LF™160 DRILL RIG AND FREEDOM™ LOADER

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BOART LONGYEAR™

LF™160 DRILL RIG

Boart Longyear has combined proven technology from its most popular surface coring drill rigs to create the powerful LF™160. When paired with the FREEDOM™ Loader, the LF160 combination is ideal for contractors who want to target sophisticated surface drilling exploration contracts that stipulate some of the highest safety standards, without compromising on productivity.

Totally hands free rod handling

The LF160 and FREEDOM Loader combination is one of the industry's first 100% hands-free rod handling solutions. No intervention from the driller's assistant is required to align and cycle the rods or connect the hoist plugs when operating the loader. All operations happen behind the control panel at the touch of a finger.

Optimal safety without compromising productivity

The FREEDOM Loader can cycle 6 meter rods in same amount of time as a manual cycle which means enhanced safety is achieved without compromising productivity.

Designed to today's rigorous CE standards

The LF160 and FREEDOM Loader combination adheres to all of today's rigorous CE standards.

Depth capacity

With up to 1,800 meters of NQ™ capacity, the LF160 can meet the demands of most diamond coring projects. The LF160 is efficient and economical on shallow hole drilling and can handle the majority of diamond coring needs.

INTRODUCING THE FREEDOM™ SERIES

Introducing Boart Longyear's FREEDOM™ series of rod loaders, handlers and presenters. Our cutting-edge range has been engineered with drillers' safety and productivity front-of-mind.

FREEDOM TO DRILL

The FREEDOM series is your best option for reducing the risk of hand and back injuries while handling rods.

FREEDOM TO MOVE

Using the FREEDOM Loader remote control enables you to work from a safer location, away from the risks of moving rods.

FREEDOM TO BID

Only the FREEDOM series complies with today's rigorous CE standards, so you will have the freedom to bid on jobs with some of the most stringent health and safety standards.

LF™160 DRILL RIG & FREEDOM™ LOADER

1. 100% HANDS-FREE ROD HANDLING

No intervention from the driller's assistant is required to trip and align the rods or connect to the top drive head when operating the Freedom™ Rod Loader. All operations happen behind the control panel at the touch of a finger.

2. TILTING TOP DRIVE HEAD

The forward tilting head design simplifies the rod handling process and reduces the need for operator intervention and maintenance.

3. CLAMPING AND BREAKING DEVICE

A hydraulic breaking device means no wrench under power. Rod alignment device and centralizer included.

4. CE CERTIFIED

The LF™160 is CE certified according to the latest EN16228 safety standards.

5. VISUAL WIRELINE

The wireline winch and sheaves are located in the front of the mast, inside the rotation barrier, for improved visibility.

6. DEPTH CAPACITY

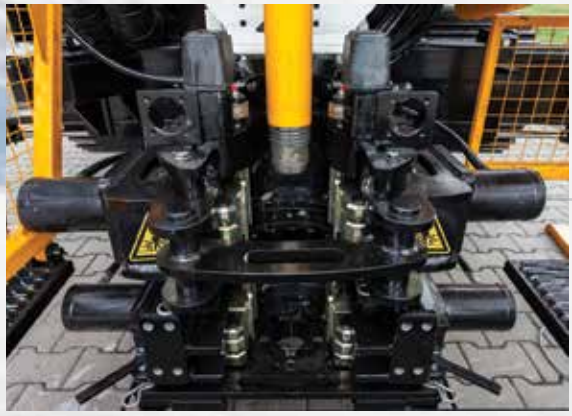
With up to 1,800 meters of NQ™ capability, the LF160 can cover the majority of diamond coring needs.

7. ENVIRONMENTALLY CONSCIOUS TIER 3 OR 4 ENGINE

Offered with either a Tier 3 or 4 final engine to comply with emissions requirements in every country.

8. VERSATILITY OF CARRIERS

The LF160 can be ordered in either a crawler or truck mount configuration. The truck mounting is compatible with International 6x4 and Mercedes 8x8 or 6x6 trucks.



Tilting Top Drive Head and Clamping Device

TOP FIVE FEATURES OF THE LF™160

1. Tilting Top Head Drive

The tilting top drive head simplifies rod handling with built-in tools and functionality.

