HarmonicPlanetary®

Hollow Planetary-Gear Speed Reducers for Precision Control   HPF series
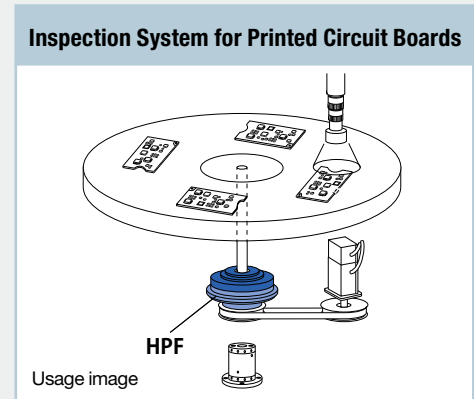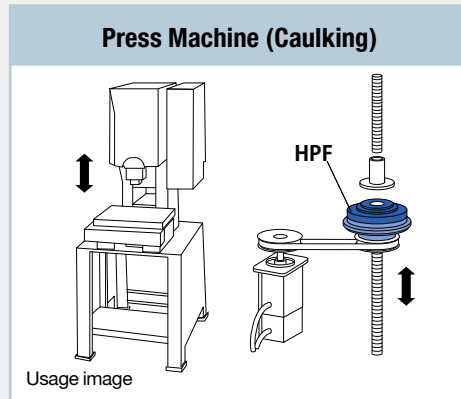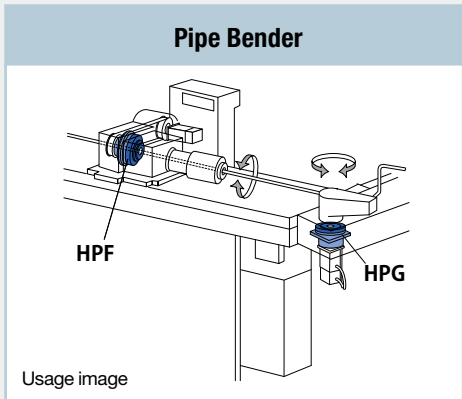
First in History   New Development - Coaxial Input and Output, Hollow Planetary-gear Speed Reducers
High-speed SHA Series Incorporating HPF Series is also Available!

Designed based on the HPG series of Harmonic Planetary® planetary-gear speed reducers that are enjoying a high reputation among their users, hollow structure units have been developed. Featuring the excellent performance and specification inherited from the HPG series, a new shape advantage called a hollow shaft structure has now been achieved. The input and output shafts are coaxial through holes allowing compact design of equipment, responding to versatile needs of the customers such as allowing tubes, wires and a laser beam to pass in them and combining a ball screw.

The HPF series is mounted on the SHA series of flat and hollow shaft AC servo actuators as a standard specification to achieve the SHA series at a higher speed. Why not study as a new variation of the SHA series?

Main Market

Machine Tools   Metal Processing Machines   Electronic Parts Manufacturing Equipment

Pipe Bender

HPF
HPG
Usage image

Press Machine (Caulking)

HPF
Usage image

Inspection System for Printed Circuit Boards

HPF
Usage image

Specification

- ■ **Hollow Shaft Structure: Coaxial input and output shafts**
- ■ **High Speed: Maximum rotational speed 500r/min (No. 25), 430r/min (No. 32)**
- ■ **Two Models: Nos. 25 and 32, One reduction ratio: 1/11**

■ Specification of Speed Reducer

Item	Model	HPF-25A-11-F0U1	HPF-32A-11-F0U1
Reduction Ratio	-	11	
Hollow Opening Diameter	mm	$\phi 25$	$\phi 30$
Rated Output Torque	Nm	21	44
Average Load Torque	Nm	48	100
Permissible Peak Torque in Starting or Stopping	Nm	100	220
Maximum Momentary Torque	Nm	170	450
Permissible Maximum Value of Average Load Torque[*1]	r/min	3000	3000
Maximum Input Rotational Speed	r/min	5600	4800
Moment of Inertia (Input shaft equivalent)	$\times 10^{-4}$kgm^2	1.63	3.84
Mass	kg	3.8	7.2
Backlash	arc min	3.0	
	$\times 10^{-4}$rad	8.7	
One side Torsion Amount D at TRx0.15[*2]	arc min	2.0	1.7
	$\times 10^{-4}$rad	5.8	4.9
Torsion Stiffness A/B[*2]	kgfm/arc min	1.7	3.5
	$\times 100$Nm/rad	570	1173
Transmission Angle Error	arc min	4.0	
	$\times 10^{-4}$rad	11.6	
Positional Accuracy Repeatability	arc sec	± 15	
Starting Torque	cNm	59	75
Acceleration Starting Torque	Nm	6.5	8.3
No Load Running Torque (Room Temperature, Input 3000r/min)	cNm	78	105
Efficiency (When rated output, Room Temperature, Input 3000r/min)	%	70	80
Applicable Motor (Rated 3000r/min ref. value) [*3]	kW	0.5 to 1.0	0.75 to 2.0
Lubricating Grease (Sealed)	-	EPNOC GREASE AP(N) 2	

