

A large yellow crane is lifting a heavy well intervention tool joint at an oil field during sunset. The crane's boom is extended high into the air, and the tool joint is suspended by cables. The sky is a mix of blue, orange, and pink, indicating the time is either dawn or dusk. The crane is mounted on a truck chassis. The tool joint is a complex piece of machinery with various valves and connections. The overall scene is industrial and captures a moment of heavy machinery in operation.

# Texas Oil Tools Well Intervention Equipment



## Leading specialty manufacturers and suppliers of pressure control equipment.

At NOV, we've come a long way in establishing ourselves as one of the leading specialty manufacturers and suppliers of pressure control equipment. While you respond to your industry challenges, we're working to develop new and more efficient solutions to your problems. We understand just how important uptime is to overall success. That's why we built a state-of-the-art service and repair facility that can get your equipment back into the field as quickly as possible. From simple redress to full recertification, our proven track record of excellence in design, manufacturing and service will help you keep your operations running at maximum efficiency, 24/7.

# Surface Well Intervention Equipment



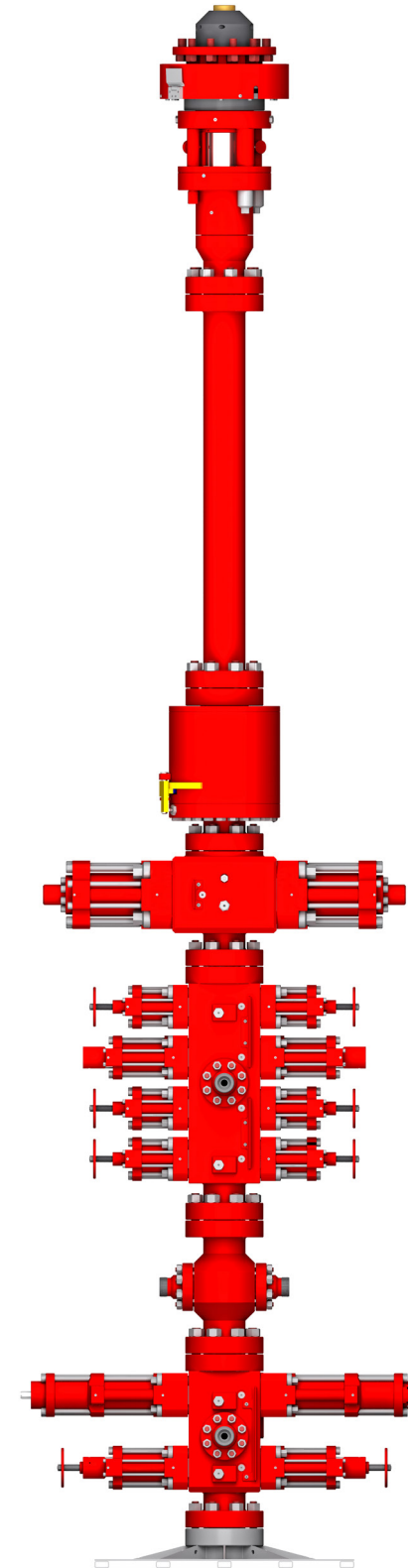
## Coiled Tubing Stack

Regardless of how demanding your operations are, our coiled tubing pressure control equipment can meet your needs and leads the industry with a proven track record of innovation and performance. We provide a variety of equipment used in the pressure control stack, including the vertical style single side door and dual over/under or the two-door stripper. If height or thru bore capabilities are an issue, then the sidewinder horizontal coil stripper could be an option.

We can meet your needs with any adapter flange, flow cross or lubricator needed - from the wellhead to the injector head. Our BOPs consist of different sizes, working pressures and configurations. The most common model, our ES Series, has hydraulic ram change, which improves safety when servicing your BOP.

### Components of the Coiled Tubing Stack

- Injector connector
- Two door stripper Packer
- Lubricator
- Hydraconn Stinger
- Hydraconn
- Sidewinder stripper packer
- ES Series Quad BOP
- Flow cross
- ES Series dual combi BOP



## Coiled Tubing (ES Series)

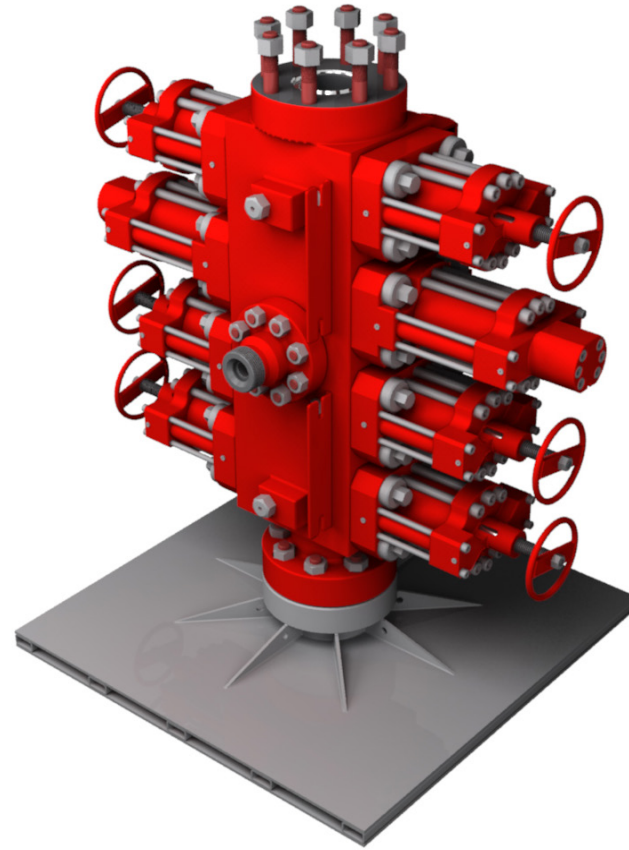
Our ES Series BOP is smaller and lighter than any other comparable BOP on the marketplace today. In addition to a hydraulic ram change that enables easier access to service the rams, the ES Series features a balanced piston on the shear actuator, which eliminates the effects of well pressure when shearing. It also comes equipped with internal hydraulic porting, along with ram position indicators, and is available in a wide range of configurations.

### Features

- Light and compact
- Pressure-balanced piston
- Low bonnet bolt torque
- Integral equalizing valves
- Well pressure isolated seals
- Hydraulic ram change
- Internal porting
- Independent bonnet testing
- Ram position indicator
- Manual locks

### Options

- Upper test and lift flange
- 4:1 de booster
- Lower test flange
- Adapter flanges



Model ES46 Quad BOP

### Specifications: ES Series Blowout Preventer

Model	Bore	Working Pressure	Tubing Range	Configuration	Weight	Height	Width
ES24	2.50"	10,000 psi	1.00" to 1.75"	Single	405 lbs.	15.25"	40.50"
	2.50"	10,000 psi	1.00" to 1.75"	Quad	1,600 lbs.	32.75"	40.50"
ES34	3.06"	10,000 psi	1.00" to 1.75"	Single	865 lbs.	13.87"	44.79"
	3.06"	10,000 psi	1.00" to 1.75"	Dual Combi	1,400 lbs.	30.00"	62.38"
ES36	3.06"	10,000 psi	1.00" to 1.75"	Quad	2,800 lbs.	34.00"	44.79"
	3.06"	15,000 psi	1.00" to 1.75"	Quad	2,800 lbs.	43.00"	51.50"
ES44	4.06"	10,000 psi	1.00" to 2.375"	Dual Combi	1,590 lbs.	31.75"	51.50"
	4.06"	10,000 psi	1.00" to 2.375"	Quad	2,790 lbs.	46.30"	51.50"
ES46	4.06"	15,000 psi	1.00" to 2.375"	Dual Combi	1,600 lbs.	31.75"	51.50"
	4.06"	15,000 psi	1.00" to 2.375"	Quad	2,800 lbs.	46.30"	51.50"
ES54	5.12"	10,000psi	1.00" to 3.50"	Dual Combi	4,700 lbs.	36.58"	85.05"
	5.12"	10,000psi	1.00" to 3.50"	Quad	6,500 lbs.	57.89"	85.31"
ES56	5.12"	15,000psi	1.00" to 3.50"	Dual Combi	4,900 lbs.	38.25"	85.31"
	5.12"	15,000psi	1.00" to 3.50"	Quad	7,000 lbs.	60.50"	70.85"
ES64	6.38"	10,000 psi	1.25" to 3.50"	Dual Combi	5,000 lbs.	40.23"	85.03"
	7.06"	10,000 psi	1.25" to 3.50"	Dual Combi	6,400 lbs.	45.25"	103.93"
ES74	7.06"	10,000 psi	1.25" to 3.50"	Quad	12,800 lbs.	79.25"	96.58"

