FORMOSA®

Spur Gearheads

WORLD STANDARD SPUR GEARHEAD CODING SYSTEM

F 5 GN 50 K

Type of Bearings or shaft direction.
K : Ball bearing type
RA : Right angle gearhead

Gear Ratio
Example
50 : Gear ratio of 50 : 1 and speed reduction of 1/50
10X denotes the decimal gearhead of gear ratio 10 : 1

Gearhead type
GN : **GN** type
(for use with **GN** type pinion shaft motor)
GU : **GU** type
(for use with **GU** type pinion shaft motor)

FORMOSA Motor

Gearhead Frame Size
0 : 42mm sq.   4 : 80mm sq.
2 : 60mm sq.   5 : 90mm sq.
3 : 70mm sq.

Note: The **GU** type includes two types of models : box-shaped models with a **"B"** at the end of their names and models with mounting flanges with with nothing at the end of their names. All other series consist of box-shaped models only and have nothing at the end of their names.

Typical Specifications

Gearhead Model	Gear Ratio	Maximum Permissiible Torque lb-in (N · m)	Permissible Overhung Load lb (N.m)		Permissible Thrust Load lb (N.m)
			0.4″ from shaft end	0.8″ from shaft end	
0GK□, 0GK□ K	3~180	8.6 (1.0)	1.73 (0.2)	—	1.30 (0.15)
2GN□ K, 2GN□ L	3~18	26.0 (3.0)	4.3 (0.5)	7.0 (0.8)	2.6 (0.3)
	25~180		10.4 (1.2)	15.6 (1.5)	
3GN□ K, 3GN□ L	3~18	43.4 (5.0)	7.0 (0.8)	10.4 (1.2)	3.5 (0.4)
	25~180		13 (1.5)	21.7(2.5)	
4GN□ K, 4GN□ L	3~18	69.4 (8.0)	8.7 (1.0)	13 (1.3)	4.3 (0.5)
	25~180		17.4 (2.0)	26.1 (3.0)	
5GU□ K, 5GU□ KB	3~18	173.6 (20.0)	35 (4.0)	43.4 (5.0)	13.0 (1.5)
	25~180		43.4 (5.0)	60.7 (7.0)	
5GU□ KBH	50~180	260.4 (30.0)	35 (4.0)	52.0 (6.0)	13.0 (1.5)
6GD□ K	5~15	260.4 (30.0)	26.1 (3.0)	43.4 (5.0)	13.0 (1.5)
	20~200		35 (4.0)	52.0 (6.0)	

＊Overhung load values for hollowshaft models are distances from the flange mounting surface.
• Enter the gear ratio in the box(□) within the model name.
• Caution: Unlike most worm gear mechanisms, the right-angle gear does not have self-locking capabilities.
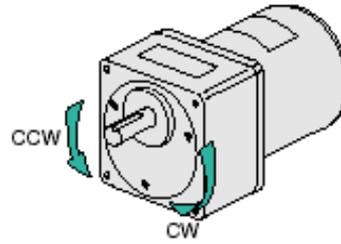
Speed and Direction of Rotation

The speed when a gearhead is directly coupled to motor is calculated according to the following formula:

$$N_G = \frac{N_M}{i}$$

N_G: Speed of Gearhead〔r/mim〕
N_M: Speed of motor〔r/mim〕
i : Gear ratio of gearhead

□ (green) Same direction as the motor shaft
□ Opposite direction as the motor shaft

The direction of gearhead shaft rotation may differ from motor shaft rotation depending on the reduction ratio of the gearhead

Gearhead Model \ Gear Ratio	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180	250	300	360
2GN□KA, 3GN□KA 4GN□KA, 5GN□KA	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■			
2GB□KA, 4GB□KA	■	■	■	■	■	■	■	■	■				■	■	■	■	■	■	■	■			
0GN□KA, 5GU□KA	■	■	■	■	■	■				■	■	■	■										
		■												■		■		■		■			

Connection of a decimal gearhead reduces the speed by 10:1 but does not affect the direction of rotation.

