



Rotary Actuators Product Manual



Harmony in motion, evolving with every move.

ABOUT US

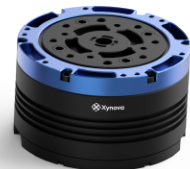
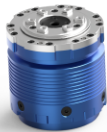
About Xynova

Hangzhou Xynova Technology Co., Ltd. is a world-leading full-stack provider of general dexterous manipulation solutions. We focus on high-sensitivity perception, intelligent control, and high-precision execution, delivering the master key that unlocks dexterous manipulation for embodied AI.

Product Overview

About the Product

The rotary joint module integrates a motor, reducer, encoder, driver, torque sensor and brake into one compact unit, delivering standardized joint-drive solutions for humanoid robots, quadruped robots and collaborative robotic arms.



Core Competence

Industry-leading Ultra-high Torque Density

- Multi-dimensional optimization of electricity, magnetism, force and heat enables continuous high-torque output in a compact size
- Exclusive winding process, high slot fill factor, high torque density and high efficiency
- Built-in high-speed heat dissipation channel, ensuring stable heat resistance under high load

CAE Optimization, Fatigue Testing to Ensure High Reliability

- Multi-physics CAE simulation + fatigue verification, long-term high reliability
- Motor reducer coordination, force-speed matching, and energy efficiency transmission
- Gear load sharing optimization, featuring high load capacity and low vibration & noise
- Integrated heat dissipation and lightweight design, featuring high torque and long service life

Lightweight and Compact in Size

(compared with the industry average)

- **45%** smaller in volume at the same peak torque
- **35%** lighter than the industry average at the same peak torque

Provide Systematic Solutions

- We provide **customized** full sets of electric drive solutions for humanoid robots, with a torque coverage ranging from 6.7 to 600 Nm that can meet the requirements of all body joints of humanoid robots, including the waist, hip, knee and elbow.

HR Series



Low Backlash and High Precision

- Backlash: ≤ 10 arcseconds
- HBF series positioning accuracy $\leq 0.01^\circ$
- High-resolution dual encoder

Lightweight and High-output

- Maximum torque density up to 177 Nm/kg
- The smallest module weighs only 0.24 kg
- Hollow threading with neat wiring layout

Force Control and Safety

- The HBF series comes standard with a torque sensor
- Force control bandwidth $\geq 100 \text{ Hz}$
- Electromagnetic brake, power-off holding

HR Series · Parameter Table

Performance Indicators	HR100-45-20	HR100-64-110	HR101-60-38-HBF	HR101-80-136-HBF	HR101-80-182-HBF
Input Voltage	48V	48V	48V	48V	48V
Rated Current	1.7A	6.2A	1.2A	4.9A	7.9A
Peak Current	5A	18.7A	4.9A	17.6A	24.9A
Power Rating	32W	170W	49W	198W	310W
Rated Speed	30r/min	30r/min	30r/min	30r/min	30r/min
No-load Speed	45r/min	45r/min	45r/min	45r/min	45r/min
Rated Torque	6.7Nm	36Nm	10Nm	40Nm	60Nm
Peak Torque	20Nm	110Nm	38Nm	136Nm	182Nm
Torque Density	82Nm/kg	173Nm/kg	45Nm/kg	97Nm/kg	114Nm/kg
Gear Ratio	100	100	101	101	101
Backlash	≤10Arcsec	≤10Arcsec	≤10Arcsec	≤10Arcsec	≤10Arcsec
Weight	0.24kg	0.64kg	0.85kg	1.4kg	1.6kg
Size	Φ45 × 63mm	Φ64 × 80mm	Φ60 × 70mm	Φ80 × 85mm	Φ80 × 95mm
Inner Diameter	4.7mm	7mm	12mm	15mm	15mm
Torque Sensor	No	No	Standard, Removable	Standard, Removable	Standard, Removable
Brake	No	No	Standard, Removable	Standard, Removable	Standard, Removable
Encoder Type	Double Encoder	Double Encoder	Double Encoder	Double Encoder	Double Encoder
Encoder Resolution	14bit	14bit	≥19bit	≥19bit	≥19bit
Temperature Sensor Accuracy	0.1°C	0.1°C	0.1°C	0.1°C	0.1°C
Operating Temperature	-20°C~55°C	-20°C~55°C	-20°C~55°C	-20°C~55°C	-20°C~55°C
Noise	≤68dB	≤68dB	≤60dB	≤60dB	≤60dB
Protection Grade	IP54	IP54	IP54	IP54	IP54
Repeatability	≤0.1°	≤0.1°	≤0.01°	≤0.01°	≤0.01°
Communication	CAN/ EtherCAT	CAN/ EtherCAT	CAN/ EtherCAT	CAN/ EtherCAT	CAN/ EtherCAT
Working Mode	Intelligent parameter tuning for torque, speed, and position under full operating conditions.		MIT	MIT	MIT

