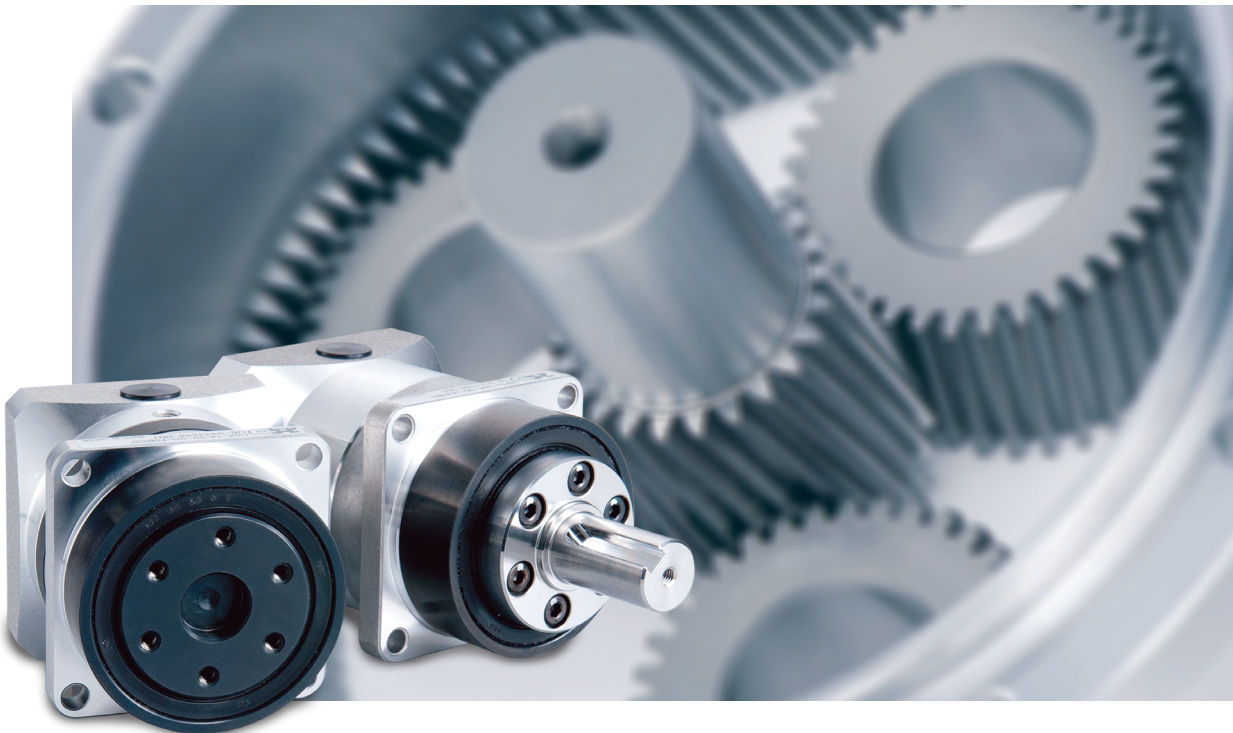


HarmonicGearhead®

High Performance Gear Head Series for Servo Motors

HarmonicPlanetary® HPG Series Helical Gear Type

The two-stage speed reducer type has been added to the HarmonicPlanetary® HPG series Helical Gear Type. A new mechanism has been adopted to realize speed reducers with extremely low backlash as two-stage helical gears. As a result of adding the two-stage speed reducer type, we now offer a full lineup of varying reduction ratios of 3 through 50.



Realizing noise reduction and higher torque capacity by using helical gears

- Realizing noise reduction and higher torque capacity by using helical gears (increased by approximately 30% compared to conventional products)
- Low backlash (Standard: 3 arc-min or less, Precision class: 1 arc-min or less)
- Higher reliability due to thin-walled elastic gears (lower increase in backlash)
- Precision rotation due to our high-precision cross roller bearing (high surface runout accuracy)

Ordering Code

HPG - **20** **R** - **05** - **J2** **XXXX** - **SP**

(1) (2) (3) (4) (5) (6) (7)

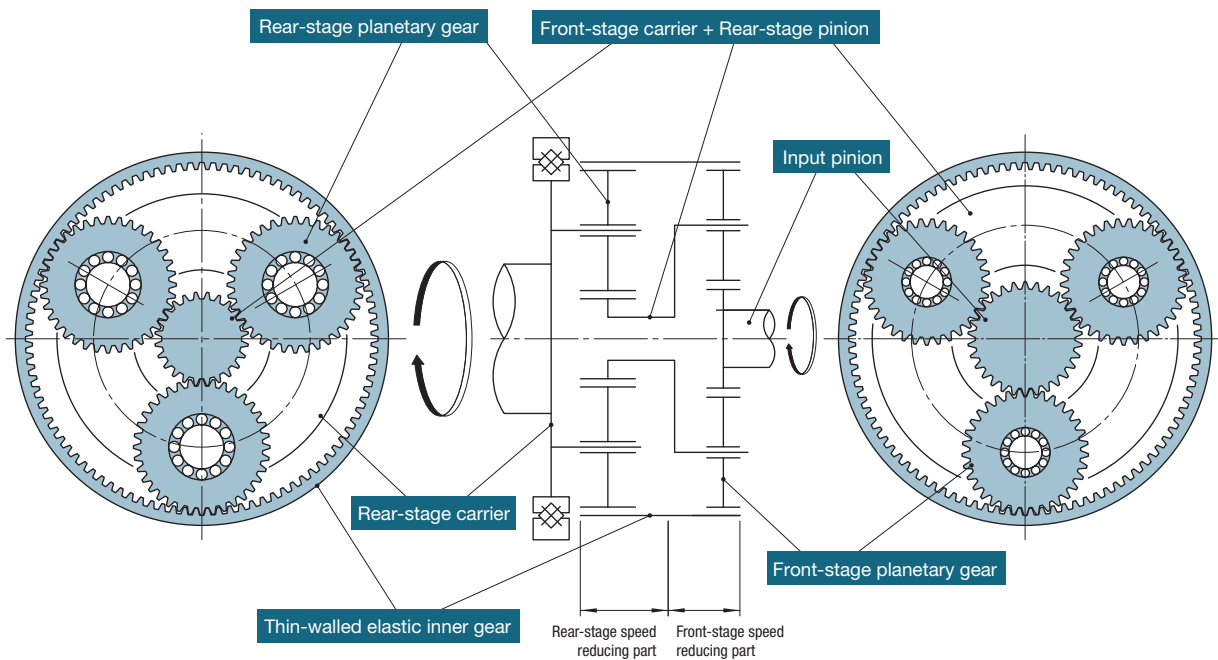
(1)	Model	HarmonicPlanetary® HPG standard type	
(2)	Size	11, 14, 20, 32	
(3)	Design revision	R	
(4)	Reduction ratio	Size 11	4, 5, 6, 7, 8, 9, 10, 20, 25, 30, 35, 40, 45, 50
		Sizes 14, 20, 32	3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50
(5)	Output shaft shape	Size 11	F0 : Flange output J20 : Straight shaft (without key) J60 : Straight shaft (with key and center tapped hole)
		Sizes 14, 20, 32	F0 : Flange output J2 : Straight shaft (without key) J6 : Straight shaft (with key and center tapped hole)

(6)	Input-side configuration symbol	4 to 6 alphabetical characters : Motor flange and Input shaft coupling shape symbol (The symbols vary depending on the motor mounted. For more information on models matching the servo motors of other manufacturers, please use the model selection tool on our website at https://hds-tech.jp/)
(7)	Special specifications	No symbol: Standard product SP : Special specifications BL1 : Backlash of 1 arc-min or less, special specifications (Sizes from 14 to 32) D : Input-side shield bearing is changed to contacted seal type [DDU]

Operation Principle

The two-stage speed reducer mechanism (with a speed ratio of 15 or above) is used for illustration purposes.

For the single-stage speed reducer mechanism (with a speed ratio of 10 or less), the operation principle is applicable only to the rear-stage speed reducing part.



Rear stage: Consists of a planetary speed reducer mechanism with 3 planetary gears.

The rear-stage pinion coupled with the front-stage carrier serves as an input to the rear-stage speed reducing part, and causes the orbital motion of the rear-stage planetary gears as in the front-stage speed reducing part. The orbital motion is transmitted to the rear-stage carrier (the inner ring of the cross roller bearing) and then outputted. The direction of rotation of the rear-stage carrier is the same as the input direction, as in the front-stage speed reducing part.

Front stage (input side): Consists of a planetary speed reducer mechanism with 3 planetary gears.

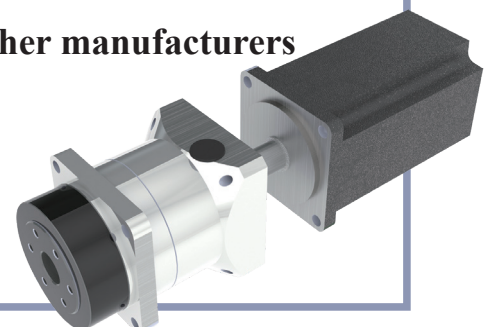
The rotation from the input pinion causes the orbital motion of the front-stage planetary gears that mesh with it. The orbital motion is transmitted to the front-stage carrier via the planetary shaft. The direction of rotation of the front-stage carrier is the same as the input direction.

Simply attach it to a servo motor of any of the other manufacturers to form a high-precision actuator.

Supported servo motor manufacturers

YASKAWA Electric Corporation/Mitsubishi Electric Corporation/FANUC/Panasonic/SANYO DENKI/TAMAGAWA SEIKI/FUJI ELECTRIC/OMRON/TOSHIBA MACHINE/Keyence, etc.

Servo motors other than those listed above can be supported. Please contact one of our sales offices.