Gearhead Model \ Gear Ratio	5	10	15	20	30	50	100	200
FBL575□W-□, FBL5120□W-□ FHBL560N-□,FHBL5100N-□	■	■	■					■

Output Torque of Gearmotor

The output torque when a gearhead is directly connected is calculated as follows:

$$T_G = T_M \times i \times \eta$$

T_G: Output Torque at Gear Shaft〔oz-in〕
T_M: Motor Torque〔oz-in〕
i : Gear Ratio of Gearhead
η : Gearhead Efficiency

Decimal Gearhead Assembly

● Gearhead Efficiency

Gearhead Model \ Gear Ratio	3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180	250	300	360
F2GN□KA, 3GN□KA, F4GN□KA, 5GN□KA	81%									73%			66%										
F2GB□KA, 4GB□KA										73%			66%								59%		
FOGN□KA, 5GU□KA										66%													
FBHI62F-□,BHI62□T-□		90%		90%		90%		86%		86%			81%			81%		81%		81%			

Gearhead efficiency of all the decimal gearheads is 81%

Gearhead Model \ Gear Ratio	5	10	15	20	30	50	100	200
FBL575□W-□, FBL5120□W-□ FHBL560N-□,FHBL5100N-□	90%				86%			81%

Please contact   telst@ms67.hinet.net   for more detailed technical spec. data/drawing

Screw Dimensions

GN type, **GU** type, **GB** type, **GC** type, **BH** Series, **FBLⅡ** Series, **HBL** Series, **FPW** Series, Gearheads
The following screws are provided with the gearhead and decimal gearhead.
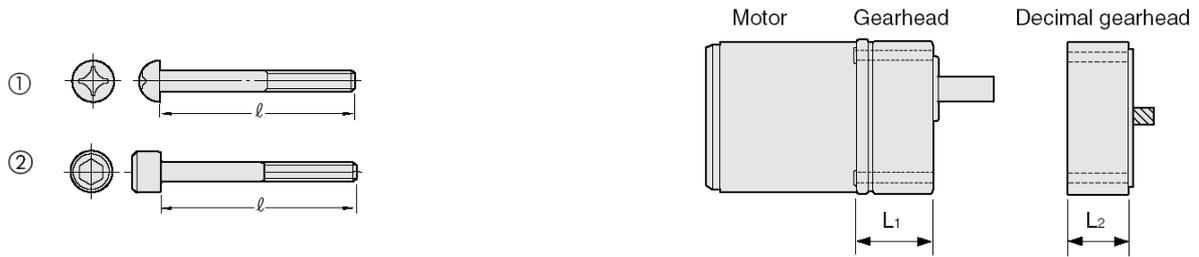
Gearhead							Screws	
Model	**L**		**L₁ + L₂**		**ℓ**			
	Inch	**mm**	**inch**	**mm**	**inch**	**mm**		**Drawing**
FOGN3KA ~ 180KA	1.22	31	—	—	1.57	40	**No.4~40UNC**	
F2GN3KA ~ 18KA	1.46	37	—	—	1.97	50	**No.8~32UNC**	
F2GN25KA ~ 180KA	1.85	47	—	—	2.36	60		
F3GN3KA ~ 18KA	1.54	39	—	—	1.97	50		
F3GN25KA ~ 180KA	1.93	49	—	—	2.56	65	**No.10~24UNC**	①
F4GN3KA ~ 18KA	1.54	39	—	—	1.97	50		
F4GN25KA ~ 180KA	1.95	49.5	—	—	2.56	65		
F5GN3KA ~ 18KA	1.95	49.5	—	—	2.76	70		
F5GN25KA ~ 180KA	2.66	67.5	—	—	3.27	83	**1 / 4~20UNC**	
F5GU3KA ~ 180KA	2.85	72.5	—	—	3.74	95		
FBH162□-3.6 ~ 180, FBH162□T-3.6 ~ 180	3.27	83	—	—	3.94	100	**M8P1.25**	②
F2GN10XK (Decimal Gearhead)	—	—	2.87	73	3.35	85	**M4P0.7**	
F3GN10XK (Decimal Gearhead)	—	—	3.11	79	3.54	90		①
F4GN10XK (Decimal Gearhead)	—	—	3.21	81.5	3.74	95	**M5P0.8**	
F5GN10XK (Decimal Gearhead)	—	—	4.11	104.5	4.72	120		
F5GU10XKB (Decimal Gearhead)	—	—	4.43	112.5	5.51	140	**M6P1.0**	②
F2GB3KA ~ 18K	1.30	33	—	—	1.77	45		
F2GB25KA ~ 360KA	1.65	42	—	—	1.97	50	**M4P0.7**	
F4GB3KA ~ 18KA	1.54	39	—	—	1.97	50		①
F4GB25KA ~ 360KA	1.95	49.5	—	—	2.56	65	**M5P0.8**	
F2GB10XK (Decimal Gearhead)	—	—	2.68	68	3.35	85	**M4P0.7**	
F4GB10XK (Decimal Gearhead)	—	—	3.21	81.5	3.74	95	**M5P0.8**	
FBL575□W-5~20, FBL5120□W-5~20,(Combination type)	2.17	55	—	—	2.95	75		
FBL575□W-30~100, FBL5120□W-30~100,(Combination type)	2.68	68	—	—	3.54	90		
FBL575□W-200, FBL5120□W-200,(Combination type)	2.91	74	—	—	3.74	95	**M8P1.25**	
FHBL560N-5~20, FHBL5100N-5~20 (Combination type)	2.17	55	—	—	2.95	75		
FHBL560N-30~100, FHBL5100N-30~100 (Combination type)	2.68	68	—	—	3.54	90		②
FHBL560N-200, FHBL5100N-200 (Combination type)	2.91	74	—	—	3.74	95		
FHBL425□-□	2.32	59	—	—	3.15	80	**M5P0.8**	
FHBL540□-□	2.85	72.5	—	—	3.54	90		
FHBL560□-□	2.93	74.5	—	—	3.54	90	**M6P1.0**	
FHBL690□-□	3.25	82.5	—	—	3.94	100	**M8P1.25**	

