



RISER, DRILLING & PRODUCTION SYSTEMS

# Advanced Connectors





RISER, DRILLING & PRODUCTION SYSTEMS

# Advanced Connectors

	Connectors for all Types of Well Architecture								Assembly
	Gas-tight Metal Seals	Elastomer Seals	High Fatigue	High Back-off Resistance	Driveable	Remote Release	Size Range	Run	
ULTRALOK™									
		✓	✓	✓	✓		30" - 42"	Box-up	<2 Turn Rotation
SWIFT									
	✓	✓	✓	✓			16" - 36"	Box-up	1½ Turn Rotation
MERLIN™									
	✓		✓	✓	✓		18 5/8" - 72"	Pin-up	Hydraulic Connector
LEOPARD									
		✓	✓		✓	✓	16" - 48"	Any	<1 Turn Rotation
PUMA									
		✓			✓		20" - 42"	Box-up	4 Turn Rotation
MMR									
		✓			✓	✓	20" - 36"	Box-up	1/6 Turn Rotation
LYNX™									
		✓		✓	✓	✓	16" - 42"	Pin-up	Weight Set

# Defining Connector Technology since 1974

Oil States designs, manufactures and tests conductor and casing connectors to suit all types of well architecture and operations – from ultra-deepwater to land and geothermal wells, as well as exploration, appraisal and tieback to production.

Our reusable multi-application connections are designed to withstand harsh environmental loadings and structural demands. With more than 1,000 engineered designs stocked globally, we can fast-track delivery to any location worldwide.

## Rapid Make-Up High-Performance Connectors

Oil States' rapid make-up high performance connectors are designed for use when rig costs and environmental conditions require fast connector make-up combined with superior performance. These are engineered to be used in offshore and onshore field production.



We provide full turnkey installation of all our connectors, which includes the connector assembly, hammering, casing cutting and installation of protection sleeves.

### Quality Manufacturing

Oil States' connectors are manufactured to the highest industry standards and have been proven in drilling, production and structural applications around the world since 1974.

Our manufacturing quality programme ensures trouble-free installation and service:

- ISO 9001, ISO 14001, ISO 45001, API Q1 and API Q2 registration for all Oil States manufacturing facilities
- Capability to machine components up to 67 inches in diameter and 69 inches tall, weighing up to 12 tonnes, while maintaining tolerances of 0.0002 inches
- Forgings have BSEN 10204 3.1 or 3.2 certification, subject to client requirements
- Critical dimensions of all connectors are verified with coordinate measuring machines
- Every component receives a unique serial number cross-referenced with certification, supplier, cast number and ring within the cast
- Alignment checks during welding onto pipe align the axis of the pin to the axis of the box to within 0.050 degrees
- All connectors are phosphated to prevent corrosion and galling
- The latest two- and three-dimensional finite element analysis (FEA) techniques are used to evaluate connector designs
- Full-scale testing provided by our in-house UKAS-accredited testing laboratory



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# Advanced Connectors

## UltraLok™

The only large-diameter  
ultra-deepwater connector  
with integral ratchet  
anti-rotation as standard



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PLATFORM



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**SELF-LOCKING** **ULTRA-CAPACITY** **FATIGUE RESISTANT**

The UltraLok™ is a next-generation heavy-duty conductor connector designed for ultra-deepwater with safety in mind, and tested for the most extreme as well as fatigue-sensitive conditions.

The UltraLok provides rapid make-up in less than two turns with dual elastomer seals, and features ratchet anti-rotation (RAR). This self-locking ratchet system is engaged under make-up torque and negates the need for separate components that can be lost or dropped. This feature provides high-capacity anti-break-out that is completely hands-free during make-up and eliminates the need for manual intervention on the rig floor.

The RAR feature in conjunction with the fatigue-resistant design makes the UltraLok connection the choice for the most challenging offshore locations where loop currents and vortex-induced vibration may occur.

### APPLICATIONS

- Ultra-deepwater conductor
- Floating production units



UltraLok™ ▲

## ADVANTAGES AND BENEFITS

- Rapid install in less than two turns
- Dual elastomer seals
- Reduced stress concentration factor
- Break-out torque up to 120,000 ft. lb. prevents vortex-induced vibration backoff
- Safe, self-locking hands-free operation
- Eliminates additional keys or loose parts that can become dropped objects
- Runs with conventional side door elevator
- Ultra-capacity meets or exceeds 100% to pipe
- Audible and visual make-up indication
- Simple break-out process with fully reusable anti-rotation feature

## ELIMINATES



Personnel in Red Zone



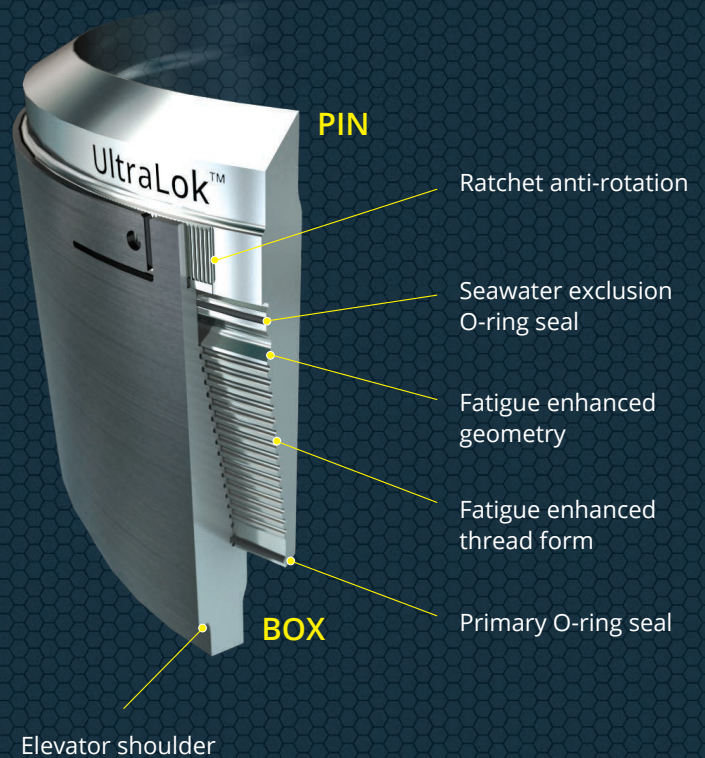
Dropped objects



Additional components/keys



Ratchet anti-rotation with audible make-up ▲





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# Advanced Connectors

## Swift

The only gas-tight  
ultra-deepwater connector  
with integral ratchet  
anti-rotation as standard



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**SAFE SELF-LOCKING GAS-TIGHT**

The Swift DW2 RAR, designed for extreme and fatigue-sensitive ultra-deepwater conditions, is the only true metal-sealing conductor and casing connector on the market that features integral ratchet anti-rotation (RAR) as a standard feature.

The dual-sealing connection features primary metal and secondary elastomer seals, and offers fatigue-reducing geometrically-enhanced thread form and stress-relieving features in every model.

Like other members in the field-proven Swift family of connectors, the Swift DW2 RAR connection combines a rugged dual-start thread form with a deep stab design to eliminate cross threading. The connection reaches full pre-loaded make-up in 1.5 rotations, with visual confirmation via external indicator faces.

