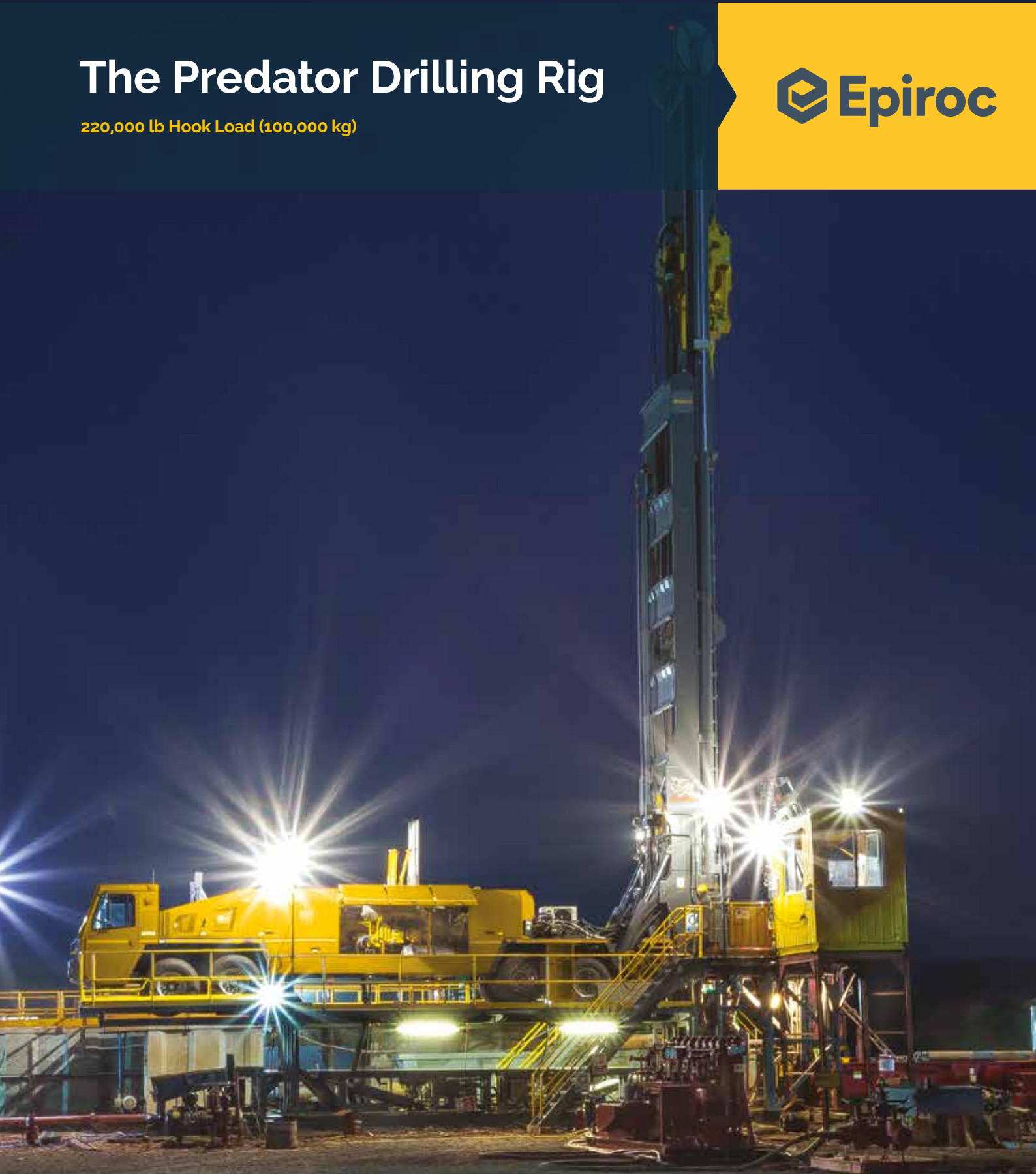


# The Predator Drilling Rig

220,000 lb Hook Load (100,000 kg)



# Insight and innovation

The Predator Drilling System is designed to meet the more complex drilling and financial requirements of today's oil and gas industry. It has the capability and precise control to drill vertical, directional or horizontal holes with air or mud in unconventional formations.

Predator combines the strength and reliability of more than 30 years of oil and gas rig design and support experience with a wide range of innovative "firsts" to the 100-ton, top-drive rig class.

Predator's design is based on a wide range of suggestions from large and small drilling contractors and producers about what they wanted in a new drilling system. Epiroc applied new, proven technology and innovative solutions to these ideas to assure optimum performance, enhanced safety and a solid financial return.