●The figure of L₁+L₂ refer to sizes when a decimal gearhead with gear reduction of 25:1 or gearhead are connected
●4 washers and 4 hexangonal nuts are provide with the screws.
●Stainless steel screws are provided with the **FPW** series washdown motors.

Right Angle Gearhead

To assemble the motor and gearhead, use the screws provided with the gearhead. To mount an additional decimal gearhead. To attach the gearhead to other devices, obtain the screws separately.

Gearhead	Screws		
	4 washers and 4 hexangonal nuts are provided		
Model	ℓ inch(mm)	Size of Screws	Shape of Screws
F4GN□RAA•RH	0.59(15)	M5P0.8	②
F5GN(U)□RAA•RH	0.79(20)	M6P1.0	②

Please contact   telst@ms67.hinet.net   for more detailed technical spec. data/drawing

Right-Angle Gearheads

Right- Angle gearheads are flange-mounted Gearheads that use worm gears and special helical gears. They allow motors to be installed at right angles to the axis of equipment such as belt conveyors. They are available in hollow shaft **RH** and solid shaft **RA** models and are ideal for keeping equipment compact.

■Features

• Right angle gearheads with mounting sizes of 3.15 inch square (for 25W) or 3.54 inch square (for 40W)are available for the **GN** pinion mounting sizes of 3.54 inch (for 60 or 90 W) are available for the **GU** pinion. They can be connected to all Oriental Motor AC motors with the exception of clutch and brake and **FPW** washdown motors.

• The output shaft is perpendicular to the motor shaft, so the motor can be installed perpendicular to the axis being driven.

• Eleven gear ratios are available from 3.6:1 to 180:1. The optimum gear ratio can be selected just as with ordinary gearheads. The maximum permissible torques are also the same as for ordinary gearheads.

