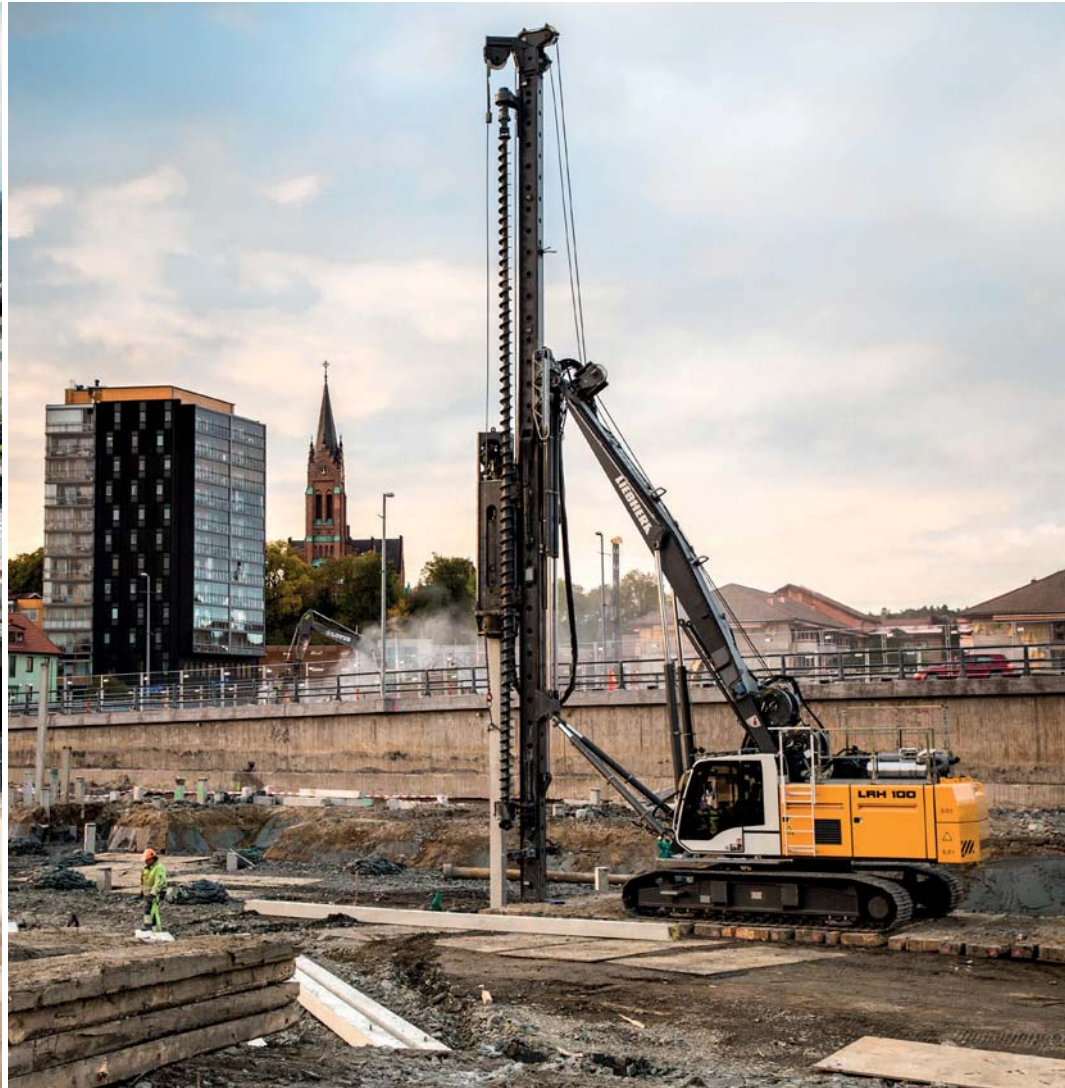


Solutions for Deep Foundation Work



LIEBHERR



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Liebherr-Werk Nenzing in Austria

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Solutions for Deep Foundation Work

Drilling Methods

Deep foundation machines from Liebherr can be applied for all common drilling methods. These include Kelly drilling, continuous flight auger drilling, full displacement drilling, double rotary drilling, down-the-hole drilling and drilling with a bored pile grab. The appropriate method is chosen in accordance with the prevalent soil conditions or depending on the required depth and/or diameter of the drilled hole.

Kelly Drilling

As the most common drilling method, Kelly drilling is suitable for almost all types of soil and rock. Relatively short drilling tools and telescopic Kelly bars, which facilitate large drilling depths, are distinguishing features of this method.



Continuous Flight Auger Drilling

This method is used for pre-drilling as well as for the installation of cast-in-place piles. The loosened soil is constantly conveyed using a continuous flight auger.



Full Displacement Drilling

Full displacement tools are frequently used for the production of cast-in-place piles. The soil is displaced by a smooth casing with an auger starter piece and only a small amount is conveyed to the surface.



Double Rotary Drilling

For this method the casing and auger (inside the casing) are simultaneously inserted and subsequently extracted. It is used for the production of cast-in-place piles and for pre-drilling.

Down-the-Hole Drilling

DTH drilling involves a hammer that is activated through compressed air and driven into the ground simultaneously rotating and impacting. A flushing current conveys the loosened drill cuttings to the surface. This method is mainly applied for rock and/or for penetrating large boulders.

Drilling with Bored Pile Grab

This common drilling method loosens the soil either by cutting or impact driving, depending on the tools used. Duty cycle crawler cranes are equipped with either a bored pile grab, a chisel or special tools.

Pile Driving Methods

With pile driving, so-called piling elements are installed in the ground and extracted again. Common piling elements include steel profiles and piles made of reinforced concrete or timber.

Nowadays, mainly sheet pile walls for supporting or securing purposes as well as foundation piles or cut-off walls are produced using the various pile driving methods. The erection of quay facilities in port construction presents difficult conditions and requires particularly heavy piling work with long piling elements. For this purpose, mainly powerful duty cycle crawler cranes with lattice booms and special leader systems are used.

Pile driving methods are divided into two categories, namely impact driving and vibrating.



Impact Driving

The piling elements are installed dynamically. A hydraulic hammer, usually mounted on a piling rig with leader, impacts on the piling element with the aid of a ram mass. Impact driving is used for the same applications as vibrating, whereby the hydraulic hammers currently available are able to transfer much higher dynamic forces.



Vibrating

The noise and vibration levels of this method are especially low, which makes vibrating particularly suitable for work in heavily built-up areas. Thereby the piling element is set into harmonious oscillation. Thanks to the weight of the vibrator and pushing with the help of the crowd system, the piling element can be installed in the ground.

Slurry Wall Installation

Slurry walls are wall structures, which are installed deep into the ground and made of concrete, reinforced concrete or binding agents. They have a static or sealing function. For their production, trenches are modularly excavated and support fluid, usually bentonite suspension, prevents the soil around the trenches from caving in.

In the single phase method a self-hardening suspension remains in the trench. In the two-phase method the support fluid is pumped out of the trench and replaced, for example by concrete, after the final depth has been reached. In the combined method, precast concrete elements, steel elements or sealing panels are inserted in the not yet hardened suspension.

The powerful Liebherr duty cycle crawler cranes are used as carrier machines.



Mechanical Slurry Wall Grabs

Mechanical grabs are the most common excavation tools used for slurry wall installation. They are opened and closed via rope and can excavate trenches down to depths of 50 m.



Hydraulic Slurry Wall Grabs

Hydraulic grabs are opened and closed via hydraulic cylinders, which facilitate extremely high closing forces. They can additionally be fitted with flexible guiding strips on the grab frame which allow to align the grab within the trench.

Hydromills

Slurry wall hydromills are suitable for great depths and particularly when very hard soil conditions prevail. In the process the soil is loosened and crushed by a cutter head on the lower end of the guide frame. The loosened material is continuously pumped to the surface in the support fluid.

Soil Improvement

This process involves the stabilization of the soil on the jobsite through treatment and/or the addition of other materials.

A number of methods are available for this purpose. Soil improvement means changing the natural properties of the soil with a view to meeting the constructional requirements of the jobsite. The natural load-bearing capacity of the ground to support construction loads is enhanced and/or the compressibility (settlement) of the ground is reduced.

Soil improvement allows for the installation of several different products. These include various types of columns, lining walls, cut-off walls, sealing slabs, and embankment or compaction structures.

Deep Compaction Using Vibro-Flotation

With this method of deep compaction non-cohesive soil is compacted using a vibro-flot. Through the vibration the soil grains change from their initial loose layering to a denser layering. A cylindrical compacted soil structure is created around the vibro-flot.



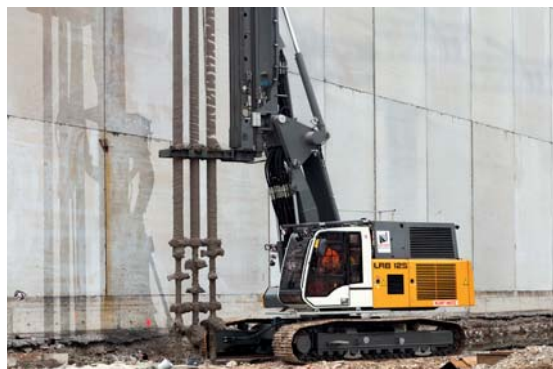
Deep Compaction Using Vibro-Replacement

A deep vibrator, fitted on a leader, compacts the soil through vibration and the simultaneous addition of a coarse extraneous material. Thus, load-bearing gravel or crushed stone columns are produced that stabilize the ground.