## Coiled Tubing (EH Series)

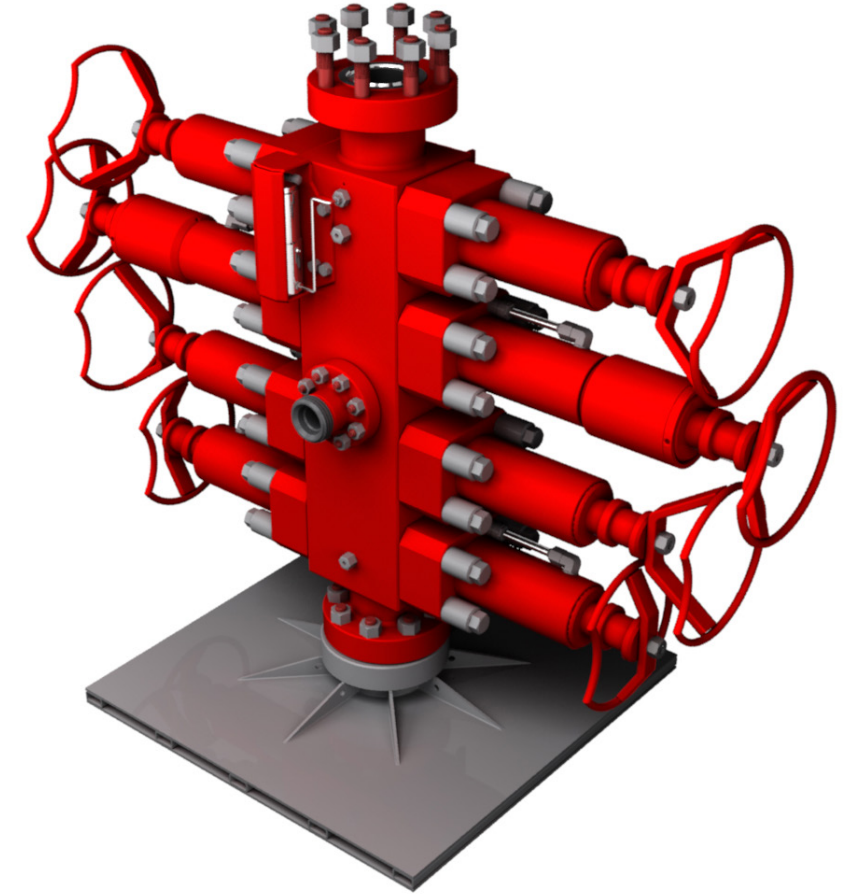
Our EH Series BOP has been utilized in the coiled tubing industry since 1978. As the coiled tubing industry has evolved, this model has been adapted to meet your needs with upgrades in shear capacity, slip holding capacity and ram seals, whilst remaining an economic solution.

The EH Series is used predominantly for 10,000 psi working pressures. However, with a wide variety of options beginning with a 2.50" bore all the way to 7.06" bore, it has the capability to meet the demands of virtually any operation.

We offer standard stacks as well as custom-designed configurations.

### Features and Benefits

- Compact integral equalizing valves
- Well pressure isolated seals
- Integral hydraulic porting
- Ram position indicator
- Non-rising manual locks
- Multi-cut super shear blades
- Replaceable slip inserts
- Easy maintenance



Model EH44-L Quad BOP

### Specifications: EH Series Blowout Preventer

Model	Bore	Working Pressure	Tubing Range	Configuration	Weight	Height	Width
EH24	2.50"	10,000 psi	1.00 to 1.75"	Single	375 lbs.	16.52"	47.00"
	2.50"	10,000 psi	1.00 to 1.75"	Quad	1,000 lbs.	33.30"	61.30"
EH34	3.06"	10,000 psi	1.00 to 1.75"	Single	490 lbs.	15.00"	47.00"
	3.06"	10,000 psi	1.00 to 1.75"	Quad	1,600 lbs.	37.13"	61.50"
EH44	4.06"	10,000 psi	1.00 to 2.375"	Single	1,100 lbs.	20.25"	69.96"
	4.06"	10,000 psi	1.00 to 2.375"	Dual Combi	2,000 lbs.	31.75"	95.69"
EH54	4.06"	10,000 psi	1.00 to 2.375"	Quad	3,500 lbs.	52.30"	95.76"
	5.12"	10,000psi	1.00 to 3.50"	Single	2,500 lbs.	25.75"	82.53"
EH64	5.12"	10,000psi	1.00 to 3.50"	Dual Combi	4,375 lbs.	41.75"	86.40"
	5.12"	10,000psi	1.00 to 3.50"	Quad	6,995 lbs.	63.50"	82.53"
EH74	6.375"	10,000 psi	1.00 to 3.50"	Single	2,800 lbs.	25.25"	85.00"
	6.375"	10,000 psi	1.00 to 3.50"	Dual Combi	4,995 lbs.	41.25"	85.00"
EH74	6.375"	10,000 psi	1.00 to 3.50"	Triple	6,995 lbs.	56.25"	85.00"
	7.06"	10,000 psi	1.25 to 3.50"	Single	3,800 lbs.	33.12"	102.25"
EH74	7.06"	10,000 psi	1.25 to 3.50"	Dual Combi	7,500 lbs.	50.00"	102.25"

## Side Door Stripper Packers

Our side door stripper packers are designed to pack-off coiled tubing as it is stripped in and out of the well. Their unique design permits the replacement of the packer elements and bushings through an open “window” below the injector. They also allow for replacement of the packer, non-extrusion ring and bushings by hydraulically retracting the pack-off piston to expose an open portal through which these elements can be changed with tubing in the well.

### Features

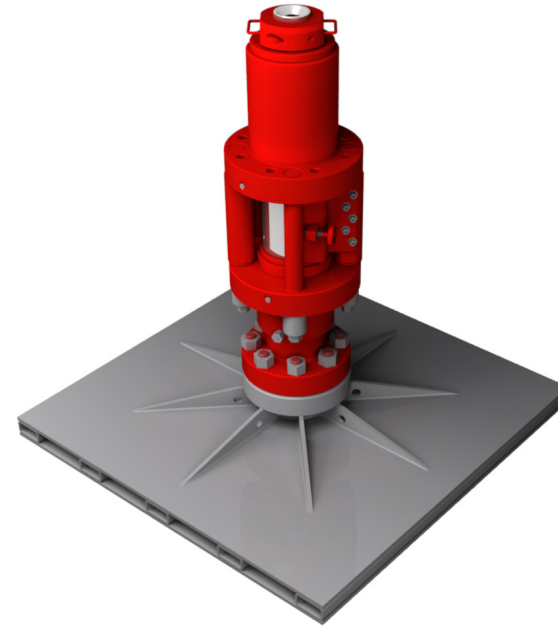
- Compact profile
- Side door for replacing packer
- One hydraulic circuit
- Pack off piston above the packer
- Long life bushings

### Benefits

- Smallest side door stripper packer manufactured
- Ease of use
- Can replace the packers with tubing inside the wellbore
- Replace all the bushings through the side door

### Temperature and Service

- H<sub>2</sub>S Service: -20°F to 250°F
- North Sea Service: -25°F to 200°F
- Arctic: -50°F to 200°F
- Steam: 75°F to 500°F



Model DSA6

## Over/Under Stripper Packers (DSV & DSU)

Our over/under design has two independent packers that are compressed by independent pistons. This setup eliminates the need for the tandem packer, which reduces the overall stack height. A pressure chamber between the packers can be used to inject lubricants or inhibitors during coiled tubing operations, extending the life of the packer.

