Hydraulic Cylinders and Cylinder Systems for Mobile Hydraulics
HYDROSAAR, part of the global HYDAC group, develops and manufactures a broad range of hydraulic cylinders and cylinder systems for mobile applications.

Drawing on our knowledge base, we develop the most appropriate hydraulic cylinder solution for your application. For example, innovative position sensor technology can be installed, or the cylinder piston rods can be supplied with special surface coatings. Our cylinder engineering includes design and calculations performed with cutting-edge 3D CAD and FE tools.

Each cylinder is optimised individually to fulfil the customer’s specific requirements.

Hydrosaar has been engaged in mobile hydraulics for more than a decade, supplying global manufacturers of cranes, construction machinery, agricultural machines and special-purpose vehicles.

### Engineering expertise

#### Development / design / strength calculation / testing

To fulfil the stringent requirements required of the final product, we employ the latest technology:
- 3D design
- Finite element calculation for optimised design
- Structural analysis
- Non-linear stability calculations
- Structural durability analysis

#### Surface treatment processes

- Electroplating
- High-speed flame spraying and plasma spraying (metallic and ceramic coatings)
- Induction melting of compound layers
- Laser-welded and plasma-welded layers
- Customised paint finishes (corrosivity categories up to C5-M)

#### Lightweight

- Weight-optimisation
- Use of high-strength steel materials
- Use of light metal and fibre-composite materials

#### Functional safety – integrated sensors

The technical requirements with regard to functional safety are based on the standards IEC 61508 and EN 13849.

HYDAC provides:
- Controllers certified to:
  - IEC 61508, SIL 2 (3)
  - EN 13849, Pl d (c)
- Other components for applications with increased functional safety
- Sensors
- Valves
- Support provided throughout, from risk analysis to certified machine function

### Cylinder solutions for all customer requirement

#### At a glance

#### Telescopic systems
- Single-cylinder telescopic systems
- Securing locking system
- Telescopic guide system
- Controller

#### Boom, outrigger and special cylinders
- Weight-optimised, space-saving design
- Integrated valve technology and sensors

#### Mining and excavator cylinders
- For high dynamic loads
- Structurally durable design

#### Suspension and accumulator cylinders
- Cylinder-integrated accumulators
- Combined cylinder/accumulator solution
- Self-supporting suspension struts
Cylinders for mobile technology.

Production expertise

Manufacturing techniques
Cutting-edge machine equipment that can be used for all kinds of machining work:
- Deep-hole boring
- Turning (CNC, NC and conventional)
- Honing
- Milling
- Grinding
- Welding

Assembly and test bench
- Cleaning and cylinder-assembly equipment
- PLC-controlled hydraulic test benches for test pressures up to 1200 bar
- Function and fatigue test benches

Paint application
Cutting-edge paint technology for protection against wear and corrosion.
- Sandblasting
- Cleaning
- Painting
- Drying

Quality assurance
Top quality is guaranteed by constantly monitoring all processes (from design to assembly), inspecting individual parts as well as finished products, monitoring of measuring equipment and contamination monitoring of the hydraulic oils used.
Consistent quality is the result of very close collaborative relationships with customers and suppliers.
Telescopic systems for mobile cranes

Telescopic systems

In modern mobile cranes, the main boom is extended and retracted by a single-cylinder telescopic system.

The systems are made up of the following main components:
- Double-acting hydraulic cylinder in lightweight design
- Guide frame
- Securing locking unit (SLU)
- Hydraulic accumulator unit including valve control
- Internal oil feed
- Telescopic boom and position detection
- Position sensor system (optional)

In addition to customised systems, a system with the in-house developed SLU is available.

Operating pressures: up to 350 bar
Stroke: up to 12,000 mm

Advantages and features:
- Complete hydraulic/mechanical/electric system from a single source
- Flexible cylinder sizing
- Cylinder and SLU produced to customer specifications or our own design
- Minimal cylinder weight

Control and display

- Telescopic guide system adapted to suit specific cranes
- Reliable, flexible HY-TTC 90 controller, certified to ISO 13849
- Universal mobile display with integrated HY-eVision controller
- Customised control and visualisation software based on standard modules

Advantages and features:
- Complete telescopic system package including control
- Specific interface programming
- Customised visualisation
- On-site commissioning support
Boom, outrigger and special cylinders

Boom cylinder

The boom cylinder alters the angle of main booms and jib booms on cranes and construction machinery. As the weight is generally restricted by permissible axle loads, boom cylinders are designed to be lightweight. High-strength materials are used and modern calculation methods are applied to optimise the design of the cylinder components. The piston rods are normally manufactured from hollow tubes. Seal and guide systems ensure the cylinder moves evenly with little friction and the load is held leak-free over the entire operating-pressure range.

Counterbalance valves or load-holding valves can be integrated into the cylinder or into blocks installed directly on the cylinder.

Hydrosaar manufactures boom cylinders with piston diameters of up to 600 mm and strokes of up to 9000 mm.