*1: The allowable average input rotational speed is set to limit a temperature rise caused by heating of the speed reducer.
　　The temperature rise varies depending on the radiation condition of the part (housing) to be provided by the customer to mount the speed reducer and on the ambient temperature. However, consider a surface temperature of the speed reducer of 70 ° C as an upper-limit criterion. Model No. 32 especially needs be cooled or an operation pattern must be set by lowering the average input rotational speed as necessary fully taking temperature rise by heat into consideration.
*2: For more information, refer to technical data in the catalog of Harmonic Planetary-Gear Speed Reducer HPG Series.
*3: The upper limit is for general information purposes assuming the peak torque in start and stop of the speed reducer to be equal to the motor peak torque and lower limit, assuming the speed reducer efficiency characteristic.

■ Specification of Bearing on Output Side (Crossed Roller Bearing)

Model No.	Roller Pitch Circular Diameter dp	Offset R	Basic Rated Load				Allowable Moment Load Mc[*3]		Moment Stiffness Km		Allowable Radial Load[*4]		Allowable Axial Load[*4]	
			Basic Dynamic Rated Load C[*1]		Basic Static Rated Load Co[*2]									
	m	m	N	kgf	N	kgf	Nm	kgfm	$\times 10^4$Nm/rad	kgfm/arc min	N	kgf	N	kgf
25	0.085	0.0153	11400	1163	20300	2071	410	41.8	37.9	11.3	1330	135	1990	203
32	0.1115	0.015	22500	2296	39900	4071	932	95	86.1	25.7	2640	269	3940	402