Rating Table

Table 3-1

Size	Reduction ratio	Rated output torque*1		Average load torque*2		Limit for repeated peak torque*3		Instantaneous maximum torque*4		Allowable average input speed*5	Maximum input speed*6	Moment of inertia (converted to input side)*7		Speed reducer unit weight*8			
		N·m	kgf·m	N·m	kgf·m	N·m	kgf·m	N·m	kgf·m			r/min	r/min	Shaft output	Flange output	Shaft output	Flange output
														×10 ⁴ ·kg·m ²	×10 ⁴ ·kg·m ²		
11	4	2.8	0.29	6.3	0.64	10	1.0	20	2.0	3000	10000	0.011	0.0084	0.24	0.19		
	5	2.9	0.30	6.5	0.66	10	1.0					0.0069	0.0053				
	6	2.9	0.30	6.5	0.66	10	1.0					0.0047	0.0036				
	7	3.1	0.32	7.0	0.71	9.0	0.92					0.0035	0.0027				
	8	3.1	0.32	7.0	0.71	7.0	0.71					0.0026	0.0020				
	9	3.1	0.32	6.0	0.61	6.0	0.61					0.0021	0.0016				
	10	3.4	0.35	5.0	0.51	5.0	0.51					0.0017	0.0013				
	20	4.5	0.46	10	1.0	13	1.3	20	2.0	3000	10000	0.0031	0.0030	0.37	0.32		
	25	4.8	0.49	10	1.0							0.0019	0.0019				
	30	5.1	0.52	11	1.1							0.0013	0.0013				
	35	5.3	0.54	12	1.2							0.00099	0.00096				
	40	5.6	0.57	12	1.2							0.00072	0.00070				
	45	5.8	0.59	13	1.3							0.00057	0.00055				
	50	6.0	0.61	13	1.3							0.00049	0.00047				
14	3	4.0	0.41	9.0	0.92	20	2.0	37	3.8	3000	5000	0.089	0.072	0.55	0.45		
	4	7.0	0.71	16	1.6	30	3.1	56	5.7		6000	0.047	0.037				
	5	7.2	0.73	16	1.6	30	3.1					0.030	0.023				
	6	7.3	0.74	16	1.6	30	3.1					0.028	0.024				
	7	7.8	0.80	18	1.8	26	2.7					0.021	0.018				
	8	7.8	0.80	18	1.8	20	2.0					0.016	0.014				
	9	7.9	0.81	17	1.7	17	1.7					0.013	0.011				
	10	8.5	0.87	15	1.5	15	1.5					0.010	0.0087				
	15	10	1.0	23	2.3	30	3.1	56	5.7	3000	6000	0.028	0.028	0.92	0.82		
	20	11	1.1	25	2.5							0.015	0.014				
	25	12	1.2	27	2.8							0.0093	0.0091				
	30	12	1.2	28	2.9							0.0061	0.0059				
	35	13	1.3	30	3.1							0.0046	0.0045				
	40	13	1.3	30	3.1							0.0035	0.0034				
	45	14	1.4	30	3.1							0.0027	0.0027				
	50	14	1.4	30	3.1	0.0023	0.0023										
20	3	11	1.1	25	2.6	90	9.2	124	13	3000	4000	0.64	0.53	1.7	1.3		
	4	23	2.3	51	5.2	133	14	217	22		6000	0.36	0.30				
	5	23	2.4	53	5.4	133	14					0.23	0.19				
	6	23	2.4	53	5.4	126	13					0.15	0.13				
	7	25	2.5	56	5.7	108	11					0.11	0.093				
	8	25	2.5	56	5.7	84	8.6					0.085	0.070				
	9	25	2.6	57	5.8	73	7.4					0.067	0.055				
	10	27	2.8	61	6.2	65	6.6					0.055	0.046				
	15	32	3.3	73	7.4	133	14	217	22	3000	6000	0.24	0.23	2.8	2.4		
	20	35	3.6	80	8.2							0.12	0.12				
	25	38	3.9	85	8.7							0.077	0.076				
	30	40	4.1	90	9.2							0.050	0.049				
	35	42	4.3	94	9.6							0.038	0.037				
	40	43	4.4	98	10							0.029	0.028				
	45	45	4.6	102	10							0.023	0.022				
	50	46	4.7	105	11	0.019	0.019										
32	3	50	5.1	110	11	290	30	507	52	3000	3600	3.5	2.8	4.5	3.1		
	4	77	7.9	170	17	400	41	650	66		6000	1.7	1.3				
	5	80	8.2	180	18	400	41					1.1	0.79				
	6	80	8.2	180	18	390	40					0.73	0.55				
	7	85	8.7	190	19	330	34					0.55	0.41				
	8	85	8.7	190	19	260	27					0.43	0.33				
	9	86	8.8	190	19	220	22					0.34	0.26				
	10	92	9.4	200	20	200	20					0.28	0.22				
	15	111	11	251	26	400	41	650	66	3000	6000	1.1	1.1	7.2	5.8		
	20	121	12	273	28							0.60	0.58				
	25	130	13	292	30							0.38	0.37				
	30	137	14	309	31							0.25	0.25				
	35	143	15	324	33							0.19	0.19				
	40	149	15	337	34							0.14	0.14				
	45	155	16	349	36							0.11	0.11				
	50	160	16	360	37	0.096	0.093										

*1: Rated output is set with the value of Life: $L_{10} = 20000$ hours when the number of input rotations is 3000 r/min, which is the rated rotational speed of the typical servo motors.

*2: The average load torque is the limit for average torque that is calculated from the load torque pattern, and a life of 2000 hours or more is a rough indication when the gear is operated at the 2000 r/min number of input rotations.

*3: This is the allowable peak torque applied when starting up or stopping during the operation cycle.

*4: This is the allowable maximum value of impact torque applied in an emergency stop or applied externally. Exceeding this torque could damage the speed reducer.

*5: This is the allowable maximum value of the average input speed during the operation. Be careful not to exceed this value especially when the operation is almost continuous.

*6: The maximum input speed under the condition of non-continuous operation.

*7: The value for a single unit of the speed reducer.

*8: This indicates the mass of a single speed reducer. For more information on the values including input joint or motor flange, please contact us.

Performance Table

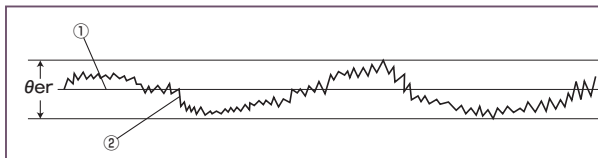
Table 4-1

Size	Reduction ratio	Rotational transmission error ^{*1}		Repeatability ^{*2}	Starting torque ^{*3}		Overdrive starting torque ^{*4}		No-load running torque ^{*5}	
		arc-min	×10 ⁻⁴ rad		arc-sec	cN-m	kgf-cm	N-m	kgf-m	cN-m
11	4	5	14.5	±20	4.7	0.48	0.19	0.019	6.8	0.69
	5				4.1	0.42	0.21	0.021	5.4	0.55
	6				3.6	0.37	0.22	0.022	4.5	0.46
	7				3.3	0.34	0.23	0.023	3.9	0.40
	8				3.0	0.31	0.24	0.024	3.4	0.35
	9				2.8	0.29	0.25	0.026	3.0	0.31
	10				2.6	0.27	0.26	0.027	2.7	0.28
	20	5	14.5	±20	3.9	0.40	0.77	0.079	1.4	0.14
	25				3.1	0.32	0.78	0.080	1.3	0.13
	30				2.6	0.27	0.79	0.081	1.2	0.12
35	2.3				0.23	0.80	0.082	1.1	0.11	
40	2.0				0.20	0.81	0.083	1.1	0.11	
45	1.8				0.18	0.81	0.083	1.0	0.10	
50	1.6				0.16	0.82	0.084	1.0	0.10	
14	3	4	11.6	±15	13	1.3	0.38	0.039	22	2.2
	4				11	1.1	0.45	0.046	17	1.7
	5				10	1.0	0.51	0.052	13	1.3
	6				9.5	0.97	0.57	0.058	11	1.1
	7				9.0	0.92	0.63	0.064	9.4	0.96
	8				8.5	0.87	0.68	0.069	8.3	0.85
	9				8.1	0.83	0.73	0.074	7.3	0.74
	10				7.8	0.80	0.78	0.080	6.6	0.67
	15	4	11.6	±15	8.7	0.89	1.3	0.13	4.4	0.45
	20				6.7	0.68	1.4	0.14	3.8	0.39
	25				5.5	0.56	1.4	0.14	3.4	0.35
	30				4.7	0.48	1.4	0.14	3.2	0.33
	35				4.1	0.42	1.4	0.14	2.9	0.30
	40				3.6	0.37	1.5	0.15	2.7	0.28
45	3.3				0.34	1.5	0.15	2.6	0.27	
50	3.0	0.31	1.5	0.15	2.5	0.26				

Table 4-2

Size	Reduction ratio	Rotational transmission error ¹		Repeatability ²	Starting torque ³		Overdrive starting torque ⁴		No-load running torque ⁵	
		arc-min	×10 ⁴ rad		arc-sec	cN·m	kgf·cm	N·m	kgf·m	cN·m
20	3	4	11.6	±10	31	3.2	0.93	0.095	50	5.1
	4				25	2.6	1.0	0.10	38	3.9
	5				22	2.2	1.1	0.11	30	3.1
	6				20	2.0	1.2	0.12	25	2.6
	7				18	1.8	1.3	0.13	21	2.1
	8				17	1.7	1.4	0.14	19	1.9
	9				17	1.7	1.5	0.15	17	1.7
	10				16	1.6	1.6	0.16	15	1.5
	15	4	11.6	±10	15	1.5	2.4	0.24	11	1.1
	20				12	1.2	2.5	0.26	9.5	0.97
	25				10	1.0	2.6	0.27	8.5	0.87
	30				8.8	0.90	2.6	0.27	7.8	0.80
	35				7.7	0.79	2.7	0.28	7.2	0.73
	40				6.9	0.70	2.8	0.29	6.8	0.69
	45				6.3	0.64	2.8	0.29	6.4	0.65
	50				5.8	0.59	2.9	0.30	6.1	0.62
32	3	4	11.6	±10	56	5.7	1.7	0.17	135	14
	4				52	5.3	2.1	0.21	101	10
	5				49	5.0	2.5	0.26	81	8.3
	6				47	4.8	2.8	0.29	68	6.9
	7				45	4.6	3.2	0.33	58	5.9
	8				44	4.5	3.5	0.36	51	5.2
	9				43	4.4	3.9	0.40	45	4.6
	10				42	4.3	4.2	0.43	41	4.2
	15	4	11.6	±10	32	3.3	4.7	0.48	29	3.0
	20				26	2.7	5.2	0.53	25	2.6
	25				23	2.3	5.7	0.58	23	2.3
	30				20	2.0	6.1	0.62	21	2.1
	35				18	1.8	6.4	0.65	19	1.9
	40				17	1.7	6.8	0.69	18	1.8
	45				16	1.6	7.1	0.72	17	1.7
	50				15	1.5	7.4	0.76	16	1.6

*1 The rotational transmission error refers to the difference between (1) Logical output rotation angle and (2) Actual output rotation angle when any rotation angle is given to the input. Note that the values in the table show the maximum values.