Benefits and special features:
- Lightweight design
- High-strength materials used
- Special seals prevent any leakage
- Integration of valve technology
- Structurally durable design

Special cylinders for cranes

Hydraulic cylinders are used for various special purposes in cranes, for example to lift or move counterweights, as mast fail-back prevention cylinders or bolting cylinders, to extend or raise masts or to tension crawler tracks. The cylinders are developed and produced in line with customer requirements, as appropriate for the particular task. Hydraulic valves, sensors and also integral tanks are frequently integrated directly into the cylinder.

Benefits and special features:
- Weight-optimised design
- High-strength materials used
- Integrated valve technology
- Integrated anti-rotation piston rod

Counterweight cylinder with integrated valve technology

Cylinders for vehicle outriggers

Mobile cranes and special-purpose vehicles that support and move loads have outriggers installed on the vehicle frame. Several cylinders are normally used for extension, pivoting and support. Like the boom cylinder, the cylinders are lightweight and meet strict requirements regarding leak-tightness. Hydrosaar provides solutions with integrated sensors, particularly position and pressure sensors, to satisfy the most stringent requirements for comfort and safety (in line with EN 13849).

Benefits and special features:
- Outrigger cylinder for static pressures of up to 600 bar with integrated valve technology
- Extension cylinder, single- and multi-stage
- Complete cylinder systems for special-purpose vehicles and crane outriggers
- Corrosion-resistant piston-rod coatings

Outrigger cylinder for mobile crane with special mounting

Steering and suspension cylinders

In the chassis of mobile cranes and construction machinery, hydraulic cylinders are used in steering and suspension functions. Hydrosaar suspension cylinders and steering cylinders boast low-friction guide & seal systems and coatings tailored to suit the operating conditions. Integrated position sensor systems from the HYDAC HLT series and HYDAC pressure sensors are available for the cylinders. The suspension cylinders can be supplied with accumulators integrated into the cylinder as well as external accumulators.

In addition to offering cylinders as components, HYDAC also manufactures complete suspension and steering systems.

Benefits and special features:
- Integration of accumulator
- Low-friction design
- Integrated end position damping
- Integrated position sensor technology

Steering cylinder with integrated position sensors
**Construction machinery and mining**

**Excavator cylinders**

Cylinders used in excavators, particularly large excavators and mining excavators, have to demonstrate a high degree of robustness and availability. Hydrosaar supplies boom, stick, bucket, jaw and track-tensioning cylinders. The cylinders are designed for structural stability even at high cycle rates. A long service life is guaranteed, thanks to special piston rod coatings, combined with seal and guide systems that are designed specially for the particular application.

**Benefits and special features:**
- Robust design for dynamic application
- Structurally durable design for high cycle rates
- Integrated position sensor technology

**Rotary joints**

For excavators, cranes and other construction machinery, Hydrosaar offers customised rotary joints. The rotary joints can be configured in terms of the number of ports, port size and port design. To ensure long service life, the rotation pistons are supplied with a special coating. If desired, the hydraulic ports can be supplemented with compressed-air ports and an electrical feed.

**Benefits and special features:**
- Up to 16 ports
- Up to 420 bar
- Piston coating for maximum service life
- Integration of compressed-air and electrical feed

**Road construction machinery**

Hydrosaar supplies cylinders for road construction machinery which meets the strictest standards for durability and functional efficiency. The cylinders are tailored to suit the construction machine to make the best use of the available space. If desired, the cylinders can be fitted with integrated valves, position sensors and pressure sensors, and also internal oil feed.

**Benefits and special features:**
- Vibration-resistant design
- Special sealing systems
- Integration of position sensor technology
- Integration of valve technology

**Mobile mining machines**

Hydraulic cylinders for mobile machines used in surface mining and tunnelling are put under great strain as a result of contamination and temperature. To withstand such loads, the Hydrosaar cylinders designed for these applications are extremely robust. Appropriate materials are used along with special piston rod coatings, wipers and seal and guide systems to guarantee a long service life.

**Benefits and special features:**
- Robust design
- Special coatings
- Special sealing systems
- Integration of position sensor technology
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Suspension and accumulator cylinders

Suspension-damper cylinders

Cylinders provide suspension and damping during vehicle travel in many mobile machines, from large mining vehicles to agricultural machinery. Hydromax supplies hydraulic cylinders with integrated gas accumulators, developed specifically to take account of the customer’s requirements in respect of suspension characteristics, forces and installation space.

Benefits and special features:
- Cylinders with integrated or external hydraulic accumulators
- Open and closed hydraulic systems
- Adjustable damping characteristics
- Designed according to Pressure Equipment Directive
- Self-supporting design possible
- Piston-rod coating tailored to suit operating conditions
- Low-temperature design (to -40 °C)

Active heave compensation

Energy consumption is of increasing importance, particularly in the machinery used in transshipment operations. Hydraulic systems for energy recovery and active heave compensation play a major role in reducing consumption. HYDAC supplies machine builders with system solutions which include cylinders, accumulators and valve equipment as primary components. In addition to cylinder/accumulator combinations, HYDAC provides cylinder-integrated solutions.

Real-world examples

Action/strategies:
- Energy recovery
- Downsizing
- Boost operation

Benefits:
- Reduced fuel consumption
- Productivity increase
- Noise control

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