



TIMKEN

PRECISION
DRIVES

for HUMANOID ROBOTICS

PRECISION MOTION FOR HUMAN-LIKE MOVEMENT

Humanoid robots require motion systems that deliver precision, torque density, stiffness, efficiency, and reliability. Timken Precision Drives brings together complementary motion technologies to help OEMs solve these demanding design challenges.

Arm Joints

Leg Joints

Waist Rotation

End Effectors

Vision Systems

Mobile Bases

Designed to Meet Critical Requirements

- ✓ Zero or low backlash
- ✓ High torque density
- ✓ High torsional stiffness
- ✓ Compact, lightweight packaging
- ✓ Long service life and reliability

Timken Precision Drives combines **strain wave, cycloidal, planetary, worm, micro gearing, and integrated actuator technologies** with **precision bearings, high-resolution encoders, and custom motion solutions** to help engineers optimize robotic motion throughout the entire system.



Arm Joints

Built on Timken Capabilities

- ✓ Global manufacturing and support
- ✓ Collaborative application engineering
- ✓ Advanced engineering and R&D resources
- ✓ Decades of proven quality systems
- ✓ Standard, modified, and custom solutions
- ✓ Multiple precision motion technologies



Full System Support



Knee Joints

Precision motion. Global engineering and manufacturing. Timken quality.



TIMKEN

PRECISION DRIVES

**SPINEA****TIMKEN
ENCODERS**

ONE PARTNER. MULTIPLE MOTION TECHNOLOGIES.

Distinct technologies engineered for different motion challenges.

Together, they create one of the industry's most comprehensive precision motion portfolios.



STRAIN WAVE GEARING

Compact, zero-backlash precision

- ✓ Zero backlash
- ✓ High reduction ratios
- ✓ Exceptional positioning accuracy



CYCLOIDAL GEARING

High torque and exceptional rigidity

- ✓ High torque capacity
- ✓ Exceptional torsional stiffness
- ✓ DriveSpin® integrated actuators



WORM GEARING

Reliable right-angle motion

- ✓ High torque capacity
- ✓ Wide range of reduction ratios
- ✓ Flexible mounting configurations



PLANETARY GEARING

Compact, efficient power transmission

- ✓ High power density
- ✓ Low backlash options
- ✓ Efficient torque transmission



SLEW BEARINGS & DRIVES

Integrated rotary positioning

- ✓ High-capacity rotary positioning
- ✓ Smooth rotary positioning
- ✓ Bearing and drive configurations



MICRO GEARING

Miniature precision motion

- ✓ Extremely small package sizes
- ✓ Precision gearheads
- ✓ Custom configurations available



MAGNETIC ENCODERS

High-resolution motion feedback

- ✓ High-resolution position sensing
- ✓ Accurate speed feedback
- ✓ Compact, integrated design



ENGINEERED SOLUTIONS

Integrated motion solutions

Standard, modified, and custom solutions backed by application engineering expertise.

Why Timken Precision Drives?

✓ Multiple Motion Technologies

✓ Proven Quality & Reliability

✓ System-Level Engineering

✓ Global Support

✓ Standard, Modified, & Custom Solutions

✓ **125+ Years of Innovation**

One Partner. Every Motion Challenge.