

# Top Drive Solutions



## National Oilwell Varco Makes History

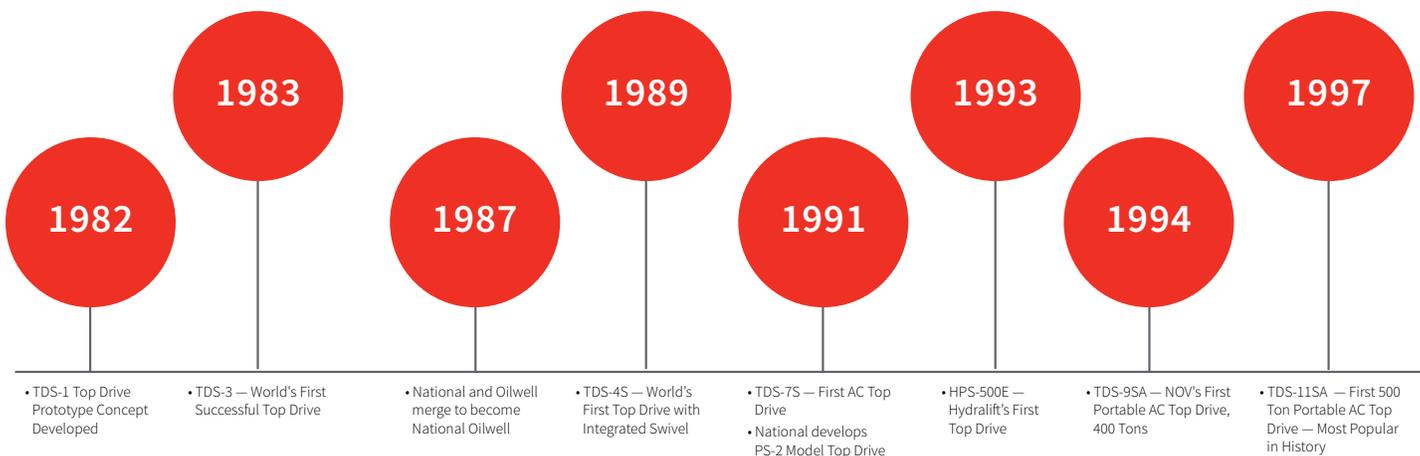


Since 1841, we have dedicated our time and resources to producing the highest quality oilfield products and services to help you get the job done efficiently and safely. From a spare part to a comprehensive drilling system, from rig-up to on-site support, we are here to assist you throughout the whole drilling process. A testament to our continual development of new technology to better serve you, our top drive line continues to grow today from the strong foundation laid decades ago.