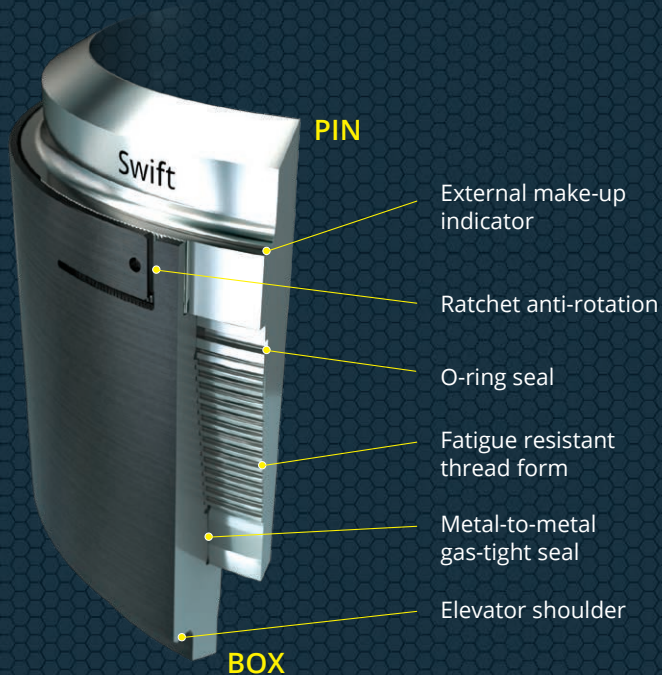
The Swift DW2 RAR self-locking ratchet system is engaged under make-up torque and eliminates the need for separate components that can be lost or dropped. This feature provides high-capacity anti-break-out capability that is completely hands-free during make-up and eradicates the need for manual intervention on the rig floor.

### APPLICATIONS

- Subsea conductor and casing
- Platform conductor and casing
- Ultra-deepwater casing
- Metal-sealing surface casing
- Metal-sealing conductor for shallow gas



Swift-RAR ▲



Metal-to-metal gas-tight seal ▲



◀ Ratchet anti-rotation with audible make-up

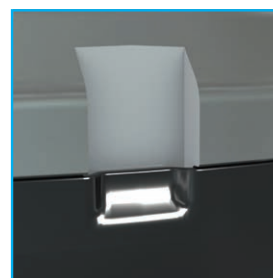
## ADVANTAGES AND BENEFITS

- Rapid installation in 1.5 turn
- Primary metal-to-metal seal
- Secondary elastomer seawater exclusion seal
- ISO13679 gas-tested
- Reduced stress concentration factor
- Break-out torque of up to 120,000 ft. lb. prevents vortex-induced vibration backoff
- Safe, self-locking hands-free operation
- Eliminates additional keys or loose parts that can become dropped objects
- Runs with conventional side door elevator
- Ultra-capacity meets or exceeds 100% of pipe
- Extreme strength  $\geq$  X80 pipe
- Audible and visual make-up indication

**Note:** Additional model options are available without anti-rotation features (typically used in platform applications). Key and shear tab anti-rotation features are also available.



▲ Anti-rotation key



▲ Anti-rotation tab



Handling 22" SWIFT DW2-AR casing ▲



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# Advanced Connectors

## Merlin™

The industry standard for high-fatigue non-rotational driveable connectors



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## FATIGUE RESISTANT FOR EXTREME CONDITIONS

Introduced in 1981, Merlin™ connectors have consistently proven to be at the forefront of connector technology worldwide with over 100,000 joints run in the last 40+ years. These connectors are installed in some of the most challenging of environments globally for example, the North Sea, Caspian and Far East.

The Merlin connector combines superior static strength and fatigue life with fast, non-rotational make-up and slim profile. Merlin connectors have been used in sizes up to 72 inches OD and for applications including open-hole and tieback casing, conductors, structural tubulars, pipeline, risers and TLP tendons.

The Merlin connection has a unique non-helical thread design that incorporates Oil States' patented tooth crest relief profile. The connector geometry ensures the teeth can only interlock once fully made-up.

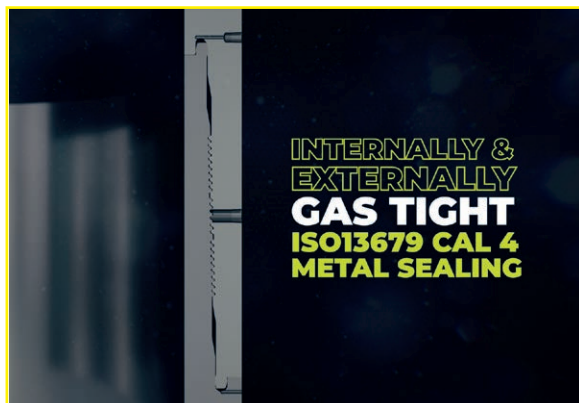
The connection can be assembled in approximately three minutes using an Oil States-supplied hydraulic clamp and air-operated power pack.

### APPLICATIONS

- Harsh environment platform conductor
- Conductor sharing wellhead systems
- Restricted clearance jacket guides
- Conductor supported platforms (CSP)
- Jack-up conductors
- Slot recovery with whipstock
- Floating production units
- Caisson repair

Merlin™ HDIF ▶





Merlin™ stabbing ▲

After stabbing, the clamp is fitted around the connector and hydraulic pressure is injected between the pin and box. As the pressure expands, the box contracts the pin, and the clamp pulls the two components together.

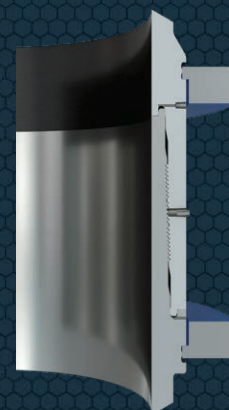
When pressure is released, the box “shrinks” onto the pin. The wedging action of the teeth converts radial pre-load into an extremely high axial pre-load that maintains connector stiffness and enhances tension fatigue – results that are unachievable with conventional helical threaded connectors. Make-up is visually confirmed by inspecting the external abutment faces and mechanically confirmed by reversing the hydraulic clamp assembly and performing a localised tension test while the connector is in situ. Break-out is achieved by reversing the process. Merlin connectors are re-usable, only requiring visual inspection.

Merlin connectors incorporate four metal-to-metal seals as well as internal and external abutment faces, which minimises pile fatigue through the teeth. This gives the connector high in-place fatigue performance even after piling.



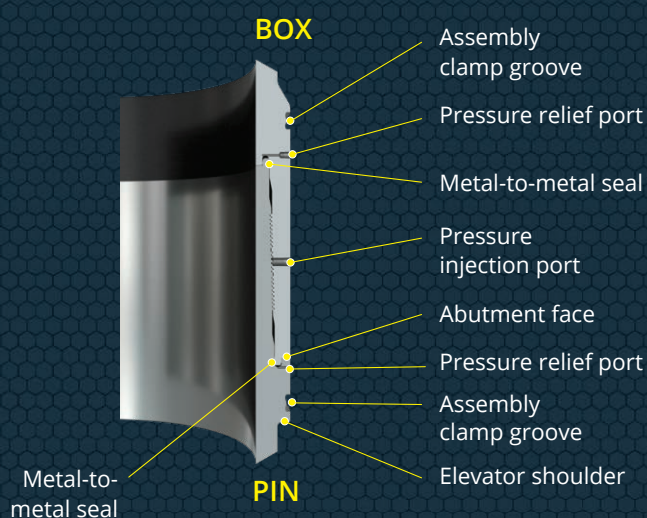
### Stabbed

Box swallows approximately 90% of pin length



### Assembly

Hydraulic pressure expands box; clamp draws components together



### Made up

Connection is pre-loaded both radially and axially



## Merlin™ R

### ADVANTAGES AND BENEFITS

- Fast, repeatable and reliable assembly in under three minutes
- Non-rotation make-up
- Non-helical tooth profile
- Simple tool running
- Multiple metal-to-metal seals
- ISO13679 CAL 4 Gas-tight
- Extreme fatigue capacity
- Pre-loaded abutment face
- Retains fatigue life post-drive
- Full bore smooth profile
- High pressure integrity
- Excellent fatigue capacity
- High-yield material
- Slimline designs
- Up to 750,000 ft. lb. passive anti-rotation which eliminates potential back-off due to cyclic tension and fatigue loading
- Fully automated tooling available

### MERLIN VERSIONS

- Merlin™ S: Slimline version
- Merlin™ D and HD: Driveable models
- Merlin™ R: Riser applications
- Merlin™ TLE: Tension leg element for extreme axial fatigue conditions

The Merlin™ R is an extensively field-proven connection system that has been designed and manufactured to meet a range of static, fatigue, temperature and pressure loads (up to 20,000 psi).