• Hollow shaft gearheads allow additional space savings and simpler mechanism designs since they do not require couplings for mounting. Usually, hollow shaft gearheads are locked with a torque arm when mounted so the gearhead does not rotate from the reactive force of the load. When mounted with a torque arm, no centering is needed, so it is faster to mount the gearhead on the device.

■Product Number Code

F 5 GU 18 R AA

Type of shaft
AA: Solid type and inch-size output shaft
H: Hollow type

Gear Ratio   R: Right Angle Gearhead

Formosa   GN: GN pinion gear
Motor   GU: GU pinion gear

Gearhead Frame Size
4: 3.15inch sq. (80mm sq.)
5: 3.54inch sq. (90mm sq.)

■Types

Type of shaft	Gearhead Model
Hollow shaft	F4GN3.6RH～4GN180RH
	F5GN3.6RH～5GN180RH
	F5GN3.6RH～5GU180RH
Solid shaft	F4GN3.6AA～5GN180RAA
	F5GN3RAA～5GN180RAA
	F5GU3RAA～5GU180RAA

■ Typical Specifications

Gearhead Model	Gear Ratio	Maximum Permissible Torque lb-in (N · m)		Permissible Overhung Load lb (N)				Permissible Thrust Load	
				0.4″ from shaft end		0.8″ from shaft end		lb	(N)
F4GN□RH	**1/3.6~1/180**	69	(8)	55	(250)*	44	(220)*	22	(100)
F5GN□RH	**1/3.6~1/180**	87	(10)	77	(350) *	68	(310) *	44	(200)
F5GU□RH	**1/3.6~1/180**	174	(20)	123	(560)*	110	(500) *	55	(250)
F4GN□RRA	**1/3.6~1/180**	69	(8)	22	(100)	33	(150)	22	(100)
	1/30~1/180			44	(100)	66	(300)		
F5GN□RRA	**1/3~1/18**	87	(10)	55	(250)	77	(350)	44	(200)
	1/25~1/180			66	(300)	99	(450)		
F5GU□RRA	**1/3~1/9**	174	(20)	88	(400)	110	(500)	55	(250)
	1/12.5~1/25			99	(450)	132	(600)		
	1/30~1/180			110	(500)	154	(700)		

✱Overhung load values for hollowshaft models are distances from the flange mounting surface.
• Enter the gear ratio in the box(□) within the model name.
• Caution: Unlike most worm gear mechanisms, the right-angle gear does not have self-locking capabilities.

Calculating permissible overhung load for hollowshaft models

When the end of the shaft being driven is supported as in the figure below, calculate the permissible overhung load using the following equations.
(This mechanism is the most demanding in terms of overhung load.)

• **F4GN□RH**

Permissible overhung load W [lb] $= \dfrac{2.34}{2.34+Lp} \times 65$ [lb]

✱65 (lb) : Permisible overhung load at flange mounting surface

• **F5GN□RH**

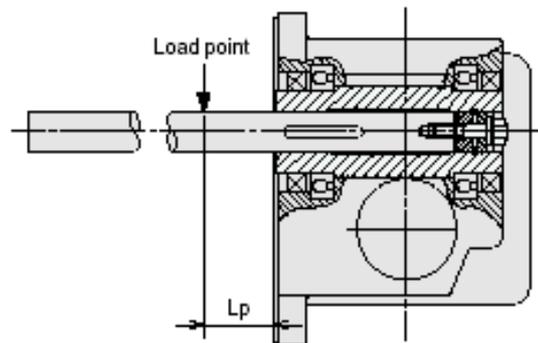Permissible overhung load W [lb] $= \dfrac{2.76}{2.76+Lp} \times 88$ [lb]

✱88 (lb) : Permisible overhung load at flange mounting surface

• **F5GU□RH**

Permissible overhung load W [lb] $= \dfrac{2.70}{270+Lp} \times 142$ [lb]

✱142 (lb) : Permisible overhung load at flange mounting surface

Lp[inch]: Distance from flange mounting surface to Overhung load point

Gearhead Efficiency

The permissible torques shown on the following page cover most motor combinations. For motor combinations not covered, use the efficiency value in the table below for your calculations.
When making a selection, remember that the transfer efficiency at startup is lower than at the rated speed.