The rod clamp attached to the head carriage is used to make and break joints at the drive sub with power from the head. You don't have to worry about inadvertently breaking a joint elsewhere in the string.

The floating spindle is spring loaded to provide just the right amount of tension or compression when threading rods. This will reduce thread wear and other issues associated with making rod joints.

The tilting function of the head allows for all joints to be made low to the ground where the driller has a clear and comfortable view of the joint. Tripping rods at a near horizontal angle is ideal for auxiliary equipment such as the FREEDOM™ Loader.

Other benefits of the tilting top drive head include the elimination of the mainline hoist, hoisting plug and water swivel management.

2. Foot Clamping and Breaking Device

The foot clamp and breaking device is four tools built into one.

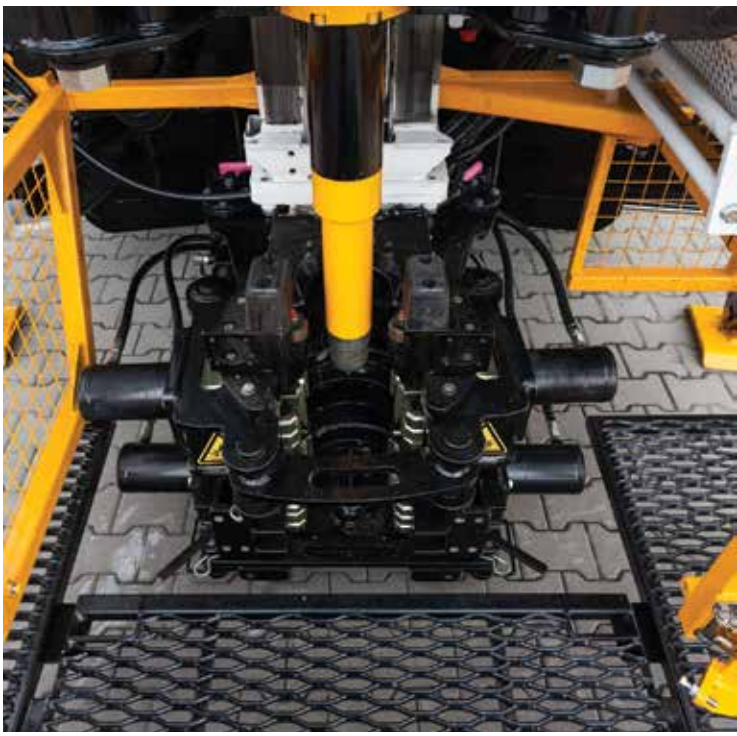
The lower ower rod clamp is a fixed clamp that is used to hold the rod string in a traditional manner.

