

ELSA-HP (High Pressure)

The ELSA-HP has been developed to service the high pressure horizontal tree completion and intervention market. With systems designed and qualified up to 15,000 psi, 250 degF and 10,000 ft water depth, this landing string assembly provides our clients the safety and reliability required to develop fields with these challenging conditions.

Expro used the highly successful and field proven ELSA-HD design as the basis for the development of the ELSA-HP products. With an established excellent track record, proven reliability and designed for operations in deep water environment these systems were ideally suited for the high pressure market, of which the majority is located in the deeper waters of the Gulf of Mexico.

Applications:

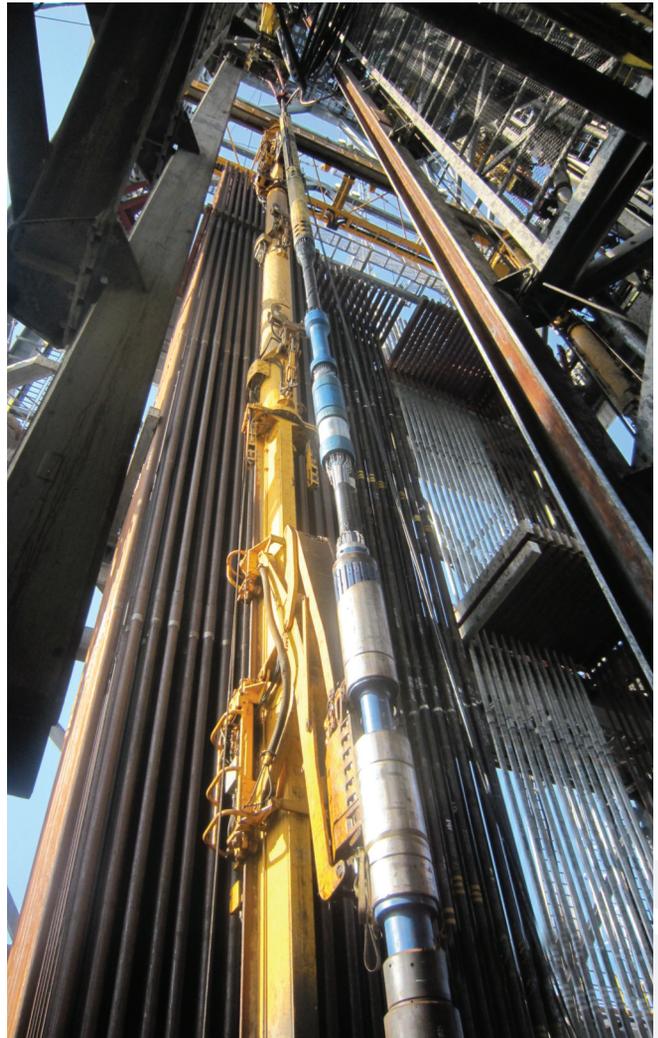
Completion installation, workover and intervention operations on horizontal subsea xmas trees from mobile offshore drilling units in water depths up to 10,000 ft (3048m)

Drill stem testing, well clean up and extended appraisal operations requiring a large flow bore

Specifically designed to suit environments where high levels of entrained solids and aggressive media are present in the completion fluids e.g. reservoir fracturing applications

Specifically designed to operate in batch completion campaigns where minimal redress operations between runs are critical

Specifically designed to suit environments where pressure up to 15k psi is present



Benefits:

Provides a dual primary subsea barrier between the well and surface during subsea operations

Allows subsea well operations to be conducted under controlled conditions without having to function BOP

Disconnect function allows MODU to unlatch and re-latch safely should environmental conditions dictate

Mechanical features permit hydraulic fracturing and back flow erosive solids through the string without compromising safety

Independent ball closure allows a single cutting device to be selected in the SSTT

System reliability and maintenance requirements virtually eliminating rig down time

High integrity ball valve construction protects seal surface from debris damage

Electrical feed through and wet connectors to facilitate surface read out

Can be run with either EXPRESS subsea control systems or direct hydraulic

Facilitate injection of chemicals to production bore

Pump through capability for well equalisation or bull heading

ELSA-HP (High Pressure)

