

Drilling Rig

LB 28-320

Litronic®

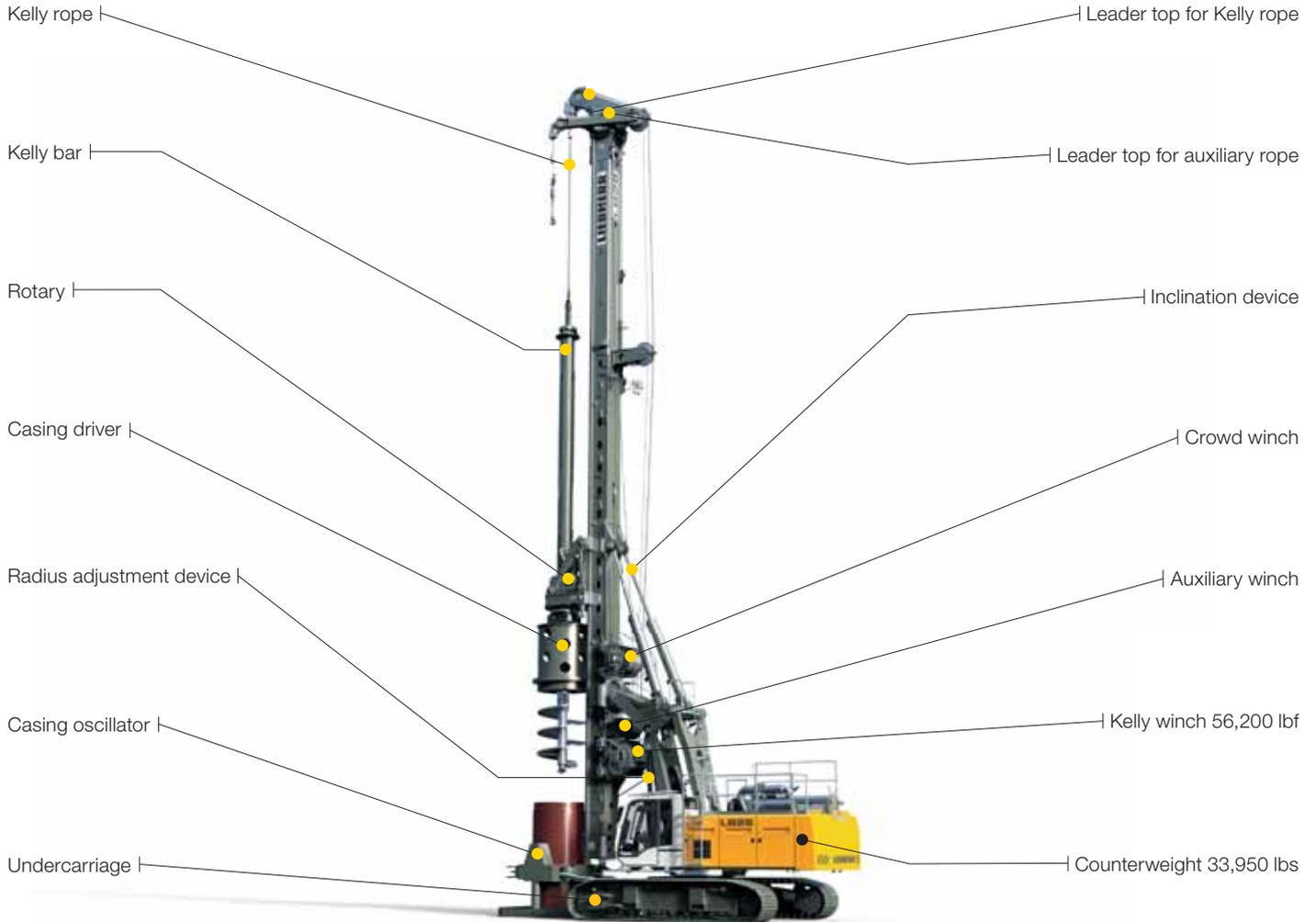
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LB 2004.05



LIEBHERR

Concept and characteristics



LB 28-320

The robust universal machine for a wide variety of applications:

- Kelly drilling
- Auger drilling
- Full displacement drilling
- Double rotary drilling

The solid undercarriage offers excellent stability and low ground bearing pressure.

The uppercarriage with its small swing radius enables operation in restricted space.

Parallel kinematics with a large working area allow to fold back the leader.

The rigid leader absorbs high torque and is fitted with a rope crowd system for high pull forces.

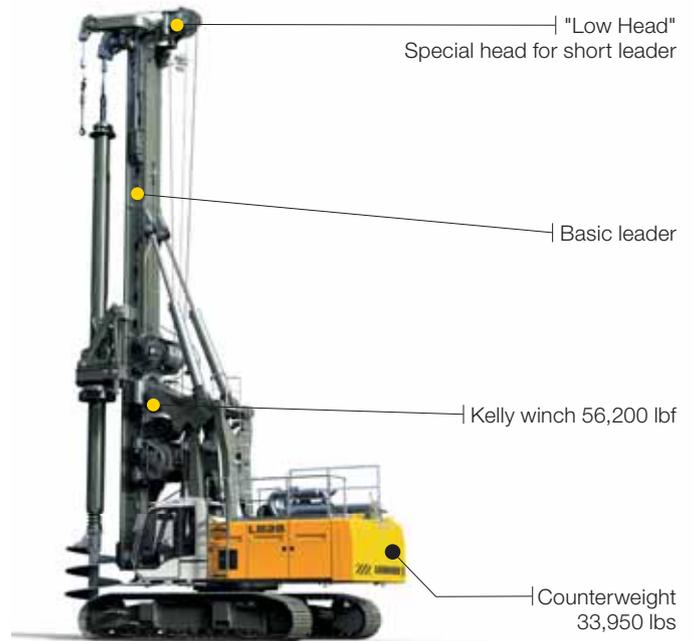
All winches are mounted on the leader, which provides a direct view of the main winch from the operator's cab.