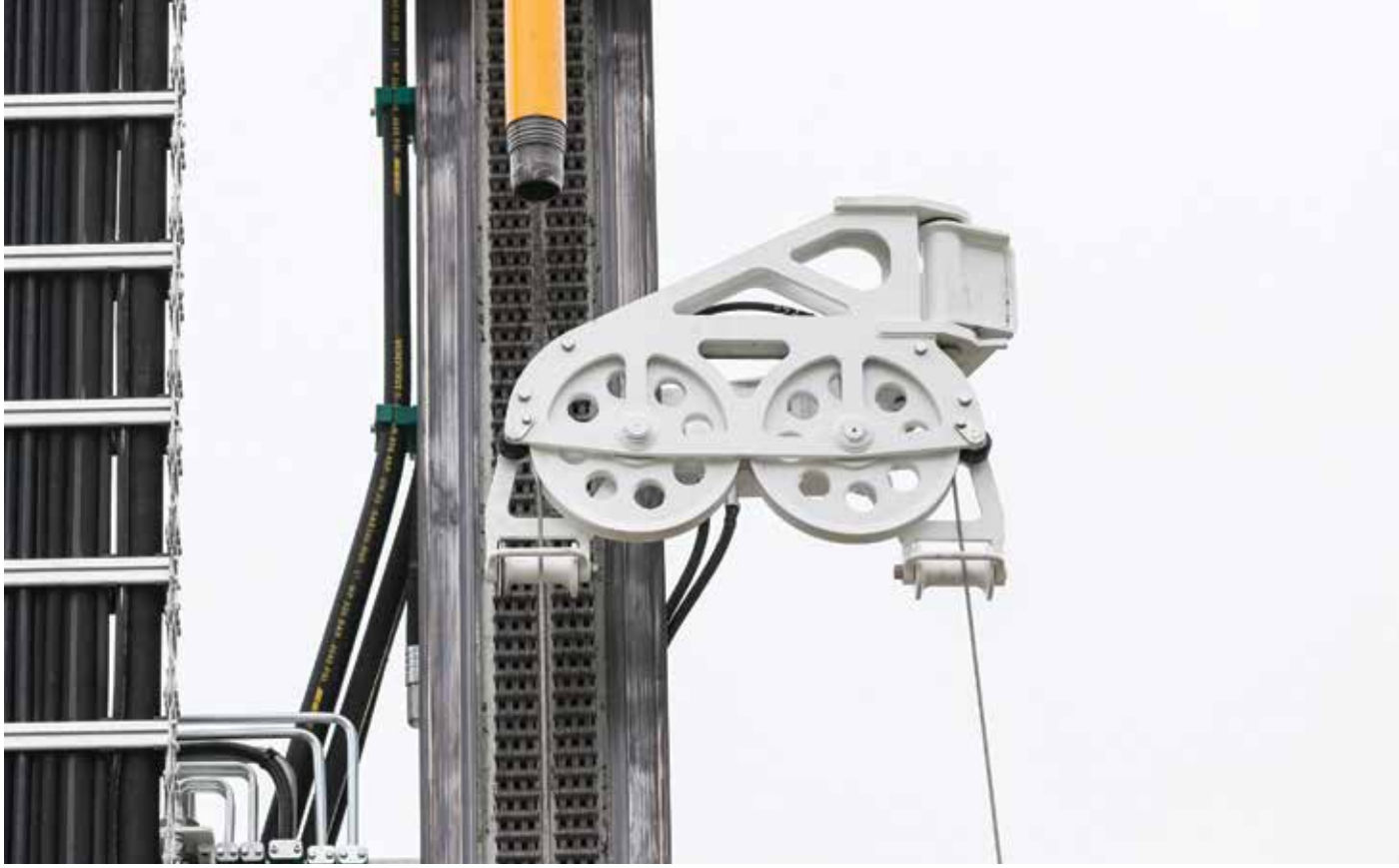
The upper rod clamp performs the same job but also rotates, and is intended to break joints positioned between the two clamps.

A rod making alignment device is located above the top clamp. This alignment device is critical to facilitate hands free rod handling. When adding a new rod, this alignment device will center the top rod with the rod already in the hole, ensuring a clean stab and thread start.

The rod centralizer, mounted under the bottom clamp, keeps the rod string centered in the drill line.

All four of these tools can be opened in the front allowing flexibility of tools to pass through as needed in special drilling conditions.





3. Visual Wireline

The wireline winch is located in front of the mast, inside the rotation barrier for improved visibility. The driller can monitor the wireline spooling from the control panel, avoiding tangling of wire rope typically experienced while lowering the overshot. The wireline sheaves are also easily seen from the driller's platform, keeping the entire wireline system within view.

4. Versatility of Carriers

The LF™160 can be ordered as either a crawler or truck mount configuration. Truck mounting is compatible with International 6x4 and Mercedes 8x8 or 6x6 trucks.

5. Driller Safety Features

The LF160 is CE certified (Machinery Directive 2006/42/EC) according to the latest EN16228 drill rig safety standards available.

The LF160 features a low noise engine and pumps, both of which are located far from drilling area and within an acoustic enclosure. Rotation Barrier with Interlocks, "Restricted Operation Mode" is engaged when barrier is open.

Dead-man buttons prevent unintentional function activation with accidental control lever movement.

