HarmonicGearhead®

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High-Performance Gearheads for Servomotors

HarmonicPlanetary®

HPN-A Right Angle Series

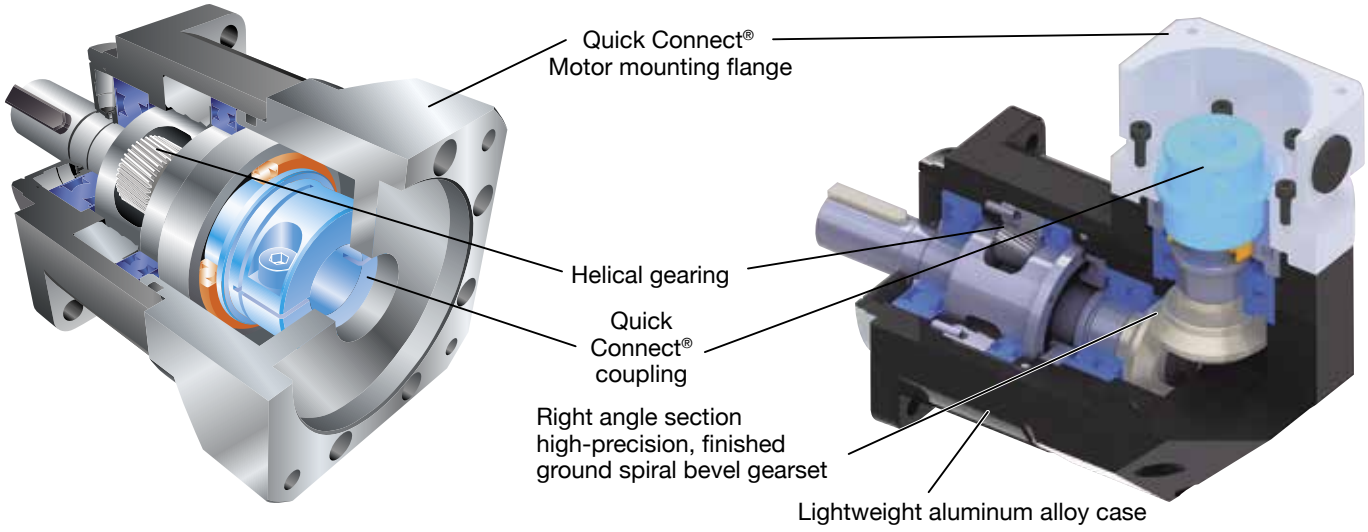
ISO14001
ISO9001

HarmonicPlanetary® HPN Series

GEARHEAD

HPN precision planetary gearheads are quiet, lightweight and compact with low cost and quick delivery.

Gearhead **Right Angle**



HPN Planetary gearheads feature a robust design utilizing helical gears for quiet performance and long life. These gearheads are available with short lead times and are designed to couple to any servomotor with our Quick Connect® motor adaptation system. HPN gearheads are suitable for use in a wide range of applications for precision motion control and positioning. HPN Harmonic Planetary® gears are available in 5 sizes: 11, 14, 20, 32, and 40, with reduction ratios ranging from 3:1 to 50:1.

- **Low Backlash:**
  - **Single Stage: < 6 arc minutes**
  - **Double Stage: < 9 arc minutes**
- **High Efficiency**
- **Available Reduction Ratios: 3:1 to 50:1**
- **Helical Gearing**
- **Low Noise Design**
- **Smooth, High-Speed Transmission**

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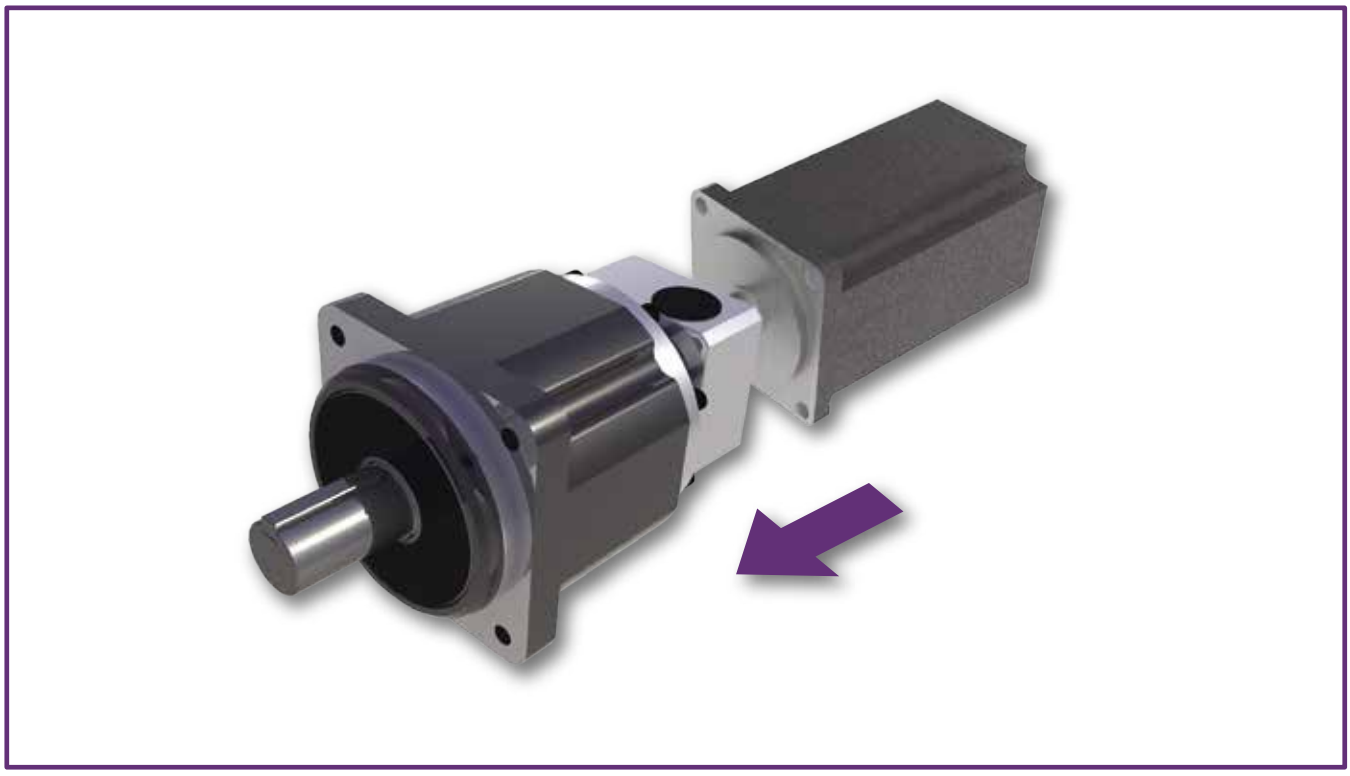
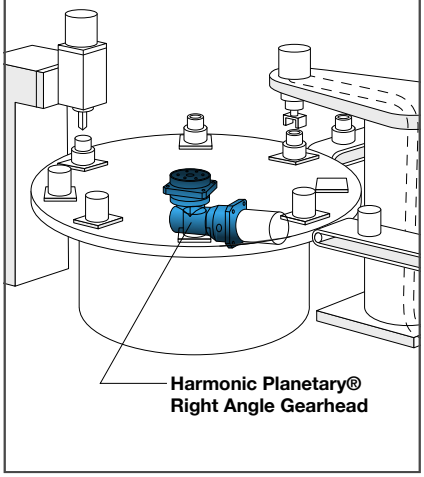
Create a high-precision actuator by connecting any manufacturer's servomotor to our precision gearhead with Quick Connect® motor adaptation design.

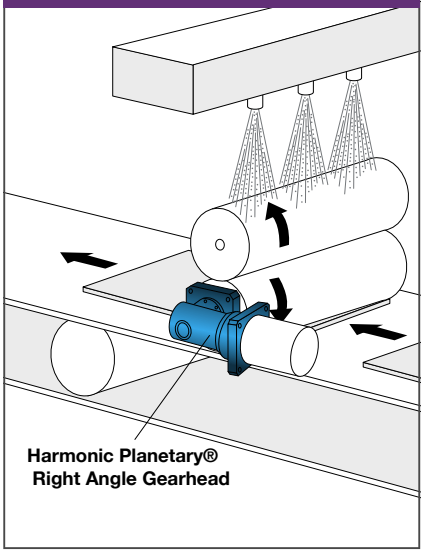


Application Examples

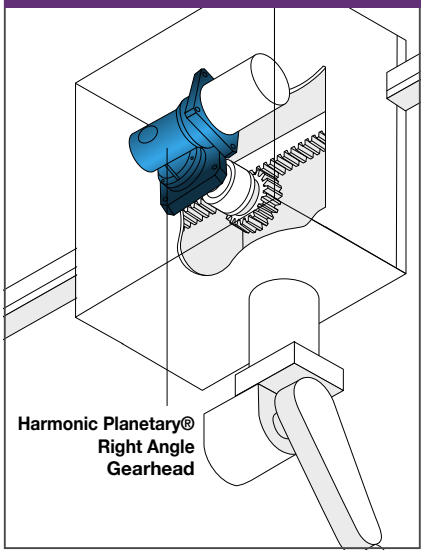
Index Tables



Roller Drive



Linear Axis Drive



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HarmonicPlanetary®
HPN Right Angle

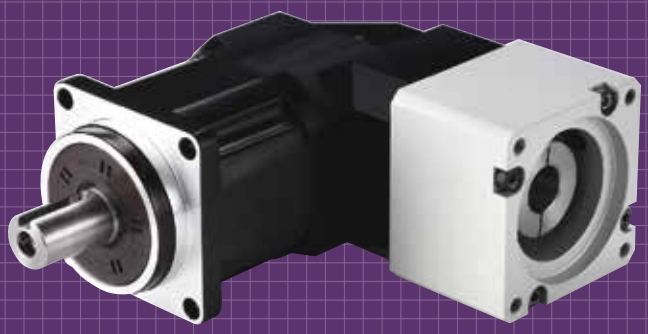
Size
11, 14, 20, 32, 40
5 Sizes

Peak Torque
9Nm ～ 752Nm

Reduction Ratio
Single Stage: 3:1 to 10:1
Two Stage: 15:1 to 50:1

Backlash
Single Stage: <6 arc-min
Two Stage: <9 arc-min

Easy mounting to a wide variety of servomotors
Quick Connect® motor adaptation system includes a clamshell style servo coupling and piloted adapter flange.



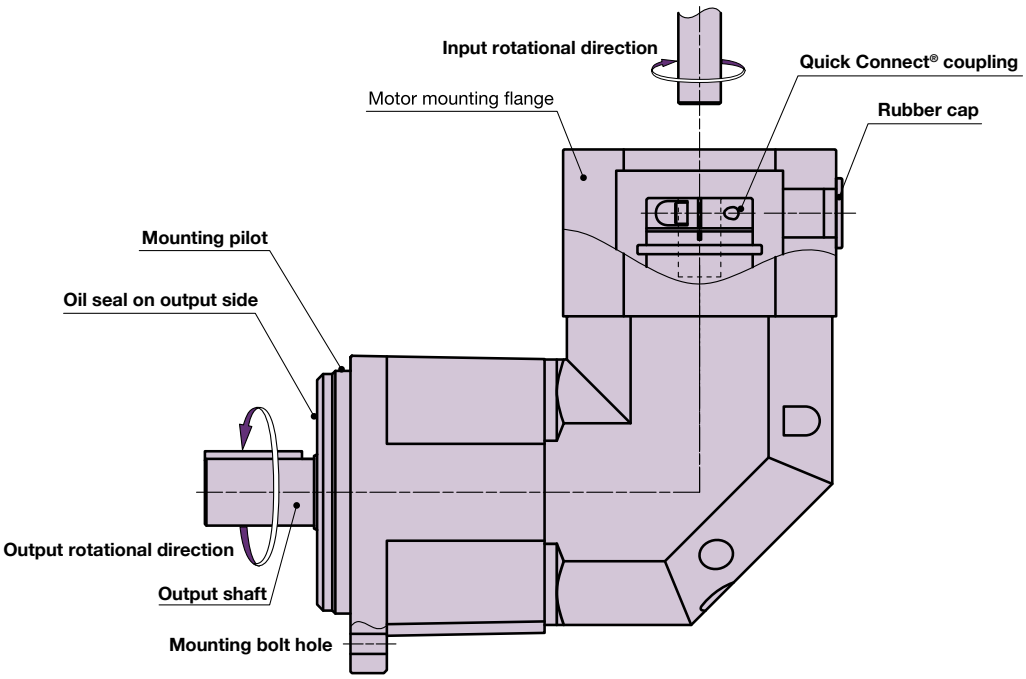
CONTENTS

HPN - 20 A - 15 - J6 RA2 - Motor Code

Model Name	Size	Design Revision	Reduction Ratio	Output Shaft Configuration	Right Angle Specification	Input Configuration
HPN Right Angle HarmonicPlanetary®	11	A	4, 5, 7, 10	J6: Shaft output with key and center tapped hole J8: Shaft output with center tapped hole	RA1	This code represents the motor mounting configuration. If unknown, substitute the motor model # and the motor code will be identified (or assigned).
	14		3, 4, 5, 7, 10, 15, 20, 25, 30, 35, 40, 45, 50		RA1, RA2	
	20				RA2, RA3	
	32				RA3, RA4	
	40				RA4, RA5	

Gearhead Construction

Figure 04-1



Rating Table

Please contact us if you have any questions about specifications and comparisons with other company's products.