Dry Soil Mixing

Dry soil mixing involves the introduction of a binding agent in a dry powder form into a moist soil. The binding agent and the soil are then mixed. In the process columnar soil-mix elements with increased load-bearing capacity are produced.



Wet Soil Mixing

For wet soil mixing the mixing tools rotate around the vertical axis of the mixing shaft. The tools break up the soil matrix and mix the suspension with the soil. The binding agents used are cement types mixed to a suspension by adding water.

Cutter Soil Mixing

This method involves rotating drums that break up the soil structure. Simultaneously a self-hardening binding agent suspension is added. The drums of the mixing tool rotate around the horizontal axis so producing soil mixing elements with a rectangular cross-section.

Impact Compaction

A heavy tamper weight is dropped from heights of up to 40 metres onto the ground to be compacted. This dynamic input of energy increases the density. Liebherr duty cycle crawler cranes carry out the compaction process efficiently and automatically with free-fall winches and crane control.

Drilling Rigs **LB Series**



Multiple Applications

The drilling rigs of the LB series are suitable for a wide range of applications in the deep foundation industry. In addition to the popular Kelly drilling method, they are also commonly applied for tasks using a continuous flight auger, full displacement tools, and a double rotary head. Down-the-hole drilling is an exceptionally popular method when working in hard soils or rock.

Successful on the Market Since 2007

Liebherr presented its first drilling rig, namely the LB 28-320, at the Bauma 2007. Today, the LB series consists of six models with torques between 180 and 510 kNm. Depending on the application, drilling depths down to 95 metres and drilling diameters up to 3,000 millimetres are possible.

Flexible Application on the Jobsite

The drilling rigs from Liebherr are available in different configurations and are highly flexible in their application according to the prevailing soil conditions. Additional equipment is available as an option for drilled piles with very large diameters. This includes an extension of the drilling axis, additional counterweight, as well as a leader extension. The drilling rigs can also be fitted with a shortened leader, therefore making them ideal for use on jobsites with height restrictions.



	Weight	Max. torque	Rope crowd system	Kelly drilling Max. drilling depth	Kelly drilling Drilling diameter	Engine
LB 16 - 180	52.8 t (116.400 lbs)	180 kNm (132.765 lbf-ft)	200 kN (44.962 lbf)	34.5 m (113.2 ft)	1500 mm (4.9 ft)	230 kW (313 hp)
LB 20 - 230	68.5 t (151.020 lbs)	230 kNm (169.640 lbf-ft)	300 kN# (67.645 lbf)	52.3 m (171.6 ft)	1500 mm (4.9 ft)	320 kW (435 hp)
LB 24 - 270	75.8 t (167.110 lbs)	270 kNm (199.145 lbf-ft)	320 kN (71.940 lbf)	58.0 m (190.3 ft)	1900 mm (6.2 ft)	320 kW (435 hp)
LB 28 - 320	98.7 t (217.600 lbs)	320 kNm (236.020 lbf-ft)	400 kN (89.925 lbf)	70.0 m (229.7 ft)	2300 mm (7.5 ft)	390 kW (530 hp)
LB 36 - 410	115.0 t (253.530 lbs)	410 kNm (302.400 lbf-ft)	400 kN (89.925 lbf)	88.0 m (288.7 ft)	3000 mm (9.8 ft)	390 kW (530 hp)
LB 44 - 510	155.0 t (341.720 lbs)	510 kNm (376.156 lbf-ft)	560 kN (125.895 lbf)	94.6 m (310.4 ft)	3000 mm (9.8 ft)	505 kW (687 hp)

Characteristics

The drilling rigs from Liebherr are distinguished through a compact design meaning they can be efficiently transported and quickly mobilized on the jobsite. Their powerful diesel engines convince with both low fuel consumption and low emissions. User-friendly rotary drives allow for high torques. Designed for continuous operation the drilling rigs achieve fast drilling cycles.

Leader Design

The drilling rigs from Liebherr are equipped with a strong torsion-free leader on which all winches, including the main winch, are directly mounted. On the one hand, this enables a clear view of the main winch from the operator's cab and, on the other hand, ensures that the ropes do not move when the leader is adjusted.

Safety Concept

The drilling rigs have a consistent safety concept that includes railings and walkways as well as an installation for winch inspection. The complete assembly and loading activities can also be carried out outside the operator's cab with a radio remote control unit.

Parallel Kinematics

Thanks to the leader system's proven parallel kinematics the drilling rigs have a large working range and, at the same time, work precisely.





Drive System

The complete drive system, including engine, pumps, distributor and on-board hydraulics, consists of Liebherr components. These are perfectly harmonized and so achieve a high efficiency factor. This results in low fuel consumption, high drilling performance and, therefore, economic machine operation.

Rope Crowd System

The rope crowd system featuring extremely high pull and push forces contributes to the excellent performance of the Liebherr drilling rigs. Furthermore, the rotary drive can utilize the entire length of the leader.

Robust Steel Structure

Drilling rigs are sometimes subjected to high stresses in deep foundation applications. This was taken into account in the steel structure of the machines in the LB series. Through optimum force transmission low wear and a long service life is achieved.

Swing Ring

The drilling rigs are equipped with a triple-row roller bearing ring which increases the stability of the machine when in operation. Thanks to an optimum adjustment of the tooth flank clearance only a minimum clearance exists between the uppercarriage and undercarriage.

High Stability

The long crawlers give the undercarriage a high level of stability and durability as well as minimize the ground pressure. Furthermore, the machines in the LB series have a comparatively low swing radius.

Attachments



Rotary Drive (BAT Series)

The powerful rotary drive designed by Liebherr delivers the torque for many different drilling applications. Significant advantages are the automatic torque regulation as well as four electronically adjustable speed ranges. Thanks to its continuous speed optimization it can be flexibly adjusted to suit the relevant soil conditions.

The standard Kelly shock absorber with springs and hydraulic dampers protects equipment and reduces noise emission.



Double Rotary Drive (DBA Series)

Secant drilled piles and foundation piles can be installed using the DBA series of double rotary drives. Two separate rotary drives drive the inner continuous flight auger independently from the casing. The DBA series of drives convinces with compact design and can, therefore, often be used in close proximity to buildings. Further advantages are their high level of stability despite lightweight design and their low noise emission.



Rotary Drive for Down-the-Hole Drilling (DTH)

Liebherr offers special rotary drives which are used for applications with DTH hammer (down-the-hole). Through shift and folding functions these can be adapted to the respective requirements.



Casing Oscillator (VRM)

The LB series of machines can be fitted with various sizes of hydraulic casing oscillators which are driven by the carrier system's on-board hydraulics. Together with the robust design of the casing oscillators this facilitates efficient operation on the jobsite.



Drilling Tools

Depending on the requirements the machines in Liebherr's LB and LRB series can be fitted with various types of drilling tools. Tools are available for displaceable, mixable, loose and densely layered soil types as well as for rock. They offer a high level of performance, low wear as well as a long service life.



Tools for Kelly Drilling (with or without casing)

- Drilling augers, drilling buckets, core barrels, cross cutters as well as various types of special tools
- Pneumatic and mechanical casing drivers
- Double wall casings, cutting shoes with different tooth change systems, casing holding device
- Concrete delivery pipe with accessories of various diameters CFA drilling tools

Continuous Flight Auger Drilling Tools

- Continuous flight augers (CFA) in various designs
- Diverse continuous flight auger starters depending on the soil conditions with optimized concrete outlet
- Concreting Kelly, jetting head, Kelly extension
- Various connecting systems

Double Rotary Drilling Tools

- Double rotary drilling augers in various designs
- Diverse auger starters depending on the soil conditions with optimized concrete outlet
- Casing drivers with optimized ejection openings
- Single and double wall drill casings
- Cutting shoes with exchangeable cutting teeth

Full Displacement Drilling Tools

- Displacement bodies for various requirements in both open and closed methods
- Extensions in various designs for open and closed methods
- Hinged joint in order to lift and install horizontal tools without an auxiliary crane
- Kelly extension to optimize the drilling depth for open and closed methods

Soil Mixing Tools

- Mixing paddles in various designs (also for multiple mixing)
- Extensions
- Guides and spacer plates

Piling and Drilling Rigs

LRB Series



One-Stop Shop

At the end of the 1990s, under the motto “one-stop shop”, Liebherr in Nenzing developed a range of combined piling and drilling rigs, the first series of pure deep foundation machines. Currently, the series consists of four models which perfectly cover the varied customer requirements.

Wide Range of Applications

Piling and drilling rigs from Liebherr are deployed for various applications on the jobsite. The smaller models are typically used for the installation of sheet piles through vibration. On the other hand, the LRB 355 has been specially developed for

drilling with full displacement tools. It is also suitable for all further common drilling applications as well as operation with a hydraulic hammer or vibrator.



