.4	14.2	56.6	13.8	55.4	13.2	53.0	9.06	36.2
4C16 □	93.4	373	60.8	243	59.0	236	40.9	164	39.7	159	29.2	117	32.1	129	31.6	126	19.8	79.0
4C17 □	161	644	102	410	101	403	77.2	309	76.0	304	69.8	279	68.3	273	67.7	271	51.4	206
4D16 □	-	-	-	-	-	-	-	-	-	-	36.8	147	39.0	156	37.1	149	24.0	96.1
4D17 □	200	801	129	516	123	494	94.5	378	90.9	364	77.5	310	75.3	301	73.4	294	55.7	223
4D18 □	304	1218	155	618	149	596	107	426	103	411	107	429	92.2	369	90.3	361	77.5	310
4E17 □	-	-	-	-	-	-	-	-	-	-	89.2	357	84.7	339	82.0	328	62.3	249
4E18 □	351	1405	182	729	174	697	126	504	120	481	119	476	102	406	98.9	395	84.0	336
4E19 □	551	2203	300	1198	291	1166	207	828	201	805	225	901	190	760	187	749	166	664
4F18 □	522	2086	286	1142	272	1087	200	801	190	762	155	618	130	519	125	500	104	416
4F19 □	686	2744	383	1534	369	1478	266	1066	257	1026	263	1054	220	880	215	861	187	750

Frame size	Reduction ratio																	
	35		39		46		53		60		67		74		80		88	
	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²
4A10 □	0.544	2.18	0.514	2.06	0.475	1.90	0.414	1.65	0.297	1.19	0.314	1.26	0.306	1.22	0.275	1.10	0.270	1.08
4A11 □	1.05	4.19	1.02	4.07	0.891	3.56	0.813	3.25	0.760	3.04	0.665	2.66	0.657	2.63	0.634	2.54	0.628	2.51
4A12 □	1.78	7.12	1.75	7.00	1.85	7.39	1.72	6.89	1.29	5.16	1.45	5.80	1.44	5.77	1.33	5.33	1.33	5.31
4A14 □	4.71	18.8	4.68	18.7	3.77	15.1	3.40	13.6	3.01	12.0	2.56	10.3	2.56	10.2	2.38	9.52	2.38	9.50
4B12 □	2.12	8.49	2.05	8.20	2.06	8.24	1.88	7.53	1.42	5.66	1.54	6.18	1.52	6.10	1.40	5.60	1.38	5.54
4B14 □	5.08	20.3	5.01	20.0	4.01	16.0	3.58	14.3	3.14	12.6	2.67	10.7	2.65	10.6	2.45	9.81	2.44	9.75
4B16 □	12.9	51.6	12.8	51.3	11.3	45.2	10.1	40.5	8.53	34.1	7.79	31.2	7.77	31.1	7.25	29.0	7.23	28.9
4C14 □	6.20	24.8	5.96	23.8	4.69	18.8	4.09	16.3	3.54	14.2	2.97	11.9	2.91	11.6	2.67	10.7	2.62	10.5
4C16 □	14.0	55.9	13.7	54.9	12.0	47.8	10.6	42.5	8.91	35.6	8.08	32.3	8.02	32.1	7.46	29.8	7.41	29.6
4C17 □	38.9	155	38.6	155	36.1	144	31.9	128	30.5	122	28.4	114	28.3	113	27.3	109	27.2	109
4D16 □	16.8	67.1	16.0	64.0	13.6	54.3	11.8	47.3	9.86	39.4	8.85	35.4	8.64	34.5	8.00	32.0	7.85	31.4
4D17 □	41.7	167	40.9	164	37.7	151	33.1	133	31.4	126	29.1	117	28.9	116	27.8	111	27.7	111
4D18 □	62.8	251	62.1	248	55.4	221	48.7	195	46.0	184	43.5	174	43.3	173	40.1	161	40.0	160
4E17 □	45.5	182	44.4	178	40.2	161	35.0	140	32.9	132	30.2	121	29.9	120	28.6	114	28.3	113
4E18 □	66.7	267	65.5	262	57.8	231	50.6	202	47.4	190	44.5	178	44.2	177	40.9	164	40.7	163
4E19 □	142	568	141	563	129	518	123	490	117	468	109	435	108	433	105	421	105	420
4F18 □	78.1	312	76.2	305	65.4	262	56.3	225	51.9	208	47.7	191	47.1	189	43.1	172	42.7	171
4F19 □	154	616	152	609	138	550	129	515	122	487	112	448	111	446	108	430	107	429

