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› FPBIGCHA Harmonic Reducer Harmonic Drive ZXS14 for 42mm Step, 100 to 1 User Manual

## FPBIGCHA ZXS14

# FPBIGCHA Harmonic Reducer Harmonic Drive ZXS14 User Manual

Model: ZXS14 for 42mm Step, 100 to 1 Ratio

## 1. INTRODUCTION

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This manual provides essential information for the safe and efficient use of the FPBIGCHA ZXS14 Harmonic Reducer Harmonic Drive. Please read this manual thoroughly before installation, operation, or maintenance to ensure proper function and longevity of the product. This model is specifically designed for a 42mm step motor with a 100 to 1 reduction ratio.

## 2. SAFETY INFORMATION

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Always observe the following safety precautions to prevent injury to personnel and damage to equipment:

- Ensure all power is disconnected before installation, maintenance, or inspection.
- Wear appropriate personal protective equipment (PPE) such as safety glasses and gloves.
- Do not exceed the specified load, torque, or speed ratings.
- Ensure the reducer is securely mounted to a stable surface.
- Keep hands and loose clothing away from moving parts during operation.
- Consult a qualified technician for any complex repairs or modifications.

## 3. PRODUCT OVERVIEW

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The FPBIGCHA ZXS14 Harmonic Reducer is a high-precision, compact, and lightweight harmonic drive system. It is engineered for industrial automation applications requiring accurate speed reduction and high torque transmission. Its design features a simple internal structure, contributing to smooth and reliable operation. This unit is a cup-type harmonic drive equipped with a flange plate for versatile mounting.



Figure 3.1: Internal view of the harmonic reducer, highlighting the precision bearing and gear components.

## 4. SPECIFICATIONS

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The following table details the technical specifications for the ZXS14 Harmonic Reducer with a 100 to 1 ratio:

Parameter	Value
Model	ZXS14
Speed Ratio	100:1
Backlash	≤10 arcsec
Weight	0.5 kg (approx. 1.1 lbs)
Rated Torque (2000r/min input)	0.7 Nm
Permissible Torque (Start/Stop)	1 Nm
Max Allowable Average Load Torque	1.4 Nm
Instantaneous Max Allowable Torque	7.2 Nm
Oil Lubrication Life	14000 hours
Grease Lubrication Life	6500 hours
Allowable Input Speed	3500 rpm
Allowable Average Input Speed	1000 rpm
Moment of Inertia	$0.033 \times 10^{-4} \text{ kgm}^2$
Package Dimensions	1.18 x 0.79 x 0.39 inches
Item Model Number (Manufacturer's Internal)	FPBIGCHA
Assembly Required	No (unit is pre-assembled, but requires installation)
Number of Pieces	1 (reducer unit)

