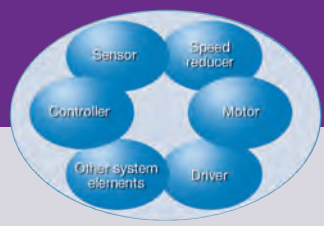
FINE MECHANICS & TOTAL Motion CONTROL

HarmonicDrive® New Product News Vol. 8



HarmonicPlanetary®

GEARHEAD

HPGP Series – High Performance Gearhead for Servomotors

Harmonic Drive Systems now offers a NEW high-torque planetary gearhead based upon our high precision HPG Series HarmonicPlanetary® gears.

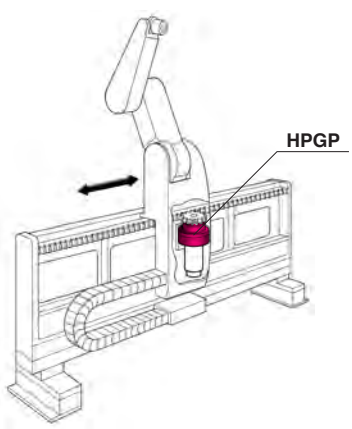
The HPGP Series has 33% higher torque than the original HarmonicPlanetary® HPG Series

The HPGP series has achieved higher torque while maintaining high precision through use of our innovative ring-gear technology and high moment stiffness through use of an integral cross-roller output bearing. The HPGP series achieves longer life and can allow smaller gearheads to be used.

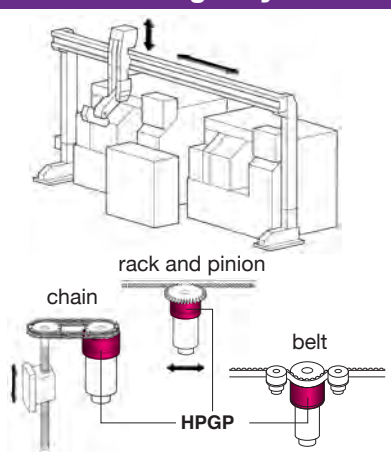
Application Examples

Machine Tools | Industrial Automation | Industrial robots

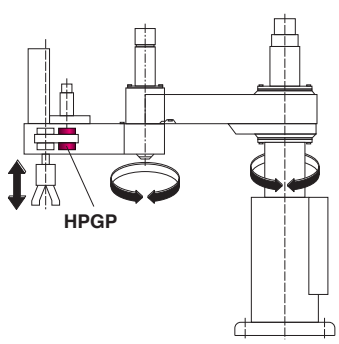
Robot linear axis (rack and pinion)

