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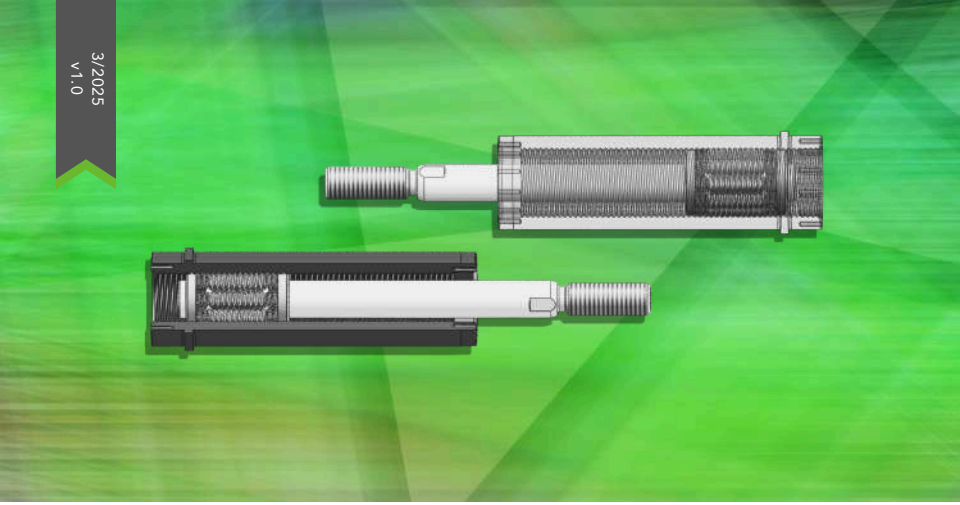


PRODUCT CATALOGUE

INVERTED PLANETARY ROLLER SCREW

High-Precision, High-Load Linear Transmission

leaderdrive®

Leader Harmonious Drive System Co., Ltd.

Industrial Automation

CNC Machines / Automated Equipment / Precision Presses

High load capacity, ultra-long service life, high speed and efficiency

Humanoid Robots

Humanoid Robot Linear Actuators

High-precision linear actuation, high durability and load-bearing capacity

Construction Equipment

Deep-sea exploration / Tunnel boring / Lifting equipment

Shock-resistant, high-load, long service life, low maintenance, adaptable to harsh environments

Scientific Research Equipment

Semiconductor Lithography Machines / Particle Accelerators / Astronomical Telescopes

Ultra-high positioning accuracy, extremely low friction, zero backlash, high rigidity, no thermal expansion

Medical Equipment

Surgical Robots / Medical Imaging Devices / Rehabilitation Equipment

Extremely high positioning accuracy, pollution-free, low noise, long service life and low maintenance

Renewable Energy

Wind Turbine Pitch Control Systems / Solar Tracking Systems

High-precision angular adjustments, long lifespan, suitable for extreme outdoor environments

Product Concept

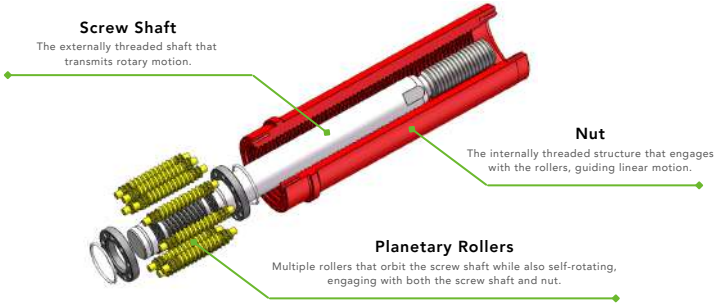
The Inverted Planetary Roller Screw (IPRS) is a high-precision, high-load-capacity linear transmission system. It is a specialized form of Roller Screw, featuring a planetary roller structure, but with an inverted roller rotation direction compared to traditional planetary roller screws (PRS).