*1: The basic dynamic rated load is a load, whose direction and level do not fluctuate, so that the basic dynamic rated life of the bearing would become one million revolutions.
*2: The basic static rated load is a static load that provides a contact stress of a certain level (4kN/mm²) at the center of the contact part between the rolling element receiving the maximum load and raceway.
*3: The allowable moment load is a maximum moment load that can be applied to the output shaft and allows the basic performance to be maintained and device operation if the load is within this range.
　　Calculate the life of the bearing according to the catalog of the HPG series and check it.
*4: The allowable radial load and allowable axial load are the values that satisfy the speed reducer life of 20,000 hours in case only a purely radial load or a purely axial load is applied to the main bearing. (Radial load is Lr + R = 0mm, axial load is La = 0mm) In case a composite load is to be applied, calculate according to the catalog of the HPG series and check it.
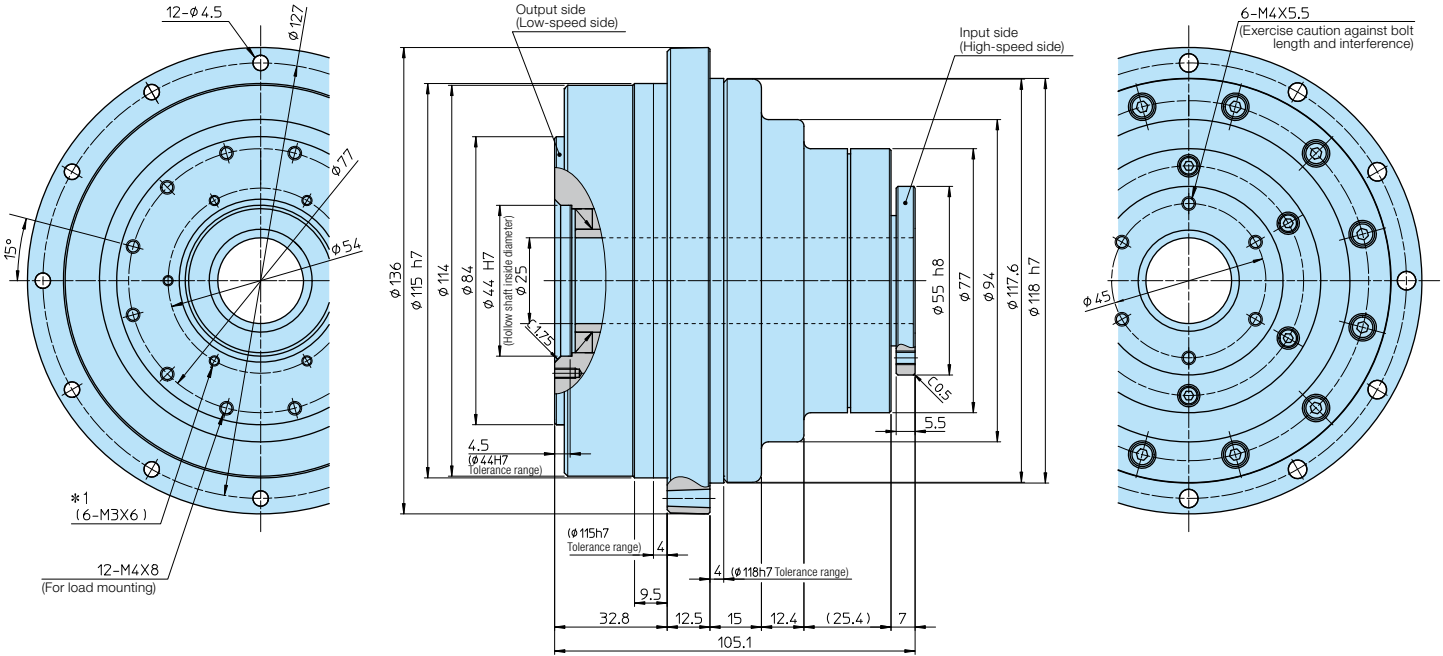
■ Specification of Bearing on Input Side (Angular Contact Ball Bearing)

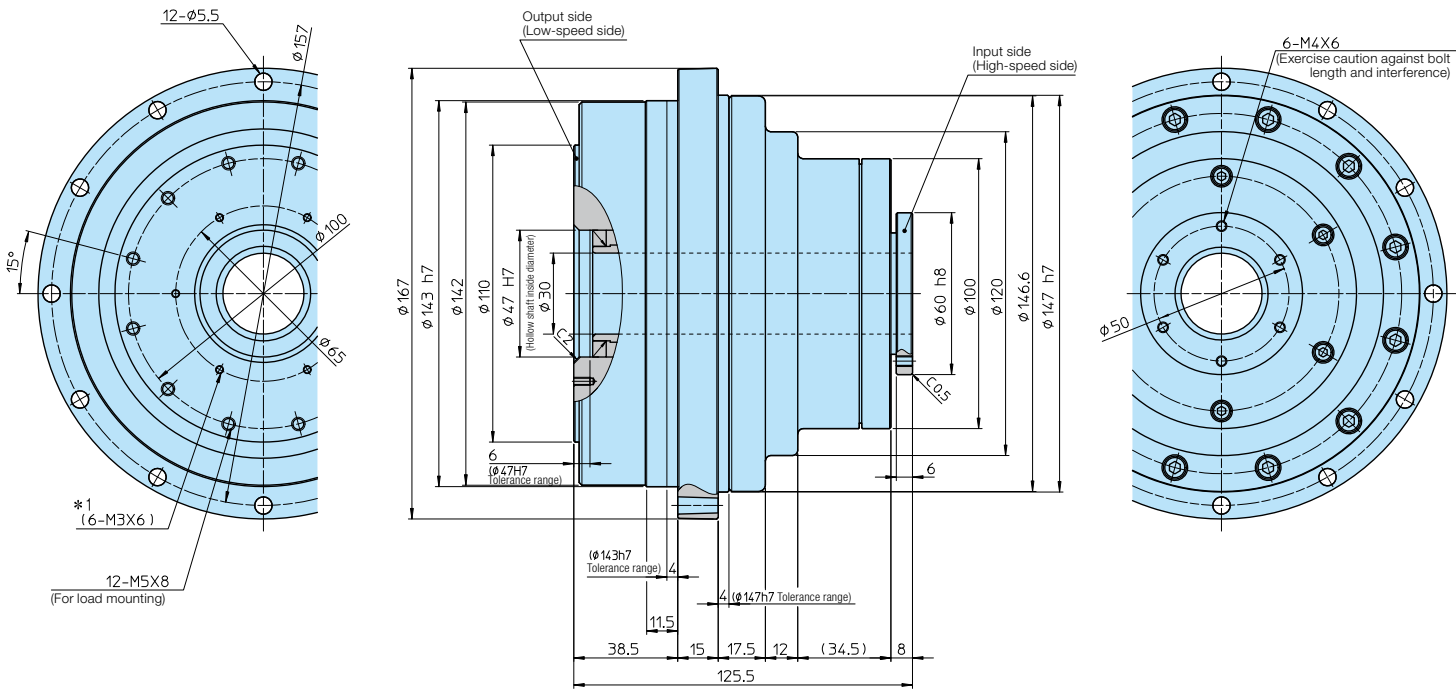| Model No.	Allowable Axial Load Fac		Allowable Radial Load Frc		Allowable Moment Load Mc	
	N	kgf	N	kgf	Nm	kgfm
25	1538	156.9	522	53.2	10	1.02
32	3263	332.9	966	98.5	19	1.93