θ_{er} : Rotational transmission error

θ_1 : Input rotation angle

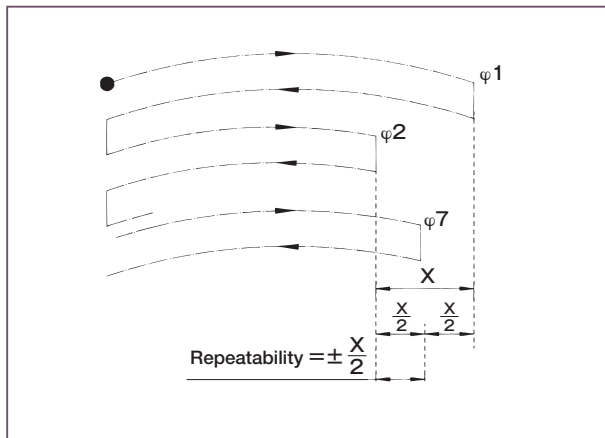
θ_2 : Actual output rotation angle

R : Reduction ratio of the HPG series

$$\theta_{er} = \theta_2 - \frac{\theta_1}{R}$$

*2 The repeatability is calculated by repeating the positioning at any position from the same direction seven times, measuring the stop position of the output shaft, and calculating the maximum difference. Measured values are expressed in angles and indicated as the 1/2 of the maximum difference with a +/- sign attached. Note that the values in the table show the maximum values.

Figure 4-2



*3 The starting torque refers to the “start-up torque” at the moment of starting rotation at the output side when torque is applied to the input side. Note that the values in the table show the maximum values.

Table 4-3

Load	No load
HPG speed reducer surface temperature	25°C

*4 The overdrive starting torque refers to the “start-up torque” at the moment of starting rotation at the input side when torque is applied to the output side. Note that the values in the table show the maximum values.

Table 4-4

Load	No load
HPG speed reducer surface temperature	25°C

*5 The no-load running torque refers to the torque at the input side that is required for rotating the speed reducer under no load. Note that the values in the table show the average values.

Table 4-5

Input rotating speed	3000 r/min
Load	No load
HPG speed reducer surface temperature	25°C

Torque – Torsional Characteristics

Gear head type standard product

Table 5-1

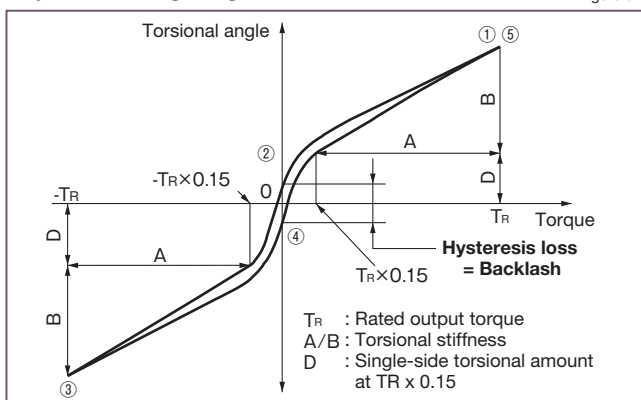
Size	Reduction ratio	Backlash		Single-side torsional amount at $T_R \times 0.15$		Torsional stiffness	
		D		A/B			
		arc-min	$\times 10^{-4}$ rad	arc-min	$\times 10^{-4}$ rad	kgf-m/arc-min	$\times 100$ N-m/rad
11	4	3.0	8.7	2.5	7.3	0.065	22
	5						
	6						
	7						
	8						
	9						
	10						
	20	3.0	8.7	3.0	8.7	0.065	22
	25						
	30						
	35						
	40						
	45						
	50						
14	3	3.0	8.7	2.2	6.4	0.14	47
	4						
	5						
	6						
	7						
	8						
	9						
	10	3.0	8.7	2.7	7.9	0.14	47
	15						
	20						
	25						
	30						
20	3	3.0	8.7	1.5	4.4	0.55	180
	4						
	5						
	6						
	7						
	8						
	9						
	10	3.0	8.7	2.0	5.8	0.55	180
	15						
	20						
	25						
	30						
32	3	3.0	8.7	1.3	3.8	2.2	740
	4						
	5						
	6						
	7						
	8						
	9						
	10	3.0	8.7	1.7	4.9	2.2	740
	15						
	20						
	25						
	30						

Backlash (Hysteresis loss)

The width at zero torque between (2) and (4) in Figure 4-1 "Torque-Torsional Angle Diagram" is called the hysteresis loss. The backlash of the HPG series is defined as the hysteresis loss during a transition from "Rated forward output torque" and "Rated reverse output torque". The backlash of the HPG series is 3 arc-min or less (1 arc-min or less for special products) at the time of shipping.

Torque-Torsional Angle Diagram

Figure 5-1



Gear head type BL1 specification (Backlash of 1 arc-min or less)

Table 5-2

Size	Reduction ratio	Backlash		Single-side torsional amount at $T_R \times 0.15$		Torsional stiffness	
		D		A/B			
		arc-min	$\times 10^{-4}$ rad	arc-min	$\times 10^{-4}$ rad	kgf-m/arc-min	$\times 100$ N-m/rad
14	3	1.0	2.9	1.1	3.2	0.14	47
	4						
	5						
	6						
	7						
	8						
	9						
	10	1.0	2.9	1.7	4.9	0.14	47
	15						
	20						
	25						
20	3	1.0	2.9	0.6	1.7	0.55	180
	4						
	5						
	6						
	7						
	8						
	9						
	10	1.0	2.9	1.1	3.2	0.55	180
	15						
	20						
	25						
32	3	1.0	2.9	0.5	1.5	2.2	740
	4						
	5						
	6						
	7						
	8						
	9						
	10	1.0	2.9	1.0	2.9	2.2	740
	15						
	20						
	25						
	30						

Torsional stiffness (wind-up curve)

When a torque is applied to the output side with the input side and casing of the speed reducer fixed, torsion corresponding to the torque is exerted on the output side. When the torque value is changed gradually in the order of (1) Rated forward output torque, (2) Zero, (3) Rated reverse output torque, (4) Zero, and (5) Rated forward output torque, a loop passing through (1), (2), (3), (4), and (5) (back to (1)) is formed as shown in Figure 4-1 "Torque-Torsional Angle Diagram".

The slope is low in the region from "0.15 x Rated output torque" and "Rated output torque", the average of which is the torsional stiffness of the HPG series. The slope is high in the region from "zero torque" and "0.15 x Rated output torque". This is caused by slight uneven contact in the meshing part or unbalanced load on the planetary gear under light load conditions.

Calculating the total torsional amount (wind-up)

The following describes how to calculate the single-side total torsional amount (average value) when load is applied to the speed reducer under no load.

Formula 5-1

● Calculation formula

$$\theta = D + \frac{T - T_L}{A/B}$$

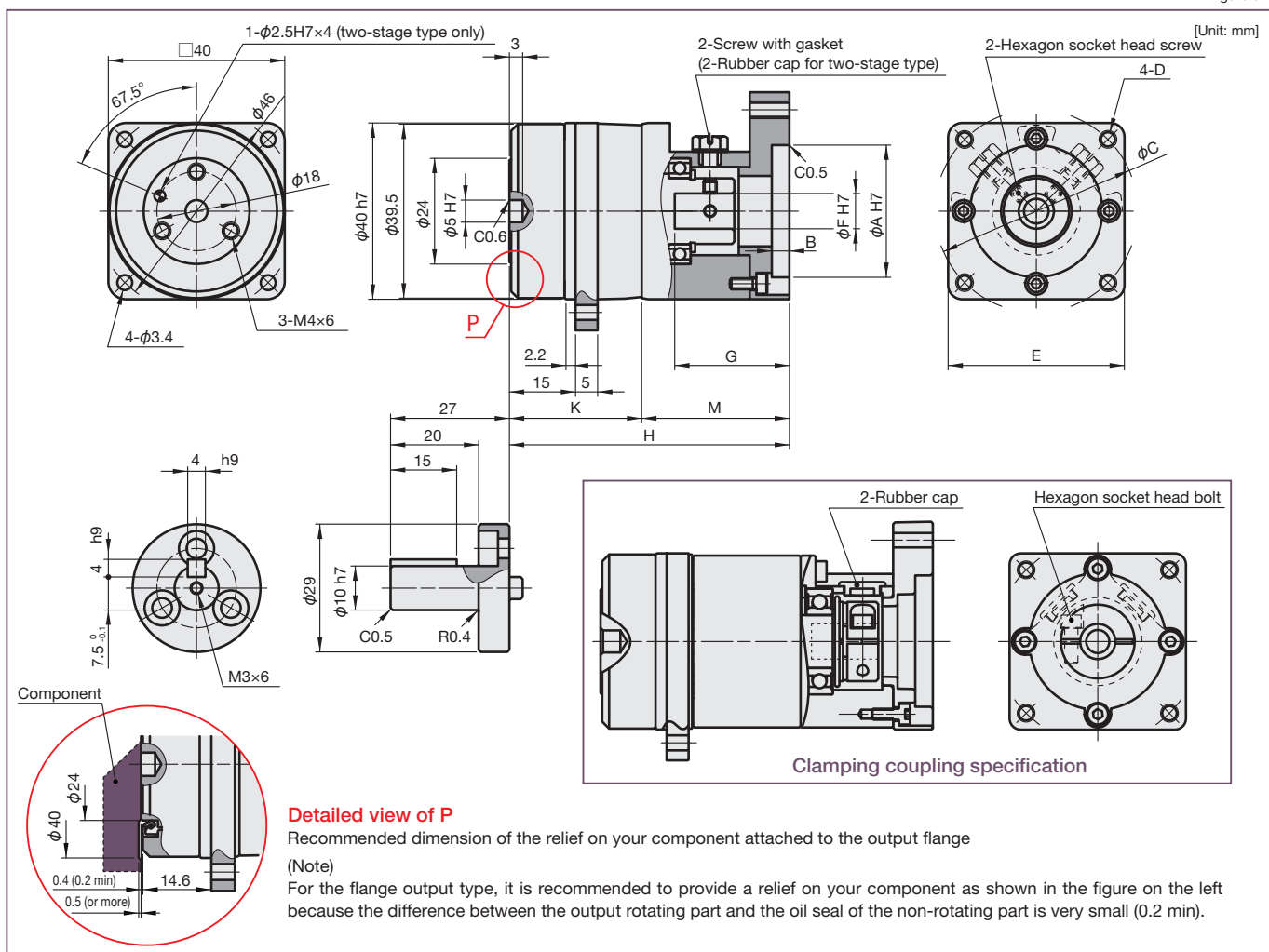
Symbols in calculation formula

Symbol	Meaning	Reference
θ	Total torsional amount	—
D	Single-side torsional amount at rated output torque $\times 0.15$	See Figure 4-1, Table 4-1, and Table 4-2
T	Load torque	—
T_L	Rated output torque $\times 0.15$ ($T_R \times 0.15$)	See Figure 4-1
A/B	Torsional stiffness	See Figure 4-1 and Tables 4-1 and 4-2

■ External Dimensions - Size 11

This dimension drawing shows the major dimensions. For more information on the details of dimensions and shapes, refer to our delivery specification drawings. You can download the CAD data of this product from our website. URL: <https://www.hds.co.jp/>

Figure 6-1



* The tolerance varies depending on the manufacturing method (casting or machining) of the parts. For more information on the tolerance of a dimension without a tolerance, please contact us.