Model	Speed ratio	Backlash	Weight	Rated torque at 2000r/min input		Permissible peak torque at start stop		Allowable MAX value of average load torque		Instantaneous MAX allowable torque		MAX allowable input speed r/min		Allowable average input speed r/min		Moment of inertia	
		arcsec	kg	Nm	kgfm	Nm	kgfm	Nm	kgfm	Nm	kgfm	Oil lubrication	Lubricating grease lubrication	Oil lubrication	Lubricating grease lubrication	X10 <sup>-4</sup> kgm <sup>2</sup>	X10 <sup>-5</sup> kgfms <sup>2</sup>
ZXS14	30:01:00	≤10	0.5	4	0.41	9	0.92	6.8	0.69	17	1.7	14000	8500	6500	3500	0.033	0.034
	50:01:00			7	0.7	23	2.3	9	0.9	46	4.7						
	80:01:00			10	1	30	3.1	14	1.4	61	6.2						
	100:01:00			10	1	36	3.7	14	1.4	70	7.2						
Note: ZXS14 has two types of shaft hole sizes: 1: Can be equipped with a 40mm flange servo motor, with a shaft diameter of 8mm and a keyway of 3mm. 2: Can be equipped with Nema17 42mm stepper motor, with a shaft diameter of 5mm, without keyway.																	
ZXS17	30:01:00	≤10	0.65	8.8	0.9	16	1.6	12	1.2	30	3.1	10000	7300	6500	3500	0.079	0.081
	50:01:00			21	2.1	44	4.5	34	3.4	91	9						
	80:01:00			29	2.9	56	5.7	35	3.6	113	12						
	100:01:00			31	3.2	70	7.2	51	5.2	143	15						
Note: ZXS17 has two types of shaft hole sizes: 1: Can be equipped with a 40mm flange servo motor, with a shaft diameter of 8mm and a keyway of 3mm. 2: Can be equipped with Nema17 42mm stepper motor, with a shaft diameter of 5mm, without keyway.																	
ZXS20	30:01:00	≤10	0.91	15	1.5	27	2.8	20	2	50	5.1	10000	6500	6500	3500	0.193	0.197
	50:01:00			33	3.3	73	7.4	44	4.5	127	13						
	80:01:00			44	4.5	96	9.8	61	6.2	165	17						
	100:01:00			52	5.3	107	10.9	64	6.5	191	20						
Note: ZXS20 has two types of shaft hole sizes: 1: Can be equipped with a 60mm flange servo motor, with a shaft diameter of 14mm and a keyway of 5mm. 2: Can be equipped with Nema23 57mm stepper motor, with a shaft diameter of 8mm, without keyway.																	
ZXS25	30:01:00	≤10	1.44	27	2.8	50	5.1	38	3.9	95	9.7	7500	5600	5600	3500	0.413	0.421
	50:01:00			51	5.2	127	13	72	7.3	242	25						
	80:01:00			82	8.4	178	18	113	12	332	34						
	100:01:00			87	8.9	204	21	140	14	369	38						
Note: ZXS25 has two types of shaft hole sizes: 1: Can be equipped with a 60mm flange servo motor, with a shaft diameter of 14mm and a keyway of 5mm. 2: Can be equipped with Nema23 57mm stepper motor, with a shaft diameter of 8mm, without keyway.																	
ZXS32	30:01:00	≤10	3	54	5.5	100	10	75	7.7	200	20	7000	4800	4600	3500	1.69	1.72
	50:01:00			99	10	281	29	140	14	497	51						
	80:01:00			153	16	395	40	217	22	738	75						
	100:01:00			178	18	433	44	281	29	841	86						
Note: ZXS32 has two types of shaft hole sizes: 1: Can be equipped with a 80mm flange servo motor, with a shaft diameter of 19mm and a keyway of 6mm. 2: Can be equipped with Nema34 86mm flange stepper motor, with a shaft diameter of 14mm and a keyway of 5mm.																	
ZXS40	100:01:00	≤30	4.54	345	35	738	75	484	49	1400	143	5600	4000	3600	3000	4.5	4.59
	120:01:00			382	39	802	82	586	60	1530	156						
	160:01:00			382	39	841	86	586	60	1530	156						
	160:01:00			382	39	841	86	586	60	1530	156						
Note: ZXS40 has two types of shaft hole sizes: 1: Can be equipped with a 110mm flange servo motor, with a shaft diameter of 19mm and a keyway of 6mm. 2: Can be equipped with a 110mm flange servo motor, with a shaft diameter of 22mm and a keyway of 6mm.																	
ZXS45	50:01:00	≤30	6.7	229	23	650	66	345	35	1235	126	5000	3800	3300	3000	8.68	8.86
	80:01:00			407	41	918	94	507	52	1651	168						
	100:01:00			459	47	982	100	650	66	2041	208						
	160:01:00			523	53	1147	117	819	84	2483	253						
Note: ZXS45 has two types of shaft hole sizes: 1: Can be equipped with a 110mm flange servo motor, with a shaft diameter of 19mm and a keyway of 6mm. 2: Can be equipped with a 110mm flange servo motor, with a shaft diameter of 22mm and a keyway of 6mm.																	
ZXS50	100:01:00	≤30	15	611	62	1274	130	866	88	2678	273	4500	3500	3000	2500	12.5	12.8
	160:01:00			688	70	1534	156	1096	112	3185	325						
Note: ZXS50 has two types of shaft hole sizes: 1: Can be equipped with a 110mm flange servo motor, with a shaft diameter of 22mm and a keyway of 8mm. 2: Can be equipped with a 110mm flange servo motor, with a shaft diameter of 19mm and a keyway of 6mm.																	
ZXS58	100:01:00	≤30	17	905	92	2067	211	1378	141	4134	422	4000	3000	2700	2200	27.3	27.9
	160:01:00			969	99	2392	244	1573	160	4459	455						
Note: ZXS58 has one type of shaft hole sizes: 1: Can be equipped with a 120mm flange servo motor, with a shaft diameter of 22mm and a keyway of 8mm.																	
ZXS65	100:01:00	≤30	20	1236	126	2990	305	1976	202	6175	630	3500	2800	2400	1900	46.8	47.8
	160:01:00			1236	126	3419	349	2041	208	6175	630						
Note: ZXS65 has two types of shaft hole sizes: standard conventional shaft hole 19mm and keyway 6mm; Unconventional shaft hole 22mm, keyway 8mm.																	