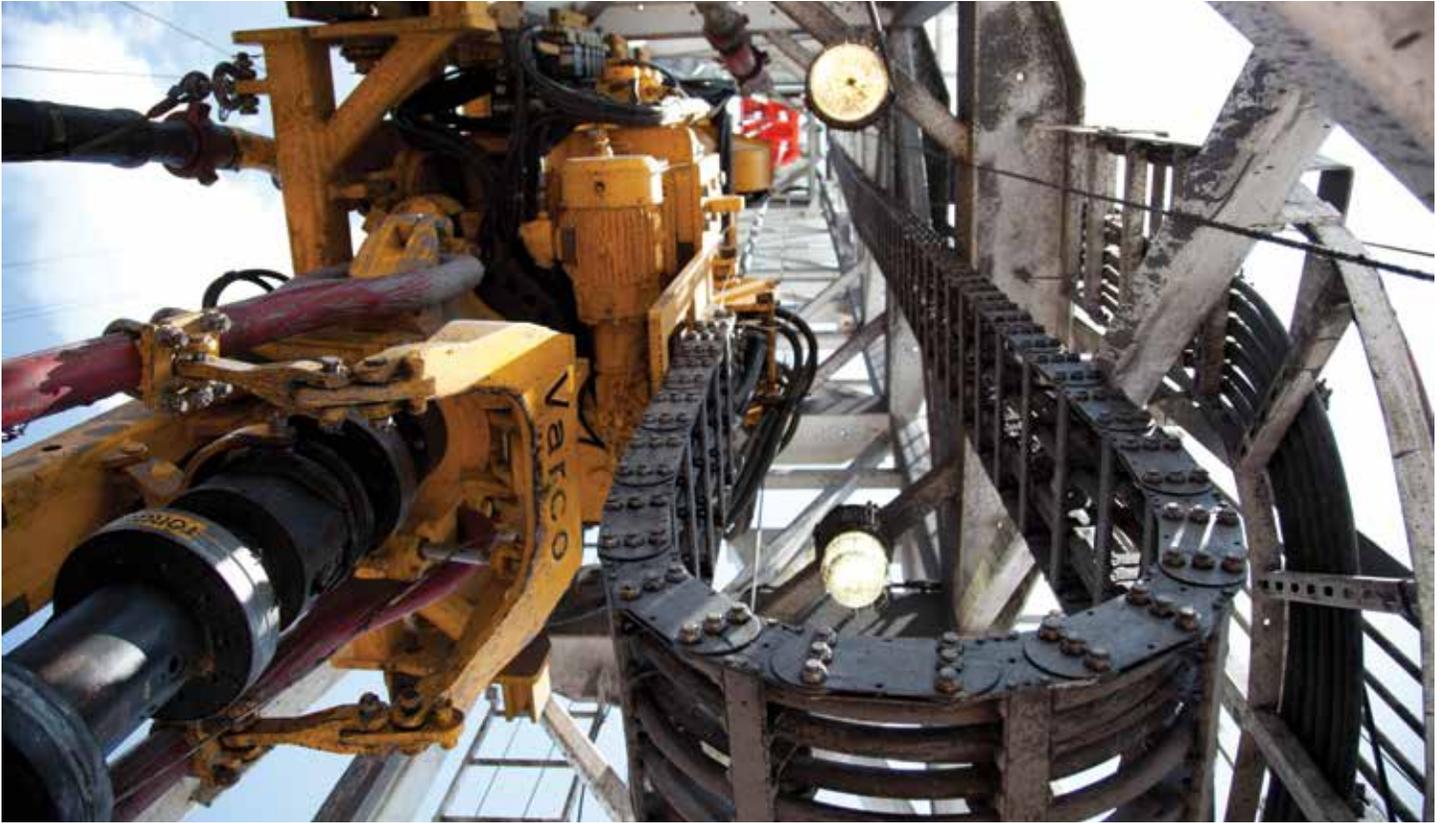
At the forefront of the top drive's drilling industry revolution, George Boyadjieff and Jim Brugman of Varco partnered with Duke Zinkgraf to take the first steps of top drive development. The first prototypes were quickly developed and made their way into the field. Through the early groundwork years, top drive technology continued to improve; its value and potential in the oil industry were quickly realized by drillers everywhere.

Continuous engineering advancements led to the first AC-powered top drive in 1991 and further performance improvements. In 1997, the TDS-11SA Top Drive was developed with an 800 horsepower twin motor and quickly became the largest-selling single design in the product line's history. Today, almost 2,000 TDS-11SA top drives have been delivered to satisfied customers, and we're continuing to advance our equipment line with new improvements and products.

With your input, field service feedback and the experiences of the leading legacy top drive suppliers — National Oilwell™, Varco™, Hydralift™ and Bowen™ — we build the widest range and variety of high performance, reliable top drive systems in the world, providing you with the best selection to fit your specific needs.



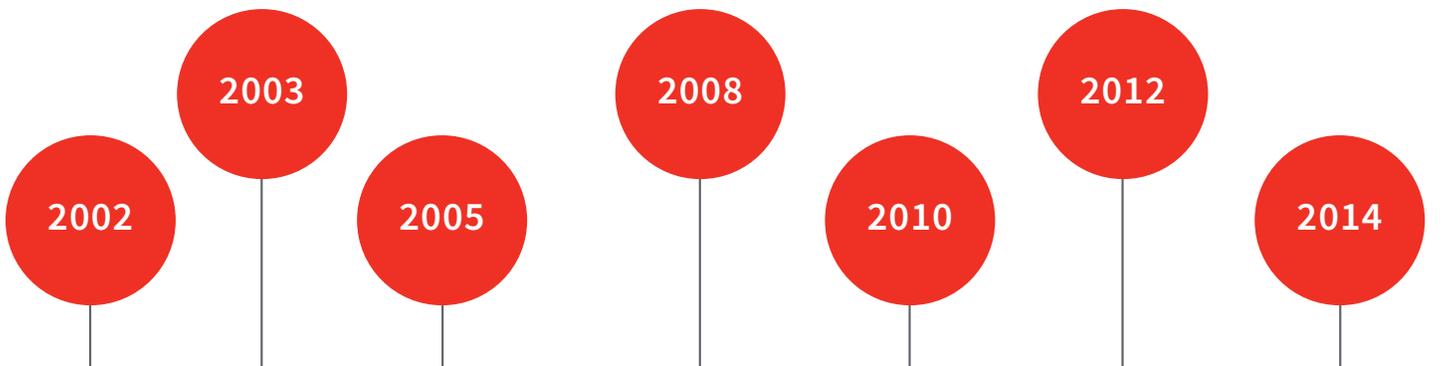
## Technological Integration



Continuing to push drilling boundaries, we built off the successful TDX-1250 Top Drive with the 2014 release of the 1,500 ton TDX-1500, the highest rated hoisting capacity top drive on the market. In 2012, we introduced another innovation in our long history of successful top drives, the TDS-11SH, delivering 1,100 horsepower through two permanent magnet motors and capable of hoisting 500 tons while providing 51,000 ft-lb of continuous torque at 110 RPM. Throughout our long history, we have been and continue to be at the leading edge of new development in drilling technology.

