

FS-MOTION

风顺自动化

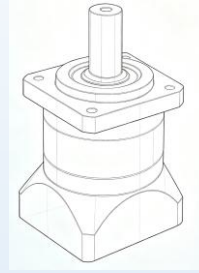
High Precision Planetary Reducer

PF/PL/PNF/ PWE/ZPF/ZPL /ZPNF /ZPWE Series

High Precision | High Rigidity | Low Backlash | Stable Transmission



Automation Transmission Solution



FS-MOTION

Shenzhen FS-MOTION Automation Technology Co., Ltd

Located in Bao'an, Shenzhen, China, FS-MOTION focuses on precision transmission solutions.

We mainly supply planetary gearboxes and hollow rotary platforms for automation equipment.

Our products deliver high precision, high rigidity, low backlash, low noise and excellent durability, perfectly matching servo and stepper motors. They are widely applied in 3C intelligent manufacturing, laser processing, packaging machinery, industrial robots, new-energy equipment and automated production lines.

Backed by professional engineering and QC teams, we provide model-selection guidance, solution optimization and custom non-standard services. Standard models are kept in stock for quick delivery.

Our products serve domestic markets and are exported globally. Upholding the philosophy of *"Precision-Oriented, Pragmatic & Win-Win Cooperation"*, we strive to be your trusted long-term partner for precision motion transmission.

Planetary Reducer

Coaxial Series

- PF Spur Gear | Cost-effective general-purpose model
- PL Spur Gear | Short housing, ideal for confined-space installation
- PNF Helical Gear | Low-noise & high-precision, suitable for long-term high-speed operation
- PWE Helical Gear | Ultra-thin flat-type, widely used for rotary worktables



90° Right-Angle Series

- ZPF Spur Gear | Economical right-angle output, square flange
- ZPL Spur Gear | Compact short housing, round flange
- ZPNF Helical Gear | Right-angle, low-noise & high-precision for high-speed conditions
- ZPWE Helical Gear | Right-angle ultra-thin flange, for rotary worktable applications



FS-MOTION 8-Series Planetary Reducer Overview & Selection

Models: PF, PL, PNF, PWE, ZPF, ZPL, ZPNF, ZPWE

Key Advantages

- Low noise: $\leq 65\text{dB}$
- Efficiency
Coaxial spur gear(PF/PL): $L1 > 97\%$, $L2 > 95\%$
Helical gear(PNF/PWE/ZPNF/ZPWE): $L1 \geq 95\%$, $L2 \geq 90\%$
Right-angle spur gear(ZPF/ZPL): same as coaxial spur gear
- Max input speed: 8000rpm(60 frame); 6000rpm(90/120 frame)
- Peak torque: $2 \times$ rated torque (transient use only)
- Hardened alloy-steel gears, 20000h service life, IP65, multi-direction mounting

Selection Steps

1. Determine service factor f_s based on load shock & working conditions
2. Confirm load torque, input speed, reduction ratio
3. Calculate required torque & input power

Calculated torque: $T_2 = T_L \times f_s$
Reduction ratio: $i = n_1 / n_2$
Input power: $P_1 = (T_2 \times n_2) / (9550 \times \eta)$

Symbol Description:

- T_L : Original load torque (N·m)
- f_s : Application service factor
- T_2 : Calculated required output torque (N·m)
- n_1 : Input speed; n_2 : Output speed
- P_1 : Reducer input power(kW); η : Transmission efficiency

Unit: Torque-N·m; Rotational speed-rpm

4. Check rated torque, radial & axial force; ensure rated torque $>$ calculated torque
5. Choose model by mounting form: Coaxial / 90° Right-Angle

Notes

- Peak torque cannot run continuously
- Use reinforced model if radial / axial force exceeds limits

Mounting Types

- Coaxial output: PF, PL, PNF, PWE
- 90° Right-angle output: ZPF, ZPL, ZPNF, ZPWE

Basic Concepts for Reducer Selection

1.Reduction Ratio

Standard definition for planetary reducers:

$$i = \frac{n_{in}}{n_{out}}$$

- n_{in} : Input speed (motor side); n_{out} : Output speed (load side)
- Example: $i = 10$, motor input 3000rpm $\rightarrow$ output speed = 3000/10 = 300rpm

2. Rated Input Speed n_i [rpm]

Max continuous input speed allowed for the reducer. When directly connected to a motor, input speed equals motor speed. Rated test condition: 20°C ambient temperature; reduce operating speed if ambient temperature is higher.

3. Output Speed n_o [rpm]

Calculated from input speed and reduction ratio: $n_2 = n_1/i$

4. Stage Number

Number of planetary gear sets. Single-stage cannot achieve large reduction ratios, so 2-stage or 3-stage combinations are used. Larger reduction ratio means more stages, longer reducer length and lower transmission efficiency.

5. Transmission Efficiency

Power transmission efficiency under rated load. For the same specification, larger reduction ratio and more stages lead to lower efficiency.

6. Average Service Life

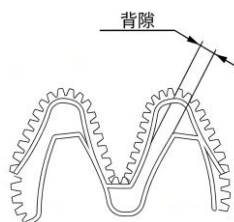
Continuous operating time under rated load and rated input speed.

7. Positioning Accuracy

Core for high-precision positioning in high-speed reciprocating motion, determined by 2 parts: Angular deviation caused by load, affected by backlash and torsional rigidity
Synchronous control error

8. Backlash

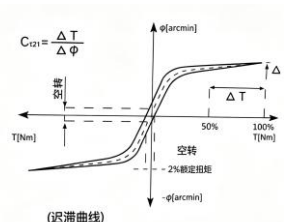
Maximum free rotation angle of the output shaft when the input shaft is fixed. Test standard: Input shaft locked, apply 2% of rated output torque T_{2N} to the output end, measure after overcoming internal friction.



9. Hysteresis Curve

Used to test reducer torsional rigidity.

Test method: Lock input shaft, apply bidirectional load to rated output torque T_{2N} on output shaft, then unload step by step. Record torque and angle synchronously to generate a closed hysteresis curve, then calculate return clearance j_t and torsional rigidity C_{90} .



10. Moment of Inertia

All values in this manual refer to input-side parameters, representing the inherent physical quantity of an object to maintain its rotational state.

11. Inertia Ratio

Ratio of load moment of inertia to drive system inertia (motor + reducer), determining the dynamic controllability of the servo system. Larger λ means more difficult to control system dynamic response; recommended $\lambda < 5$. The reducer can convert load-side inertia to the input side, with a conversion factor of $1/i^2$.

12. Noise

Unit: dB. Test conditions: input speed 3000rpm, no-load, 1m distance from the reducer housing.

13. Operating Conditions

Working temperature: -10°C ~ +80°C ; Protection class: IP65

Lubrication: Long-term lubrication, no need to add grease within the design service life

Installation: Any orientation installation

Quick-Selection Core Logic

Step 1: Model by Transmission Layout

Coaxial In-line

- PF (Straight Tooth): Cost-effective general use
- PL (Straight Tooth): Limited axial space
- PNF (Helical Tooth): High-precision, low-noise, continuous high-speed
- PWE (Helical Tooth): Turntable & hollow shaft

90° Right-Angle

- ZPF (Straight Tooth, Square Flange): Cost-saving for general conditions
- ZPL (Straight Tooth): Compact short-body, round flange
- ZPNF (Helical Tooth): High-speed, low-noise & precision
- ZPWE (Helical Tooth): Right-angle turntable & hollow shaft

Step 2: Straight Tooth vs Helical Tooth

Straight-tooth (PF/PL/ZPF/ZPL)

✓ Pros: Low cost, short lead time

✗ Cons: Higher high-speed noise, average precision & shock resistance

✚ For: Intermittent operation, normal load, budget-limited equipment

Helical-tooth (PNF/PWE/ZPNF/ZPWE)

✓ Pros: Smooth, low-noise, small backlash, shock-resistant, long-term high-speed

✗ Cons: Higher cost

✚ For: Continuous running, precise positioning, frequent shock, low-noise demand

Step 3: Key Selection Notes ⚠

1. Safety factor: 1.5-2.5 for shock/frequent start-stop; ≥ 1.2 for steady load
2. Max short-term overload: $2 \times$ rated torque. Long-term overload forbidden
3. Operating temp: $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$; custom grease for over-temp
4. Must apply special grease; dry-run prohibited
5. Right-angle models: Reserve 5%-10% torque margin for bevel gear loss
6. PWE / ZPWE hollow-shaft: Not for heavy cantilever radial loads

8-Series Planetary Reducer Quick Reference

PF Straight-tooth | Coaxial Square-Flange, Shaft Output

- ✓ Cost-effective, good radial load, stable lead time
- ⚠ High-speed noise, limited precision
- 📌 Packaging, general automation, budget-oriented projects

PL Straight-tooth | Coaxial Round-Flange, Shaft Output

- ✓ Short axial size, multiple shaft options
- ⚠ Lower interchangeability & radial load
- 📌 Space-tight equipment, light-duty rotary fixtures

PNF Helical-tooth | Coaxial Square-Flange, Shaft Output

- ✓ Smooth, low noise, small backlash, shock-resistant
- ⚠ Higher cost
- 📌 High-precision, long-term high-speed, lead-screw drive

PWE Helical-tooth | Coaxial Disk-Flange, Face Output

- ✓ Ultra-thin, large flange for direct turntable load
- ⚠ Not fit for long drive shafts
- 📌 Rotary tables, compact rotating mechanisms

ZPF Straight-tooth | 90° Right-Angle, Shaft Output

- ✓ 90° direction change, space-saving, low cost
- ⚠ High-speed noise, minor bevel-gear loss
- 📌 Lateral drive, budget-limited corner transmission

ZPL Straight-tooth | 90° Right-Angle, Shaft Output

- ✓ Compact round-flange, small footprint
- ⚠ High-speed noise, minor bevel-gear loss
- 📌 Narrow-space small-medium load corner drive

ZPNF Helical-tooth | 90° Right-Angle, Shaft Output

- ✓ Smooth, low-noise, high-precision, shock-resistant
- ⚠ Higher cost
- 📌 High-precision & quiet right-angle transmission

ZPWE Helical-tooth | 90° Right-Angle, Disk-Flange, Face Output

- ✓ Ultra-thin, large flange for turntable load
- ⚠ Not fit for long drive shafts, minor gear loss
- 📌 Right-angle rotary tables, ultra-space-limited installation

Note: Custom non-standard reducers are also available.

PF-Series Precision Straight-Tooth Planetary Reducer



General-purpose square-flange straight-tooth planetary solution. Gears adopt carburizing-quenched hard tooth surface with tooth profile modification for stable operation. Single-/double-stage reduction, standard & precision grades available, compatible with most servo and stepper motors.



Key Advantages

Standard square-flange design, excellent compatibility & interchangeability. Mature supply chain, stable lead time, cost-effective. Great radial load capacity, full-range specifications.