The rotary drive of the BAT series combines exceptional torque with optimum operating comfort.

The powerful Liebherr diesel engine is low in emission and economical through SCR technology.



LB 28-320 with optional equipment



LB 28-320 Low Head

The Litronic control with assistance systems supports the operator:

- Cruise Control for the drilling process
- Joystick control for all machine functions
- Automatic shake-off function for working tools
- Leader inclination memory etc.

Sophisticated solutions provide safe operation and maintenance of the machine.

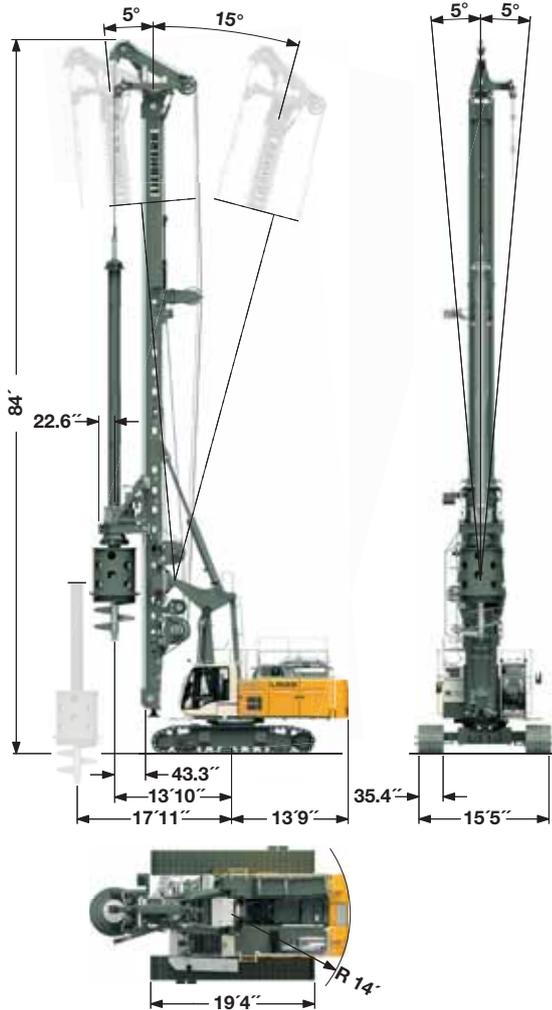
- Cab design for optimum visibility
- Acoustic and optic warning

- Walkways on the uppercarriage
- Safety rails on top of the uppercarriage
- Rear and side view cameras etc.

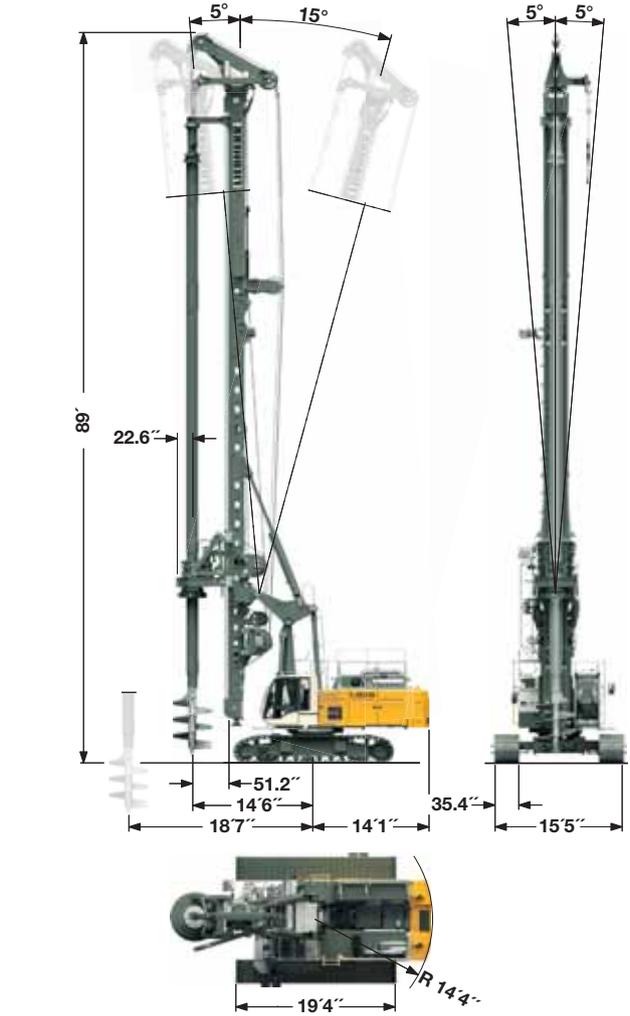
Liebherr Kelly bars feature strongly overlapping elements resulting in less wear.

Precise and robust Liebherr casings and drilling tools provide excellent drilling performance.

Dimensions



LB 28-320



LB 28-320 with optional equipment

Technical data LB 28-320

| | |
|---------------------------------------|-------|
| Total height | 84 ft |
| Continuous rig inclination adjustment | |
| Lateral inclination | ± 5° |
| Forward inclination | 5° |
| Backward inclination | 15° |

Operating weight LB 28-320

| | |
|---|-------------|
| Total weight with 31.5 inch 3-web shoes | 217,600 lbs |
| Total weight with 35.4 inch 3-web shoes | 218,920 lbs |

The operating weight includes the basic machine LB 28-320 (with rotary and Kelly bar MD 28/3/30) and 33,950 lbs counterweight, without equipment for casing oscillator.