Table 05-1

Size	Number of stages	Ratio	Rated output torque *1 L10	Rated output torque *1 L50	Limit for repeated peak torque *2	Limit for momentary peak torque *3	Rated Input Speed (rpm) *4	Maximum Input Speed (rpm) *5	Backlash
			N·m	N·m	N·m	N·m	rpm	rpm	arc-min
11A	1	4	9	14	14	40	3000	10000	<9
		5	9	14	16	40			<8
		7	8	11	11	40			<7
		10	7	9	9	40			
14A	1	3	14	21	21	78	3000	6000	<6
		4	18	28	28	104			
		5	18	29	35	107			
		7	20	30	37	100			
		10	14	18	18	79			
	2	15	21	30	43	97			<9
		20	23	30	49	100			
		25	26	30	38	102			
		30	26	40	48	98			
		35	28	40	49	99			
		40	29	30	38	100			
		45	29	30	38	100			
		50	20	26	26	94			
20A	1	3	31	45	45	147	3000	6000	<6
		4	50	60	60	196			
		5	52	75	75	245			
		7	55	80	105	256			
		10	41	54	54	216			
	2	15	59	80	105	256			<9
		20	66	80	140	256			
		25	72	80	114	256			
		30	72	80	139	250			
		35	79	80	112	256			
		40	80	80	112	256			
		45	80	80	112	256			
		50	58	75	75	216			
32A	1	3	84	84	84	288	3000	6000	<6
		4	112	112	112	384			
		5	127	139	139	480			
		7	135	195	195	625			
		10	128	185	185	625			
	2	15	146	200	225	625			<9
		20	162	200	297	625			
		25	176	200	371	625			
		30	179	250	376	625			
		35	193	250	376	625			
		40	200	300	376	625			
		45	206	300	376	625			
		50	193	251	251	625			
40A	1	3	186	186	186	1,137	3000	5000	<6
		4	245	245	245	1,265			
		5	298	310	310	1,265			
		7	317	430	430	829			
		10	302	480	509	829			
	2	15	342	417	417	1265		6000	<9
		20	380	555	555	1265			
		25	413	650	694	1127			
		30	421	650	752	1265			
		35	452	700	752	1127			
		40	468	700	752	1127			
		45	484	700	752	1,127			
		50	432	562	562	1,162			

*1: Rated torque is based on life of 20,000 hours at max average input speed.
*2: Limit for torque during start and stop cycles.
*3: Limit for torque during emergency stops or from external shock loads. Always operate below this value.
*4: Limit for average input speed during operation.
*5: Maximum instantaneous input speed.

Performance

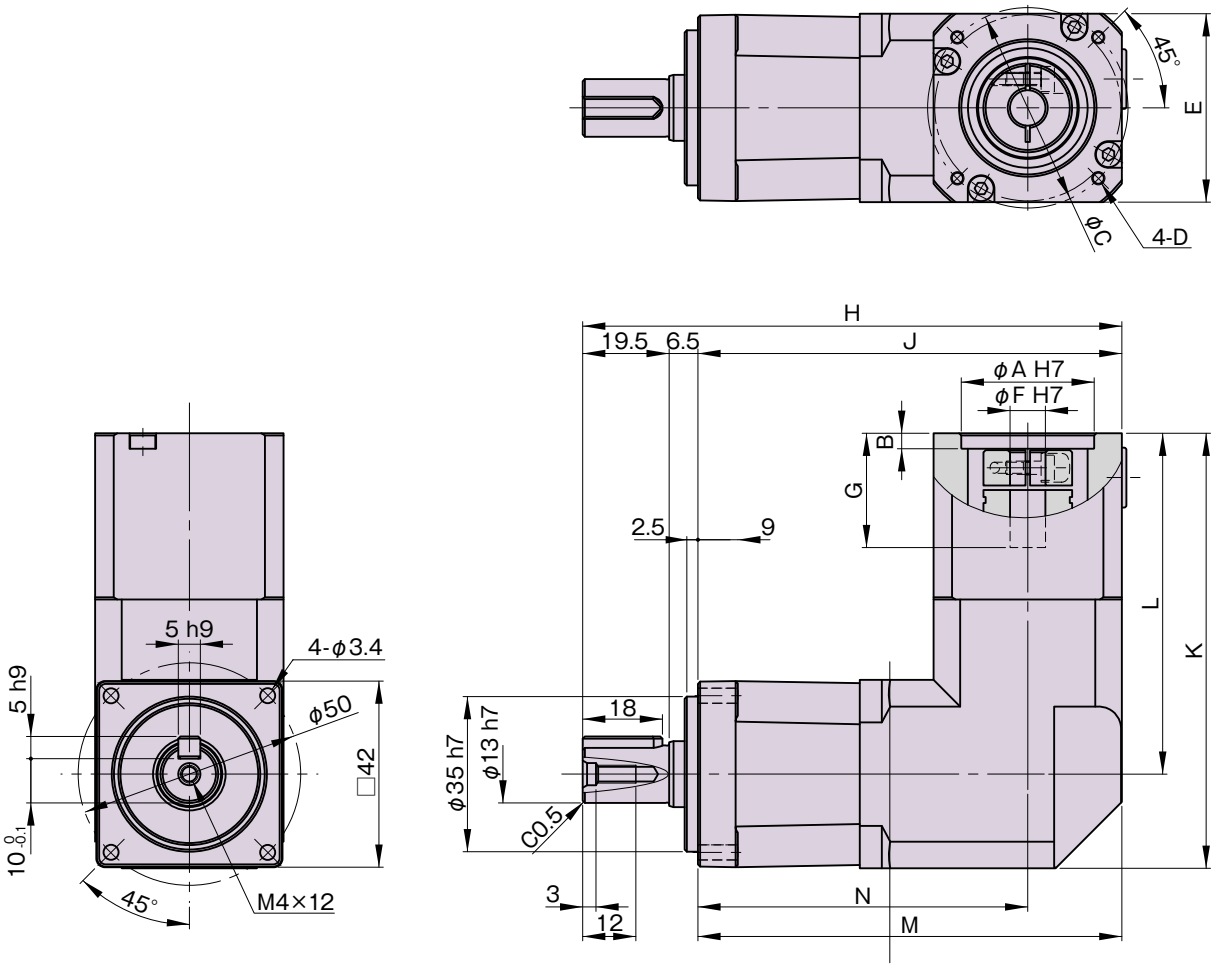
Table 05-2

Size	11			14	20	32	40	14	20	32	40
Number of stages	1							2			
Reduction ratio	4	5	7, 10	3, 4, 5, 7, 10				15, 20, 25, 30, 35, 40, 45, 50			
Backlash arc min	<9	<8	<7	<6				<9			

11A Outline Dimensions

Figure 06-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 06-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Single Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	8	8	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	95.7	74.4	0.95

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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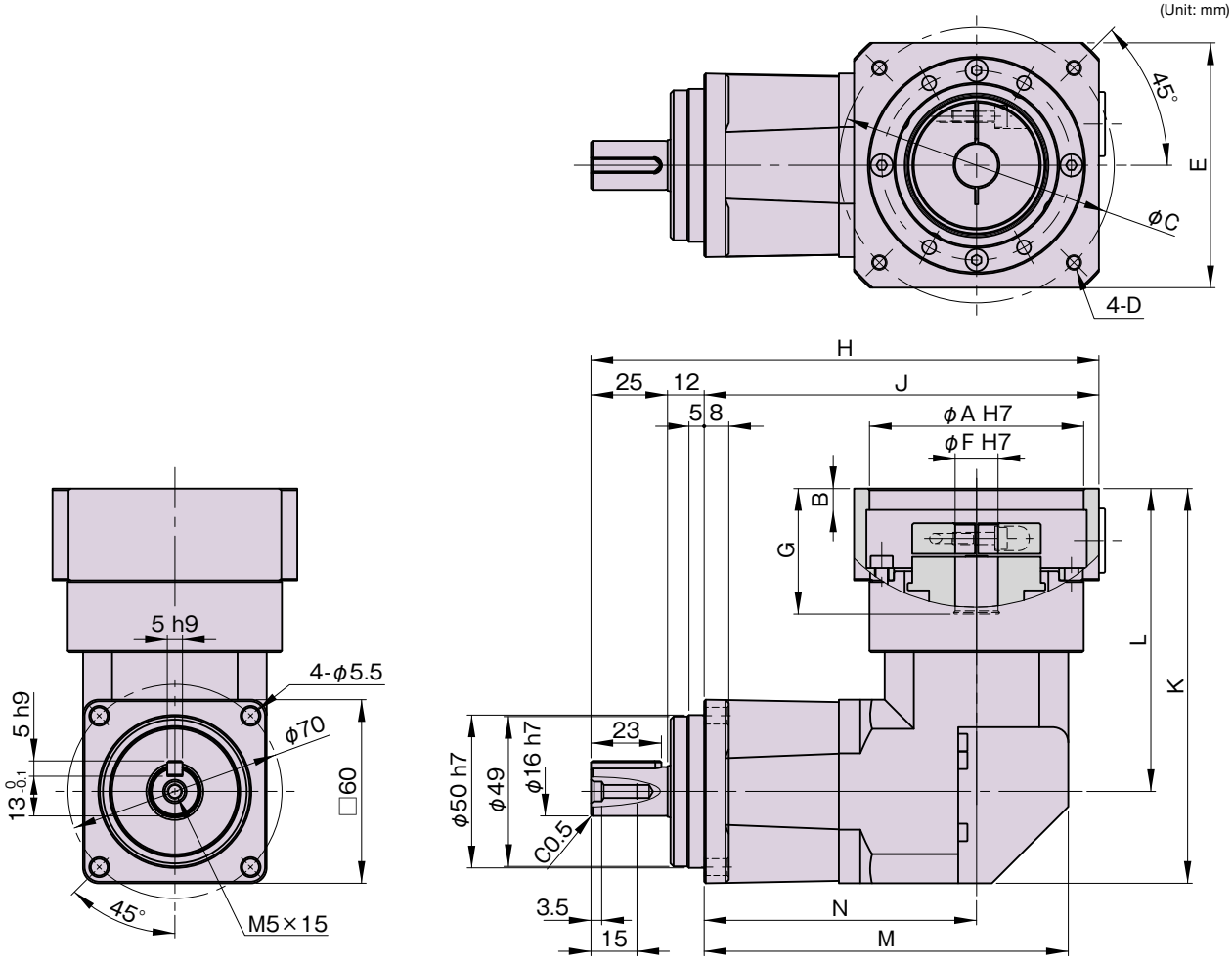
14A Outline Dimensions

Figure 07-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 07-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Single Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	8	24	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	119	89	2.1