LF™160 DRILL RIG TECHNICAL INFORMATION

Drilling Capacity*		
	Metric	**U.S.**
Diamond Core BQ™ / BRQ™ (BQ™ rod is rated to 1500 m depth)	2,100 m	6,900 ft
Diamond Core NQ™ / NRQ™ / NRQ™ W-Wall™	1,800 m	5,900 ft
Diamond Core HQ™ / HRQ™ / HRQ™ W-Wall™	1,250 m	4,100 ft
Diamond Core PQ™ / PHD / PHD W-Wall™	700 m	2,300 ft

*The figures in this table have been calculated using torque and pulling capacity of the head with a fluid filled verticle hole and an effective rock tensile strength of 5 Mpa. Actual drilling results may vary and will be affected by in-hole tools, fluid level in the hole, subsurface conditions, drilling techniques, additives and equipment used.

Safety Design Standards and Highlights	
Design Standards	EN ISO 16228
CE Certification	Machinery Directive 2006/42/EC
Rod Handling	Hands Free when used with compatable Rod Loader
Interlocked Rotation Barrier	Restricted Operation Mode
Noise Level	LW(A)=112 dB / Lp(A)=89 dB
Other Safety Feature	No uncontrolled movement after a restart or Mode switch, Safety Cage, Deadman Buttons, Mode-switches, Emergency Stops, Head Rod Clamp, Breaking device, Beepers during tramming and more.

Prime Mover		
	Metric	**U.S.**
Engine (option)	Deutz TCD 6.1 L06 Diesel Engine Turbocharged, intercooled, 6.1 L displacement, inline 6 cylinder.	
Emmissions compliance	EU Stage IV	EPA Tier 4 Final
Fuel	Diesel	
Fuel Consumption @ Full Power	40 L/hr	10.5 gal/hr
Maximum Power @ 2300 RPM	170 kW	231 HP
Electrical Voltage	24 V	
Recommended max altitude of operation	2,000 m	6,560 ft

Prime Mover (continued)		
Engine (option)	DEUTZ TCD 2013 L06 4V Diesel Engine Turbocharged, intercooled, 7.2 L displacement, inline 6 cylinder.	
Emmissions compliance	EU Stage IIIA	EPA Tier 3
Fuel	Diesel	
Fuel Consumption @ Full Power	55 L/hr	14.5 gal/hr
Maximum Power @ 2000 RPM	227 kW	304 HP
Electrical Voltage	24 V	
Recommended max altitude of operation	4,500 m	14,760 ft
Fuel Tank Capacity	500 L	132 gal

Prime Mover (continued)		
Engine (option)	CUMMINS QSB 6.7 Diesel Engine Turbocharged, intercooled, 6.7 L displacement, inline 6 cylinder.	
Emmissions compliance	EU Stage IV	EPA Tier 4 Final
Fuel	Diesel	
Fuel Consumption @ Full Power	48.5 L/hr	12.8 gal/hr
Maximum Power @ 2000 RPM	194 kW	264 HP
Electrical Voltage	24 V	
Recommended max altitude of operation	3,300 m	10,800 ft

Hydraulic System		
	Metric	**U.S.**
Primary Pump	Axial Piston Pump with Power Regulator, Load Sensing and Pressure Requlator	
Maximum Flow, Q1	250 L/min	66 gal/min
Maximum Flow, Q2	195 L/min	51 gal/min
Maximum Pressure	300 bar	4,300 psi
Auxilairy Pumps	2 x Gear Pumps	
Flow Q3	43 L/min	11.3 gal/min
Flow Q4	36 L/min	9.5 gal/min
Hydraulic Oil Tank Capacity	600 L	158 gal
PTO1	35 L/min @ 200 bar	9.25 gal/min @ 2,900 psi

Rotary Head		
	Metric	**U.S.**
Model	Boart Longyear™ LCH20	
Configuration	Top Drive, floating spindle, tilt-out with rod clamps	
Number of Gear Speeds	2 Speeds	
Ratio 1st Gear	13.22:1	
Ratio 2nd Gear	3.23:1	
Head fine RPM control	Motor displacement adjustment	
High Speed Torque @ RPM	0.92 kNm @ 1,050 RPM 1.63 kNm @ 590 RPM	678 ft-lbf @ 1,050 RPM 1,202 ft-lbf @ 590 RPM
Low Speed Torque @ RPM	3.75 kNm @ 255 RPM 6.65 kNm @ 145 RPM	2,183 ft-lbf @ 255 RPM 4,912 ft-lbf @ 145 RPM
Head Lubrication Pump	Speed Dependent. Driven by head rotation.	
Head Lubrication Flow	17 L/min @ 1000 rpm	4.5 gal/min @ 1000 rpm
Floating Spindle: Inside Diameter	25 mm	1 in
Floating Spindle: Floating Distance	120 mm	4.7 in
Tilt-out head	90°	90°
Head Mounted Rod Clamp Extension Distance	840 mm	33 in