Designed in accordance with ISO13628-7 for use in riser applications, the Merlin R connection system consists of male and female couplings at either end of the pipe. These connectors can be factory welded onto pipe, or the connectors can be machined directly onto upset riser pipe, allowing the joints to be assembled offshore without hot work offshore. Merlin R connectors are compatible with pipe diameters ranging from 6 5/8" to 25" and in joint lengths of up to 90 feet.

Extensive qualification testing has been carried out on the Merlin R connection system that includes internal gas pressure, external water pressure, tension, temperature, axial fatigue, bending fatigue, corrosion simulation, crevice corrosion and a variety of load combinations that simulate operating conditions.

Merlin R connection assembly is fast, safe and does not require any rotation or torquing equipment. For assembly, Merlin R connectors are stabbed, the Oil States-supplied hydraulic clamp is fitted around the connector and connector make-up fluid is injected between the pin and the box. As the injection pressure increases, this elastically expands the box and compresses the pin while the hydraulic clamp is activated axially to pull the two halves of the connector together. When pressure is released, the box shrinks onto the pin, and the pin expands into the box. The connection is assembled in a maximum time of three minutes.

The Merlin R features non-helical interlocking teeth which, because of the design geometry, ensure that the connector pin and box can only be mated in one precise configuration. After assembly is complete, Merlin R connectors provide a preload against operating tension, thereby minimizing stress concentrations to extend service life. Features of the Merlin R design can be used to verify successful make up.

To aid efficient and safe installation of the Merlin R connection system, Oil States has designed and tested handling tools that include assembly clamps, stab guides, pressure test caps for riser string testing, hydraulically operated spider units to support the full weight of the riser during assembly and pick-up tools that are operated by experienced, in-house offshore technicians, ensuring a smooth installation service.



These connectors are installed on the world's deepest HP riser, which extends 8,500 feet



▲ 17.25" Merlin™ R high pressure riser

▼ 24" Merlin™ R high pressure riser



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# Advanced Connectors

## Leopard

Multi-application,  
rapid make-up  
driveable connectors



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### UNIVERSAL EXSTOCK MULTI-APPLICATION DRIVABLE CONNECTORS

The Leopard is a cost-effective driveable family of connections that is stocked globally, reducing costs with high-volume supply chain optimization.

Combining the advantages of a pre-loaded, thread-type connector with the rapid make-up desired for offshore operations, the Leopard's strength characteristics are equivalent to conductor pipe. The Leopard has a high cone angle and integral stabbing guide with multi-thread design, which prevents cross-threading. Full make-up is achieved in less than one full turn with required make-up torque of 40,000 ft. lb. for a 30-inch connection.

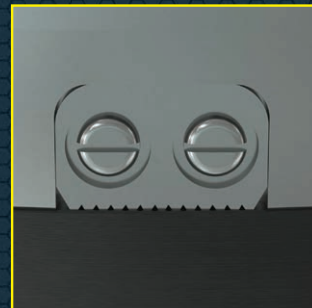
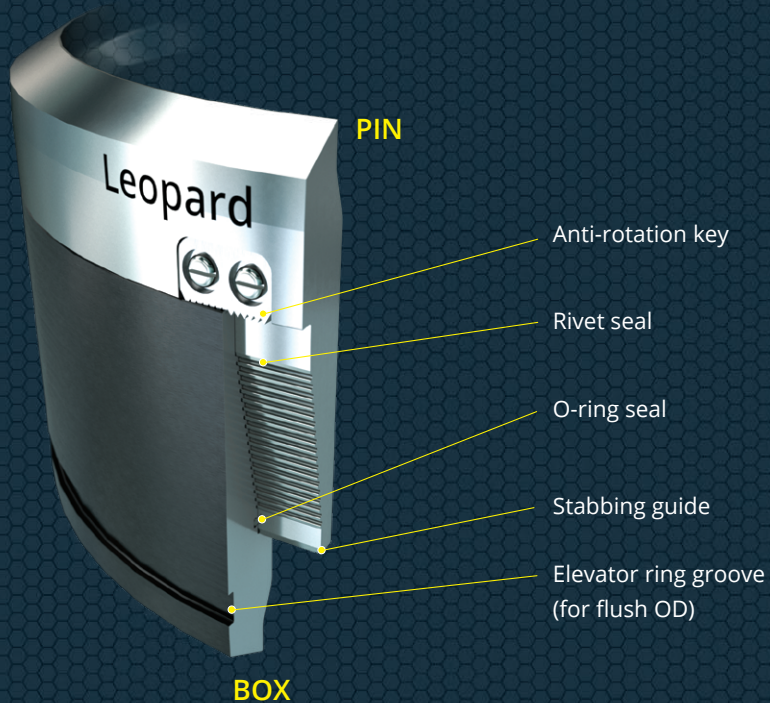
To prevent back-off during driving or running in open water, various anti-rotation options are available including integral anti-rotation tabs, key or ratchet. The anti-rotation tabs increase breakout torque to as high as 90,000 ft. lb., depending on the number of tabs engaged.

### APPLICATIONS

- Platform conductor and casing
- Jack-up conductor and casing
- Subsea conductor and casing
- Deepwater conductor and casing



Leopard SDEF-AR ▲



▲ Anti-rotation key



▼ Anti-rotation tab

## ADVANTAGES AND BENEFITS

- Multi-thread connector for conductor and casing
- Low torque make-up with rig tongs
- Less than one turn make-up
- Multiple anti-rotation options
- Driveable
- Reversible and reusable
- Visual indication of make-up
- Optimised and extensively fatigue-tested to minimise
- Dual-seal option for platform conductor
- Suitable for jetting operations
- Over 200 designs in stock globally



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# Advanced Connectors

## Puma

Slimline connectors  
for special clearance



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**FLUSH DRIVEABLE 100% CONNECTOR EFFICIENCY**

The Puma is a dual flush-threaded connector for use on geothermal, exploration and platform drilling operations where special clearance prevents the use of conventional upset connectors. This driveable connector uses high-strength material to enable the connection to meet pipe body capacities using standard pipe grades.

The connection can be installed using conventional casing tongs without any additional requirement for compensated weight release. A customised drive chaser system eliminates the need for PDL's – and the potential for stuck connections. As a result, the typical running time is 30% faster than other flush connection designs.

The Puma incorporates a load-bearing abutment to prevent thread damage during installation, enabling simple breakout after driving the conductor.

### APPLICATIONS

- Platform conductor
- Conductor sharing wellhead systems
- Restricted clearance jacket guides
- Conductor-supported platforms (CSP)
- Jack-up conductor
- Slot recovery with whipstock
- Caisson repair
- Geothermal

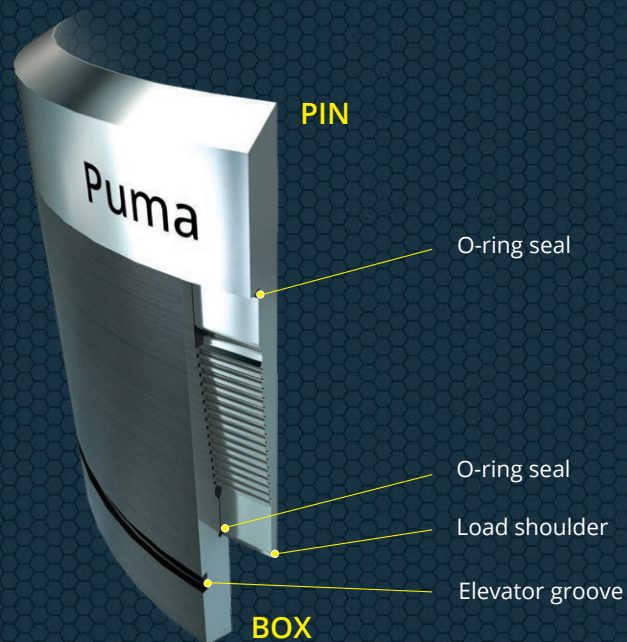


Puma DF





External flush for special clearance ▲



## ADVANTAGES AND BENEFITS

- Flush OD/Flush ID
- Driveable
- Pre-loaded
- Strong, forged design with 100% connector efficiency
- Dual elastomer O-ring seals
- Low torque, four-turn make-up
- Visual indication of make-up



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# Advanced Connectors

## Mudline Mechanical Release (MMR)

The only diverless mudline conductor connector with 100% running and tieback success



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### RELIABLE MUDLINE SUSPENSION

The Mudline Mechanical Release (MMR) is a diverless, rapid-install connector that has been used in shallow-water applications globally with a faultless record. Large, load-bearing faces ensure suitability for driven conductor operations.