### Features

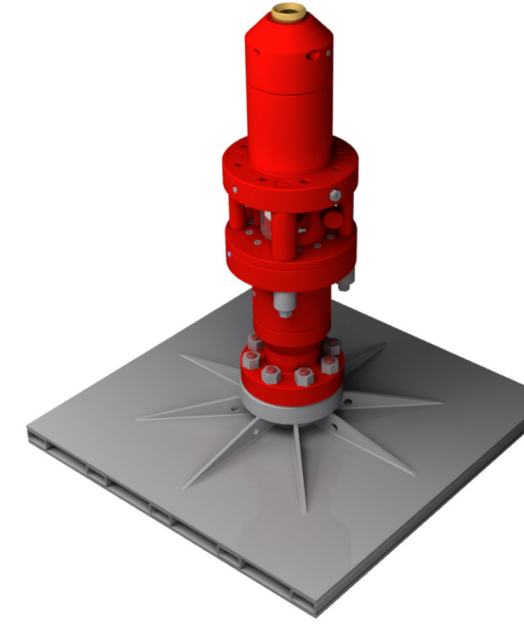
- Compact profile
- Packers can be operated independently
- Pressure chamber between packers for lubricating coiled tubing, monitoring pressure and monitoring inhibitor injection
- Snub into well with either packer
- Long-life bushings
- Replaces standard side door and tandem side door packers

### Benefits

- Utilizes one packer while the other is held in reserve. When first packer is unable to affect a seal, the second packer is actuated, thus doubling the time between packer changes.
- Side door provides easy access to replace the packers
- Provides dual barrier instead of a single barrier which increases safety
- If the primary packer wears out, the secondary packer can be activated to complete the job.

### Temperature and Service

- H<sub>2</sub>S Service: -20°F to 250°F
- North Sea Service: -25°F to 200°F
- Arctic: -50°F to 200°F
- Steam: 75°F to 500°F



Model DSU6

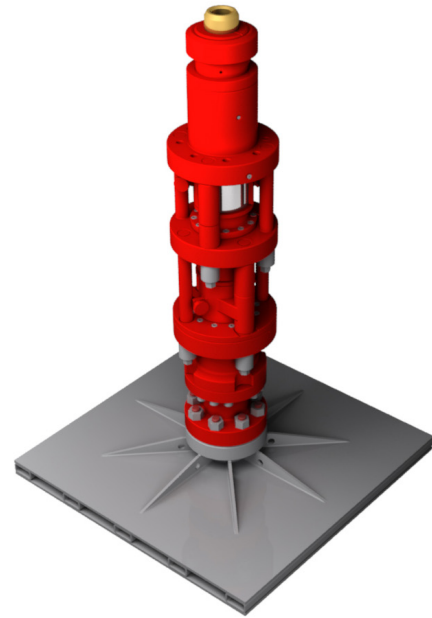
### Specifications: Side Door Stripper Packers

Model	Bore	Working Pressure	Connections		Dimensions		
			Lower End	Tubing Range	Weight	Height	OD
DSY4	2.06"	10,000 psi	Quick Union	1" to 1.50"	262 lbs.	38.75"	9.92"
DS74	2.50"	10,000 psi	Quick Union, Flange or Hydraconn connection	1" to 1.75"	250 lbs.	33.97"	11.40"
DSH4	3.06"	10,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2.375"	340 lbs.	42.38"	11.40"
DSH6	3.06"	15,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2.375"	580 lbs.	48.1"	12.40"
DSA4	4.06"	10,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2.875"	925 lbs.	46"	17.20"
DSA6	4.06"	15,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2.875"	775 lbs.	48"	16.38"

### Specifications: Over/Under Door Stripper Packers

Model	Bore	Working Pressure	Connections		Dimensions		
			Lower End	Tubing Range	Weight	Height	OD
DSV4	3.06"	10,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2"	650 lbs.	46.85"	12.75"
DSV6	3.06"	15,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2"	650 lbs.	45.65"	12.75"
DSU4	4.06"	10,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2.875"	1,375 lbs.	52.40"	17"
DSU6	4.06"	15,000 psi	Quick Union, Flange or Hydraconn connection	1" to 2.875"	1,375 lbs.	52.9"	17"

## Two Door Stripper Packers (DSM & DSW)



Model DSW6

Our two door stripper packer has two independent packers that can be changed through a side door. This two-door setup is based on the over/under design; however, with the ability to replace the upper packer through a side door, the new design allows for quicker and safer packer changes. It also eliminates the need for the tandem packer, which reduces the overall stack height. A pressure chamber between the packers can be used to inject lubricants or inhibitors during coiled tubing operations, thus extending the life of the packer.

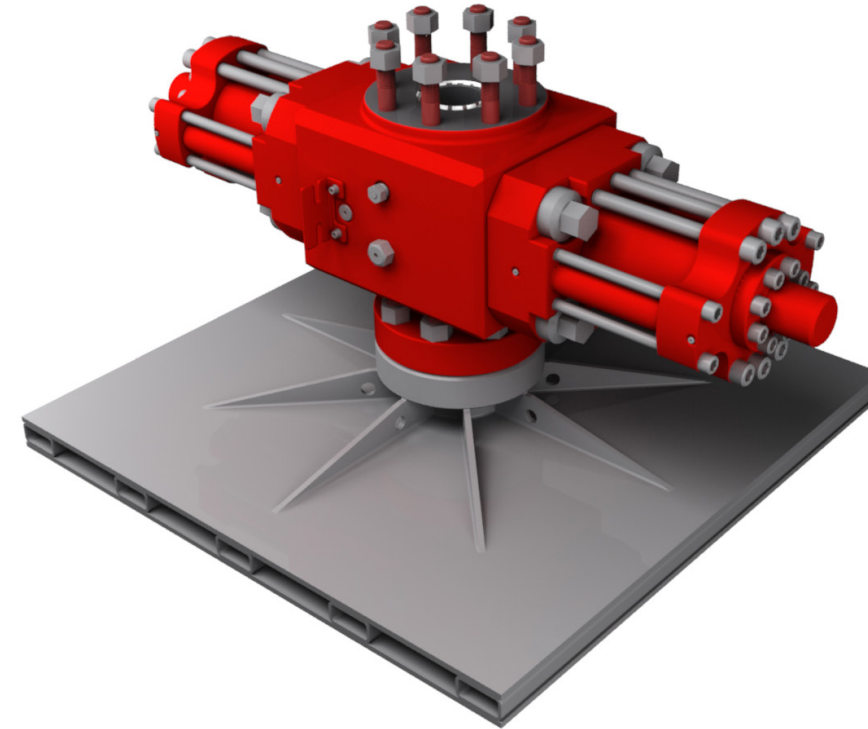
### Features

- Packers can be operated independently
- Pressure chamber between packers for lubricating coiled tubing, monitoring pressure, and monitoring inhibitor injection
- Snub into well with either packer
- Long-life bushings
- Same mounting flange as the over/under and side door

### Specifications: Two Door Stripper Packers

Model	Bore	Working Pressure	Connections		Weight	Dimensions	
			Lower End	Tubing Range		Height	OD
DSM4	3.06"	10,000 psi	Quick Union or Flange	1.00 to 2.00"	830 lbs.	63.75"	12.75"
DSM6	3.06"	15,000 psi	Quick Union or Flange	1.00 to 2.00"	840 lbs.	63.75"	12.75"
DSW4	4.06"	10,000 psi	Quick Union or Flange	1.00 to 2.875"	1,855 lbs.	73.50"	17.00"
DSW6	4.06"	15,000 psi	Quick Union or Flange	1.00 to 2.875"	1,875 lbs.	73.97"	17.00"

## Sidewinder Stripper Packers (DSO & DSK6)



Model DSO6

Our Sidewinder stripper packer is designed to reduce overall stack height, as well as pack-off on a full range of coiled tubing sizes as it is stripped in and out of the well. To further enhance the safety and efficiency of your operations, each sidewinder features the ability to fully retract the packer elements and wear bushings from the vertical wellbore. This method allows the bottom hole assembly to be inserted through the stripper packer without breaking previously tested lubricator components or connections. With unparalleled workmanship and a field-proven design, you can count on our Sidewinder during your next project.