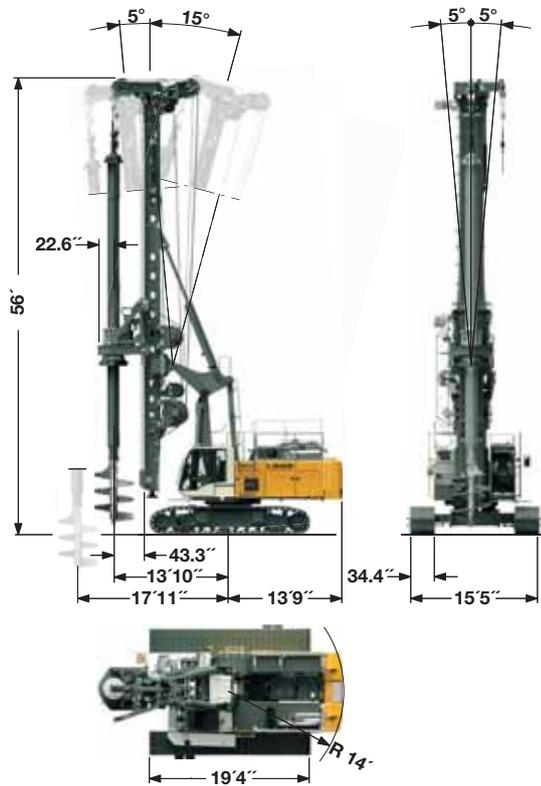
Technical data LB 28-320 with optional equipment

| | |
|---------------------------------------|-------|
| Total height | 89 ft |
| Continuous rig inclination adjustment | |
| Lateral inclination | ± 5° |
| Forward inclination | 5° |
| Backward inclination | 15° |

Operating weight LB 28-320 with optional equipment

| | |
|---|-------------|
| Total weight with 31.5 inch 3-web shoes | 233,910 lbs |
| Total weight with 35.4 inch 3-web shoes | 235,235 lbs |

The operating weight includes the basic machine LB 28-320 (with rotary and Kelly bar MD 28/4/54), extension of drilling axis (51.2 inch), leader extension (44.1 inch) and 37,920 lbs counterweight, without equipment for casing oscillator.



LB 28-320 Low Head

Technical data LB 28-320 Low Head

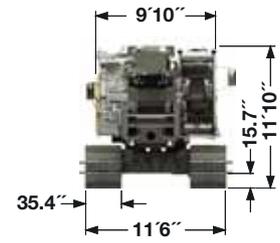
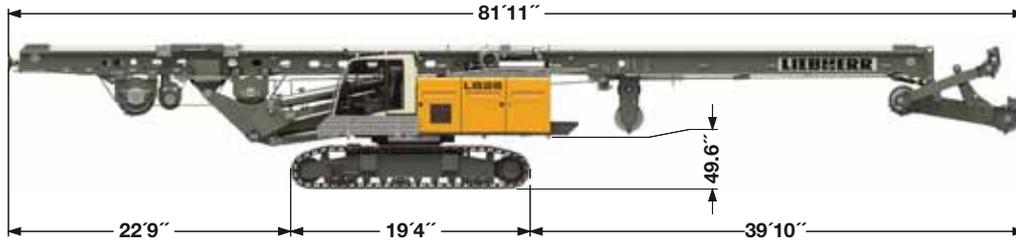
| | |
|---------------------------------------|-------|
| Total height | 56 ft |
| Continuous rig inclination adjustment | |
| Lateral inclination | ± 5° |
| Forward inclination | 5° |
| Backward inclination | 15° |

Operating weight LB 28-320 Low Head

| | |
|---|-------------|
| Total weight with 31.5 inch 3-web shoes | 208,780 lbs |
| Total weight with 35.4 inch 3-web shoes | 210,100 lbs |

The operating weight includes the basic machine LB 28-320 (with rotary and Kelly bar MD 28/3/24) and 33,950 lbs counterweight, without equipment for casing oscillator.

Transport dimensions and weights

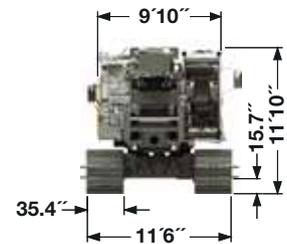
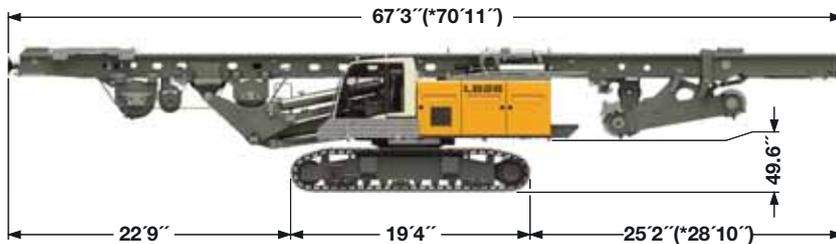


Transport standard

includes the basic machine (ready for operation) with leader, without working tools (such as rotary, Kelly bar etc.) and without counterweight.

Dimensions and weights

| | |
|---------------------------------------|-------------|
| Length | 81.9 ft |
| Weight complete without counterweight | 156,750 lbs |

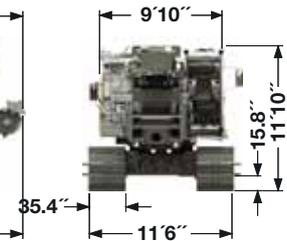


Transport option leader folded

includes the basic machine (ready for operation) with leader, without working tools (such as rotary, Kelly bar etc.) and without counterweight.

Dimensions and weights

| | |
|---------------------------------------|------------------------|
| Length | 67.2 ft |
| Weight complete without counterweight | (*160,940) 147,850 lbs |

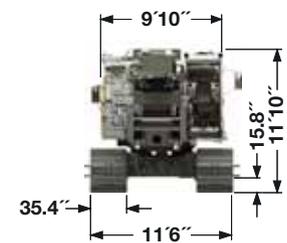
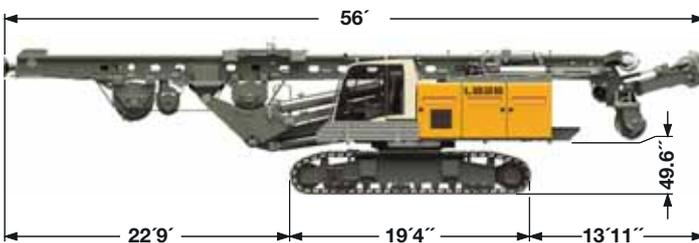


Transport with optional equipment

includes the basic machine (ready for operation) with leader, without working tools (such as rotary, Kelly bar etc.) and without counterweight.