Limitations

Noisier and less smooth at high speed vs helical-tooth models. Limited max backlash & shock-load performance. Larger axial dimension than PL round-flange type.



Application Guide

Suitable for packaging machinery, transfer platforms, small-medium automation & conveying mechanisms. For long-term high-speed, ultra-low-noise or ultra-high-precision applications, select PNF helical-tooth series.

PF

PL

PNF

PWE

ZPF

ZPL

ZPNF

ZPWE

MODEL EXPLANATION

PF60-L1-10-S2-P2

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
PF	60	L1	10	S2	P2
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	80		4	S2: Single-key shaft	P2: Standard grade
	90		5	K: Hollow single-key shaft	
	120		7		
		L2: Two-stage reduction	10		
			15		
			20		
			25		
			30		
			35		
			40		
			100		



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SPEED REDUCER SELECTION INSTRUCTIONS

Required Selection Parameters

- Model, rated torque
- Reduction ratio / output speed
- Working conditions & mounting method
- Load type (steady / intermittent shock / continuous shock)
- Daily running hours, start-stop cycles per minute
- Output connection (coupling, pulley, gear, lead-screw direct drive, etc.)
- Order quantity & matched equipment name
- Input mode & input speed
- Motor brand/model, flange size & shaft diameter
- Special environment (high temp, humidity, dust, corrosion)

⚠ Key Selection Notes

- For shock load & frequent start-stop: torque safety factor 1.5~2.5; for steady continuous load: ≥ 1.2
- Max $2 \times$ rated torque for short-term use only. Long-term overload prohibited.
- For operating temp outside $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$, contact us for custom solution in advance.
- Fill with special grease before installation. Dry running is strictly forbidden.

Technical Parameters

Parameter	Stage	Reduction Ratio	PF60	PF80	PF90	PF120	
Rated Torque T _N (N·m)	L1: Single-stage	3	22	55	96	155	PF
		4	34	88	122	216	
		5	35	92	122	223	
		7	27	56	95	164	
		10	16	31	56	90	
	L2: Two-stage	12	28	68	96	206	PL
		15	28	72	96	155	
		16	35	93	122	230	
		20	35	93	122	230	
		25	37	95	122	237	
		28	35	88	122	230	
		30	25	55	96	164	
		35	35	98	122	237	
		40	35	93	122	230	
		50	37	98	122	237	
		70	30	60	95	174	
		100	16	31	56	90	
Maximum Output Torque T _{2N} (N·m)		2 times rated torque output					ZPF
Full-load Efficiency (%)		L1≥96% L2≥92%					ZPL
Average Service Life (h)		20000 h					ZPNF
Working Temperature (°C)		- 10°C ~ +80°C					ZPWE
Protection Class		IP65					
Mounting Direction		Arbitrary mounting direction					
Weight (kg)	Stage	PF60	PF80	PF90	PF120		
	L1	0.95	2.3	2.9	6.9		
	L2	1.25	3	3.85	9		

Notes

1. Rated torque: long-term continuous output; Max torque: short-term peak only, not for continuous use. Reserve safety factor for shock load.
2. 20000h service life: under rated load, standard ambient & normal lubrication. Overload, high temp, frequent forward/reverse will shorten life.
3. Full-load efficiency: tested at standard input speed, fluctuates slightly with actual speed & load.
4. Weight: theoretical reference only, varies with different motor flange accessories.
5. Technical parameters are subject to optimization without prior notice.

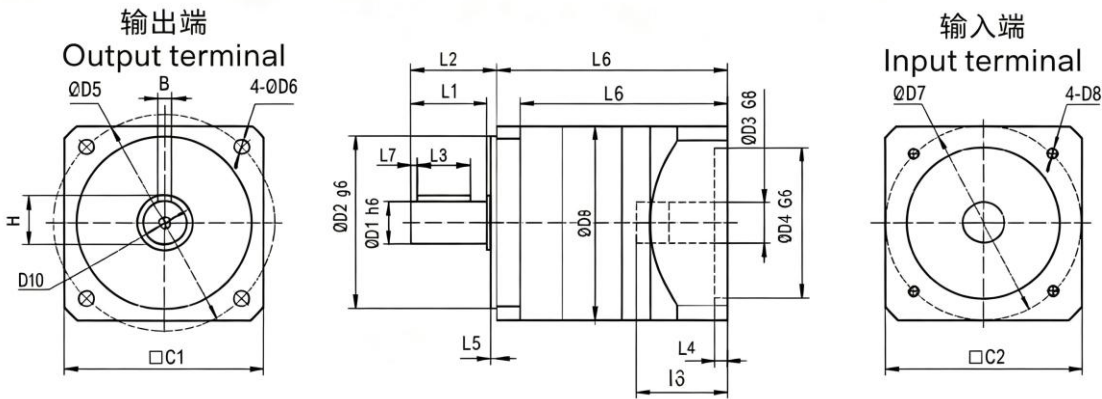
Technical Parameters

Specifications			PF60	PF80	PF90	PF120
Maximum Input Speed (rpm)			8000	6000	6000	4800
Rated Input Speed (rpm)			4000	3500	3500	3000
Maximum Allowable Radial Force (N)			320	650	680	1730
Maximum Allowable Axial Force (N)			260	610	620	1270
Torsional Rigidity (Nm/arcmin)			2	6.1	6.2	11.1
Noise Level (dB)			≤58	≤60	≤60	≤65
Backlash (arcmin)	P1	L1: Single-stage	≤8	≤8	≤8	≤8
		L2: Two-stage	≤12	≤12	≤12	≤12
	P2	L1: Single-stage	≤16	≤16	≤16	≤16
		L2: Two-stage	≤20	≤20	≤20	≤20
Moment of Inertia (kg · cm ²)	L1: Single-stage	3	0.28	0.59	1.55	7.3
		4	0.27	0.54	1.5	7
		5	0.27	0.53	1.49	6.97
		7	0.25	0.47	1.24	6.26
		10	0.25	0.47	1.24	6.24
	L2: Two-stage	12	0.27	0.56	1.33	6.92
		15	0.26	0.54	1.31	6.9
		16	0.27	0.52	1.3	6.74
		20	0.27	0.51	1.28	6.67
		25	0.27	0.51	1.28	6.67
		28	0.27	0.5	1.27	6.66
		30	0.25	0.5	1.27	6.66
		35	0.25	0.5	1.27	6.65
		40	0.27	0.5	1.27	6.65
		50	0.22	0.43	1.1	6.3
		70	0.22	0.43	1.1	6.3
		100	0.22	0.43	1.1	6.3

PF
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Notes

1. Limit speed for short-term use only; use rated speed for continuous operation.
2. Backlash, noise & torsional rigidity: no-load test values, actual values may vary.
3. Reserve safety margin for radial & axial loads on output shaft.
4. Inertia values refer to reducer input side, excluding external load parts. Parameters subject to change without notice.



PF Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Diameter D1	Output Flange D5	Output Spigot D2	Motor Spigot D4	Key Width B	Key Depth H	Overall Length L1
Single-Stage - L1	PF60	14	70	50	50	5	16	31
	PF80	20	90	60	73	6	22.5	36
	PF90	20	100	80	73	6	22.5	36
	PF120	25	130	110	95	8	28	48.5
Two-Stage - L2	PF60	14	70	50	50	5	16	31.5
	PF80	20	90	60	73	6	22.5	41.5
	PF90	20	100	80	73	6	22.5	41.5
	PF120	25	130	110	95	8	28	59

Output Flange Bolts: PF60: 4×M5; PF80: 4×M6; PF90: 4×M6; PF120: 4×M8

Supplementary Notes

Stage column: L1 stands for single-stage reduction, L2 stands for two-stage reduction.
L1 in drawing label represents the extension length of output shaft. The L1/L2 in table stage column only indicates reduction stages. The Overall Length column refers to the complete reducer dimension. Do not confuse them as the symbol definitions are different.

Remarks

- 1. All dimensions are in mm (millimeters).
- 2. All outline dimensions in this table are for equipment layout and selection reference only. Shall not be directly used for production drawings.
- 3. Unspecified dimensional tolerances comply with general mechanical machining standards.
- 4. Product specifications are subject to change for continuous product improvement without prior notice.

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PL Series Precision Spur-Gear Planetary Reducer



The PL series features a coaxial round-flange spur-gear planetary transmission scheme. The gears adopt carburized-quenched hard tooth surfaces with tooth profile modification for reliable operation. This product offers single-stage / two-stage reduction, with two accuracy grades: standard grade and precision grade. It supports multiple output forms including smooth shaft, single-key shaft and hollow shaft, and is compatible with most servo and stepper motors.

✓ Core Advantages

Adopting round-flange short-body design with small axial depth dimension, it saves internal installation space of equipment. Rich options of output-shaft forms adapt to compact equipment layout.

⚠ Product Limitations

Its general-purpose interchangeability is inferior to PF square-flange model. Under the same specifications, its radial load-bearing capacity is slightly lower than PF. With spur-gear meshing, its high-speed noise and running smoothness are not as good as helical-gear models.

📌 Selection Guide

Suitable for scenarios with limited internal axial space of equipment, small rotary toolings and light-load rotary mechanisms. For working conditions of long-term high-speed, low-noise and high positioning accuracy, PNF helical-gear series is recommended.

PF

PL

PNF

PWE

ZPF

ZPL

ZPNF

ZPWE

MODEL EXPLANATION

PL60-L1-10-S2-P2

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
PL	60	L1	10	S2	P2
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	80		4	S2: Single-key shaft	P2: Standard grade
	90		5	K: Hollow single-key shaft	
	120		7		
			10		
		L2: Two-stage reduction	15		
			20		
			25		
			30		
			35		
			40		
			...		
			100		



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SPEED REDUCER SELECTION INSTRUCTIONS

- Series, Model, Rated Torque
- Reduction Ratio or Output Shaft Speed
- Operating Conditions and Mounting Method
- Load Type (Smooth Load, Intermittent Shock Load, Continuous Shock Load)
- Daily Operating Hours, Start-Stop Cycles per Minute
- Output-end Connection Mode (Coupling, Pulley, Gear, Lead-Screw Direct Connection, etc.)
- Order Quantity and Name of Matched Mechanical Equipment
- Input Mode and Input Speed
- Motor Brand & Model, Flange Dimension and Motor Shaft Diameter
- Special Environmental Requirements (High Temperature, Humidity, Dust, Corrosive Environment)

⚠ Important Selection Reminders

- For shock-loaded and frequent start-stop applications, it is recommended to reserve a torque safety factor of 1.5-2.5 times; for smooth continuous operation, the safety factor shall be ≥ 1.2 .
- The reducer can withstand twice the rated torque for short-term operation. Long-term continuous overload operation is prohibited.
- If the operating ambient temperature is outside the range of $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$, please contact us in advance for customized solutions.
- Fill with special lubricant grease before installation. Running without lubrication is strictly forbidden.

