

High quality, reliable and compact

Gearboxes and Rope Winches by Liebherr



LIEBHERR

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Liebherr is one of the world's leading manufacturers of gearboxes and rope winches for construction machinery, maritime applications and other sophisticated fields. Thereby we have more than 60 years of experience in the development, design and manufacture of these products. Since then, the factories in Biberach an der Riss, Germany and Dalian, China, have been producing more than 700 different models yearly for worldwide use in the most diverse applications both within and outside the Liebherr Group.

Advantages

Customers particularly value the large product range, the application-specific design and the high quality of the gearboxes and rope winches by Liebherr. The gearboxes display their full potential when used in conjunction with

Liebherr's large diameter bearings as well as with electric or hydraulic motors, incorporated into complete hydraulic or electric systems or subsystems, which Liebherr as a system supplier develops in line with requirements.

Engineering expertise

Competent design and calculation for a long service life

Wide product range

From series model to custom solution

Quality and reliability

Complete quality management assures the high standard

Engineering expertise

Liebherr's planetary gearboxes and rope winches are all designed for specific uses. Experienced design engineers work out the right gearbox solution for every requirement. The gearboxes are designed using the most modern development and calculation methods, and the components and overall systems are continually developed further.



Competent design and calculation for a long service life

High performance density

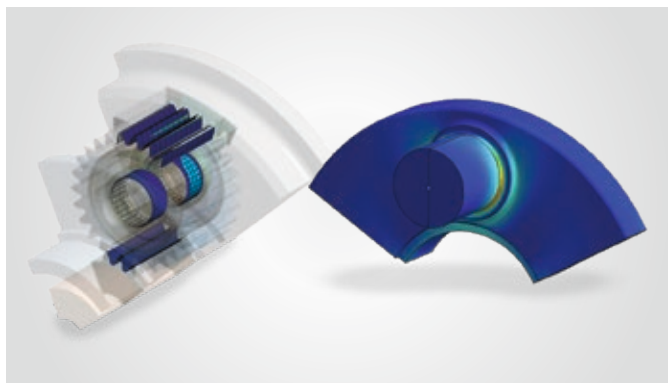
The integral design of Liebherr's gearboxes allows for compact installation spaces and the best weight to performance ratio. The sun and planetary wheels are optimised for a low circumferential backlash. Well thought-out construction principles ensure an even load distribution of the individual stages and therefore a high performance density. Liebherr's gearboxes and rope winches are characterised by their optimised design that uses few components, with a minimum number of seal surfaces and a high level of functionality.

Components optimized through FEM

During the gear configuration process, the design engineers are supported, when required, by simulation and calculation specialists, who use the Finite Element Method and further special programmes to determine, for example, the load bearing behaviour and the safety of the gearing. In addition, extensive gearbox calculations are carried out and the dynamic behaviour of the gearbox in its entirety is investigated. Whole systems are also intensively analysed and assessed as required.

Calculations using the Finite Element Method

To optimise the gearboxes the tension course of the teeth of the planetary wheels will be determined, for example.



Comprehensive testing and laboratory equipment

For the most exact interpretation of results, the calculation engineers at Liebherr rely on load carrying capacity measurements from their own high frequency pulsator and FZG tension tests. Factors such as operational behaviour or noise levels are optimised through in-house load testing.

Load bearing tests under realistic conditions

During testing, the life-cycle of the gearbox is simulated under realistic conditions.



Quality and reliability

The name Liebherr stands for quality – the same naturally applies for gearboxes and rope winches. All the individual components are made of high grade materials and are subject to the highest demands of quality. To guarantee high standards, all business processes are focussed on quality. This starts with the selection of the suppliers and is maintained right through to the after-sales service.



Complete quality management assures the high standard

High quality gearbox design

All torque-conveying gear parts are made from premium hardened and tempered steel, which is certified to Liebherr's factory standard. The specification standard, which exceeds current industry standards, is based on Liebherr's decades-long experience in the most varied areas of application and comprises a material certificate (Inspection certificate 3.1) according to DIN EN 10204. Certified suppliers are also subject to Liebherr's stipulated high quality standards.

High quality through manufacturing expertise

Liebherr attaches great importance to a high standard of manufacturing with a simultaneous concentration on the core processes. The resulting linked production and process competencies are the basis for first class products. Production plants at the cutting edge of technology allow not only variable lot sizes but also guarantee a consistently high quality. Fully automatic gear production lines, the most modern induction hardening machines and CNC-controlled processing centres with integrated measurement technology are employed in the manufacture of gear parts.

