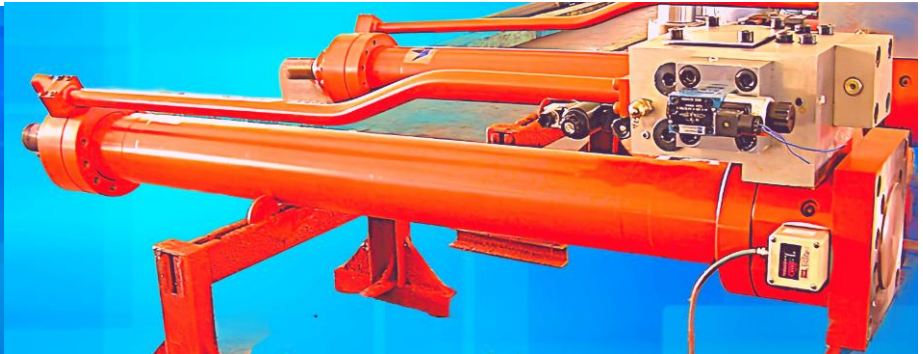
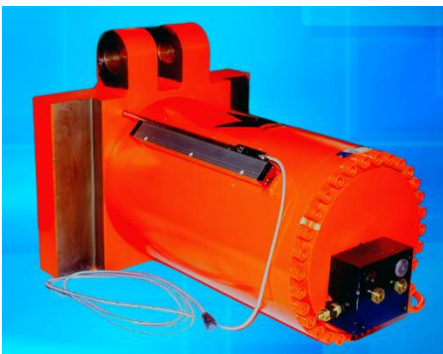
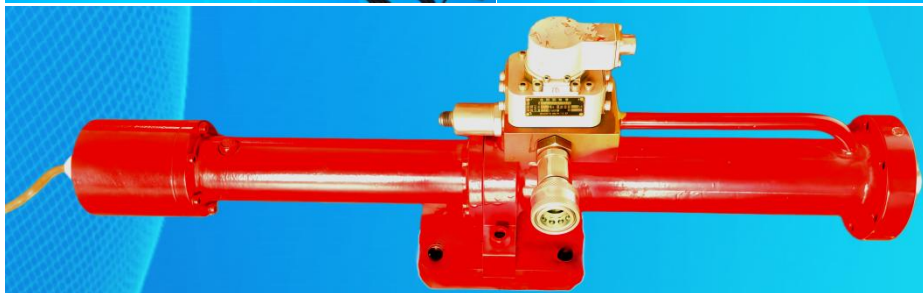
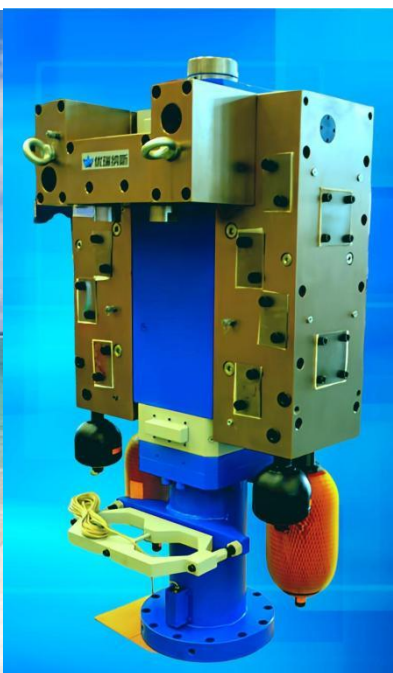
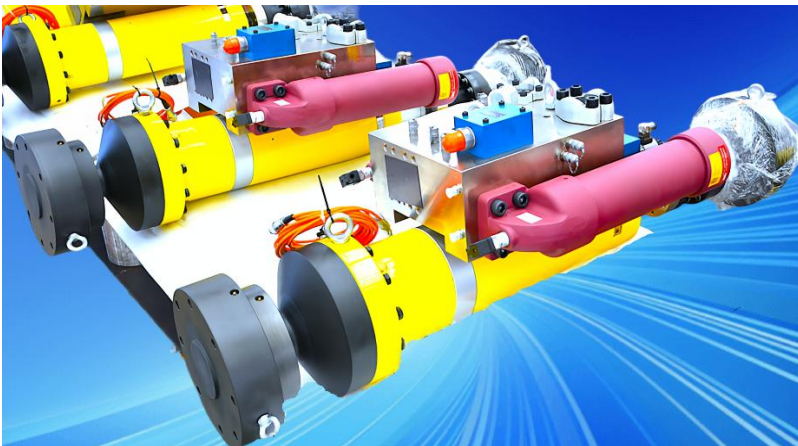
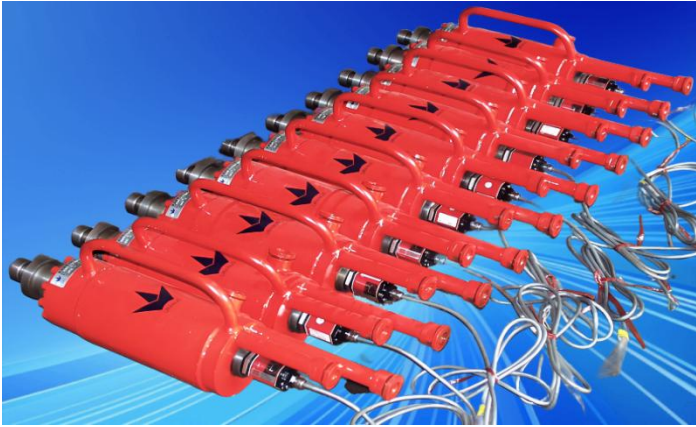