Undercarriage Mount		
	Metric	**U.S.**
Type	20 ton - class	
Crawler Width	500 mm	19.7 in
Crawler Track Type	Steel, 3 rib grouser plate	
Max Driving Speed in (Low l High) gear	2 km/h l 4 km/h	1.25 mph l 2.5 mph
Maximum Grade (without support winch)	20º	

Truck Mount	
International	7600 - 6x4 (with Pusher axle)
Mercedes ACTROS	4143 AK 8x8
Mercedes ACTROS	3343 AK 6x6 (6x4)

Rig Controls	
Drilling Controls	Pilot Hydraulic
Drilling Control Panel	2 point positioning adjustment / height adjustable
Crawler Tramming Controls	Radio Remote Control
Digital Drilling Data Display	Weight on Bit / Head-rpm / Mud Flow / Wireline Depth
Hose Management	Energy Chain

Mud Pump		
Pump Type (option)	FMC W1122 Triplex Piston Pump	
Valve Type	Ball Valves	
Flow	130 L/min	35 gal/min
Pressure	70 bar	1,000 psi

Mud Pump - continued		
Pump Type (option)	FMC L1118 Triplex Piston Pump	
Valve Type	Ball Valves	
Flow	112 L/min	30 gal/min
Pressure	83 bar	1,200 psi

Rod Clamping/Breaking Systems		
	Metric	**U.S.**
Maximum Clamp Diameter	178 mm	7 in
Clamping Range	60 mm - 178 mm	2.4 in - 7 in
Type	Hydraulically Closed / Hydraulically Opened	
Power Failure Protection	Valved Accumulators	
Maximum Holding Force (adjustable)	196 kN	44,000 lbf
Maximum Break Out Torque	20 kNm	14,750 ft-lbf
Centralizer Sizes	BQ™, NQ™, HQ™, PQ™, PW (other size available)	
Clamp Jaw Style	Floating 2.5 mm - Coring Jaws	
Rod Making Alignment Device	60 mm - 178 mm	2.4 in - 7 in

Drill Mast and Feed System		
	Metric	**U.S.**
Drill Mast Feed Method	Chain and Hydraulic Cylinder	
Drill Mast Length	9 m	29 ft 6 in
Feed Stroke Length	6.7 m	22 ft
Super Fast Feed Up (up to 80 kN load)	76 m/min	249 ft/min
Fast Feed Up (over 80 kN load)	43 m/min	141 ft/min
Fast Feed Down	80 m/min	262 ft/min
Max Pull Down Force	90 kN	20,230 lbf
Max Pull Back Force	170 kN	38,200 lbf
Mast Dump	1.8 m	5 ft 11 in
Maximum rod pull length	6 m	20 ft
Drilling Inclination	45°- 90° (vertical down)	

Pressure Washer / Mist Pump		
	Metric	**U.S.**
Pump Model	Dynaset HPW200	
Flow	30 L/min	8 gpm
Pressure	200 bar	2,900 psi

Wireline		
	Metric	**U.S.**
Maximum pull on inner layer	9.7 kN @ 205 m/min	2,180 lbf @ 672 ft/min
Line Speed	up to 340 m/min	up to 1,115 ft/min
Cable Diameter	6 mm	0.24 in
Cable Capacity (6mm)	2,200 m	7,200 ft
Spooling device	Standard	
Max Lifting Capacity (for auxilliary use)	550 kg	1,200 lbs

Wireline Cleaner (air knife)		
	Metric	**U.S.**
Air Compressor Model	Dynaset HK 1000/12-35	
Compressor Type	Hydraulic Piston Compressor	
Max Flow	1,000 l/min @ 6 bar	264 gal/min @ 87 psi
Max Pressure	12 bar	174 psi