Technical Parameters

Parameter Item	Stage	Reduction Ratio	PL60	PL80	PL90	PL120	
Rated Torque $T_N(N\cdot m)$	L1-Single-Stage	3	22	55	96	155	PF
		4	34	88	122	216	
		5	35	92	122	223	PL
		7	27	56	95	164	
		10	16	31	56	90	PNF
	L2- Two-Stage	12	28	68	96	206	
		15	28	72	96	155	PWE
		16	35	93	122	230	
		20	35	93	122	230	ZPF
		25	37	95	122	237	
		28	35	86	122	230	ZPL
		30	25	55	96	164	
		35	35	96	122	237	ZPNF
		40	35	93	122	230	
		50	37	98	122	237	ZPWE
		70	30	60	95	174	
		100	16	31	56	90	
Maximum Output Torque $T_2(N\cdot m)$	2×Rated Torque Output						
Full Load Efficiency (%)	L1 ≥96%; L2 ≥92%						
Average Service Life (h)	20000						
Operating Temperature (°C)	-10°C ~ +80°C						
Protection Class	IP65						
Mounting Orientation	Any Mounting Direction						
Weight (kg)	L1		0.9	2.2	2.75	6.5	
	L2		1.2	2.9	3.8	8.85	

Remarks

- ① Rated torque for continuous duty; max output torque is short-term peak only. Reserve safety factor for shock-load applications.
- ② 20000-hr service life under rated load & standard conditions. Overload, high-temp and frequent reversing reduce service life.
- ③ Full-load efficiency tested at standard input speed; actual efficiency varies with speed and load.
- ④ Weight is theoretical reference; varies with different motor flange adapters.
- ⑤ Specifications subject to change without prior notice.

Technical Parameters

Parameter Item			measurement unit	PL60	PL80	PL90	PL120
Max. Input Speed n_{1N}			rpm	8000	6000	6000	4800
Rated Input Speed n_{1B}			rpm	4000	3500	3500	3000
Max. Allowable Radial Force F_{2rB}			N	320	650	680	1730
Max. Allowable Axial Force F_{2aB}			N	260	510	620	1270
Torsional Rigidity			Nm/arcmin	2	6.1	6.2	11.1
Noise Value			dB	≤58	≤60	≤60	≤65
Backlash	P1	L1	arcmin	≤8	≤8	≤8	≤8
		L2	arcmin	≤12	≤12	≤12	≤12
	P2	L1	arcmin	≤16	≤16	≤16	≤16
		L2	arcmin	≤20	≤20	≤20	≤20
Moment of Inertia	L1-Single Stage	3	kg·cm ²	0.28	0.59	1.55	7.3
		4	kg·cm ²	0.27	0.54	1.5	7
		5	kg·cm ²	0.27	0.53	1.49	6.97
		7	kg·cm ²	0.25	0.47	1.24	6.26
		10	kg·cm ²	0.25	0.47	1.24	6.24
	L2-Two Stage	12	kg·cm ²	0.27	0.56	1.33	6.92
		15	kg·cm ²	0.26	0.54	1.31	6.9
		16	kg·cm ²	0.27	0.52	1.3	6.74
		20	kg·cm ²	0.27	0.51	1.28	6.67
		25	kg·cm ²	0.27	0.51	1.28	6.67
		28	kg·cm ²	0.27	0.5	1.27	6.66
		30	kg·cm ²	0.25	0.5	1.27	6.66
		35	kg·cm ²	0.25	0.5	1.27	6.65
		40	kg·cm ²	0.27	0.5	1.27	6.65
		50	kg·cm ²	0.22	0.43	1.1	6.3
		70	kg·cm ²	0.22	0.43	1.1	6.3
		100	kg·cm ²	0.22	0.43	1.1	6.3

Remarks:

- ① The limit speed is for short-term use only. Rated speed shall be adopted for long-time operation.
- ② Backlash, noise and torsional stiffness are standard no-load test values, and slight differences may occur under actual working conditions.
- ③ A safety margin is recommended for radial and axial load selection of the output shaft end.
- ④ The moment of inertia in this table is the value at the reducer input side, excluding external load accessories. Product parameters are subject to update without prior notice.

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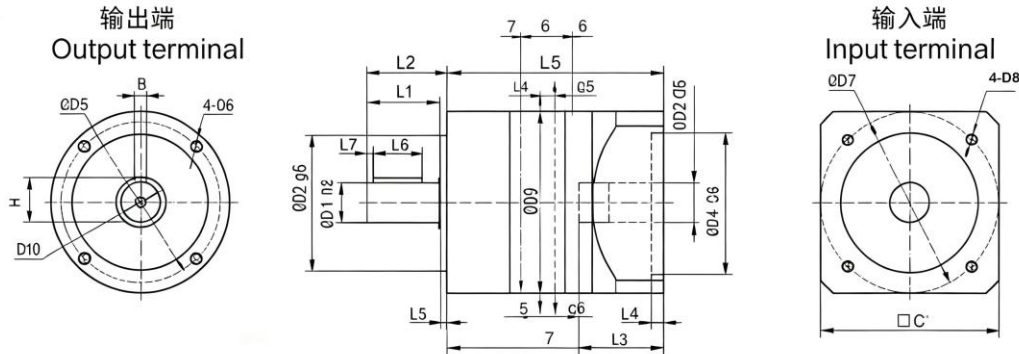
PWE

ZPF

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PL Series Reducer Outline Drawing Data

Stage	Model	Applicable Ratio	Output Shaft Diameter D1	Output Locating Diameter D2	Output Flange D5	Motor Locating Diameter D4	Key Width B	Key Depth H	Overall Length L1
Single Stage-L1	PL60	3/4/5	14	40	52	53	5	16	31
		7/10	14	40	52	38.1	5	16	31
	PL80	3/4/5/7/10	20	60	70	70	6	22.5	36
	PL90	3/4/5/7/10	20	60	80	80	6	22.5	36
	PL120	3/4/5	25	80	100	110	8	28	48.5
		7/10	25	80	100	95	8	20	48.5
Two Stage-L2	PL60	12/15	14	40	52	53	5	16	35
		16/20/25	14	40	52	38.1	5	16	35
	PL80	12/15/16/20/25	20	60	70	70	6	22.5	40
	PL90	12/15/16/20/25	20	60	80	80	6	22.5	40
	PL120	12/15/16	25	80	100	110	8	28	54
		20/25	25	80	100	95	8	20	54

Output Flange Bolts: PL60: 4×M5; PL80: 4×M6; PL90: 4×M6; PL120: 4×M10

Supplementary Notes

- Stage marking: L1-single-stage reduction; L2-two-stage reduction.
- L1 and L2 on outline drawings denote shaft segment dimensions. In table, L1/L2 are only for distinguishing reduction stages. The Overall Length column shows total reducer dimension. Identical symbols in drawing and table have different definitions, do not confuse them.

Remarks

1. All dimensions are in mm.
2. The outline dimensions in this table are for equipment layout & selection reference only, not for production drawing.
3. Unspecified dimensional tolerances comply with general mechanical processing standards.
4. Product is subject to continuous improvement; specifications may change without prior notice.

PNF-Series Precision Helical Gear Planetary Reducer



The PNF-series is a coaxial square-flange helical-gear planetary transmission solution. Its helical gears adopt carburizing-quenched hardened tooth surfaces with tooth profile modification, delivering smooth meshing performance. Available in single-stage and two-stage reduction versions, it provides two accuracy grades: Standard and Precision, compatible with most servo and stepper motors.

✓ Core Advantages

Helical-gear meshing ensures smooth operation, low backlash, low noise and excellent shock-resistance. It supports long-term continuous high-speed operation. The square-flange design offers great universality and outstanding radial load-bearing capacity.

⚠ Product Limitations

Higher procurement cost compared with PF and PL spur-gear models; longer axial length than PWE ultra-thin models of the same size.

📌 Selection Guide

Suitable for applications requiring high-precision positioning, long-term continuous high-speed operation, lead-shaft direct-driven equipment, and coaxial transmission with strict noise requirements.

For scenarios demanding extreme axial compactness and direct-mount turntable installation, please select the PWE-series.

PF

PL

PNF

PWE

ZPF

ZPL

ZPNF

ZPWE

MODEL EXPLANATION

PNF60-L1-10-S2-P1

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
PNF	60	L1	10	S2	P1
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	80		4	S2: Single-key shaft	P2: Standard grade
	90		5	K: Hollow single-key shaft	
	120		7		
			10		
		L2: Two-stage reduction	15		
			20		
			25		
			30		
			35		
			40		
			100		



PF

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SPEED REDUCER SELECTION INSTRUCTION

- Series, Model, Rated Torque
- Reduction Ratio or Output Shaft Speed
- Operating Conditions and Mounting Method
- Load Type (Smooth Load, Intermittent Shock Load, Continuous Shock Load)
- Daily Operating Hours, Start-Stop Cycles per Minute
- Output-end Connection Mode (Coupling, Pulley, Gear, Lead-Screw Direct Connection, etc.)
- Order Quantity and Name of Matched Mechanical Equipment
- Input Mode and Input Speed
- Motor Brand & Model, Flange Dimension and Motor Shaft Diameter
- Special Environmental Requirements (High Temperature, Humidity, Dust, Corrosive Environment)



Important Selection Reminders

- For shock-loaded and frequent start-stop applications, a torque safety factor of 1.5-2.5 times is recommended; for smooth continuous operation, the safety factor shall be ≥ 1.2 .
- The reducer can withstand twice the rated torque for short-term operation. Long-term continuous overload operation is prohibited.
- If the operating ambient temperature exceeds the range of $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$, please contact us in advance for customized solutions.
- Fill with special lubricant grease before installation. Running without lubrication is strictly forbidden.

Technical Parameters

Parameter Item	Stage	Reduction Ratio	PNF60	PNF90	PNF120	
Rated Torque $T_N(N \cdot m)$	L1	3	53	130	208	
		4	52	140	290	
		5	57	150	310	
		7	47	135	285	
		10	38	98	225	
	L2	12	52	130	208	PF
		15	53	135	250	
		16	52	140	290	PL
		20	52	140	290	
		25	57	150	310	
		28	52	140	290	PNF
		30	53	130	225	
		35	52	140	295	
		40	47	130	285	PWE
		50	57	150	310	
		70	47	135	285	
		100	38	98	225	ZPF
Maximum Output Torque $T_{2N}(N \cdot m)$	2 times rated torque output					ZPL
Full Load Efficiency (%)	$L1 \geq 97\%$; $L2 \geq 94\%$					
Average Service Life (h)	20000 h					ZPNF
Operating Temperature ($^{\circ}C$)	$-10^{\circ}C \sim +80^{\circ}C$					
Protection Class	IP65					ZPWE
Mounting Orientation	Arbitrary mounting direction					
Weight (kg)	L1 Single Stage		1.3	3.7	7.8	
	L2 Two Stage		1.48	4.1	9.4	

Remarks:

- ① Rated torque is the allowable long-term output torque under continuous operating conditions. Maximum output torque refers to short-term peak torque and shall not be applied for continuous long-time operation. A safety factor shall be reserved for applications with shock load.
- ② The average service life of 20000 hours is obtained under rated load, standard ambient temperature and normal lubrication & maintenance conditions. Overload, high temperature and frequent forward-reverse rotation will shorten service life.
- ③ Full-load efficiency is the tested value at standard input speed. Actual efficiency will fluctuate slightly with input speed and load magnitude.
- ④ Product weight is theoretical reference value. Slight weight difference exists when assembled with different motor flange accessories.
- ⑤ Product technical parameters are subject to further optimization and upgrade without prior notice.