### Features

- Extended life packer insert
- Light and compact
- Hydraulic ram change
- No welds - solid body
- Pressure-balanced piston
- Low bonnet bolt torque
- Independent bonnet testing
- Ram position indicator
- Internal equalizing valves
- Well pressure isolated seals
- Internal porting

### Specifications: Over/Under Door Stripper Packers

Model	Bore	Working Pressure	Hydraulic Working Pressure	Hydraulic Wellbore Ratio	Weight	Height	Width
DSO6	4.06"	15,000 psi	3,000 psi	8	2,400 lbs.	21.09"	66.03"
DSK6	5.12"	15,000 psi	3,000 psi	8	2,400 lbs.	23.50"	66.03"



Hydraconn JU

Our Hydraconn union is a rugged connector that permits the coiled tubing injector assembly and stripper packer to be stabbed and latched onto the top of the coiled tubing BOPs, creating a funnel to guide the stabbing operation. It has a tapered seal bore which allows the connector to mate even when the injector is suspended at a slight angle. The Hydraconn is operated by a single hydraulic line that opens a series of latching dogs on the BOP-mounted connector half to accept the stinger sub-mounted on the bottom of the stripper packer. Once the two parts are stabbed together, the hydraulic pressure is vented and the spring-loaded system forces the latch dogs closed, locking the Hydraconn together.

Features

- Constructed to provide a safe and reliable connection in a compact, rugged design
- Incorporates a tapered seal bore that facilitates stabbing the connection
- Hydraulic open safety latch with a manual override and an indicator included to prevent an unintentional release while operating with well pressure in the stack
- Safety quick latch between the stripper packer and the injector head
- Hydraulic pressure to latch and unlatch; no pressure required to hold in place
- Designed to latch the injector to the pressure control stack without the need for personnel standing underneath the injector

Injector Connector JIC

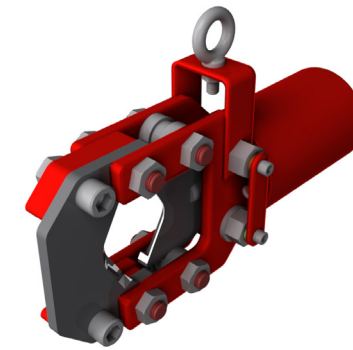
The Injector Connector is the safety quick latch between the stripper packer and the injector head. This is made possible by a male flange that stays connected to the stripper and latches when it is inserted through the injector connector. The quick latch uses the same latching dogs design as the Hydraconn quick latch.

Features

- Hydraulic pressure to latch and unlatch; no pressure required to hold in place
- Designed to latch the injector to the pressure
- Control stack without the need for personnel standing underneath the injector
- Available in 3.06" and 4.06" sizes for manual and hydraulic applications

Specifications: Hydraconn

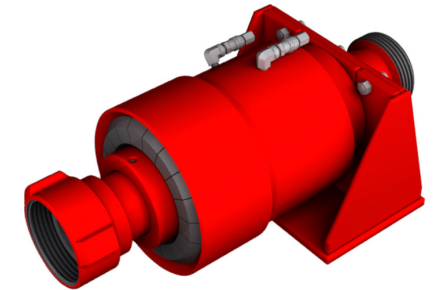
Model	Bore	Working Pressure	Weight	Height	Width
JU34	3.06"	10,000 psi	900 lbs.	21.67"	12.75"
JU36	3.06"	15,000 psi	1,200 lbs.	25.88"	17.75"
JU44	4.06"	10,000 psi	1,120 lbs.	25.11"	17.75"
JU46	4.06"	15,000 psi	1,200 lbs.	25.86"	17.75"
JU54	5.12"	10,000 psi	600 lbs.	27.77"	17.62"
JU74	7.06"	10,000 psi	4,000 lbs.	31.75"	27.12"



Tubing Cutter



Flow Cross



Quick Disconnect

Tubing Cutter

In response to the needs of the coiled tubing industry, we have developed a line of tubing cutters for use in a variety of applications.

- Three models are currently available for shearing up to 3.50" OD tubing
- Hydraulically operated cutter comes in a configuration as light as 42 lbs. for easy handling
- Generates over 60,000 lbs. of force
- Requires only one hydraulic hose connection
- Air spring return for blades

Flow Cross

We offer flow crosses from 2.56" to 7.06" with 2.06", 3.06" or 4.06" side outlets. Flow crosses can be manufactured to any desired length or the shortest standard length possible.

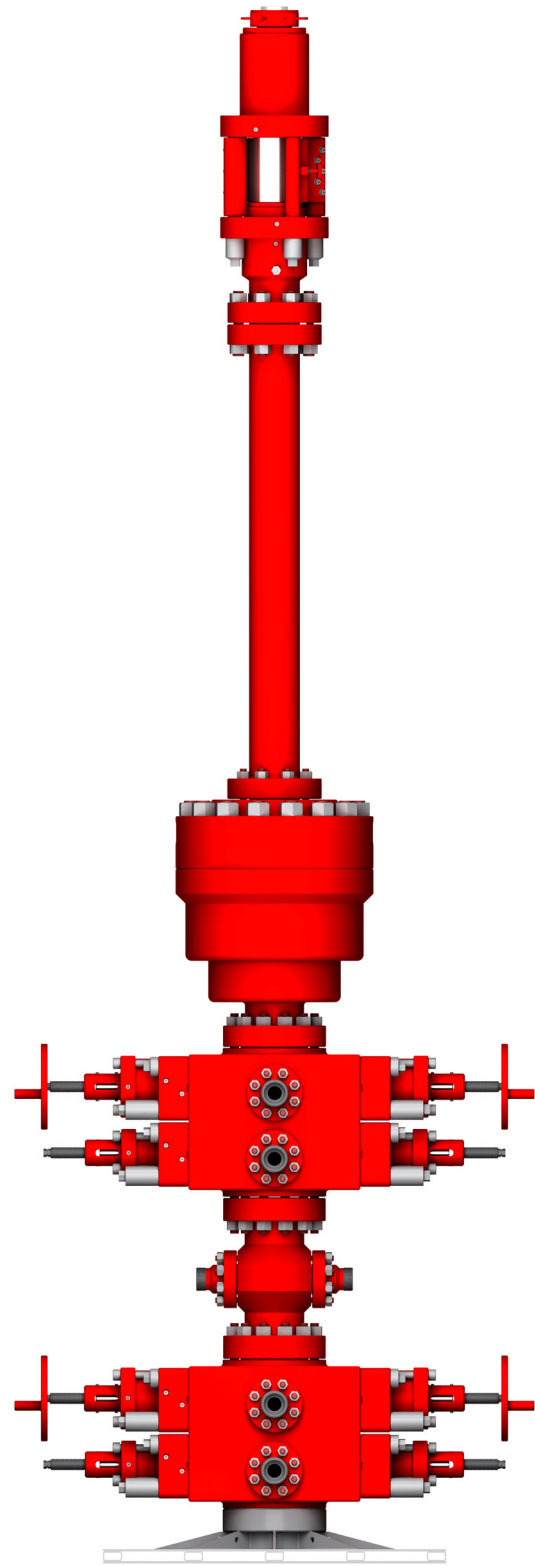
Quick Disconnect

We offer Quick Disconnects that range in size from 2.56" to 4.06". The disconnects are based the same locking dog principle as the Hydraconn and Injector connector quick latches. They are predominantly used with coflexit hoses, which are designed to disconnect in the event of an emergency.

Additional Accessories

- Adapter Flange
  - API 6A flange x Quick Union Box (Bowen, TOT or API Connections)
  - API 6A flange x Quick Union Pin (TOT, Bowen or API connections)
- Quick Union (Hand Union) x industry standard connection
- Adapter spools for different sizes or working pressure combinations
- Flow Tee for taking returns or pumping down the well
- Flow Cross for taking returns or pumping down the well
- Lubricator Quick union connections in various lengths from 2' to 12'
- Risers API flanged end connections in various lengths from 2' to 12'

All items are available in applicable bore sizes and working pressures.