	Weight	Max. torque	Max. pile length	Max. pull/push force	Engine
LRB 16	47.9 t (105.600 lbs)	120 kNm (88.510 lbs-ft)	15.2 m (49.87 ft)	200 kN (44.960 lbs)	390 kW (530 hp)
LRB 18	50.9 t (112.215 lbs)	120 kNm (88.510 lbs-ft)	17.2 m (56.43 ft)	200 kN (44.960 lbs)	390 kW (530 hp)
	Weight	Torque rotary drive	Max. pile length	Max. drilling depth	Engine
LRB 355	94.0 t (207.235 lbs)	450 kNm (331.905 lbs-ft)	21.0 m (68.89 ft)	29.0 m (95.1 ft)	600 kW (816 hp) 750 kW (1020 hp)
LRB 355 XL*	95.3 t (210.100 lbs)	450 kNm (331.905 lbs-ft)	26.0 m (85.30 ft)	34.0 m (111.5 ft)	600 kW (816 hp) 750 kW (1020 hp)

* with optional equipment

Characteristics

With the LRB series Liebherr offers its customers combined piling and drilling rigs for a diverse range of applications on the jobsite. The universal machines are characterized by both high performance and efficiency as well as reliability. Easy transportation and quick set-up are only two fundamental characteristics for the flexible application of the LRB machines on jobsites. For example, the leader can simply be folded backwards during transportation and does not need to be dismantled.

Innovative Leader Design

The rigid leader absorbs high torque and is fitted with a rope crowd system for high pull forces. All winches are mounted directly on the leader meaning it is not necessary to move the ropes when adjusting the inclination or radius of the leader.


Parallel Kinematics

A large working area is possible thanks to the parallel kinematics. At the same time the leader can thus be folded back.

Robust Undercarriage

Thanks to an extremely solid undercarriage the machines in the LRB series have excellent stability and low ground bearing pressure.





Modular Leader Top

The leader top can be appropriately equipped for the actual application. Both the radius and the rope lead-off are adjustable.



Auxiliary Winch

The LRB machines can also carry out lifting work thanks to an auxiliary winch on the leader top. It is possible to swing the auxiliary winch around 270°. Furthermore, the radius can be adjusted.



Compact Uppercarriage

Despite their high performance the machines in the LRB series have a compact uppercarriage. This results in a relatively small swing radius and therefore efficient work in restricted spaces.

Supports

Thanks to both rear and leader supports the undercarriage can be elevated and swivelled on the spot. This is of particular benefit in restricted spaces. Moreover, the supports provide more stability during operation.

Attachments

The LRB series of machines can be fitted with a range of attachments, some of which are produced by Liebherr. Therefore it is possible for the operators of these machines to perform all common drilling and vibratory applications.



Hydraulic Hammer

Liebherr's own H series of hydraulic free-fall hammers consists of three types with a maximum impact energy of 225 kNm. These are guided on the leader when installed on Liebherr's piling and drilling rigs.

Through the mounting of modular weights the hammers can be perfectly adapted to the particular piling requirements. Thanks to their short and lightweight design they are, on the one hand, user-friendly with regards to transportation and maintenance. On the other hand, with a maximum length of only 5 metres (H 10), they allow for the impact driving of very long piles. Furthermore, the lightweight design results in higher load capacities. The pile helmet of the free-fall hammer is soundproofed as a standard.

	Max. impact energy	Max. drop weight	Length incl. pile helmet	Type
H 6	72 kNm (53.105 lbf-ft)	6 t (13.228 lbs)	4110 mm (13.48 ft)	LRB 16 / LRB 18
H 10	120 kNm (88.507 lbf-ft)	10 t (22.046 lbs)	5000 mm (16.40 ft)	LRB 355



Vibrator

With the LV 20 Liebherr offers its customers a powerful high frequency vibrator. Thanks to the symmetrical layout and linear guiding of the vibrator the loss of energy is reduced. The vibrator is particularly easy to maintain, mainly due to a new cooling system as well as the use of the most advanced components. It is designed for a long service life thanks to largely dimensioned main bearings.

	Static moment	Max. centrifugal force	Max. frequency	Total weight with clamp	Type
LV 20	0-20 kgm (0-145 lbs-ft)	1160 kN (260.780 lbf)	2500 rpm	4400 kg (9.700 lbs)	LRB 16 / LRB 18
1500 H	0-30 kgm (0-217 lbs-ft)	1535 kN (345.082 lbf)	2160 rpm	8300 kg (18.300 lbs)	LRB 355



Rotary Drive (BAT Series)

The powerful rotary drive designed by Liebherr delivers the torque for many different drilling applications. Considerable advantages are the automatic torque regulation as well as four electronically adjustable speed ranges. Thanks to its continuous speed optimization it can be flexibly adjusted to suit the relevant soil conditions.

The standard Kelly shock absorber with springs and hydraulic dampers protects equipment and reduces noise emission.



Double Rotary Drive (DBA Series)

Secant drilled piles and foundation piles can be installed using the DBA series of double rotary drives. Two separate rotary drives drive the inner continuous flight auger independently from the casing. The DBA series of drives convinces with compact design and can, therefore, often be used in close proximity to buildings. Further advantages are their high level of stability despite lightweight design and their low noise emission.

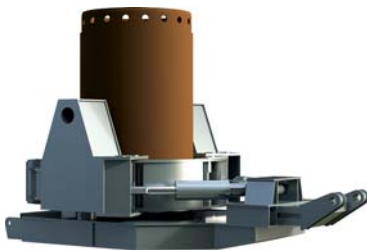
	Max. torque Rotary drive I	Max. torque Rotary drive II	Type
DBA 80	80 kNm (59.005 lbf-ft)	67 kNm (49.417 lbf-ft)	LRB 16 / LRB 18
DBA 300	300 kNm (0-221.270 lbf-ft)	150 kNm (0-110.635 lbf-ft)	LRB 355



Mixing Drive (MA Series)

Should the piling and drilling rigs be required for soil improvement applications mixing drives are used. These are characterized through their compact design.

The MA series of rotary drives is modularly designed and suitable for different applications such as single, double and triple mixing drives.



Casing Oscillator (VRM)

The LRB series of machines can be fitted with hydraulic casing oscillators which are driven by the carrier system's on-board hydraulics. Together with the robust design of the casing oscillators this facilitates efficient operation on the jobsite.



Rotary Drive for Down-the-Hole Drilling (DTH)

Liebherr offers special rotary drives which are used for applications with DTH hammer (down-the-hole). Through shift and folding functions these can be adapted to the respective requirements.

Piling Rigs

LRH Series



Flexible Piling Application

The machines in the LRH series are suitable for jobs which involve the installation of piling elements in different types of soil. Liebherr's piling rigs are the first choice especially when very large radii and extreme angles are required. Depending on the requirements, the carrier machine is selected from the successful series of Liebherr duty cycle crawler cranes, crawler cranes or drilling rigs, which are fitted with stable leader systems.

Efficiency on the Jobsite

Combined with a stable leader the piling rigs convince with excellent performance characteristics and flexibility. Thanks to the sophisticated hydraulic system equipment such as vibrator or hammer can be operated without an additional power pack. This leads to significant savings in running costs and underlines their reputation as highly efficient machines.



LRH 100

LRH 600 with LR 1300

Weight	Total height	Max. pile length	Max. weight of hammer	Carrier machine
65 t (143.300 lbs)	24 m (78.7 ft)	19 m (62.3 ft)	10.4 t (22.930 lbs)	LB 20-230
330 t (727.525 lbs)	52,6 m (157.5 ft) *60 m (196.9 ft)	50 m (167.3 ft)	35.0 t (44.093 lbs)	LR 1300 HS 895 HD

* Swinging leader

Characteristics

LRH 100

With this piling rig Liebherr offers its customers a compact machine with especially flexible leader kinematics. This allows for large radii as well as inclination in all directions. The LRH 100 is based on the LB 20-230, a proven drilling rig of the LB series. The design of this carrier machine enables quick and economic transportation, fully assembled with mounted hammer, so allowing for quick set-up on the jobsite. With the LRH 100 various types of timber, concrete or steel piles can be installed.