Long service life

All production and assembly processes are documented in a computer-aided operating data recording system. This simultaneously serves as a central quality management system that captures production and assembly measurements. This allows comprehensive control, monitoring and traceability. A wide range of evaluations not only quickly detects and corrects process deviations but also contributes to the continuous improvement of processes. Before delivery, the gearboxes undergo leakage and functionality tests and if required, a test run.

Certified quality management

The quality management of Liebherr-Components Biberach GmbH is certified according to DIN EN ISO 9001:2008. The requirements of the different classification bodies such as Det Norske Veritas (DNV), Germanischer Lloyd (GL), American Bureau of Shipping (ABS), Lloyds Register of Shipping (LRS) and others are complied with as well. E.g. the "inspection certificate 3.2" according to DIN EN 10204 will be provided.

Modern measuring equipment

Pinions are not only measured, they are also checked for grinding burns.



Consistent quality in material

Raw materials are investigated for chemical composition and characteristics.



Tests and certifications

Corresponding to the regulations of the common classification bodies respective certificates are provided.



Wide product range

Gearboxes and rope winches by Liebherr are available in a large variety of shapes and sizes. Each year, Liebherr manufactures thousands and thousands of gearboxes and rope winches. They are tried and tested day in and day out in a wide range of applications under the harshest environmental conditions.



From series model to custom solution

Variety of sizes and designs

Liebherr offers perfectly dimensioned gearbox versions up to large-scale gearboxes. The scope of performance also comprises individual customer developments. The product range extends from slewing and swivelling drives, wheel and travel drives as well as compact and heavy duty winches to drilling drives, cyclone drives, mixer drives and other special solutions. Gearboxes are available in a large range of sizes and transmit drive torques of 2,000 to 2,500,000 Nm with gears up to module 50. Standard gearboxes are designed as two- to four-stage planetary gears and can be extended with spur gear drives or bevel gears. Depending on gearbox design and number of planetary stages, a torque ratio of the driving electric or hydraulic motors is possible between $i=15$ and $i=1,500$. The lightest slewing drive, DAT 200, weighs barely 75 kg, the heaviest rope winch to date, the ZSW 2400, weighs more than 175 tonnes.

Wide range of applications

The multitude of designs results from the wide range of applications of the gearboxes. They can be used in lightweight constructions, such as mobile cranes, and also in heavy mining excavators. Even if all the drives are used for the transmission of rotational movements, these movements can, as with compact winches, lift and lower loads in construction or ship cranes, swivel the upper carriage of mobile excavators or mobile cranes, or even drive the chain on a crawler vehicle. The „stirring action“ in stationary mixing plants, the turning of the Kelly rail in drilling rigs or the wheel hub in mining trucks is effected using Liebherr's planetary gearboxes.

Variety of sizes

The largest and smallest compact winches, slewing drives and travel drives available at present can be seen to scale in the picture.



Efficient production line

State-of-the-art manufacturing plants enable a cost-effective production of a whole range of different sizes and shapes.



Slewing and swivelling drives

Slewing and swivelling drives are coaxial planetary gearboxes with two to four planetary stages, which drive large diameter bearings or geared rings using an out-put pinion. The optimum backlash between the pinion of the slewing drive and a large diameter bearing is easily adjusted through the gearboxes' optional eccentricity.



High power density under high dynamic loads

Versatile slewing drives

The compact slewing drives are distinguished by their high power density and are available as a series product or individual customer solution. Combined with our large diameter bearings, an optimally engineered system is created that impresses with minimum backlash.

Slewing drives are employed in the slewing mechanisms of construction and mobile cranes as well as ship and offshore cranes. They are also used in rotor blade and yaw adjustment in wind turbines.

They can be driven either electrically or hydraulically and are available in higher transmission ratios than swivelling drives. If there is limited installation space, a bevel gear can serve as an entry stage for a slewing drive. The installation position is variable, and can be vertical, horizontal or upside down. For long operating times, as it is the case with drives used in gear ring winches, external oil coolers can be provided.