The Predator Drilling System is a three-component package consisting of a mobile rig, substructure and a pipe skate. The components are designed, and manufactured at Epiroc in Garland, Texas and supported by a global network of Epiroc facilities and distributors. Predator is built oil field tough and is licensed #4F-0460 API 4F 4th Edition.

Visit [www.epiroc.com](http://www.epiroc.com)

or contact your **Epiroc oil and gas rigs** representative to see how the Predator Drilling System will add value to your company.





# The Predator advantage

Predator is a new generation of mobile top-drive drilling system that offers producers and contractors:

## **A reduction of non-drilling time and cost**

By improving mobility and reducing rig up time.

## **Enhanced safety**

By reducing crew size, manual labor; using hands-free pipe and casing handling and a simple, precise, on-demand control system

## **Improved drilling performance**

Of a 950 HP (708 kW) engine and hydraulic system with enough power and speed to maintain maximum production in even the most challenging drilling conditions

## **Lower operating costs**

Of a hydraulic system built with premium, high-efficiency components and designed to utilize less power, thereby reducing fuel consumption

## **Smaller environmental impact**

With special leak and spill protection features and a substructure design suited to zero impact locations



## **Epiroc Service Agreements**

Epiroc provides several types of service agreements to meet operational requirements and to secure your productivity.

**Variable price repairs**—Service when you need it

**Fixed price repairs**—Service with controlled cost

**Equipment Audit**—Scheduled equipment quality control

**Preventive Maintenance Programs**—Peace of mind and focus on core business



A robust military grade control console monitor sharply displays Predator drilling parameter gauges, engine parameters and drilling system diagnostics screens.



The Driller has complete control over the Predator drill pipe to top drive connection process by clamping and extending the drill pipe to the top drive and threading into the pipe for a secure connection before bringing the drill pipe in through the drill floor.



The Predator Pipe Skate features hands free pipe handling from the pipe racks all the way to the pipe connection via wireless remote controller.

The Predator Mast design incorporates twin feed cylinders and an inner/outer telescoping mast components that handle drill string weight by channeling the loads through the bottom of the outer mast directly through the substructure to the ground, thus eliminating the crown loads seen on conventional draw works rigs.

With 30,000 ft. lbs. of available torque, the Predator top drive can handle just about any well design. Top Drive tip out capability enables hands free pipe handling from the pipe skate.



The Predator carrier is hydrostatically driven via a hydraulic motor powered by the deck engine diesel hydraulic system, eliminating the need for a dedicated carrier engine.

Tri-axle drive on the Predator carrier rear axle sets ensures positive traction for maneuvering in difficult oilfield terrain.

# Technical specifications

## Predator, Drill Rig-220K Hook Load

### Transport Mode Weights & Dimensions

Overall length	46 ft 5 in	14.07 m
Width	8 ft 6 in	2.59 m
Height	14 ft 2 in	4.32 m
*Estimated weights with fluids	117,000 lb	53,070 kg *Weights are estimates and actual weights may differ
Handling clearances (on hole center) bottom of spindle to top of master bushing	58 ft 6 in	17.83 m
bottom of master bushing to ground level	10 ft 0 in	3.05 m

### Power Train

Engine	Single deck-mounted engine used to power the drill in transport and drilling modes	
Manufacturer and model rating	CAT C-27 950 hp @ 1800 rpm	CAT C-27 708 kW @ 1800 rpm
Cooling system	Separate cooler with hydraulic fan, on-demand electronic control and charge air cooler rated to 125° F (51° C)	

### Hydraulic System

Pump drive gear box	5-pad gear box with lubrication pump and cooler – direct drive from rig engine	
Pumps	(maximum rated performance as used on Predator)	
Fast feed and rotation	576 hp @ 4,600 psi	429 kW @ 329 bar
Normal feed	242 hp @ 4,600 psi	180 kW @ 329 bar
Auxiliary functions	190 hp @ 4,500 psi	142 kW @ 322 bar
Substructure	190 hp @ 4,500 psi	142 kW @ 322 bar
Engine fan	93 hp @ 3,200 psi	69 kW @ 229 bar
Hydraulic cooler fan	132 hp @ 2,800 psi	98 kW @ 193 bar*
*Absorber-replenisher (*Patent # US 8,596,054)	225/2,250 psi	15.5/155 bar
	*The absorber-replenisher replenishes oil to the hydrostatic circuit when the feed cylinders extend and absorb oil from the circuit when the feed cylinders retract and directs that hydraulic energy to power the cooling fan motor.	
Charge for feed pump	1.5 hp @ 300 psi	1.1 kW @ 21 bar
	*Pump capacity – total fan demand is about 70 hp / 52 kW max	
Cooling	Single cooler with hydraulic fan, on-demand electronic control, rated to 125° F (52° C)	
Hydraulic tank	452 gal	1,711 liters
Hydraulic filters	4 filters @ 3 micron	4 filters @ 3 micron
*Hydraulic carrier drive (*Patent # US 8,463,762,132)	The carrier uses a hydraulic drive system powered by the deck engine. The feed/rotation pump powers a hydraulic drive motor coupled to a clutch and manual transmission.	