In addition to the technological advancements of our overall top drive line, we also developed software that integrates seamlessly for optimized performance.

- SoftSpeed™ II helps cure and prevent torsional stick-slip oscillations of the drill string over a wide range of conditions, including extremely long wells where competitive systems normally fail.
- Twister™ assists the top drive in rotating the drill string through desired angles of rotation to provide improved performance of directional BHAs without adding costly pieces of equipment.



• NOV delivers its 1000th Top Drive

• TDS-1000SA — Upgrades TDS-8S design for 1000 Ton Capacity

• National Oilwell merges with Varco to become National Oilwell Varco

• TDX-1250 — NOV's First 1250 Ton Top Drive

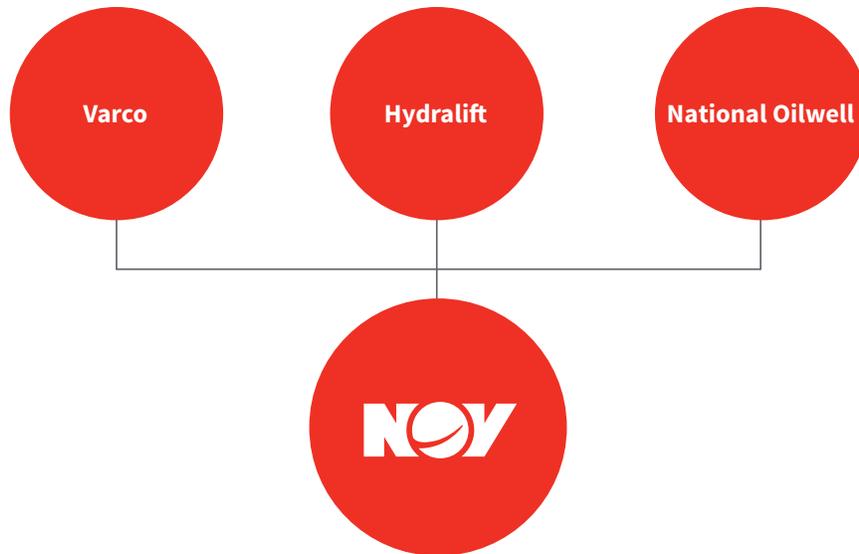
• NOV delivers 1000th TDS-11 Top Drive

• TDS-11SH — NOV's First Dual Motor Portable Top Drive

• TDX-1500 — NOV's First 1,500 Ton Top Drive and the Highest Rated Hoisting Capacity Top Drive on the market  
• TDH-150 — NOV's First Hydraulic Top Drive

## The Top Drive Story

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With the merging of the three leading top drive suppliers – National Oilwell, Hydralift and Varco – the newly formed company under the NOV roof pulled together field service feedback, customer input and the experiences of the three design teams to develop the top drive designs for the future. Today, NOV produces the premier model top drives such as the TDX-1250 and the TDS-11SH.



### Varco

VARCO began with one man and a vision of drilling down from the top of the drill string. Duke Zinkgraf partnered with Varco and began the initial designs of the top drive. Through the years, the Varco engineering team improved on the top drive design and the TDS series was paving the road of innovation, modularity, and reliability.



### Hydralift

Hydralift developed the Hydralift™ Power Swivel – 500 (HPS), a unit that continually made improvements to the market-standard TDS.



### National Oilwell

National Oilwell first brought to the market the National™ PS-500, a design focused on more serviceability and redundancy than the TDS and DDM designs. Key to the design was the pipehandling unit, which featured a more robust dual-actuated IBOP, with side in-line motor couplings that enabled a quick disengage system for drilling motors from the gear train, and a system for modular motor replacement.