Dimensions and weights

| | |
|---------------------------------------|-------------|
| Length | 86.3 ft |
| Weight complete without counterweight | 159,835 lbs |



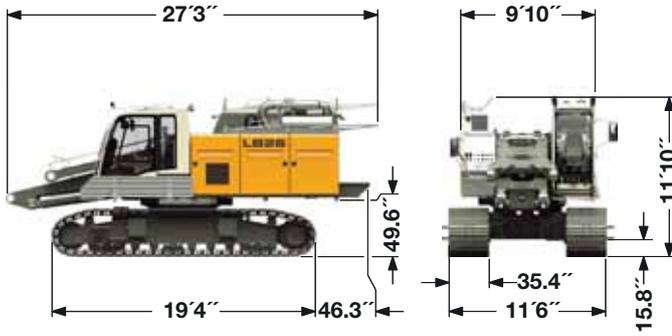
Transport Low Head

includes the basic machine (ready for operation) with leader, without working tools (such as rotary, Kelly bar etc.) and without counterweight.

Dimensions and weights

| | |
|---------------------------------------|-------------|
| Length | 56.0 ft |
| Weight complete without counterweight | 149,915 lbs |

*) Dimensions for machines with optional equipment

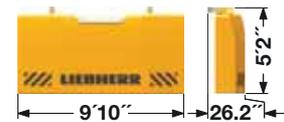


Transport basic machine

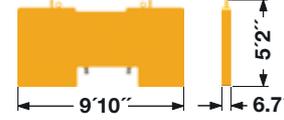
without counterweight.

Transport weight ————— 97,000 lbs

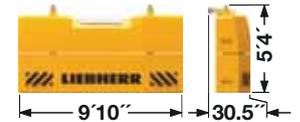
Counterweight I



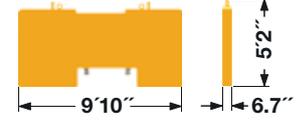
Counterweight II



Counterweight I



Counterweight II



Counterweight (standard)

Counterweight I — 22,490 lbs

Counterweight II — 11,465 lbs

Counterweight (optional equipment)

Counterweight I · 2x 13,230 lbs

Counterweight II — 11,465 lbs



Rotary (standard)

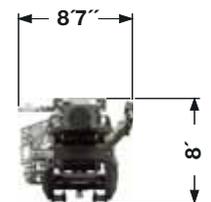
Transport weight

BAT 320 ————— 15,215 lbs

Rotary (optional equipment)

Transport weight

BAT 320 ————— 15,875 lbs



Transport leader

includes the leader without working tools (such as rotary, Kelly bar etc.)

Dimensions and weights

Length ————— (*86.3) 81.9 ft

Weight complete ————— 59,745 lbs

Weight complete with optional equipment ————— 62,835 lbs

Lower part of the leader ————— 3,310 lbs

Upper part of the leader with leader top ————— 10,145 lbs

Weights can vary with the final configuration of the machine. The figures in this brochure may include options which are not within the standard scope of supply of the machine.

Rotary BAT 320 with shock absorber



Automatic gearbox for best operating comfort

- No stopping required to change gears
- No interruption of the drilling process
- Automatic torque adjustment
- Continuous optimization of speed
- Four electronically adjustable speed ranges

Highest availability through easy set-up

- No mechanical shift gearbox
- Higher availability thanks to less moving parts

- Less maintenance required
- No pressure lubrication necessary
- No interferences through defective lubrication pump
- Simplified hydraulics
- Lower risk of hydraulics leakages

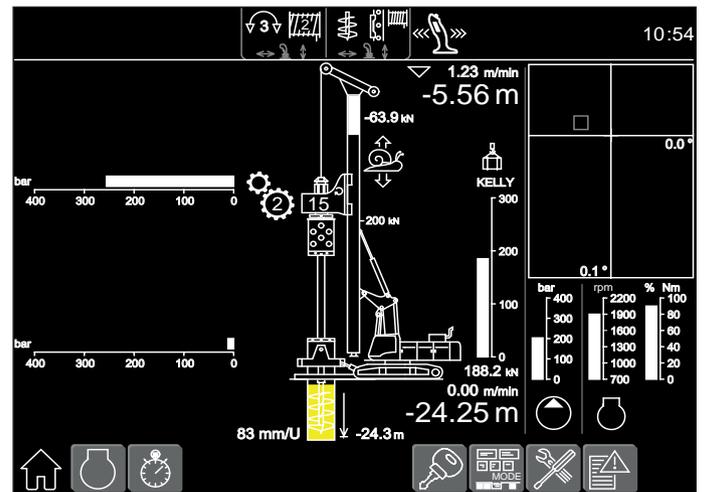
Flexibility through modular design

- Exchangeable drive adapters for use of other Kelly bars
- Exchangeable cardan joint for other casing drivers
- Quickly exchangeable equipment for other methods of operation