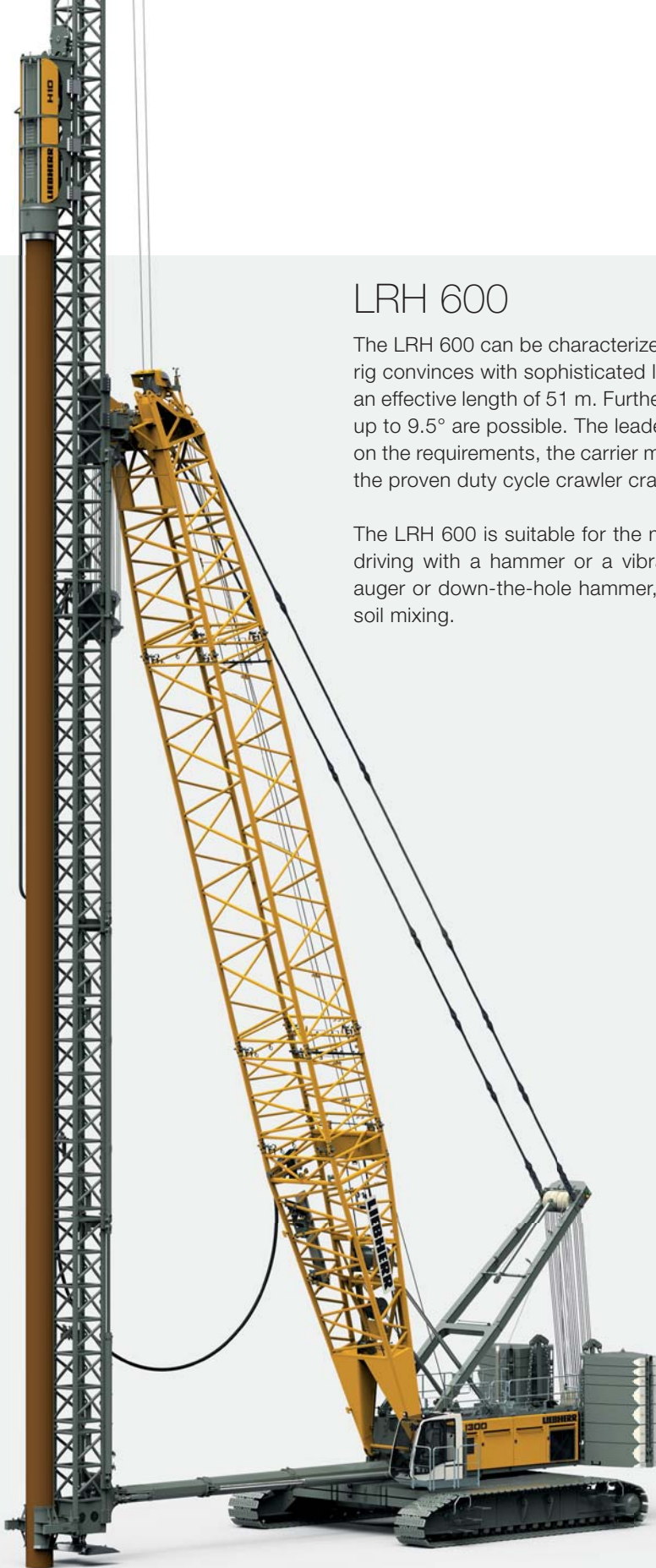
Mobility

The LRH 100 can erect and lower the leader independently (no auxiliary machines required) and it is transported with mounted hammer.

Leader Kinematics

Thanks to the special leader system, the LRH 100 achieves a radius of 8.75 m as well as a continuous inclination adjustment of 18° in all directions.





LRH 600

The LRH 600 can be characterized as ideal for heavy piling work with a large radius. The piling rig convinces with sophisticated leader kinematics which enable a working radius of 15 m and an effective length of 51 m. Furthermore, backward inclination up to 14° and forward inclination up to 9.5° are possible. The leader's lattice design provides a high level of stability. Depending on the requirements, the carrier machine is either the successful crawler crane type LR 1300 or the proven duty cycle crawler crane type HS 895 HD.

The LRH 600 is suitable for the most common deep foundation processes. In addition to pile driving with a hammer or a vibrator, these include drilling operations with continuous flight auger or down-the-hole hammer, as well as diverse procedures for soil improvement such as soil mixing.

Vertical Travel

In order to provide maximum stability the kicker is connected to the boom head via supporting tubes. This allows to change the leader height without influencing the leader inclination.

Rotation Device

Two compensation cylinders always keep the leader parallel to the upper-carriage. This allows for maximum torque transmission of 320 kNm. Radius and inclination are adjusted using only one pair of cylinders.

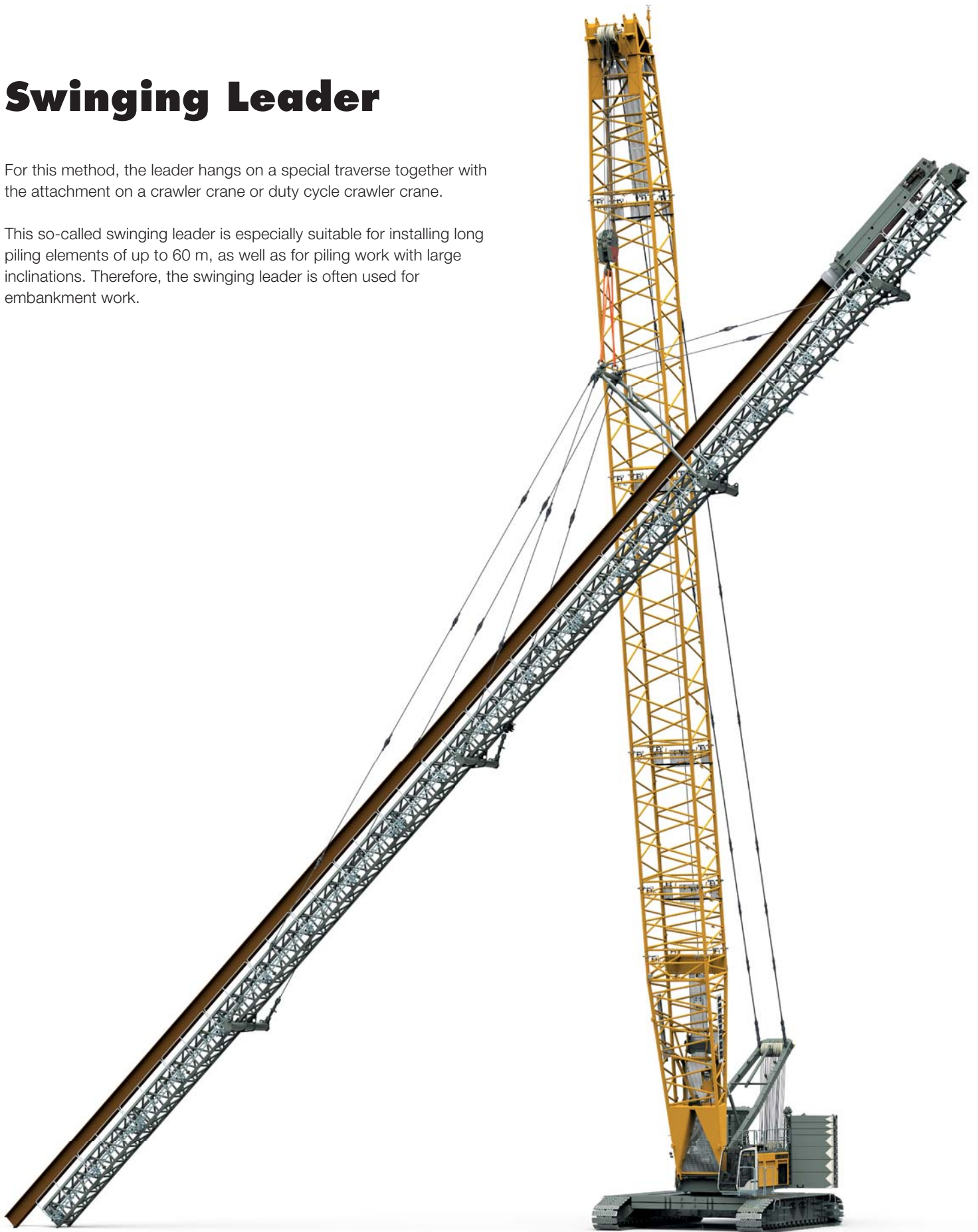
Easy Assembly

Pin connections allow for quick and easy assembly of the newly designed fixed leader.

Swinging Leader

For this method, the leader hangs on a special traverse together with the attachment on a crawler crane or duty cycle crawler crane.

This so-called swinging leader is especially suitable for installing long piling elements of up to 60 m, as well as for piling work with large inclinations. Therefore, the swinging leader is often used for embankment work.



Attachments



Pre-Drill BA 12

The pre-drill BA 12 is an attachment for the LRH 100. It is used mostly for pre-drilling prior to piling work.

	Torque Rotary drive	Speed Rotary drive	Drilling depth	Max. drilling diameter	Type
BA 12	0-12 kNm (0-8.850 lbf-ft)	0-65 rpm	12 m (39.3 ft)	350 mm (1.14 ft)	LRH 100



Rotary Drive BAT 320

The Liebherr rotary drives in the BAT series are powerful and deliver high torque. Considerable advantages are the automatic torque regulation as well as four electronically adjustable speed ranges. The LRH 600 can be fitted with a BAT 320 for continuous flight auger drilling. Thanks to the innovative leader system the energy of the rotary drive can utilize the entire length of the leader.

	Torque Rotary drive	Speed Rotary drive	Drilling depth	Max. drilling diameter	Type
BAT 320	0-320 kNm (0-236.020 lbf-ft)	0-47 rpm	51 m (167.3 ft)	1200 mm (3.93 ft)	LRH 600



Hydraulic Hammer

Liebherr's own H series of hydraulic free-fall hammers consists of three types with a maximum impact energy of 225 kNm. These are guided on the leader when installed on Liebherr's piling and drilling rigs. If duty cycle crawler cranes serve as carrier machines they can also be free hanging.