### Mast

Length (transport length)	46 ft 5 in	14.07 m
Width (road width)	8 ft 6 in	2.59 m
Bottom of spindle to top of table	59 ft 1 in	18.01 m
Bottom of saver sub to top of table	53 ft 5 in	16.28 m
Design	Licensed #4F-0460 API 4F 4th Edition	
Raising and lowering	Twin hydraulic cylinders	
Feed system	Twin 4 in x 20 in steel tubes with large diameter Nylatron® sheaves on the top and bottom. Carriage powered up and down by twin hydraulic feed cylinders. The carriage is connected to the top drive carriage with high-strength steel cables.	
<b>Components</b>		
Pulldown cables	7/8 in diameter, 75,000 lb breaking strength (22.2 mm / 34,019 kg)	
Pullback cables	1 ½ in diameter, 360,000 lb breaking strength (38.1 mm / 163,293 kg)	
2 upper sheaves (nylatron material)	45 in diameter	1143 mm diameter
4 lower sheaves (nylatron material)	20 in diameter	508 mm diameter
<b>Performance rating</b>		
Pullback (hoisting)	110 ton / 220,000 lb	100 tonnes / 100,000 kg
Fast feed speed-up	0 – 120 ft/min and 0 – 180 ft/min with manual regeneration (0 – 36.4 m/min, 0 – 54 m/min)	
Pulldown	25 ton / 50,000 lb	23 tonnes / 22,680 kg
Fast feed speed-down	0 – 140 ft/min	0 – 42.4 m/min
<b>Top drive system</b>		
	Twin hydraulic motors, top-drive mounted in a top-drive carriage with 90° tip-out feature.	
Specifications	Twin motor spur gear design with steel housing and pressure lubrication system. Rated for 100 ton (91 tonnes) operation with safety factor. Infinitely variable speed control in two torque ranges.	
high torque range	30,000 lbf-ft @ 0 – 90 rpm	40.7 kNm @ 0 – 90 rpm
high speed range	15,000 lbf-ft @ 0 – 180 rpm	20.3 kNm @ 0 – 180 rpm
by-pass rotation – high torque range	25 rpm	25 rpm
by-pass rotation – high speed range	50 rpm	50 rpm

# Technical specifications

## Predator, Drill Rig-220K Hook Load

### Mast (continued)

Spindle ID/lower connection	5 in / 6 5/8 FH box	127 mm / 6 5/8 FH box
Swivel	3,000 psi (215 bar) cartridge replacement chevron packings	
Top drive carriage	Steel plate construction. Upper and lower feed cables are attached to the carriage. Top drive tip-out mechanism is part of the carriage. Carriage is guided on adjustable roller assemblies on feed carriage.	
Top drive tip-out	0 - 90° twin cylinder top drive tip-out to 8000 lb (3 629 kg) load rating @ 0 - 45° with a 30 ft (9.1 m) pipe length.	

### Drill Rig Enclosure

Sheet steel drill enclosure reduces noise emissions and keeps power components cleaner. Open roof with hinged side panels facilitates maintenance operations.

### Carrier Rig Mounting

5-pad gear box with lubrication pump and cooler – direct drive from rig engine.

#### Performance

Max. road speed / max. speed creep mode	62 mph / 4 mph	100 km/hour / 6 km/hour
Max. gradability	44%	44%
Turning radius (curb-to-curb)	56 ft 6 in	7.22 m
<b>GVWR</b>	122,000 lb	55,338 kg
Front axles	22,000 lb each	9,979 kg each
Front suspension	44,000 lb – leaf spring	19,958 kg – leaf spring
Front tires and wheels	4 x 445 / 65R 225 – (both U.S. and metric)	
Rear axles	26,000 lb each	11,793 kg each
Rear suspension	78,000 lb walking beam	35,380 kg walking beam
Rear tires and wheels	12 x 11R 22.5 14 ply – aluminum wheels	
Brakes	Air brakes with maxi-brake system	
Steering	TWR TAS-85 integral power steering gear	
Frame twin	16 in (406 mm) H-beam frame members	
*Hydraulic drive system *Patent # US 8,463,762 B2	Transport power provided by a single, deck-mounted engine driving a hydraulic pump and motor. Power from the hydraulic motor runs through a clutch and manual transmission to the tridem rear axles.	
Motor	500 hp	373 kW
Clutch	15 1/2 in twin plate	394 mm twin plate
Transmission	8-speed, low-low with reverse – manual	
Dynamic braking	Hydrostatic braking – manual selection	