## Fixed Electric Top Drives



TDX-1500

TDX-1250

TDX-1000

### Installation / Technical Specifications

	TDX-1500	TDX-1250	TDX-1000
<b>Motor Type</b>	Baldor Reliance AC Induction Motors	Baldor Reliance AC Induction Motors	Baldor Reliance Permanent Magnet Motors OR GE AC Induction Motors
<b>Horsepower Rating</b>	2 x 1,340 HP	2 x 1,340 HP	2 x 1,150 HP
<b>TDS Working Height</b>	29 ft (8,839 mm)	26.5 ft (8,077 mm)	22 ft (6,705 mm)
<b>Weight</b>	95,000 lb (43,091 kg)	89,700 lb (40,687 kg)	85,000 lb (38,555 kg)
<b>Transmission</b>			
Gear Ratio	6.1:1	6.1:1	6.9:1
<b>Drilling Parameters</b>			
Max Speed	275 RPM	275 RPM	250 RPM
Max Continuous Torque	105,000 ft-lb (142,360 N-m)	105,000 ft-lb (142,360 N-m)	91,000 ft-lb (123,379 N-m)
Speed at Max Continuous Torque	130 RPM	130 RPM	116 RPM
Max Breakout Torque	150,000 ft-lb (203,372 N-m)	150,000 ft-lb (203,372 N-m)	150,000 ft-lb (203,372 N-m)
Max Makeup Torque	120,000 ft-lb (162,698 N-m)	120,000 ft-lb (162,698 N-m)	120,000 ft-lb (162,698 N-m)
Static Lock Brake	105,000 ft-lb (142,360 N-m)	105,000 ft-lb (142,360 N-m)	105,000 ft-lb (142,360 N-m)
<b>Rating Capacities</b>			
Hoisting	1,500 ton (1,360,777 kg)	1,250 ton (1,133,980 kg)	1,000 ton (907,184 kg)
Water Course	4 in (101.6 mm)	4 in (101.6 mm)	3 3/4 in (95.3 mm)
Washpipe Packing	7,500 psi (517 bar)	7,500 psi (517 bar)	7,500 psi (517 bar)
<b>Pipe Handler</b>	PH-CLK	PH-150	PH-203
Breakout Torque Capacity	150,000 ft-lb (203,372 N-m)	150,000 ft-lb (203,372 N-m)	150,000 ft-lb (203,372 N-m)
Drill Pipe Range	3 1/2 in – 6 in (88.9 mm – 168.2 mm)	3 1/2 in – 6 in (88.9 mm – 168.2 mm)	3 1/2 in – 6 in (88.9 mm – 168.2 mm)
Connection OD	4 in – 8 1/2 in (101.6 mm – 215.9 mm)	4 in – 8 1/2 in (101.6 mm – 215.9 mm)	4 in – 8 1/2 in (101.6 mm – 215.9 mm)
IBOP Pressure Rating	20,000 psi (1,379 bar)	15,000 psi (1,034 bar)	15,000 psi (1,034 bar)
Upper IBOP	API NC84 x API NC77 (remote operated) with additional ball valve for redundancy	API NC84 x API NC77 (remote operated) with additional ball valve for redundancy	API NC77 x API NC77 (remote operated) with additional ball valve for redundancy
Lower IBOP	API NC77 x API NC77 (manual)	API NC77 x API NC77 (manual)	API NC77 x API NC77 (manual)
Rotation/Orientation	360°/Proportional control with position feedback	360°/Proportional control with position feedback	360°/Unlimited
<b>Other</b>			
Cooling System	Water Cooled	Water Cooled	Water Cooled
Hydraulic Power	HPU Required	HPU Required	HPU Required
Temperature Range	-20°C to +50°C (-4°F to +122°F)	-20°C to +50°C (-4°F to +122°F)	-20°C to +50°C (-4°F to +122°F)
Casing Running Tool Ready	Yes	Yes	Yes
Elevator Links	350, 500, 750, 1000, 1250 or 1500 ton API	350, 500, 750, 1000 or 1250 ton API	350, 500, 750 or 1000 ton API