Photo of Servo Hydraulic Cylinder









Servo Hydraulic Cylinder

High Precision · High Dynamics · High Reliability**

A Servo Hydraulic Cylinder is a fully closed-loop controlled actuator integrating a **precision cylinder body**, **high-performance sensor suite**, **electro-hydraulic servo valve**, and **intelligent controller**.

It provides continuous, real-time, and highly accurate control of **position, velocity, and force**, serving as the unified core of **Sensing – Decision – Execution** in modern advanced equipment.

1. Multi-Dimensional Closed-Loop Control Architecture

1.1 Position & Velocity Closed-Loop Control

According to accuracy, speed, and environmental requirements, different displacement transducers can be configured:

- **Magnetostrictive Position Sensor**
The most widely used internal sensor. High reliability, strong anti-interference capability, and maintenance-free.
- **Optical Grating Scale (External)**
Precision up to $\pm 1 \mu\text{m}$ with extremely high response frequency. Sensitive to oil, dust, vibration; ideal for laboratory or ultra-high-precision applications.
- **Magnetic Scale**
High cost-performance ratio, easy installation, and better contamination resistance than optical scales.
- **LVDT (Linear Variable Differential Transformer)**
Infinite resolution, excellent zero-point stability, high accuracy, high robustness, suitable for short-stroke high-precision measurement.
- **Magnetosensitive displacement**

- **sensor:** It is rugged and durable, suitable for harsh working conditions such as high temperature, dust, oil contamination and water vapor; it has extremely strong resistance to impact and vibration.
-

1.2 Force & Pressure Closed-Loop Control

- **Pressure Sensors (Chamber Pressure Monitoring)**
Installed in the rod and/or cap chamber. Force is calculated by pressure \times piston area. Widely used in AGC, press-fit, and force-regulated processes.
 - **Load Cells (Rod-End Force Sensors)**
Direct measurement of push/pull force with the highest accuracy. Ideal for material testing and fatigue loading.
-

1.3 Multi-Mode & Hybrid Control

Advanced servo systems support seamless switching or blending of multiple control modes within one operation cycle:

- **Position \rightarrow Force Switching Control**
Example: robotic interference/press-fit assembly
Fast approach under position mode \rightarrow automatic transition to force mode upon contact \rightarrow constant-force insertion to avoid jamming or damage.
 - **Hybrid Force–Position Control**
Example: AGC cylinders in rolling mills
Both roll gap (position) and rolling force must be precisely controlled to achieve accurate thickness regulation.
-

2. Technical Advantages

- **Ultimate Precision**
Micron-level positioning, stable velocity control, and highly accurate force regulation.
 - **High Dynamic Response**
Millisecond-level response time to meet high-speed, high-acceleration industrial applications.
 - **High Power Density**
Inherits the fundamental advantages of hydraulic transmission, easily delivering tens to hundreds of tons of output force.
 - **Energy Efficiency**
When combined with a servo pump unit, energy consumption can be significantly reduced compared with conventional valve-controlled systems.
 - **Flexibility & Intelligence**
Motion profiles and control modes can be reconfigured through software—one actuator suitable for multiple technological processes.
Ideal for **flexible manufacturing, smart factories, and digital twin systems**.
-

3. Application Fields: Empowering Advanced Equipment

Metallurgical Equipment

- Continuous casting and rolling lines
- Mold oscillator
- AGC (Automatic Gauge Control) cylinders
- Electrodes lifting for EAF
- Servo alignment, centering, and precision positioning

Intelligent Press-Fit & Assembly

- Interference assembly of engines, bearings, gears
- Full monitoring of force–displacement curves to ensure assembly quality

Material & Structural Testing

- Fatigue testing machines
- Universal testing machines
- Complex load spectrum simulation

Metal Forming

- Precision stamping, bending, embossing
- Closed-loop control of forming force and depth

Simulation & Motion Platforms

- Flight simulators
- Earthquake simulation platforms
- Multi-DOF dynamic actuators

Heavy-Duty Robotics

- High-precision joints for large collaborative robots
- High-force operations with stable fine control

Aerospace Ground Testing

- Landing gear extension/retraction simulation
- Flight control surface load simulation

4. URANUS – Global Expert in Custom Servo Hydraulic Cylinders

Since its establishment, **Tianjin URANUS Hydraulic Machinery Co., Ltd.** has successfully designed, engineered, and manufactured **hundreds of customized servo hydraulic cylinder models and over ten thousand units** for customers across metallurgy, aerospace, testing equipment, robotics, automotive manufacturing, and many other industries.

URANUS offers:

- Strong non-standard engineering & customization capability
- Advanced precision machining centers and large-scale processing equipment
- We can produce piston rods with sintered surface materials such as tungsten carbide (WC), silicon carbide (SiC), aluminum oxide (Al₂O₃), silicon nitride (Si₃N₄), and zirconium oxide (ZrO₂), as well as alloy steel and stainless steel, to meet various special operating conditions.
- Comprehensive servo control and testing platforms
- Full quality-traceability and rigorous inspection standards

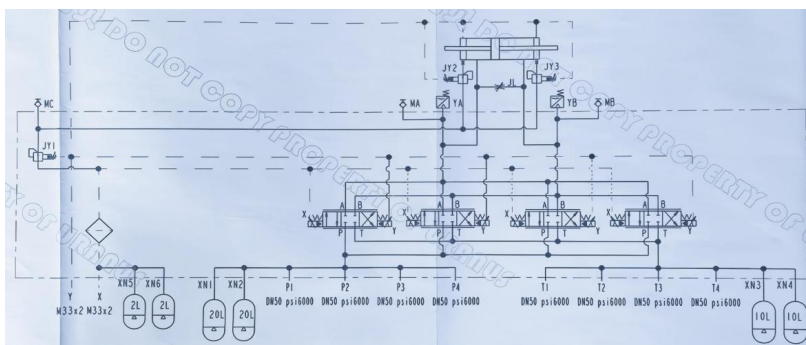
We welcome global partners to cooperate on **customized servo cylinders, high-precision hydraulic actuators, and OEM/ODM electro-hydraulic servo systems.**