■ Dimension Table

Table 6-1

	Configuration symbol Note 1	A (H7)	B	C	D	E	F (H7)		G	K	H	M	Weight (kg) Note 2	
							Min	Max					Shaft output	Flange output
Single-stage (Note) 3	RAB□	20	3	28	ϕ3.4 through-hole	□25	5	8	20.5	40.6	49.5	28.5	0.32	0.27
	RAC□	22		43.8		□40			0.33		0.28			
	RAA□	28		33		M2.5X5			ϕ40		0.31	0.26		
	RAD□	30	4	46	M4X9	□40			25.5		54.5	33.5	0.35	0.30
	RAE□			45	M3X9									
	RAN□	34		48	□60	M4X9							0.40	0.35
	RAF□	50		70		M5X9								
	RAG□		60	M4X9										
RAH□														
Two-stage (Note) 3	SB□	20	3	28	ϕ3.4 through-hole	ϕ40	5	5	16.4	45.4	70.4	25.0	0.48	0.43
	SD□	30	4	46	M4X9	□40	6	7	26.4		75.4	30.0	0.49	0.44
							8"	8"	27.5					
							6	7	26.4					
	SE□	50	5	70	M4X9	□60	8"	8"	27.5		0.63	0.58		
							6	7	26.4					
							8"	8"	27.5					

* Clamping coupling specification.

The dimension table above shows the values of typical products. For products not listed above, please contact us.

For more information on the details of dimensions and shapes, refer to our delivery specification drawings.

When installing the speed reducer as a single unit or in a special manner, please contact us.

(Notes) 1. The square (□) in the configuration symbols indicates the symbol of the input shaft coupling. Please use the model selection tool on our website (<https://hds-tech.jp/>).

2. Weight may slightly vary depending on the reduction ratio and the inner diameter of the input shaft coupling.

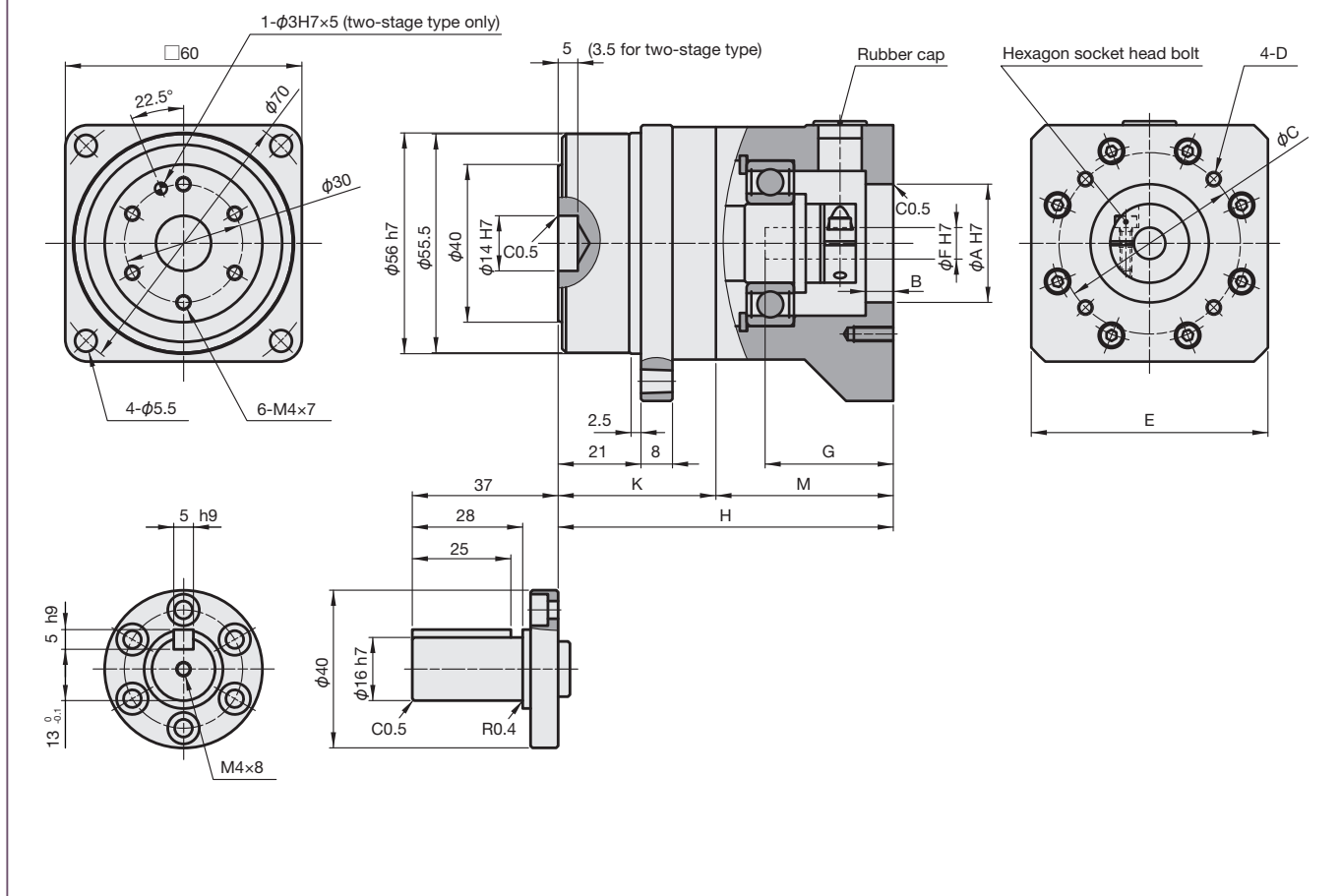
3. Reduction ratios are 4, 5, 6, 7, 8, 9, and 10 for single-stage speed reducers and 20, 25, 30, 35, 40, 45, and 50 for two-stage speed reducers.

■ External Dimensions - Size 14

This dimension drawing shows the major dimensions. For more information on the details of dimensions and shapes, refer to our delivery specification drawings. You can download the CAD data of this product from our website. URL: <https://www.hds.co.jp/>

Figure 7-1

[Unit: mm]



* The tolerance varies depending on the manufacturing method (casting or machining) of the parts. For more information on the tolerance of a dimension without a tolerance, please contact us.

■ Dimension Table

Table 7-1

	Configuration symbol Note 1	A (H7)	B	C	D	E	F (H7)		G	K	H	M	Weight (kg) Note 2	
							Min	Max					Shaft output	Flange output
Single-stage (Note) 3	AA□	30	7	45	M3X8	□60	6	8	32	40	85	45	1.02	0.92
	AB□			46	M4X10									
	AF□			34	48									
	AC□	50	6.5	70	M5X12									
	AD□			M4X10	60									
	AE□				70									
	RAX□				60									
	RAY□				70	M5X12	9	14	33	86	46	1.07	0.97	
	RAZ□			M6X12										
	RDA□	70	7	90	M5X12	□80	11	33	86	46	1.07	0.97		
RDB□	M5X12													
Two-stage (Note) 3	MA□	30	7	45	M3X8	□60	6	8	32.5	58.5	85	26.5	1.20	1.10
	MB□			46	M4X10									
	MD□			70	M5X12									
	ME□	M4X10	9		14									
	NA□													
	NB□	50	6.5	M5X12										
	LA□			70	7	90	M6X12	□80	11	33.5	86	27.5	1.24	1.14
	LB□													

The dimension table above shows the values of typical products. For products not listed above, please contact us.

For more information on the details of dimensions and shapes, refer to our delivery specification drawings.

When installing the speed reducer as a single unit or in a special manner, please contact us.

(Notes) 1. The square (□) in the configuration symbols indicates the symbol of the input shaft coupling. Please use the model selection tool on our website (<https://hds-tech.jp/>).

2. Weight may slightly vary depending on the reduction ratio and the inner diameter of the input shaft coupling.

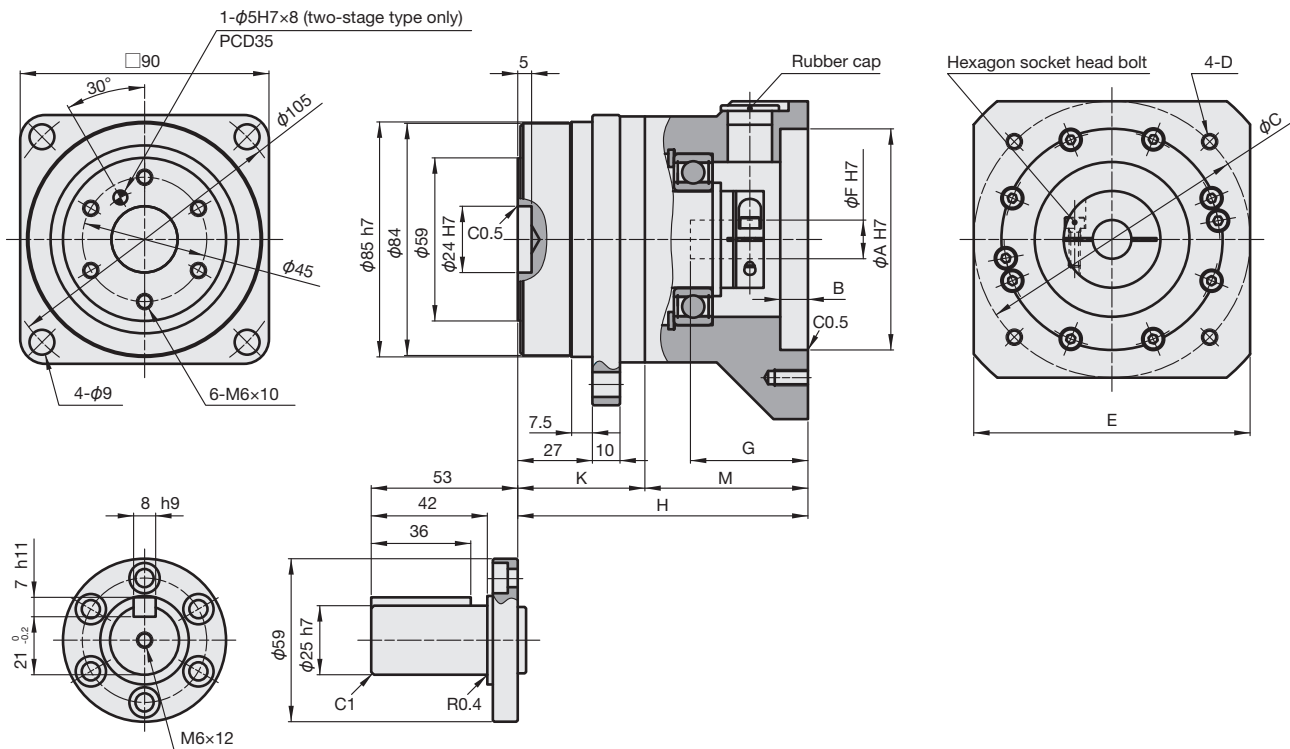
3. Reduction ratios are 3, 4, 5, 6, 7, 8, 9, and 10 for single-stage speed reducers and 15, 20, 25, 30, 35, 40, 45, and 50 for two-stage speed reducers.