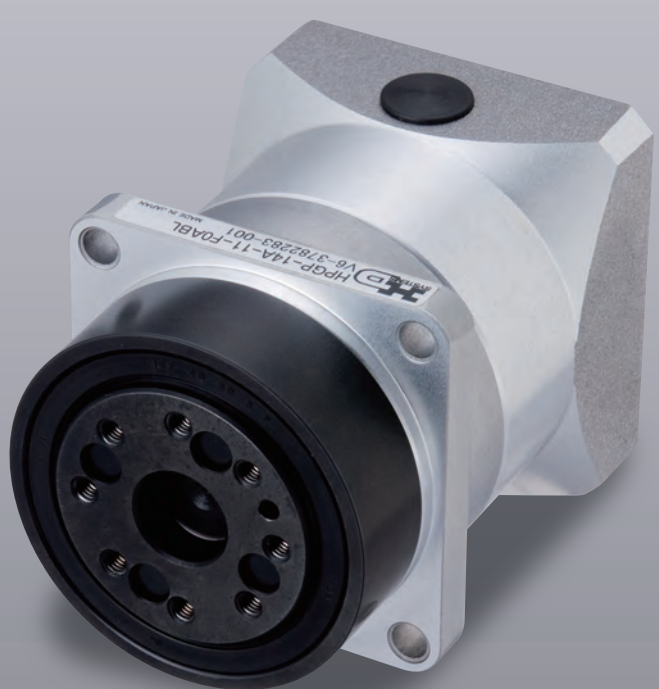


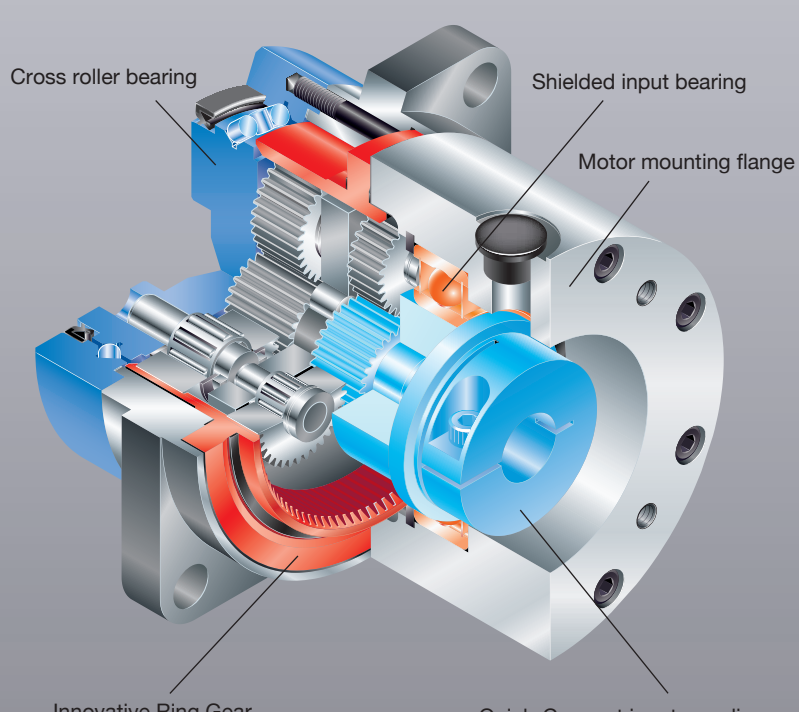
Machine tool gantry robot



SCARA robot







Ordering Code

HPGP - 14 A - 05 - FO XXX - SP

Model	Size	Revision	Ratio	Output Shaft Options	Input Shaft Configuration	Special Options
HPGP, High-Torque, HarmonicPlanetary®	11	A	5,21,37,45	FO : Output Flange J20 : Shaft without a key J60 : Shaft with a key and center tapped hole	This code represents the motor mounting configuration. This code differs depending on the motor to be used. Please contact the Sales Division for the mounting codes of motors not listed in the matching table.	BL 1 : Backlash less than 1 arc-min. (Available size # 14-65) D : Input side contact sealed bearing (DDU) NR6 : Noise reduction, backlash less than 6 arc-min (Available size # 14-50) Blank : Standard product SP : Custom Specification
	14 20 32 50		5,11,15,21,33,45	FO : Output Flange J2 : Shaft without a key J6 : Shaft with key and center tapped hole (J2 & J6 for size 65 are by special order only)		
	65		4,5,12,15,20,25			

Rating Table

Size	Ratio	Rated Torque at 3000rpm*1		Limit for Average Torque*2		Limit for Repeated Peak Torque*3		Limit for Momentory Torque*4		Max. Average Input Speed*5	Maximum Input Speed*6	Moment of Inertia*7 Input Shaft Type		Weight*8 Gearheads w/output	
		Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	r/min	r/min	Shaft x 10^{-4}kg.m^2	Flange x 10^{-4}kg.m^2	Shaft kgf	Flange kgf
11	5	3.4	0.35	6.7	0.68	10	1.0	20	2.0	3000	10000	0.0040	0.0024	0.18	0.14
	21	4.6	0.47	8	0.82	13	1.3					0.0019	0.0018	0.24	0.20
	37											0.00069	0.00066		
	45											0.00050	0.00048		
14	5	7.8	0.80	17	1.7	30	3.1	56	5.7	3000	6000	0.023	0.017	0.54	0.42
	11	10	1.0	20	2.0							0.019	0.018	0.63	0.51
	15	12	1.2									0.017	0.016		
	21											0.0093	0.0090		
	33	13	1.3									0.0030	0.0029		
	45											0.0028	0.0027		
20	5	21	2.1	47	4.8	133	14	217	22	3000	6000	0.20	0.16	1.6	1.2
	11	26	2.7	60	6.1							0.17	0.17	1.9	1.5
	15	32	3.3	70	7.1							0.16	0.15		
	21	33	3.4	73	7.4							0.073	0.071		
	33	39	4.0	80	8.2							0.030	0.029	2.0	1.6
	45											0.023	0.022	1.9	1.5
32	5	87	8.9	200	20	400	41	650	66	3000	6000	1.1	0.8	4.4	3.0
	11	104	11	226	23								1.0	5.1	3.7
	15	122	12									0.77	0.74		
	21	130	13									0.37	0.35		
	33	143	15	266	27							0.17	0.17	5.4	4.0
	45											0.12	0.12	5.1	3.7
50	5	226	23	452	46	1130	115	1850	189	2000	4500	6.2	4.9	13	10
	11	266	27	532	54							4.2	4.0	15	12
	15	306	31	600	61							3.7	3.5		
	21	346	35	665	68							1.7	1.6		
	33	359	37									0.75	0.72		
	45											0.52	0.50		
65	4	665	68	1200	122	2920	300	4500	460	2000	2500	46*9	31	32*9	22
	5	705	72	1330	136						3000	30*9	21		
	12	798	81	1460	149							22*9	20	47*9	37
	15	971	99	1730	177							20*9	19		
	20	1060	109	2000	204							7.8*9	7.3		
	25	1130	115									7.2*9	6.8		