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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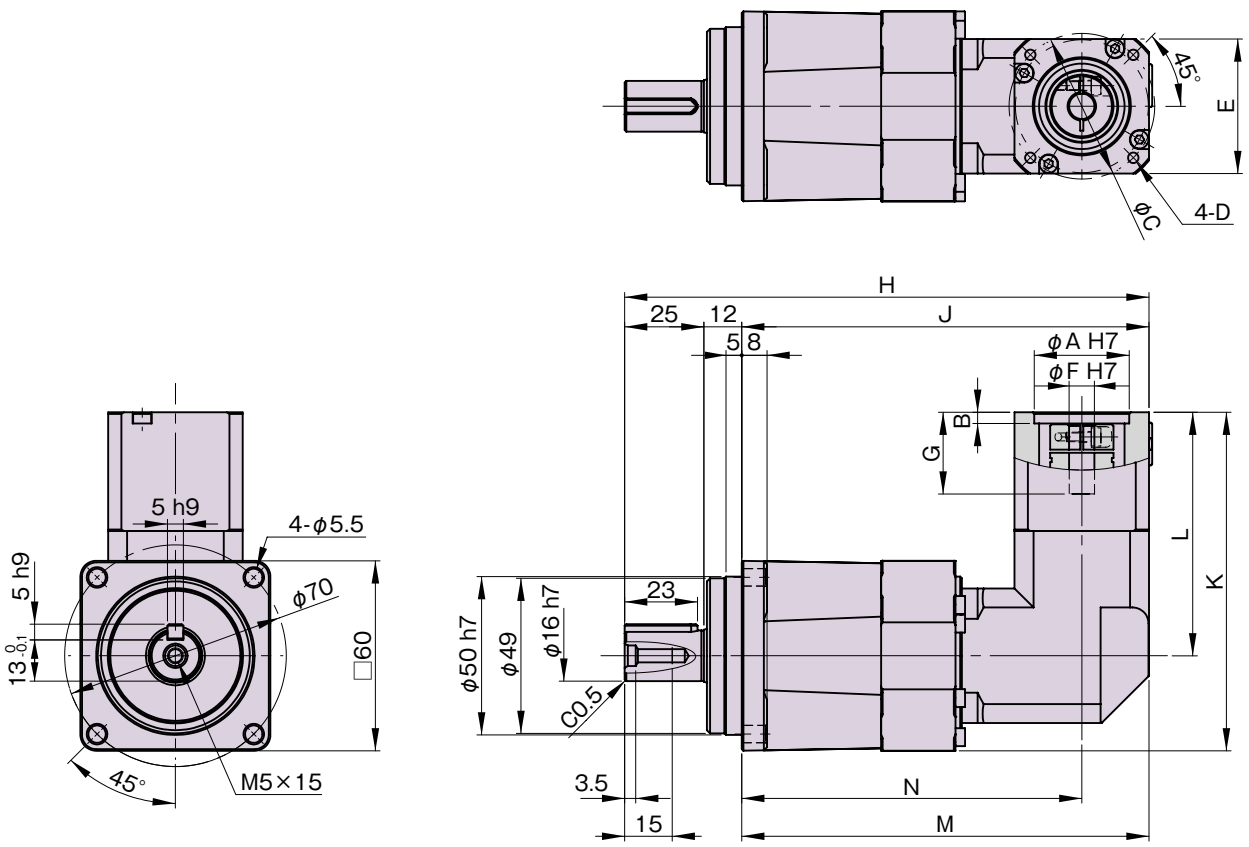
14A Outline Dimensions

Figure 08-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 08-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Double Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	8	24	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	128.7 / 142	107.4 / 112	2.3

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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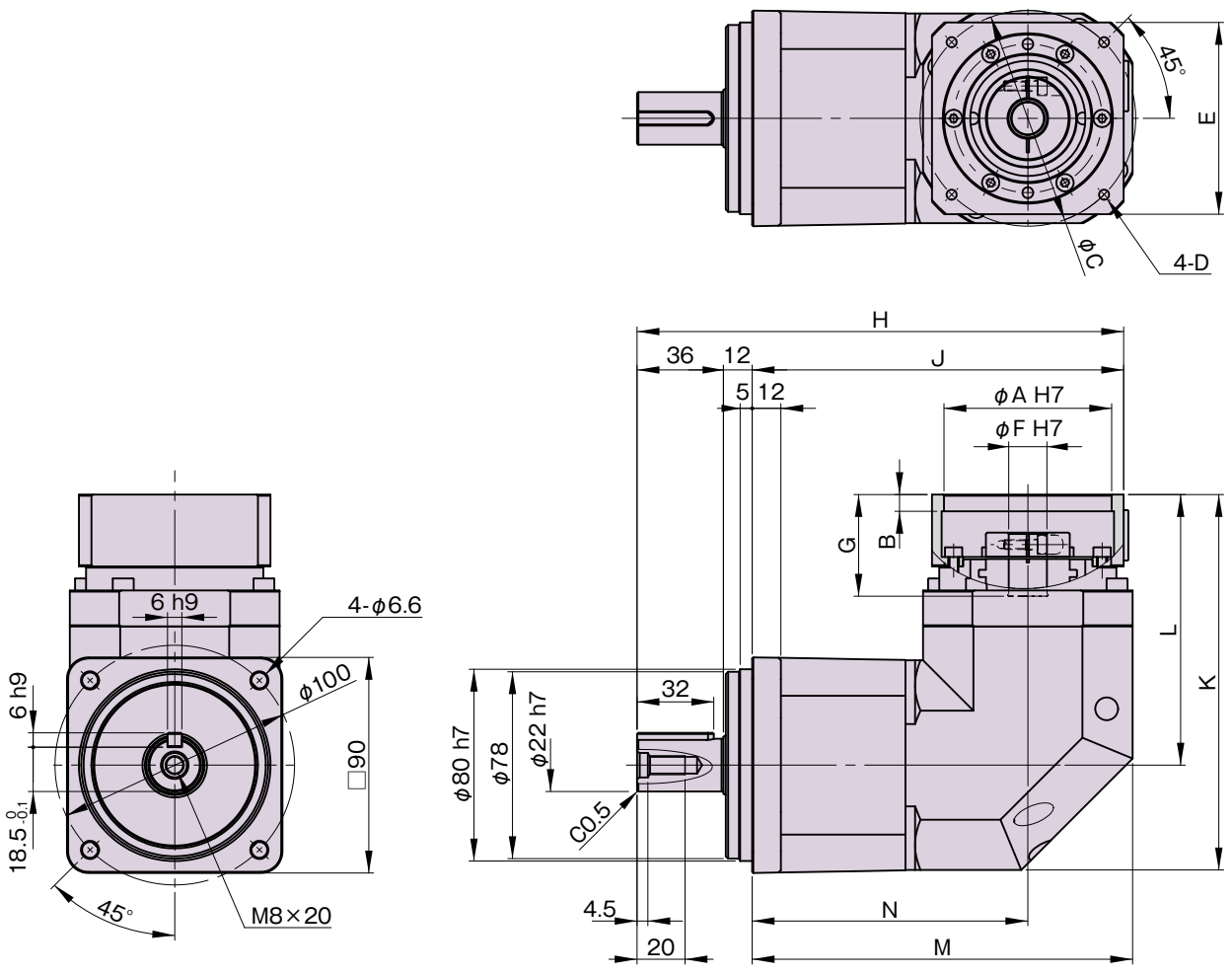
20A Outline Dimensions

Figure 09-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 09-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Single Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	14	24	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	158.9	115.1	5.8

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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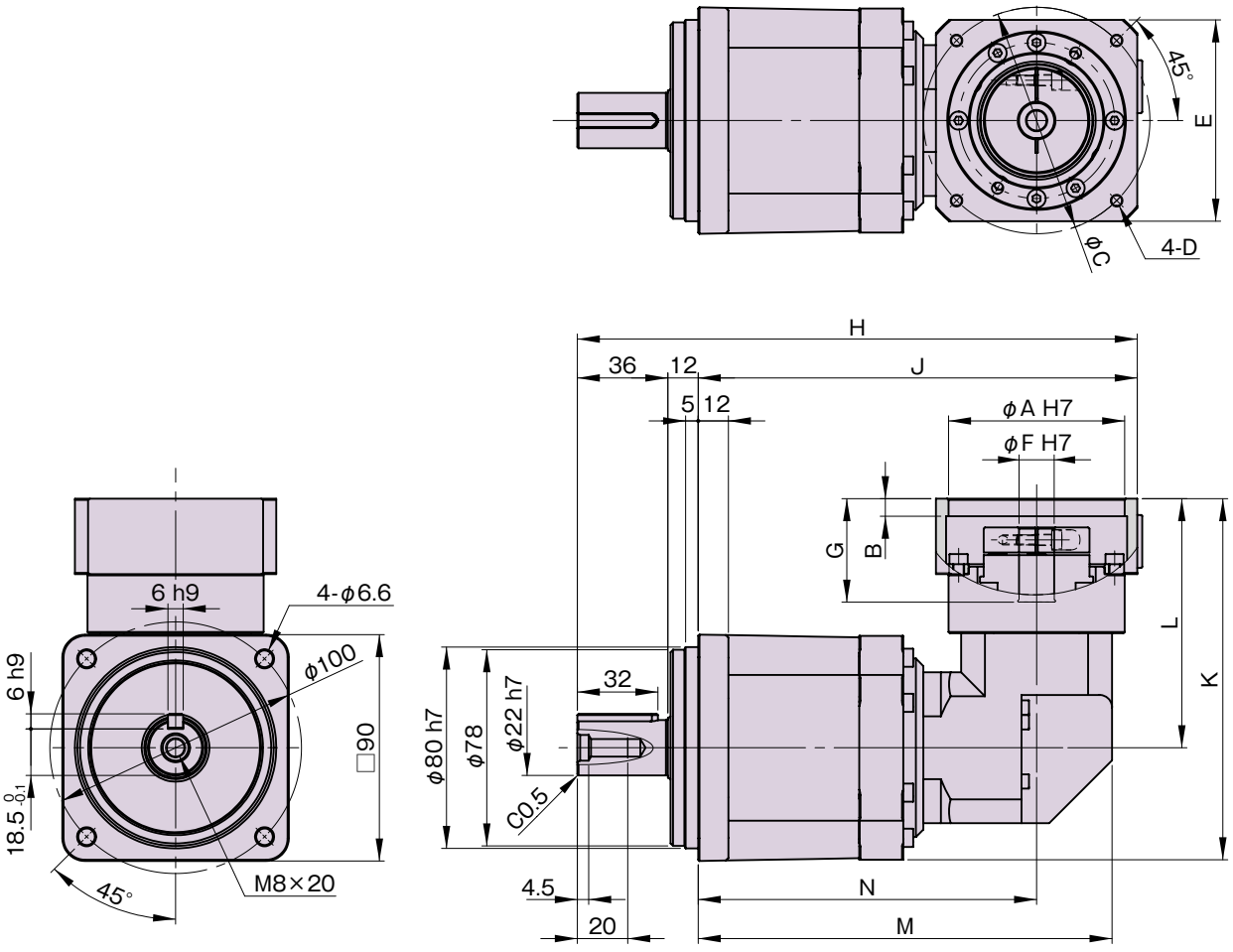
20A Outline Dimensions

Figure 010-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 010-1
(Unit: mm)

	A H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Double Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	11	24	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	164.5	164.5	4.3

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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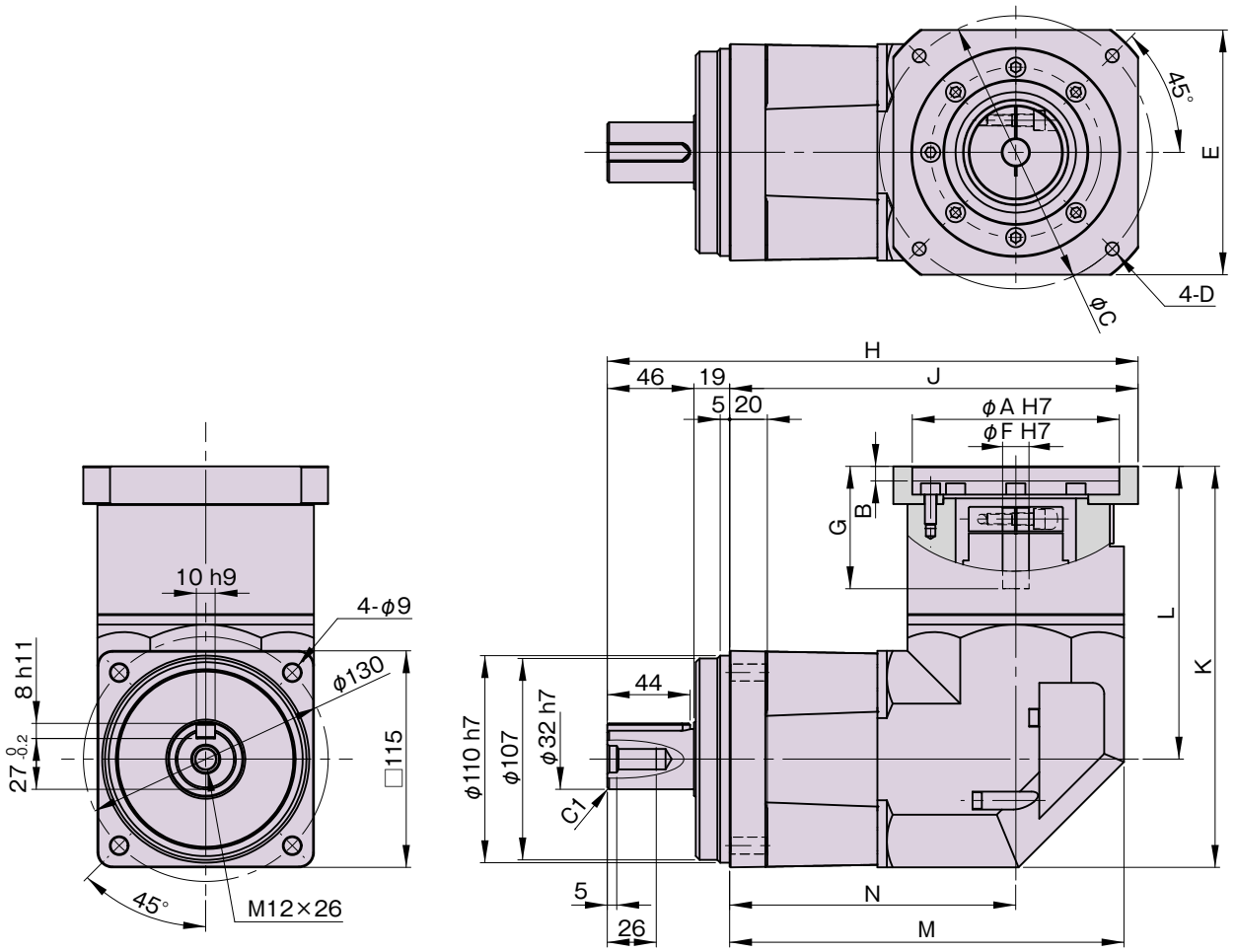
32A Outline Dimensions