External Dimensions - Size 20

This dimension drawing shows the major dimensions. For more information on the details of dimensions and shapes, refer to our delivery specification drawings. You can download the CAD data of this product from our website. URL: <https://www.hds.co.jp/>

Figure 8-1

[Unit: mm]



* The tolerance varies depending on the manufacturing method (casting or machining) of the parts. For more information on the tolerance of a dimension without a tolerance, please contact us.

Dimension Table

Table 8-1

	Configuration symbol Note 1	A (H7)	B	C	D	E	F (H7)		G	K	H	M	Weight (kg) Note 2				
							Min	Max					Shaft output	Flange output			
Single-stage (Note) 3	PGC□	50	10	70	M5X12	ø89	7	19	38	46	98	52	2.8	2.4			
	PGD□			M4X10													
	PGE□			M4X8													
	PFF□	70	7	90	M5X12	□80			45		105	59	3.0	2.6			
	PFE□				M6X12												
	PHC□				80										20	100	□100
	PHD□	6	115	M8X16													
Two-stage (Note) 3	ZA□	30	5	45	M3X8	ø55	8	8	30.5	70	98.5	28.5	3.1	2.7			
	ZB□			46	M4X10												
	YA□	50	5	70	M5X12	ø89	9	19	35		98	28	3.3	2.9			
	YB□				M4X10												
	WA□	70	7	90	M6X12	□80			42		105	35					
	WB□				M5X12												
	XA□	80	10	100	M6X12	□100											
	XB□	95	6	115	M8X16												
	XC□				M6X12												
	TA□	110	6.5	145	M8X25	□130	19	24					71	134	64	4.3	3.9
	UA□		7		M8X16	□120							65	128	58	3.8	3.4
	VA□		6.5		200	M8X25			□130		59	122	52	4.1	3.7		
	VB□	114.3		M12X25		□180											

The dimension table above shows the values of typical products. For products not listed above, please contact us.

For more information on the details of dimensions and shapes, refer to our delivery specification drawings.

When installing the speed reducer as a single unit or in a special manner, please contact us.

(Notes) 1. The square (□) in the configuration symbols indicates the symbol of the input shaft coupling. Please use the model selection tool on our website (<https://hds-tech.jp/>).

2. Weight may slightly vary depending on the reduction ratio and the inner diameter of the input shaft coupling.

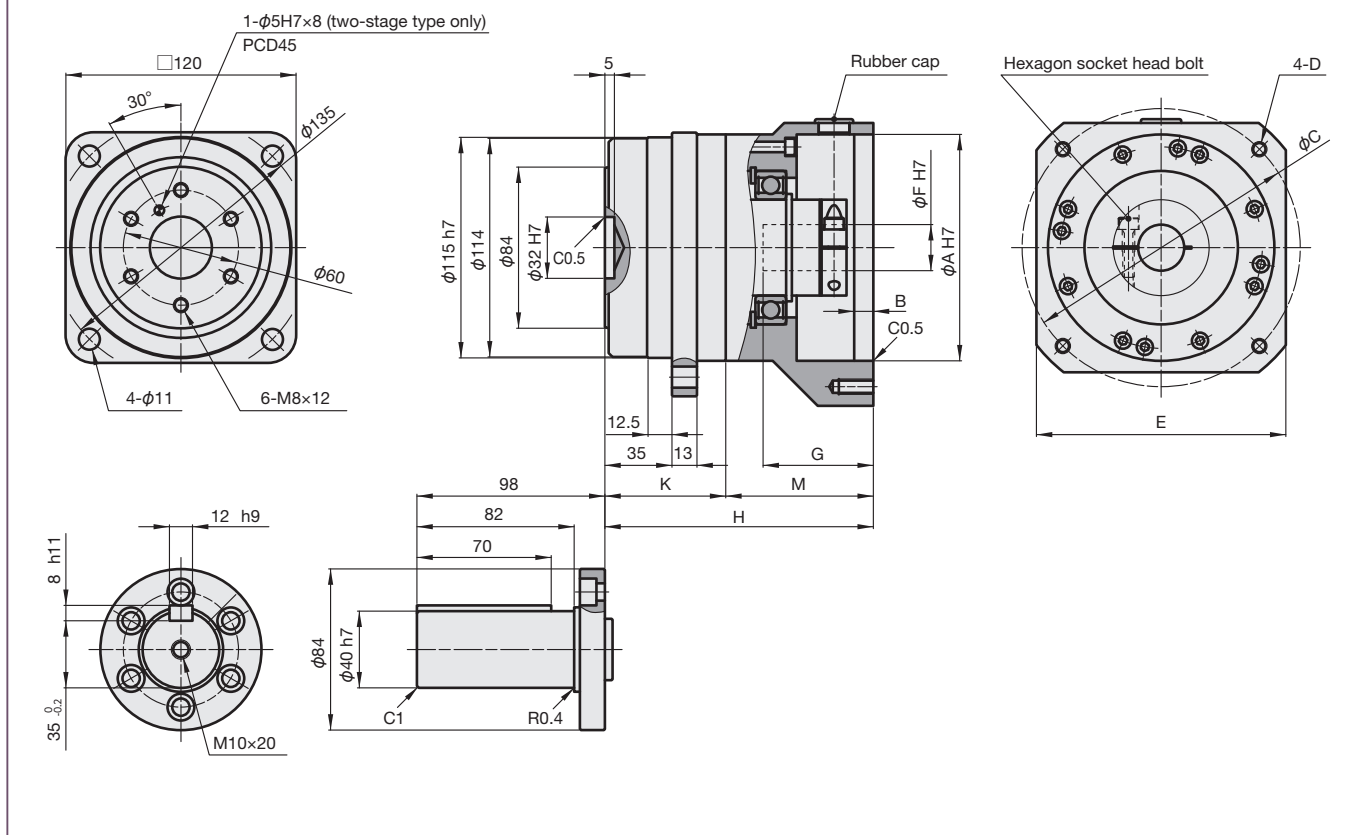
3. Reduction ratios are 3, 4, 5, 6, 7, 8, 9, and 10 for single-stage speed reducers and 15, 20, 25, 30, 35, 40, 45, and 50 for two-stage speed reducers.

■ External Dimensions - Size 32

This dimension drawing shows the major dimensions. For more information on the details of dimensions and shapes, refer to our delivery specification drawings. You can download the CAD data of this product from our website. URL: <https://www.hds.co.jp/>

Figure 9-1

[Unit: mm]



* The tolerance varies depending on the manufacturing method (casting or machining) of the parts. For more information on the tolerance of a dimension without a tolerance, please contact us.

■ Dimension Table

Table 9-1

	Configuration symbol Note 1	A (H7)	B	C	D	E	F (H7)		G	K	H	M	Weight (kg) Note 2						
							Min	Max					Shaft output	Flange output					
Single-stage (Note) 3	PNG□	70	4	90	M6X12	ϕ122	10	24	38	63	139	76	7.5	6.1					
	PNA□				M5X12														
	PNC□		7		M6X12				56										
	PNB□	80																	
	PNF□	95	6	115	M8X10	ϕ135	16	35	62		145	82	7.6	6.2					
	PNJ□				M6X10														
	PMC□	110	10	145	M8X18	□135			59		142	79	7.5	6.1					
	PPA□		6.5		200	M8X25			81						164	101	8.1	6.7	
	PPB□	M12X25		□180		9.1	7.7												
	PQP□				235			□220			14.7	13.3							
	PPC□												200	235					9.2
Two-stage (Note) 3	LA□	50	10	70	M5X12				ϕ80	10			19	39.5	97	135	38	8.3	
	LB□				M4X10														
	KA□				M5X12														
	KB□	70	7	90	M6X12	ϕ122	24	56	139		42	8.8				7.4			
	KC□				80					100									
	JJ□	95	6	115	M6X10	ϕ135				62			145	48			8.9	7.5	
	JF□				M8X10														
	HA□	110	10	145	M8X18	□130	59	142	45		9.0	7.6							
	GA□				6.5								200	M8X25		81	164	67	9.4
	GB□	114.3	165	M12X25		□180				10.4				9.0					
	GF□			130				M10X25	10.3		8.9								
GC□	200			235			M12X25	□220				10.5	9.1						

The dimension table above shows the values of typical products. For products not listed above, please contact us.

For more information on the details of dimensions and shapes, refer to our delivery specification drawings.

When installing the speed reducer as a single unit or in a special manner, please contact us.

(Notes) 1. The square (□) in the configuration symbols indicates the symbol of the input shaft coupling. Please use the model selection tool on our website (<https://hds-tech.jp/>).

1. The square ($\square$) in the configuration symbols indicates the symbol of the input shaft coupling. Please use the
2. Weight may slightly vary depending on the reduction ratio and the inner diameter of the input shaft coupling.

3. Reduction ratios are 3, 4, 5, 6, 7, 8, 9, and 10 for single-stage speed reducers and 15, 20, 25, 30, 35, 40, 45, and 50 for two-stage speed reducers.