Key Features:

- Inverted roller rotation optimizes force distribution, reduces friction, and improves transmission efficiency.
- Larger contact area compared to ball screws, resulting in lower unit pressure, higher load capacity, and extended lifespan.
- Ideal for high-load and high-precision applications.

Working Principle

The IPRS consists of three key components:



Key Motion Characteristics:

- As the screw shaft rotates, the planetary rollers orbit the screw shaft while self-rotating.
- Unlike traditional PRS, the rollers in IPRS rotate in the opposite direction.
- Due to inverted rotation, the force distribution is optimized between the screw thread and the nut, reducing friction and improving efficiency.

Roller vs. Ball

1. Higher Load Capacity

Roller screws use line contact, while ball screws use point contact.
The larger contact area distributes load more evenly, reducing unit pressure and allowing higher axial and impact loads.

2. Longer Lifespan

Due to larger contact areas and lower unit pressure, roller screws experience less material fatigue and last significantly longer than ball screws.

3. Higher Rigidity

Roller screws have higher stiffness than ball screws, ensuring minimal deformation under load, making them ideal for precision control applications.

4. Higher Positioning Accuracy

Preloading the nut in roller screws is easier and more precise, reducing backlash and improving system accuracy.

5. Higher Efficiency

The rolling contact in roller screws is more uniform, reducing local sliding friction and improving overall transmission efficiency.

Feature	Load Capacity	Precision	Lifespan	Application
Ball Screw	Medium	High	Moderate	CNC machines, 3D printing
PRS	High	Very High	Long	High-load industrial equipment
IPRS	Very High	Extreme	Longest	Robotics, high-precision machining, scientific instruments, medical equipment

Inverted vs. Standard

1. Lower Friction

- In standard PRS, the contact between rollers, screw shaft, and nut generates sliding friction, reducing efficiency.
- IPRS uses inverted roller rotation, minimizing sliding motion and bringing the contact points closer to pure rolling, reducing friction.

2. Higher Transmission Efficiency

Since frictional losses are lower, IPRS achieves higher linear motion output for the same power input.

3. Optimized Force Distribution

- Standard PRS generates additional lateral shear forces on the screw shaft and nut, increasing wear.
- IPRS' inverted rotation results in more uniform force distribution, improving system stability and durability.

4. Reduced Roller Interference

- In PRS, adjacent rollers rotate in the same direction, which can cause localized interference and increase friction.
- IPRS optimizes roller rotation, reducing interference and ensuring smoother motion.

5. More Compact Structure

- IPRS reduces external support structures and integrates drive components, making it ideal for space-constrained, high-end industrial applications.
- Although the forward design still has advantages in certain scenarios (such as long-stroke applications), it is slightly less compact.

Model Code Example: FZ - 5 - 1.8 - 52 - 40 - 1 - 8 - 0 - R - 1

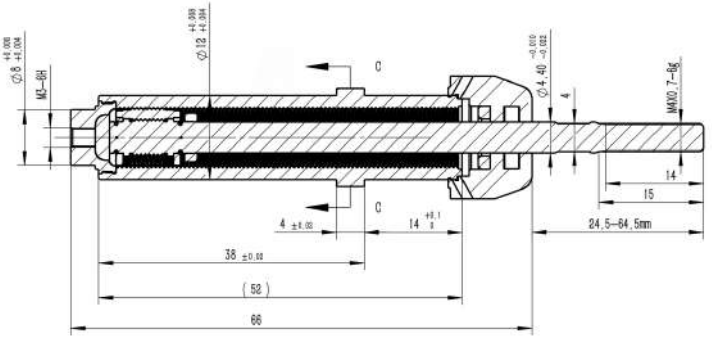
Screw Type	FZ: Inverted Type BZ: Standard Type * XH: Recirculating Type * ZC: Bearing Ring Type * CD: Differential Type *
Screw Diameter	5mm, 13.5mm, 15mm
Lead	1.8mm, 4.5mm, 5mm
Nut Length	52mm, 130mm, 156mm
Maximum Stroke	40mm, 85mm, 115mm
Nut Type	1: Single Nut 2: Preloaded Nut * 3: Double Nut 4: Internally Preloaded Nut *
Nut Design	1: Cylindrical Nut 6: Single-Sided Flange Nut 7: Middle-Sided Flange Nut 8: Non-Standard Nut
Sealing Options	0: Without Wiper Seal 1: With Wiper Seal
Thread Direction	R: Right-Hand Thread L: Left-Hand Thread
Thread Precision	1: P1 2: P2 3: P3