The Retainer Valve

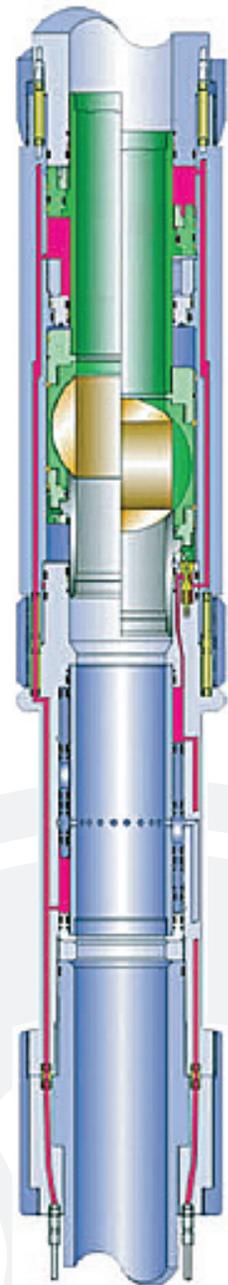
The retainer valve (RV) forms an integral part of the subsea landing string for well test or intervention operations. It is situated above the shear sub within the BOP stack. In the event of an emergency the RV acts as an environmental valve reducing the spill of hydrocarbons into the environment.

The RV is 'fail as is' design. To cycle the ball to the open position, control fluid is pumped into the ball open line, displacing the piston/mandrel assembly; the displaced fluid will vent up the ball close line. The valve is either closed by pumping fluid into the ball close line and allowing it to vent into the ball open line. Once the ball is in the fully closed position an interlock (which can be disabled, depending on pressure testing requirements) is opened allowing control fluid to move the vent sleeve into the open position and equalise pressure between production bore and marine riser. The vent sleeve is cycled into the closed position before the ball valve is opened.

For well isolation purposes the valve is designed to hold pressure differential from above only.

Features:

- To retain the contents of the landing string above the ball after disconnection
- To vent the production bore pressure between the RV and the subsea test tree to the marine riser prior to disconnection of the SSTT
- To provide a slick diameter for the annular preventer to seal around (BOP spaceout dependant)
- To provide hydraulic interlock feature between the retainer valve and SSTT Latch assembly to ensure the RV has fully sequenced prior to disconnection (optional)
- To provide through porting capability for hydraulic control lines
- To provide a pressure tight barrier between the well bore and BOP stack
- To provide a bore large enough to accommodate plugs or tool strings specified by the customer



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The Retainer Valve

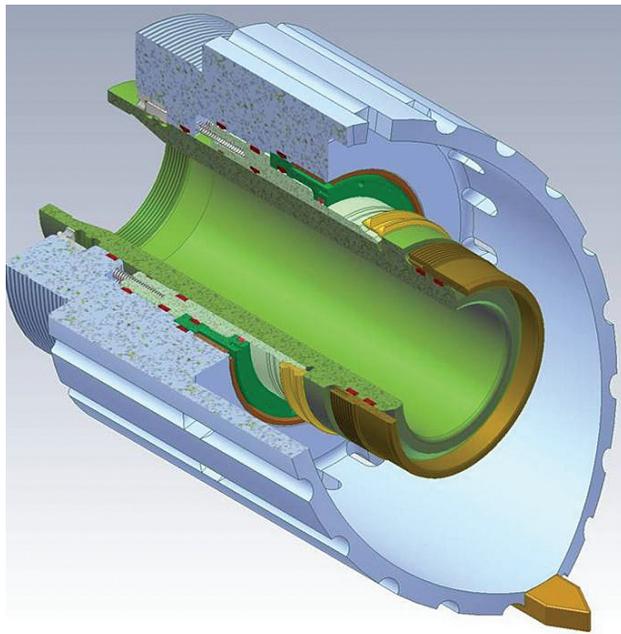
Technical Specifications:

Service	H ₂ S NACE MR 0175 + CO ₂
Maximum Working Pressure	15,000 psi (1,034 bar)
Test Pressure	22,500 psi (1,551 bar)
Design Temperature	-18°C to 121°C (0°F to +250°F)
Maximum Tensile Loading @ MWP	Up to 500,000 lbs (2,224,110 N)
Maximum Tensile Loading @ 0 psi / Bar	1,200,000 lbs (5,337,864 N)
Torsion Capacity	30,000 ft lbs (40,675 Nm)
Pump Through Capability	No Facility
Pressure Differential Support Facility From Above Only	15,000 psi (1,034 bar)
Working Pressure Operating Chambers (max)	10,000 psi (690 bar)
Test Pressure Operating Chambers (max)	15,000 psi (1034 bar)
Working Pressure for through lines (max)	15,000 psi (1034 bar)
Test Pressure for through lines (max)	22,500 psi (1,551 bar)
Overall Length	100.945" (2564 mm)
Outside Diameter (max.)	18.010" (457 mm)
Internal Diameter (min)	6.045" (154 mm)
Valve Failure Mode	Fail As Is
Hydraulic Control Fluid Cleanliness	Up to AS 4059 Class 6B through to F
Through Bore Hydraulic Line	28
Weight (approx)	5830 lbs (2645 kg)