## Fixed Electric Top Drives



TDS-1000



TDS-8S



TDS-4S

## Installation / Technical Specifications

	TDS-1000	TDS-8S	TDS-4S
<b>Motor Type</b>	GE AC Induction Motor	GE AC Induction Motor	GE 752 Hi-Torque Series/Shunt DC
<b>Horsepower Rating</b>	1 x 1,150 HP	1 x 1,150 HP	1,100 HP
<b>TDS Working Height</b>	24 ft (7,315 mm)	24 ft (7,315 mm)	20.8 ft (6,339 mm)
<b>Weight</b>	40,000 lb (18,143 kg)	38,000 lb (17,236 kg)	32,000 lbs (14,514 kg)
<b>Transmission</b>			
<b>Gear Ratio</b>	8.5:1	8.5:1	Low: 7.95:1, High: 5.08:1
<b>Drilling Parameters</b>			
<b>Max Speed</b>	270 RPM	270 RPM	Low: 130 RPM, High: 205 RPM
<b>Max Continuous Torque</b>	62,250 ft-lb (84,399 N-m)	62,250 ft-lb (84,399 N-m)	45,500 ft-lb (61,689 N-m) in low gear
<b>Speed at Max Continuous Torque</b>	95 RPM	95 RPM	120 rpm
<b>Max Breakout Torque</b>	103,000 ft-lb (139,649 N-m)	103,000 ft-lb (139,649 N-m)	85,000 ft-lb (115,244 N-m)
<b>Max Makeup Torque</b>	95,000 ft-lb (128,802 N-m)	95,000 ft-lb (128,802 N-m)	85,000 ft-lb (115,244 N-m)
<b>Static Lock Brake</b>	76,000 ft-lb (103,042 N-m)	76,000 ft-lb (103,042 N-m)	34,000 ft-lbs (46,097 N-m)
<b>Rating Capacities</b>			
<b>Hoisting</b>	1,000 ton (907,184 kg)	750 ton (680,388 kg)	750 ton (680,388 kg)
<b>Water Course</b>	3.82 in (97 mm)	3.82 in (97 mm)	3.82 in (97 mm)
<b>Washpipe Packing</b>	5,000 or 7,500 psi (344 or 517 bar) (Hammerless option)	5,000 or 7,500 psi (344 or 517 bar) (Hammerless option)	5,000 or 7,500 psi (344 or 517 bar)
<b>Pipe Handler</b>	PH-100	PH-100	PH-85
<b>Breakout Torque Capacity</b>	103,000 ft-lb (139,649 N-m)	103,000 ft-lb (139,649 N-m)	85,000 ft-lbs (115,244 N-m)
<b>Drill Pipe Range</b>	3½ in – 6½ in (88.9 mm – 168.2 mm)	3½ in – 6½ in (88.9 mm – 168.2 mm)	3½ in - 6½ in (88.9 mm - 168.2 mm)
<b>Connection OD</b>	4 in – 8½ in (101.6 mm – 215.9 mm)	4 in – 8½ in (101.6 mm – 215.9 mm)	4 in - 8½ in (101.6 mm - 215.9 mm)
<b>IBOP Pressure Rating</b>	15,000 psi (1,034 bar)	15,000 psi (1,034 bar)	15,000 psi (1,034 bar)
<b>Upper IBOP</b>	7% in API Reg. RH Box (remote operated)	7% in API Reg. RH Box (remote operated)	7% in API Reg. RH Box (remote operated)
<b>Lower IBOP</b>	7% in API Reg. RH Pin/Box (manual)	7% in API Reg. RH Pin/Box (manual)	7% in API Reg. RH Box (remote operated)
<b>Rotation/Orientation</b>	360°/Unlimited	360°/Unlimited	360°/Unlimited
<b>Other</b>			
<b>Cooling System</b>	Local Blower	Local Blower	Local or Remote
<b>Hydraulic Power</b>	HPU Required	HPU Required	HPU Required
<b>Temperature Range</b>	-20°C to +45°C (-4°F to +113°F)	-20°C to +45°C (-4°F to +113°F)	-20°C to +45°C (-40°F to +113°F)
<b>Casing Running Tool Ready</b>	Yes	Yes	Yes
<b>Elevator Links</b>	350, 500, 750 or 1000 ton API	350, 500 or 750 ton API	300, 500, or 750 ton API

## Portable Electric Top Drives



TDS-11SA



TDS-11SH

### Installation / Technical Specifications

	TDS-11SA	TDS-11SH
<b>Motor Type</b>	Baldor Reliance AC Induction Motors	Baldor Reliance AC Permanent Magnet Motors
<b>Horsepower Rating</b>	2 x 400 HP	2 x 550 HP
<b>TDS Working Height</b>	17.8 ft (5,425 mm)	19 ft (5,791 mm)
<b>Weight</b>	27,000 lb (12,246 kg)	28,000 lb (12700 kg)
<b>Transmission</b>		
Gear Ratio	10.5:1	10.6:1
<b>Drilling Parameters</b>		
Max Speed	228 RPM	228 RPM
Max Continuous Torque	37,500 ft-lb (50,843 N-m)	51,000 ft-lb (69,146 N-m)
Speed at Max Continuous Torque	125 RPM	125 RPM
Max Breakout Torque	75,000 ft-lb (101,686 N-m)	75,000 ft-lb (101,686 N-m)
Max Makeup Torque	62,500 ft-lb (84,738 N-m)	62,500 ft-lb (84,738 N-m)
Static Lock Brake	50,000 ft-lb (67,790 N-m)	50,000 ft-lb (67,790 N-m)
<b>Rating Capacities</b>		
Hoisting	500 ton (453,592 kg)	500 ton (453,592 kg)
Water Course	3 in (76.2 mm)	3 in (76.2 mm)
Washpipe Packing	7,500 psi (517 bar)	7,500 psi (517 bar)
<b>Pipe Handler</b>	PH-75	PH-75
Breakout Torque Capacity	75,000 ft-lb (101,686 N-m)	75,000 ft-lb (101,686 N-m)
Drill Pipe Range	3½ in – 6¾ in (88.9 mm – 168.2 mm)	3½ in – 6¾ in (88.9 mm – 168.2 mm)
Connection OD	4 in – 8½ in (101.6 mm – 215.9 mm)	4 in – 8½ in (101.6 mm – 215.9 mm)
IBOP Pressure Rating	15,000 psi (1,034 bar)	15,000 psi (1,034 bar)
Upper IBOP	6¾ in API Reg. RH Box (remote operated)	6¾ in API Reg. RH Box (remote operated)
Lower IBOP	6¾ in API Reg. RH Pin/Box (manual)	6¾ in API Reg. RH Pin/Box (manual)
Rotation/Orientation	360°/Unlimited	360°/Unlimited
<b>Other</b>		
Cooling System	Local Blower	Local Blower
Hydraulic Power	Onboard	Onboard
Temperature Range	-40°C to +55°C (-40°F to +131°F)	-40°C to +55°C (-40°F to +131°F)
Casing Running Tool Ready	Yes	Yes
Elevator Links	250, 350 and 500 ton API	250, 350 and 500 ton API