Figure 011-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 011-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Single Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	14	35	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	209.5	152	15

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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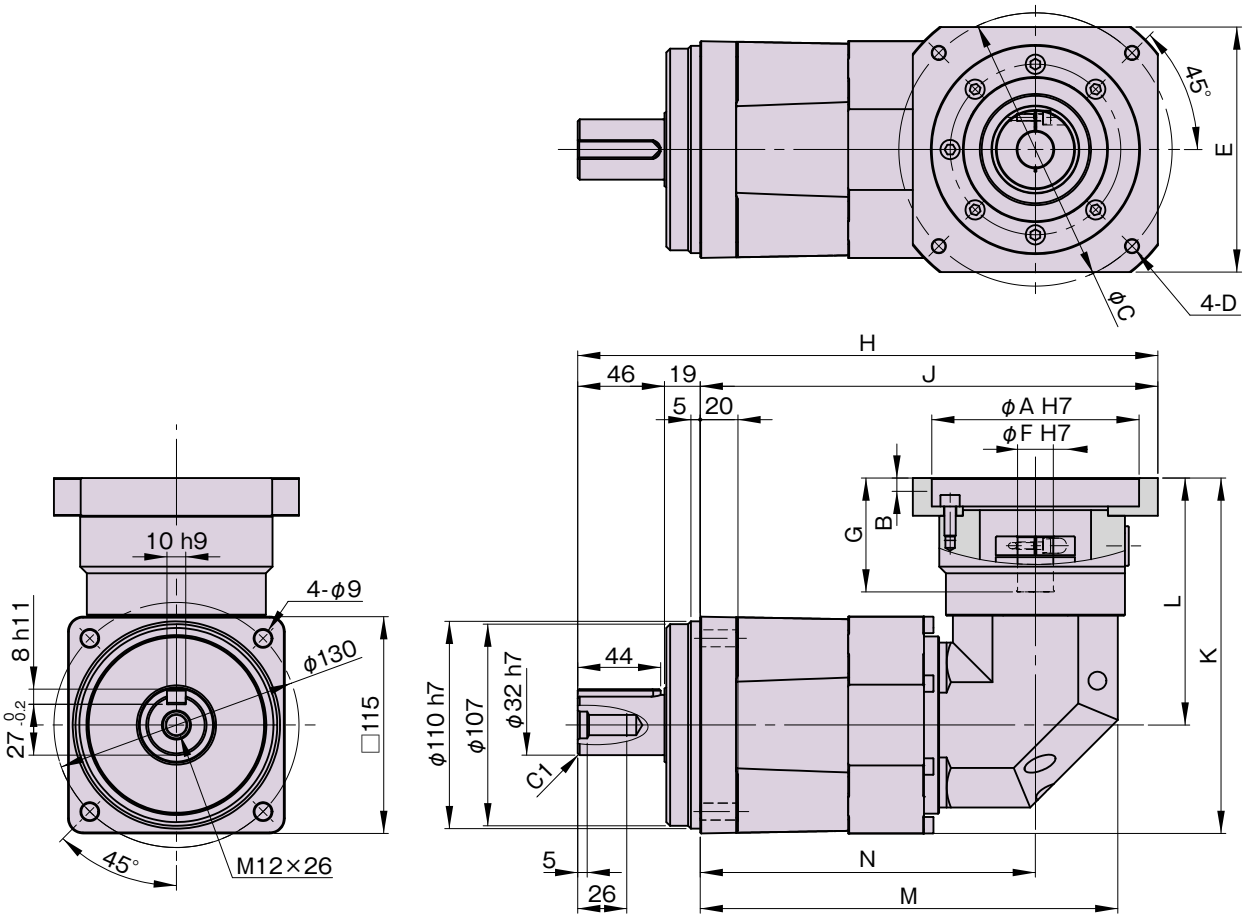
32A Outline Dimensions

Figure 012-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 012-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Double Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	14	24	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	221.6	177.8	11

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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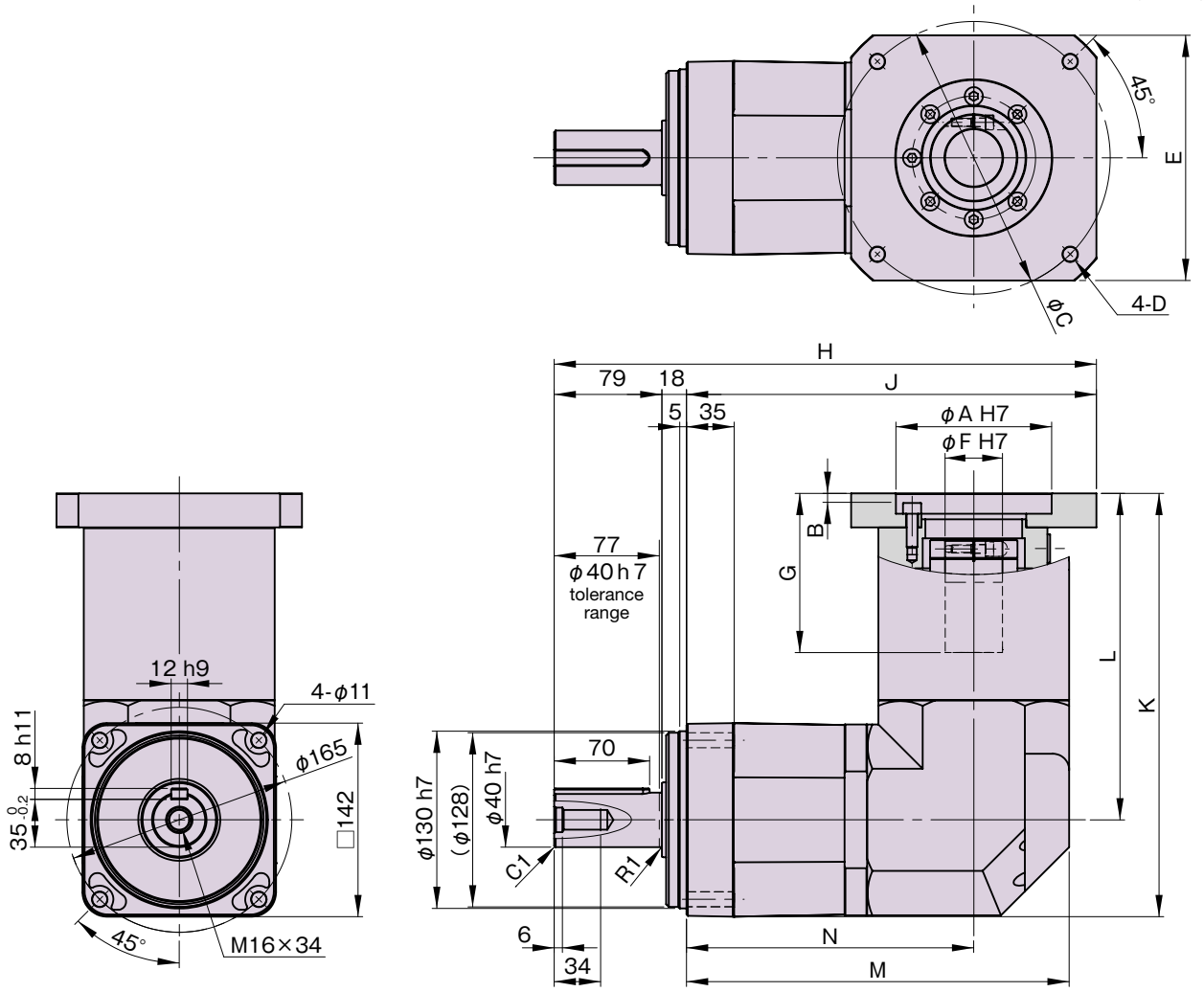
40A Outline Dimensions

Figure 013-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 013-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Single Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	16	42	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	280.7	210.7	28

*1: Dimensions for Quick Connect Adaptation Designs are tailored to the customer specified motor; detailed part #, drawings, and models furnished upon request
*2: The mass varies slightly depending on the reduction ratio and on the inside diameter of the input shaft coupling

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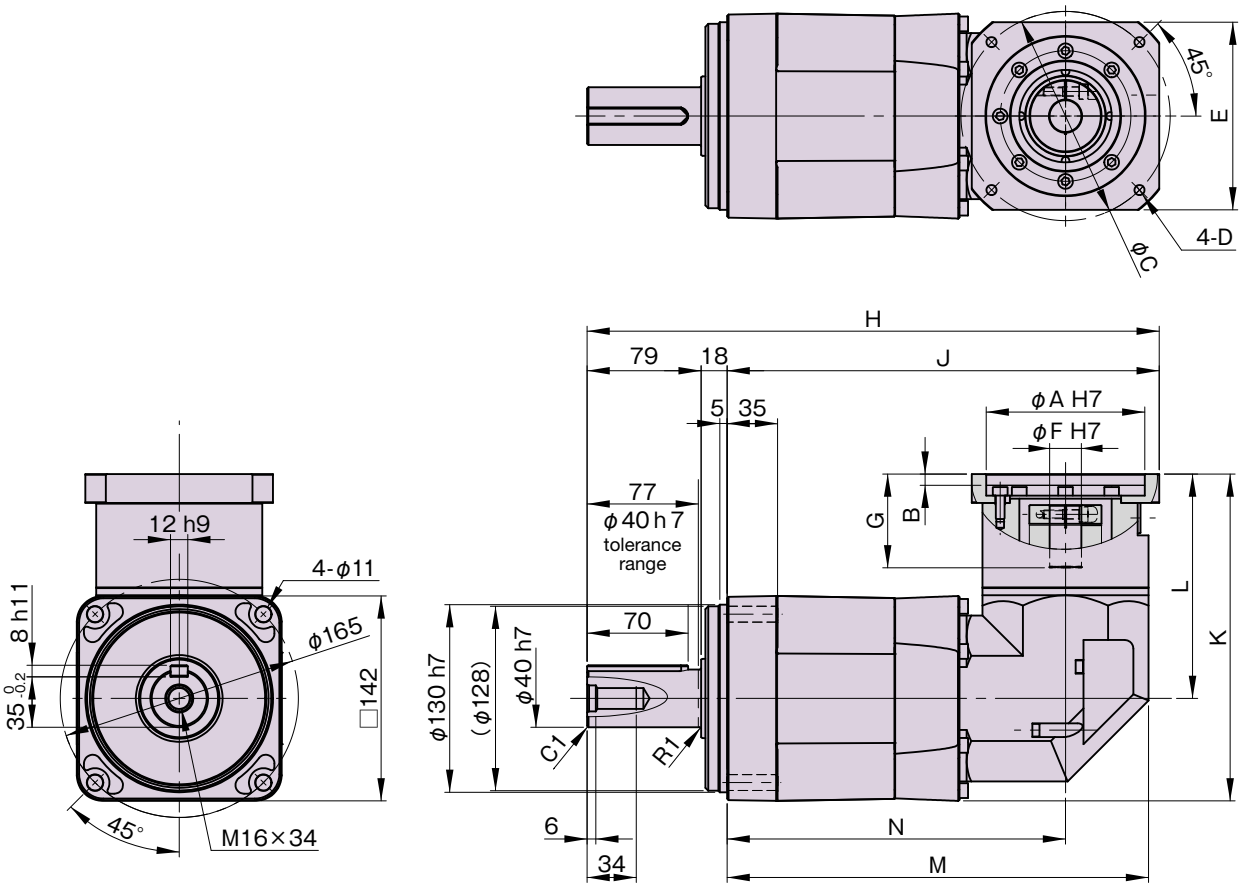
40A Outline Dimensions

Figure 014-1

(Unit: mm)



* The dimension tolerances that are not specified vary depending on the manufacturing method (casting, machined components). Please contact us for dimension tolerances not shown on the drawing above.
* Output shaft configuration shown is J6 (with a key and center tapped hole). The configuration J8 does not have a key.