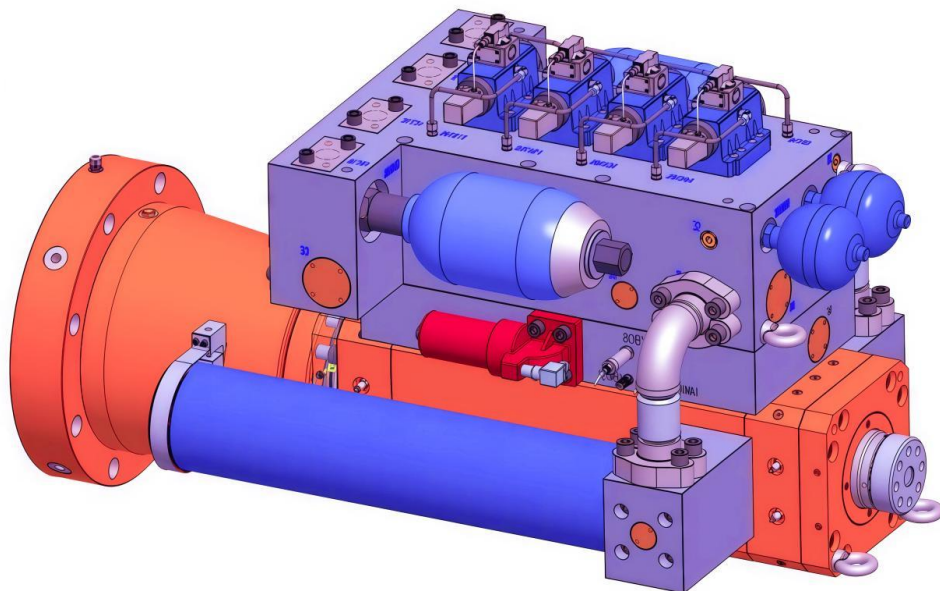
Product Examples

1.Name: Servo Vibration Hydraulic Cylinder; Model: USYJ220/160-500LH

Bore: 220 mm; Rod: 160 mm; Stroke: 500 mm; Cushion stroke: 50 mm

Working pressure: 28 MPa; Test pressure: 35 MPa; Starting pressure ≤ 0.2 MPa

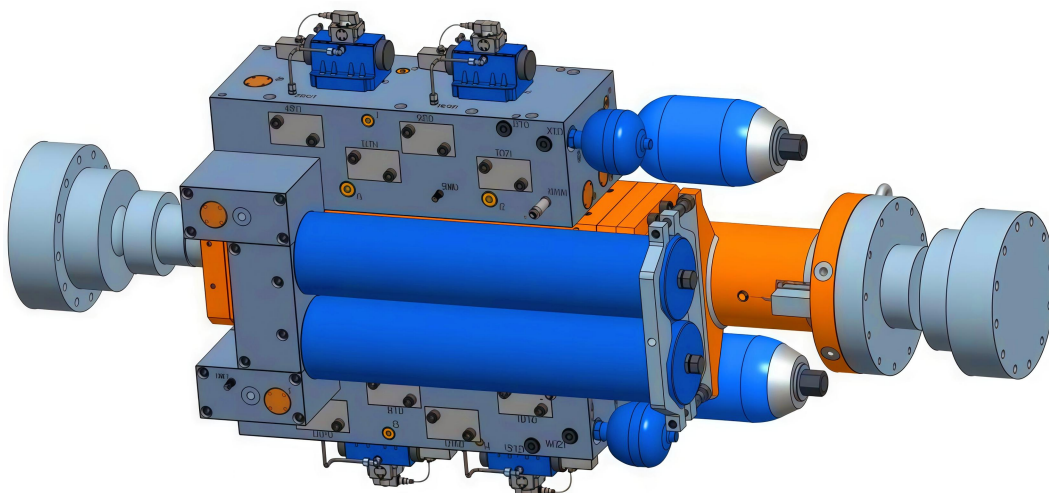
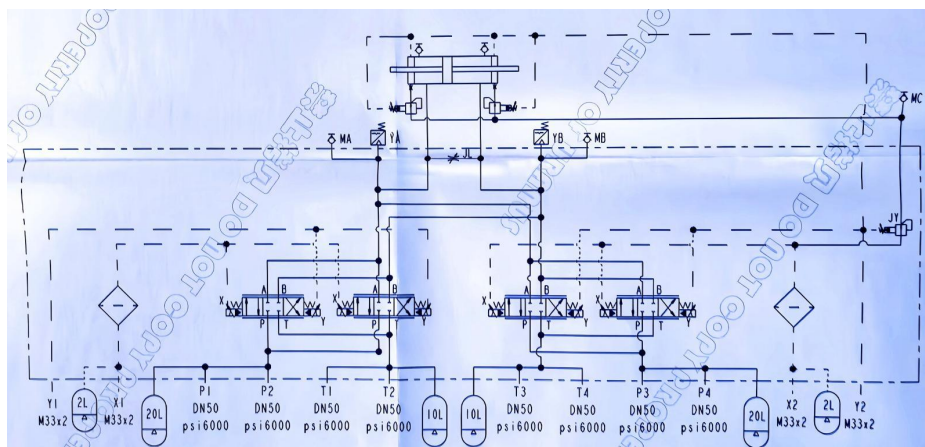