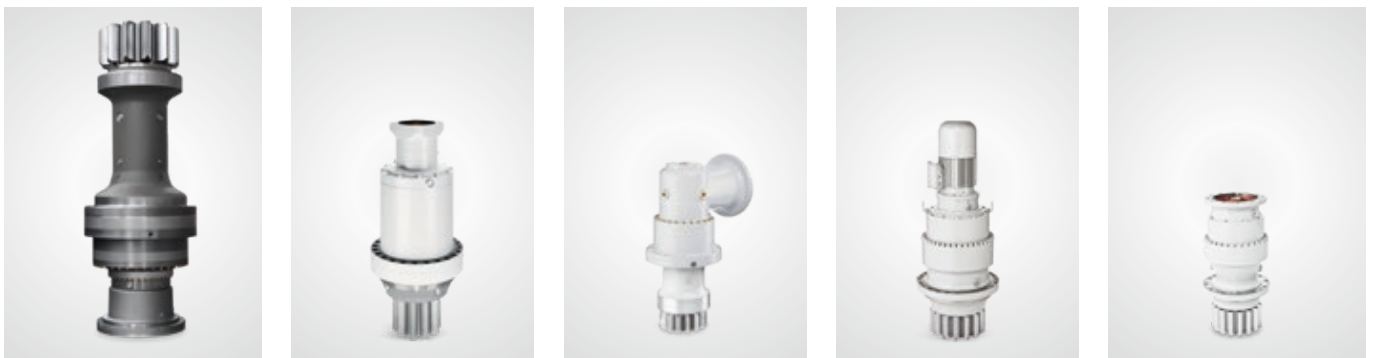
Strong swivelling drives

Swivelling drives are used in swivelling mechanisms in excavators of all types and feature a very robust design due to the highly dynamic loads. As a rule, most of the two-stage gearboxes are driven hydraulically.

Customised adjustment

Both swivelling and slewing drives are made with short or long output shafts, depending on the installation situation. The single-piece, case hardened and ground output shaft withstands the highest loads and can be carried out with profile-corrected teeth if required.

Slewing drives



Swivelling drives



Travel drives

Liebherr travel drive systems impress with their high power density and compact dimensions. Various attachment options, such as an integrated tumbler enable perfect integration in a whole range of different applications.



Service friendly and compact for a whole range of different deployment situations

High power density

Travel drives are multi-stage planetary gearboxes, which are predominantly driven hydraulically with constant or variable motors. Commonly with larger travel drives, several hydraulic motors are used, whose drive performance is added up via a spur wheel gear as entry stage. The torque is usually transmitted by the internal gear wheel to a tumbler, which can be supplied as an option.

Versatile means of deployment

There are basically two different design versions: very compact coaxial units, ideal for excavators, and travel drives with input spur wheel gears, which allow the equipment a greater ground clearance – a common requirement in crawler tractors or crawler loaders.

Sturdy and maintenance friendly

Liebherr's travel drives are custom-made upon request and carried out according to requirements. They have proven their worth in the toughest environments and under harshest operating conditions thanks to their robust design and optimised sealing systems, e.g. double mechanical seal, and are especially noteworthy for their high quality and ease of maintenance. Liebherr's travel drives can be successfully employed in a wide variety of crawler and chain vehicles.