Dimensions

Table 014-1
(Unit: mm)

	A (H7)	B	C	D	E	Motor Shaft Diameter F (H7) Min	Motor Shaft Diameter F (H7) Max	G	H	J	K	L	M	N	Mass (kg) *2
Double Stage	Pilot Diameter*1	Pilot Bore Depth*1	Bolt Circle Diameter*1	Bolt Hole Thread and Depth*1	Input Flange Width (square)*1	14	35	Input Coupling Bore Depth*1	Length Dimension Output Axis*1	Length Output Axis*1	Length Input Axis*1	Length Output Axis*1	337	279.5	24

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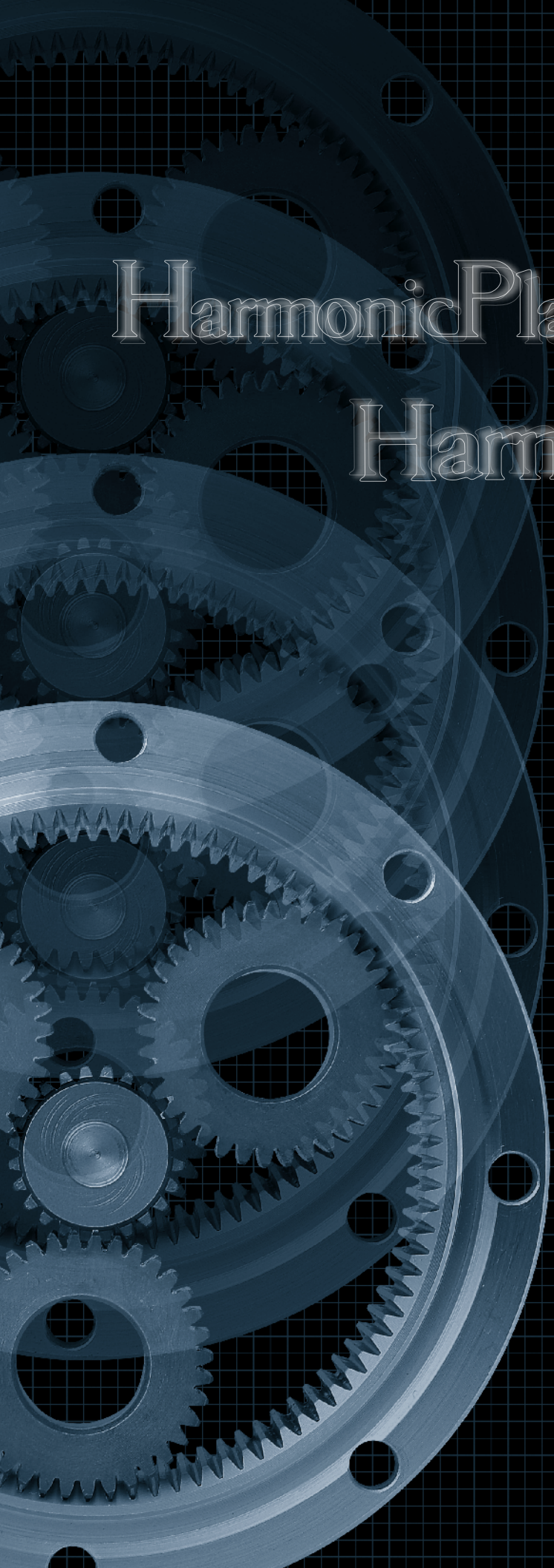

HarmonicPlanetary®

HarmonicDrive®

Technical Information

Product Handling

The rated value and performance vary depending on the product series.
Be sure to check the usage conditions and refer to the items conforming to the related product.

Efficiency

In general, the efficiency of a speed reducer depends on the reduction ratio, input rotational speed, load torque, temperature and lubrication condition.
The efficiency under the following measurement conditions is plotted in the graphs on the next page.
The values in the graph are average values.

Measurement Condition

Table 016-1

Input speed	HPN: 3000rpm
Ambient temperature	25°C
Lubricant	Use standard lubricant. (See page 024 for details.)

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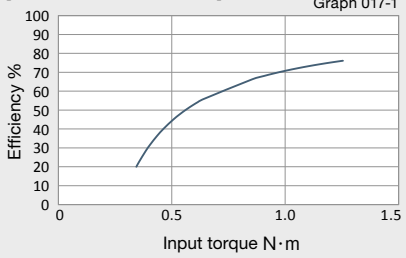
Size 11A Gearhead

HPN Right Angle

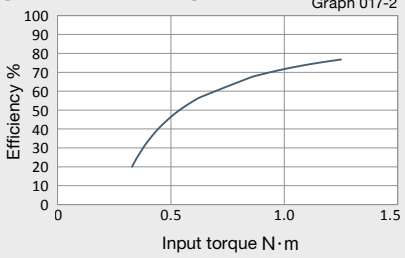
[Reduction ratio = 4, 5]

Graph 017-1



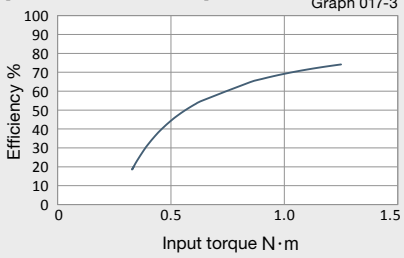
[Reduction ratio = 7]

Graph 017-2



[Reduction ratio = 10]

Graph 017-3

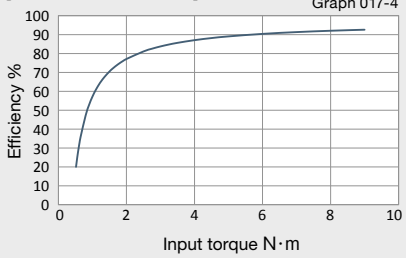


Size 14A Gearhead

HPN Right Angle

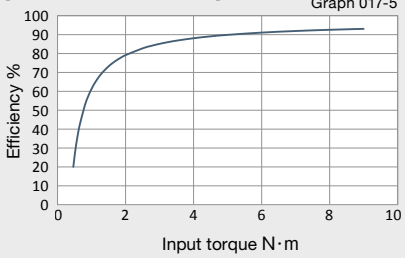
[Reduction ratio = 3]

Graph 017-4



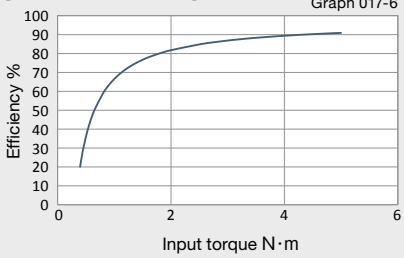
[Reduction ratio = 4, 5]

Graph 017-5



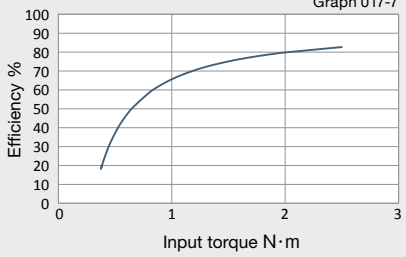
[Reduction ratio = 7]

Graph 017-6



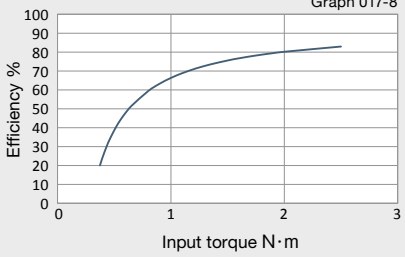
[Reduction ratio = 10]

Graph 017-7



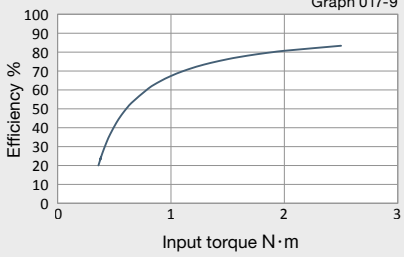
[Reduction ratio = 15]

Graph 017-8



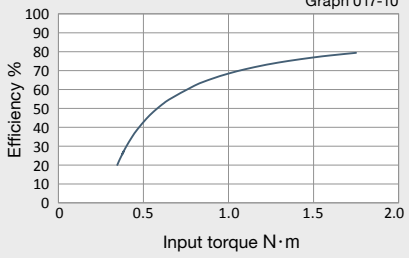
[Reduction ratio = 20, 25]

Graph 017-9



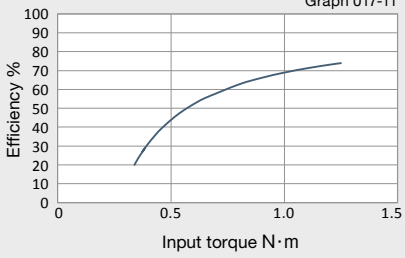
[Reduction ratio = 30, 35]

Graph 017-10



[Reduction ratio = 40, 45, 50]

Graph 017-11



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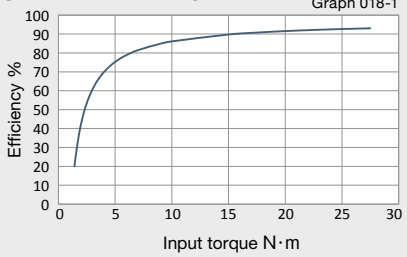
Size 20A Gearhead

HPN Right Angle

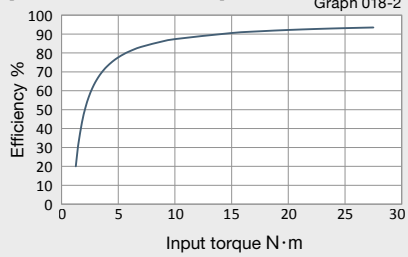
[Reduction ratio = 3]

Graph 018-1



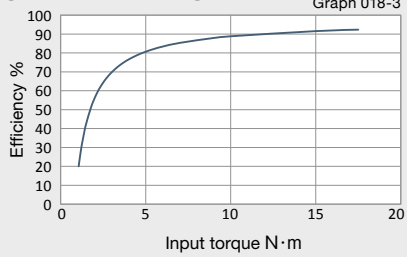
[Reduction ratio = 4, 5]

Graph 018-2



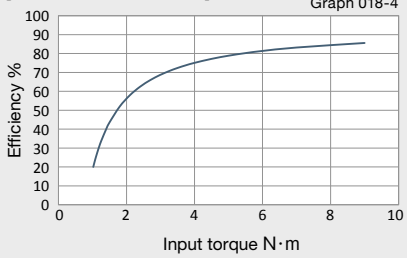
[Reduction ratio = 7]

Graph 018-3



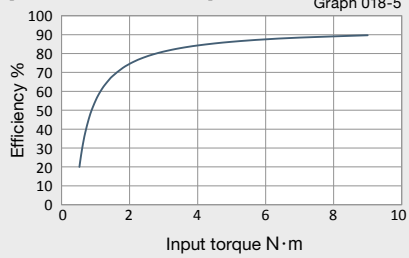
[Reduction ratio = 10]

Graph 018-4



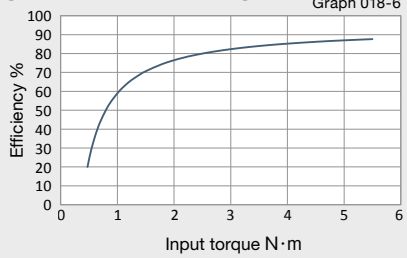
[Reduction ratio = 15]

Graph 018-5



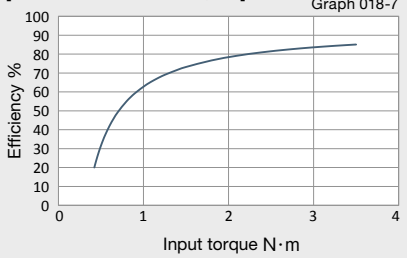
[Reduction ratio = 20, 25]