Rod Loader Power Supply		
	Metric	**U.S.**
Hydraulic PTO2 - Load Sensing	95 L/min @ 250 bar (200 L/min @ 120bar)	25 gal/min @ 3625 psi (53 gal/min @ 1740psi)
Electrical Supply	24 V	

Dimensions - Crawler Mount		
	Metric	**U.S.**
Weight (dry)	21,100 kg	46,520 lb
Width	2,430 mm	8 ft
Length	10,900 mm	35 ft 10 in
Height - road transport position	3,100 mm	10 ft 2 in
Width - container transport	2,250 mm	7 ft 5 in
Height - container transport	2,590 mm	8 ft 6 in

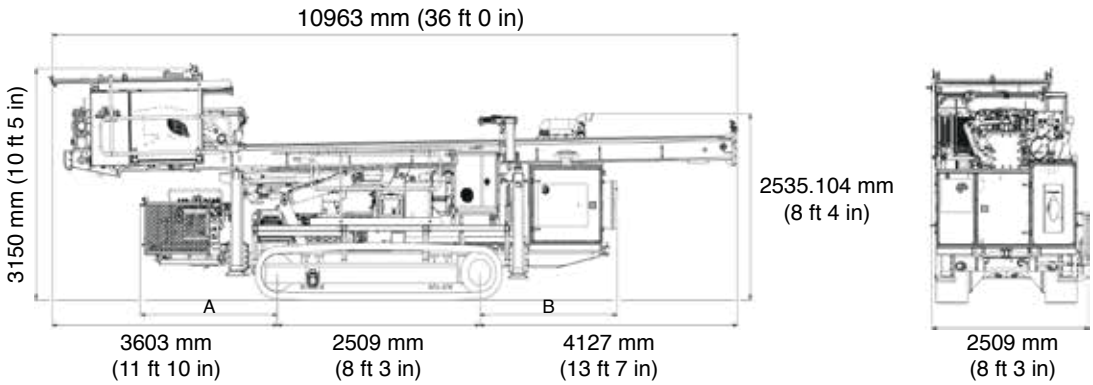
Dimensions - Truck Mount / Skid		
	Metric	**U.S.**
Weight (dry)	16,300 kg	36,000 lb
Width - Skid	2,490 mm	8 ft 2 in
Length - Skid	10,900 mm	35 ft 10 in
Height - Skid	3,250 mm	10 ft 8 in
Height - Road Transport (from Truck platform)	2,700 mm	8 ft 10 in
Length - Base Frame (for Truck Platform connection)	6,500 mm	21 ft 4 in
Width - Container Transport	2,250 mm	7 ft 5 in
Height - Container Transport	2,590 mm	8 ft 6 in

Dimensions - Job Site 90°		
LF™160 Crawler Mount with FREEDOM™ Loader	**Metric**	**U.S.**
Width	3,500 mm	11 ft 6 in
Length	17,000 mm	55 ft 10 in

Dimensions - Job Site 45°		
LF™160 Crawler Mount with FREEDOM™ Loader	**Metric**	**U.S.**
Width	3,500 mm	11 ft 6 in
Length	18,500 mm	60 ft 9 in