Gear Ratio / Gearhead Model		3.6	6	9	15	18	30	36	60	90	120	180
F4GN□RH	Rating	40%		50%				60%				
	Startup	40%		50%				54%				
F5GN□RH	Rating	50%			68%			60%				
	Startup	50%			60%			54%				
F5GU□RH	Rating	50%			68%			60%			50%	
	Startup	50%			60%			54%			45%	
F4GN□RRA	Rating	50						60%				
	Startup	50						54%				

Gear Ratio / Gearhead Model		3	3.6	5	6	7.5	9	12.5	15	18	25	30	36	50	60	75	90	100	120	150	180
F5GN□RRA	Rating					68%									60%						
	Startup					60%									54%						
F5GU□RRA	Rating					68%							60%						50%		
	Startup					60%							54%						45%		

Linear Heads

F type

Reversible Motor
(Terminal Box Type)

Electromagnetic
Brake Motor

Reversible Motor

B type

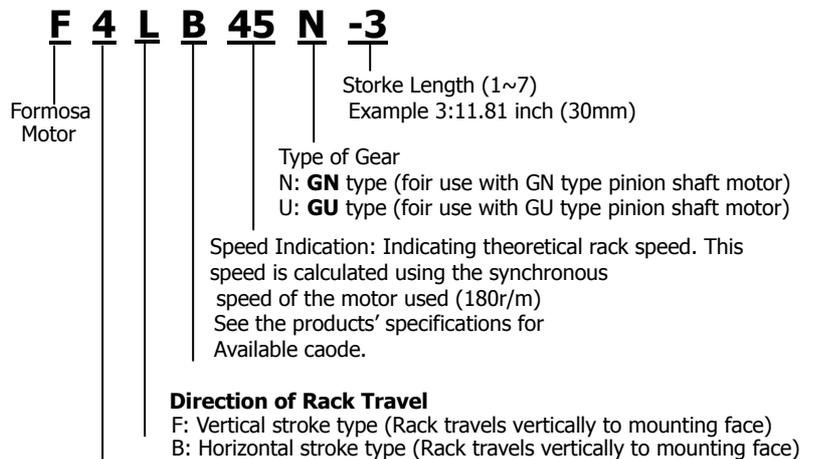**(Motors are sold seperately)**

■Features

Linear heads are linear motion rack-and-pinion units for use
With our standard AC motors.

● Depending on the type of motor coupled directly to the linear
  head, various types of movements are possible.
● A wide range of products are available.
● Motors for direct coupling to the linear heads are sold
  separately.
● Decimal gearheads which reduce the basic speed by 10:1
  are available.

■Product Number Code

F 4 L B 45 N -3

Formosa
Motor

Storke Length (1~7)
  Example 3:11.81 inch (30mm)

Type of Gear
N: **GN** type (foir use with GN type pinion shaft motor)
U: **GU** type (foir use with GU type pinion shaft motor)

Speed Indication: Indicating theoretical rack speed. This
speed is calculated using the synchronous
 speed of the motor used (180r/m)
See the products' specifications for
Available caode.

Direction of Rack Travel
F: Vertical stroke type (Rack travels vertically to mounting face)
B: Horizontal stroke type (Rack travels vertically to mounting face)

L: Linear Head

Frame size
0: 1.67inch sq. (42mm sq.)
2: 2.36inch sq. (60mm sq.)
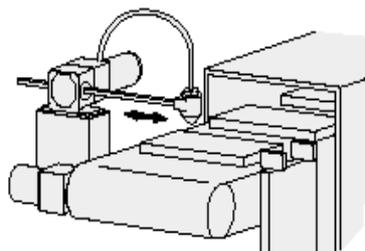4: 3.15inch sq. (80mm sq.)
5: 3.54inch sq. (90mm sq.)