2.Name: Servo Vibration Hydraulic Cylinder; Model: USYR220/160-500LH

Bore: 220 mm; Rod: 160 mm; Stroke: 500 mm; Cushion stroke: 50 mm

Working pressure: 28 MPa; Test pressure: 35 MPa; Starting pressure ≤ 0.2 MPa



3.Name: Embedded Centering Triple-Cylinder Composite Servo Hydraulic Actuator;

Model: USYQ225/195-32+140/50-32HA+FK

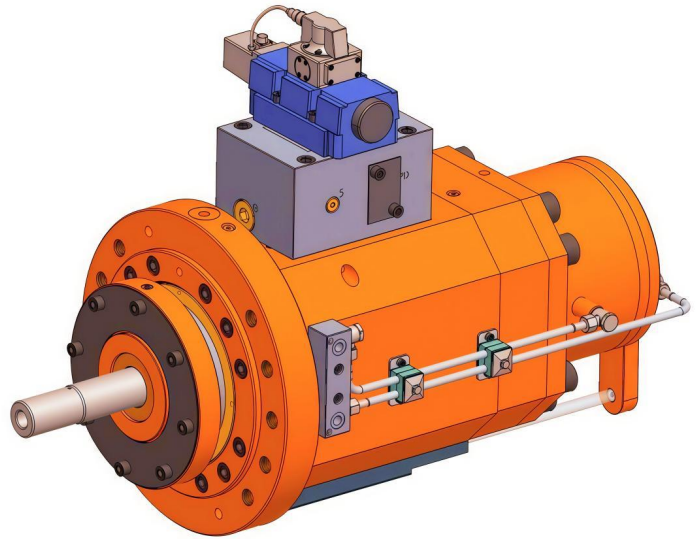
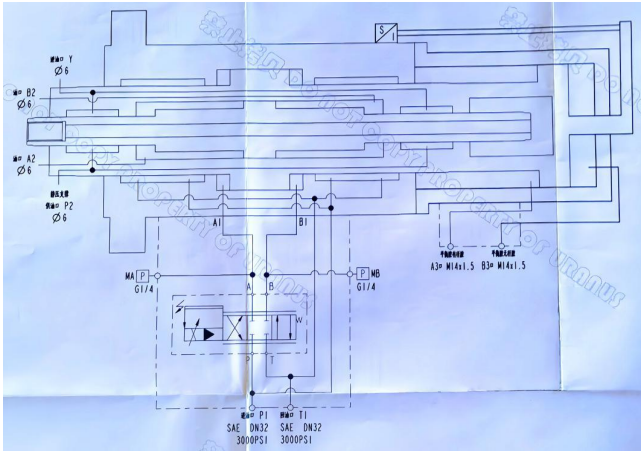
Vibration cylinder: Bore 225 mm; Rod 195 mm; Stroke ± 16 mm; Cushion stroke 50 mm