The breech-lock connection features 1/6-turn make-up and can be reused multiple times. On completion or suspension of drilling operations, when disconnection is required, right-hand torque is applied to the string to actuate the shear pins to allow back-off and retrieval. Break-out torque can be accurately set to different values depending upon requirements. The purely mechanical connection eliminates the need for umbilical or ROV intervention.

The MMR box connector is tieback-ready with the original running pin or a stab-in pin that requires no tools for assembly and is secured with an external lock-ring. This weight-set option features our Lynx field-proven technology.

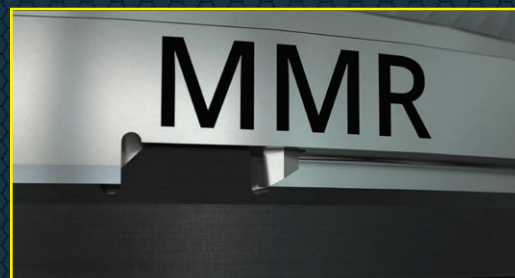
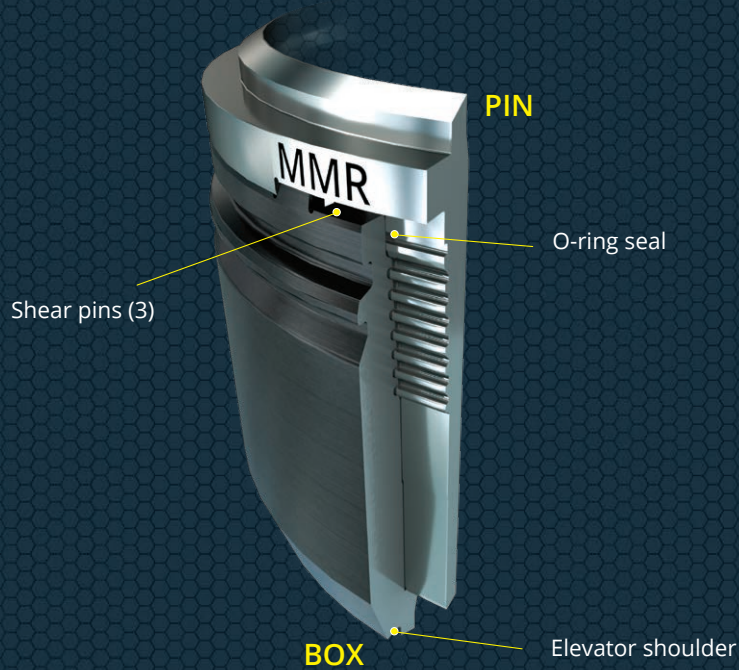
The MMR design also features an elastomeric seal for pressure integrity in both running and tieback modes.

### APPLICATIONS

- Jack-up mudline suspension systems
- Jack-up and platform mudline suspension systems with tieback



MMR ▲



MMR shear pin with variable break out torque ratings ▲

## ADVANTAGES AND BENEFITS

- Driveable
- Diverless
- Simple, rapid 1/6-turn install
- Variable break-out torque
- Tieback-ready
- Eliminates specialised tooling
- Eliminates umbilicals
- Field-proven in more than 150 wells



▲ MMR stabbing



◀ MMR tieback ▶





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# Advanced Connectors

## Lynx™

The only driveable,  
weight-set connector  
with external lock-ring



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DRILL-SHIP

**ZERO TORQUE EASY RUN FOR HIGH SEAS**

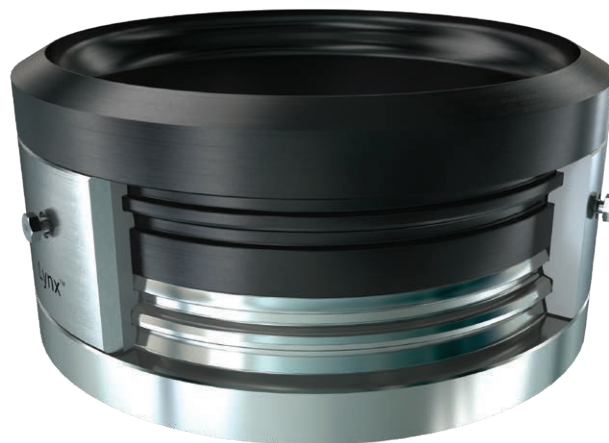
The Lynx™ is a robust connector for conductor, casing and surface landing strings, and ideal for challenging high seas conditions and land wells. Its weight-set design is the easiest connector to run, as it eliminates the need for special tools or personnel.

Lynx connectors stab easily, self-align axially with zero torque and assemble under the weight of the joint. When the box is stabbed over the pin, the joint weight expands the lock-ring and the abutment faces meet which snaps the lock-ring closed. Full make-up is visually confirmed by inspection of the lock-ring.

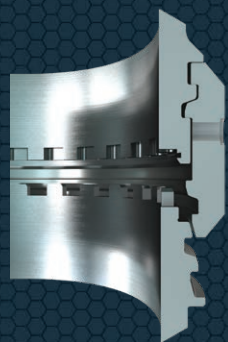
The external lock-ring design is superior to other weight-set products that rely on an internal lock-ring which is prone to jamming and deformation. Lynx connectors disengage by running jacking bolts through the lock-ring to release the pin.

### APPLICATIONS

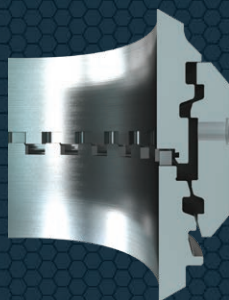
- Subsea conductor and casing
- Jack-up and land wells



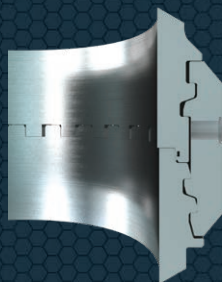
Lynx™ HDEF ▲



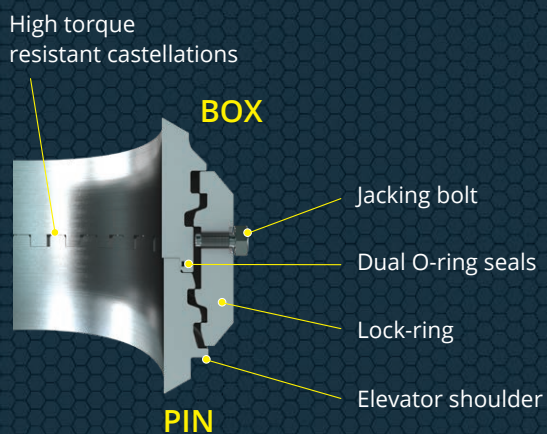
*Lock-ring contacts pin*



*Joint weight spreads lock-ring*



*Lock-ring snaps closed*



*Jacking bolts release lock-ring on break-out*

Lynx™ HDHT lock-ring ►

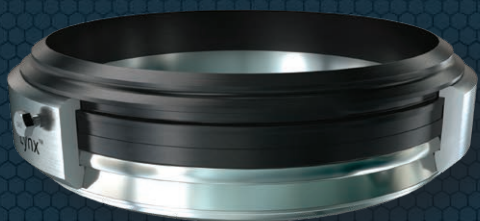


The Lynx™ is a robust connector for conductor, casing and surface landing strings