Parameter Item			measurement unit	PNF60	PNF90	PNF120
Max. Input Speed n_{1N}			rpm	8000	6000	6000
Rated Input Speed n_{1B}			rpm	4000	3000	3000
Max. Allowable Radial Force F_{2rB}			N	1530	2480	3640
Max. Allowable Axial Force F_{2aB}			N	620	1550	2850
Torsional Rigidity			Nm/arcmin	6	13	24
Noise Value			dB	≤58	≤60	≤65
Backlash	P1	L1	arcmin	≤3	≤3	≤3
		L2	arcmin	≤5	≤5	≤5
	P2	L1	arcmin	≤5	≤5	≤5
		L2	arcmin	≤7	≤7	≤7
Moment of Inertia	L1-Single Stage	3	kg·cm ²	0.21	0.82	2.75
		4	kg·cm ²	0.16	0.58	2.2
		5	kg·cm ²	0.15	0.55	2.11
		7	kg·cm ²	0.14	0.52	2.08
		10	kg·cm ²	0.14	0.51	1.99
	L2-Two Stage	12	kg·cm ²	0.15	0.58	2.1
		15	kg·cm ²	0.15	0.39	0.56
		16	kg·cm ²	0.14	0.36	0.52
		20	kg·cm ²	0.15	0.39	0.56
		25	kg·cm ²	0.03	0.39	0.56
		28	kg·cm ²	0.03	0.39	0.56
		30	kg·cm ²	0.03	0.37	0.54
		35	kg·cm ²	0.03	0.37	0.54
		40	kg·cm ²	0.03	0.37	0.54
		50	kg·cm ²	0.03	0.36	0.51
		70	kg·cm ²	0.03	0.36	0.51
		100	kg·cm ²	0.03	0.36	0.51

PF

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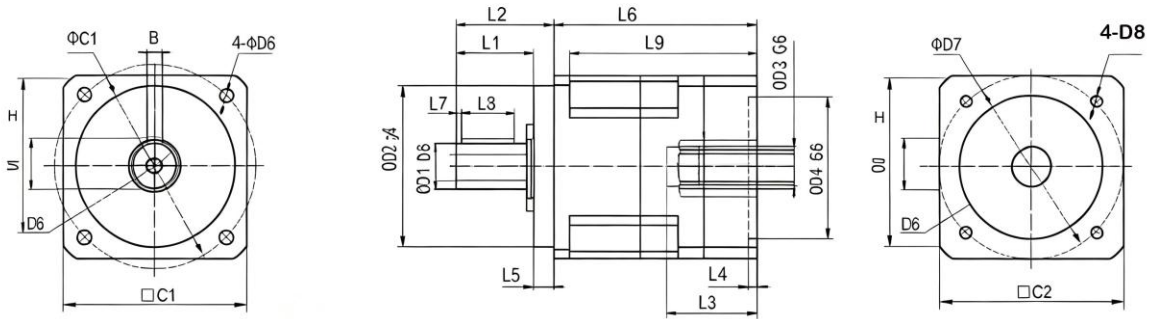
ZPNF

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Remarks

1. Maximum speed is for short-term use only. Use rated speed for continuous operation.
2. Backlash, noise and torsional stiffness are measured under standard no-load condition; slight deviations may occur under actual working conditions.
3. Safety margin is recommended for radial and axial loads at output shaft end during selection.
4. Moment of inertia in this table refers to reducer input side, excluding external load accessories. Product parameters are subject to change without prior notice.

PNF Outline Drawing



PNF Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Dia. D1	Output Flange D5	Output Locating Shoulder D2	Motor Locating Shoulder D4	Key Width B	Key Depth H	Overall Length L1
Single Stage - L1	PNF60	16	70	50	50	5	18	29.5
		16	70	50	38.1	5	18	29.5
	PNF90	22	100	80	70	6	24.5	37.5
		22	100	80	73	6	24.5	37.5
	PNF120	32	130	110	110	10	35	51
		32	130	110	95	10	35	51
Two Stage - L2	PNF60	16	70	50	50	5	18	37
		16	70	50	38.1	5	18	37
	PNF90	22	100	80	70	6	24.5	48
		22	100	80	73	6	24.5	48
	PNF120	32	130	110	110	10	35	63
		32	130	110	95	10	35	63

Output Flange Bolts: PNF60: 4×M5; PNF90: 4×M6; PNF120: 4×M8

Supplementary Notes

- Stage column: L1 = single-stage reduction; L2 = two-stage reduction.
- On drawings, L1 stands for output shaft extension length. In this table, L1/L2 are only used to distinguish reduction stages. The Overall Length column shows the complete reducer dimension. Symbols carry different definitions in drawing and table, do not confuse them.

Remarks

1. All dimensions are in mm.
2. Outline dimensions in this table are for equipment layout & selection reference only, shall not be directly used as production drawings.
3. Tolerances for unspecified dimensions comply with general mechanical processing standards.
4. Products are subject to continuous improvement. Specifications are subject to change without prior notice.

PWE Series Precision Helical-Gear Planetary Reducer



The PWE series adopts coaxial disc-flange helical-gear planetary transmission solution. The helical gears feature carburizing-quenched hardened tooth surfaces plus tooth profile modification, with an ultra-thin flat-type structure. This product offers single-stage / two-stage reduction, two accuracy grades (Standard Grade and Precision Grade), and large-size end-face output flange, compatible with most servo and stepper motors.

✓ Core Advantages

Extremely short axial dimension, ultra-thin & flat design. Large disc-type flange can directly support turntable loads, specially designed for rotary mechanisms.

⚠ Product Limitations

Not suitable for long drive-shaft transmission; less versatile than PNF series; the hollow-shaft structure is not fit for heavy radial overhung loads.

📌 Selection Guide

Suitable for rotary worktables, indexing turntables, and rotary mechanisms with highly limited axial installation space. For applications requiring long-shaft transmission or large radial overhung loads, PNF series is recommended.

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MODEL EXPLANATION

PWE60-L1-10-S2-P1

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
PWE	60	L1	10	S2	P1
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	90		4	S2: Single-key shaft	P2: Standard grade
	120		5	K: Hollow single-key shaft	
			7		
		L2: Two-stage reduction	10		
			15		
			20		
			25		
			30		
			35		
			40		
			...		
			100		



SPEED REDUCER SELECTION INSTRUCTIONS

- Series, Model, Rated Torque
- Reduction Ratio or Output Shaft Speed
- Operating Conditions and Mounting Method
- Load Type (Smooth Load, Intermittent Shock Load, Continuous Shock Load)
- Daily Operating Hours, Start-Stop Cycles per Minute
- Output-end Connection Mode (Coupling, Pulley, Gear, Lead-Screw Direct Connection, etc.)
- Order Quantity and Name of Matched Mechanical Equipment
- Input Mode and Input Speed
- Motor Brand & Model, Flange Dimension and Motor Shaft Diameter
- Special Environmental Requirements (High Temperature, Humidity, Dust, Corrosive Environment)

 Important Selection Reminders

1. For shock-loaded and frequent start-stop applications, it is recommended to reserve a torque safety factor of 1.5-2.5 times; for smooth continuous operation, the safety factor shall be ≥ 1.2 .
2. The reducer can withstand twice the rated torque for short-term operation. Long-term continuous overload operation is prohibited.
3. If the operating ambient temperature is outside the range of $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$, please contact us in advance for customized solutions.
4. Fill with special lubricant grease before installation. Running without lubrication is strictly forbidden.

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Technical Parameters

Parameter Item	Stage	Reduction Ratio	PWE60	PWE90	PWE120	
Rated Torque T _N (N.m)	L1 –Single Stage	3	35	95	148	
		4	40	110	210	
		5	40	110	210	
		7	40	90	200	
		10	18	60	120	
	L2 –Two Stage	12	35	95	148	PF
		15	40	110	210	
		16	40	110	210	
		20	40	110	210	PL
		25	40	110	210	
		28	40	110	210	
		30	35	95	148	PNF
		35	40	110	210	
		40	40	110	210	
		50	40	110	210	PWE
		70	40	90	200	
		100	35	60	120	
Maximum Output Torque T _{2N} (N.m)		2×Rated Torque Output				
Full Load Efficiency (%)		L1≥95%, L2≥90%				ZPF
Average Service Life (h)		20000 h				ZPL
Operating Temperature (°C)		-10°C~+80°C				
Protection Class		IP65				ZPNF
Mounting Orientation		Any Mounting Direction				
Weight (kg)	L1		1.3	3.2	5.8	ZPWE
	L2		1.5	4.1	7.6	

Remarks

- Rated torque for continuous operation; max torque for short-term peak only. Apply safety factor for shock-load applications.
- 20000-hr service life based on rated load, standard temp and proper lubrication. Overload, high temp and frequent reversing shorten service life.
- Full-load efficiency is tested at standard input speed; actual efficiency varies slightly with speed and load.
- Weight is theoretical reference; slight difference with different motor flange adapters.
- Technical parameters subject to change without notice.