Figure 4.1: Comprehensive specification table for FPBIGCHA Harmonic Reducers.

## 5. SETUP AND INSTALLATION

The ZXS14 Harmonic Reducer is designed for easy assembly due to its compact size. Proper installation is crucial for optimal performance and safety.

### 5.1 Component Identification

Before installation, identify all components. The unit typically includes the harmonic reducer body and a flange plate.

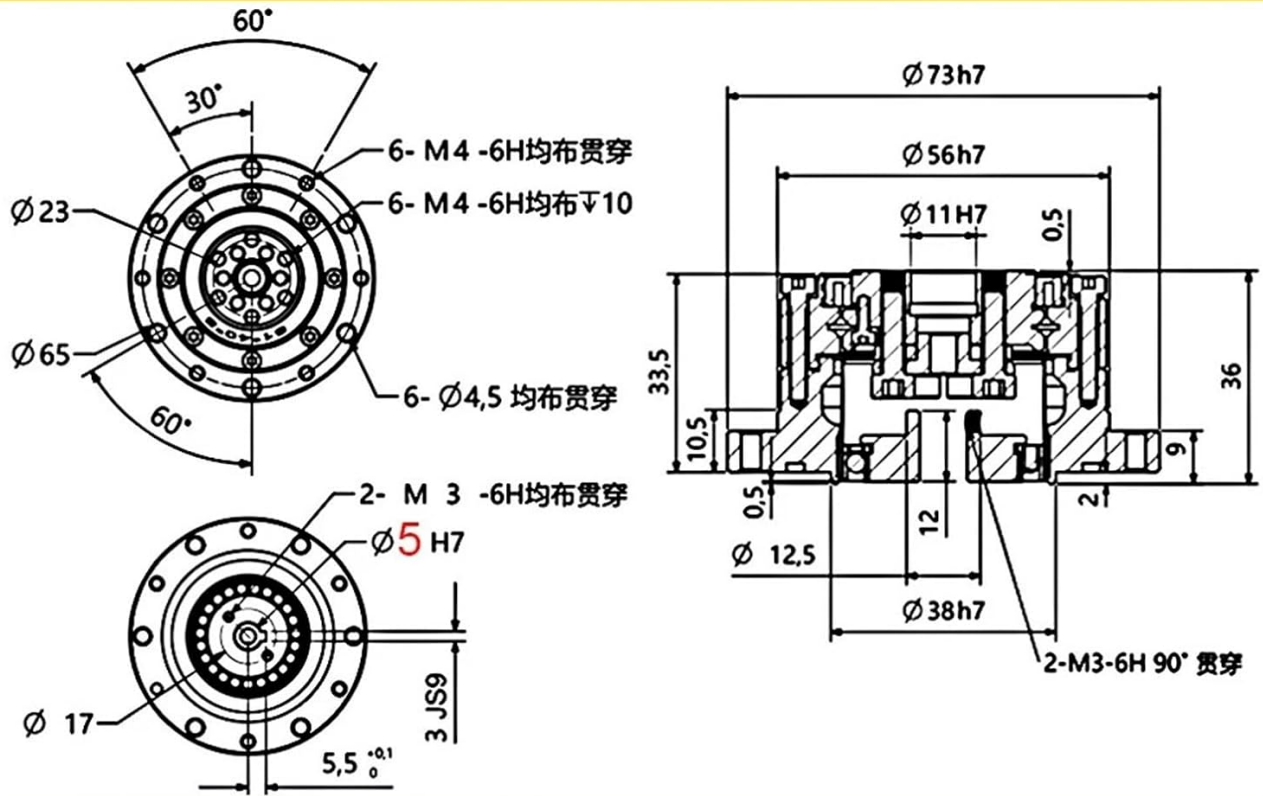


*Figure 5.1: Main components of the harmonic reducer.*

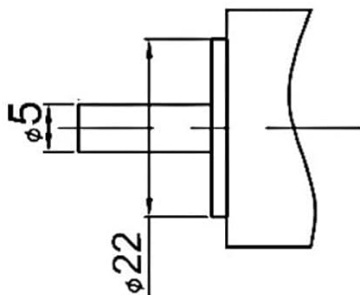
## **5.2 Mounting and Dimensions**

The ZXS14 model is compatible with Nema-17 stepper motors, featuring a 5mm shaft and a 42mm flange, with an installation circle of 43.8mm. Refer to the detailed dimensional drawing for precise mounting hole patterns and overall dimensions.