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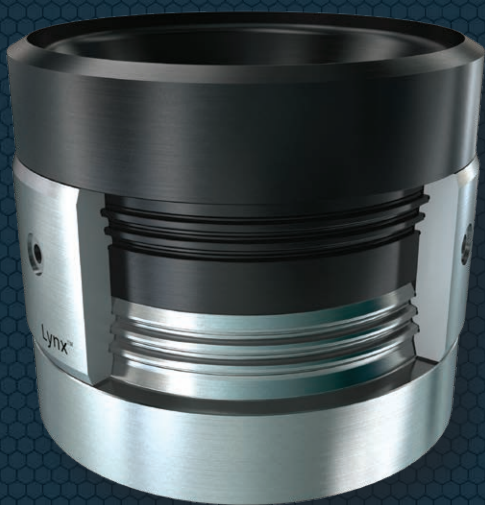
# Advanced Connectors



Lynx™ SA2 ▲



Lynx™ HD ▲



Lynx™ HDEF3 ▲

## ADVANTAGES AND BENEFITS

- Assembles without special tools or personnel
- Driveable, weight-set system
- External lock-ring eliminates jamming and driving deformation
- Visual indication of make-up
- Anti-rotation design
- Quick release

## LYNX™ VERSIONS

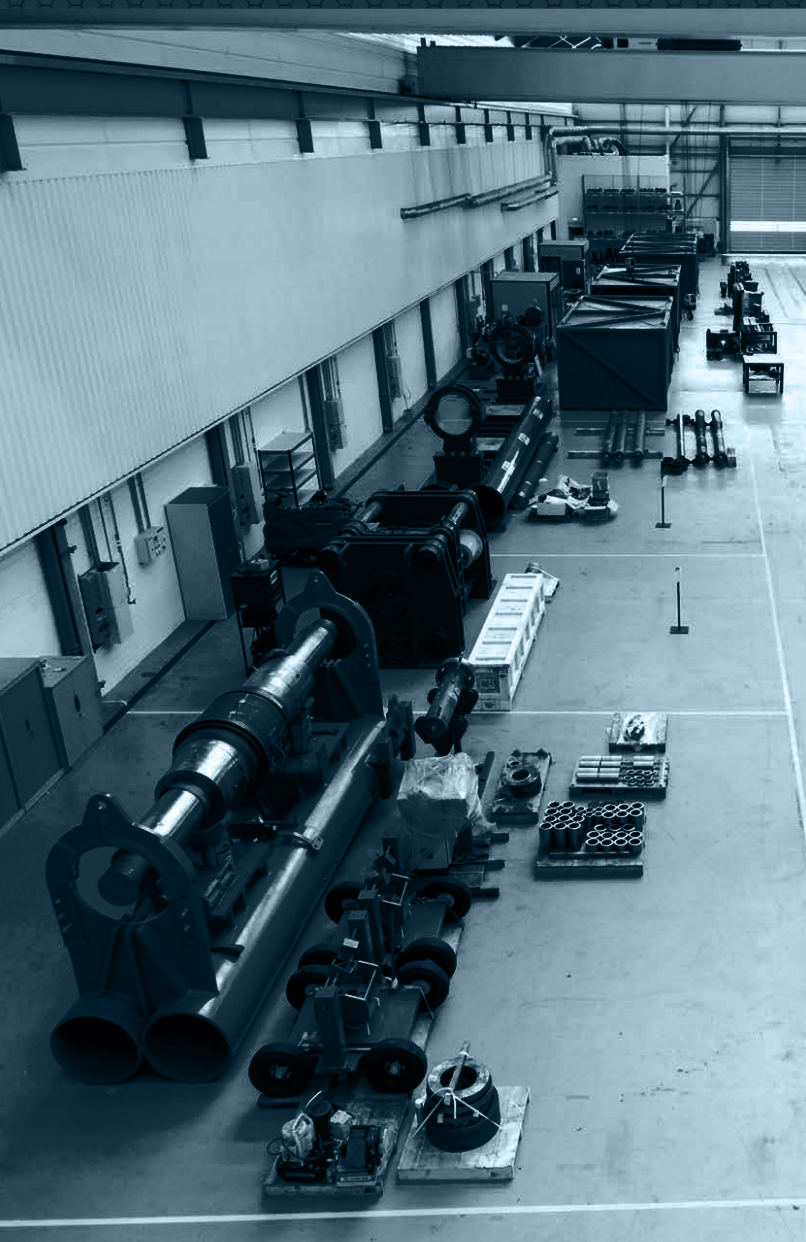
- SA2 Standard-duty single load shoulder with standard anti-rotation keys
- HD Heavy-duty dual load shoulder with standard anti-rotation keys
- HT High-torque dual load shoulder with integrated castellations offering extremely high torque resistance
- EF External flush for use in jetting applications



Lynx™ weight-set design is the easiest connector to run, as it eliminates the need for special tools or personnel

# Supporting Services

Our global facilities are dedicated to manufacturing risers, managed pressure drilling equipment, conductor and casing connectors, pull-in connectors, and more. Additionally, the UK Heartlands is home to our structural testing facility, which offers comprehensive testing and qualifications capabilities to serve the unique needs of the oil and gas, renewables, aerospace, shipbuilding and general industrial.



## UKAS ISO 17025 Accredited Test Facility

### The only facility of its kind in the UK

With full scale test frames that have a maximum capacity of 2800 tonnes in tension and 1800 tonnes in compression, our test laboratory is able to meet the robust requirements of our customers, while the confidentiality gained through our accreditation ensures that no conflict-of-interest issues arise.

All OSI conductors, casings and riser connections are subjected to vigorous testing protocols, designed to meet the needs of our diverse, globally distributed customer base.

Capabilities available are:

- Combined load testing with tension, compression and bend to recognised standards
- Static four-point bending
- Resonance fatigue testing up to 24.00" OD casing
- Bespoke testing solutions to meet any requirements
- MPD packer stripping trials

The variety and flexibility of our frames and the experience of the personnel within the facility allows us to design and conduct full scale testing that provides a more accurate representations of the forces that will be witnessed in situ.



RISER, DRILLING & PRODUCTION SYSTEMS

# Advanced Connectors

## UltraLok™

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Pressure		Compression Yield	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN
UltraLok	70	36	914	1.00	25.4	37.25	946.2	31.39	797.3	21.08	535.4	7.63	33.94	5.46	7.40	3,403	23.5	7.63	33.94
UltraLok	100	36	914	1.00	25.4	37.25	946.2	31.39	797.3	21.08	535.4	10.90	48.49	7.80	10.58	4,861	33.5	10.90	48.49
UltraLok	70	36	914	1.50	38.1	37.25	946.2	31.39	797.3	21.08	535.4	11.38	50.60	7.85	10.65	5,000	34.5	9.73	43.28
UltraLok	100	36	914	1.50	38.1	37.25	946.2	31.39	797.3	21.08	535.4	16.25	72.28	11.22	15.21	5,000	34.5	13.90	61.83
UltraLok	70	36	914	2.00	50.8	37.25	946.2	31.39	797.3	21.08	535.4	12.04	53.56	8.05	10.91	5,000	34.5	9.80	43.59
UltraLok	100	36	914	2.00	50.8	37.25	946.2	31.39	797.3	21.08	535.4	17.20	76.51	11.50	15.59	5,000	34.5	14.00	62.28

## Swift - RAR

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield		Anti-rotation Type
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN	
DW2 (RAR)	100	22	559	1.0	25.4	24.28	617	19.75	502	14.50	368	5,900	26.2	2,480	3.36	6,500	44.8	5,900	26.2	Ratchet
DW2 (RAR)	80	22	559	1.25	31.8	24.28	617	18.75	476	18.21	463	5,656	25.2	2,264	3.07	7,500	51.7	5,656	25.2	Ratchet
DW2 (RAR)	100	22	559	1.25	31.8	24.28	617	18.75	476	18.21	463	7,070	31.4	2,830	3.84	8,700	60.0	7,070	31.4	Ratchet
DW2 (RAR)	110	22	559	1.5	38.1	24.28	617	18.75	476	18.21	463	7,780	34.6	3,150	4.27	9,605	66.2	7,780	34.6	Ratchet