Technical Parameters

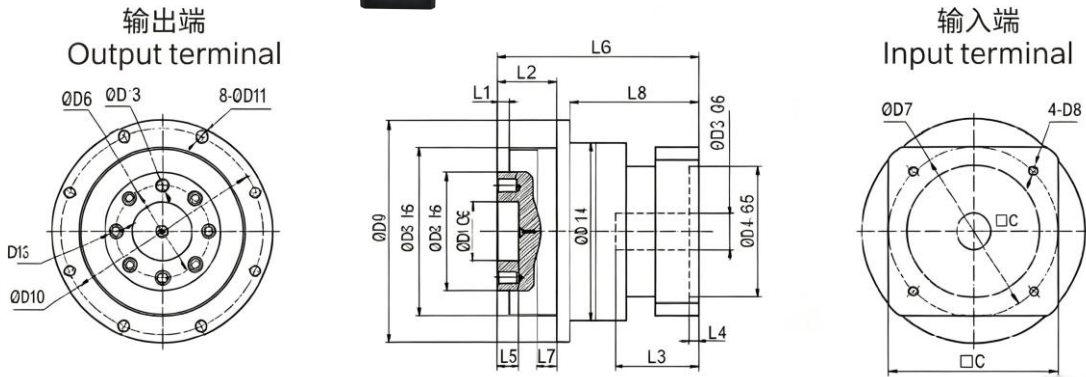
Parameter Item			measurement unit	PWE60	PWE90	PWE120
Max. Input Speed n_{1N}			rpm	8000	6000	6000
Rated Input Speed n_{1B}			rpm	4000	3000	3000
Max. Allowable Radial Force F_{2rB}			N	680	1750	3100
Max. Allowable Axial Force F_{2aB}			N	340	375	1250
Torsional Rigidity			Nm/arcmin	13	31	82
Noise Value			dB	≤58	≤60	≤65
Backlash	P1	L1	arcmin	≤3	≤3	≤3
		L2	arcmin	≤5	≤5	≤5
	P2	L1	arcmin	≤5	≤5	≤5
		L2	arcmin	≤7	≤7	≤7
Moment of Inertia	L1 –Single Stage	3	kg·cm ²	0.11	0.4	1.65
		4	kg·cm ²	0.13	0.51	2.87
		5	kg·cm ²	0.13	0.47	2.71
		7	kg·cm ²	0.13	0.45	2.62
		10	kg·cm ²	0.03	0.44	2.57
	L2 –Single Stage	12	kg·cm ²	0.03	0.4	1.65
		15	kg·cm ²	0.03	0.4	1.22
		16	kg·cm ²	0.03	0.23	1.22
		20	kg·cm ²	0.03	0.23	0.47
		25	kg·cm ²	0.03	0.23	0.47
		28	kg·cm ²	0.03	0.23	0.47
		30	kg·cm ²	0.03	0.23	0.47
		35	kg·cm ²	0.03	0.23	0.47
		40	kg·cm ²	0.03	0.23	0.47
		50	kg·cm ²	0.03	0.2	0.44
		70	kg·cm ²	0.03	0.2	0.44
		100	kg·cm ²	0.03	0.2	0.44

Remarks

1. Maximum speed is for short-term use only. Use rated speed for continuous operation.
2. Backlash, noise and torsional stiffness are measured under standard no-load condition; slight deviations may occur under actual working conditions.
3. Safety margin is recommended for radial and axial loads at output shaft end during selection.
4. Moment of inertia in this table refers to reducer input side, excluding external load accessories. Product parameters are subject to change without prior notice.

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PWE Outline Drawing



PWE Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Dia. D1	Output Pilot D2	Output Flange D5	Motor Pilot D4	Key Width B	Key Depth H	Total Length L1
Single Stage - L1	PWE60	20	40	64	50	4.5	7	34
		20	40	61	38.1	4.5	7	34
	PWE90	31.5	63	90	80	5.5	7	44.5
		31.5	63	90	73	5.5	7	44.5
	PWE120	40	80	110	110	5.5	11	58
		40	80	110	95	5.5	11	58
Two Stage - L2	PWE60	20	40	64	50	4.5	7	34
		20	40	61	38.1	4.5	7	34
	PWE90	31.5	63	90	80	5.5	7	105.5
		31.5	63	90	73	5.5	7	105.5
	PWE120	40	80	110	110	5.5	11	163.5
		40	80	110	95	5.5	11	163.5

Output Flange Bolts: PWE60: 4×M4 ; PWE90: 4×M5 ; PWE120: 4×M5

Supplementary Notes

- Stage marking: L1 stands for single-stage reduction; L2 stands for two-stage reduction.
- On outline drawings, L1 and L2 represent shaft-section dimensions. L1/L2 in this table only distinguish reduction stages. Total Length indicates overall reducer dimension. Drawing reference codes and table column headers share identical labels but have different definitions, do not confuse them.

Remarks

1. All dimensions are in mm.
2. Outline dimensions in this table are for equipment layout & selection reference only, not to be used as manufacturing drawings.
3. Unspecified dimensional tolerances follow general mechanical machining standards.
4. Product subject to continuous improvement. Specifications are subject to change without prior notice.

Planetary Reducer

ZPF Series Precision Spur-Gear 90° Right-Angle Planetary Reducer



The ZPF series adopts 90° right-angle offset spur-gear planetary transmission. Its input-side planetary spur gears work together with bevel-gear offset mechanism. All gears feature carburizing-quenched hardened tooth surfaces and tooth profile modification. Available in single-stage / two-stage reduction, with standard-grade and precision-grade accuracy. Square-flange shaft output, compatible with most servo and stepper motors.

✔ Key Advantages

Enables 90° vertical power offset to save inline installation space. Square-flange output, cost-effective with mature supply chain.

⚠ Product Limitations

Spur-gear design generates relatively high noise at high speed. Bevel-gear offset brings minor efficiency loss; 5-10 % safety margin shall be reserved for torque calculation. Continuous high-speed performance is inferior to helical-gear right-angle models.

📌 Selection Guide

Suitable for general lateral drive, space-limited angular transmission and budget-constrained equipment.

For applications requiring high-speed, low-noise and high-precision angular transmission, please select ZPNF helical-gear series.

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MODEL EXPLANATION

ZPF60-L1-10-S2-P2

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
ZPF	60	L1	10	S2	P2
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	90		4	S2: Single-key shaft	P2: Standard grade
	120		5	K: Hollow single-key shaft	
			7		
			10		
		L2: Two-stage reduction	15		
			20		
			25		
			30		
			35		
			40		
			...		
			100		



SPEED REDUCER SELECTION INSTRUCTIONS

Selection Information Checklist

- Model, Type and Rated Torque
- Reduction Ratio or Output-shaft Speed
- Operating Conditions and Mounting Method
- Load Type (Smooth Load, Intermittent Shock Load, Continuous Shock Load)
- Daily Operating Hours, Starts-Stops per Minute
- Output-side Connection (Coupling, Pulley, Gear, Direct-connected Lead Screw, etc.)
- Order Quantity and Name of Matched Machinery
- Input Type and Input Speed
- Motor Brand & Model, Flange Size and Motor Shaft Diameter
- Special Environmental Requirements (High-temperature, Humid, Dusty, Corrosive atmosphere)

⚠ Important Selection Notes

1. For shock-loaded and frequent start-stop applications, torque safety factor of 1.5 ~ 2.5 is recommended; ≥1.2 for smooth continuous operation.
2. Reducer can withstand 2× rated torque for short-term duty. Continuous overload operation is prohibited.
3. If operating ambient temperature is outside -10°C ~ +80°C, contact us in advance for custom solution.
4. Fill with dedicated grease before installation. Dry-running without lubrication is strictly forbidden.

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Technical Parameters

Parameter Item	Stage	measurement unit	ZPF60	ZPF90	ZPF120	
Rated Torque T _N (N·m)	L1-Single Stage	3	22	96	155	PF
		4	34	122	216	
		5	35	122	223	
		7	27	95	164	
		10	16	56	90	
	L2 双级	12	28	96	206	PL
		15	28	96	155	
		16	35	122	230	
		20	35	122	230	PNF
		25	37	122	237	
		28	35	122	230	
		30	25	96	164	PWE
		35	35	122	237	
		40	35	122	230	
		50	37	122	237	
	70	30	95	174		
	100	16	56	90		
Maximum Output Torque T _{2N} (N·m)	2 times rated torque output					ZPF
Full Load Efficiency (%)	L1≥96%, L2≥92%					ZPL
Average Service Life (h)	20000 h					ZPNF
Operating Temperature (°C)	-10°C~+80°C					ZPWE
Protection Class	IP65					
Mounting Orientation	Arbitrary mounting direction					
Weight (kg)	L1		1.8	5.1	10.5	
	L2		2.1	6.05	12.7	

Remarks

- Rated torque for continuous operation; max output torque is short-term peak only. Apply safety factor for shock-load conditions.
- 20000-hour service life under rated load, standard temperature & proper lubrication. Overload, high-temp and frequent reversing shorten service life.
- Full-load efficiency tested at standard input speed; actual efficiency varies slightly with speed and load.
- Weight for reference only; varies with different motor-flange adapters.
- Specifications subject to optimization without prior notice.

Technical Parameters

Parameter Item			measurement unit	ZPF60	ZPF90	ZPF120
Max. Input Speed n_{1N}			rpm	8000	6000	4800
Rated Input Speed n_{1B}			rpm	4000	3500	3000
Max. Allowable Radial Force F_{2rB}			N	320	680	1730
Max. Allowable Axial Force F_{2aB}			N	260	520	1270
Torsional Rigidity			Nm/arcmin	2	6.2	11.1
Noise Value			dB	≤58	≤60	≤65
Backlash	P1	L1	arcmin	≤8	≤8	≤8
		L2	arcmin	≤12	≤12	≤12
	P2	L1	arcmin	≤16	≤16	≤16
		L2	arcmin	≤20	≤20	≤20
Moment of Inertia	L1	3	kg·cm ²	0.28	1.55	7.3
		4	kg·cm ²	0.27	1.5	7
		5	kg·cm ²	0.27	1.49	6.97
		7	kg·cm ²	0.25	1.24	6.26
		10	kg·cm ²	0.25	1.24	6.24
	L2	12	kg·cm ²	0.27	1.33	6.92
		15	kg·cm ²	0.26	1.31	6.9
		16	kg·cm ²	0.27	1.3	6.74
		20	kg·cm ²	0.27	1.28	6.67
		25	kg·cm ²	0.27	1.28	6.67
		28	kg·cm ²	0.27	1.27	6.66
		30	kg·cm ²	0.25	1.27	6.66
		35	kg·cm ²	0.25	1.27	6.65
		40	kg·cm ²	0.27	1.27	6.65
		50	kg·cm ²	0.22	1.1	6.3
		70	kg·cm ²	0.22	1.1	6.3
		100	kg·cm ²	0.22	1.1	6.3

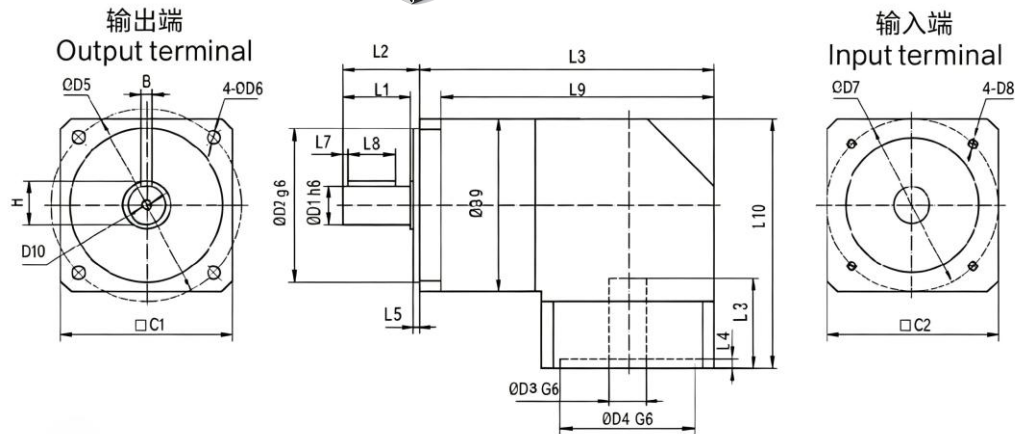
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Remarks

1. Max speed is for short-term use only. Use rated speed for continuous operation.
2. Backlash, noise and torsional stiffness are measured under no-load standard conditions; slight deviations may occur in actual service.
3. Safety margin is recommended for radial and axial loads on output shaft.
4. Moment of inertia listed refers to reducer input side, excluding external load components. Specifications subject to change without prior notice.