■Example Applications

L-line provides a linear drive mechanism in the form of a unit. it can be used in a variety of applications,
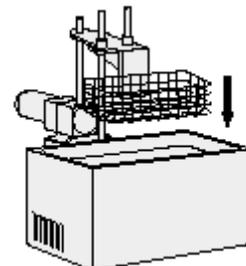As shown in the figures, for simpler mechanism design and easier wiring.

1. pressing operation
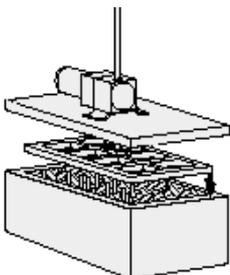
2.Reversing operation

3.Traveling operation

General Specifications

Type of Linear Hand	Basic Speed		Max. Permissible Thrust Force		Stroke Length	Page
	In./s	mm/s	lbs.	kg	in. (mm)	
0L type	0.94	24	8.4	3.8	3.9, 7.9 (100, 200)	A-233
	0.47	12	14	6.3		
	0.24	6	22	10		
2L type	2.4	60	19	8.7	3.9, 7.9, 11.8, 15.7, 19.7 (100,200,300,400,500)	A-234
	1.2	30	33	15		
	0.47	12	44	20		
4L type	2.1	54	68	31	3.9, 7.9, 11.8, 15.7, 19.7, 23.6, 27.6 (100,200,300,400,500,600,700)	A-238
	0.94	24	128	58		
	0.47	12	154	70		
5L-N type	2.1	54	229	104	3.9, 7.9, 11.8, 15.7, 19.7, 23.6, 27.6 (100,200,300,400,500,600,700)	A-243
	0.94	24	308	140		
	0.47	12	308	140		
5L-U type	2.1	54	229	104	3.9, 7.9, 11.8, 15.7, 19.7, 23.6, 27.6 (100,200,300,400,500,600,700)	A-248
	0.94	24	308	140		
	0.47	12	308	104		

- Basic speed is based on the synchronous speed (1800r/min at 60Hz). The actual speed varies with the load or power supply frequency.
- The permissible thrust force is determined by the strength of the linear head. Just as when connecting a gearhead to the motor, increasing the gear ratio
  generates greater thrust force, but the motor should always be operated below the maximum permissible thrust force.
- The thrust force is the value when operating the rack in a horizontal direction.
- The thrust force given is for when combined with a reversible motor.

Applications and Recommended Motor Combinations

Application	Applicable Motor	0L type	2L type	4L type	5L-N type	5L-U type
Constant Speed	**Reversible Motors**	FORK1GN-AUL	F2RK6GN-AW(T)U F2RK6GN-CW(T)E F2RK6GN-AUL	F4RK25GN-AW(T)U F4RK25GN-CW(T)E F4RK25GN-AUL	F5RK40GN-AW(T)U F5RK40GN-CW(T)E F5RK40GN-AUL	F5RK60GN-AW(T)U F5RK60GN-CW(T)E F5RK60GN-AUL F5RK90GN-AW(T)U F5RK90GN-CW(T)E F5RK90GN-AUL
	Synchronous Motors	—	F2SK4GN-AUL	F4SK15GN-AUL	F5SK25GN-AUL	—
	Electromagnetic Brake Motors	—	F2RK6GN-AWMU F2RK6GN-CWME F2RK6GN-AMUL	F4RK25GN-AWMU F4RK25GN-CWME F4IK25GN-SWM F4RK25GN-AMUL	F5RK40GN-AWMU F5RK40GN-CWME F5IK40GN-SWM F5RK40GN-AMUL —	F5RK60GN-AWMU F5RK60GN-CWME F5IK60GN-SWM F5RK60GN-AMUL F5RK90GN-AWMU F5RK90GN-CWME F5IK690N-SWM F5RK90GN-AMUL
	Torque Motors	—	—	F4TK10GN-AUL	F5TK20GN-AUL	—

- The torque motor does not have a built-in friction brake. Be sure that the torque motor has no holding brake force even when stopping during vertical operation. When operating a torque motor at high-speed. Ensure that the rack does not hit an object and stop, since this can add excessive torque to the linear head and subject it to inertial stock which can significantly shorten its life.