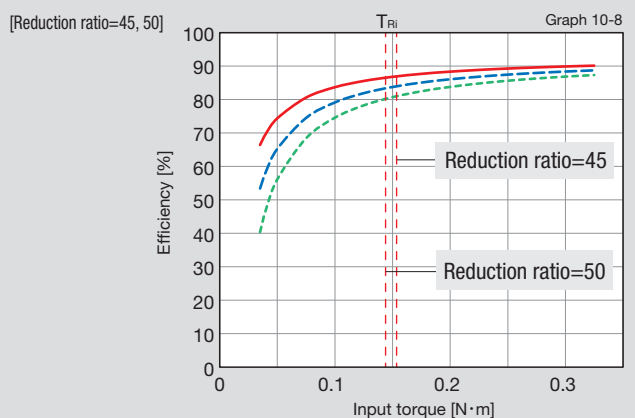
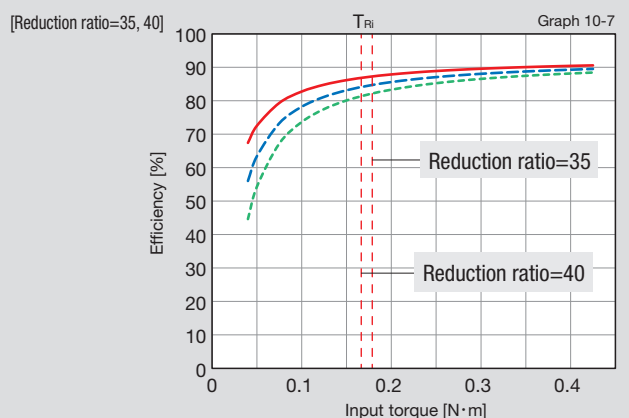
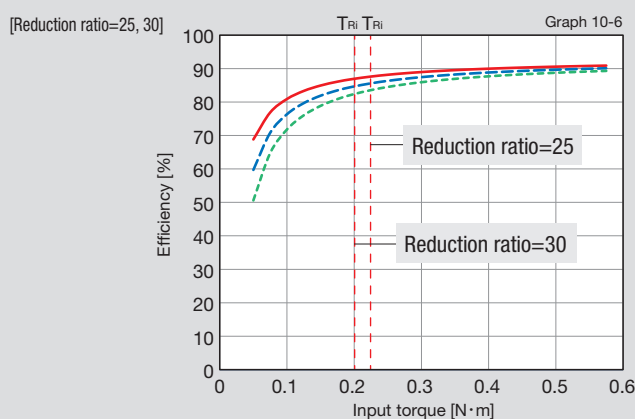
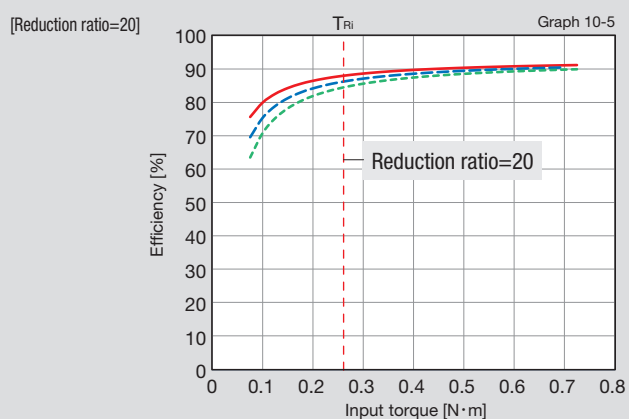
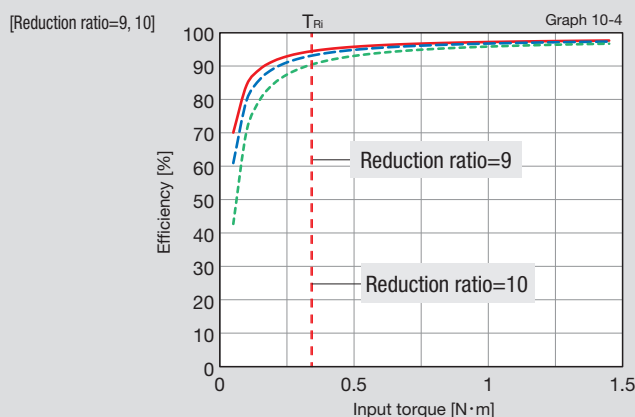
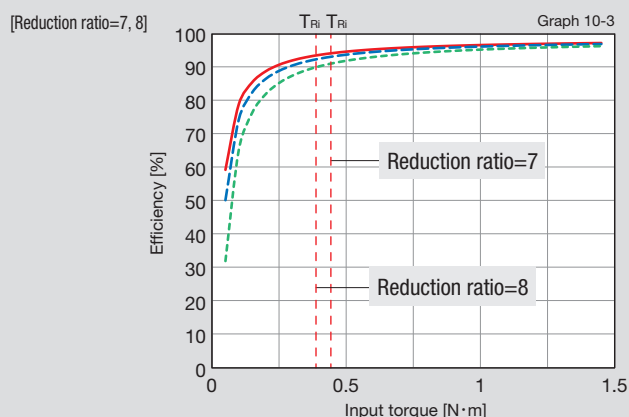
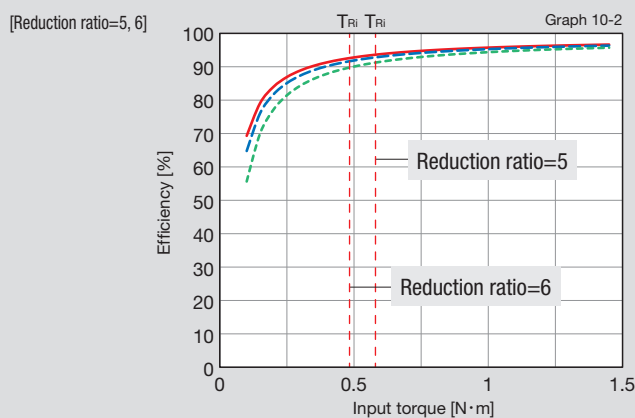
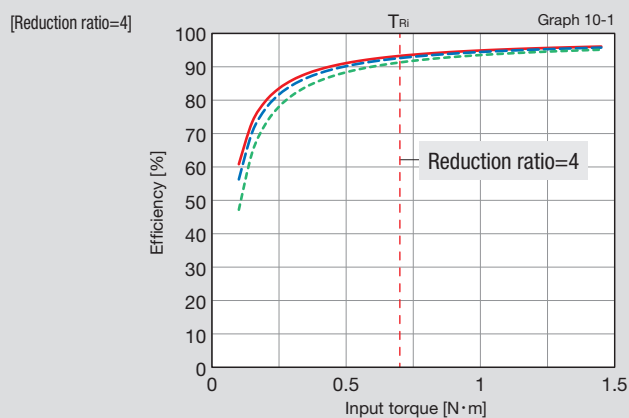
Efficiency Characteristics

Generally, the efficiency of a speed reducer varies depending on the reduction ratio, input speed, load torque, temperature, and lubrication conditions. The efficiencies of different series under the following measuring conditions are shown below. * The graphs show the average values.

Measuring conditions

Input speed	3000 r/min
Ambient temperature	25°C
Lubrication agent	Single-stage: Multemp AC-P/Two-stage: Harmonic Grease® PAL-1

Efficiency characteristics graph - Size 11

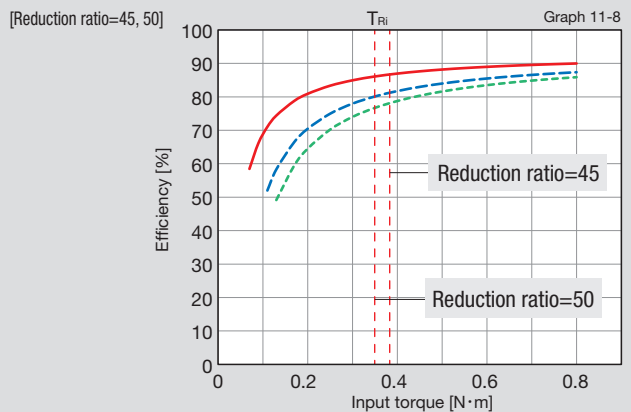
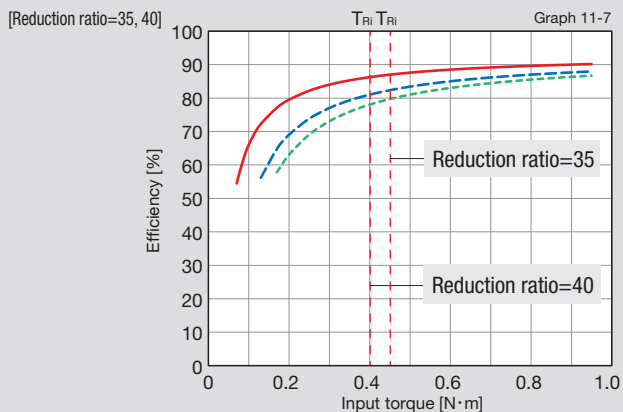
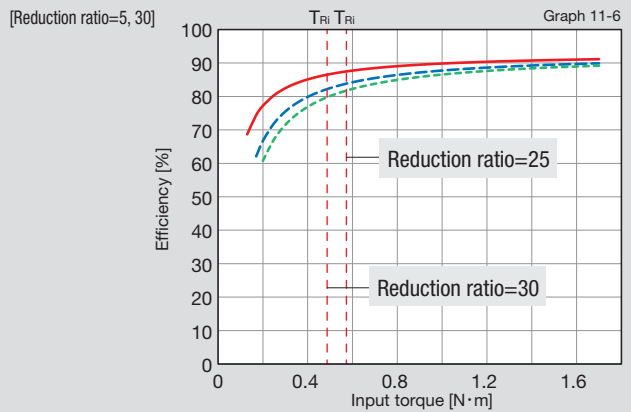
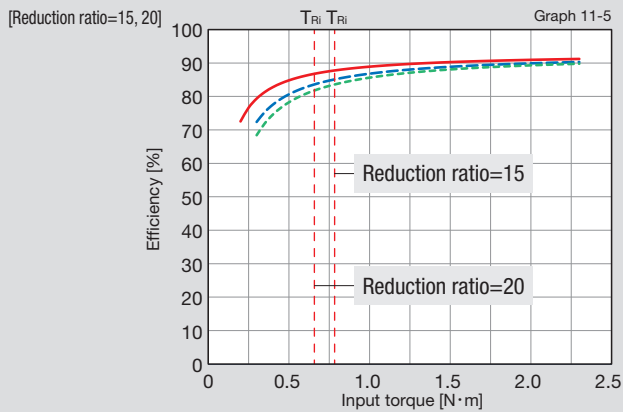
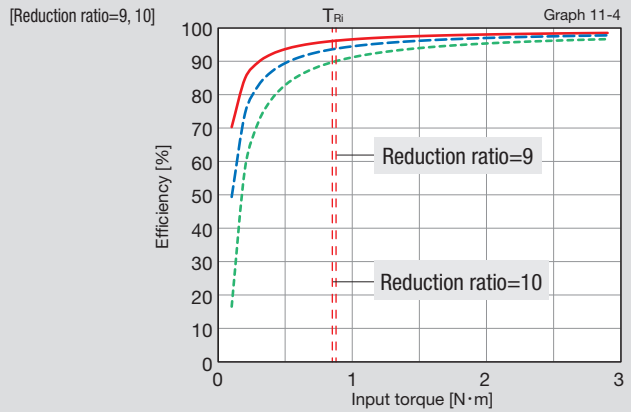
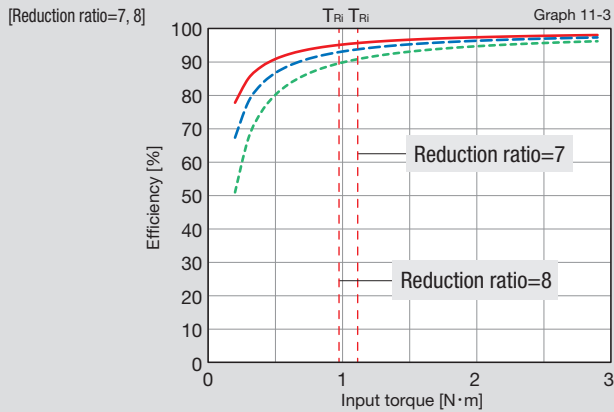
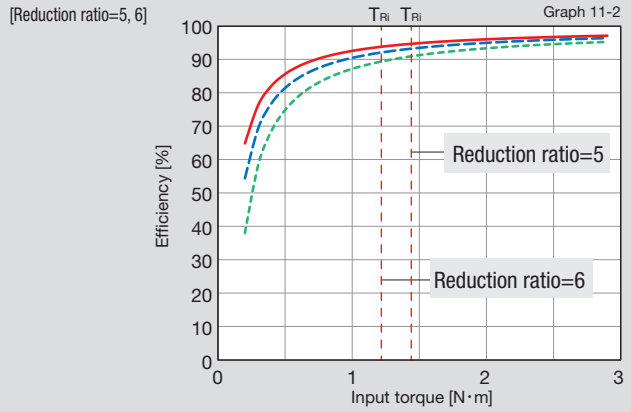
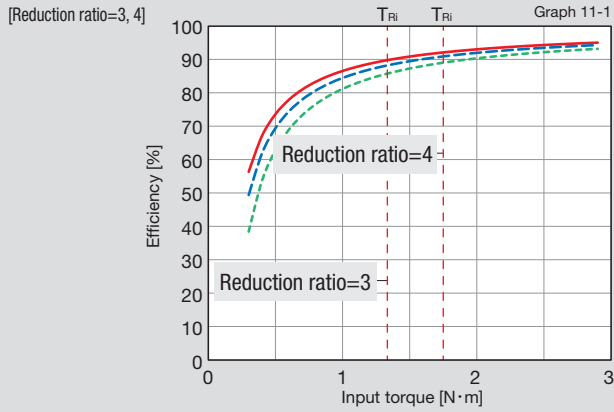