*1: Rated torque is based on an L10 life of 20,000 hours with an input speed of 3,000 rpm, which is the typical rated speed of servo motors. Rated input speed for sizes 50 and 65 are 2,000 rpm.
*2: The limit for average torque is calculated based on the load torque pattern. At this torque, life will be 2,000 hours or more when operated at an input speed of 2,000 rpm.
*3: The limit for torque seen during start and stop cycles.
*4: The limit for torque resulting from an emergency stop or from external shock loads. Always operate below this value. Calculate the permissible number of events to assure it meets the required operating conditions.
*5: Maximum instantaneous input speed.
*6: Maximum average input speed depends on the operating environment, but it is the limiting value for the continuous operating speed or the average input speed of a motion profile. Average input speed is limited due to heat generated in the reducer.
*7: Inertia value is for the gearhead only
*8: The weight is for the gearhead only. (Without input shaft coupling and motor flange)
*9: Flange output is standard for the size 65 gearhead. Shaft type (J2 & J6) is available by special order only.

Performance Table

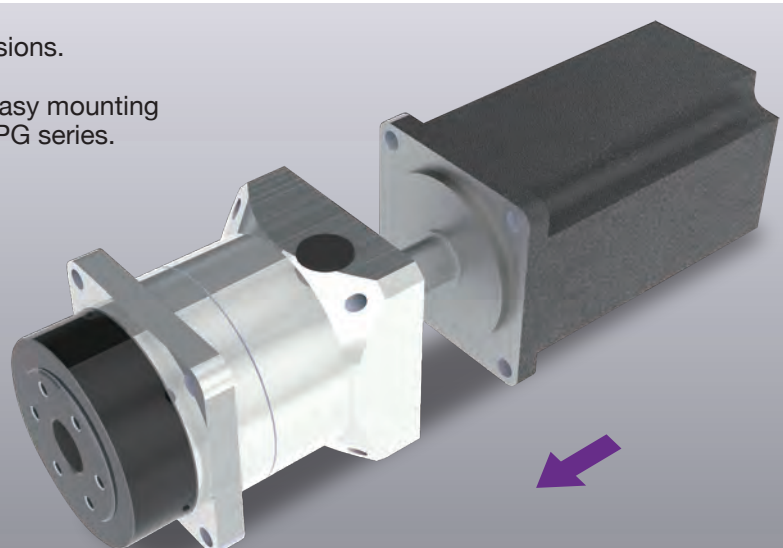
Size	Ratio	Positioning Accuracy *1		Repeatability *2	Starting Torque *3		Backdriving Torque *4		No Load Running Torque *5	
		arc min	x10^{-4}rad	arc sec	cNm	kgfcm	Nm	kgfm	cNm	kgfcm
11	5	5	14.5	±30	4.0	0.41	0.20	0.020	5.0	0.51
	21				2.9	0.29	0.60	0.061	1.3	0.13
	37				1.6	0.17		0.062	0.90	0.092
	45				1.4	0.15	0.64	0.066	0.80	0.082
14	5	4	11.6	±20	8.6	0.88	0.43	0.044	9.8	1.0
	11				8.0	0.82	0.90	0.092	4.9	0.50
	15				7.4	0.75	1.1	0.11	2.9	0.30
	21				5.2	0.53		0.12		
	33				3.3	0.34			2.0	0.20
	45				2.4	0.25				
20	5	4	11.6	±15	19	1.9	0.93	0.095	28	2.9
	11				15	1.6	1.7	0.17	15	1.5
	15				12	1.2	1.8	0.18	11	1.1
	21				9.3	0.95	2.0	0.20	8.8	0.90
	33				6.4	0.65	2.1	0.22	5.9	0.60
	45				4.7	0.48			4.9	0.50
32	5	4	11.6	±15	33	3.4	1.7	0.17	73	7.4
	11				27	2.7	2.9	0.30	38	3.9
	15				25	2.5	3.7	0.38	29	3.0
	21				22	2.3	4.7	0.48	24	2.4
	33				15	1.5	4.8	0.49	14	1.4
	45				11	1.2	5.1	0.52	13	1.3
50	5	3	8.7	±15	80	8.2	4.0	0.41	130	13
	11				45	4.6	5.0	0.51	60	6.1
	15				40	4.1	6.0	0.61	47	4.8
	21				36	3.7	7.6	0.78	40	4.1
	33				24	2.4	7.8	0.80	24	2.5
	45				20	2.0	8.9	0.91	20	2.0
65	4	3	8.7	±15	288	29	12	1.2	420	43
	5				240	24			360	37
	12				125	13	15	1.5	190	19
	15				110	11	17	1.7	160	16
	20				95	10	19	1.9	130	13
	25				84	8.6	21	2.1	110	11