Through the mounting of modular weights the hammers can be perfectly adapted to the particular piling requirements. Thanks to their short and lightweight design they are user-friendly with regards to transportation and maintenance. With a maximum length of only 5.2 metres (H 15 L), they also allow for the impact driving of very long piles. Furthermore, the lightweight design results in higher load capacities. The pile helmet of the free-fall hammer is soundproofed as a standard.

	Max. impact energy	Max. drop weight	Length incl. pile helmet	Type
H 6	72 kNm (53.105 lbf-ft)	6 t (13.2 lbs)	4110 mm (13.48 ft)	LRH 100
H 10	120 kNm (88.507 lbf-ft)	10 t (22.0 lbs)	5000 mm (16.40 ft)	LRH 600
H 15 L	225 kNm (165.952 lbf-ft)	15 t (33.0 lbs)	5180 mm (16.99 ft)	LRH 600

Duty Cycle Crawler Cranes

HS Series



Universal Machines for Deep Foundation Work

In addition to machines purely for deep foundation work, Liebherr also offers a series of duty cycle crawler cranes which are deployed with appropriate attachments. Therefore they can be fitted with casing oscillators, slurry wall grabs or hydromills, as well as tamper weights for carrying out dynamic soil compaction.

Proven in Heavy-Duty Construction Tasks

Thanks to their robust design the HS series of machines is ideally suited to the demands of deep foundation work. The three duty cycle crawler cranes with lifting capacities between 70 and 130 tonnes are especially popular for deep foundation applications. Additionally, Liebherr also offers smaller classes of machines with

lifting capacities below 70 tonnes, as well as two types with lifting capacities up to 300 tonnes. These machines are applied particularly for material handling with dragline buckets or grabs, but are also sometimes applied for deep foundation work.



	Max. capacity	Min. transport weight	Min. transport width	Max. drilling diameter*	Max. chisel weight**	Max. drop weight***
HS 8070 HD	70 t (77 US t)	47 t (103.620 lbs)	3000 mm (9.8 ft)	1800 mm (5.9 ft)	12 t (26.5 lbs)	19 t at 8 m radius (42 lbs at 26.2 ft radius)
HS 8100 HD	100 t (110 US t)	40 t (88.185 lbs)	3500 mm (11.5 ft)	2000 mm (6.6 ft)	12/16 t (26.5 / 35 lbs)	25 t at 8 m radius (54 lbs at 26.2 ft radius)
HS 8130 HD	130 t (143 US t)	50 t (110.235 lbs)	3500 mm (11.5 ft)	3300 mm (10.8 ft)	35 t (77 lbs)	34.1 t at 8 m radius (75 lbs at 26.2 ft radius)

* Casing oscillator

** Slurry wall grab

*** Dynamic soil compaction

Characteristics

Duty cycle crawler cranes are exposed to high stresses in their various jobsite applications. A high level of stability is a basic requirement for efficiency when carrying out deep foundation work. Thus, the uppercarriage of the machine has a robust box design and is mounted on a large undercarriage. Therefore, the operating demands on the duty cycle crawler crane are met and, at the same time, an extended service life of the machine is achieved.

Winches

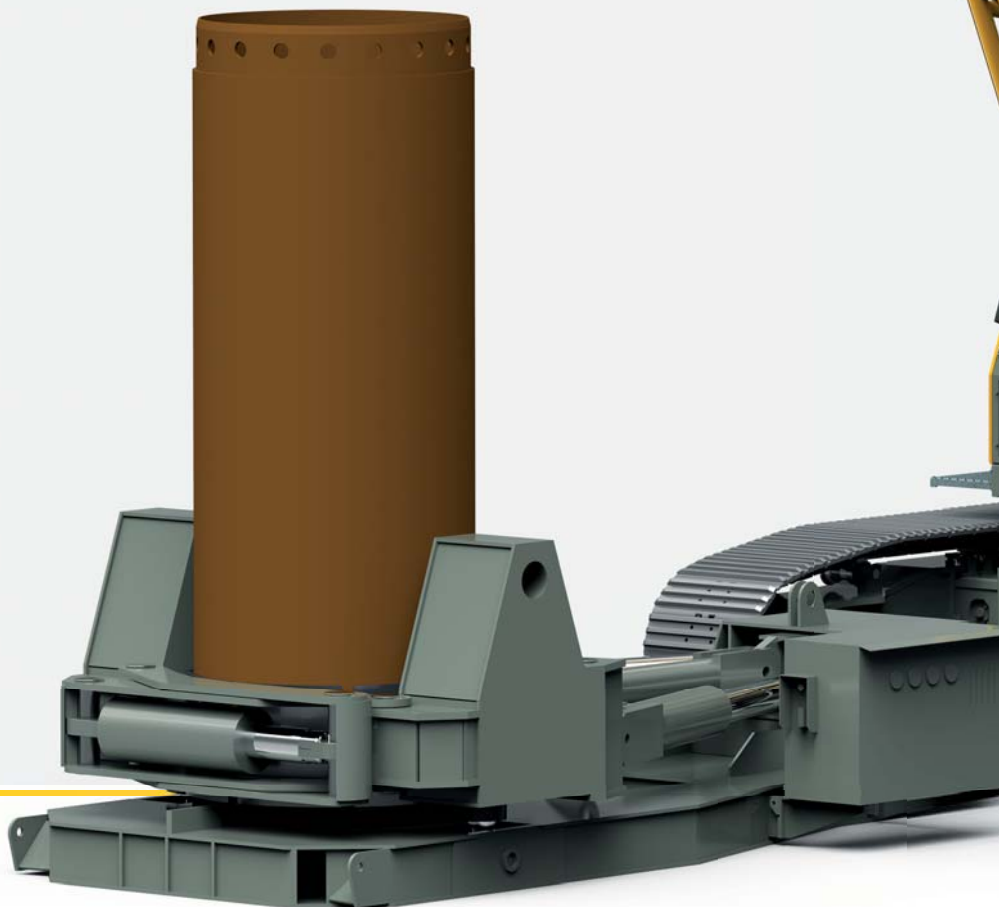
The low-maintenance hydraulic free-fall winches are installed as complete units. Depending on the model, they have a maximum line pull of 35 tonnes. Thanks to state-of-the-art variable flow hydraulic motors the rope speed is automatically adapted for all working ranges without any output losses.

Self-Assembly System

No additional auxiliary crane is necessary for the assembly of duty cycle crawler cranes. All components, such as crawlers and counterweight, have a space-saving design and weights are optimized. These can be autonomously assembled using the sophisticated self-assembly system.

Safety

The duty cycle crawler cranes meet the highest safety standards. Furthermore, the uppercarriage can be transported with mounted railings, walkways and pedestals. This speeds up the assembly on the jobsite.





Hydraulic System

Thanks to the innovative hydraulic design with a closed circuit the duty cycle crawler cranes are fuel-saving and therefore economic. The available hydraulic power is optimally split between the winches, luffing gear or the external devices. Thus, parallel operation of all gears is possible.

Crawlers

Depending on the machine's size the crawlers can be dismantled with the aid of the self-assembly system or, thanks to a hydraulic cylinder, they can be retracted to transport width.

Control System

The duty cycle crawler crane is fitted with an intelligent control system which also includes a multitude of monitoring functions. Service and machine functions are clearly displayed on high contrast colour monitors. Depending on the requirements and the application, further assistance systems, such as the slurry wall grab control, are available.

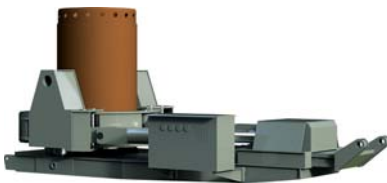
Attachments

The machines in the HS series are ideal carrier machines for various deep foundation applications. The most common attachments are casing oscillator, bored pile grab, slurry wall grab and hydromill.



Bored Pile Grab

Duty cycle crawler cranes are equipped with universal bored pile grabs when installing pile foundations with casing oscillator. These can be deployed for different soil conditions. The universal bored pile grabs are extremely robust and fitted with hard-wearing components. A further advantage is that the body of the grab has a streamlined design so that a high falling speed can be achieved in water.



Casing Oscillator

For the installation of casings, the duty cycle crawler cranes are always fitted with a casing oscillator. These are coupled with the carrier machine and excel through their extremely robust design. They are driven through the carrier machine's hydraulic system.

The casing oscillator is positioned on the working level at exactly right angles to the drilling axis. It then encloses and clamps the casing projecting above the ground. Through alternate rotation to the right and to the left the casings are finally pulled upwards or pressed downwards.



Slurry Wall Grab

Thanks to their robust design and the high line pull of the main winches, duty cycle crawler cranes from Liebherr are excellently suited for deep foundation work using a slurry wall grab. Furthermore, they are fitted with hydraulic free-fall winches, which enable precise handling of the grab. Electronic multi-functional joysticks provide for sensitive control of the grab. These joysticks incorporate all operating elements required during operation.

It is possible to differentiate between mechanical and hydraulic grabs. The commonly used verticality measuring system for mechanical and hydraulic slurry wall grabs is fully integrated in the Liebherr control system. Additionally, hydraulic slurry wall grabs make it possible to carry out a vertical correction. This allows for a high level of accuracy, even at great depths.