## Swift

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield		Anti-rotation Type
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN	
DW2 (IF)	65	18.625	473	0.435	11.0	20.50	521	17.76	451	10.00	254	1,599	7.1	592	0.80	3,000	20.7	1,014	4.5	None
DW2 (HC)	100	20	508	0.625	15.9	22.00	559	18.75	476	11.00	279	3,630	16.1	1,460	1.98	5,000	34.5	3,060	13.6	None
DW2 (AR)	100	20	508	0.625	15.9	21.52	546	18.75	476	15.00	381	3,550	15.8	1,390	1.88	5,000	34.5	1,670	7.4	Tab
DW2 (HTAR)	70	20	508	0.625	15.9	21.52	546	18.75	476	15.00	381	2,490	11.1	970	1.32	4,000	27.6	1,160	5.2	Tab
DW2 (IF)	65	20	508	0.625	15.9	21.50	546	18.75	476	10.00	254	2,310	10.3	900	1.22	3,550	24.5	1,080	4.8	None
DW2 (IF)	100	20	508	0.625	15.9	21.50	546	18.75	476	10.00	254	3,550	15.8	1,390	1.88	5,000	34.5	1,670	7.4	None
DW2 (AR)	70	20	508	0.812	20.6	22.27	566	18.00	457	15.40	391	3,430	15.3	1,316	1.78	4,500	31.0	2,835	12.6	Key
DW2 (AR)	110	20	508	0.812	20.6	22.27	566	18.00	457	15.40	391	5,390	24.0	2,070	2.81	7,000	48.3	4,460	19.8	Key
DW2 (AR)	70	20	508	0.812	20.6	21.52	546	18.25	464	15.00	381	2,490	11.1	970	1.32	4,500	31.0	2,080	9.3	Tab
DW2 (AR)	100	20	508	0.812	20.6	21.52	546	18.25	464	15.00	381	3,550	15.8	1,380	1.87	5,000	34.5	2,970	13.2	Tab
DW2 (AR)	80	22	559	1.0	25.4	24.27	616	20.00	508	15.40	391	4,920	21.9	2,070	2.81	5,000	34.5	3,580	15.9	Key
DW2 (AR)	100	22	559	1.0	25.4	24.27	616	20.00	508	15.40	391	6,150	27.4	2,580	3.50	6,500	44.8	4,470	19.9	Key
DW2 (X80)	100	22	559	1.0	25.4	23.90	607	18.99	482	16.32	415	5,310	23.6	2,220	3.01	6,500	44.8	4,500	20.0	None
DW2 (IF)	80	24	610	0.75	19.1	25.50	648	22.50	572	10.50	267	4,000	17.8	2,000	2.71	5,000	34.5	2,030	9.0	Tab
DW2 (IF)	70	26	660	0.625	15.9	27.90	709	24.625	625	10.88	276	3,000	13.3	1,560	2.12	3,000	20.7	2,330	10.4	None
DW2 (IF)	100	26	660	0.625	15.9	27.90	709	24.625	625	10.88	276	4,290	19.1	2,230	3.02	4,250	29.3	3,330	14.8	None
DW2 (IF)	80	26	660	1.0	25.4	27.25	692	24.00	610	10.88	276	4,000	17.8	2,000	2.71	3,600	24.8	2,200	9.8	None
DW2 (IF)	100	26	660	1.0	25.4	27.25	692	24.00	610	10.88	276	5,000	22.2	2,500	3.39	4,500	31.0	2,700	12.0	None
DW2 (AR)	100	28	711	0.75	19.1	29.76	756	26.50	673	16.01	407	5,390	24.0	3,050	4.14	5,000	34.5	4,260	18.9	Tab
DW2 (IF)	70	30	762	1.0	25.4	31.25	794	28.00	711	10.88	276	3,900	17.3	2,290	3.10	4,100	28.3	2,940	13.1	None
DW2 (IF)	100	36	914	1.0	25.4	37.25	946	34.00	864	10.88	276	6,220	27.7	4,420	5.99	4,000	27.6	4,000	17.8	None

## Merlin™ - Conductor

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN
S	100	16	406	0.5	12.7	16.40	417	14.75	375	10.14	258	1,490	6.6	530	0.7	3,000	20.7	1,400	6.2
DIF	100	20	406	0.625	15.9	22.07	561	18.75	476	15.10	384	3,340	14.9	1,260	1.7	5,000	34.5	4,740	21.1
HDIF	100	20	406	0.812	20.6	21.88	556	18.38	467	19.26	489	3,940	17.5	1,510	2.0	5,750	39.6	3,940	17.5
DIF	100	22	406	1.0	25.4	23.50	597	20.00	508	15.35	390	3,700	16.5	1,550	2.1	5,000	34.5	5,280	23.5
HDIF	100	22	406	1.0	25.4	23.17	589	20.00	508	18.51	470	4,300	19.1	1,800	2.4	6,000	41.4	5,300	23.6
DIF	100	24	406	1.0	25.4	25.50	648	22.00	559	15.35	390	4,050	18.0	1,860	2.5	5,000	34.5	5,780	25.7
HDIF	100	26	406	1.25	31.8	28.25	718	23.50	597	27.76	705	7,500	33.4	3,110	4.2	6,000	41.4	9,240	41.1
HDRB	100	26	406	1.50	38.1	27.90	709	22.15	563	32.54	827	9,240	41.1	4,460	6.0	8,075	55.7	9,240	41.1
DIF	100	30	406	1.0	25.4	31.50	800	28.00	711	15.35	390	5,100	22.7	2,980	4.0	5,000	34.5	7,300	32.5
DIF	100	30	406	1.5	38.1	30.50	775	27.00	686	15.35	390	5,000	22.2	3,200	4.3	5,000	34.5	7,000	31.1
HDSL	100	30	406	1.5	38.1	30.50	775	26.63	676	23.22	590	7,000	31.1	4,000	5.4	5,000	34.5	7,000	31.1
HDIF	100	30	406	1.5	38.1	31.75	806	27.00	686	27.76	705	8,770	39.0	4,960	6.7	6,000	41.4	8,770	39.0
HDEFSL	100	30	406	1.5	38.1	30.00	762	26.13	664	23.14	588	7,000	31.1	4,000	5.4	4,000	27.6	7,000	31.1
HDEF	100	36	406	1.0	25.4	36.00	914	31.25	794	27.76	705	10,600	47.2	7,300	9.9	5,000	34.5	13,000	57.8
HDEF	100	36	406	1.5	38.1	36.00	914	31.25	794	27.76	705	10,600	47.2	7,300	9.9	5,000	34.5	13,000	57.8
HDEF	100	36	406	2.0	50.8	36.00	914	27.56	700	46.24	1174	17,090	76.0	11,470	15.6	7,750	53.4	16,100	71.6

## Merlin™ - Riser

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN
CC-15	110	7.125	181	1.0	25.4	8.62	219	5.13	130	43.42	1103	1,570	7.0	177	0.2	22,500	155.1	1,250	5.6
R (IF)	100	10.75	273	0.75	19.1	11.45	291	9.25	235	14.44	367	1,420	6.3	280	0.4	7,500	51.7	1,340	6.0
R (IF)	85	17.25	438	0.92	23.4	20.63	524	15.41	391	26.26	667	3,960	17.6	1,280	1.7	7,840	54.1	3,960	17.6
R (IF)	80	20.5	521	0.75	19.1	22.85	580	19.00	483	24.39	619	3,720	16.5	1,480	2.0	5,120	35.3	3,720	16.5
R 5K	100	24	610	1.5	38.1	26.00	660	21.00	533	32.54	827	7,940	35.3	3,740	5.1	8,750	60.3	6,170	27.4
R 10K	100	25	635	2.5	63.5	28.76	731	20.00	508	60.27	1531	1,270	5.6	6,038	8.2	10,000	68.9	1,290	5.7
Integral 10k	110	9.6	243.8	1.0	25.4	11.6	293.4	7.6	193.0	22.1	561.3	1,850	8.3	335	0.45	10,000	68.9	1,850	8.3
R 15K	85	27.1	688.3	3.9	99.7	28.5	723.6	19.3	489.0	63.5	1612.9	13,600	60.5	6,750	9.15	15,000	103.4	11,162	49.7