*1: Positioning accuracy represents the error between the theoretical and actual output angle. The values in the table are maximum values.
*2: Repeatability is the difference in position measured after multiple movements to the same desired position from the same direction. The repeatability is defined as one half the value of the maximum difference measured, preceded by a ± sign. The values in the table are maximum values.
*3: Starting torque is the torque required to begin rotation of the input element (high speed side), with no load applied to the output. The values in the table are maximum values.
*4: Backdriving torque is the torque applied at the output side (low speed side) to begin rotation of the input element (high speed side). The values in the table are maximum values.
*5: No-load running torque is the input torque required to rotate the input at 3,000 rpm with no load applied to the output.

Dimensions

Please contact our sales office for detailed dimensions.

Quick couple input shaft and motor flange allow easy mounting to a servo motor, the same as the conventional HPG series.



Easy mounting to a wide variety of servo motors.

Yaskawa Electric, Mitsubishi Electric, Fanuc, Panasonic, Sanyo Electric, Tamagawa Seiki, Fuji Electric, Omron, Toshiba Machine, Keyence.

Please contact our sales office for servo motors not listed in this brochure.
In the future, additional motor manufacturers will be listed in the catalog and on our website.

Specification for Crossroller Bearing

Size	Pitch Circle dp m	Offset R m	Basic Load Rating				Allowable Moment Load Mc*3		Moment Stiffness Km*4	
			Basic Dynamic Load Rating C*1		Basic Static Load Rating Co*2		Nm	kgfm	x10⁴ Nm/rad	kgfm/ arc min
			N	kgf	N	kgf				
11	0.0275	0.006	3116	318	4087	417	9.50	0.97	0.88	0.26
14	0.0405	0.011	5110	521	7060	720	32.3	3.30	3.0	0.90
20	0.064	0.0115	10600	1082	17300	1765	183	18.7	16.8	5.0
32	0.085	0.014	20500	2092	32800	3347	452	46.1	42.1	12.5
50	0.123	0.019	41600	4245	76000	7755	1076	110	100	29.7
65	0.170	0.023	90600	9245	148000	15102	3900	398	364	108

*1: Basic dynamic rated load is a constant stationary radial load that achieves a basic dynamic rated life of the bearing of one million revolutions.
*2: Basic static rated load is a static load that achieves a contact stress of a constant level (408kN/mm2) at the center of a contact zone between the rolling element receiving a maximum load and track.
*3: Allowable Moment Load is the maximum moment load that can be applied to the output shaft bearing, Do not exceed this limit.
*4: The moment stiffness are mean values.