● For details, please contact your nearest HarmonicDrive distributor.

External Dimensions

■ HPF-25A-11-F0U1

■ HPF-32A-11-F0U1

*1: The inside diameter of the hollow shaft rotates in sync with the input shaft.
Use it when installing an inside-diameter sleeve to the input side from the output side. (It is not for load mounting)

For the machine accuracy and for more information, please contact your nearest HarmonicDrive distributor.

For Higher Speed Requirement by Combining HPF Series

■ Maximum Output Rotational Speed
SHA25A11HP (No. 25) 500r/min
SHA32A11HP (No. 32) 430r/min

■ Actuator Specification

Item		Model	SHA25A11HP	SHA32A11HP
Reduction Ratio			11	
Combined driver			HA-800□-3D	HA-800□-6D
Maximum Torque		Nm	26	62
		kgfm	2.7	6.3
Maximum Rotational Speed		r/min	500	430
Torque Constant		Nm/Arms	4.2	4.5
		kgfm/Arms	0.43	0.46
Maximum Current		Arms	8.9	19
Moment of Inertia	$GD^2/4$	kg·m²	0.029	0.091
(Without Brake)	J	kgf·cm·s²	0.296	0.929
Moment of Inertia	$GD^2/4$	kg·m²	0.034	0.105
(With Brake)	J	kgf·cm·s²	0.347	1.071
Uni-directional Positional Accuracy		Sec.	120	120
Encoder Method			magnetic type absolute encoder	
Encoder Resolution per Motor Revolution			2^{17} (131,072)	
Multi Revolution Detection			2^{16} (65,536)	
Output Side Resolution		Pulse/revolution	1,441,792	
Mass (without B)		kg	5.0	9.4
Mass (with B)		kg	5.1	9.7
Environmental Conditions			Operating temperature 0 to 40˚ C, storage temperature -20 to 60˚ C, Operating humidity / storage humidity 20 to 80% RH (Do not expose to condensation), Resistance to vibration 25m/s² (frequency 10 to 400Hz), shock resistance 300m/s², No dust, no metal powder, no corrosive gas, no inflammable gas and no oil mist, Indoor use only. No exposure to direct sunshine. Altitude 1000m or less.	
Mounting Direction			All directions	

SHA series combined drivers/open field network supprted AC servo driver HA-800 series

Features

■ **Open field network supported**

■ **Unique control theory reduces positional settling time to 1/2**
(compared with HA-655 of Harmonic Drive Systems)

■ **Auto tuning function is available**

■ **Control mode can be switched by I/O input**

■ **Regenerative absorbing circuit and dynamic brake are embedded**

* Please contact Harmonic Drive Systems for details.

HarmonicDrive®   HarmonicPlanetary®   Harmonicsyn®
HarmonicLinear®   AccuDrive®   BEAM SERVO®