Hydromill

Slurry walls can be installed practically vibration-free using a special cutter (hydromill). Cutter wheels are mounted on the bottom of a steel profile frame and continuously break up and crush the soil at the bottom of the trench. The loosened soil particles are pumped to the surface together with the bentonite from the trench via a hose line.

An important advantage of the hydromill is that it can be deployed for almost all types of soil, including rock. Furthermore, work can be carried out at depths of over 100 m.



Transportation and Set-up



Focus on Cost-Efficiency

Special attention was given to the uncomplicated and economic transportation of Liebherr's deep foundation machinery and duty cycle crawler cranes. Thanks to minimum set-up work, the machine can be quickly mobilized between jobsites so promoting economic deployment.

Efficient Transportation and Easy Set-up

Deep Foundation Equipment

The LB series of drilling rigs, the LRB series of piling and drilling rigs as well as the smallest piling rig LRH 100 can all be transported in one piece thanks to their compact measurements and low weights. This means that ropes need not be dismantled and the leader can simply be folded back. Therefore, the set-up work is completed in a considerably shorter time. If necessary, the LB 16-180 and the LB 20-230 can also be transported with mounted rotary drive.

Completely assembled machines can be quickly and easily set-up and are ready for operation within a short time. If the counterweight of a larger machine is transported separately it can be mounted on site using the leader without the need for an auxiliary crane. This means significant cost savings. The mounting of the rotary drive is also carried out directly and without the aid of an auxiliary crane. With the aid of a guide on the sledge it is hitched on the upper pin and then secured through two further pins on the lower end of the sledge. If the attachment is exchanged, this is carried out using a quick connection system.

Duty Cycle Crawler Cranes

All components in Liebherr's duty cycle crawler cranes have a space-saving design and weights are optimized so allowing for smooth transportation on all roads in accordance with current international transport regulations. Pendant straps and pins remain in the intended mountings during transportation so speeding up assembly.

The smaller duty cycle crawler cranes can be transported in one piece so reducing assembly and disassembly work to a minimum. By larger models the basic machines are transported without the crawlers. First of all the uppercarriage is unloaded independently using a jack-up system, whereby the duty cycle crawler crane is supported by hydraulic jack-up cylinders. Subsequently the uppercarriage unloads the crawlers, counterweight and boom sections using either its A-frame or boom foot. Hydraulically activated pins, quick connections and an auxiliary rope winch simplify and accelerate the assembly process.

Rapid Mobilization

The rotary drive is mounted using an auxiliary winch without the need for an additional crane.

Easy Disassembly

The leader can be folded forward during the dismantling of the drilling rig.

Intelligent Assembly

Through the self-assembly system no additional crane is necessary for the set-up or disassembly of Liebherr's duty cycle crawler cranes.



Control and Assistance Systems



Innovative and User-Friendly

All control and assistance systems are user-friendly solutions from Liebherr - including the Litronic control system, the core of the deep foundation machines. For the operator this means that unnecessary interfaces are avoided and a homogeneous system environment is created.

Control System

Liebherr's Litronic control system is based on the latest control software and includes all control and monitoring functions. Developed in-house, it is designed for tough jobsite applications even under harsh environmental conditions.

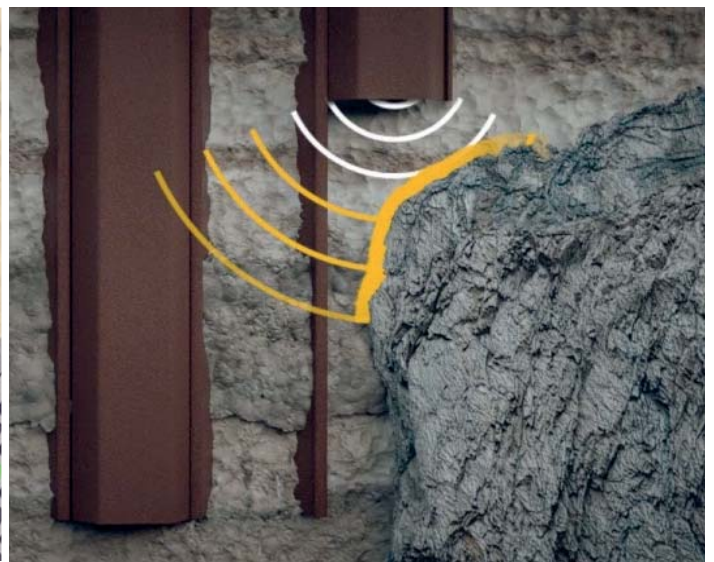
All information regarding service and machines is clearly displayed on colour monitors. Furthermore, numerous functions simplify the handling of the machines, which helps to achieve quicker working cycles. These include electro-hydraulic proportional control for precise operation or the handling of all machine functions with the joystick.



Assistance Systems

Liebherr offers a large number of different control assistance systems in order to facilitate machine operation. This is even more important in the deep foundation sector as a lot of the work is performed outwith the operator's field of vision.

Therefore, the operator profits from simplified handling even for challenging tasks. At the same time, the assistance systems increase both the level of performance as well as safety on the jobsite.



Automation for Soil Compaction

An automatic control system can be applied for dynamic soil compaction. This allows for precise working cycles as well as reduced rope wear.

Cruise Control

Values such as pull-down speed and rotational speed can be programmed in advance for an automatic drilling process.

Slurry Wall Grab Control

This is an electronic control for precise lowering of the grab. It protects the grab during positioning, prevents caving in of the trench due to high speeds, saves fuel, and is simple to handle.

Automatic Shake-Off

When emptying the auger, the amount and intensity of the left-right movements of the rotary drive can be preset with the help of the automatic shake-off.

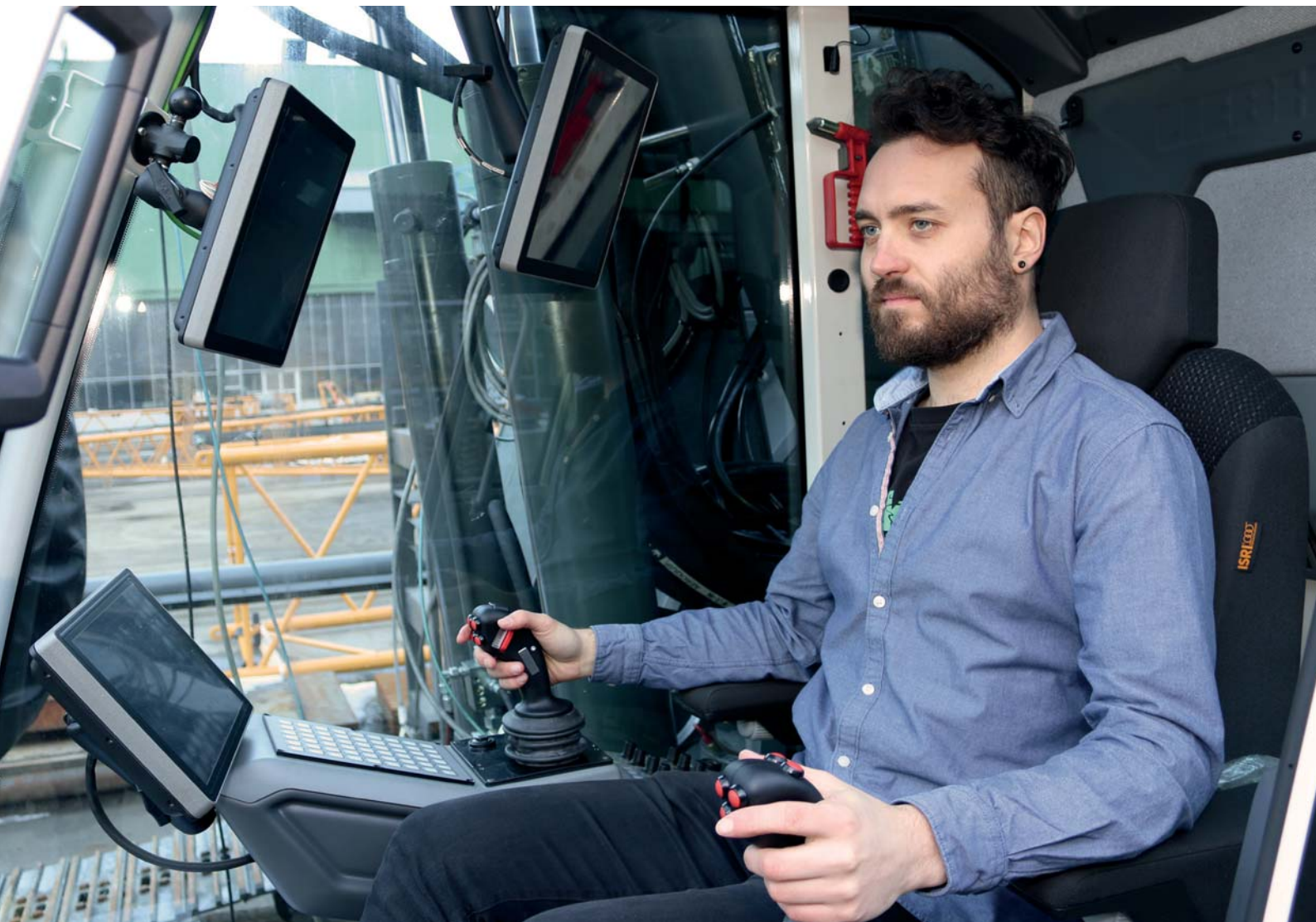
Obstacle Recognition

This system enables the timely recognition of obstacles in the soil during piling work, so protecting both the machine and the tools.