Gearhead Mounting Bolts and Resulting Transmission Torque

Size		11	14	20	32	50	65
Number of Screws		4	4	4	4	4	4
Size of Screws		M3	M5	M8	M10	M12	M16
Pitch Circle Diameter	mm	46	70	105	135	190	260
Screw Tightening Torque	Nm	1.4	6.3	26.1	51.5	103	255
	kgfm	0.14	0.64	2.66	5.25	10.5	26.0
Torque Transmitting Capacity	Nm	26.3	110	428	868	2030	5180
	kgfm	2.69	11.3	43.6	88.6	207	528

Recommended bolt : JIS B 1176 socket head cap screw, Bolt strength: JIS B 1051, 12.9 or higher

Output Flange Mounting Bolts and Resulting Transmission Torque

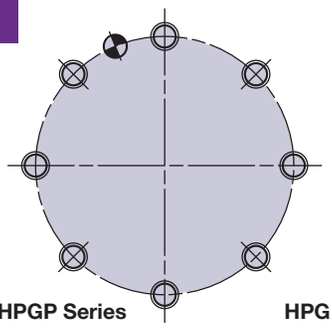
		11	14	20	32	50	65
Number of Screws		4	8	8	8	8	8
Size of Screws		M4	M4	M6	M8	M12	M16
Pitch Circle Diameter	mm	18	30	45	60	90	120
Screw Tightening Torque	Nm	4.5	4.5	15.3	37.2	128.4	319
	kgfm	0.46	0.46	1.56	3.8	13.1	32.5
Torque Transmitting Capacity	Nm	25.3	84	286	697	2406	5972
	kgfm	2.48	8.6	29.2	71.2	245	609

The torque of the HPGP is higher than HPG Series and has a different number of bolts, size of bolts & PCD. Detailed drawings are available upon request.
Recommended bolt : JIS B 1176 socket head cap screw, Bolt strength: JIS B 1051, 12.9 or higher

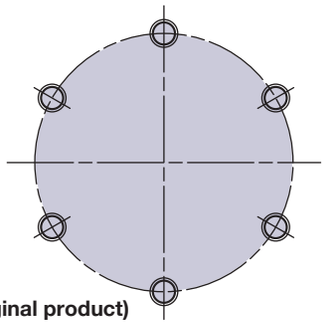
Output Flange Bolt Pattern Reference Drawing

The number of bolts, size of bolts & PCD vary depending on the size of the gear. Additionally, the HPGP Series has an added dowel pin hole.

Please refer to the Gearhead Series Catalog or contact our Sales Division for more information.



HPGP Series



HPG Series (Original product)

Harmonic Drive Systems Inc.

Head Office: Believe Omori 7F, 6-25-3 Minami-Ohi, Shinagawa-ku,Tokyo, Japan 140-0013 TEL 03 (5471) 7800 FAX 03 (5471) 7811
Overseas Division: 1856-1 Maki, Hotaka, Azumino-shi, Nagano, Japan 399-8305 TEL 0263 (83) 6935 FAX: 0263 (83) 6901
Tokyo Office: Believe Omori 7F, 6-25-3 Minami-Ohi, Shinagawa-ku,Tokyo, Japan 140-0013 TEL 03 (5471) 7830 FAX 03 (5471) 7836
Kita-Kanto Office: Y.S.T. Building 3F, 4-263 Sakuragi-cho, Ohmiya-ku, Saitama-shi, Saitama, Japan 330-0854 TEL 048 (647) 8891 FAX: 048 (647) 8893
Koshin Office: 1856-1 Maki, Hotaka, Azumino-shi, Nagano, Japan 399-8305 TEL 0263 (83) 6910 FAX: 0263 (83) 6911
Chu-bu Office: Nagoya Inter Building 6F, 2-173-4 Hongo, Meito-ku, Nagoya-shi, Aichi, Japan 465-0024 TEL 052 (773) 7451 FAX 052 (773) 7462
Kansai Office: Shin-Osaka Ueno To-yo Building 3F, 7-4-17 Nishi-nakajima, Yodogawa-ku, Osaka-shi, Osaka, Japan 532-0011 TEL 06 (6885) 5720 FAX 06 (6885) 5725
Kyushu Office: EME Hakata station-front Building 7F, 1-15-20 Hakata station-front, Hakata-ku, Fukuoka-shi, Fukuoka, Japan 812-0011 TEL 092 (451) 7208 FAX 092 (481) 2493
Hotaka Plant: 1856-1 Maki, Hotaka, Azumino-shi, Nagano, Japan 399-8305 TEL 0263 (83) 6935 FAX: 0263 (83) 6901