Travel drive with spur wheel gear stage for a crawler vehicle



Travel drive for a crawler vehicle with two motor connections



Travel drive for crawler excavators with two motor connections



Travel drive with spur wheel gear stage and three hydraulic motors



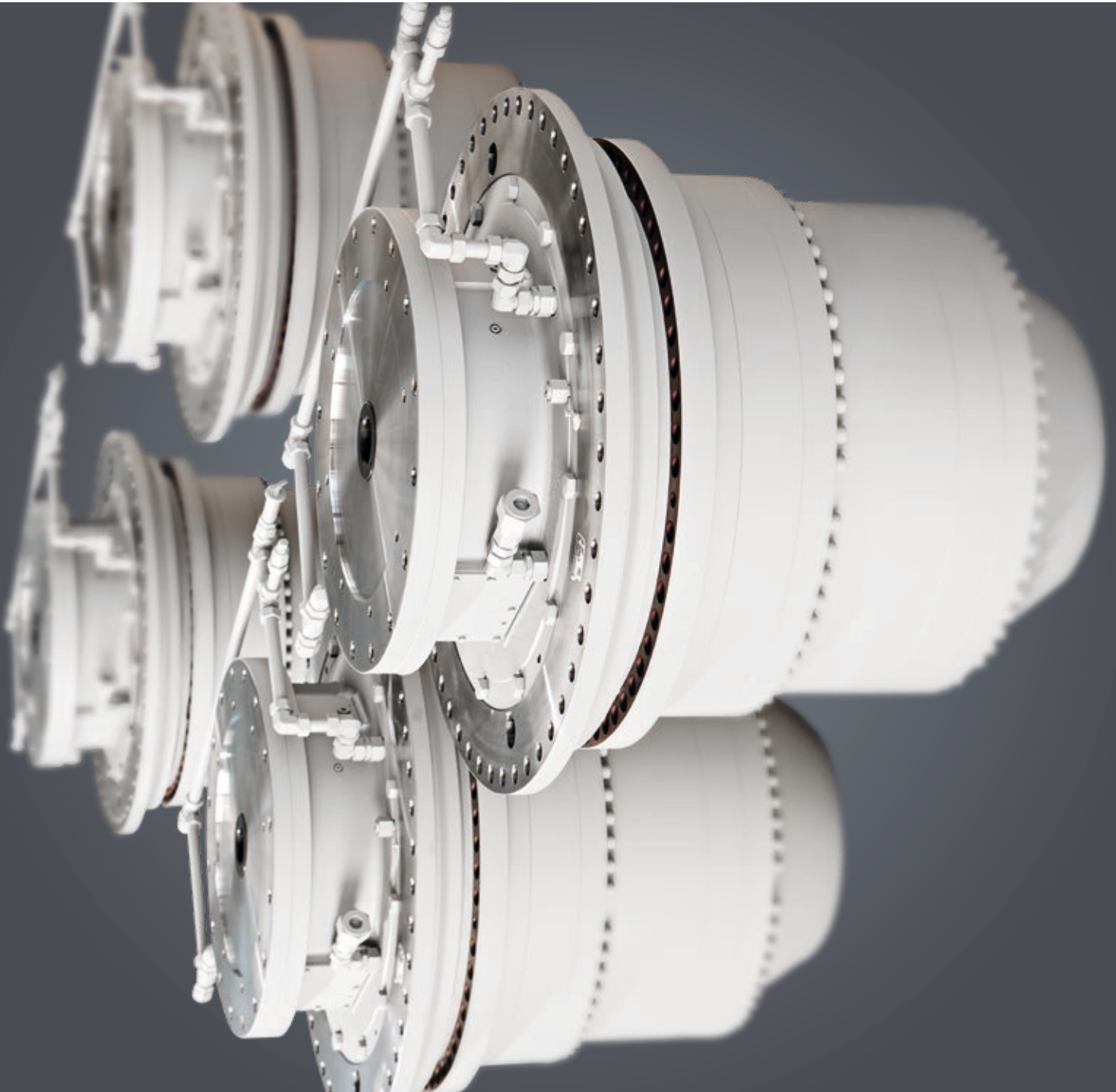
Travel drive with plug-in hydraulic motor



Travel drive with hydraulic motor for crawler excavators

Planetary plug-in gearboxes

Reliable and powerful, Liebherr planetary plug-in gearboxes cover many areas of deployment. They have the benefit of compact dimensions and are easy to use and maintenance friendly. Aside from series production units, Liebherr optimises planetary plug-in gearboxes individually.



Compact dimensions and easy to use

Reliable and powerful

Planetary plug-in gearboxes are intended for installation in rope winches, and specifically suit customers who order winch drums and frames separately, or manufacture them themselves. The standard gearboxes, prepared for horizontal installation, can be adapted to be driven by electric or by hydraulic motors. The transmission of torque onto the rope drum is carried out via the internal gear wheel of the gearbox.

As an option, it is possible to drive the gearboxes using several hydraulic motors via an input spur wheel gear stage. The integrated main bearing features high basic load ratings and therefore offers a very compact construction with a high power density. Optionally, ports for external oil coolers can be provided.

Series or customer-specific production

Liebherr offers fourteen gearbox sizes as series-production models, from PEG 250 to PEG 1100, which can be designed as two, three or four-stage versions in a variety of different transmission ratios from $i=50$ to $i=700$. The maximum dynamic torque is 944,000 Nm. For customised gearboxes, torques of up to 1,000,000 Nm have been produced already.



Plug-in gearbox with spur wheel gear stage and four motor connections



Plug-in gearbox with spur wheel gear stage and two motor connections



Coaxial plug-in gearbox with one motor connection

Compact, heavy duty and gear ring winches

The product range of Liebherr rope winches is divided into compact, heavy duty and gear ring winches. They all have in common that they can be adapted for use in any application. Liebherr rope winches are characterised by compact designs and perfected safety equipment, and make high rope speeds and rope capacities possible.



High rope speeds and rope capacities

Functional and application related

Liebherr rope drums can be designed to have normal or special grooving, for one or more layers of rope. In addition, two separate winding areas and a third flange in the middle are possible, if the winch is to be operated with two ropes in more than one layer. Depending on the application and customer's requirements, rope winches are delivered with or without a frame or further options like a pressure roller or slack rope safeguard including rope limit stop device.

Rope grooves produced on special CNC machines ensure minimal rope wear, a long service life and a precise rope guidance. The rope winches are used as hoisting winches for main or auxiliary hoists, as boom/luffing winches or for crane trolleys. Liebherr rope winches are also used as deep-sea and deck winches, as well as derrick winches.