Measurements

Crawler Mount - Street Transportion

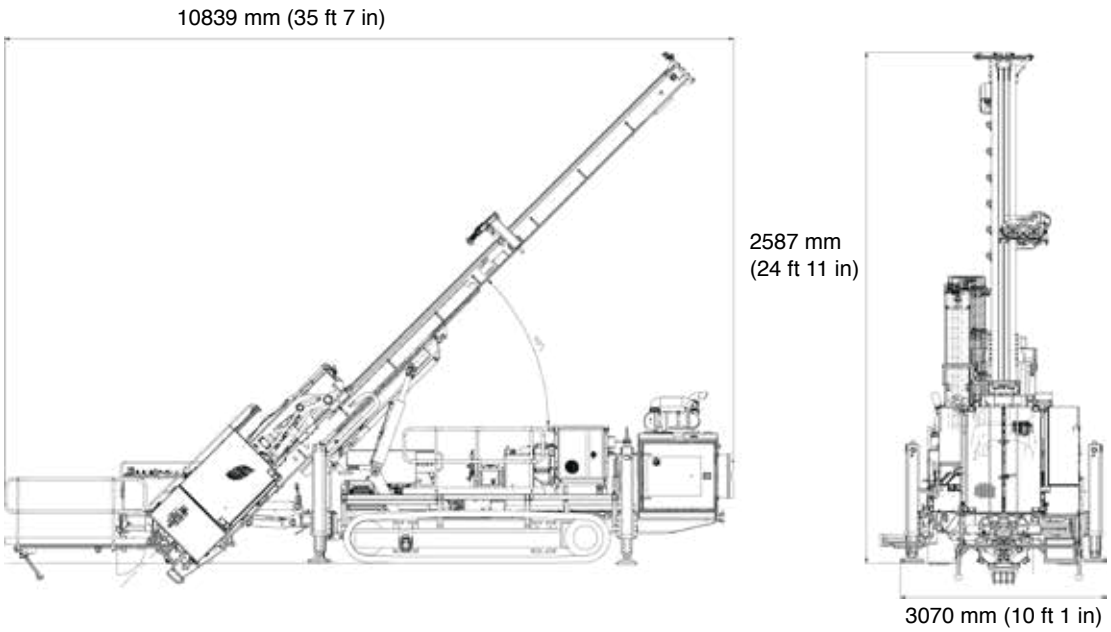


A = 2188 mm (7 ft 3 in)

B = 2203 mm (7 ft 3 in)