Frame size	Reduction ratio															
	102		112		123		151		179		207		249		305	
	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²	J	GD²
4A10 □	0.19	0.75	0.172	0.69	0.17	0.676	0.154	0.618	0.206	0.824	0.138	0.552	0.196	0.785	0.131	0.523
4A11 □	0.60	2.42	0.577	2.31	0.57	2.30	0.559	2.24	0.541	2.16	0.536	2.14	0.529	2.12	0.525	2.10
4A12 □	0.94	3.74	0.887	3.55	0.88	3.54	0.838	3.35	1.16	4.64	0.795	3.18	1.12	4.50	0.763	3.05
4A14 □	2.18	8.72	2.11	8.42	2.10	8.41	1.97	7.87	1.92	7.66	1.91	7.66	1.86	7.45	1.85	7.41
4B12 □	0.98	3.91	0.921	3.68	0.91	3.65	0.857	3.43	1.17	4.69	0.805	3.22	1.13	4.53	0.768	3.07
4B14 □	2.23	8.90	2.14	8.57	2.14	8.54	1.99	7.96	1.93	7.73	1.93	7.70	1.87	7.48	1.86	7.43
4B16 □	6.41	25.7	6.15	24.6	6.14	24.6	5.88	23.5	5.77	23.1	5.80	23.2	5.54	22.2	5.46	21.8
4C14 □	2.36	9.45	2.25	9.01	2.23	8.92	2.05	8.21	1.98	7.90	1.96	7.84	1.89	7.58	1.87	7.49
4C16 □	6.54	26.2	6.26	25.0	6.23	24.9	5.94	23.8	5.81	23.2	5.83	23.3	5.56	22.2	5.47	21.9
4C17 □	25.7	103	25.4	102	25.4	102	24.6	98.3	24.3	97.0	23.9	95.8	23.8	95.3	23.7	94.9
4D16 □	6.87	27.5	6.53	26.1	6.46	25.8	6.09	24.3	5.92	23.7	5.90	23.6	5.62	22.5	5.51	22.0
4D17 □	26.0	104	25.7	103	25.6	103	24.7	98.9	24.4	97.4	24.0	96.1	23.9	95.5	23.8	95.0
4D18 □	38.0	152	37.4	150	37.4	149	36.2	145	35.2	141	34.9	140	34.6	138	34.4	137
4E17 □	26.5	106	26.1	104	26.0	104	25.0	99.8	24.5	98.1	24.1	96.6	24.0	95.9	23.8	95.2
4E18 □	38.5	154	37.8	151	37.7	151	36.5	146	35.3	141	35.0	140	34.7	139	34.4	138
4E19 □	102	407	98.9	396	98.8	395	97.1	388	96.0	384	95.2	381	94.6	378	94.1	376
4F18 □	40.0	160	38.9	156	38.7	155	37.2	149	35.8	143	35.4	142	34.9	140	34.6	138
4F19 □	103	413	100	400	99.9	400	97.9	391	96.6	386	95.6	382	94.9	380	94.3	377

Notes: 1. The □ mark of each frame size contains 0 or 5.
2. Table 25 does not include the moment of inertia or GD² values of any motor.
To calculate the moment of inertia or GD² for the gearmotor type, add the GD² of motor (Table 26 or 27) to the value listed in the table.
3. Consult us for the moment of inertia and GD² for a reduction ratio of 364 or more.
4. The above values are subject to change without notice.