Please contact   telst@ms67.hinet.net   for more detailed technical spec. data/drawing

Planetary Gearheads

The basic gearing system of a planetary is showed as below. This gearhead gets its name from its resemblance to a solar system.   In this case, planet gears revolve around a sun gear. The input shaft rotates the sun gear. Each of the planet gears simultaneously apply a torque to the rotating planet member which then applies a torque to the output shaft (back side) This is a more sturdy and accurate system than the inline spur. An inline planetary gearhead can handle more than double the output torque of a spur of the same size. But due to the extra parts and assembly work, they can be quite a bit more expensive.

In general, planetary gearheads are used in positioning applications and usually far more precise, robust, and costly. Offset gearheads are ideal for unidirectional constant velocity applications where backlash is not a concern.

sun gear (coupled to input shaft)

planet gear (coupled to rotating planet member)

rotating planet member (coupled to output shaft)

stationary member **(Ring Gear)**

The planetary gearhead is approximately 90% efficient and can have a backlash as low as 5 arc minutes. Gear reductions is more elastic than spurs gears. To learn more information about the planetary gearhead and full range of our detailed catalogue, we suggest you contact our sales engineer by telst@ms67.hinet.net.

RING GEAR

PLANET GEAR (CARRIER)

SUN GEAR
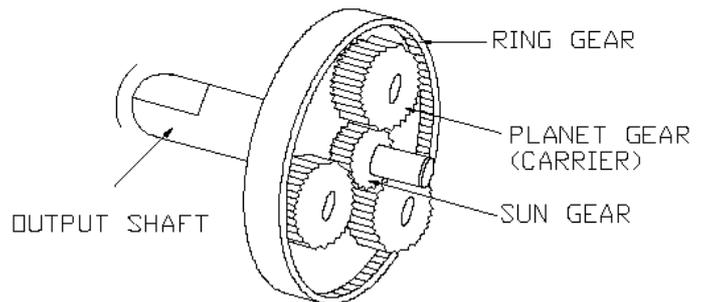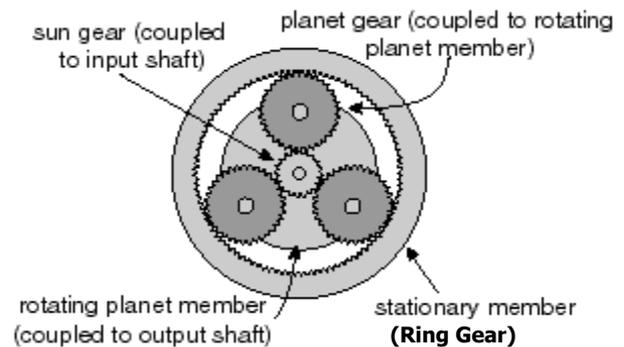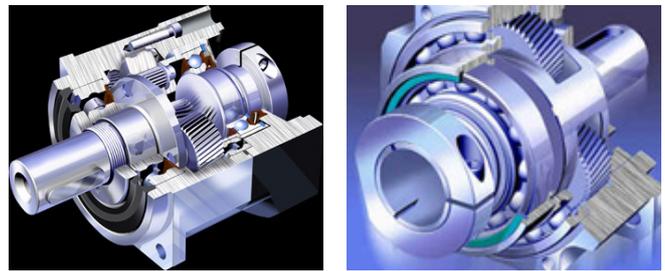
OUTPUT SHAFT