RISER, DRILLING & PRODUCTION SYSTEMS

# Advanced Connectors

## Leopard

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN
SD2	70	18.625	473	0.435	11.0	19.91	506	17.76	451	7.97	202	1,520	6.8	5,800	7.86	2,861	19.7	1,240	5.5
SD2	70	20	508	0.625	15.9	21.19	538	18.50	470	8.75	222	2,490	11.1	970	1.3	3,500	24.1	1,940	8.6
SD2 IF	70	20	508	0.625	15.9	21.44	545	18.75	476	8.75	222	2,490	11.1	970	1.3	3,500	24.1	1,940	8.6
SD2	80	20	508	0.812	20.6	21.19	538	18.00	457	8.75	222	3,200	14.2	1,230	1.7	5,600	38.6	3,200	14.2
SD2	100	20	508	0.812	20.6	21.94	557	18.38	467	9.50	241	4,000	17.8	1,540	2.1	5,720	39.4	4,000	17.8
SD2 IF	80	20	508	1.0	25.4	21.19	538	18.00	457	8.75	222	3,700	16.5	1,500	2.0	3,500	24.1	3,380	15.0
SD2 IF	80	24	610	0.75	19.1	25.19	640	22.50	572	8.77	223	3,100	13.8	1,460	2.0	3,000	20.7	1,800	8.0
SD2	80	26	660	0.75	19.1	28.29	719	24.25	616	13.64	346	4,500	20.0	2,300	3.1	3,500	24.1	3,500	15.6
SD2 IF	80	26	660	1.00	25.4	28.29	719	24.00	610	13.62	346	5,420	24.1	2,720	3.7	3,500	24.1	4,460	19.8
SD2 IF	100	28	711	0.75	19.1	29.50	749	26.50	673	9.12	232	4,810	21.4	2,660	3.6	3,500	24.1	4,550	20.2
SD2	80	30	762	1.0	25.4	31.79	807	27.50	699	13.12	333	6,320	28.1	3,690	5.0	3,500	24.1	5,170	23.0
SD2 IF	100	30	762	1.5	38.1	31.79	807	27.00	686	13.12	333	8,910	39.6	5,240	7.1	3,500	24.1	9,270	41.2
SD2 IF	80	36	914	1.0	25.4	38.29	973	34.00	864	13.12	333	7,600	33.8	5,400	7.3	3,500	24.1	4,800	21.4
SD2 EF	80	36	914	1.0	25.4	36.00	91	31.75	806	14.69	373	6,590	29.3	4,680	6.3	3,500	24.1	6,040	26.9
SD2 IF	80	36	914	1.5	38.1	37.79	960	33.00	838	13.12	333	11,200	49.8	7,700	10.4	3,500	24.1	9,100	40.5
SD2 EF	80	36	914	1.5	38.1	36.00	914	31.20	792	16.19	411	11,380	50.6	7,850	10.6	3,500	24.1	9,690	43.1
SD2 RB	80	36	914	1.5	38.1	36.90	937	32.06	814	13.19	335	9,200	40.9	6,350	8.6	3,500	24.1	7,800	34.7
SD2 EF	100	36	914	2.0	50.8	36.00	914	31.20	792	16.19	411	14,300	63.6	9,920	13.4	3,500	24.1	11,960	53.2
SD2	100	36	914	2.0	50.8	37.25	946	31.50	800	19.42	493	16,100	71.6	11,500	15.6	3,500	24.1	9,500	42.3
SD2 HD	80	36	914	1.0	25.4	37.25	946	31.39	797	21.08	535	8,720	38.8	6,240	8.5	3,000	20.7	8,720	38.8
SD2 HD	80	36	914	1.5	38.1	37.25	946	31.39	797	21.08	535	13,000	57.8	8,980	12.2	3,000	20.7	11,100	49.4
SD2 HD	100	36	914	2.0	50.8	37.25	946	31.39	797	21.08	535	17,100	76.1	11,400	15.5	3,000	20.7	13,900	61.8

## Lynx™

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield		Torque Capacity (Anti-rotation)	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN	kips.ft	kN.m
SA2	100	20	508	0.625	15.9	22.33	567	18.67	474	6.05	154	1,530	6.8	820	1.1	3,000	20.7	2,090	9.3	15	20.3
HD	100	20	508	1.0	25.4	22.71	577	18.00	457	10.34	263	3,100	13.8	1,350	1.8	3,000	20.7	3,100	13.8	15	20.3
SA2	100	24	610	0.75	19.1	28.00	711	22.50	572	9.07	230	2,560	11.4	1,730	2.3	3,000	20.7	3,760	16.7	24	32.5
SA2	100	30	762	1.0	25.4	33.50	851	28.00	711	9.10	231	3,200	14.2	2,800	3.8	3,000	20.7	4,740	21.1	50	67.8
HD HT	100	20	508	0.625	15.9	22.73	577	18.00	457	10.18	258	2,480	11.0	940	1.3	2,400	16.5	2,480	11.0	400	542
HD	100	30	762	1.0	25.4	34.10	866	27.00	686	15.48	393	6,970	31.0	4,550	6.2	3,000	20.7	6,980	31.0	50	67.8
HD	100	30	762	1.5	38.1	34.10	866	27.00	686	15.50	394	6,970	31.0	4,550	6.2	3,000	20.7	6,980	31.0	50	67.8
HD3 HT	100	30	762	1.75	44.5	36.74	933	26.50	673	25.66	652	10,900	48.5	7,300	9.9	3,000	20.7	6,600	29.4	2,700	3661
HD	100	36	914	1.0	25.4	40.00	1016	33.00	838	15.50	394	8,450	37.6	5,800	7.9	3,000	10.3	8,450	37.6	60	81.3
HD HT EF	100	36	914	1.0	25.4	36.00	914	29.00	737	18.16	461	6,000	26.7	5,800	7.9	3,000	10.3	5,300	23.6	2,000	2712
HD	100	36	914	1.5	38.1	40.00	1016	33.00	838	15.49	393	8,450	37.6	5,800	7.9	3,000	20.7	8,450	37.6	60	81.3
HD HT	100	30	762	1.0	25.4	34.10	866	27.00	686	15.30	389	6,980	31.0	3,950	5.4	3,000	20.7	6,980	31.0	1,650	2237
HD HT	100	30	762	1.5	38.1	34.10	866	27.00	686	15.30	389	6,980	31.0	3,950	5.4	3,000	20.7	6,980	31.0	1,650	2237
HD HT	100	36	914	1.5	38.1	40.00	1016	33.00	838	15.16	385	8,450	37.6	5,800	7.9	3,000	20.7	8,450	37.6	2,000	2712
HD3 HT EF	100	36	914	1.5	38.1	36.74	933	26.13	664	31.20	792	12,000	53.4	8,030	10.9	3,000	20.7	8,000	35.6	3,000	4067
HD HT	100	36	914	2.0	50.8	40.00	1016	32.00	813	15.26	388	7,200	32.0	5,800	7.9	3,000	10.3	11,100	49.4	3,300	4474
HD3 HT	100	36	914	2.0	50.8	36.74	933	26.13	664	31.20	792	9,090	40.4	7,300	9.9	3,000	20.7	7,980	35.5	3,000	4068