Compact and heavy duty winches

Compact and heavy duty winches are mainly used for small to medium rope pull forces. A planetary gearbox integrated into the rope drum transmits a torque of between 6,000 and 944,000 Nm via the internal gear wheel onto the rope drum. Depending on the requirements, two gearboxes can be integrated for a double sided drive.

Gear ring winches

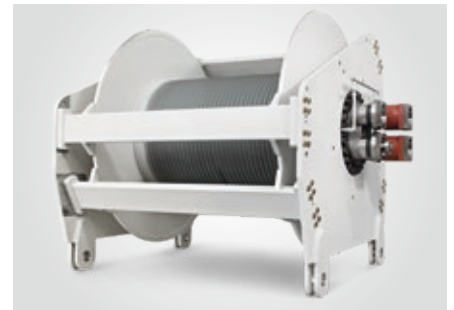
Gear ring winches are used for high to extremely high rope tension forces, such as those that occur with heavy duty and crawler cranes, deep-sea winches and other special applications. Output torques of up to 2,500 kNm are transmitted most economically by using a geared ring with several external slewing drives, that can be driven electrically or hydraulically. Through their redundancy, the slewing drives offer a high level of reliability.



Compact rope winch without frame for integrated installation



Compact rope winch with lightweight frame



Compact rope winch with frame for maritime use



Hoist winch with electric motor



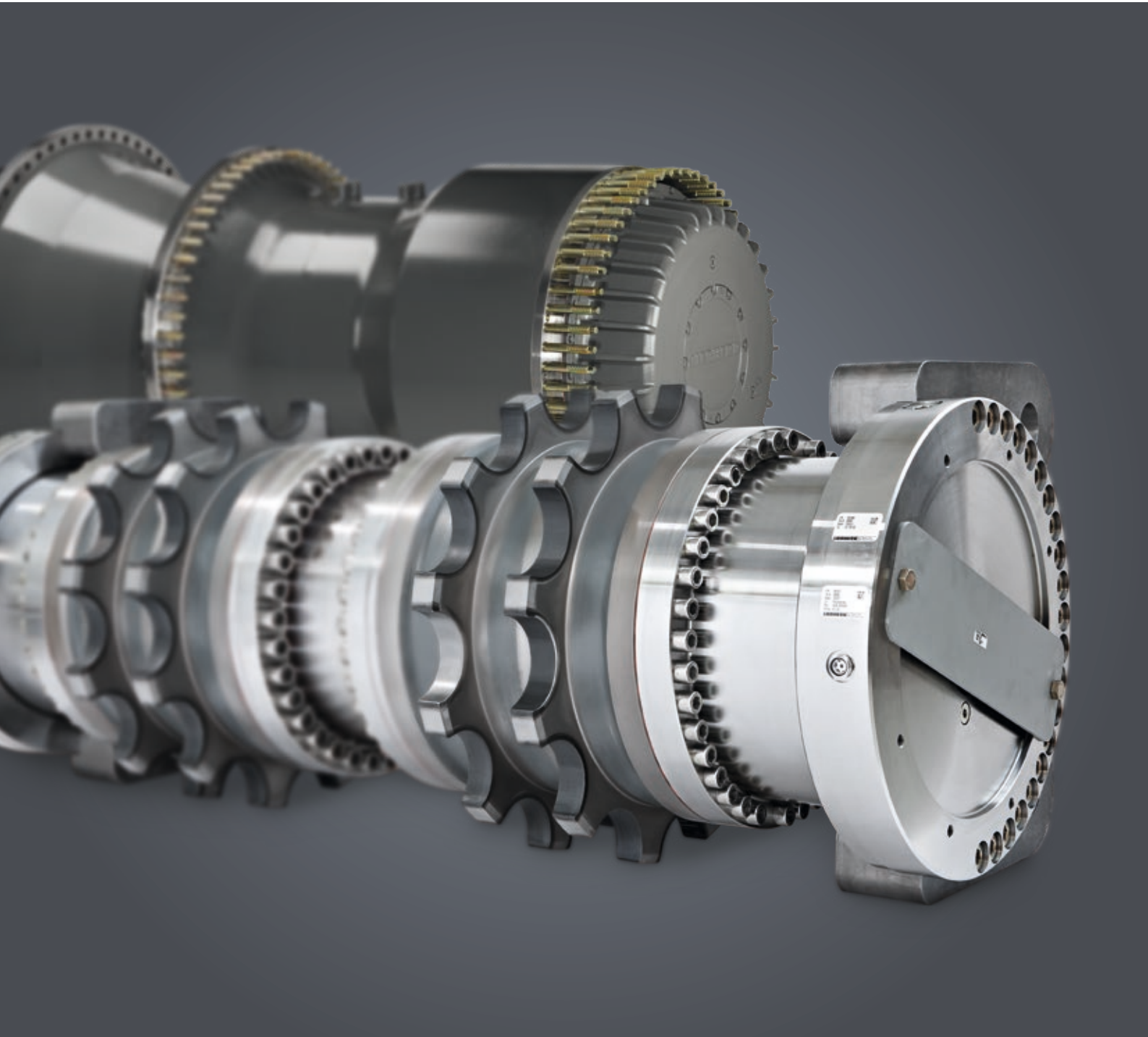
Heavy duty rope winch with slack rope safeguard and two winding areas on the drum