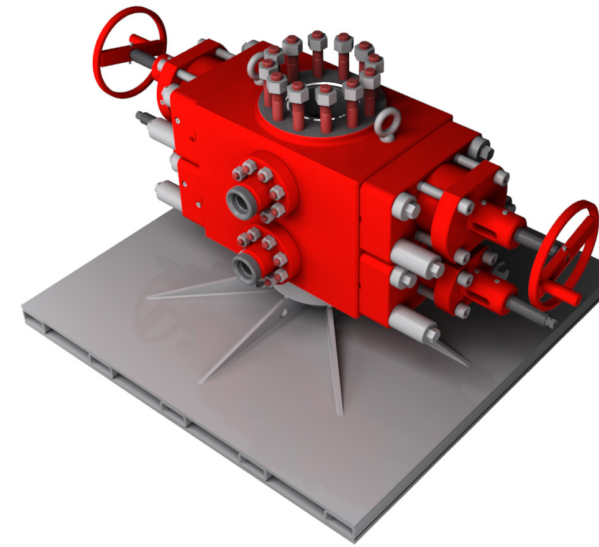
Coiled tubing drilling (CTD) is rapidly becoming the drilling method of choice for underbalanced horizontal re-entry drilling in wells with fragile formations. Fast rig-up and shorter trip times make CTD cost-effective and generally results in higher production rates than conventional overbalanced drilling techniques.

For specific types of well conditions, coiled tubing drilling can also be cost-effective for new well projects and in remote areas where the cost to mobilize a conventional drilling rig can be cost-prohibitive.

The main challenge with well control equipment during CTD operations is to make sure you have the ram sizes available in the event that it is necessary to close on a section of the bottom hole assembly (BHA). Our options for the CTD stack are normally geared toward the larger bore size. Various sizes of pipe rams and pipe slip rams are available depending on the section of the BHA that operations require the rams to close on. Another component commonly used in the CTD stack that is different from normal CT operations is the annular BOP. The annular BOP in this case is used as an additional sealing barrier, with its capabilities on sealing an open hole up to 5.50" in the case of the 7.06" annular BOP.

The additional components in the well control stack such as the Stripper Packer and riser are all standard components. In some cases, you will have extra ram cavities depending on the operations and conditions.

We have several options on ram configurations and the number of rams in a block that we can work with to create a CTD package that meets your needs and expectations.



### EGA

Our latest workover BOP is the newly designed EGA Series. This compact design has a solid forged body with open or studded flanges on top and bottom.

The BOP can include the following: studded side outlet, auto locks on the actuators and manual ram change.

#### Features and Benefits

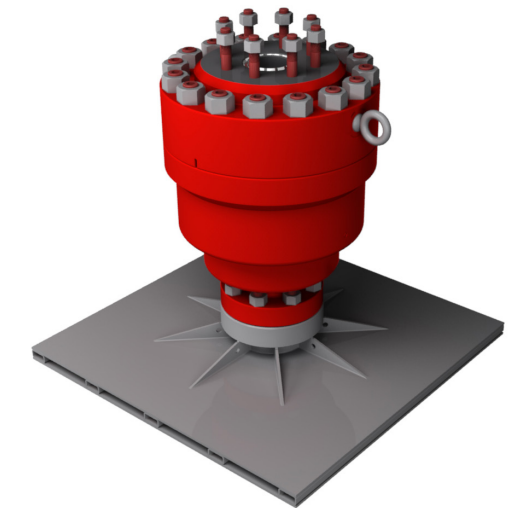
- External mechanical locks for ease of operation and safety
- Studded side outlets, full 2 1/16" - bore below each ram compartment
- Well pressure isolated seals
- NACE MR-0175 compliant components
- Multi-cut shear blades and replaceable slip inserts
- Interchangeable rams
- Forged body
- Heavy-duty lifting bracket
- Shortest stack height available
- Quick ram change
- Light and short (easy to transport and install)
- Ram guides to center coiled tubing in the rams
- Easily customizable, as actuators are interchangeable for any BOP configuration

#### Specifications: EGA Series Blowout Preventer

Model	Bore	Working Pressure	Tubing Range	Configuration	Weight	Height	Width
EGA72	7.06"	5,000 psi	1.00 to 3.50"	Single	1,942 lbs.	12.99"	78.45"
	7.06"	5,000 psi	1.00 to 3.50"	Dual	3,627 lbs.	22.50"	78.45"

#### Specifications: EJ Series Annular Blowout Preventer

Model	Bore	Working Pressure	Tubing Range	Configuration	Weight	Height	Width
EJ44	4.06"	10,000 psi	1.00 to 3.50"	Single	2,400 lbs.	12.99"	78.45"
EJ72	7.12"	5,000 psi	1.00 to 3.50"	Single	3,900 lbs.	22.50"	78.45"



### Annular BOP (EJ Series)

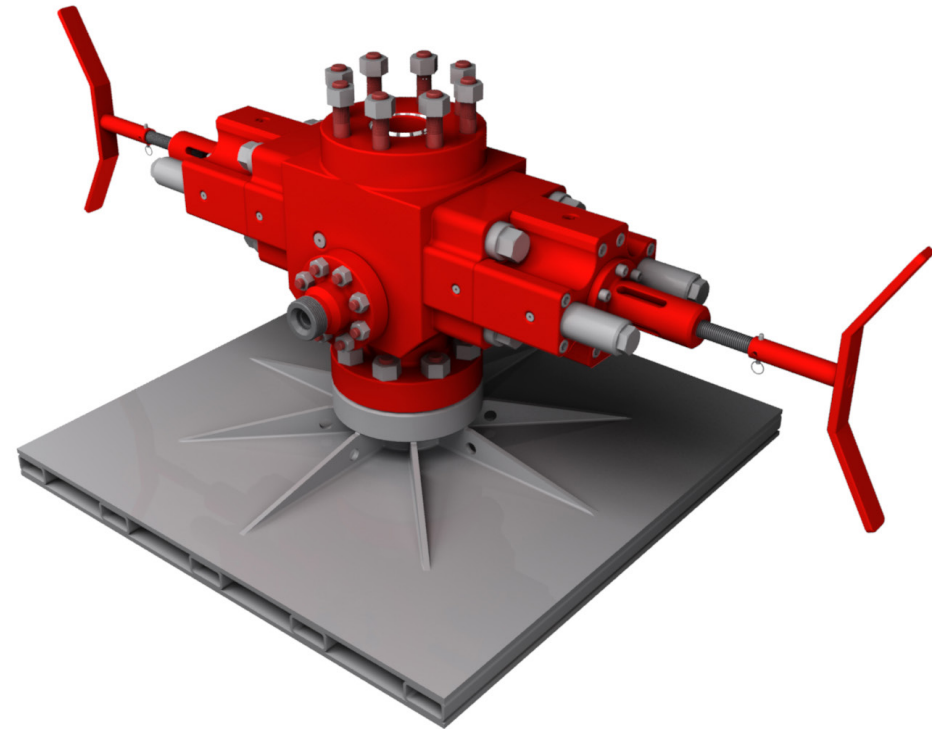
We have taken the drilling annular BOP and customized it to fit your coiled tubing operations. In some coiled tubing applications it may be necessary to seal on various diameters of the BHA. The annular design will seal on an open hole up to 5.50" diameter.

The hydraulic operating piston of the annular BOP is designed to efficiently actuate the piston, thereby closing the packer and minimizing the effect that well pressure has on the pack-off. The normal 1,500 psi hydraulic pressure is the maximum required for BOP operation over the full 10,000 psi working pressure range.

#### Features

- Designed for coiled tubing, snubbing and wireline operations
- Quick and efficient packer replacement and a shorter overall height
- Configuration has a studded body for quick removal of the bonnet and rapid packer removal
- Lightweight and compact design
- Includes vented ports between the hydraulic system seals and the well bore seals





Model DD44

Snubbing pressure control equipment is available for your workover applications. We manufacture a full range of equipment for the workover environment and well interventions. We supply pressure control equipment for both snubbing and workover operations. The products we supply include blowout preventers, annular BOPs, work windows, risers, telescoping joints, rotating strippers and snubbing rams.

Our Workover/Snubbing BOPs are designed to seal off tubing strings during well servicing operations, which require snubbing pipe into or out of a well under pressure. The BOPs feature high-pressure ratings in a compact design and allow for fast ram seal removal and replacement. The snubbing BOP is rated for H<sub>2</sub>S Service and is available with internal diameters that range from 3.06" to 7.06".