Graph 018-6



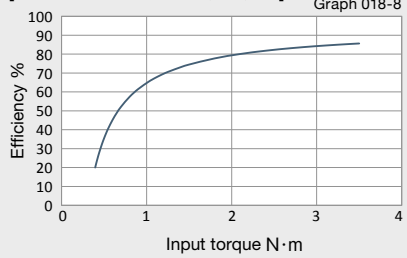
[Reduction ratio = 30, 35]

Graph 018-7



[Reduction ratio = 40, 45, 50]

Graph 018-8

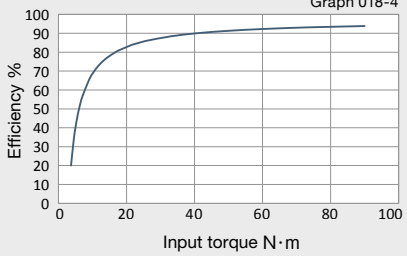


Size 32A Gearhead

HPN Right Angle

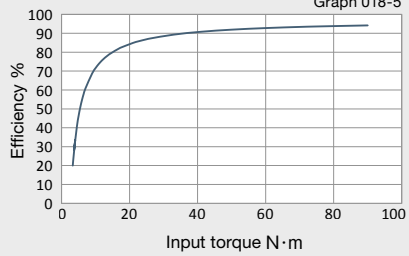
[Reduction ratio = 3]

Graph 018-4



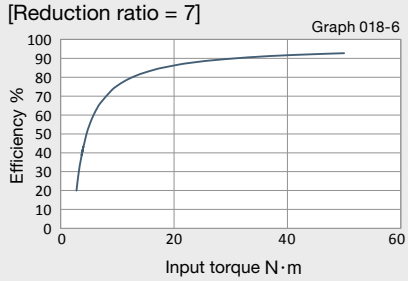
[Reduction ratio = 4, 5]

Graph 018-5



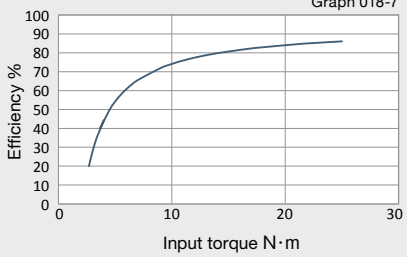
[Reduction ratio = 7]

Graph 018-6



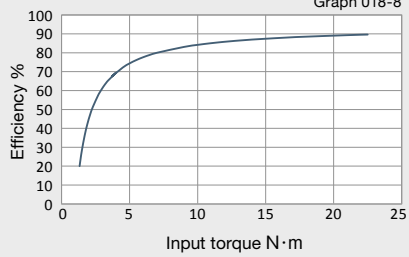
[Reduction ratio = 10]

Graph 018-7



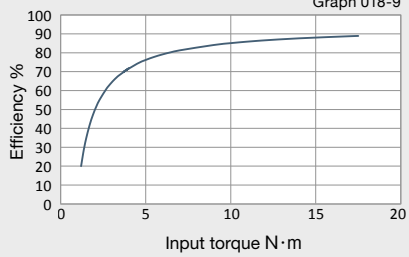
[Reduction ratio = 15]

Graph 018-8



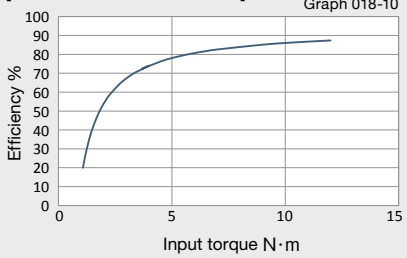
[Reduction ratio = 20, 25]

Graph 018-9



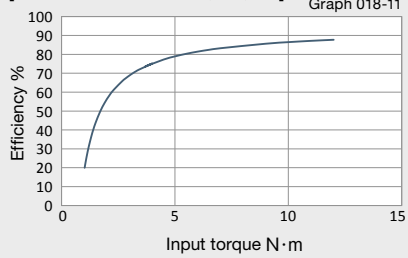
[Reduction ratio = 30, 35]

Graph 018-10



[Reduction ratio = 40, 45, 50]

Graph 018-11

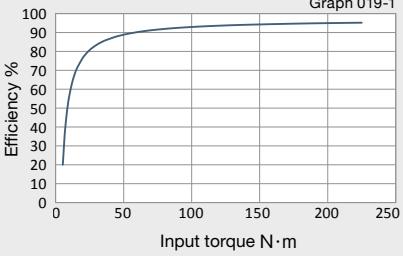


Size 40A Gearhead

HPN Right Angle

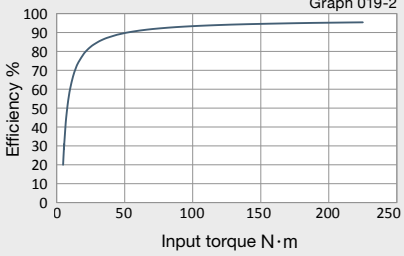
[Reduction ratio = 3]

Graph 019-1



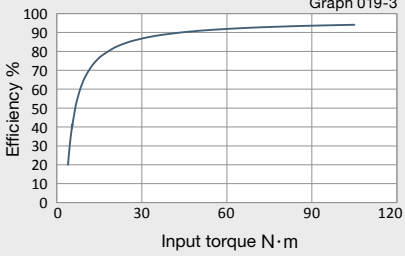
[Reduction ratio = 4, 5]

Graph 019-2



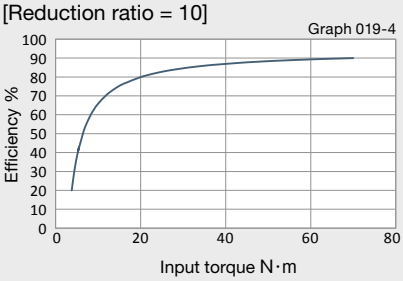
[Reduction ratio = 7]

Graph 019-3



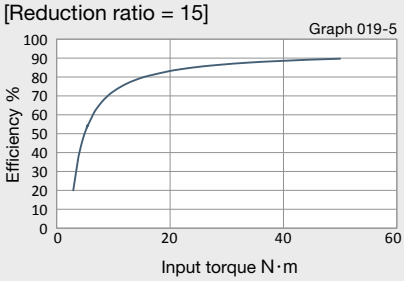
[Reduction ratio = 10]

Graph 019-4



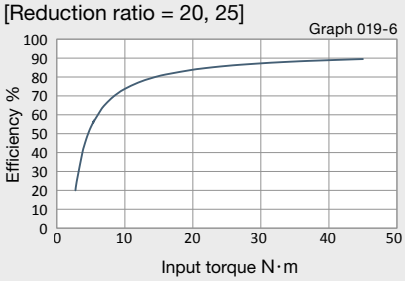
[Reduction ratio = 15]

Graph 019-5



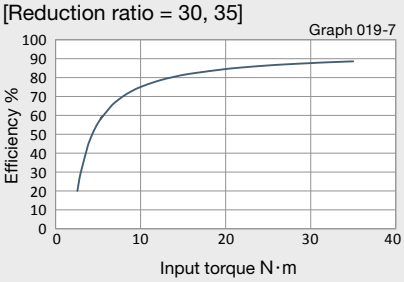
[Reduction ratio = 20, 25]

Graph 019-6



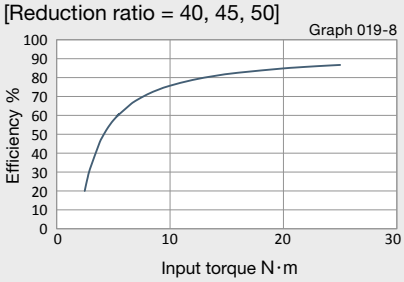
[Reduction ratio = 30, 35]

Graph 019-7



[Reduction ratio = 40, 45, 50]

Graph 019-8



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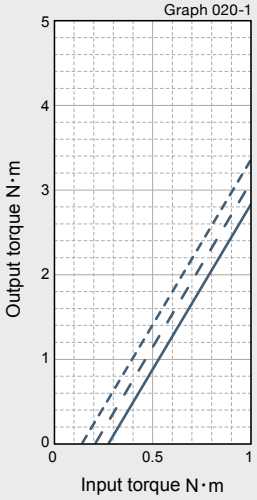
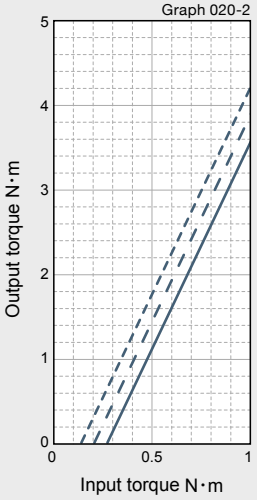
Input / Output Torque Diagram