ZPF Outline Drawing



ZPF Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Dia D1	Output Spigot D2	Output Flange D5	Motor Spigot D4	Key Width B	Key Depth H	Total Length L1
Single Stage-L1	ZPF60	14	50	70	50	5	16	35
		14	50	70	33.1	5	16	35
		14	50	70	38	5	16	35
	ZPF90	20	80	100	70	6	22.5	47
		20	80	100	73	6	22.5	47
		20	80	100	100	6	22.5	47
	ZPF120	25	110	145	110	8	28	59.5
		25	110	145	95	8	28	59.5
		25	110	145	85	8	28	59.5
Two Stage-L2	ZPF60	14	50	70	50	5	16	51
		14	50	70	33.1	5	16	51
		14	50	70	38	5	16	51
	ZPF90	20	80	100	70	6	22.5	65
		20	80	100	73	6	22.5	65
		20	80	100	100	6	22.5	65
	ZPF120	25	110	145	110	8	28	207
		25	110	145	95	8	28	207
		25	110	145	85	8	28	207

Output Flange Bolts: ZPF60: 4×M5; ZPF90: 4×M6; ZPF120: 4×M8

Supplementary Description

- Stage notation: L1-Single-stage reduction; L2-Two-stage reduction.
- L1, L2 on outline drawings represent segment dimensions. In this table, L1/L2 only distinguish reduction-stage types. Total Length indicates overall reducer dimension. Drawing reference codes differ from table item names, do not confuse them.

Remarks

1. All dimensions in mm.
2. Outline dimensions in this table are for layout & selection reference only, shall NOT be used as manufacturing drawings.
3. Tolerances for unspecified dimensions follow general mechanical-processing standards.
4. Product subject to continuous improvement. Specifications are subject to change without prior notice.

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ZPL Series Precision Spur-Gear 90° Right-Angle Planetary Reducer



The ZPL series adopts 90° right-angle offset spur-gear planetary transmission. Its input-side planetary spur gears work with bevel-gear offset mechanism. All gears are carburized-quenched for hard tooth surfaces and profile modified. Available in single-/two-stage reduction, with Standard and Precision accuracy grades. Short-body round-flange shaft output, compatible with most servo and stepper motors.

✅ Core Advantages

90° right-angle offset, compact short overall size, round flange output, flexible layout and space-saving for installation.

⚠️ Product Limitations

Spur-gear design generates relatively high noise at high speed; bevel-gear offset causes minor efficiency loss. Reserve 5-10 % safety margin for torque calculation. Lower interchangeability compared with ZPF series.

📌 Selection Guide

Suitable for lateral drive in confined space, medium-and-low-load angular transmission and cost-sensitive equipment.

For high-speed, low-noise and high-precision angular applications, choose ZPNF helical-gear series.

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MODEL EXPLANATION

ZPL60-L1-10-S2-P2

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
ZPL	60	L1	10	S2	P2
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	90		4	S2: Single-key shaft	P2: Standard grade
	120		5	K: Hollow single-key shaft	
			7		
			10		
		L2: Two-stage reduction	15		
			20		
			25		
			30		
			35		
			40		
			...		
			100		

SPEED REDUCER SELECTION INSTRUCTIONS

The ZPL series adopts 90° right-angle offset spur-gear planetary transmission. Its input-side planetary spur gears work with bevel-gear offset mechanism. All gears are carburized-quenched for hard tooth surfaces and profile modified. Available in single-/two-stage reduction, with Standard and Precision accuracy grades. Short-body round-flange shaft output, compatible with most servo and stepper motors.

✓ Core Advantages

90° right-angle offset, compact short overall size, round flange output, flexible layout and space-saving for installation.

⚠ Product Limitations

Spur-gear design generates relatively high noise at high speed; bevel-gear offset causes minor efficiency loss. Reserve 5-10 % safety margin for torque calculation. Lower interchangeability compared with ZPF series.

📌 Selection Guide

Suitable for lateral drive in confined space, medium-and-low-load angular transmission and cost-sensitive equipment.

For high-speed, low-noise and high-precision angular applications, choose ZPNF helical-gear series.

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Technical Parameters

Parameter Item	Stage	Reduction Ratio	ZPL60	ZPL90	ZPL120
Rated Torque T_N (N.m)	L1-Single Stage	3	22	96	155
		4	34	122	216
		5	35	122	223
		7	27	95	164
		10	16	56	90
	L2-Two Stage	12	28	96	206
		15	28	96	155
		16	35	122	230
		20	35	122	230
		25	37	122	237
		28	35	122	230
		30	25	96	164
		35	35	122	237
		40	35	122	230
		50	37	122	237
		70	30	95	174
		100	16	56	90
Maximum Output Torque T_{2N} (N.m)	2 times rated torque output				
Full-load Efficiency (%)	L1 $\geq$ 96% L2 $\geq$ 92%				
Average Service Life (h)	20000 h				
Working Temperature (°C)	- 10°C ~ +80°C				
Protection Class	IP65				
Mounting Direction	Arbitrary mounting direction				
Weight (kg)	Stage	ZPL60	ZPL90	ZPL120	
	L1	1.75	4.95	10.45	
	L2	2.05	6	12.55	

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Remarks

- Rated torque for continuous duty; max torque is short-term peak only. Apply safety factor for shock-load conditions.
- 20000-hr service life based on rated load & proper lubrication. Overload, high-temp & frequent reversing reduce service life.
- Full-load efficiency measured at standard input speed; actual value varies with speed and load.
- Weight is theoretical reference; varies with motor flange accessories.
- Specifications subject to change without prior notice.

Technical Parameters

Parameter Item			measurement unit	ZPL60	ZPL90	ZPL120
Max. Input Speed n_{1N}			rpm	8000	6000	4800
Rated Input Speed n_{1B}			rpm	4000	3500	3000
Max. Allowable Radial Force F_{2rB}			N	320	680	1730
Max. Allowable Axial Force F_{2aB}			N	260	620	1270
Torsional Rigidity			Nm/arcmin	2	6.2	11.1
Noise Value			dB	≤58	≤60	≤65
Backlash	P1	L1	arcmin	<8	≤8	≤8
		L2	arcmin	≤12	≤12	≤12
	P2	L1	arcmin	≤16	≤16	≤16
		L2	arcmin	≤20	≤20	≤20
Moment of Inertia	L1-Single Stage	3	kg-cm ²	0.28	1.55	7.3
		4	kg-cm ²	0.27	1.5	7
		5	kg-cm ²	0.27	1.49	6.97
		7	kg-cm ²	0.25	1.24	6.26
		10	kg-cm ²	0.25	1.24	6.24
	L2 Two Stage	12	kg-cm ²	0.27	1.33	6.92
		15	kg-cm ²	0.26	1.31	6.9
		16	kg-cm ²	0.27	1.3	6.74
		20	kg-cm ²	0.27	1.28	6.67
		25	kg-cm ²	0.27	1.28	6.67
		28	kg-cm ²	0.27	1.27	6.66
		30	kg-cm ²	0.25	1.27	6.66
		35	kg-cm ²	0.25	1.27	6.65
		40	kg-cm ²	0.27	1.27	6.65
		50	kg-cm ²	0.22	1.1	6.3
		70	kg-cm ²	0.22	1.1	6.3
		100	kg-cm ²	0.22	1.1	6.3

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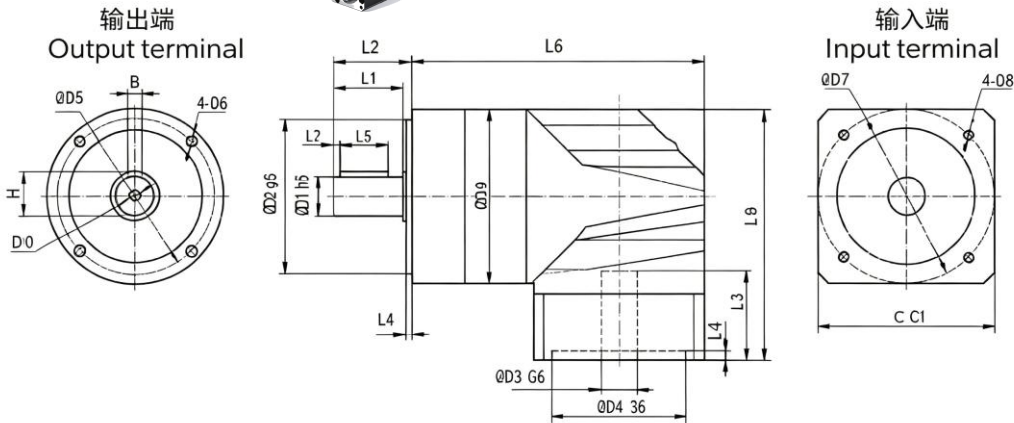
ZPNF

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Remarks

1. Max speed for short-term use only; use rated speed for continuous operation.
2. Backlash, noise & torsional stiffness are no-load test values; slight deviations in actual service.
3. Safety margin is recommended for radial & axial loads on output shaft.
4. Moment of inertia refers to reducer input side, excluding external loads.
Specifications subject to change without prior notice.

ZPL Outline Drawing



ZPL Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Dia D1	Output Locating Shoulder D2	Output Flange D5	Motor Locating Shoulder D4	Key Width B	Key Depth H	Overall Length L1
L1-Single Stage	ZPL60	14	40	60	52	5	16	111.5
	ZPL90	20	68	90	70	6	22.5	153.5
	ZPL120	25	80	120	110	8	28	191
L2-Two Stage	ZPL60	14	40	60	52	5	16	127.5
	ZPL90	20	68	90	70	6	22.5	177.5
	ZPL120	25	80	120	110	8	28	222

Output flange bolts: ZPL60: 4×M5; ZPL90: 4×M6; ZPL120: 4×M10

Supplementary Notes

- Stage marking: L1 represents single-stage reduction; L2 represents two-stage reduction.
- L1 and L2 on outline drawings denote shaft segment dimensions. L1/L2 in this table only indicate reduction stage type. Overall Length refers to full dimension of reducer unit. Drawing codes differ from table identifiers, please do not mix them up.