Kelly drilling

LB 28-320



Display for Kelly drilling

Technical data

Rotary drive - torque ————— 0 – 236,020 lbf-ft

Rotary drive - speed ————— 0 – 47 rpm

Performance data

Max. drilling diameter* ————— 6.2 ft uncased

Max. drilling diameter* ————— 4.9 ft cased

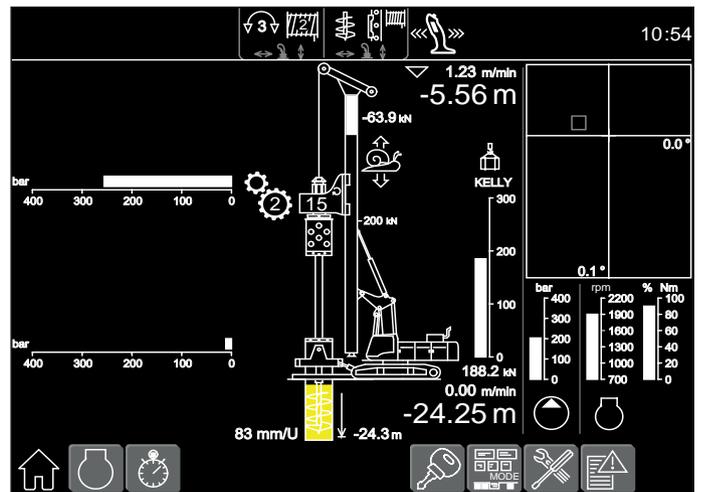
*) Other drilling diameters available on request
 Other Kelly bars available on request
 When using a casing oscillator, value X has to be reduced
 by 4.9 ft.

Kelly bars

| | A | X | Drilling depth | Weight | Kelly Ø |
|------------|------|------|----------------|--------|---------|
| | (ft) | (ft) | (ft) | (lbs) | (inch) |
| MD 28/3/24 | 32.4 | 36.7 | 75.2 | 11,025 | 16.1 |
| MD 28/3/27 | 35.7 | 33.5 | 82.0 | 12,125 | 16.1 |
| MD 28/3/30 | 39.0 | 30.2 | 91.9 | 13,010 | 16.1 |
| MD 28/3/33 | 42.3 | 26.9 | 101.7 | 14,110 | 16.1 |
| MD 28/3/36 | 45.5 | 23.6 | 111.5 | 14,995 | 16.1 |
| MD 28/4/36 | 37.6 | 31.8 | 111.5 | 16,086 | 16.1 |
| MD 28/4/42 | 42.5 | 26.9 | 131.2 | 17,860 | 16.1 |
| MD 28/4/48 | 47.4 | 22.0 | 150.9 | 19,845 | 16.1 |
| MD 28/4/54 | 52.3 | 17.1 | 170.6 | 21,605 | 16.1 |
| MD 28/4/60 | 57.3 | 12.1 | 190.3 | 23,590 | 16.1 |
| MD 28/4/66 | 62.2 | 7.2 | 210.0 | 25,575 | 16.1 |
| MD 28/4/72 | 67.1 | 2.3 | 229.7 | 37,340 | 16.1 |

Kelly drilling

LB 28-320 with optional equipment



Display for Kelly drilling

Technical data

| | |
|-----------------------|--------------------|
| Rotary drive - torque | 0 – 236,020 lbf-ft |
| Rotary drive - speed | 0 – 47 rpm |

Performance data

| | |
|-------------------------|----------------|
| Max. drilling diameter* | 7.5 ft uncased |
| Max. drilling diameter* | 6.6 ft cased |

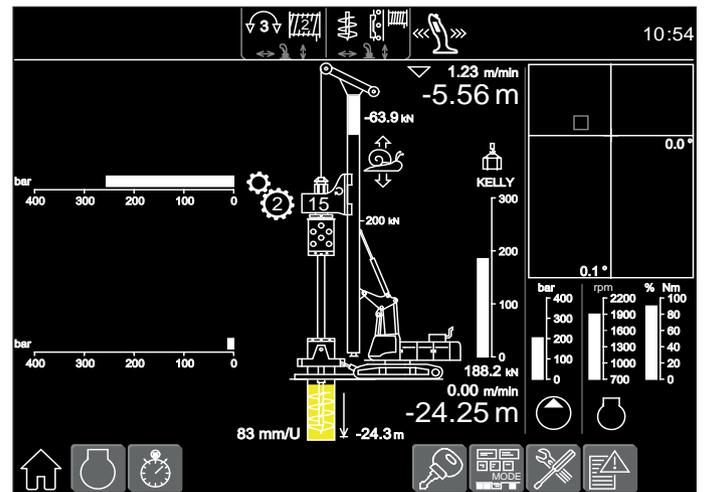
*) Other drilling diameters available on request
 Other Kelly bars available on request
 When using a casing oscillator, value X has to be reduced by 5.2 ft.

Kelly bars

| | A | X | Drilling depth | Weight | Kelly Ø |
|------------|------|------|----------------|--------|---------|
| | (ft) | (ft) | (ft) | (lbs) | (inch) |
| MD 28/3/24 | 32.4 | 41.0 | 72.2 | 11,025 | 16.5 |
| MD 28/3/27 | 35.7 | 37.7 | 82.0 | 12,125 | 16.5 |
| MD 28/3/30 | 39.0 | 34.4 | 91.9 | 13,010 | 16.5 |
| MD 28/3/33 | 42.3 | 31.2 | 101.7 | 14,110 | 16.5 |
| MD 28/3/36 | 45.5 | 27.9 | 111.5 | 14,995 | 16.5 |
| MD 28/4/36 | 37.6 | 36.1 | 111.5 | 16,095 | 16.5 |
| MD 28/4/42 | 52.5 | 31.2 | 131.2 | 17,860 | 16.5 |
| MD 28/4/48 | 47.4 | 26.2 | 150.9 | 19,845 | 16.5 |
| MD 28/4/54 | 52.3 | 21.3 | 170.6 | 21,605 | 16.5 |
| MD 28/4/60 | 57.3 | 16.4 | 190.3 | 23,590 | 16.5 |
| MD 28/4/66 | 62.2 | 11.5 | 210.0 | 25,575 | 16.5 |
| MD 28/4/72 | 67.1 | 6.6 | 229.7 | 27,340 | 16.5 |