■ 11A

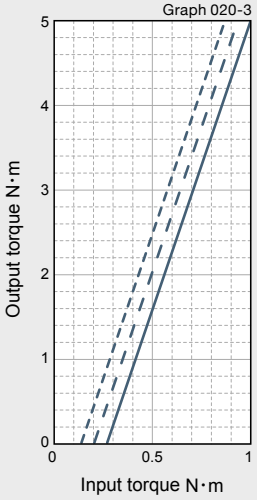
[Reduction ratio = 4]
Graph 020-1



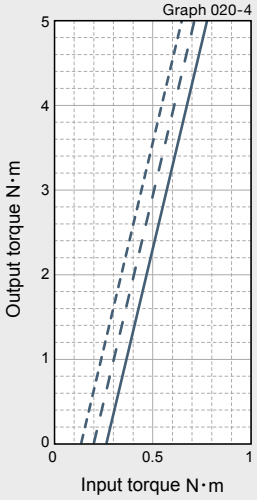
[Reduction ratio = 5]
Graph 020-2



[Reduction ratio = 7]
Graph 020-3

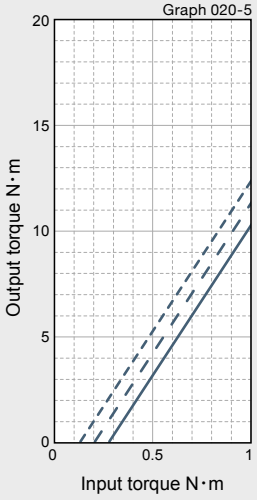


[Reduction ratio = 10]
Graph 020-4

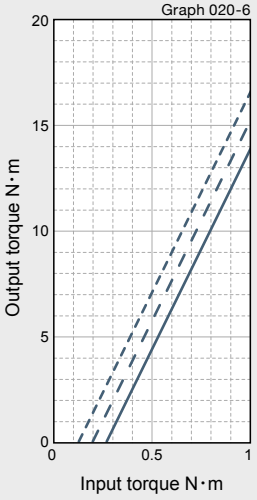


■ 14A

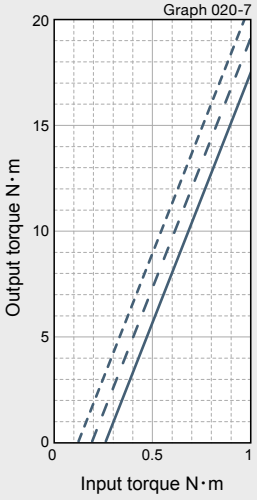
[Reduction ratio = 15]
Graph 020-5



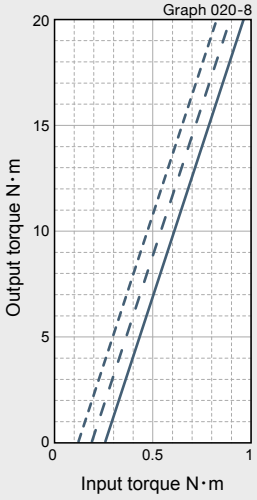
[Reduction ratio = 20]
Graph 020-6



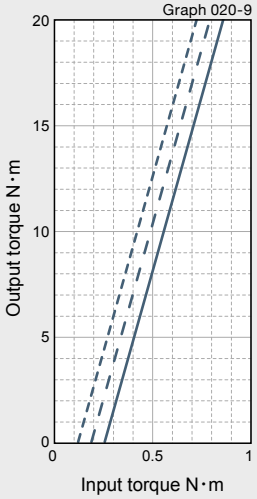
[Reduction ratio = 25]
Graph 020-7



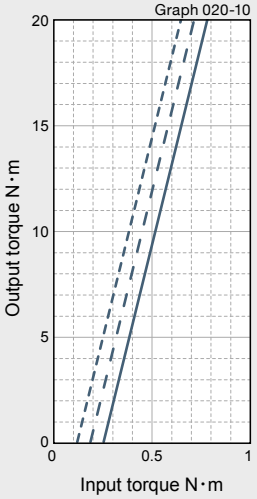
[Reduction ratio = 30]
Graph 020-8



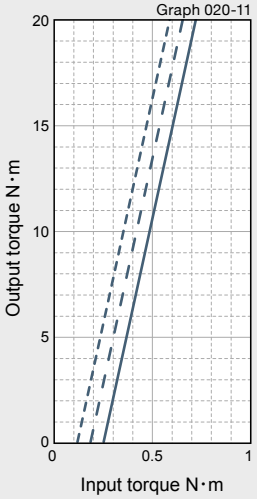
[Reduction ratio = 35]
Graph 020-9



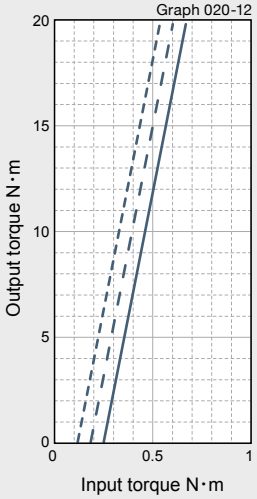
[Reduction ratio = 40]
Graph 020-10



[Reduction ratio = 45]
Graph 020-11



[Reduction ratio = 50]
Graph 020-12

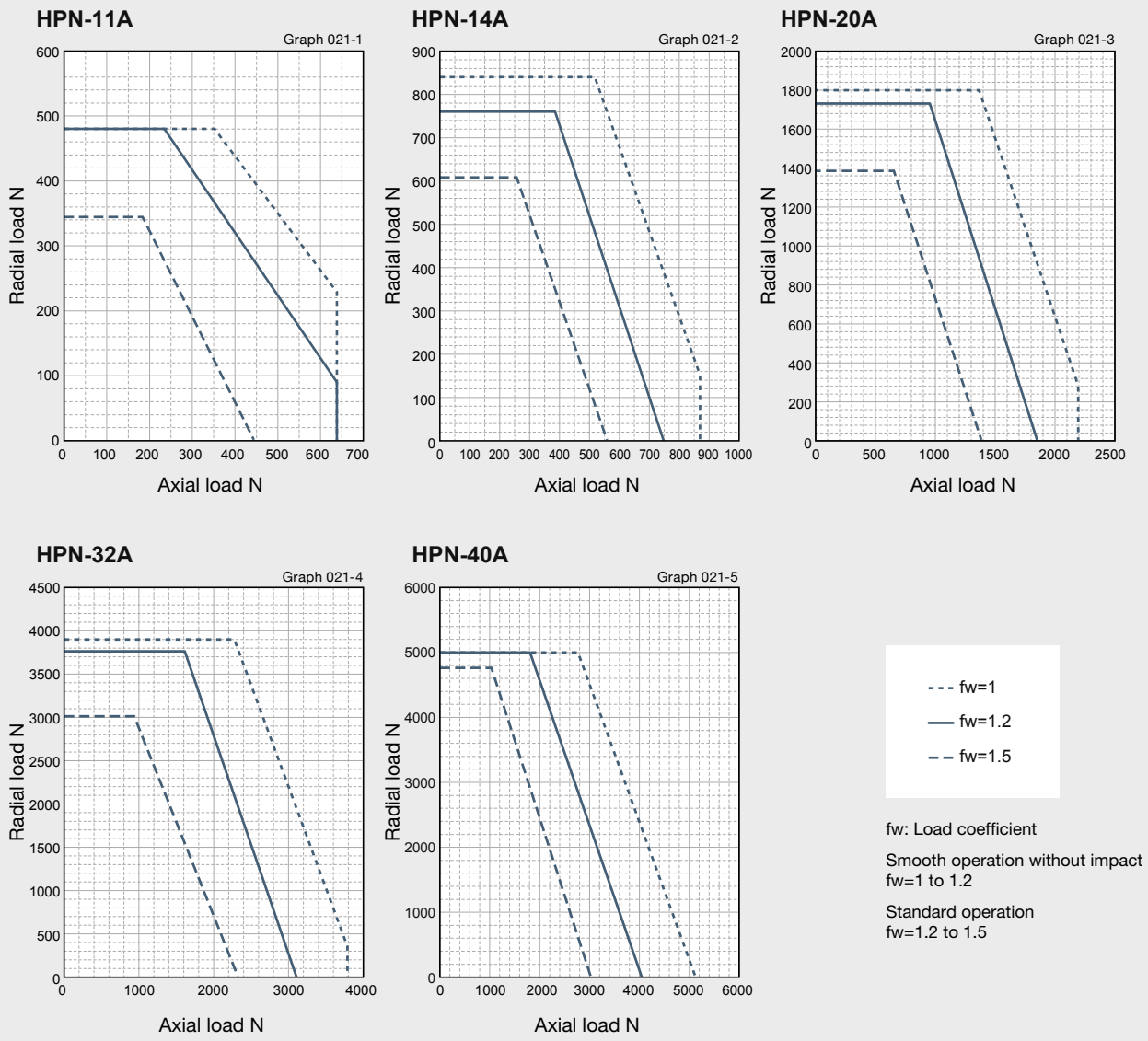


Motor rpm ------ 1000rpm - - - 2000rpm ——— 3000rpm

Output Shaft Bearing Load Limits

HPN Series Output shaft load limits are plotted below.

HPN series uses radial ball bearings to support the output shaft. Please use the curve on the graph for the appropriate load coefficient (fw) that represents the expected operating condition.



Output shaft speed - 100 rpm, bearing life is based on 20,000 hours. The load-point is based on shaft center of radial load and axial load.

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Assembly

Assemble and mount your gearhead in accordance with these instructions to achieve the best performance.
Be sure to use the recommended bolts and use a torque wrench to achieve the proper tightening torques as recommended in tables below.

Motor Assembly Procedure

To properly mount the motor to the gearhead, follow the procedure outlined below.

- Turn the input shaft coupling and align the bolt head with the rubber cap hole.

Optional Assembly Step for Improved Sealing

- Apply a sealant to the surface of the motor flange that will contact the gearhead mounting flange. (Recommended sealant: LOCKTITE 515)

- With the speed reducer in an upright position as illustrated in the figure below, slowly insert the motor shaft into the coupling of speed reducer. Slide the motor shaft without letting it drop down. If the speed reducer cannot be positioned upright, slowly insert the motor shaft into the coupling of speed reducer, then tighten the motor bolts evenly until the motor flange and gearhead flange are in full contact. Exercise care to avoid tilting the motor when inserting it into the gearhead.

- Fasten the motor and speed reducer flange with bolts.

Bolt* tightening torque

Table 022-1

Bolt size		M2.5	M3	M4	M5	M6	M8	M10	M12
Tightening torque	N·m	0.59	1.4	3.2	6.3	10.7	26.1	51.5	89.9
	kgf·m	0.06	0.14	0.32	0.64	1.09	2.66	5.25	9.17

Recommended bolt: JIS B 1176 Hexagon socket head bolt, Strength: JIS B 1051 12.9 or higher Caution: Be sure to tighten the bolts to the tightening torques specified in the table.

- Tighten the input shaft coupling bolt to the recommended torque specified in the table below. The bolt(s) or screw(s) is (are) already inserted into the input shaft coupling when delivered. Check the bolt size on the confirmation drawing provided.

Bolt* tightening torque

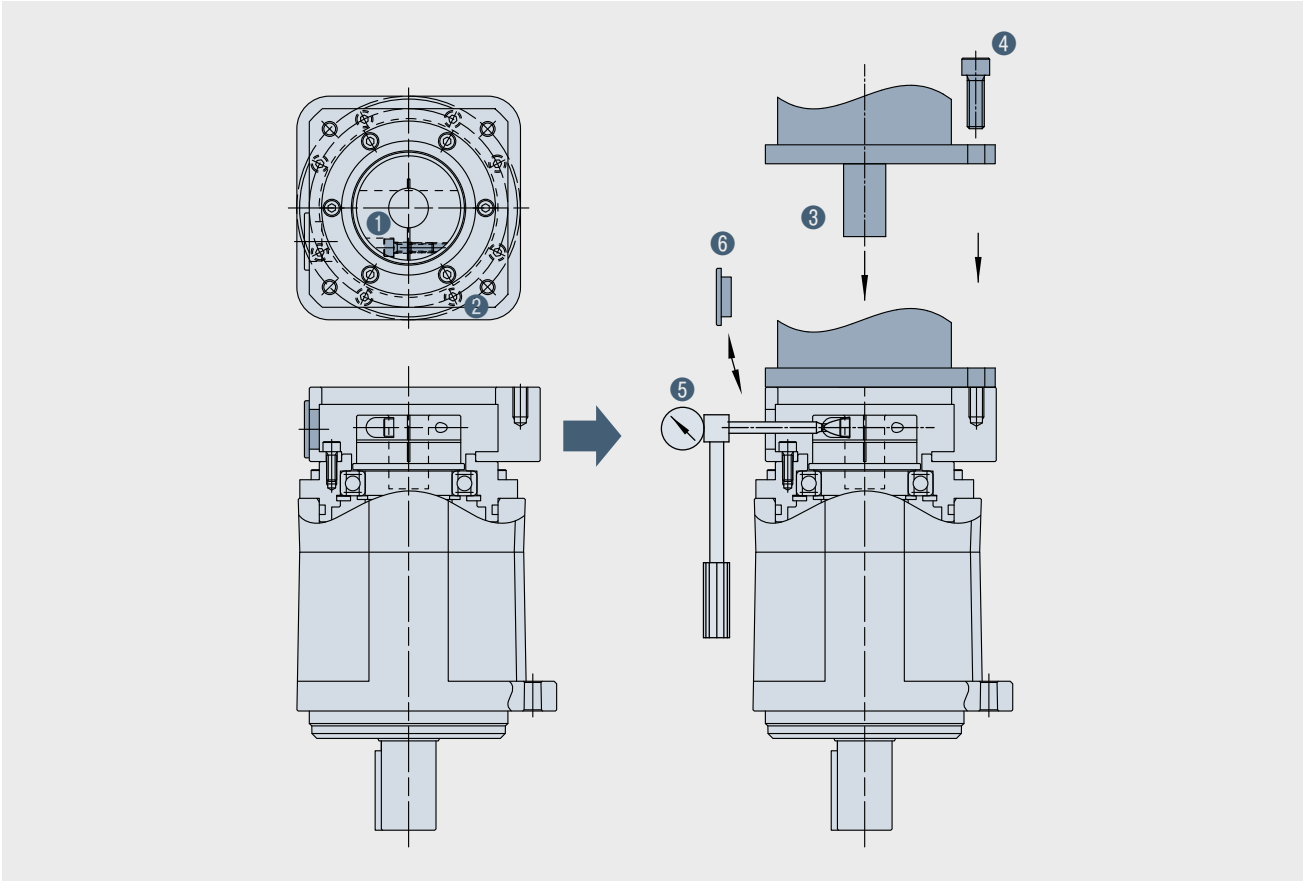
Table 022-2

Bolt size		M3	M4	M5	M6	M8	M10	M12
Tightening torque	N·m	2.0	4.5	9.0	15.3	37.2	73.5	128
	kgf·m	0.20	0.46	0.92	1.56	3.8	7.5	13.1

Caution: Always tighten the bolts to the tightening torque specified in the table above. If the bolts is not tightened to the torque value recommended slippage of the motor shaft in the shaft coupling may result. The bolt size will vary depending on the size of the gear and the shaft diameter of the mounted motor. Check the bolt size on the confirmation drawing provided.

- Insert the rubber cap provided. This completes the assembly.

Figure 022-1



Speed Reducer Assembly

No thread for eyebolt is provided because the mounting orientation varies depending on the customer's need. When mounting the reducer, hoist it using a sling paying extreme attention to safety.
When assembling gearheads into your equipment, check the flatness of your mounting surface and look for any burrs on tapped holes. Then fasten the flange (Part A in the diagram below) using appropriate bolts.