Remarks

1. All dimensions are in mm.
2. Outline dimensions are for equipment layout reference only, not to be used directly for machining.
3. Tolerances for unmarked dimensions comply with general mechanical machining standards.
4. Product is under continuous improvement; specifications are subject to change without prior notice.

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ZPNF Series Precision Helical 90° Right-Angle Planetary Reducer



The ZPNF series adopts a 90° right-angle deflecting helical-planetary transmission solution. The input-side helical planetary gears are paired with bevel gears for direction change. All gears are carburized-quenched for hard tooth surfaces with gear profile modification. Available in single-stage / two-stage reduction, with standard-grade and precision-grade accuracy options. Square flange shaft output, compatible with most servo and stepper motors.

✔ Core Advantages

Helical-planetary transmission delivers smooth operation, low noise, low backlash and strong shock resistance. It achieves 90-degree direction change for flexible layout, and supports long-term high-speed continuous operation.

⚠ Product Limitations

Higher procurement cost than ZPF / ZPL straight-tooth right-angle models. Bevel-gear direction change causes minor efficiency loss; reserve 5-10% torque margin during calculation.

📌 Selection Guide

Suitable for high-precision positioning, long-time high-speed operation and angle transmission with low-noise requirements. For direct-mount right-angle turntable applications, ZPWE series is recommended.

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MODEL EXPLANATION

ZPNF60-L1-10-S2-P1

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
ZPNF	60	L1	10	S2	P1
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	80		4	S2: Single-key shaft	P2: Standard grade
	90		5	K: Hollow single-key shaft	
	120		7		
		L2: Two-stage reduction	10		
			15		
			20		
			25		
			30		
			35		
			40		
			...		
			100		



SPEED REDUCER SELECTION INSTRUCTIONS

Required Selection Information

- Series, model and rated torque
- Reduction ratio or output-shaft speed
- Working conditions and mounting method
- Load type (smooth load, intermittent shock load, continuous shock load)
- Daily operating hours, start-stop cycles per minute
- Output-side connection mode (coupling, pulley, gear, direct screw drive, etc.)
- Purchase quantity and name of matched mechanical equipment
- Input mode and input speed
- Motor brand & model, flange size and motor shaft diameter
- Special environmental requirements (high temperature, humidity, dust, corrosive atmosphere)

Important Selection Notes

1. For shock-loaded and frequent start-stop applications, torque safety factor of 1.5-2.5 is recommended; for smooth continuous operation, safety factor ≥ 1.2 .
2. The reducer can withstand twice the rated torque for short-term periods. Long-term continuous overload operation is prohibited.
3. For operating temperatures outside $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$, please contact us in advance for customized solutions.
4. Fill with special lubricant grease before installation. Dry-running without lubrication is strictly forbidden.

Technical Parameters

Parameter Item	Stage	Reduction Ratio	ZPNF60	ZPNF90	ZPNF120	
Rated Torque T_N (Nm)	L1-Sigle Stage	3	53	130	208	PF
		4	52	140	290	
		5	57	150	310	
		7	47	135	285	
		10	38	98	225	
	L2 Two Stage	12	52	130	208	PL
		15	53	135	250	
		16	52	140	290	
		20	52	140	290	PNF
		25	57	150	310	
		28	52	140	290	
		30	53	130	225	
		35	52	140	295	PWE
		40	47	130	285	
		50	57	150	310	
		70	47	135	285	
		100	38	98	225	
Maximum Output Torque T_{2N} (Nm)	2 times rated torque output					ZPF
Full Load Efficiency (%)	$L1 \geq 97\%$; $L2 \geq 94\%$					ZPL
Average Service Life (h)	20000					ZPNF
Operating Temperature (°C)	$-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$					
Protection Class	IP65					ZPWE
Mounting Orientation	Arbitrary mounting direction					
Weight (kg)	L1	1.8	4.5	8.8		
	L2	1.98	4.9	10.4		

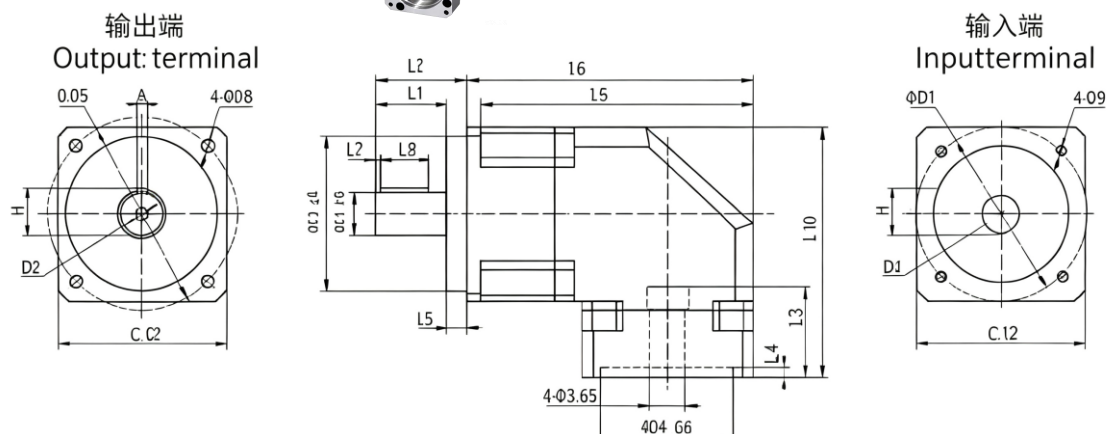
Remarks

- ① Rated torque: long-term continuous output torque. Max output torque is short-term peak value only; safety factor required for shock-load applications.
- ② 20000-hour average service life based on rated load, standard temperature and proper lubrication. Overload, high temperature or frequent reversing will reduce service life.
- ③ Full-load efficiency is tested at standard input speed; actual efficiency varies slightly with speed and load.
- ④ Weight is for reference only; slight deviation occurs with different motor flange kits.
- ⑤ Technical parameters subject to change without prior notice.

Parameter Item			measurement unit	ZPNF60	ZPNF90	ZPNF120	
Max. Input Speed n_{1N}			rpm	8000	6000	6000	
Rated Input Speed n_{1B}			rpm	4000	3000	3000	
Max. Allowable Radial Force F_{2rB}			N	1530	2480	3640	
Max. Allowable Axial Force F_{2aB}			N	620	1550	2850	
Torsional Rigidity			Nm/arcmin	6	13	24	
Noise Value			dB	≤58	≤60	≤65	PF
Backlash	P1	L1	arcmin	≤3	≤3	≤3	PL
		L2	arcmin	≤5	≤5	≤5	
	P2	L1	arcmin	≤5	≤5	≤5	PNF
		L2	arcmin	≤7	≤7	≤7	PWE
Moment of Inertia	L1-Single Stage	3	kg·cm ²	0.21	0.82	2.75	
		4	kg·cm ²	0.16	0.58	2.2	
		5	kg·cm ²	0.15	0.55	2.11	
		7	kg·cm ²	0.14	0.52	2.08	ZPF
		10	kg·cm ²	0.14	0.51	1.99	
	L2-Two Stage	12	kg·cm ²	0.15	0.58	2.1	ZPL
		15	kg·cm ²	0.15	0.39	0.56	
		16	kg·cm ²	0.14	0.36	0.52	
		20	kg·cm ²	0.15	0.39	0.56	
		25	kg·cm ²	0.03	0.39	0.56	ZPNF
		28	kg·cm ²	0.03	0.39	0.56	
		30	kg·cm ²	0.03	0.37	0.54	
		35	kg·cm ²	0.03	0.37	0.54	ZPWE
		40	kg·cm ²	0.03	0.37	0.54	
		50	kg·cm ²	0.03	0.36	0.51	
		70	kg·cm ²	0.03	0.36	0.51	
		100	kg·cm ²	0.03	0.36	0.51	

Remarks

- ① Limit speed for short-term use only; use rated speed for continuous operation.
- ② Backlash, noise and torsional rigidity are no-load test values; slight deviations occur under actual working conditions.
- ③ Reserve safety margin for radial and axial loads on output shaft.
- ④ Moment of inertia refers to reducer input side, excluding external load accessories. Parameters subject to update without prior notice.



ZPNF Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Dia. D1	Output Port D2	Output Flange D5	Motor Pilot D4	Key Width B	Key Depth H	Overall Length L
L1-Single Stage	ZPNF60	18	70	50	50	5	18	29.5
		18	70	50	38.1	5	18	29.5
	ZPNF90	22	100	80	70	5	24.5	37.5
		22	100	80	73	5	24.5	37.5
	ZPNF120	32	130	110	110	10	35	51
		32	130	110	95	10	35	51
L2-Two Stage	ZPNF60	18	70	50	50	5	18	37
		18	70	50	38.1	5	18	37
	ZPNF90	22	100	80	70	5	24.5	48
		22	100	80	73	5	24.5	48
	ZPNF120	32	130	110	110	10	35	63
		32	130	110	95	10	35	63

Output Flange Bolts: ZPNF60: 4×M5; ZPNF90: 4×M6; ZPNF120: 4×M8

Supplementary Description

Stage notation: L1 stands for single-stage reduction; L2 stands for two-stage reduction.

L1 and L2 on outline drawings represent segment dimensions. The L1/L2 in this table only denote reduction-stage types. The Overall Length column indicates total reducer dimension. Drawing symbols share identical naming with table labels but carry different definitions, please do not confuse them.

Remarks

1. All dimensions are in mm (millimeters).
2. Outline dimensions are for equipment layout & model-selection reference only, not for manufacturing drawings.
3. Tolerances for non-specified dimensions comply with general mechanical machining standards.
4. Product is subject to continuous improvement. Specifications may be modified without prior notice.

ZPWE Series Precision Helical 90° Right-Angle Planetary Reducer



The ZPWE series features a 90° right-angle helical-bevel planetary drive solution. The input-side helical planetary gear set pairs with bevel-gear direction change. All gears adopt carburizing-quenched hardened tooth surfaces plus tooth profile modification. It outputs via an ultra-thin disc-type face flange. Available in single-stage and two-stage versions with standard-grade and precision-grade accuracy, compatible with most servo and stepper motors.

✓ Core Advantages

90° right-angle direction change, ultra-thin disc-style flange for compact axial dimension. Large-diameter flange can directly take turret loads, ideal for rotary indexing worktables.

⚠ Product Limitations

Not suitable for long driveshaft transmission. Bevel-gear direction change brings minor efficiency loss; reserve 5-10% torque margin during calculation. The hollow structure cannot bear heavy overhanging radial loads.

📌 Selection Guide

Suitable for right-angle rotary worktables, turret indexing mechanisms, and equipment with extremely tight corner-mount space. For shaft-output corner transmission, please select ZPNF series.