Automatic System for Vibro-Flotation

Automatic control of the hoist winch enables progressive extraction of the vibro-flot. This can be set depending on the vibro-flot's power consumption.

Operator Comfort



State-of-the-Art Cabin Equipment

The focus of Liebherr machines is on the operator. High operator comfort makes the handling of the deep foundation machines and duty cycle crawler cranes considerably easier. The innovative design of the cabin sets new standards in the construction industry regarding ergonomics, interior fittings and air conditioning. Furthermore, the optimum view from the cabin allows for precise and safe operation.

Ergonomic Cabin Design

An orthopaedic operator's seat with automatic adjustment is installed in the cabin as a standard and is a health-conscious contribution to the daily routine of the operator. Furthermore, it can be heated or cooled as required.

All operating elements including redesigned joysticks and dashboards, as well as pedals, are ergonomically arranged and allow for precise control of all machine movements.

Modern Air Conditioning System

The new cabin distinguishes itself with a well thought out air conditioning system, which is fitted directly in the cabin and electrically powered. Therefore, it is no longer dependent on energy from the engine. The heat output is taken from the available warm water.

Thanks to an optimized circuit, the air conditioning is extremely energy-saving. The airflow of the air conditioning is also optimized: the airstreams run above the ceiling area and the windscreen and are, therefore, unnoticed by the operator.

Clear Field of Vision

Safety on site is Liebherr's highest priority - an unobstructed and extensive view from the cabin is an important prerequisite. Through optimization of the field of vision, the new cabin ensures unobstructed views in all working areas.

A standard sliding window and sunshade serve as additional features for improving comfort.

Interior Equipment

Not only a cooler for provisions, but also storage space, work surfaces, a storage box for a cell phone and a USB connection are situated directly next to the operator.



Air Conditioning

The complete air conditioning is installed in the cabin and is electrically powered.



Unobstructed View

An unrestricted view from the cabin contributes to the safe operating of the machine.



Fuel Costs Matter



A Decisive Factor for the Purchase of a Liebherr Machine

The newest Liebherr drive and control systems offer several optional features that help to reduce fuel consumption and maximize the reliability and productivity of duty cycle crawler cranes as well as piling and drilling rigs.

Increased Power Through Engine Functions

Downsizing of the Engine

Thanks to the machine's optimized hydraulic system the size of the primary source can be reduced without negative effects on the turnover. The efficiency is thus significantly increased while the fuel consumption is decreased.

In the new duty cycle crawler crane HS 8130 HD, for instance, the engine power has been reduced to 505 kW compared to 670 kW in the preceding model.

Engines of the Latest Generation

Deep foundation machines are fitted with Liebherr's own diesel engines. All diesel engines complying with Stage IV/TIER 4f have a limited maximum speed of only 1,700 rpm. This contributes to fuel savings of approximately 5% compared to previous engines.



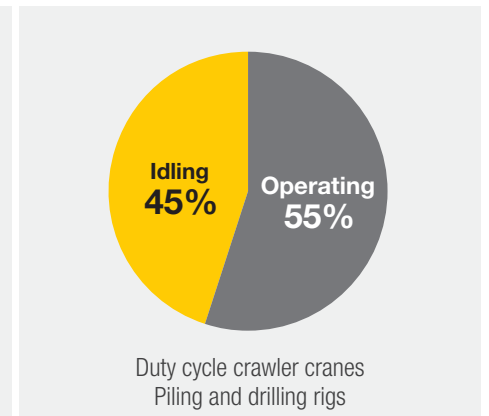
Automatic Engine Stop Control

The engine switches off automatically during longer work interruptions after having checked certain system functions. These include the actual charge level of the battery, the operating temperature of the engine as well as the control that all machine functions are deactivated. This saves fuel and reduces emissions. At the same time the machine has fewer operating hours, thus increasing its residual value, extending both its warranty and the maintenance intervals.



Eco-Silent Mode

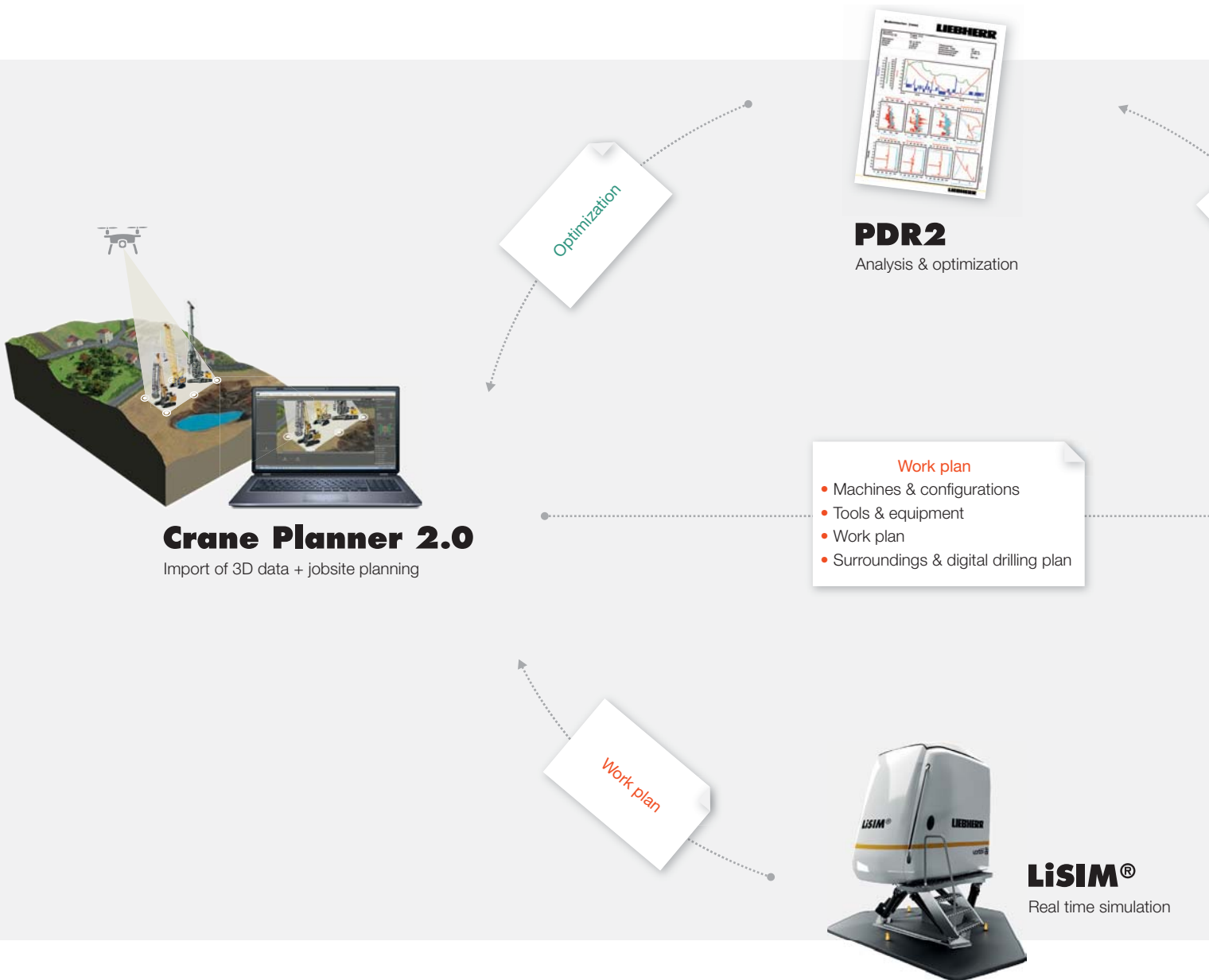
With the aid of this function the engine speed is reduced to a required predefined level. Hence, a notable reduction in diesel consumption can be achieved without any impact on operational output. As a further benefit, noise is also reduced by the Eco-Silent Mode.