# ZXS14 Harmonic Drive



## Compatible With Motor Size



Nema-17 Stepper Motor  
 5mm Shaft  
 42mm Flange  
 Installation Circle 43.8mm

Figure 5.2: ZXS14 Harmonic Drive dimensions for Nema-17 Stepper Motor.

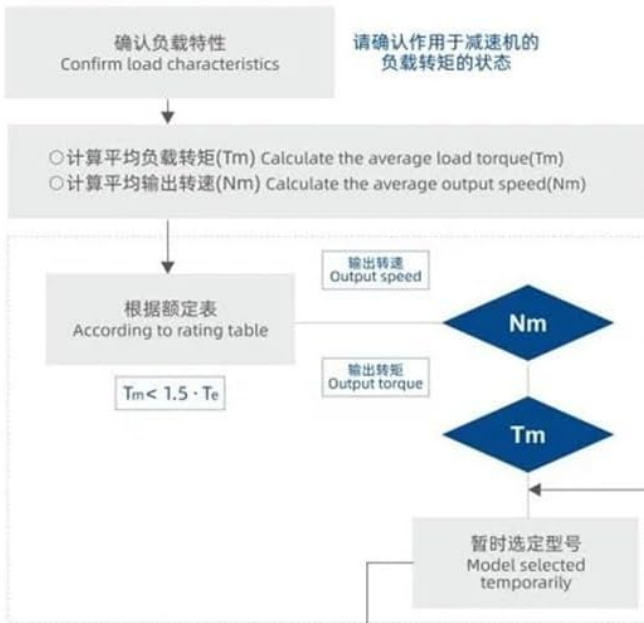
For alternative servo motor compatibility, specifically 50W-100W servo motors with an 8mm shaft and 40mm flange, refer to the following diagram:

# SELECTION PROCESS

## 选型流程

$$T_m = \sqrt[10]{\frac{t_1 \cdot N_1 \cdot T_1^{10} + t_2 \cdot N_2 \cdot T_2^{10} + \dots + t_n \cdot N_n \cdot T_n^{10}}{t_1 \cdot N_1 + t_2 \cdot N_2 + \dots + t_n \cdot N_n}}$$

$$N_m = \frac{t_1 \cdot N_1 + t_2 \cdot N_2 + \dots + t_n \cdot N_n}{t_1 + t_2 + \dots + t_n}$$



### 选定时的确认条件

	启动时(MAX) At startup	稳定时 When stable	停止时(MAX) When stopped	紧急停止冲击时 When emergency stop impact
负载转矩Nm Load torque	T1	T2	T3	Tem
转速r/min Speed	N1	N2	N3	Nem
时间sec Time	t1	t2	t3	tem