## Portable Electric Top Drives



TDS-10SH

IDS-350PE

TDS-150

### Installation / Technical Specifications

	TDS-10SH	IDS-350PE	TDS-150
<b>Motor Type</b>	Baldor Reliance AC Induction Motors	Baldor Reliance AC Permanent Magnet Motors	AC Induction Motors
<b>Horsepower Rating</b>	1 x 400 HP	1 x 1,000 HP	2 x 250 HP
<b>TDS Working Height</b>	15.3 ft (4,663 mm)	20.8 ft (6,339 mm)	16 ft 8 in (5,080 mm)
<b>Weight</b>	18,000 lb (8,164 kg)	33,000 lb (14,968 kg)	16,500 lb (7,484 kg)
<b>Transmission</b>			
<b>Gear Ratio</b>	13.1:1	12.6:1	17.69:1
<b>Drilling Parameters</b>			
<b>Max Speed</b>	182 RPM	212 RPM	200 RPM
<b>Max Continuous Torque</b>	22,288 ft-lb (30,218 N-m)	37,000 ft-lb (50,165 N-m)	24,700 ft-lb (33,488 N-m)
<b>Speed at Max Continuous Torque</b>	85 RPM	145 RPM	100 RPM
<b>Max Breakout Torque</b>	55,000 ft-lb (74,569 N-m)	65,000 ft-lb (88,128 N-m)	36,500 ft-lb (49,487 N-m)
<b>Max Makeup Torque</b>	42,680 ft-lb (57,866 N-m)	60,000 ft-lb (81,349 N-m)	36,500 ft-lb (49,487 N-m)
<b>Static Lock Brake</b>	50,000 ft-lb (67,790 N-m)	55,000 ft-lb (74,569 N-m)	36,500 ft-lb (49,487 N-m)
<b>Rating Capacities</b>			
<b>Hoisting</b>	250 ton (226,796 kg)	350 ton (317,514 kg)	150 ton (136,077 kg)
<b>Water Course</b>	3 in (76.2 mm)	3 in (76.2 mm)	2 3/4 in (69.8 mm)
<b>Washpipe Packing</b>	7,500 psi (517 bar)	7,500 psi (517 bar)	5,000 psi (344 bar)
<b>Pipe Handler</b>	PH-55	PH-65	N/A
<b>Breakout Torque Capacity</b>	55,000 ft-lb (74,569 N-m)	65,000 ft-lb (88,128 N-m)	36,500 ft-lb (49,487 N-m)
<b>Drill Pipe Range</b>	2 7/8 in - 5 in (73 mm - 127 mm)	3 1/2 in - 6 in (88.9 mm - 168.2 mm)	2 7/8 in - 4 1/2 in (73 mm - 114.3 mm)
<b>Connection OD</b>	4 in - 6 in (101.6 mm - 168.2 mm)	4 in - 8 1/2 in (101.6 mm - 215.9 mm)	up to 6 3/8" OD
<b>IBOP Pressure Rating</b>	15,000 psi (1,034 bar)	15,000 psi (1,034 bar)	10,000 psi (689 bar)
<b>Upper IBOP</b>	6 in API Reg. RH Box (remote operated)	6 in API Reg. RH Box (remote operated)	Dual Ball IBOP (1 Remote, 1 Manual)
<b>Lower IBOP</b>	6 in API Reg. RH Pin/Box (manual)	6 in API Reg. RH Pin/Box (manual)	N/A
<b>Rotation/Orientation</b>	360°/Unlimited	360°/Unlimited	360°/Unlimited
<b>Other</b>			
<b>Cooling System</b>	Local Blower	Remote Water Cooling	Air Cooled
<b>Hydraulic Power</b>	Onboard	HPU Required	N/A
<b>Temperature Range</b>	-40°C to +40°C (-40°F to +104°F)	-40°C to +55°C (-40°F to +131°F)	-40°C to +40°C (-40°F to +104°F)
<b>Casing Running Tool Ready</b>	No	Yes	No
<b>Elevator Links</b>	250 ton API	250 and 350 ton API	150 ton API