## Predator, Substructure

A single load, hydraulic substructure and BOP house elevate the rig over a 10 ft (3.08 m) BOP stack. The substructure includes a hydraulic boom crane, hydraulic blocking/leveling jacks, catwalks, railings, stairways, a large work floor with access ramps and a hydraulic rig elevation system. The table, master bushing, circulation piping manifold and slips are mounted on the substructure and travel with it.

### Weights & Dimensions

Design	Licensed #4F-0460 API 4F 4th Edition	
<b>Transport mode</b>		
Overall length	49 ft 0 in	14.94 m
Width	11 ft 0 in	3.35 m
Height	11 ft 1 in	3.33 m
Estimated weight (incl. breakout) tools and options)	85,000 lb	38,636 kg
<b>Drilling mode</b>		
Overall length (access ramps deployed, with stairways)	56 ft 6 in	17.22 m
Width (including catwalks and stairways)	22 ft 4 in	6.81 m
Height (including work floor railings)	14 ft 4 in	4.37 m

# Technical specifications

## Predator, Substructure

### Performance Clearances & Specifications

Capacity (drill string in the slips)	110 ton / 220,000 lb	125 tonnes / 100,000 kg
Ground pressure (less rig)	2.8 psi	0.19 bar
Ground pressure (including rig)	6.4 psi	0.46 bar
Bottom of master bushing to ground (on hole center)	10 ft	3.08 m

### Blocking Jacks

4 jacks with 22 in (539 mm) stroke to raise and level the substructure.

### Deployment

Generator junction box catwalks and work floor work floor railings and stairways rig elevation to drilling position	For lighting and deployment power pack work floor hydraulic crane work floor hydraulic crane – uses rig hydraulic system hydraulic with remote control – uses rig hydraulic system
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### Catwalks Railings & Stairways

All designed to ISO / SAE standards.

Catwalks, stairways and work floor work floor railings	Steel – open grip strut material pre-formed steel tubing sections, drop-in sockets
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### Work Floor

Dimensions	10 ft x 22 ft / 220 ft <sup>2</sup>	3 m x 6.7 m / 20.4 m <sup>2</sup>
Layout	10 ft x 10 ft (3 m x 3 m) fixed with two fold-up sections	
Work floor opening	44 in (1 118 mm) with main table bushing removed	
Table opening	Steel adapter for master bushing – 27 ½ in (699 mm)	
Master bushing standard	17 ½ in (445 mm) bushing with hydraulic slips optional 27 ½ in (699 mm) bushing available	
Driller's control console	Cast aluminum with sealed top plate. Mounted on a pedestal with height adjustment, swing and rotate motion. Console can be mounted on the work floor or in a drill cabin. Optional control package for Class 1, Division 2 rated. All control levers and switches are safe for pressure washing.	
Display	19 in (457 mm) full-color flat screen. Military field rated for temperature, moisture and lighting conditions. Display module is attached to the back of the driller's console. The screens include a drill monitoring screen, drill status screen, and a utility screen. Optional package for display module is Class 1, Division 2 rated.	

### Breakout System

Slips	Hydraulic operated pipe slips with master bushing	
Capacity	150 ton / 300,000 lb	150 ton / 300,000 lb
Diameter range (may require component changes)	2 7/8 in to 13 3/8 in	73 mm to 339 mm
Iron roughneck	Mounted on a roller trolley to move forward to hole center and back into mast when not in use. Hydraulic roughneck height adjustment of 14 in (356 mm) roughneck clears hydraulic slips in low height position. Rigged up and down with floor crane. Jaw clamping force and makeup torque are adjustable from driller's console.	
Capacity	3 ½ in to 8 ¼ in diameter range (88.9 mm to 209 mm)	
Torque control (make up)	Driller controlled with digital read out 0 – 65,000 lbf-ft (0 – 89.2 kNm)	
Torque (breakout)	Fixed with digital read out 80,000 lbf-ft (108.5 kNm)	
Upped and lower jaw clamping force control	Driller controlled with digital read outs 0 – 20,000 lb (0 – 9 091 kg)	
Controls	Driller's console	

### Air/Mud Manifold

Mounted on the lower right side of the substructure for easy hook up at ground level.