## Puma

Type	Mat Yield	Pipe Nominal OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tension Yield		Bending Yield		Compression Yield		Internal Yield Pressure		Make-up Torque	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	kips	MN	psi	MPa	kips.ft	kN.m
DF	100	20	508	1.0	25.4	20.12	511	17.92	455	12.05	306	3,690	16.4	1,390	1.9	3,580	15.9	3,000	20.7	20 to 23	27.1 to 31.2
DF	100	22	559	1.0	25.4	22.12	562	19.92	506	11.05	281	3,730	16.6	1,560	2.1	3,730	16.6	3,000	20.7	44 to 49	59.7 to 66.4
DF	100	24	610	0.625	15.9	24.12	613	22.75	578	7.14	181	2,382	10.6	1,130	1.5	2,380	10.6	3,000	20.7	24 to 28	32.5 to 38.0
DF	110	24	610	0.625	15.9	24.12	613	22.75	578	7.14	181	2,620	11.7	1,240	1.7	2,620	11.7	3,000	20.7	24 to 28	32.5 to 38.0
DF	100	24	610	0.75	19.1	24.12	613	22.47	571	8.42	214	3,100	13.8	1,460	2.0	3,290	14.6	3,000	20.7	30 to 35	40.7 to 47.5
DF	100	24	610	1.0	25.4	24.12	613	21.99	559	11.05	281	4,050	18.0	1,860	2.5	4,050	18.0	3,500	24.1	44 to 49	59.7 to 66.4
DF	110	24	610	1.0	25.4	24.12	613	21.99	559	11.05	281	4,460	19.8	2,050	2.8	4,460	19.8	3,500	24.1	44 to 49	59.7 to 66.4
DF	100	26	660	0.625	15.9	26.13	664	24.76	629	8.14	207	2,600	11.6	1,340	1.8	2,600	11.6	3,000	20.7	26 to 30	35.3 to 40.7
DF	110	26	660	0.625	15.9	26.13	664	24.76	629	8.14	207	2,860	12.7	1,470	2.0	2,860	12.7	3,000	20.7	26 to 30	35.3 to 40.7
DF	100	26	660	0.75	19.1	26.12	663	24.47	622	8.43	214	3,330	14.8	1,700	2.3	3,570	15.9	3,000	20.7	36 to 41	48.8 to 55.6
DF	110	26	660	0.75	19.1	26.12	663	24.47	622	8.43	214	3,660	16.3	1,870	2.5	3,930	17.5	3,000	20.7	36 to 41	48.8 to 55.6
DF	100	26	660	1.0	25.4	26.13	664	23.93	608	12.05	306	4,400	19.6	2,200	3.0	4,710	21.0	3,500	24.1	55 to 80	74.6 to 108.5
DF	110	26	660	1.0	25.4	26.13	664	23.93	608	12.05	306	4,840	21.5	2,420	3.3	5,180	23.0	3,500	24.1	55 to 80	74.6 to 108.5
DF	100	30	762	0.75	19.1	30.15	766	28.45	723	11.42	290	3,860	17.2	2,290	3.1	3,860	17.2	3,500	24.1	38 to 43	51.1 to 58.3
DF	110	30	762	0.75	19.1	30.15	766	28.45	723	11.42	290	4,250	18.9	2,520	3.4	4,250	18.9	3,500	24.1	38 to 43	51.1 to 58.3
DF	100	30	762	1.0	25.4	30.15	766	27.95	710	12.05	306	5,100	22.7	2,980	4.0	5,100	22.7	3,500	24.1	50 to 55	67.8 to 74.6
DF	110	30	762	1.0	25.4	30.15	766	27.95	710	12.05	306	5,610	25.0	3,280	4.4	5,610	25.0	3,500	24.1	50 to 55	67.8 to 74.6
DF	100	30	762	1.5	38.1	30.18	767	26.89	683	17.64	448	7,600	33.8	4,300	5.8	7,600	33.8	3,000	20.7	75 to 80	101.2 to 108.5
DF	100	36	914	1.0	25.4	36.18	919	33.98	863	16.53	420	5,780	25.7	4,100	5.6	6,530	29.0	3,500	24.1	60 to 65	81.3 to 88.1
DF	110	36	914	1.0	25.4	36.18	919	33.98	863	16.53	420	6,420	28.6	4,550	6.2	7,260	32.3	3,500	24.1	60 to 65	81.3 to 88.1
DF	100	36	914	1.25	31.8	36.18	919	33.44	849	14.79	376	7,720	34.3	5,400	7.3	7,720	34.3	3,500	24.1	65 to 70	88.1 to 94.9
DF	100	36	914	1.5	38.1	36.18	919	32.89	835	17.64	448	9,700	43.1	6,700	9.1	9,800	43.6	3,000	20.7	78 to 83	105.8 to 112.5
DF	100	36	914	2.0	50.8	36.15	918	32.04	814	24.11	612	12,800	56.9	9,030	12.2	12,800	56.9	3,000	20.7	60 to 65	81.3 to 88.1
DF	100	42	1067	1.0	25.4	42.33	1075	39.83	1012	16.54	420	7,040	31.3	5,870	8.0	7,290	32.4	3,000	20.7	79 to 84	107.1 to 113.9
DF	110	42	1067	1.0	25.4	42.33	1075	39.83	1012	16.54	420	7,740	34.4	6,460	8.8	8,020	35.7	3,000	20.7	79 to 84	107.1 to 113.9
DF	100	42	1067	1.50	38.1	42.18	1071	38.89	988	22.14	562	9,920	44.1	8,090	11.0	9,900	44.0	3,250	22.4	78 to 83	105.8 to 112.5
DF	110	42	1067	1.50	38.1	42.18	1071	38.89	988	22.14	562	10,910	48.5	8,900	12.1	10,890	48.4	3,250	22.4	78 to 83	105.8 to 112.5

## MMR

Type	Mat Yield	Pipe Nom OD		Pipe Wall Thickness		Connector OD		Connector ID		Made-up Length		Tensile Yield		Bending Yield		Internal Yield Pressure		Compression Yield		Anti-rotation Torque	
	ksi	in	mm	in	mm	in	mm	in	mm	in	mm	kips	MN	kips.ft	MN.m	psi	MPa	kips	MN	kips.ft	kN.m
20" Install	100	20	508	0.625	16	22.904	582	18.75	476	15.277	388	2,530	11.3	1,190	1.6	3,000	20.7	3,240	14.4	25.0	33.9
20" tieback						24.75	629			18.48	469	2,530	11.3	1,190	1.6	3,000	20.7	3,240	14.4	-	-
30" Install	100	30	762	1.0	25	33.73	857	27.50	699	22.92	582	5,710	25.4	4,250	5.8	3,000	20.7	7,750	34.5	37.5	50.8
30" tieback						36.50	927			27.67	703	7,110	31.6	4,160	5.6	3,000	20.7	7,750	34.5	-	-



RISER, DRILLING & PRODUCTION SYSTEMS

# Advanced Connectors



## Conductor & Casing Environmental Statement

Oil States Industries' specialty connectors improve sustainability by reducing carbon footprint through three pillars:

### Logistics

Oil States provides comprehensive, localized turnkey solutions and mobile welding units for the inspection, repair, and replacement of critical connector components, which helps minimize emissions-related travel and avoids the carbon impact of manufacturing new parts. Local content not only speeds project lead time but also minimizes overall environmental impact. Utilizing local facilities reduces sea freight emissions as raw materials are directly transported to the final-use location rather than a third-party processing facility in a different country.

Additionally, our local facilities are equipped with solar panels to improve industrial energy efficiency.

### Design

Oil States connectors are designed to be reusable when the application allows, as with jack-up exploration wells. The string above the mudline can be recovered and reused multiple times.

### Reusable Protectors

Oil States protectors are engineered for reuse multiple times, lowering costs and waste. Once a protector is no longer fit for service, it is recycled for use in the manufacture of new protectors.

More on mobile welding:



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## About Oil States Industries



Oil States Industries, a subsidiary of Oil States International (NYSE: OIS), is a major global provider of integrated energy systems and solutions with a field-proven track record of supporting operators' successes for over 75 years. With proven components and seamless project performance, we enable our customers to build and operate high-performance offshore fields in the most demanding environments.

Our industry-leading technologies and unsurpassed technical expertise deliver reliable, cost-effective solutions to meet offshore drilling and workover, production, lifting and mooring challenges. We also serve customers in the onshore, marine and industrial markets.

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