Kelly drilling

LB 28-320 Low Head



Display for Kelly drilling

Technical data

| | |
|-----------------------|--------------------|
| Rotary drive - torque | 0 – 236,020 lbf-ft |
| Rotary drive - speed | 0 – 47 rpm |

Performance data

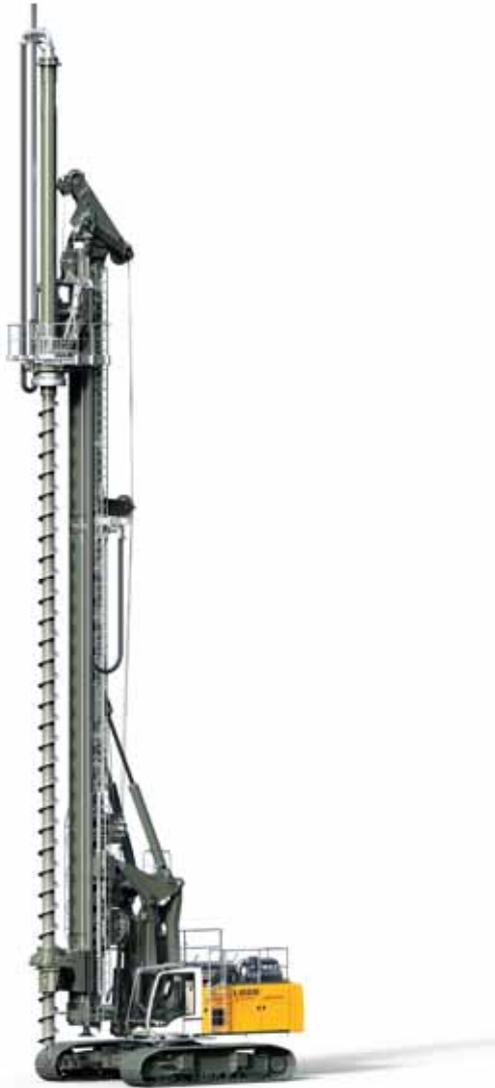
| | |
|-------------------------|----------------|
| Max. drilling diameter* | 6.2 ft uncased |
| Max. drilling diameter* | 4.9 ft cased |

Kelly bars

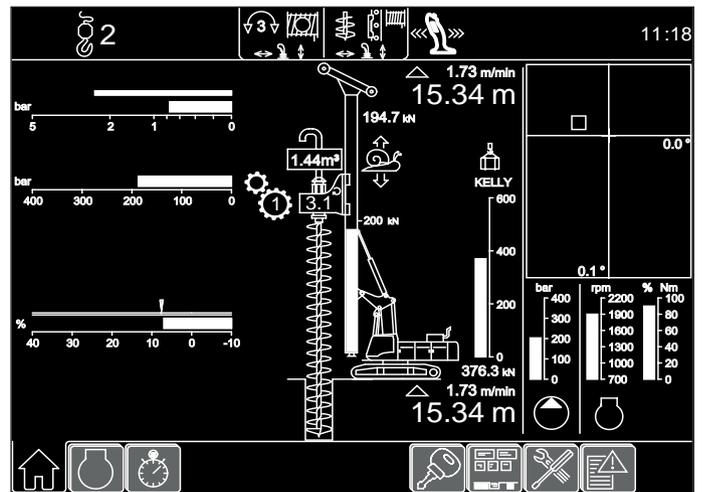
| | A | X | Drilling depth | Weight | Kelly Ø |
|------------|------|------|----------------|--------|---------|
| | (ft) | (ft) | (ft) | (lbs) | (inch) |
| MD 28/3/24 | 32.4 | 8.9 | 72.2 | 11,025 | 16.5 |
| MD 28/3/27 | 35.7 | 5.6 | 82.0 | 12,125 | 16.5 |

*) Other drilling diameters available on request
 Other Kelly bars available on request
 When using a casing oscillator, value X has to be reduced by 4.9 ft.

Continuous flight auger drilling



Auger with auger cleaner



Display for continuous flight auger drilling

Technical data

| | |
|-----------------------|--------------------|
| Rotary drive - torque | 0 – 236,020 lbf-ft |
| Rotary drive - speed | 0 – 47 rpm |

Performance data

| | |
|---|-------------|
| Drilling depth with auger cleaner* | 56.8 ft |
| Drilling depth with 26.2 ft Kelly extension without auger cleaner | 83.0 ft |
| Max. pull force (crowd winch and Kelly winch) | 202,330 lbf |
| Max. push force (weight of rotary and auger to be added) | 44,965 lbf |
| Max. drilling diameter** | 39.4 inch |

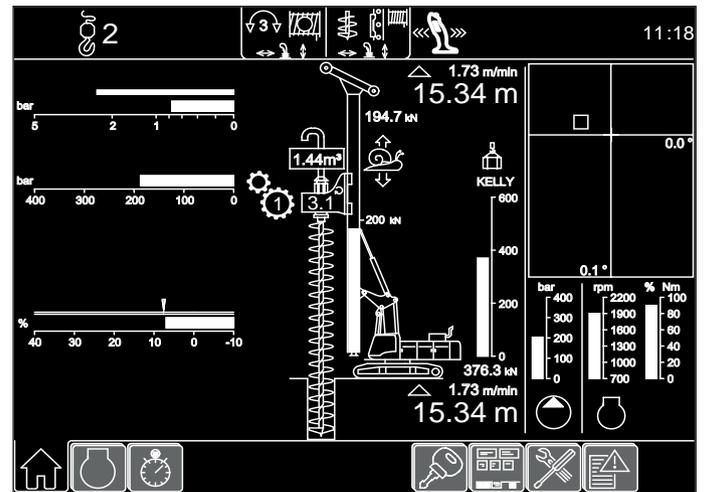
*) Without Kelly extension and without leader extension