Bolt* tightening torque

Table 023-1

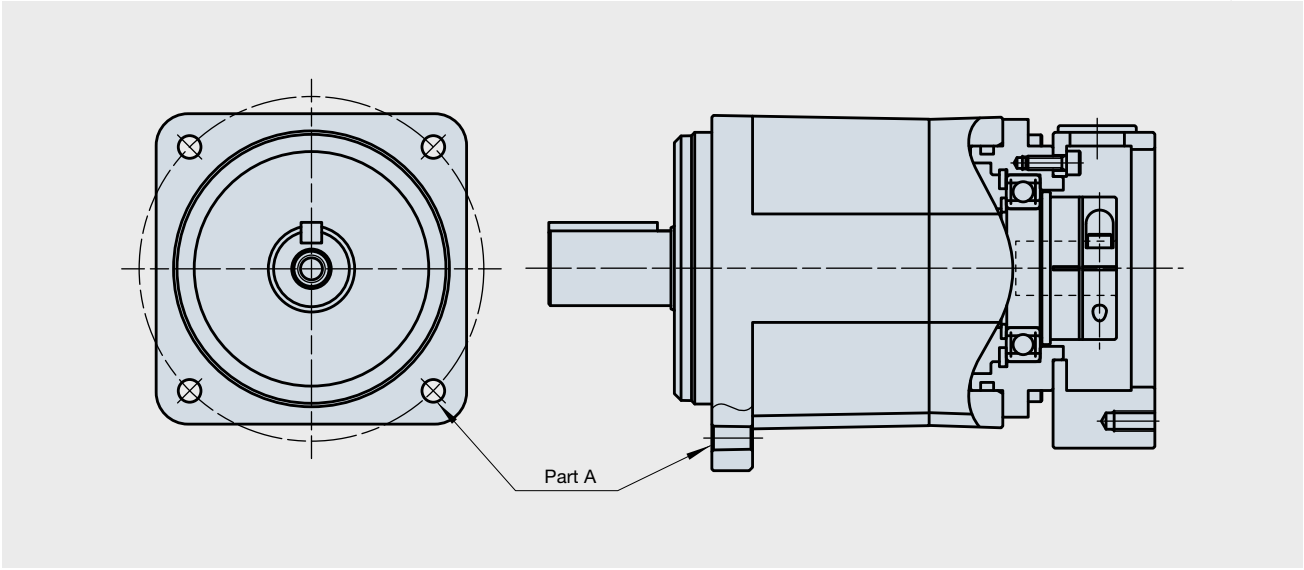
Size		HPN				
		11	14	20	32	40
Number of bolts		4	4	4	4	4
Bolt size		M3	M5	M6	M8	M10
Mounting PCD	mm	50	70	100	130	165
Tightening torque	N·m	1.4	6.3	10.7	26.1	51.5
	kgf·m	0.14	0.64	1.09	2.66	5.26
Transfer torque	N·m	27.9	110	223	528	1063
	kgf·m	2.85	11.3	22.8	53.9	108.5

* Recommended bolts: JIS B 1176 "Hexagon socket head bolts. "Strength classification 12.9 or higher in JIS B 1051.

Mounting the Load to the Output Shaft

When mounting a load onto the output shaft, take the specification of the output bearing into consideration.

Figure 023-1



Gearheads with an Output Shaft

Do not subject the output shaft to any impact when mounting a pulley, pinion and other parts.
An impact to the output bearing will deteriorate the speed reducer precision and may cause reduced life or failure.

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Lubrication

Prevention of Grease and Oil Leakage

- Only use the recommended greases.
- Provisions for proper sealing to prevent grease leakage are incorporated into the gearheads. However, please note that some leakage may occur depending on the application or operating condition. Discuss other sealing options with our applications engineers.
- When mounting the gearhead horizontally, position the gearhead so that the rubber cap in the adapter flange is facing upwards.

Sealing

- A double lip Teflon oil seal is used for the output shaft, gaskets or o-rings on all mating surfaces.

Lubricant

The standard lubrication for the HPN series is grease. All gearheads are lubricated at the factory prior to shipment and additional application of grease during assembly is not required. The gearheads are lubricated for the life of the gear and do not require re-lubrication.
High efficiency is achieved thorough the unique planetary gear design and grease selection.

Name of Lubricant

PYRONOC UNIVERSAL 0
Manufacturer: Nippon Oil Co.

Base oil: Rened mineral oil	**Consistency: 375 at 25°C**
Soap radical: Urea	**Dropping point: 250°C or higher**
Standard: NLGI No. 0	**Product appearance: Light yellow**

Ambient Operating Temperature Range: 0°C to +40°C

The lubricant may deteriorate if the ambient operating temperature is too high or too low. Please contact our sales office or distributor for operation outside of the ambient operating temperature range.
The temperature rise of the gear depends upon the operating cycle, ambient temperature and heat conduction and radiation as affected by the customers installation of the gear. A housing surface temperature of 70°C is the maximum allowable limit.

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ELECTROMATE
Toll Free Phone (877) SERVO98
www.electromate.com
sales@electromate.com

Warranty

Please contact us or visit our website at www.harmonicdrive.net for warranty details for your specific product.

Warranty Terms

All the products are warranted against defects in workmanship and materials for the warranted period.
This limited warranty does not apply to any product that has been subject to:

- **User's misapplication, improper installation, inadequate maintenance, or misuse.**
- **Disassembling, modification or repair by others than Harmonic Drive.**

Our liability shall be limited exclusively to repairing or replacing the product only found by Harmonic Drive to be defective.
Harmonic Drive shall not be liable for consequential damages of other equipment caused by the defective products, and shall not be liable for the incidental and consequential expenses and the labor costs for detaching from and installing to the driven equipment.

Disposal

When disposing of the product, disassemble it and sort the component parts by material type and dispose of the parts as industrial waste in accordance with the applicable laws and regulations. The component part materials can be classified into three categories.

- **Rubber parts: Oil seals, O-rings, rubber caps**
- **Aluminum parts: Housings, motor flanges**
- **Steel parts: Other parts**

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All efforts have been made to ensure that the information in this catalog is complete and accurate. However, Harmonic Drive LLC is not liable for any errors, omissions or inaccuracies in the reported data. Harmonic Drive LLC reserves the right to change the product specifications, for any reason, without prior notice. For complete details please refer to our current Terms and Conditions posted on our website.

Safety

⚠ Warning Means that improper use or handling could result in a risk of death or serious injury.

⚠ Caution Means that improper use or handling could result in personal injury or damage to property.

Limited Applications

This product cannot be used for the following applications:

* Space flight hardware
* Aircraft equipment
* Nuclear power equipment
* Equipment and apparatus used in domestic homes
* Vacuum environments
* Automotive equipment
* Personal recreation equipment
* Equipment that directly works on human bodies
* Equipment for transport of humans
* Equipment for use in a special environment

Please consult Harmonic Drive Systems beforehand when intending to use one of its product for the aforementioned applications.
Install a safety device that avoids an accident even if output of this product becomes uncontrollable due to breakdown when using it in equipment that affects human lives and that may trigger serious damage.

Design Precaution: Be certain to read the catalog when designing the equipment.

Caution

Use only in a specified environment.

- In case of using Harmonic Planetary® please ensure the following environmental conditions are complied with:
  - Ambient temperature 0 to 40°C
  - Do not expose to corrosive or explosive gas
  - No splashing of water or oil
  - No dust such as metal powder

Caution

Install the equipment in a specified precision.

- Design and assemble parts to keep the recommended installation precision on the catalog.
- Failure to keep the precision can cause troubles such as generation of vibration, reduction of life, deterioration of precision and breakdown.

Caution

Install the equipment in a specified manner.

- Carry out assembly precision in the specified order according to the catalog.
- Observe our recommended tightening methods (such as bolts used)
- Operating the equipment without precise assembly can cause troubles such as generation of vibration, reduction of life, deterioration of precision and breakdown.

Caution

Use the specified lubricant.

- Using other lubricant than our recommended products can reduce the life. Replace the lubricant in a specified condition.
- Grease is sealed in a unit product for Harmonic Planetary®. Do not mix other kinds of grease.

Operational Precaution: Be certain to read the catalog before operating the equipment.

Warning

Do not put a finger into the gearing to turn it.

- If the gearing is turned by inserting a finger into it to turn it, the finger may be caught in the gear, resulting in an unexpected injury. Do not attempt this under any circumstances.

Warning

This is a heavy item. Please handle with care.

- This item is very heavy and may cause back injury or injuries due to dropping or knocking over the product and getting fingers caught in between. Please take precautions such as wearing safety shoes and use a supporting tool when handling.

Caution

Be careful in handling products and parts.

- Do not give strong shock to parts and units with a hammer.
- If you use the equipment in a damaged condition , the specified performance may not be retained. It can also cause troubles such as breakdown.

Caution

Do not change product and part setting.

- Harmonic Planetary® products are manufactured by incorporating their parts in a set. If settings are changed, specified performance cannot be maintained.

Caution

Be careful of oil leaks.

- Although a highly reliable oil seal is used as an output shaft, it does not guarantee leak-tight sealing. Depending on the use, please apply grease or oil for protection.

Caution

Apply torque within the allowable range.

- Do not apply torque exceeding the limit for momentary torque. Applying excess torque can cause troubles such as loose tightening bolts, generation of backlash and breakdown.
- Striking an arm directly attached to the output shaft can damage the arm and make the output shaft uncontrollable.

Caution

Do not break down unit products.

- Do not break down and reassemble unit products. Original performance may not be reproduced.

Caution

Stop operating the system when an anomaly is detected

- Shut down the system promptly if an abnormal sound or vibration is detected, rotation is stopped, abnormally high temperature is generated, an abnormal current value is observed or other anomalies are detected. Continuing to operate the system without stopping may adversely affect the system.
- Please contact our sales office or distributor if an anomaly is detected.

Caution

- For the product that has been stored for a long time, it is recommended to confirm performance and rust-proofing. To store the product for a long time, check no rust is generated about every six month and carry out the rust-proofing again. For the re-rust-proofing method etc., please contact Harmonic Drive Systems.
- Although black oxide finish is applied to some of our products, it dose not guarantee the antirust effect.

Handling Lubricant

Warning

Precautions on handling lubricant

- Lubricant got in the eye can cause an inflammation. Wear protective glasses to prevent it from getting in your eye when you handle it.
- Lubricant coming in contact with the skin can cause an inflammation. Wear protective gloves to prevent it from contacting your skin when you handle it.
- Do not eat it (to avoid diarrhea and vomiting).
- When you open the container, you might have your hand cut by it. Wear protective gloves.
- Keep lubricant off children.

Warning

First-aid

- If lubricant gets in your eye, you should wash your eye with clean water for 15 minutes and submit to medical treatment.
- If lubricant comes in contact with your skin, you should thoroughly wash it with water and soap.
- If you swallowed it, you should immediately submit to medical treatment without throwing it up by constraint.

Caution

Treatment of waste oil and containers

- Treatment methods are obliged by law. Treat wastes appropriately according to the law. If you are unsure how to treat them, you should consult with the dealer before treating them.
- Do not apply pressure on an empty container. The remainder may ignite with an explosion.
- Do not weld, heat, drill or cut the container. The remainder may ignite with an explosion.

Caution

Storage

- Tightly plug the container after use to prevent intrusion of dusts and water. Avoid direct sunlight to store lubricant in a dark place.

Disposal

Caution

Please dispose as industrial waste.

- Please dispose of the products as industrial waste when their useful life is over.

Major Applications of Our Products

Metal Working Machine

Processing Machine Tools

Measurement, Analytical and Test Systems

Medical Equipment

Telescopes

Source: National observatory of Inter-University Research Institute Corporation

Energy

Courtesy of Halliburton/Sperry Drilling Services

Crating and Packaging Machines

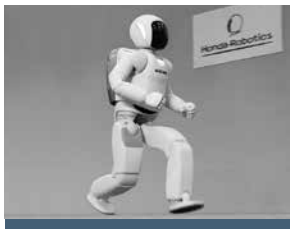
Communication Equipment

Space Flight Hardware

Rover image created by Dan Maas, copyrighted toCornell and provided courtesy NASA/ JPL-Caltech.

Glass and Ceramic Manufacturing Systems

Robots



Humanoid Robots

Source: Honda Motor Co., Ltd.

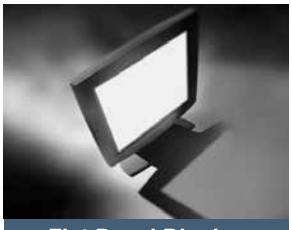
Printing, Bookbinding and Paper Machines

Semiconductor Manufacturing Equip.

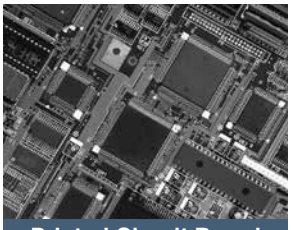
Optical Machines

Machine Tools

Paper-making Machines



Flat Panel Display Manufacturing Equip.



Printed Circuit Board Manufacturing Machines

Aerospace

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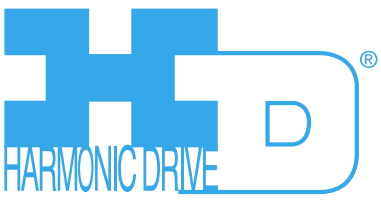

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