Working pressure 21 MPa; Test pressure 32 MPa; Vibration frequency 200 Hz

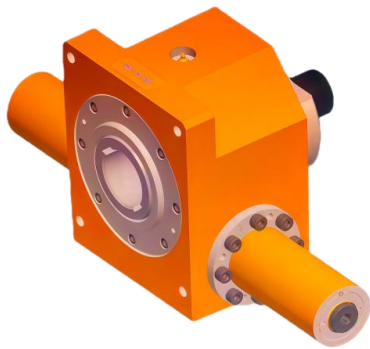
Embedded centering cylinder: Bore 140 mm; Rod 50 mm; Stroke ± 16 mm; Cushion stroke 50 mm

Working pressure 21 MPa; Test pressure 32 MPa

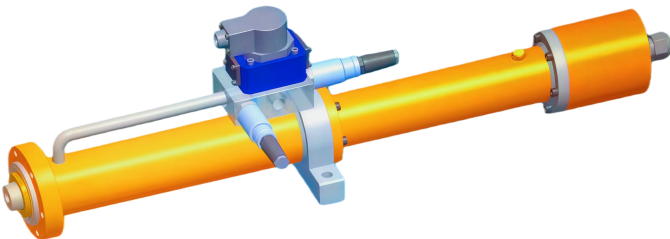
Balance cylinder: Piston diameter 220 mm; Rod-side area 8149 mm^2 ; Annular area 38013 mm^2



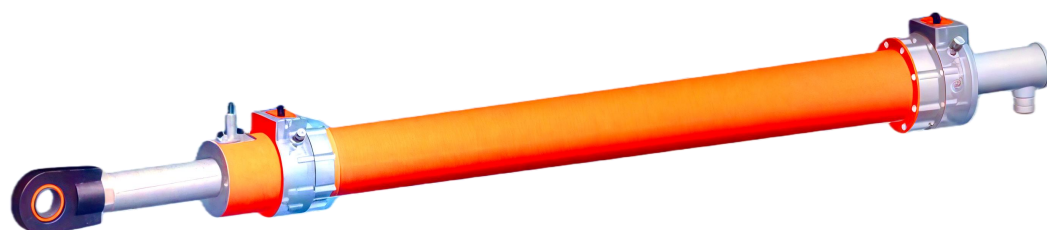
- 4.Name: Rack-and-Pinion Swing Servo Hydraulic Cylinder; Model: UBFKD40-90°
 Bore: 40 mm; Swing angle 90°; Vibration frequency 50 Hz; Amplitude $\pm 3^\circ$;
 External angular displacement sensor
 Working pressure: 14 MPa; Test pressure: 21 MPa; Rated-pressure output torque 770 N·m



- 5.Name: Servo Hydraulic Cylinder; Model: UGDT40/28-200
 Bore: 40 mm; Rod: 28 mm; Stroke ± 100 mm; Vibration frequency 200 Hz; Amplitude $\pm 1-10$ mm
 Working pressure: 16MPa; Test pressure: 24 MPa;
 Built-in displacement sensor, Servo valve installed



- 6.Name: High-Temperature Servo Hydraulic Cylinder; Model: UYS100/70-1100
 Bore: 100 mm; Rod: 70 mm; Stroke 1100 mm
 Built-in displacement sensor; Magnetostrictive displacement sensor on piston rod end
 Working pressure: 16 MPa; Test pressure: 24 MPa



7.Name: Material Fatigue Testing Machine Servo Hydraulic Cylinder; Model: UYSTD800+500/360-620
Bore: Large cylinder 800 mm; Small cylinder 500 mm; Rod 360 mm; Stroke ± 305 mm
Working pressure: 23 MPa; Test pressure: 37.5 MPa; Starting pressure ≤ 0.1 MPa
Built-in displacement sensor; Vibration frequency 1–10 Hz