PR Series



High Dynamic Response

- Maximum rated speed up to **158r/min**
- Peak torque reaches a maximum of **600Nm**
- Supports high-dynamic movements (running, jumping)

High Torque Density

- Max. **323Nm/kg**
- Planetary reduction architecture with high transmission efficiency
- Compact size delivers consistent high torque output

Impact-resistant Heavy-duty

- Planetary gear structure with **high impact resistance**
- Stable operation when squatting to cross obstacles
- Designed specifically for waist and leg load-bearing

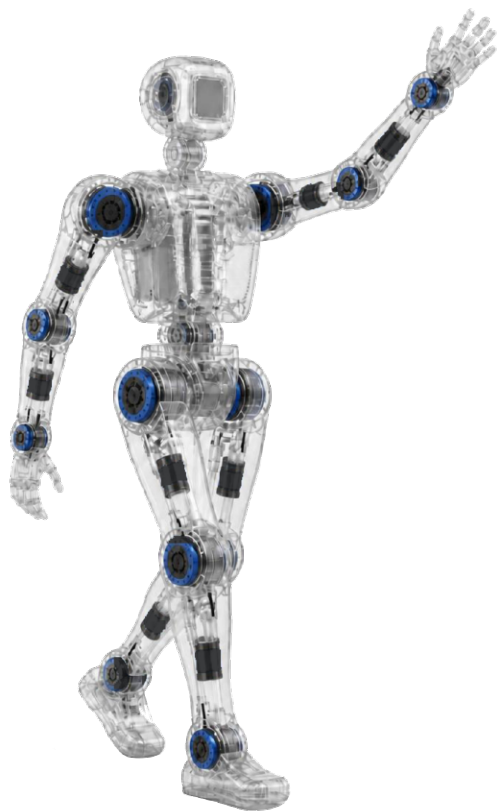
PR Series · Parameter Table

Performance Indicators	PR20-102-130-HS	PR64-110-500	PR43-120-600-HB	PR57-108-270-HB
Input Voltage	48V	48V	48V	48V
Rated Current	18A	23A	19A	7.7A
Peak Current	61.5A	70A	65A	25A
Power Rating	867W	672W	1078W	399W
Rated Speed	120r/min	30r/min	30r/min	30r/min
No-load Speed	150r/min	45r/min	32r/min	32r/min
Rated Torque	40Nm	150Nm	200Nm	90Nm
Peak Torque	130Nm	500Nm	600Nm	270Nm
Torque Density	113Nm/kg	323Nm/kg	140Nm/kg	108Nm/kg
Gear Ratio	20	64	43	57
Backlash	≤12Arcmin	≤12Arcmin	≤12Arcmin	≤12Arcmin
Weight	1.2kg	1.6kg	3.8kg	2.5kg
Size	Φ102 × 59mm	Φ110 × 64.3mm	Φ120 × 110mm	Φ108 × 95mm
Inner Diameter	10mm	0	24mm	20mm
Brake	No	No	Standard, Removable	Standard, Removable
Encoder Resolution	17bit	14bit	17bit	16bit
Operating Temperature	-20°C~55°C	-20°C~55°C	-20°C~55°C	-20°C~55°C
Noise	≤70dB	≤70dB	≤60dB	≤60dB
Protection Rating	IP54	IP54	IP54	IP54
Repeatability	≤0.1°	≤0.1°	≤0.1°	≤0.1°
Communication	CAN/ EtherCAT	CAN/ EtherCAT	CAN/ EtherCAT	CAN/ EtherCAT
Working Mode	Intelligent parameter tuning for torque, speed, and position under full operating conditions.		MIT	MIT