T_{Ri} Input torque corresponding to the rated output torque

— Speed reducer unit — Gear head type (standard product)

--- When a DDU bearing (with rubber contact seals on both sides) is built into the input side of the gear head type (special product)

Efficiency characteristics graph - Size 14

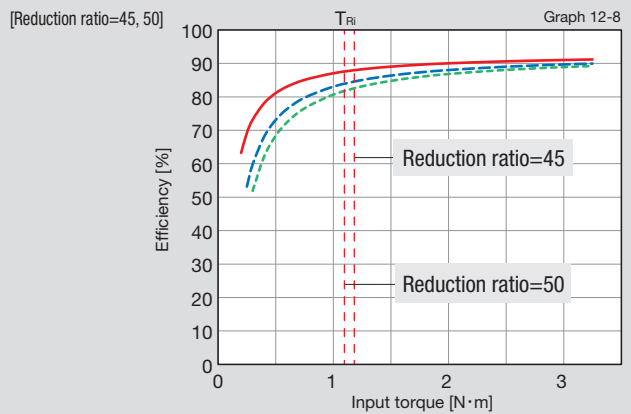
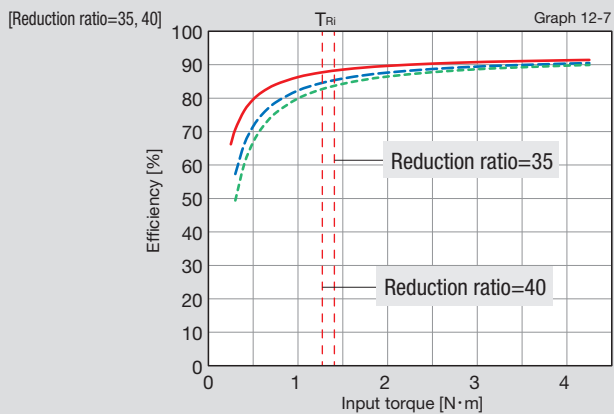
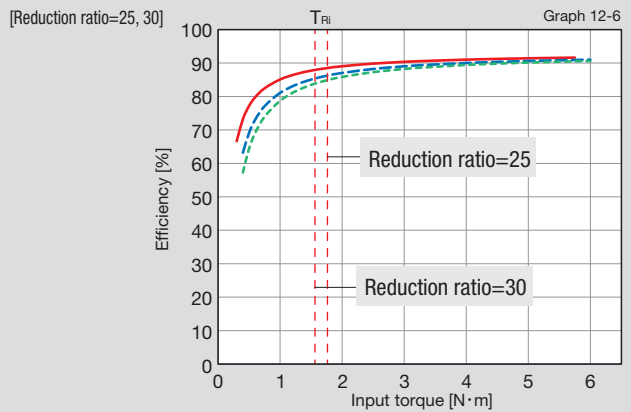
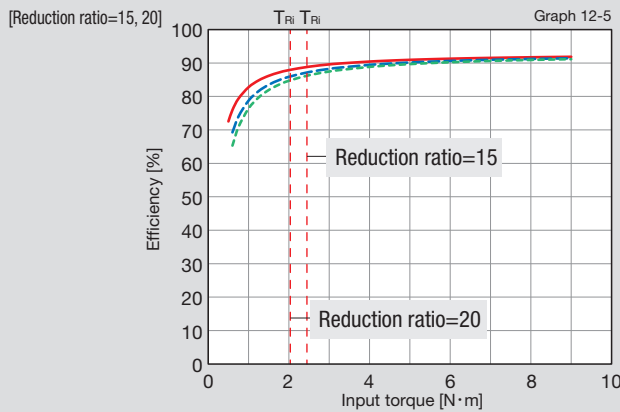
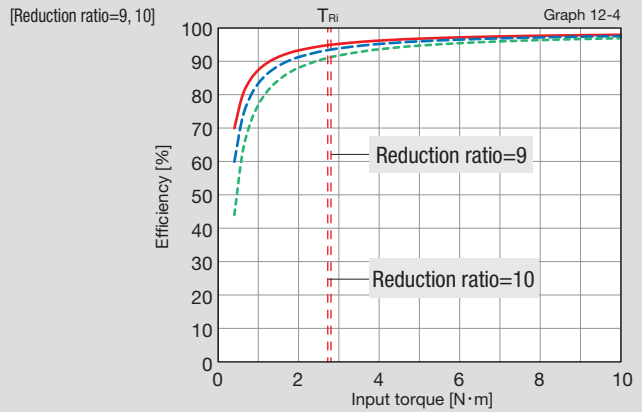
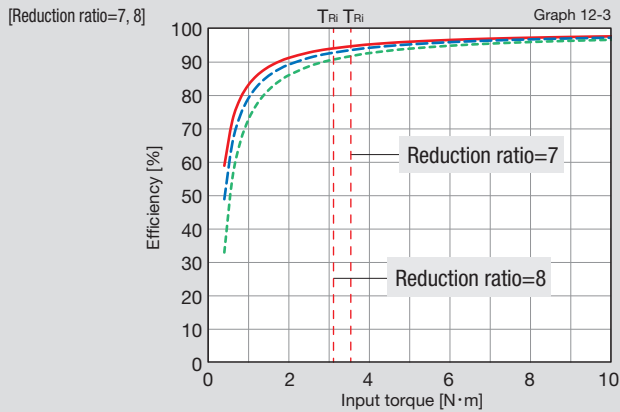
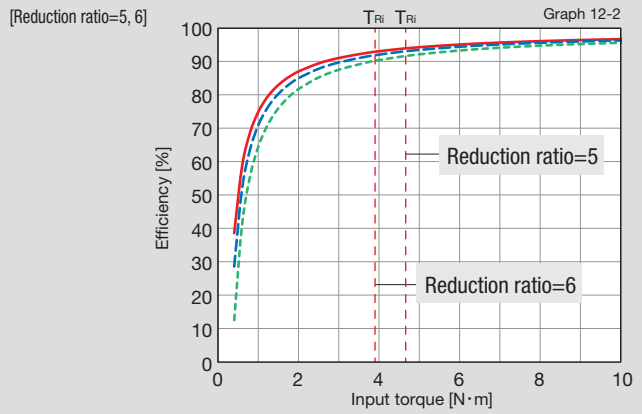
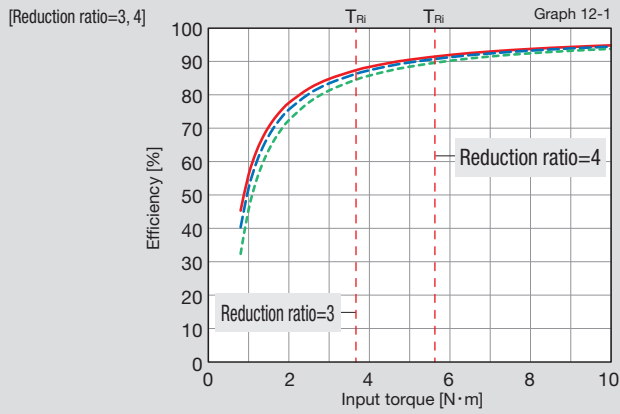


T_{Ri} Input torque corresponding to the rated output torque

— Speed reducer unit — Gear head type (standard product)

--- When a DDU bearing (with rubber contact seals on both sides) is built into the input side of the gear head type (special product)