Gear ring winch with external slewing drives

Customised gearboxes

At the heart of Liebherr gearboxes have always been the user and function. Consequently, a diverse range of drive systems has been created over the years. Series products from our product portfolio serve as a basis for this. The gearboxes can be arranged as standalone units or integrated in an adjacent structure.



For user-specific requirements

Application and function at a glance

Whether in deep foundation machines, concrete mixing plants or large dumper trucks, gearboxes from Liebherr are always application-specific and function-oriented. Thereby customers and users benefit from a variety of special drives and designs. These are tailored to the particular application. Individual gearboxes result from the many possible combinations of planetary stages, spur wheel gear stages and bevel stages. The number and size of the driving electric or hydraulic motors vary, and are mostly decided by economic criteria. The torque can be transmitted via the internal gear wheel as well as by an output pinion, a drive shaft, a shaft flange link or other specially designed solutions. Several drives are also possible, an example is the cyclone drive for concrete mixing plants.

Autonomous or integrated gearboxes

Furthermore, the gearbox can act as an independent unit or can be completely integrated into the adjacent assembly, depending on requirements. In certain circumstances, the components of the adjacent assembly can also be included in the scope of delivery, such as with the drilling drive.



Wheel drive for mining truck



Front wheel suspension for dumpers



Cyclone drive for concrete mixing plants



Drilling drive



Chain drive for pipe-laying vessels

Product overview



Slewing drives – series production

Output torque (dyn.)	Nm	5,000–142,000*
Transmission range		60–1,600
Modular output shaft		9–24
Drive		Hydraulic or electric motor
Gear brake		With or without integrated brake
Weight	kg	71–1,170

*on request up to DAT 1000, 610,000 Nm



Customised slewing drives

Output torque (dyn.)	Nm	5,000–610,000
Transmission range		19–1,600
Modular output shaft		8–50
Drive		Hydraulic or electric motor
Gear brake		With or without integrated brake
Weight	kg	71–5,600



Planetary plug-in gearboxes – series production

Output torque (dyn.)	Nm	6,000–944,000
Transmission range		20–900
Connection diameter		295–1,045
Weight	kg	100–3,600



Customised planetary plug-in gearboxes

Output torque (dyn.)	Nm	6,000–1,000,000
Transmission range		20–1,200
Connection diameter		295–1,045
Weight	kg	100–4,000



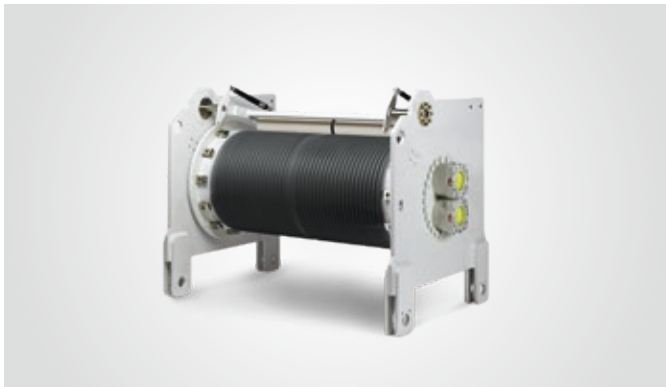
Swivelling drives

Output torque (dyn.)	Nm	4,000–65,000
Transmission range		25–51
Modular output shaft		4–24
Drive		Hydraulic motor
Gear brake		With integrated brake
Weight	kg	100–2,200



Travel drives

Output torque (dyn.)	Nm	24,000–2,300,000
Transmission range		15–600
Drive		Hydraulic motor
Weight	kg	250–16,000