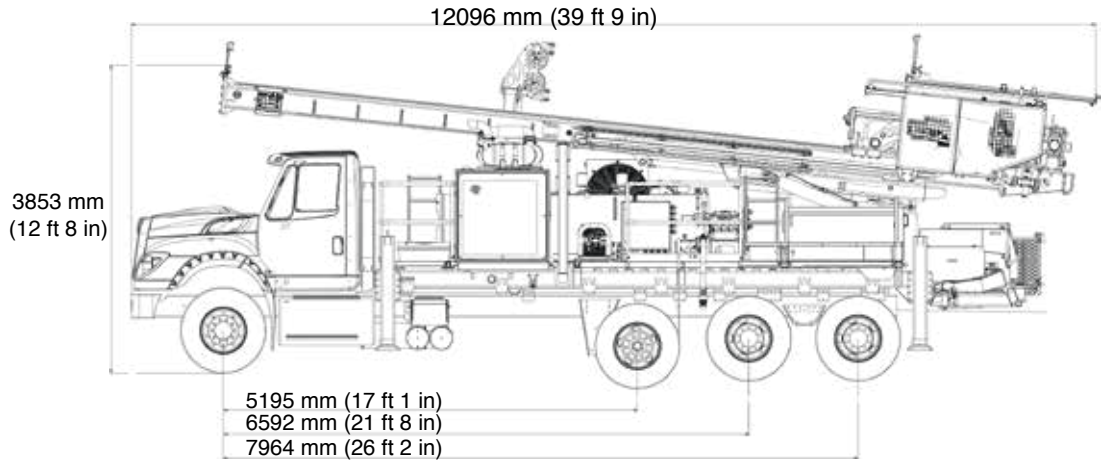
Measurements

Drilling at 45°



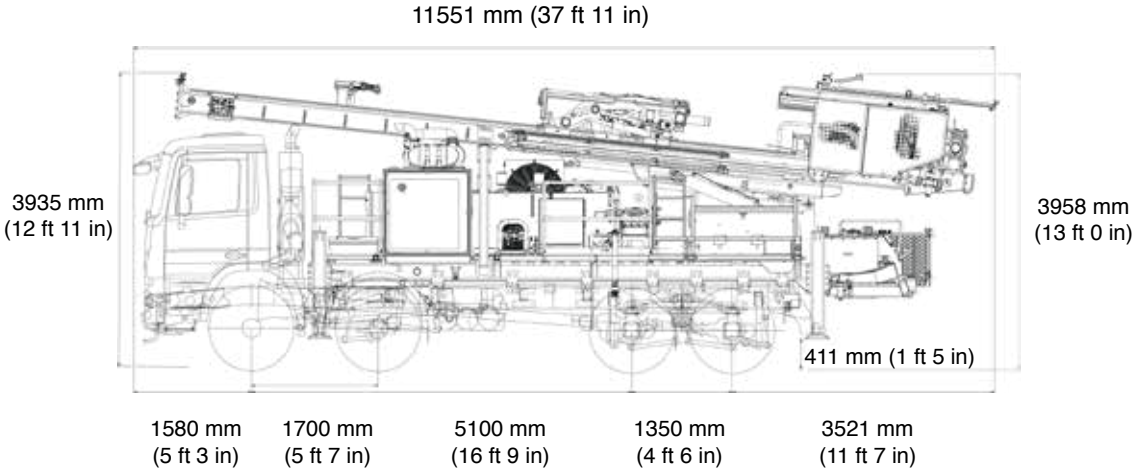
Measurements

Truck Mount - Transport (International)



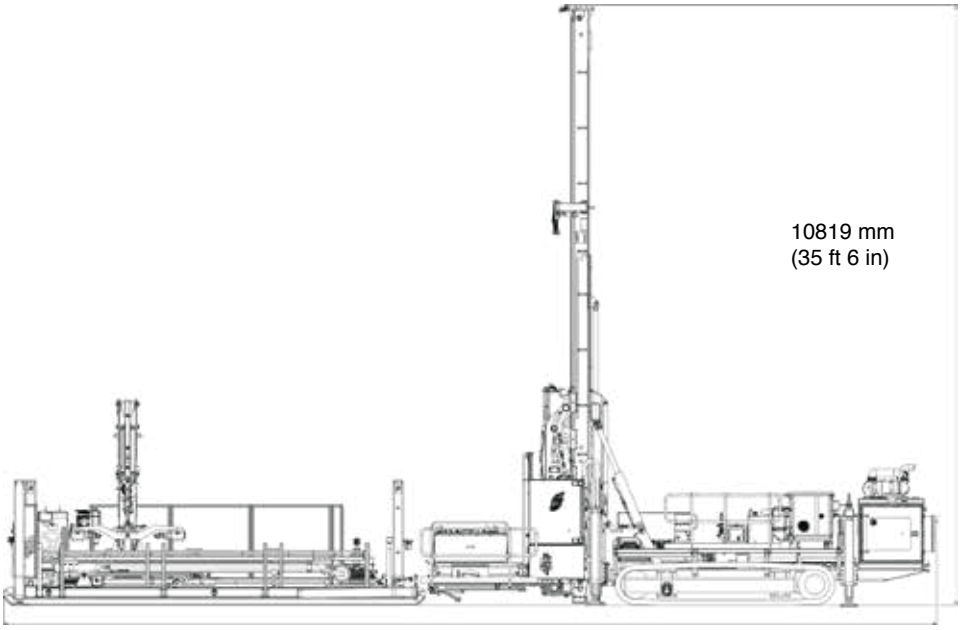
Measurements

Truck Mount - Transport (Mercedes 8X8)



Measurements

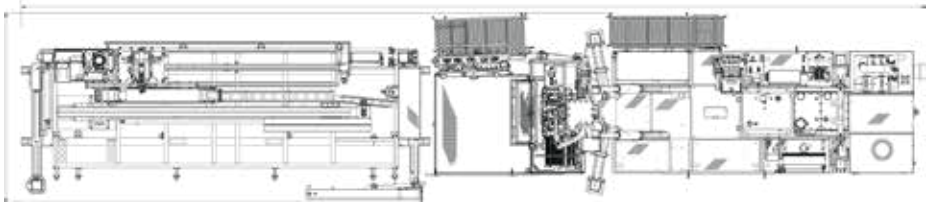
Drilling at 90° Mast in on ground with FREEDOM™ Loader



16840 mm (55 ft 3 in)

16840 mm (55 ft 3 in)

3512 mm
(11 ft 7 in)



BOART LONGYEAR™ PERFORMANCE TOOLING

DIAMOND PRODUCTS

GENUINE Q™ WIRELINE TOOLING

RODS AND CASINGS

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