**Features**

- Mono block body design available in single, dual, triple and quad.
- Shearing capability: 3/4" - 2 3/8" S-135 heavy wall pipe
- Easy maintenance of rams and stem seals
- External ram indicators
- Simple hydraulic ram removal mechanism
- Closing ratios available in 16:1 and 25:1

**Options**

- Inconel inlay on seal surfaces
- Fluoropolymer coating of BOP internal body surfaces
- Available with keyed or keyless rams

**Specifications: DD Series snubbing Blowout Preventer**

Model	Bore	Working Pressure	Tubing Range	Configuration	Weight	Height	Width
DD46	4.06"	15,000 psi	1.00" to 2.87"	Single	1,966 lbs.	24.75"	77.50"
	4.06"	15,000 psi	1.00" to 2.87"	Twin	3,489 lbs.	37.75"	77.50"
	4.06"	15,000 psi	1.00" to 2.87"	Quad	6,715 lbs.	63.75"	77.50"



Our Automated Control Systems are used around the globe for wellhead surface and subsurface safety valve control in both onshore and offshore applications. We offer hydraulic power units along with high-pressure test racks for use in testing facilities. NOV Automated Control Systems has been providing these services for over 30 years to every major petroleum producing region of the world. Whether the control system is an extension of an existing unit or exists only as a conceptual project element, NOV ACS is capable of providing the solution.

**Safety Systems Accessories**

- ESD stations
- Flow line pilots
- Fusible plugs
- Valves

**Features**

- Custom hydraulic and pneumatic control systems
- Coiled tubing standalone control skids
- Floating production systems controls
- Hydraulic power units
- Process control panels
- Self-contained hydraulic well control units
- Accumulator packages
- Chemical injection units
- API SCSSV test consoles
- Wellhead surface and sub-surface safety
- Portable well control units for well servicing operations
- Fusible loop charge panels
- Tubing string equalization skids

# Subsea Well Intervention Equipment



## Riserless Subsea Well Intervention

Our subsea products can help you save time and money during subsea well interventions. In this configuration we have both an ET Series Single Safety Head and an EIA series triple wireline BOP. The Safety Head is a blind shear ram that meets the requirements of NORSOK D002 for a Safety Head. The EIA triple BOP meets the requirements of ISO 13628-7 for a subsea well intervention BOP.

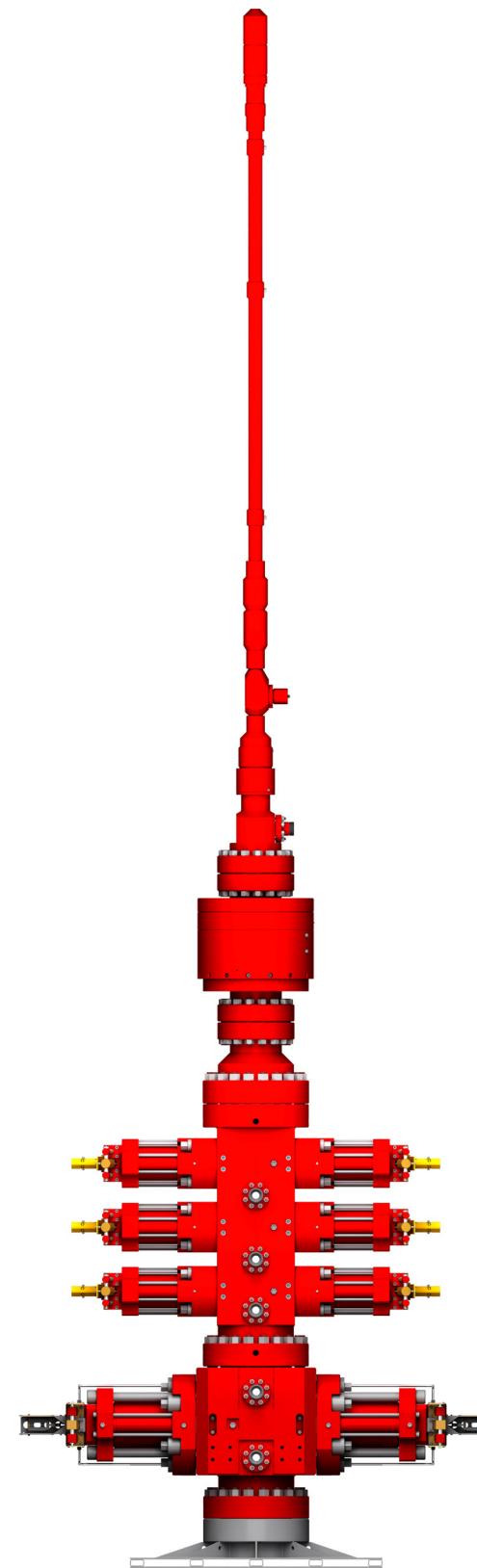
The subsea well intervention stack shown is used for riserless well intervention on an offshore well. This system has been used in major subsea markets including the Gulf of Mexico, North Sea, West Africa and Southeast Asia. The main benefit of a system such as this is to provide an economical method for wireline well intervention in subsea wells. The biggest savings is that a smaller vessel can be used to perform this well Intervention.

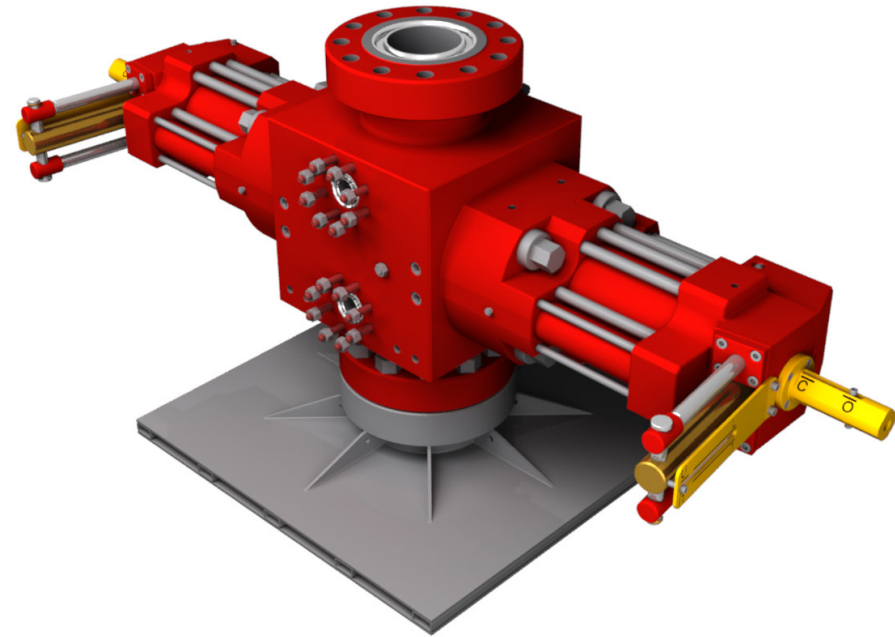
### Applications

- All riserless coiled tubing and wireline subsea well interventions
- Subsea (up to 10,000 feet in depth)
- Working pressure up to 15,000 psi
- -4°F to 300°F
- Explosive decompression resistant seals
- Currently developing subsea equipment to meet HPHT requirements

### Components of the Subsea Stack

- Subsea wireline packoff
  - Subsea stripper packer
- Subsea wireline wiper assembly
- Subsea grease head with multiple flow tube assemblies
- Subsea head catcher with ball check assembly
- Subsea hydraulic Quick Latch Assembly
- Subsea tooltrap
- Triple wireline BOP
- Single Safety Head BOP





The EIA actuators are well control components used during a subsea well intervention. There are two sets of rams: Blind Shear Rams and Grip Seal Rams. Blind Shear Rams are designed to cut the coiled tubing and/or wireline to form a blind seal. Grip Seal Rams are designed to grab, hold, and seal around the coiled tubing. The EIA Series BOP is an integral component of the lower wellhead riser package. It features a single line hydraulic system and an automatic, wedge-type, "Autolock" actuator system. The Autolock system secures the rams in the closed position in the event of a hydraulic failure or an emergency situation that requires disconnecting from the subsea wellhead.

Each EIA BOP can be built to your specific design requirements, including a dual-bore valve block with a combination of Blind Shear and Grip Seal Ram assemblies. The combi rams offer increased functionality and the ability to use a wide range of coiled tubing and wireline sizes in a field proven, compact design. All pressure ratings and service applications are available including certification for use in the North Sea.