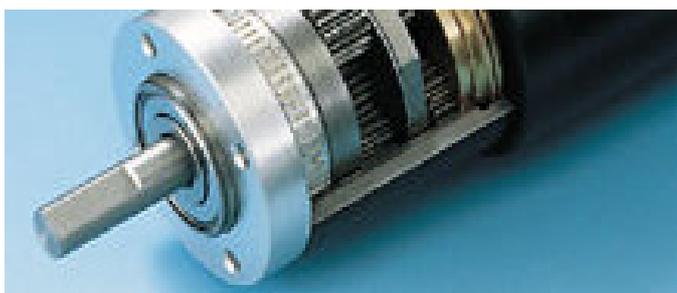● **HIGH PRECISION SQUARE FLANGE TYPE FOR INDUSTRIAL USAGE**

Typical Specifications

Gearhead Model	Size (mm)	Output Shaftt (mm)	Gear Ratio	Maximum Permissiible Torque Ib-in (N · m)	Permissible Overhung Load Ib (N.m)		Permissible Thrust Load
					0.4″ from shaft end	0.8″ from shaft end	Ib (N.m)
FPG42	□42x42x66L	Φ13x21L	1/3~1/150	190 (22)	26 (3.0)	39 (4.5)	8.6 (1.0)
FPG60	□60x60x84L	Φ16x30L	1/3~1/150	520 (60)	52 (6.0)	78 (9.0)	17.4 (2.0)
FPG70	□70x70x100L	Φ14x30L	1/3~1/150	520 (60)	52 (6.0)	78 (9.0)	17.4 (2.0)
FPG90	□90x90x106L	Φ22x38L	1/3~1/350	1388 (160)	130 (15.0)	195 (22.5)	43.4(5.0)
FPG115	□115x115x134L	Φ32x53L	1/3~1/350	2864 (330)	277 (32.0)	416 (48.0)	92.0 (10.6)
FPG142	□142x142x158L	Φ40x82L	1/3~1/1000	5642 (650)	434 (50.0)	651 (75.0)	148 (17.0)
FPG180	□180x180x200L	Φ55x80L	1/3~1/1000	10416 (1200)	694 (80.0)	1042 (120.0)	234 (27.0)
FPG220	□220x220x230L	Φ75x108L	1/3~1/1000	17360 (2000)	1110 (128.0)	1665 (192.0)	373 (43.0)

∗Overhung load values for hollowshaft models are distances from the flange mounting surface.
● Enter the gear ratio in the box(□) within the model name.
● Caution: Unlike most worm gear mechanisms, the right-angle gear does not have self-locking capabilities.

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● ROUND HOUSING TYPE FOR ECONOMIC USAGE

Typical Specifications

Gearhead Model	Size (mm)	Output Shaftt (mm)	Gear Ratio	Maximum Permissiible Torque Ib-in (N · m)	Permissible Overhung Load Ib (N.m)		Permissible Thrust Load Ib (N.m)
					0.4″ from shaft end	0.8″ from shaft end	
FPG42R	Φ 42x52L	Φ8x20L	1/4~1/3000	78 (9.0)	8.7 (1.0)	13.0 (1.5)	4.3 (0.5)
FPG60R	Φ 60x62L	Φ12x22L	1/4~1/1000	173 (20.0)	17.4 (2.0)	26.1 (3.0)	8.7 (1.0)
FPG70R	Φ 70x100L	Φ12x22L	1/3~1/1000	260 (30)	17.4 (2.0)	26.1(3.0)	8.7 (1.0)
FPG80R	Φ 80x100L	Φ14x30L	1/3~1/1000	520 (60)	52 (6.0)	39.1 (9.0)	26 (3.0)
FPG90R	Φ 90x105L	Φ18x42L	1/3~1/1000	1042 (120)	104 (12.0)	156 (18.0)	52 (6.0)

✳Overhung load values for hollowshaft models are distances from the flange mounting surface.

● Enter the gear ratio in the box(□) within the model name.

● Caution: Unlike most worm gear mechanisms, the right-angle gear does not have self-locking capabilities.

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