PR Series · Parameter Table

Performance Indicators	PR21-100-140-HS	PR21-84-42-HS	PR17-65-29-HS	PR19-57-25-HS
Input Voltage	48V	48V	48V	48V
Rated Current	15.7A	5.1A	4.5A	3A
Peak Current	50A	18.3A	14.2A	9.6A
Power Rating	369W	88W	157W	109W
Rated Speed	80r/min	60r/min	158r/min	130r/min
No-load Speed	130r/min	155r/min	200r/min	156r/min
Rated Torque	44Nm	14Nm	9.5Nm	8Nm
Peak Torque	140Nm	42Nm	29Nm	25Nm
Torque Density	117Nm/kg	60Nm/kg	57Nm/kg	63Nm/kg
Gear Ratio	21	21	17	19
Backlash	≤12Arcmin	≤12Arcmin	≤12Arcmin	≤12Arcmin
Weight	1.2kg	0.7kg	0.5kg	0.4kg
Size	Φ100 × 61.7mm	Φ84 × 61.1mm	Φ65 × 61.5mm	Φ57 × 57mm
Inner Diameter	10mm	8mm	5.5mm	4.5mm
Brake	No	No	No	No
Encoder Resolution	16bit	16bit	16bit	16bit
Operating Temperature	-20°C~55°C	-20°C~55°C	-20°C~55°C	-20°C~55°C
Noise	≤60dB	≤60dB	≤60dB	≤60dB
Protection Rating	IP20	IP20	IP20	IP20
Repeatability	≤0.1°	≤0.1°	≤0.1°	≤0.1°
Communication	CAN/ EtherCAT	CAN/ EtherCAT	CAN/ EtherCAT	CAN
Working Mode	MIT	MIT	MIT	MIT

Application Solution



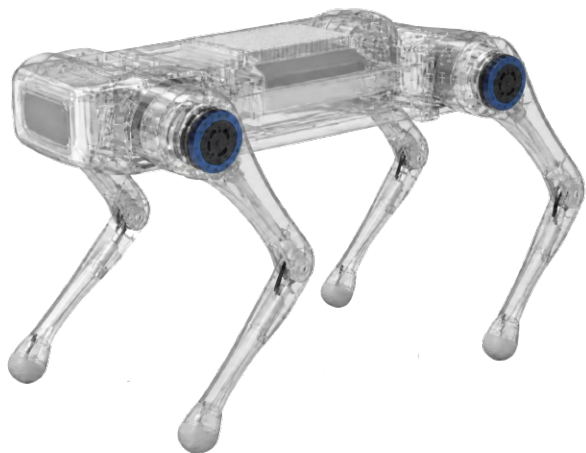
Schematic Diagram of Recommended Placement for Humanoid Robot Modules

Joint Position	Recommended Model
Head/ Distal Interphalangeal Joints	PR19-57-25-HS
Wrist/ Forearm	PR17-65-29-HS
Upper Arm/ Shoulder	PR21-84-42-HS
Hip/ Leg	PR21-100-140-HS

Schematic Diagram of Recommended Module Positions for Wheel-Legged Humanoid Robots

Joint Position	Recommended Model
Head	HR100-45-20
J1-J2 Shoulder/ Upper Arm	HR101-80-182-HBF
J3-J4 Elbow/ Forearm	HR101-80-136-HBF
J5-J7 Wrist/ End Effector	HR101-65-38-HBF
Folding legs	PR43-120-600-HB
	PR57-108-270-HB

Application Solution



Schematic Diagram of Recommended Module Positions for Quadruped Robots

Joint Position	Recommended Model
Hip Joint (Forward Swing/ Lateral Swing)	PR20-102-130-HS
Knee Joint	PR20-102-130-HS
Total for the whole body	12 modules



The rotary joint module integrates a motor, reducer, encoder, driver, torque sensor and brake into one compact unit, delivering standardized joint-drive solutions for humanoid robots, quadruped robots and collaborative robotic arms.

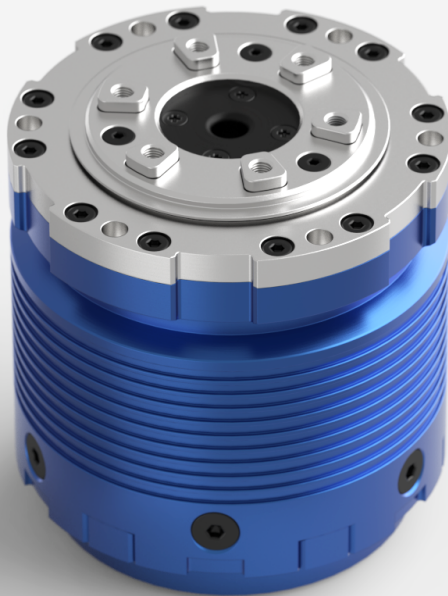
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