Lower Engine Speed While Idling

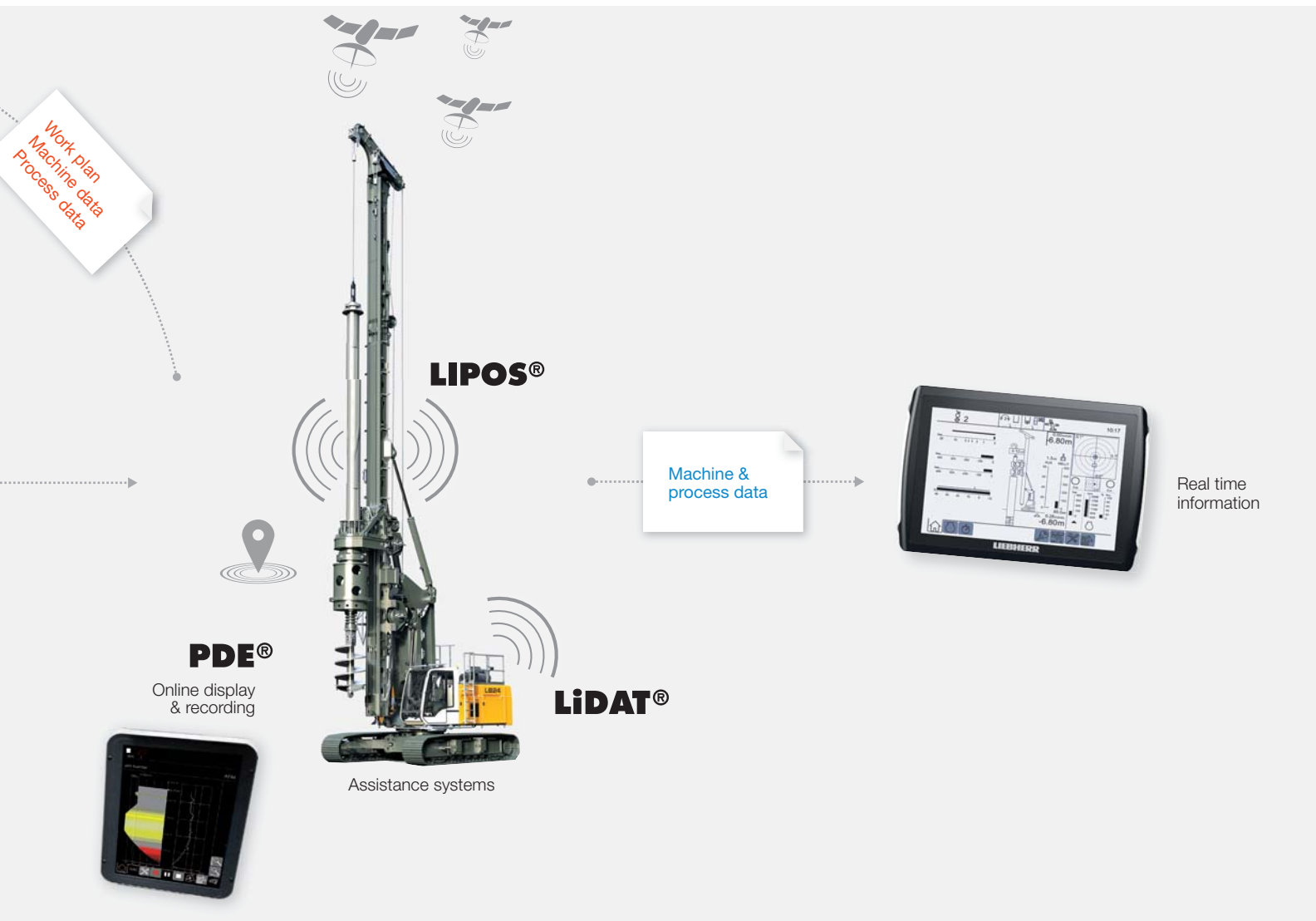
Deep foundation machines and duty cycle crawler cranes are in idling mode for 45% of their operating time. With the lowering of the engine speed from 950 rpm to 750 rpm while the machine is in idling mode, up to two litres of fuel per hour can be saved.

IT Solutions



Digitization on the Construction Site of Tomorrow

Liebherr-Werk Nenzing GmbH has set itself the goal of optimizing the processes carried out on the job-site through networking. In the progression from an experienced machine manufacturer to a full-service provider Liebherr already has a number of IT solutions, which provide substantial support for all those involved in the construction site.



Crane Planner 2.0

The Crane Planner uses actual data in order to determine the ideal crane for the respective lifting job.

LiSIM®-Simulators

Highly developed simulators enable safe training under realistic conditions.

PDE®/PDR2

Process data recorded with PDE® are imported and summarized in a report by the Process Data Report software PDR2.

LIPOS®

Machines and working tools can be precisely and efficiently positioned on the jobsite using this positioning system.

Li DAT®

The data transmission system supplies information about the location and operation of the machine and so makes it possible to efficiently manage and optimally plan operation remotely.

Customer Service and Application Technology



Technical Services for all Requirements

Liebherr Customer Service aims to effectively help in maintaining Liebherr equipment at its best, and at the same time to assist customers in making full use of the benefits of a Liebherr machine.

Service Solutions for Added Value

Global Service Network

A tight network of service stations with highly qualified personnel ensures quick assistance at any time throughout the world. Permanent readiness for operation is a prerequisite for smooth and efficient application on the jobsite.

Preventive Measures

Liebherr offers a wide range of services tailor-made for all requirements. These include inspection and preventive maintenance programmes, routine service calls or full service contracts.

Optimization on the Jobsite

Practical Advice from Professionals for Professionals

The application of sometimes very complex technologies and the correct choice of equipment require special knowledge and practical experience. With the appropriate training in daily operations Liebherr can help to achieve excellent results.

Advice and Support

Application specialists assist with the correct choice of application and the most suitable equipment in consideration of job-site conditions. Ideal machine configuration and application planning save both time and fuel as well as reduce repairs and downtimes.

High Quality and Availability

Original Spare Parts

Liebherr original spare parts (OEM) are optimally adapted to Liebherr machines and ensure high quality standards.

A comprehensive stock is held by various service centres throughout the world and a standardized distribution service ensures fast delivery to the customer.

Liebherr also recommends that a supply of critical spare parts be stored on-site. In combination with Liebherr technical training, this allows for minimum downtime of machines.

Technical Support

Liebherr's support team provides quick and reliable advice regarding machines and equipment. Specially trained technical advisers are available worldwide in order to ensure the high efficiency and availability of Liebherr machinery.



Reman Program and Retrofits

Liebherr offers three-stage reconditioning of components: from repair to general overhaul and exchange. Retrofit packages are also available to improve economy and comfort, to adapt to new requirements or to further extend the machine's service life.

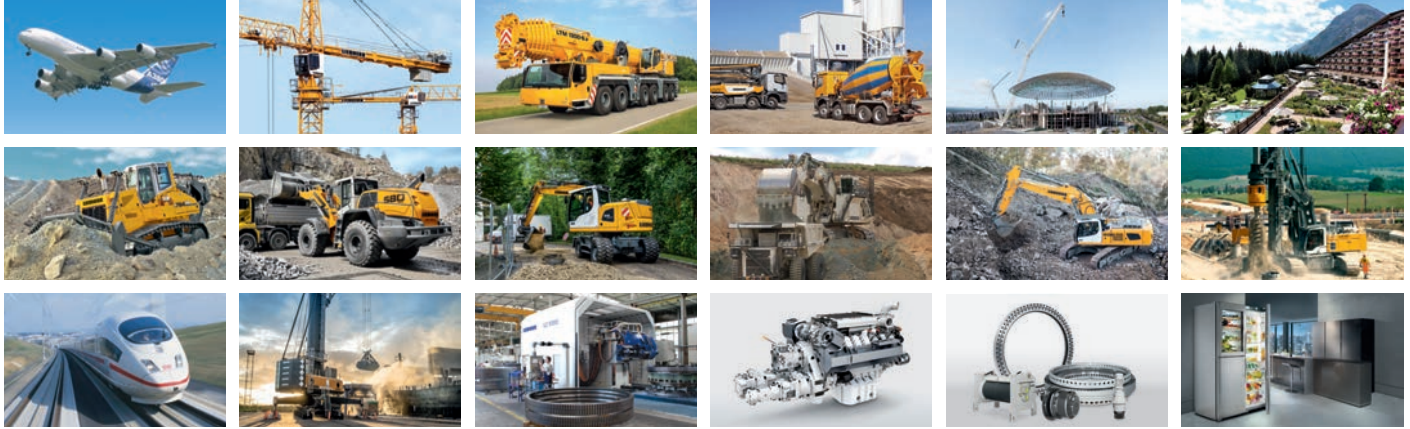


Application Technology

Practical advice from experienced specialists regarding machine configuration, geological conditions or environmental requirements, as well as the communication of new technological features, aim at achieving optimum results and ensuring high operative safety for customers.



The Liebherr Group of Companies



Wide Product Range

The Liebherr Group is one of the largest construction equipment manufacturers in the world. Liebherr's high-value products and services enjoy a high reputation in many other fields. The wide range includes domestic appliances, aerospace and transportation systems, machine tools and maritime cranes.

Exceptional Customer Benefit

Every product line provides a complete range of models in many different versions. With both their technical excellence and acknowledged quality, Liebherr products offer a maximum of customer benefits in practical application.

State-of-the-art Technology

To provide consistent, top quality products, Liebherr attaches great importance to each product area, its components and core technologies. Important modules and components are developed and manufactured in-house, for instance the entire drive and control technology for construction equipment.

Worldwide and Independent

Hans Liebherr founded the Liebherr family company in 1949. Since that time, the enterprise has steadily grown to a group of more than 130 companies with over 41,000 employees located on all continents. The corporate headquarters of the Group is Liebherr-International AG in Bulle, Switzerland. The Liebherr family is the sole owner of the company.

www.liebherr.com