## Portable Hydraulic Top Drives



TDH-150

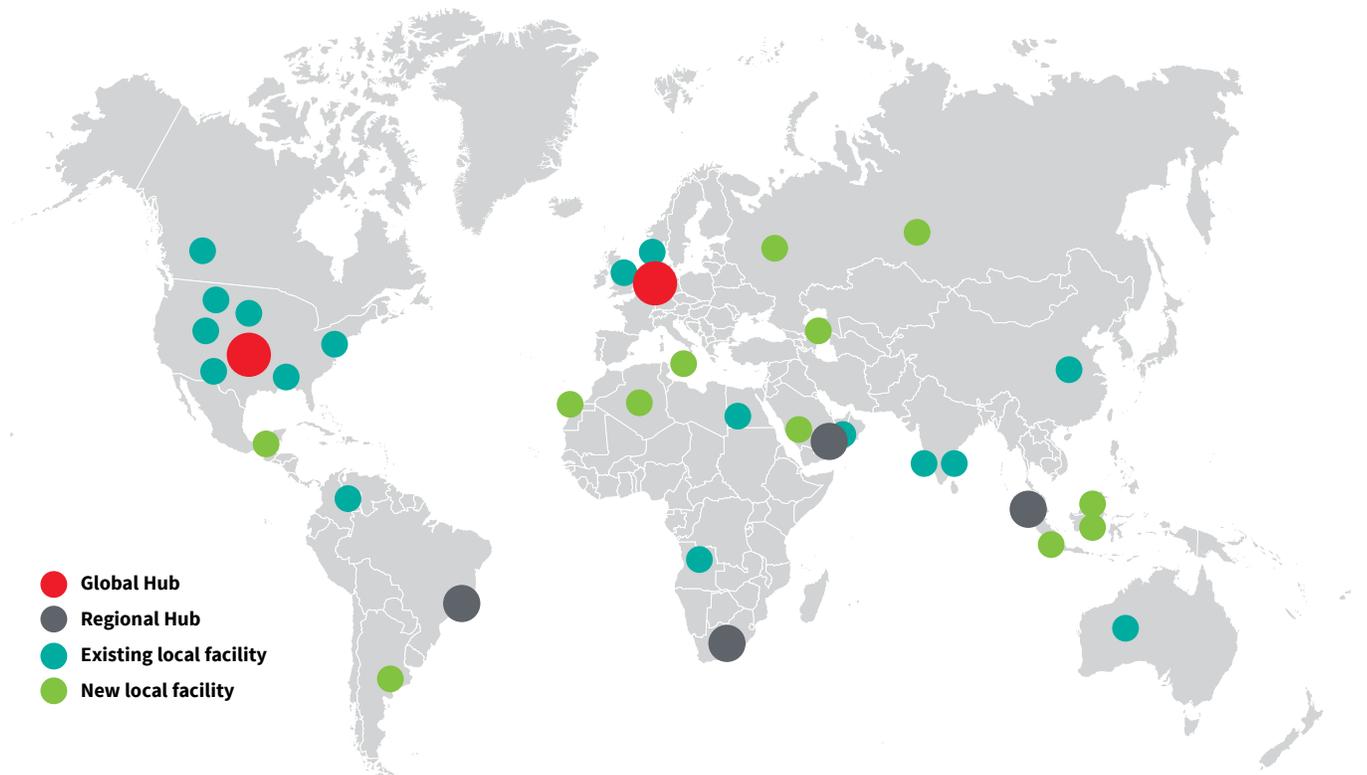


TDH-250

### Installation / Technical Specifications

	TDH-150	TDH-250
<b>Motor Type</b>	Hydraulic Motors	Hydraulic Motors
<b>Horsepower Rating</b>	2 x 112 HP	3 x 150 HP
<b>TDS Working Height</b>	12.4 ft (3,779 mm)	14.5 ft (4,419 mm)
<b>Weight</b>	9,800 lb (4,445 kg)	13,400 lb (6,078 kg)
<b>Transmission</b>		
Gear Ratio	14.59:1	18.7:1
<b>Drilling Parameters</b>		
Max Speed	200 RPM	225 RPM
Max Continuous Torque	15,000 ft-lb (20,337 N-m)	23,000 ft-lb (31,183 N-m)
Speed at Max Continuous Torque	76 RPM	100 RPM
Max Breakout Torque	35,000 ft-lb (47,453 N-m)	40,000 ft-lb (54,232 N-m)
Max Makeup Torque	35,000 ft-lb (47,453 N-m)	40,000 ft-lb (54,232 N-m)
Static Lock Brake	15,000 ft-lb (20,337 N-m)	35,000 ft-lb (47,453 N-m)
<b>Rating Capacities</b>		
Hoisting	150 ton (136,077 kg)	250 ton (226,796 kg)
Water Course	2-13/16 in (71.4 mm)	2 1/4 in (69.8 mm)
Washpipe Packing	5,000 psi (344 bar)	5,000 psi (344 bar)
<b>Pipe Handler</b>	N/A	N/A
Breakout Torque Capacity	35,000 ft-lb (47,453 N-m)	40,000 ft-lb (54,232 N-m)
Drill Pipe Range	2 7/8 in - 4 1/2 in (73 mm - 114.3 mm)	2 7/8 in - 5 1/2 in (73 mm - 139.7 mm)
Connection OD	up to 6 5/8" OD	up to 6 5/8" OD
IBOP Pressure Rating	10,000 psi (689 bar)	10,000 psi (689 bar)
Upper IBOP	Dual Ball IBOP (1 Remote, 1 Manual)	Dual Ball IBOP (1 Remote, 1 Manual)
Lower IBOP	N/A	N/A
Rotation/Orientation	No Rotation	360°/Unlimited
<b>Other</b>		
Cooling System	None	None
Hydraulic Power	Stand Alone Diesel Driven HPU Provided	Stand Alone Diesel Driven HPU Provided
Temperature Range	-20°C to +45°C (-4°F to +113°F)	-20°C to +45°C (-4°F to +113°F)
Casing Running Tool Ready	No	No
Elevator Links	150 ton API	250 ton API

## Aftermarket Services



Comprehensive Aftermarket Products and Services — NOV is with you every step of the way

### Field Service

Our growing staff of proven field service personnel is available 24/7 to support all NOV products. Knowledgeable field service technicians can quickly deploy to your operating site to resolve your equipment issues, whether structural, mechanical, electrical or software-related. Our FAST solution service trucks are stocked with an extensive list of NOV's top drive, iron roughneck, BOP, EDS, and Amphion replacement parts, filters, consumables and tools to get your NOV equipment running at OEM specifications. Expert on-call technicians are ready to provide FAST, on-site service and repair.