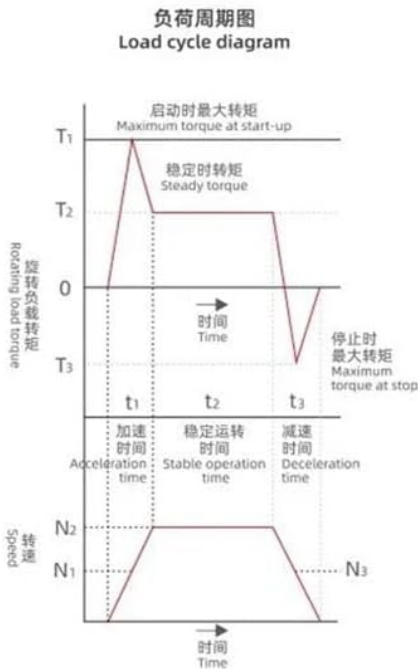


Figure 5.3: ZXS14 Harmonic Drive dimensions for 50W-100W Servo Motor.

- Prepare Mounting Surface:** Ensure the mounting surface is clean, flat, and rigid enough to support the reducer and connected motor.
- Attach Flange:** Secure the flange plate to the reducer body using the provided fasteners, if not pre-assembled.

3. **Mount Motor:** Align the motor shaft with the reducer's input shaft. Carefully slide the motor onto the reducer, ensuring proper engagement. Secure the motor to the reducer's flange using appropriate bolts.
4. **Secure Reducer:** Mount the entire assembly to your equipment using the designated mounting holes on the reducer's flange. Ensure all fasteners are tightened to the manufacturer's recommended torque specifications.
5. **Check Alignment:** Verify that there is no misalignment or excessive stress on the shafts or mounting points.

## 6. OPERATION

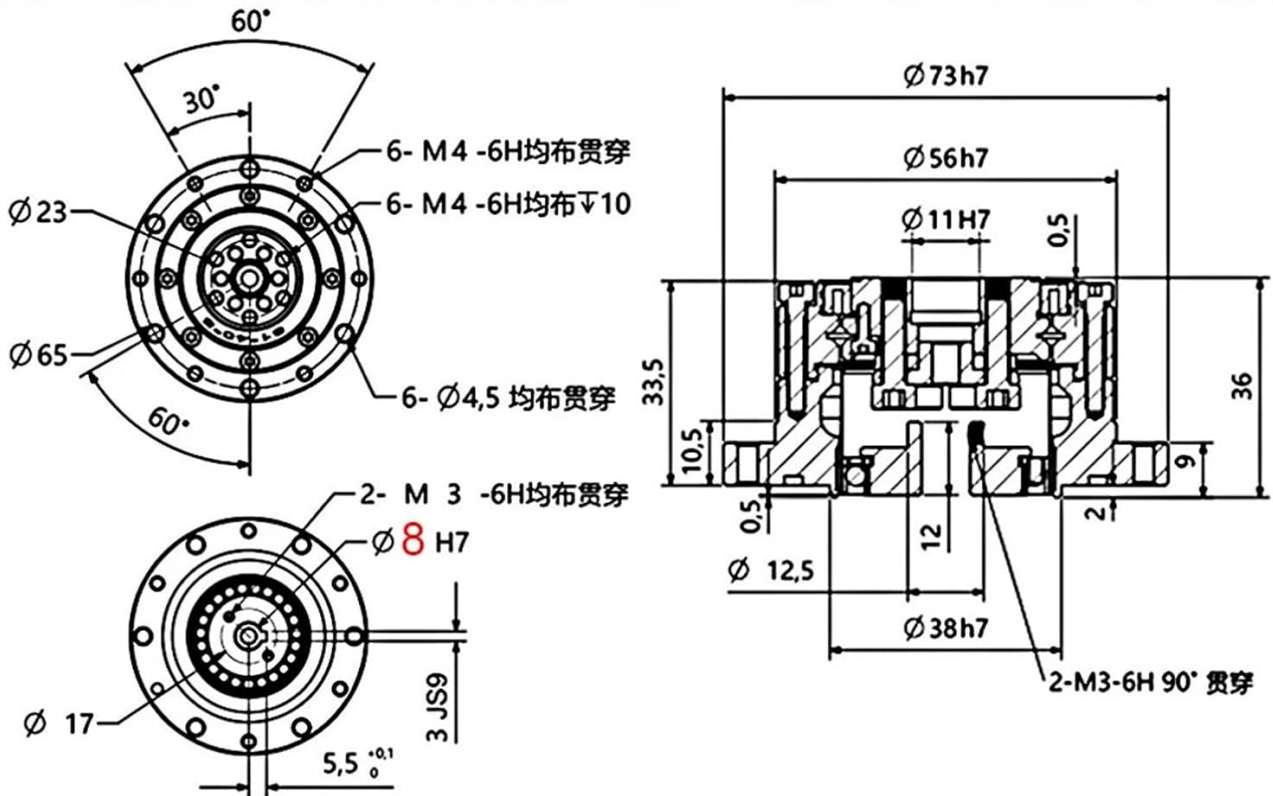
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The harmonic reducer functions to precisely reduce the rotational speed from the input motor to the output, thereby increasing torque. It is crucial to operate the unit within its specified limits to ensure optimal performance and prevent damage.