**) Other drilling diameters available on request

Full displacement drilling



Full displacement tool with auger guide



Display for full displacement drilling

Technical data

| | |
|-----------------------|--------------------|
| Rotary drive - torque | 0 – 236,020 lbf-ft |
| Rotary drive - speed | 0 – 47 rpm |

Performance data

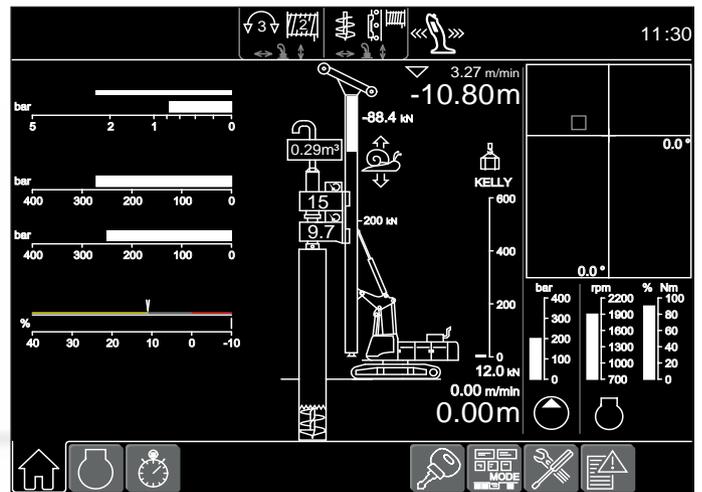
| | |
|--|-------------|
| Drilling depth* | 58.4 ft |
| Drilling depth with 26.2 ft Kelly extension | 84.6 ft |
| Max. pull force (crowd winch and Kelly winch) | 202,330 lbf |
| Max. push force (weight of rotary and drilling tool to be added) | 44,965 lbf |
| Max. drilling diameter** | 23.6 inch |

*) Without Kelly extension

**) Other drilling diameters available on request

Double rotary drilling

Model DBA 200



Display for double rotary drilling

Technical data

| | | |
|--------------------------|-------------|--------|
| Rotary drive I - torque | 0 – 154,888 | lbf-ft |
| Rotary drive I - speed | 0 – 17 | rpm |
| Rotary drive II - torque | 0 – 77,444 | kNm |
| Rotary drive II - speed | 0 – 37 | rpm |

Performance data

| | |
|-------------------------|-------------|
| Max. drilling diameter* | 29.5 inch |
| Max. drilling depth** | 58.4 ft |
| Max. pull force | 202,330 lbf |

*) Other drilling diameters available on request

**) Other drilling depths available on request

Technical description



Engine

Power rating according to ISO 9249, 390 kW (523 hp) at 1700 rpm
Engine type _____ Liebherr D 946 A7 - 04
Fuel tank _____ 185 gal capacity with continuous level indicator and reserve warning
Engine complies with 97/68 EC Stage IV and NRMM exhaust certification EPA/CARB Tier 4f.



Hydraulic system

The main pumps are operated by a distributor gearbox. Axial piston displacement pumps work in open circuits supplying oil only when needed (flow control on demand).
The hydraulic pressure peaks are absorbed by the integrated automatic pressure compensation, which relieves the pump and saves fuel.

Pumps for working tools _____ 2x 92.5 gal/min
Separate pump for kinematics _____ 47.5 gal/min
Hydraulic oil tank _____ 211 gal
Max. working pressure _____ 5076 PSI

The cleaning of the hydraulic oils occurs via an electronically monitored pressure and return filter.
Any clogging is shown on the display in the cab.
The use of synthetic environmentally friendly oil is also possible.



Crawlers

Propulsion through axial piston motor, hydraulically released spring loaded multi-disc brake, maintenance-free crawler tracks, hydraulic chain tensioning device.

Drive speed _____ 0 – 1.15 mph
Track force _____ 153,095 lbf
Width of 3-web grousers (option 31.5 inch) _____ 35.4 inch



Swing

Consists of triple-row roller bearing with external teeth and two swing drives, fixed axial piston hydraulic motor, spring loaded and hydraulically released multi-disc holding brake, planetary gearbox and pinion.
Selector for 3 speed ranges to increase swing precision.
Swing speed from 0 – 2 rpm is continuously variable.



Noise emission

Noise emissions correspond with 2000/14/EC directive.
Guaranteed sound pressure level L_{PA} in the cabin _____ 76.5 dB(A)
Guaranteed sound power level L_{WA} _____ 112 dB(A)
Vibration transmitted to the hand-arm system of the machine operator _____ < 8.20 ft/s²
Vibration transmitted to the whole body of the machine operator _____ < 1.64 ft/s²



Control

The control system – developed and manufactured by Liebherr – is designed to withstand extreme temperatures and the many heavy-duty construction tasks for which this machine has been designed. Complete machine operating data are displayed on a high resolution monitor screen. A GSM/GPRS telematics module allows for remote inquiry of machine data and operational conditions. To ensure clarity of the information on display, different levels of data are shown in enlarged lettering and symbols.

Control and monitoring of the sensors are also handled by this high technology system. Error indications are automatically displayed on the monitor in clear text. The machine is equipped with proportional control for all movements, which can be carried out simultaneously.

Two joysticks are required for operation. Pedal control can be changed to hand control.