Efficiency characteristics graph - Size 20

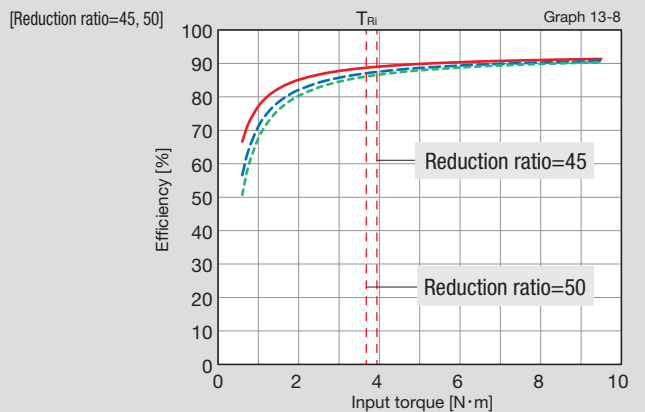
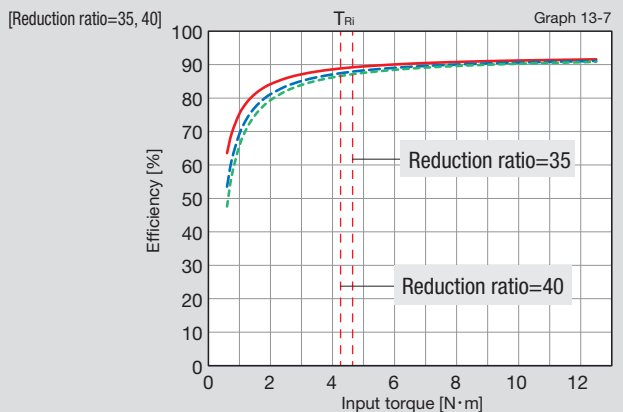
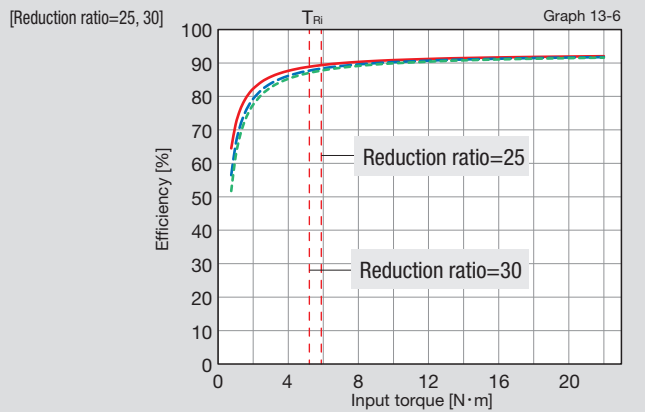
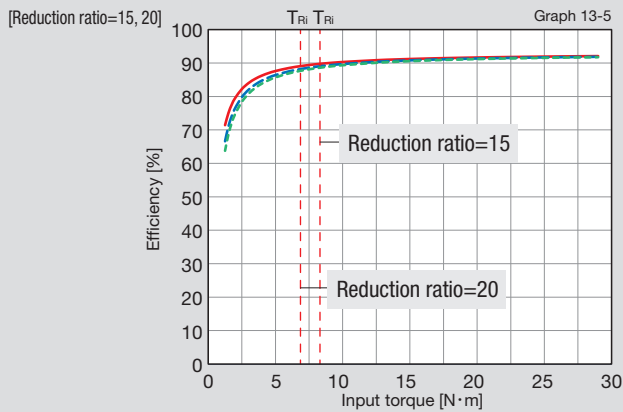
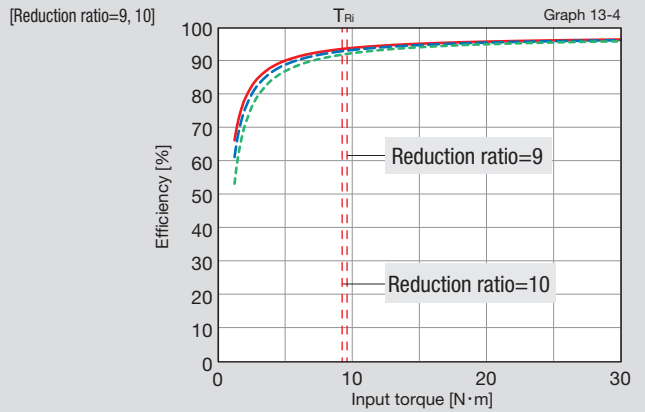
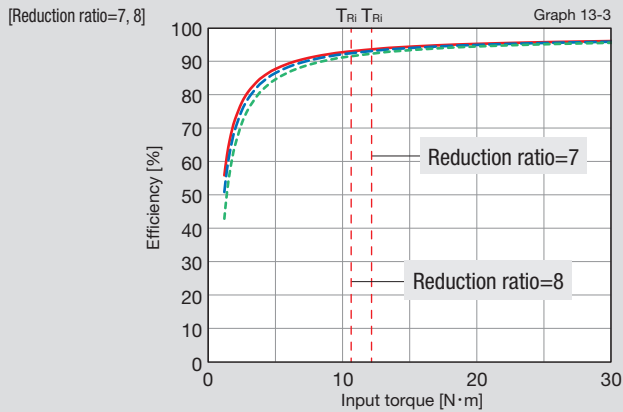
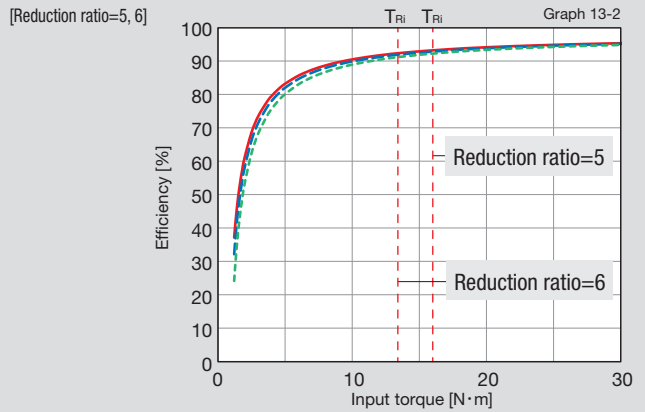
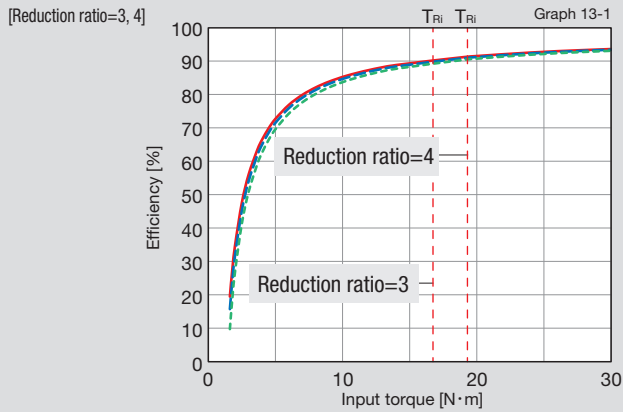


T_{Ri} Input torque corresponding to the rated output torque

— Speed reducer unit — Gear head type (standard product)

--- When a DDU bearing (with rubber contact seals on both sides) is built into the input side of the gear head type (special product)

Efficiency characteristics graph - Size 32



T_{Ri} Input torque corresponding to the rated output torque

— Speed reducer unit — Gear head type (standard product)

--- When a DDU bearing (with rubber contact seals on both sides) is built into the input side of the gear head type (special product)

■ Allowable load on the main bearing

The allowable radial load and allowable axial load indicate values that satisfy a LB10 lifetime of 20000 hours of the output bearing at the allowable average input speed in the "Rating Table" when only the pure radial load or axial load (with no bending moment) is exerted on the output shaft.

When any bending moment is involved or complex load is exerted, confirm the values by calculation by referring to the technical data "Specifications and check procedure of the output bearing" in the catalog.

Table 14-1

Size	Reduction ratio	Allowable radial load	Allowable axial load
		N	N
11	4	260	400
	5	280	430
	6	300	450
	7	310	470
	8	330	490
	9	340	510
	10	350	530
	20	430	650
	25	460	690
	30	490	730
	35	510	770
	40	530	800
	45	550	830
	50	570	860
14	3	400	600
	4	440	660
	5	470	700
	6	490	740
	7	520	780
	8	540	810
	9	560	840
	10	580	860
	15	650	980
	20	710	1070
	25	760	1140
	30	810	1200
	35	840	1260
	40	880	1310
	45	910	1360
	50	940	1410

Table 14-2

Size	Reduction ratio	Allowable radial load	Allowable axial load
		N	N
20	3	840	1250
	4	910	1370
	5	980	1460
	6	1030	1540
	7	1080	1620
	8	1130	1680
	9	1170	1740
	10	1200	1800
	15	1360	2030
	20	1480	2220
	25	1590	2370
	30	1680	2510
	35	1760	2620
	40	1830	2730
	45	1890	2830
	50	1950	2920
32	3	1630	2430
	4	1770	2650
	5	1900	2830
	6	2000	2990
	7	2100	3130
	8	2180	3260
	9	2260	3380
	10	2330	3480
	15	2640	3940
	20	2880	4300
	25	3080	4590
	30	3250	4850
	35	3400	5080
	40	3540	5290
	45	3670	5480
	50	3790	5660

Notices on Handling Products

■ Size selection

To achieve the full performance of the HarmonicPlanetary® HPG series, make sure to check the operating conditions and select a size by referring to the flow chart. For more information, please refer to "Size selection" in our gear head series catalog.

■ Specifications and check procedure of the output bearing

A high-precision cross roller bearing is built in for directly supporting the external load (output flange part).

To achieve the full performance, check the maximum moment load, life of the cross roller bearing, and static safety coefficient.

For more information, please refer to the "Specifications and check procedure of the output bearing" in our gear head series catalog.

■ Handling instruction

To achieve the full performance of the gear head series, perform installation and mounting correctly.

Follow our recommendation on bolts to use and tightening torque.

For more information, please refer to "Handling instruction" in our gear head series catalog.

■ Lubricant names

Multemp AC-P specification (HPG helical gear type, single-stage)

Manufacturer: KYODO YUSHI CO., LTD.

Base oil: Composite hydrocarbon oil and diester	Consistency: 280 (at 25°C)
Thickener: Lithium soap	Drop point: 200°C or above
Additives: Extreme-pressure additive and others	Appearance: Black

Harmonic Grease® PAL-1 specification (HPG helical gear type, two-stage)

Manufacturer: Harmonic Drive Systems Inc.

Base oil: Mineral oil/synthetic oil	Consistency: 295-325 (at 25°C)
Thickener: Lithium complex	Drop point: 230°C or above
Additives: Extreme-pressure additive and others	Appearance: Light yellow

Motor Capacity / Size Matching Table

The matching table is a guide for the combinations with the standard motors.

For information on the combination with specific motors, please contact our sales office.

Motor capacity	Motor rated speed	Reduction ratio							
W	r/min	3	4	5	6	7	8	9	10
50	3000		11	11	11	11	11	11	11
100	3000		11	11	11	11	14	14	14
150	3000		11	11	11	14	14	14	14
200	3000	14	14	14	14	14	14	20	20
400	3000	14	14	14	14	20	20	20	20
600	3000	20	20	20	20	20	20	20	20
750	3000	20	20	20	20	20	20	20	32
1000	3000	20	20	20	20	20	20	32	32
1500	3000	32	32	32	32	32	32	32	32
2000	3000	32	32	32	32	32	32	32	32
2500	3000	32	32	32	32	32	32	32	
3000	3000	32	32	32	32	32	32		
4000	3000	32	32	32	32	32			
5000	3000	32	32	32					

Motor capacity	Motor rated speed	Reduction ratio							
W	r/min	15	20	25	30	35	40	45	50
50	3000		11	11	14	14	14	14	14
100	3000	14	14	14	14	20	20	20	20
150	3000	14	14	20	20	20	20	20	20
200	3000	14	20	20	20	20	20	20	20
400	3000	20	20	20	20	32	32	32	32
600	3000	20	20	32	32	32	32	32	32
750	3000	20	32	32	32	32	32	32	32
1000	3000	32	32	32	32	32	32		
1500	3000	32	32	32	32				
2000	3000	32	32						
2500	3000	32							

The values in the table above show the sizes of the speed reducers. The mounting angle sizes for the respective sizes of speed reducer are shown below:

11: □40mm

14: □60mm

20: □90mm

32: □120mm



■ Please contact our sales office with any questions.

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