**Specifications: EIA**

Model	Bore	Working Pressure	Tubing Range
EIA56	5.12"	15,000 psi	1.25" to 3.50"
EIA74	7.06"	10,000 psi	1.25" to 3.50"
	7.38"	10,000 psi	1.25" to 3.50"

**Features**

- SSR or GSR configuration for coil and wire
- 3,000 - 5,000 psi hydraulic operating pressure
- Single or dual circuit
- Hydraulic ram change (quick change rods)
- Metal-to-metal bonnet gaskets
- Hydraulic wedgelock
- Ram and wedgelock position indicators

**Tested Benefits**

- Hyperbaric tested to 10,000'
- Actuators and seals qualified from 32° to 311°F

The Subsea Quick Latch is a rugged connector designed for multiple subsea latch and unlatch connections. The latch can be stabbed at an angle due to the tapered design that guides the stinger into the connector and into the seal bore during the stab operation. The Quick Latch is hydraulically-operated and uses a set of locking dogs to lock the two pieces of equipment together.

The locking dogs work independently and are not affected by the wellbore pressure. A spring mechanism holds the piston and tool in the locked position and is unaffected by water depth. A visual indicator and lock prevents the tool from accidentally opening during unintended loss of hydraulic pressure.

**Features**

- Working pressure of 5,000, 10,000 and 15,000 psi
- Working temperature of -4°F to 250°F (with options for 300°F)
- Elastomer wellbore seals
- Bore sizes: 5.12", 7.06" and 7.375"
- Hydraulically-operated
- Visual indicators
- Fail-safe closed

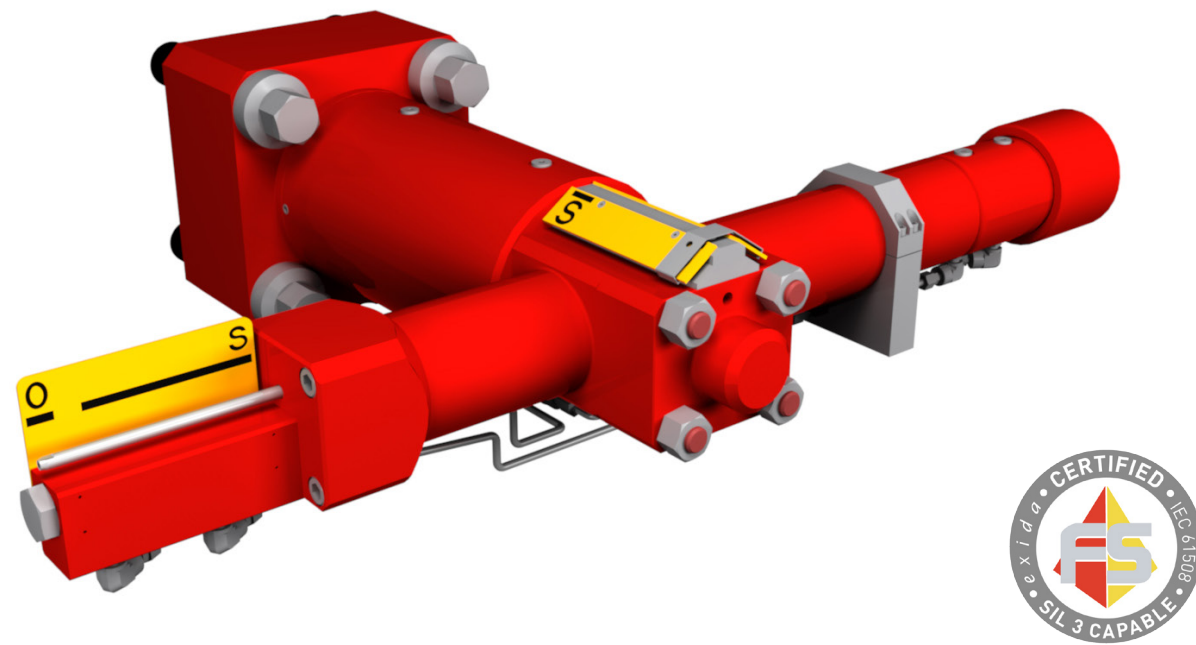
**Benefits**

- Quick subsea installation
- Safe and reliable connection
- Allows multiple connections in subsea environment
- Provides a connection so that subsea wireline tools can be run into the well

**Options**

- Metal to metal wellbore seals
- Manual locking mechanism
- Inconel inlay
- Rotational alignment





The EI BOPs are well control components used during a subsea well intervention. There are two sets of rams - Blind Shear Rams and Grip Seal Rams. The first being a Blind Shear Ram that will cut the coiled tubing and/or wireline and form a blind seal. The other set of rams is a set of Grip Seal Rams that will grab, hold and seal around the coiled tubing. The EI Series is an integral component of the lower wellhead riser package. The EI features a single line hydraulic system and an automatic, wedge-type, "Autolock" actuator system. The autolock system secures the rams in the closed position in the event of a hydraulic failure or an emergency situation requires disconnecting from the subsea wellhead.

Each EI BOP is built to your specific design requirements which can include a dual-bore valve block with a combination of Blind Shear and Grip Seal ram assemblies. The combi rams offer increased functionality and the ability to use a wide range of coiled tubing and wireline sizes in a field-proven, compact design.

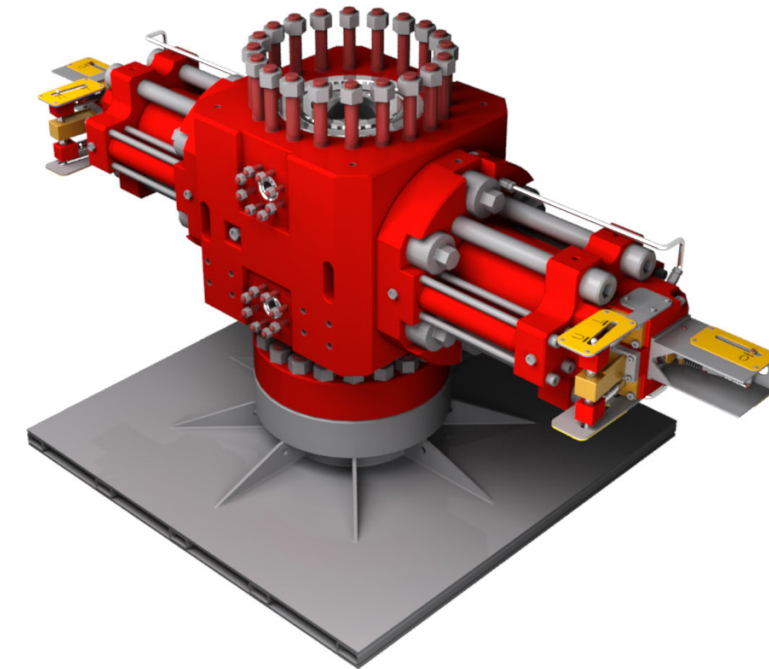
All pressure ratings and service applications are available including certification for use in the North Sea.

**Specifications: Subsea BOP**

Bore	Working Pressure	Tubing Range
3.06"	10,000 psi	1.00" to 1.75"
4.06"	10,000 psi	1.00" to 2.37"
5.12"	10,000 psi	1.00" to 2.87"
	15,000 psi	1.00" to 2.87"
6.38"	10,000 psi	1.00" to 3.50"
7.06"	10,000 psi	1.00" to 3.50"
	15,000 psi	1.00" to 3.50"
7.38"	10,000 psi	1.00" to 3.50"

**Features**

- SSR or GSR configuration for coiled tubing or wireline operations
- 3,000 or 5,000 PSI hydraulic operating pressure
- Single Circuit design
- Metal-to-metal bonnet gaskets
- Hydraulic wedgelock
- Ram and wedgelok position indicators
- SIL 3 certified



The ET Series Safety Head BOP is certified to API/ISO/NORSOK standards and is an integral component of the lower wellhead riser package. It features a single line hydraulic system and an automatic, wedge-type, "Autolock" actuator system. The Autolock system secures the rams in the closed position in the event of a hydraulic failure or an emergency situation that requires disconnecting from the subsea wellhead. Each ET BOP is built to your specific design requirements and can include a single-bore valve block with a Blind Shear Ram assembly. The shear rams offer increased functionality and the ability to use a wide range of coiled tubing and wireline sizes in a field proven, compact design. All pressure ratings and service applications are available, including certification for use in the North Sea.