Rating of components	3 ½ in (88.9 mm) ID piping and valves @ 3,000 psi (88.9 mm @ 215 bar) 2 in (50.8 mm) plugged access port in vertical standpipe
Air hookups	Two primary compressors and booster compressor with dump driver, water injection and DHD lubricator ports.
Mud hook ups	Two mud pump input lines with drain valve



# Technical specifications

## Predator, Substructure

### Hydraulic Floor Crane

Hoist maximum capacity	7,000 lb	3,175 kg
Capacity and reach – boom retracted	4,200 lb @ 14 ft	1,905 kg @ 4.2 m
Capacity and reach – boom fully extended	2,500 lb @ 22 ft	1,134 kg @ 6.7 m

### Lighting Package

Six high output oilfield flood lights. Positioned to light the work floor, drill rig deck, substructure, BOP house, pipe skate, catwalks and stairways.

Locations	Right and left rear corners of work floor, left and right catwalks, under work floor, under substructure deck.
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### Optional Water Injection

Hydraulic powered tri-plex pump mounted on the substructure and piped into the air manifold for circulation water/foam.

Capacity	0 – 30 gpm @ 2000 psi	114 L/min @ 138 bar
Capacity and reach – boom fully extended	On/off flow control on driller's console	

## Predator, Pipe Skate

A single load, hydraulic pipe and casing handling system. Attaches to the substructure. Hydraulic jacks for leveling and alignment. Designed to work with Predator tip-out top drive system to load and trip drill pipe, drill collars and casing. Features rapid deployment and hands-free handling. Left and right fold-out racks are standard. Hydraulic power supplied by the rig hydraulic system.

Skate operations are controlled with a wireless remote control that can be operated from the ground or the rig work floor.

### Weights And Dimensions

Overall length	54 ft 6 in	16.61 m
Width (in transport mode)	8 ft 6 in	2.59 m
Width (left and right pipe racks fully deployed)	47 ft 11 in	14.61 m
Height	4 ft 6 in	1.37 m
Estimated weight (less pipe on tracks)	40,000 lb	18,144 kg

### Capacity

lifting arm capacity	8,000 lb	3,629 kg
<b>Drill pipe &amp; collar handling</b>	oil field pipe and collars	
Length	Range II and III drill pipe 30 ft-31 ft drill collars	Range II and III drill pipe 9.1 - 9.4 m drill collars
Diameter	3 ½ in to 5 in drill pipe / 4 in to 8 ¼ in drill collars	89 mm to 127 mm 102 mm to 209 mm drill collars
<b>Casing handling</b>	Oil field threaded and coupled casing	
Length	Range II and range III casing joints	
Diameter	4 ½ in to 24 in	14 mm to 610 mm

### Pipe Racks

Left and right fold-out pipe racks for Range II and III pipe lengths. Racks deploy manually with hydraulic jacks for leveling and to tip racks to roll pipe on or off lifting arm.

Pipe rack capacity 4 ½ in (114 mm) x Range III (left/right tracks)	30 pcs each side, maximum weight 90,000 lb (40,823 kg) per side
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### Pipe Control Mechanism

Pipe stops to position single pieces of pipe for lifting arm. Flippers to move single pipe on or off of lifting arm, roller pipe trollies on lifting arm to contain and control bottom end of pipe and avoid thread damage.

Make-up/breakout	Hydraulic clamping jaws to hold upper end of pipe for make-up/breakout from top-drive spindle. Clamp extends and retracts to move pipe to/from spindle for loading/unloading.
Pipe arm positioning	Elevated at end of rig by two hydraulic cylinders that position pipe at work floor to thread up to top of drive spindle.
Control system	Skate controls are on driller's console and separate wireless remote control.



## Predator, Float Base

### General Dimensional Data

<b>Transport</b>		
Length	46.1 ft	14m
Width	10 ft	3.05m
Height	9.8 ft	2.99m
<b>Deployed</b>		
Length	60.6 ft	18.47m
Width	22.5 ft	6.86m
Height	9.8 ft	2.99m
<b>Load 1 Weight</b>		
Base Float	43,648 lbs	19,840 kgs
Roughneck handler	1,496 lbs	680 kgs
Roughneck	2,860 lbs	1300 kgs
<b>Load 1 Weight</b>		
Ramp, Left	2,761 lbs	1,255 kgs
Ramp, Right	2,761 lbs	1,255 kgs
Ext. Catwalk, left	583 lbs	265 kgs
Ext. Catwalk, right	583 lbs	265 kgs
Air Drilling Skid	1,727 lbs	785 kgs
Crane	2,541 lbs	1,155 kgs



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