Compact and heavy duty rope winches

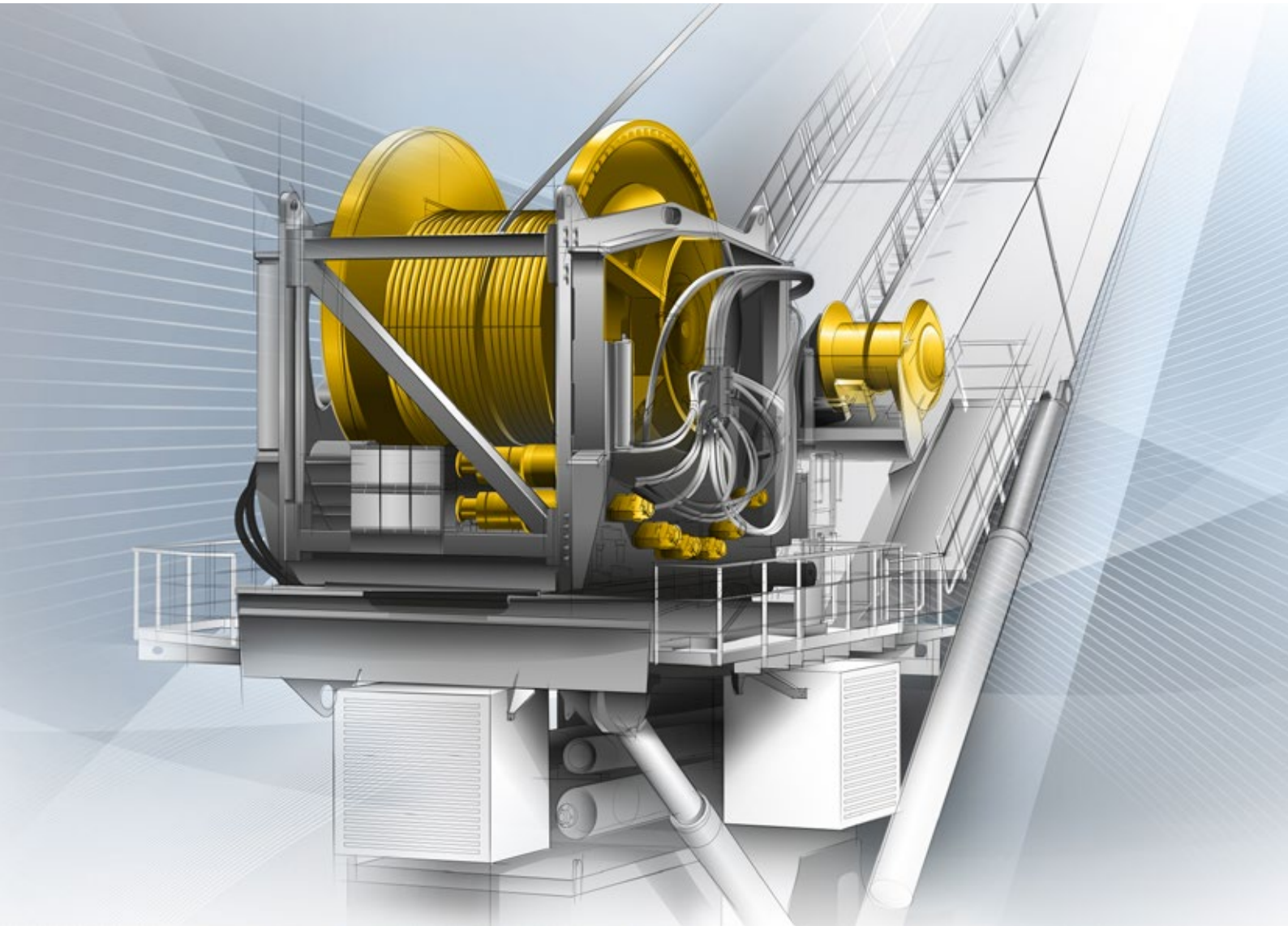
Output torque (dyn.)	Nm	6,000–944,000
Cable diameter	mm	13–76
Drum diameter	mm	340–1,650
Drive		Hydraulic or electric motor
Weight	kg	200–22,000



Gear ring rope winches

Output torque (dyn.)	Nm	390,000–2,500,000
Cable diameter	mm	50–100
Drum diameter	mm	1,000–3,600
Drive		Hydraulic or electric motor
Weight	kg	7,000–175,000

Examples of use



Harbour, ship and offshore equipment

- Gearboxes and rope winches made by Liebherr can be found in a variety of harbour, ship and offshore cranes.
- Slewing and special drives are also used in Azipod® ship propulsion systems and tensioner units in special ships.

Gearboxes and compact winches by Liebherr withstand even the most unfavourable operating conditions and perform well in extremely dusty and dirty surroundings and under heavy mechanical loads, for example in opencast mining and earthmoving work. They can be used in ambient temperatures of as low as -30 °C and with oil temperatures of up to +90 °C.