**Specifications: Safety Head**

Model	Bore	Working Pressure	Tubing Range
ET76	7.06"	10/15,000 psi	NORSOK
ET7C	7.37"	10/15,000 psi	NORSOK

**Features**

- Multi-shear blind ram 10,000 psi or 15,000 psi working pressure
- Hydraulic ram change
- Metal-to-metal bonnet gaskets
- Hydraulic wedgelock
- Ram and wedgelok position indicators
- Subsea safety head blind shear rams meeting shear requirements of NORSOK D002 for a safety head

**NORSOK Shear Tests**

- 0.108" Slickline without tension, 1 strand
- 0.108" Slickline, 10 strands
- 0.438" Cable without tension
- 0.438" 5 Core cables without tension, 10 strands
- 1.25", 0.109" wall coiled tubing, 10 strands
- 3 Parallel strings of heavy wall 1.5", 1.75" and 2.0" coiled tubing with 7/16 cable inside
- 2.0" Sinker bar, ans 4230 steel
- 3.5" Drill pipe S-135, 226.2 N/m (15.5 Lb/ft)
- 4" Tubing 13 chrome I-80
- 4.5" Perforating gun
- 4.5" 184.0 N/m (12.6 Lb/ft) tubing
- 4 5/8" Gravel pack screen with 2 3/8" wash pipe inside

## Subsea Triple Stripper

The DZA4 Subsea Modular 3 Window Stripper Packer is designed to pack-off on coiled tubing as it is stripped in and out of the well at working pressures up to 10,000 psi. This design provides three independent hydraulically-actuated packers within the same body, allowing you to utilize one packer while the others are held in reserve. When the first packer is unable to affect a seal, the second packer is actuated. Once the second cannot affect a seal, the third packer is actuated.

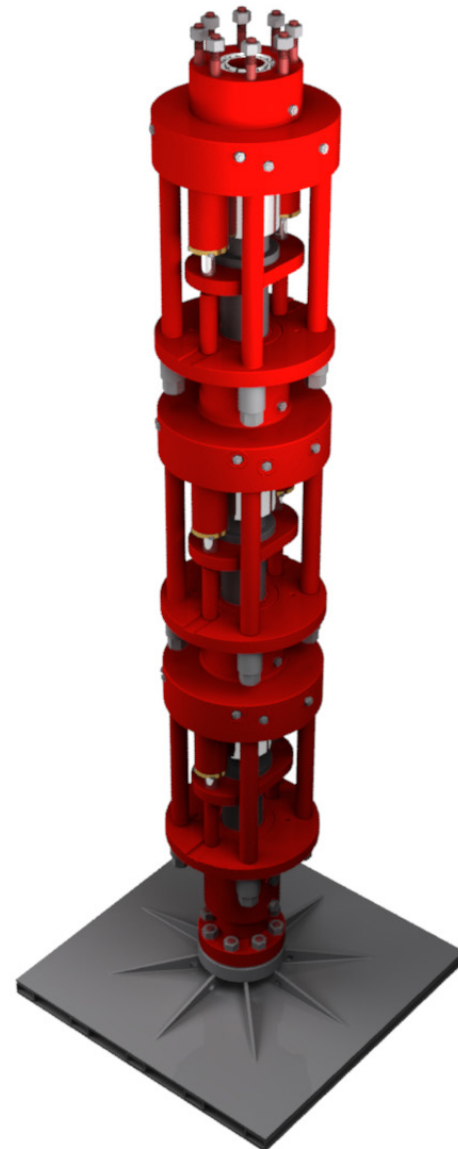
This effectively triples the time between packer changes. Changing packers is always easier, but it is particularly advantageous when changing packers with tubing in the well. The stripper is designed to create a dynamic seal around the work string while maintaining 10,000 psi full differential well bore pressure. With the appropriate packing element and bushings the stripper will be compatible with pipe sizes ranging from 1" to 2.875". The unique aspect of this design is it is a modular concept, each additional packer required is just adding it into the stack.

### Features

- Triple packer arrangement
- Extended life packers
- CRA materials for dynamic and static sealing areas
- CRA hydraulic ports
- Rated for 10,000' water depth
- Expanded access for packer replacement

### Qualifications

- API PR2 Qualification
- API hyperbaric tested to 10,000' water depth



# Engineering & Aftermarket

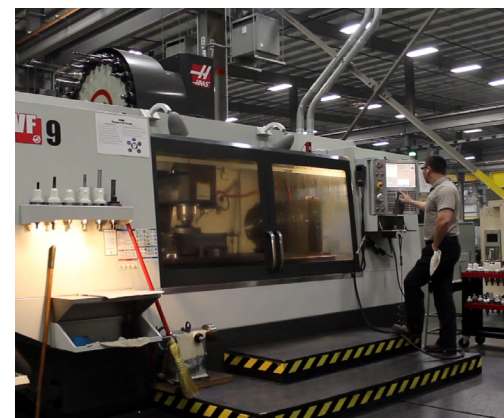


We have developed a 6,000 sq. ft. state-of-the-art high-pressure, high-temperature test facility. This engineering lab (E-Lab) is capable of providing large sample testing (20 Tons) at high pressure and temperatures safely within its subsurface vault (pit). The vault measures 12' wide x 35' long and 12' deep, and features electric-operated armour steel covers as a barrier. Along with the armored covers, the vault features remote explosion proof cameras, which enables real-time monitoring of samples during testing, as well as the capability to be flooded entirely with water. It also includes multiple umbilical feed thru ports to allow for use with a wide range of control and data cable interfaces.

Current subzero testing capability includes the use of a 100 Ton chiller unit utilized to flow water-based glycol mixtures/solutions for use in reduced temperature testing down to -30°F in complete submersion of the test sample.

Our high temperature testing capability is a 'through sample capable' flow system utilizing a 35Kw heat skid capable of flowing hot oil to maximum (plus) 450°F (media dependent). High pressure testing capabilities are currently at 45,000 psi hydrostatic testing and 30,000 psi Nitrogen gas. Hydraulic control systems up to 10,000 psi can be operated through our standard control panel. We also have a 40-gallon accumulator system rated to 5,000 psi used in timed shearing operations, ram cycle fatigue testing, and more.

All data is recorded via digital data acquisition systems that are capable of capturing up to 30 channels of equipment performance in both pressure and temperature parameters. Our above ground, free standing, 10' X 10' test bay is used to conduct hydraulic function testing and hydrostatic testing up to 30,000 psi.



**Capabilities**

- 12' wide x 35' long x 12' deep
- 45,000 psi hydrostatic high pressure
- 30,000 psi Nitrogen gas high pressure
- -30 F to +450 F (media-dependant) temperature range
- 3,000 psi to 10,000 psi hydraulic control
- Digital data acquisition, 30 channels simultaneous, pressure/temperature data recording
- 20-Ton lifting capacity



Our state-of-the-art service and repair facilities were created solely to support world-class repair and maintenance services.

**Service and Repair**

Our service and repair department provides everything from simple redress to full recertification for our customers. This department has provided a direct link to our customers for technical support to the field.

With increasingly stringent industry standards on the documentation and recertification of well control equipment, service companies have had to change their approach on product maintenance and recertification. In response to these changes, we have allocated addition resources to our service and repair department.

**Training**

As part of our commitment to provide a safe and reliable workforce, we offer an array of training programs throughout the year covering all types of well intervention and stimulation equipment. Along with these scheduled courses, we partner with our customers to integrate training packages and equipment tailored to fit your needs.

Whether you are looking to gain knowledge on your equipment's functionality or improve the safety of your operations, our goal is to ensure that you leave the course with the confidence and skills to keep even the most demanding jobsites running at maximum efficiency, 24/7.

**Parts**

The lifecycle of your equipment is important to us. To ensure your critical parts are on-hand when you need them, our global facilities are continuously replenishing inventory while providing 24/7 technical support. With our deep knowledge of your processes, we will meet your demand like no other supplier.

We provide genuine OEM-supplied parts that preserve the integrity of your asset. Made of the same high-quality material as the original equipment, our 100% OEM spare parts are designed to fit your needs with every delivery. We offer a true collaboration that helps improve your jobsites performance, reliability and safety in no time.

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