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MODEL EXPLANATION

ZPWE60-L1-10-S2-P1

Product Series	Frame Size	Stage	Reduction Ratio	Output Shaft Type	Precision Class
ZPWE	60	L1	10	S2	P1
	60	L1: Single-stage reduction	3	S1: Smooth shaft	P1: Precision grade
	90		4	S2: Single-key shaft	P2: Standard grade
	120		5	K: Hollow single-key shaft	
			7		
		L2: Two-stage reduction	10		
			15		
			20		
			25		
			30		
			35		
			40		
			100		



SPEED REDUCER SELECTION INSTRUCTION

Required Information for Reducer Selection

- ◆ Series, Model, Rated Torque
- ◆ Reduction Ratio or Output Shaft Speed
- ◆ Working Conditions and Mounting Method
- ◆ Load Type (Smooth Load, Intermittent Shock Load, Continuous Shock Load)
- ◆ Daily Operating Hours, Start-Stop Cycles per Minute
- ◆ Output-end Connection Type (Coupling, Pulley, Gear, Direct Screw-rod Connection, etc.)
- ◆ Order Quantity and Name of Matched Machinery
- ◆ Input Mode and Input Speed
- ◆ Motor Brand & Model, Flange Size and Motor Shaft Diameter
- ◆ Special Environmental Requirements (High-temperature, Humid, Dusty, Corrosive Atmosphere)

⚠ Important Selection Notes

1. For shock-load and frequent start-stop applications, apply a torque safety factor of 1.5-2.5. For smooth continuous operation, safety factor ≥ 1.2 is recommended.
2. The reducer can withstand $2 \times$ rated torque for short durations. Long-term continuous overload operation is prohibited.
3. For operating temperatures outside $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$, contact us in advance for customized solutions.
4. Fill with special lubricating grease before installation. Dry-running without grease is strictly forbidden.

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Technical Parameters

Parameter Item	Stage	Reduction Ratio	ZPWE60	ZPWE90	ZPWE120
Rated Torque T_N (N.m)	L1 –Single Stage	3	35	95	148
		4	40	110	210
		5	40	110	210
		7	40	90	200
		10	18	60	120
	L2 –Two Stage	12	35	95	148
		15	40	110	210
		16	40	110	210
		20	40	110	210
		25	40	110	210
		28	40	110	210
		30	35	95	148
		35	40	110	210
		40	40	110	210
		50	40	110	210
		70	40	90	200
		100	35	60	120
Maximum Output Torque T_{2N} (N.m)	2×Rated Torque Output				
Full Load Efficiency (%)	L1 ≥ 95%, L2 ≥ 90%				
Average Service Life (h)	20000 h				
Operating Temperature (°C)	-10°C ~ +80°C				
Protection Class	IP65				
Mounting Orientation	Any Mounting Direction				
Weight (kg)	L1	1.7	3.8	6.5	
	L2	1.9	4.9	7.3	

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Remarks

1. Rated torque: long-term continuous output torque. Max torque is short-term peak value, not for continuous use. Apply safety factor for shock-load conditions.
2. 20000-hr average service life under rated load, standard temperature and correct lubrication. Overload, high-temp and frequent reversing shorten service life.
3. Full-load efficiency is measured at standard input speed; actual efficiency fluctuates with speed and load.
4. Weight is for reference only, varies with different motor flange adapters.
5. Technical specs subject to update without prior notice.



Technical Parameters

Parameter Item			measurement unit	ZPWE60	ZPWE90	ZPWE120
Max. Input Speed n_{1N}			rpm	8000	6000	6000
Rated Input Speed n_{1B}			rpm	4000	3000	3000
Max. Allowable Radial Force F_{2rB}			N	680	1750	3100
Max. Allowable Axial Force F_{2aB}			N	340	375	1250
Torsional Rigidity			Nm/arcmin	13	31	82
Noise Value			dB	≤58	≤60	≤65
Backlash	P1	L1	arcmin	≤3	≤3	≤3
		L2	arcmin	≤5	≤5	≤5
	P2	L1	arcmin	≤5	≤5	≤5
		L2	arcmin	≤7	≤7	≤7
Moment of Inertia	L1-Single Stage	3	kg·cm ²	0.11	0.4	1.65
		4	kg·cm ²	0.13	0.51	2.87
		5	kg·cm ²	0.13	0.47	2.71
		7	kg·cm ²	0.13	0.45	2.62
		10	kg·cm ²	0.03	0.44	2.57
	L2-Two Stage	12	kg·cm ²	0.03	0.4	1.65
		15	kg·cm ²	0.03	0.4	1.22
		16	kg·cm ²	0.03	0.23	1.22
		20	kg·cm ²	0.03	0.23	0.47
		25	kg·cm ²	0.03	0.23	0.47
		28	kg·cm ²	0.03	0.23	0.47
		30	kg·cm ²	0.03	0.23	0.47
		35	kg·cm ²	0.03	0.23	0.47
		40	kg·cm ²	0.03	0.23	0.47
		50	kg·cm ²	0.03	0.2	0.44
		70	kg·cm ²	0.03	0.2	0.44
		100	kg·cm ²	0.03	0.2	0.44

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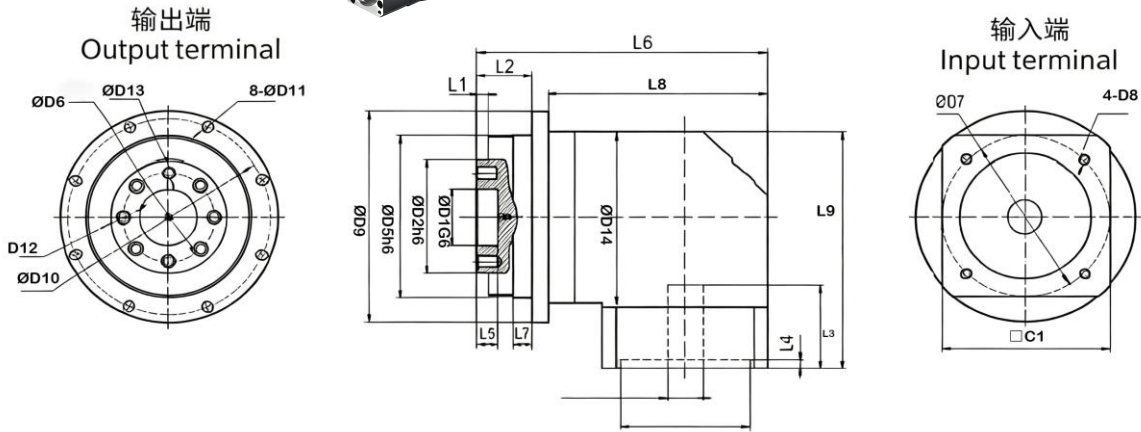
ZPL

ZPNF

ZPWE

Remarks

1. Limit speed is for short-term use only. Use rated speed for continuous operation.
2. Backlash, noise and torsional stiffness are measured under standard no-load conditions; actual values may differ in practical application.
3. Reserve safety margin for radial and axial loads on output shaft during selection.
4. Moment of inertia in this table refers to reducer input side, excluding external load accessories. Specifications are subject to change without prior notice.



ZPWE Series Reducer Outline Drawing Data

Stage	Model	Output Shaft Dia. D1	Output Flange D5	Output Locating Shoulder D2	Motor Locating Shoulder D4	Total Length L1
L1-Single Stage	ZPWE60	20	64	50	50	120
		20	64	50	38.1	120
		20	64	36	50	120
	ZPWE90	31.5	90	70	50	155.5
		31.5	90	80	50	155.5
		31.5	90	73	50	155.5
		31.5	90	60	50	155.5
	ZPWE120	40	110	110	63	192
		40	110	95	63	192
		40	110	85	63	192
L2-Two Stage	ZPWE60	20	64	50	50	146.5
		20	64	50	38.1	146.5
		20	64	36	50	146.5
	ZPWE90	31.5	90	70	50	190
		31.5	90	80	50	190
		31.5	90	73	50	190
		31.5	90	60	50	190
	ZPWE120	40	110	110	63	230.5
		40	110	95	63	230.5
		40	110	85	63	230.5

PF

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ZPWE

Output Flange Bolts

ZPWE60: 4×M4; ZPWE90: 4×M5; ZPWE120: 4×M5

⚠ The inner 8-ØC11 holes are for internal assembly screws. Do NOT fix external equipment via these holes. Use outer threaded mounting holes for installation.

Supplementary Explanation

- Stage marking: L1 = single-stage reduction; L2 = two-stage reduction.
- L1/L2 on drawing refer to segment dimensions. L1/L2 in table only indicate reduction stage. Total Length means overall reducer dimension. Drawing codes differ from table identifiers, do not confuse them.

Remarks

1. All dimensions in mm.
2. These outline dimensions are for equipment layout & selection reference only, shall NOT be used directly for machining drawings.
3. Tolerances for unspecified dimensions comply with general mechanical machining standards.
4. Product is subject to continuous improvement; specifications may be adjusted without prior notice.

Planetary Reducer Operating Precautions

Installation Requirements

1. Before installation, confirm matching interface dimensions between motor and reducer. Clean connecting end-faces and prevent foreign debris from entering the interior.
2. Do not strike the reducer output shaft to avoid damage to bearings and gears. Keep load coaxiality within allowable range to prevent eccentric load.
3. Tighten flange bolts evenly to specified torque; do not fasten forcibly on one-sided only.

Load & Operation

1. Overload and instantaneous shock overload are prohibited. Avoid sharp forward-reverse rotation during start-up and shutdown.
2. Continuous operating speed shall not exceed the reducer's rated maximum speed.
3. Apply safety factor during model selection. Reduce load for long-term continuous operation.

Lubrication & Maintenance

1. Pre-filled grease from factory. No short-term re-greasing required for normal working conditions. Periodically refill grease of the same grade for high-speed or high-temperature applications.
2. Do not mix grease of different brands or grades.
3. Recommended operating ambient temperature: $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$. Excessive temperature accelerates grease aging.

Environmental Protection

1. Standard models are not waterproof or dust-proof. Additional protection measures are required for humid, dusty or spray-exposed environments.
2. Avoid long-term operation under corrosive gas or oil-immersed conditions.

Prohibited Operations

- ✗ Do not manually lock output shaft or force forward/reverse rotation.
- ✗ No welding work on reducer output end; heat conduction will damage internal bearings.
- ✗ Prohibit long-time high-speed no-load running-in.
- ✗ Do not disassemble the reducer by yourself. Unauthorized disassembly voids warranty.

Other Notes

1. Perform 30-minute no-load test-run for first commissioning, then apply load gradually.
2. Shut down immediately for inspection if abnormal noise, excessive temperature rise or vibration occurs during operation.

Reducer Application Industries



Industrial Robots



CNC Machine Tools



3C Electronic Automatic Assembly Line



PV Production Equipment Operation



3C Automation



Intelligent Logistics Sorting & Handling



PV Equipment



Packaging Machinery



Logistics Equipment

行星减速机

Planetary Gear Reducer

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