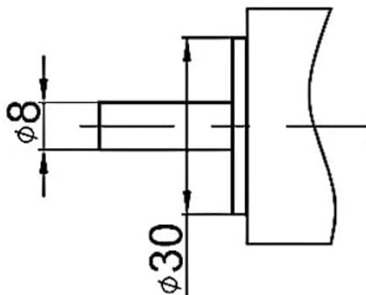
- **Load Management:** Do not exceed the rated or maximum allowable torque values. Overloading can lead to premature wear or failure.
- **Speed Control:** Maintain input speeds within the allowable range (up to 3500 rpm instantaneous, 1000 rpm average).
- **Environmental Conditions:** Operate the reducer within suitable temperature and humidity ranges. Avoid environments with excessive dust, moisture, or corrosive substances.
- **Monitoring:** During initial operation and periodically thereafter, monitor for unusual noises, vibrations, or excessive heat, which may indicate an issue.

For detailed selection and operational considerations, including load cycle analysis, refer to the selection process flowchart:

# ZXS14 Harmonic Drive



## Compatible With Motor Size



50W 100W Servo Motor  
8mm Shaft  
40mm Flange  
Installation Circle 46mm

Figure 6.1: Harmonic Drive Selection Process and Load Cycle Diagram.

## 7. MAINTENANCE

Regular maintenance ensures the longevity and reliable performance of your harmonic reducer.

- **Lubrication:** The ZXS14 model is pre-lubricated. For oil-lubricated units, the oil life is approximately 14,000 hours. For grease-lubricated units, the grease life is approximately 6,500 hours. Follow manufacturer guidelines for re-lubrication intervals and type of lubricant if applicable for your specific unit.
- **Inspection:** Periodically inspect the reducer for any signs of wear, damage, or loose fasteners. Check for oil leaks or unusual residue.
- **Cleaning:** Keep the exterior of the reducer clean and free from dust, debris, and contaminants.
- **Storage:** If storing the unit, ensure it is kept in a dry, clean environment, protected from extreme temperatures and humidity.

## 8. TROUBLESHOOTING

If you encounter issues with your harmonic reducer, consider the following common troubleshooting steps:

Problem	Possible Cause	Solution
Unusual Noise/Vibration	Misalignment, loose mounting bolts, worn bearings, excessive load.	Check alignment, tighten bolts, inspect for wear, reduce load.
Overheating	Excessive load, insufficient lubrication, high ambient temperature.	Reduce load, check lubrication levels/type, improve ventilation.
Failure to Transmit Power	Input shaft not engaged, internal damage, motor failure.	Verify shaft engagement, inspect for internal damage (professional service recommended), check motor function.
Reduced Accuracy	Excessive backlash, wear in components.	Inspect for wear, consider professional recalibration or replacement.

If problems persist after attempting these solutions, contact customer support.

## 9. WARRANTY AND SUPPORT

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For warranty information, technical support, or service inquiries, please refer to the product's purchase documentation or contact FPBIGCHA customer service directly. Ensure you have your product model number (ZXS14) and purchase date available when contacting support.

**Manufacturer:** FPBIGCHA

**Model Number:** ZXS14