Option:
PDE®: Process data recording



Kelly winch with freewheeling

Line pull effective (1st layer) _____ 56,200 lbf
Rope diameter _____ 34 mm
Line speed _____ 0-279 ft/min

Option:
Line pull effective (1st layer) _____ 64,445 lbf
Rope diameter _____ 34 mm
Line speed _____ 0-249 ft/min



Auxiliary winch

Line pull effective (1st layer) _____ 22,480 lbf
Rope diameter _____ 20 mm
Line speed _____ 0-292 ft/min



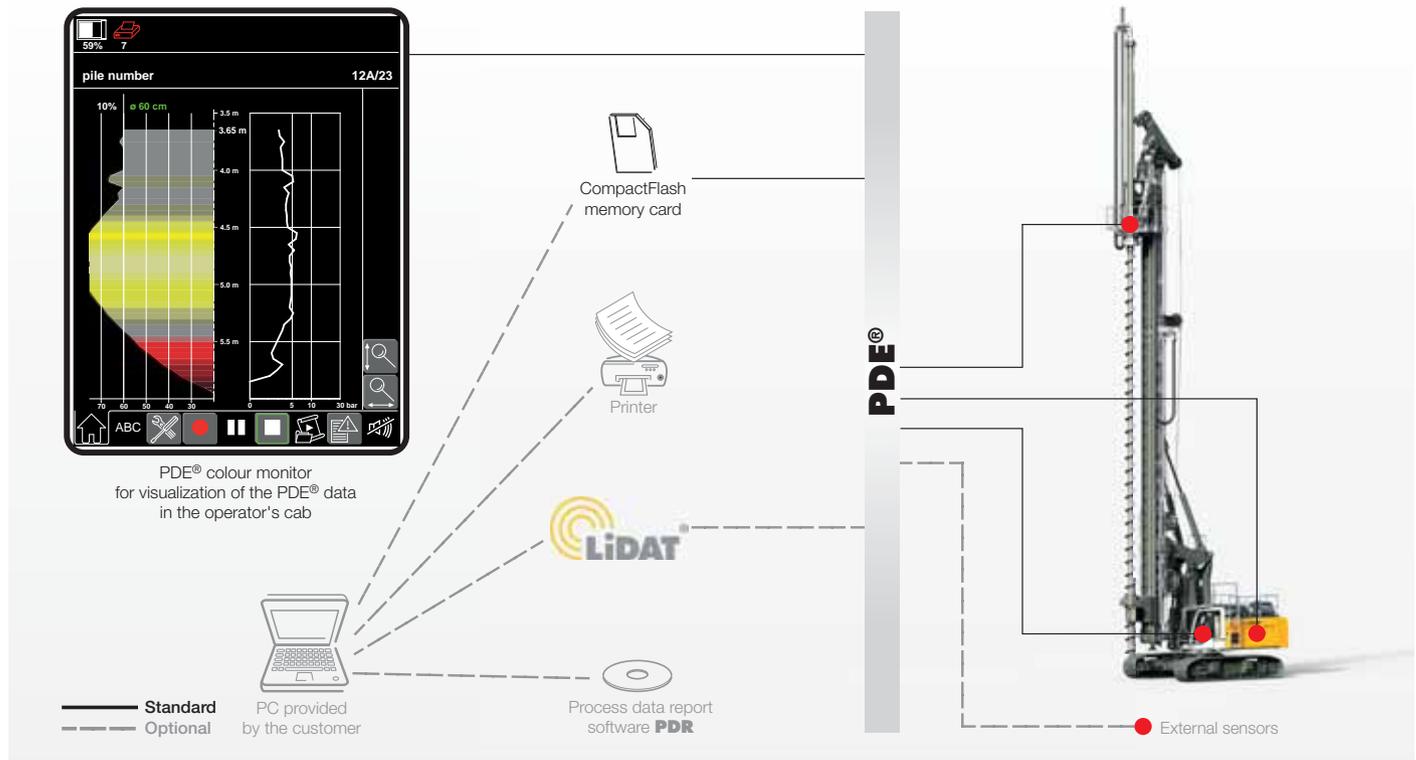
Rope crowd system

Crowd force push/pull _____ 89,925/89,925 lbf
Line pull (effective) _____ 44,965 lbf
Rope diameter _____ 28 mm
Travel with standard leader between mechanical limit stops, without extension _____ 60.7 ft
Line speed _____ 0-230 ft/min

The winches are noted for compact, easily mounted design. Propulsion is via a maintenance-free planetary gearbox in oil bath. Load support by the hydraulic system; additional safety factor by a spring-loaded, multi-disc holding brake. All line pull values are effective values. The efficiency factor of approx. 25% has already been deducted.

Process data recording system - PDE® (additional equipment)

The Liebherr process data recording system PDE® constantly records the relevant process data during the working process.



Depending on the application the recorded and processed data are displayed on the PDE® touchscreen in the operator's cab, e.g. in the form of an online cast-in-place pile.

At the same time the PDE® is operated using this touchscreen. The operator can enter various details (e.g. jobsite name, pile number, etc.) and start and stop recordings. A recording of every start-stop cycle carried out in the PDE® is established on a CompactFlash memory card.

The PDE® can be configured in a number of ways, e.g. for the connection of external sensors, for the generation of a simple protocol as graphic file and/or for a printout directly in the operator's cab.

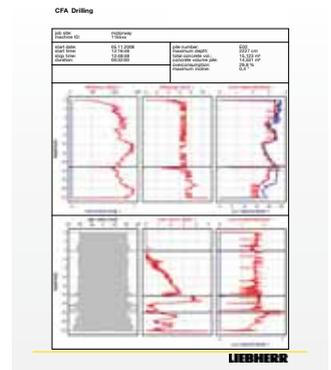
Process data reporting - PDR (additional equipment)

Comprehensive data evaluation and generation of reports on a PC is possible using the software PDR.

Recordings management - The recordings generated by the PDE® system can be imported and managed in PDR. The data can be imported directly from the CompactFlash card or via the Liebherr telematics system LiDAT. Certain recordings, e.g. for a particular day or jobsite, can be found using filter functions.

Viewing data - The data in each record is displayed tabularly. Combining several recordings provides results, for example, regarding the total concrete consumption or the average depth. Furthermore, a diagram editor is available for quick analysis.

Generating reports - A vital element of PDR is the report generator, which allows for the generation of individual reports. These can be printed out directly or stored as pdf files. In the process the size, colour, line thickness or even the desired logo can be configured. Moreover, the reports can be displayed in different languages, e.g. in English and in the national language.



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