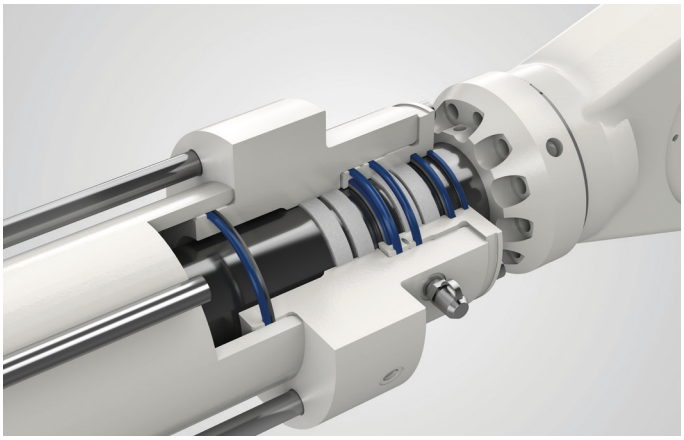
Short Description

Pitch cylinders for wind turbines



Part of the Liebherr's hydraulic cyllinder portfolio are pitch cylinders for the blade adjustment of wind turbines. Depending on the application, these hydraulic cylinders are available both as tie-rod and as screwed designs to achieve maximum efficiency in continuous operation.

The sealing systems, which are designed for vibration and high-frequency operation with short strokes, operate with low friction and no leakage. In addition, the solutions guarantee smooth and quite running with a minimum of wear.

Pitch cylinders by Liebherr are suitable for both onshore and offshore applications. A wide range of piston rod coatings and cylinder paintings is available for an optimised corrosion protection. State-of-the-art assembly and painting facilities also guarantee flexible quantities with a high process stability at the same time.

Features

- Proven piston rod coatings and corrosion protection for continental and maritime environment
- Designed for a lifetime of 20 years and more
- Low-friction sealing systems and surfaces
- Various sensor technologies includable
- Acceptance by certification companies as DNV-Type Approval possible

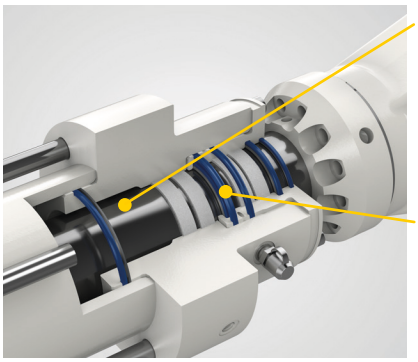
LIEBHERR

Features and Technical Data
Pitch cylinders for wind turbines

Design competences for pitch cylinders in wind industry

Maximum lifetime as well as less and easy maintenance
- FEM-calculations as a basis for a long lifetime and design efficiency
- Special sealing bushing for replacement without special tools

Various technical features
- Limit and proximity switch, cushioning systems
- Position transducers
- Specific interfaces and connections



Piston rod coatings
- Chromium, nickel-chromium, HVOF and further coatings
- Corrosion protection for continental and maritime environment

Sealing systems
- Friction optimised solutions adapted to applications with tandem-sealing or mechanical gap sealing

Comparison of concepts

	Tie rod cylinder	Screwed cylinder
Characteristics	Cylinder components hold together by tie-rods	Cylinder components with screwed or welded connections
	Integrated special sealing bushing	Interface to customer system by trunnions
	Interface to customer system by plain bearings on cylinder bottom	Inside chroming of cylinder tube
	Inside chroming of cylinder tube	
Advantages	Easy dis- and reassembly of hydraulic cylinder without special tool in turbine	Long-term proven design for continuous usage in turbines
	Simple and fast sealing replacement due to the special sealing bushing	Robust design ensures safety at overload cases
	State-of-the-art and FE-optimised design for stressed parts to achieve maximum lifetime and safety	

Components verification by FEM-analysis and testings

State-of-the-art static and dynamic calculations and simulation methods are used during development. These provide information about the material behaviour and the vibration resistance whereby an optimum choice of material and sealing systems is permitted. Liebherr verifies the lifetime of the hydraulic cylinders of several decades due to highly cyclical endurance tests on special pulse test benches under realistic operating conditions.

Worldwide availability

The design concepts of the pitch cylinders are engineered by the German components site in Kirchdorf an der Iller. Due to the flexible design principles, these hydraulic cylinders can be manufactured worldwide. Liebherr also produces pitch cylinders based on the German developments at its Chinese location in Dalian for the local market. The use of an international purchasing structure and local proximity to the customer enables the highest efficiency and availability.

HyZ-PC-SD-12.19-en
Subject of modifications.

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