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The Subsea Test Tree

The Subsea Test Tree (SSTT) forms an integral part of the subsea landing string for well test or intervention operations, and mimics the functionality of the BOP stack. It provides an operable primary safety system to control tubing pressure with dual barrier isolation in the event of an undesired situation or emergency.



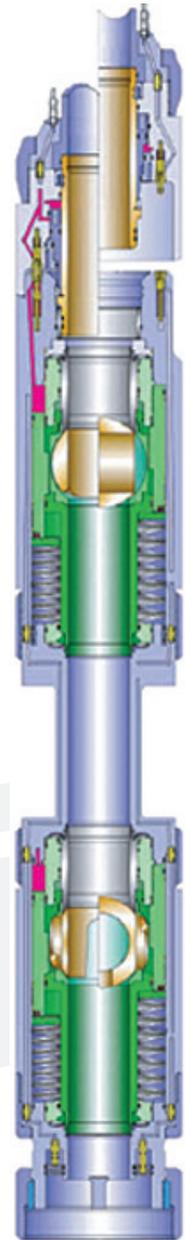
Features:

- To provide a means to isolate the well
- To provide a means to disconnect safely from the well
- Compact in size, thus facilitating the closure of the BOP pipe/shear rams
- To provide a connectable conduit for hydraulic control functions for the tree vendor and down hole functions
- To provide secondary methods for disconnection, closure and tubing hanger running tool (THRT) disconnection
- To allow chemicals to be injected directly into the well stream through a dual sealing/backflow valve arrangement, with injection point between the balls
- To provide a pressure tight barrier between the well bore and BOP stack
- To provide a bore large enough to accommodate plugs or tool strings specified by the customer
- To facilitate the pressure testing of the landing string above the upper ball latch retrieval tool profile (LRT)

The lower ball within the SSTT is capable of cutting wireline and/or coil tubing. The SSTT has a passive, debris tolerant, high tensile latch arrangement which is capable of multiple unlatch/latch operations. The latch assembly also isolates the hydraulics after disconnection and facilitates communication upon reconnection. Should all hydraulic pressure be lost downhole then a secondary disconnect can be performed with the application of pressure below the closed annular element.

To open either valve, hydraulic pressure is applied to the open side of the actuation piston, which compresses the spring pack, and an offset camming pin arrangement rotates the ball to the open position. To close either valve the open hydraulic pressure is vented to allow the spring pack to push the piston, which in turn closes the ball. Inherent to the valve is an interlock that ensures the well is isolated prior to disconnection.

Functional redundancy can be provided via a secondary system that is activated independently from the primary hydraulic circuit; pressure manipulation from surface through the choke / kill lines below the BOP pipe rams will access a pre-arranged sequential set of shuttles that direct the pressure to the desired function.



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Design Temperature	-18°C to 121°C (0°F to +250°F)
Maximum Tensile Loading @ MWP	Up to 500,000 lbs (2,224,110 N)
Maximum Tensile Loading @ 0 psi / Bar	1,200,000 lbs (5,337,864 N)
Torsion Capacity	30,000 ft lbs (40,675 Nm)
Pump Through Capability	Yes
Differential Pressure from above (max)	12,500 psi (Close Assist ratio 3:2)
Differential Pressure from below (max)	15,000 psi (1,034 bar)
Control Line pressure at working conditions (max)	10,000 psi (690 bar)
Control Line pressure at control line test (max)	15,000 psig (1,034 bar)
Working Pressure for through lines (max)	15,000 psi (1,034 bar)
Test Pressure for through lines (max)	22,500 psi (1,551 bar)
Overall Length (approx)	142.022" (3607mm)
Outside Diameter (max)	18.635" (473mm)
Internal Diameter (min)	6.045" (153mm)
Through Bore Hydraulic Line	17
Working Pressure for chemical injection ports (max)	15,000 psi (1,034 bar)
Test Pressure for chemical injection ports (max)	22,500 psi (1,551 bar)
Weight Approximately	7685 lbs (3486 kg)