### Training

Field technicians train extensively on NOV Rig Systems product lines including competency training and evaluations through our NOV technical colleges and training facilities to ensure the highest quality service and support for your equipment repairs on-site.

### Repair

Our highly skilled shop technicians overhaul, repair, rebuild, and re-certify a wide range of NOV equipment to the NOV Quality Assurance and OEM specifications — using only OEM parts. Our worldwide network of repair centers provides unrivaled quality customer service, on-time delivery and unmatched technical integrity. In addition, equipment exchange programs are available at various facilities. Through the Used Equipment Refurbishment Program, we provide viable, short turnaround solutions to immediate capital equipment needs, complete with data books and certificates of conformance as required.

### Technical Support

One phone call to one of our technical support centers initiates a technical support team of multi-skilled backgrounds to troubleshoot and resolve your worldwide equipment needs, 24/7/365. Our team of highly skilled and experienced technical support members work together with our global pool of qualified field service technicians and subject matter experts to keep your rigs operating. The technical support team utilizes our web-based application "Tracker" to record, manage, and resolve issues.

### Field Engineering

Our field engineering groups offer the unique service of providing one-off, rig-specific equipment designs, modifications and solutions to your rig-specific issues. This includes rig surveys, proposal drawings, design drawings, product manufacturing, service manuals, data books, and equipment installations. Field Engineering capabilities include mechanical and electrical engineering, software/programming modifications, training and troubleshooting.

For 24/7 Support Services: [+1 281 569 3050](tel:+12815693050)

## TDS-11SA: The World's Most Popular Top Drive

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**Corporate Headquarters**

7909 Parkwood Circle Drive  
Houston, Texas 77036  
USA

**Rig Solutions Headquarters**

10000 Richmond Avenue  
Houston, Texas 77042  
USA

For a complete list of NOV's Rig Systems locations, visit us online:

[www.nov.com/rigsolutionslocations](http://www.nov.com/rigsolutionslocations)