*Coming soon

Screw Diameter (mm)	Lead (mm)	Nut Length (mm)	Max Stroke (mm)	Rated Load (kN)	Max Load (kN)	Rated Speed (mm/s)	Max Speed (mm/s)	Precision Grade*
5	1.8	52	40	0.4	0.6	160	220	P2/P1
13.5	4.5	130	85	2	4	260	320	P2/P1
15	5	156	115	4	8	300	360	P2/P1

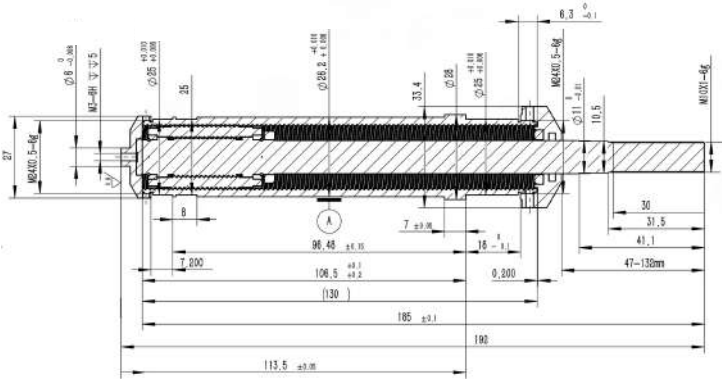
**Precision Grades (Conforming to ISO 3408-3, GB/T 17587.3):*
P1 - Ep: 6 μm; V2πp: 4 μm; V300p: 6 μm; Vup: 6 μm
P2 - Ep: 8 μm; V2πp: 5 μm; V300p: 8 μm; Vup: 8 μm

Units: mm



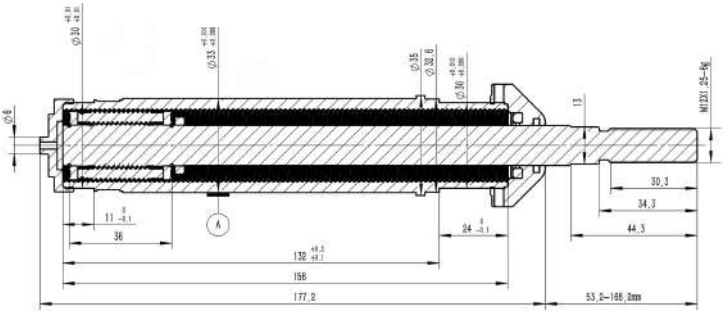
Model: 5*1.8

1. Lead: 1.8 mm
2. Rated Load: 0.4 kN
3. Max Load: 0.6 kN
4. Max Stroke: 40 mm
5. Rated Speed: 160 mm/s
6. Max Speed: 220 mm/s
7. Precision Grade: P2/P1



Model: 13.5*4.5

1. Lead: 4.5 mm
2. Rated Load: 2 kN
3. Max Load: 4 kN
4. Max Stroke: 85 mm
5. Rated Speed: 260 mm/s
6. Max Speed: 320 mm/s
7. Precision Grade: P2/P1



Model: 15*5

1. Lead: 5 mm
2. Rated Load: 4 kN
3. Max Load: 8 kN
4. Max Stroke: 115 mm
5. Rated Speed: 300 mm/s
6. Max Speed: 360 mm/s
7. Precision Grade: P2/P1

LEADER HARMONIOUS DRIVE SYSTEM CO., LTD.

ИННОДРАЙВ
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