With Liebherr's durable, proven sealing and coating systems, the compact winches and gearboxes fulfil the highest longevity demands, even with the effects of salt water in maritime conditions.



Earthmoving and deep foundation machines

- For construction machinery, Liebherr supplies slewing and swivelling drives for the slewing and turning mechanism.
- Drilling rigs are equipped with slewing, drill and travel drives as well as with rope winches.



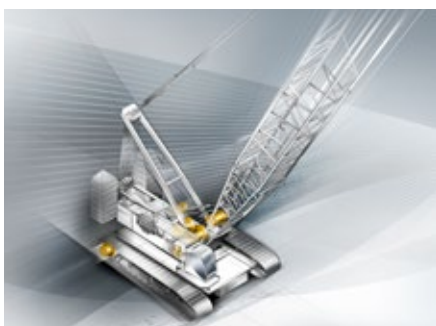
Energy technology

- As a strong partner of the wind industry, Liebherr offers individual components and complete systems for wind turbines.
- Slewing drives are used in rotor blade and yaw adjustment.



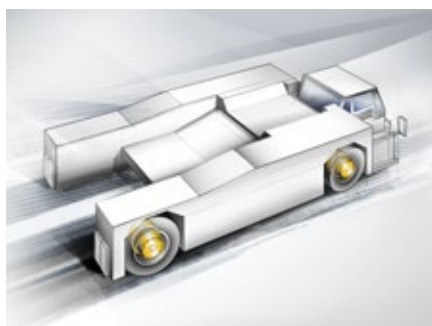
Mining equipment

- Liebherr manufactures robust swivelling and travel drives for mining excavators, which really live up to the high mechanical loads.
- Wheel drives are used in large dumper trucks.



Mobile cranes, construction cranes and hoists

- Liebherr offers a wide range of gearboxes for construction, mobile, crawler and special cranes.
- Crawler cranes are equipped with rope winches, slewing and travel drives from Liebherr.



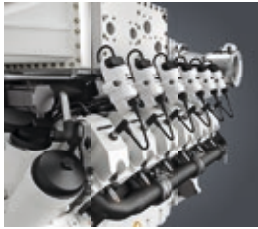
Specialised vehicles and machines

- Liebherr gearboxes are also suitable for a whole range of special applications and special vehicles.
- For example, aircraft tractors are equipped with wheel drives.

Mixing technology and concrete pumps

- Concrete pumps are fitted with slewing drives from Liebherr.
- Special mixer drivers and cyclone drives are used in concrete mixing plants.

Liebherr Components



Gas engines



Diesel engines



Fuel injection systems



Axial piston hydraulics



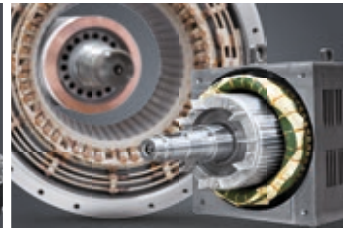
Hydraulic cylinders



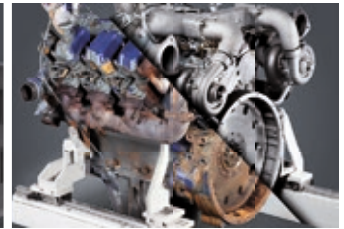
Large diameter bearings



Gearboxes and winches



Electric machines



Remanufacturing



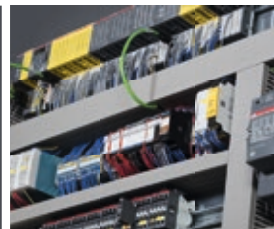
Human-machine interfaces and gateways



Control electronics and sensor technology



Power electronics



Control cabinets



Software

From A to Z – the components division of the Liebherr Group offers a broad range of solutions in the area of mechanical, hydraulic, electric and electronic drive system and control technology. The efficient components and systems are produced at a total of ten production sites around the world to the highest standards of quality. Central contact persons for all product lines are available to our customers at Liebherr-

Components AG and the regional sales and distribution branches.

Liebherr is your partner for joint success: from the product idea to development, manufacture and commissioning right through to customer service solutions like remanufacturing.

components.liebherr.com

Liebherr-Components AG

Post box 222, CH-5415 Nussbaumen/AG
☎ +41 56 296 43 00
✉ components@liebherr.com

Liebherr USA, CO.

1465 Woodland Drive, Saline, MI 48176, USA
☎ +1 734 944 63 34
✉ components.usa@liebherr.com