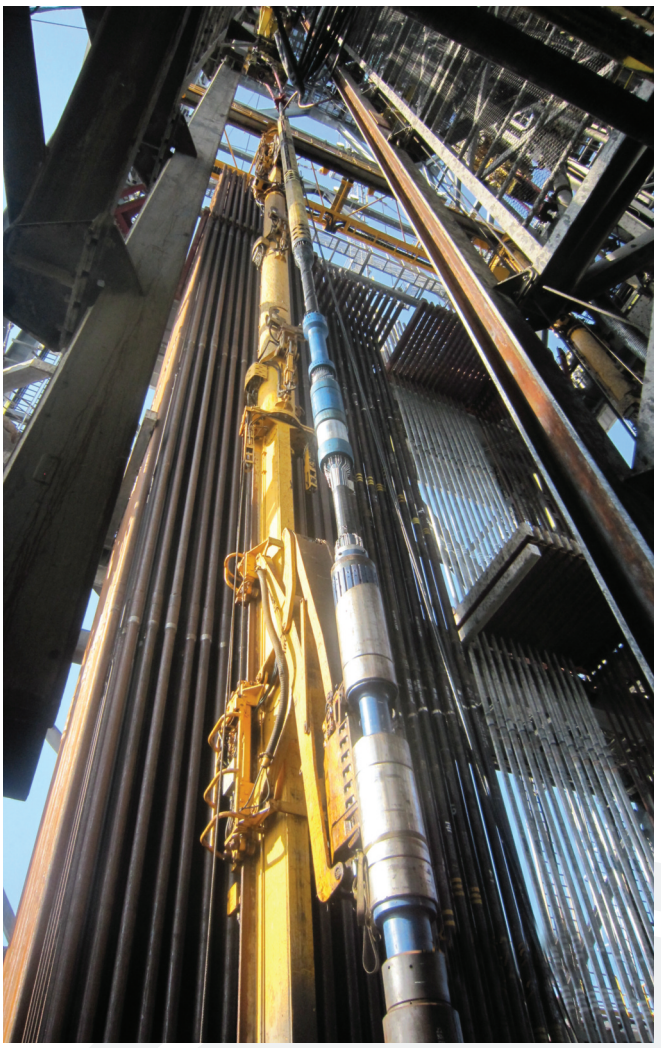
# ELSA®-HP (High Pressure)

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

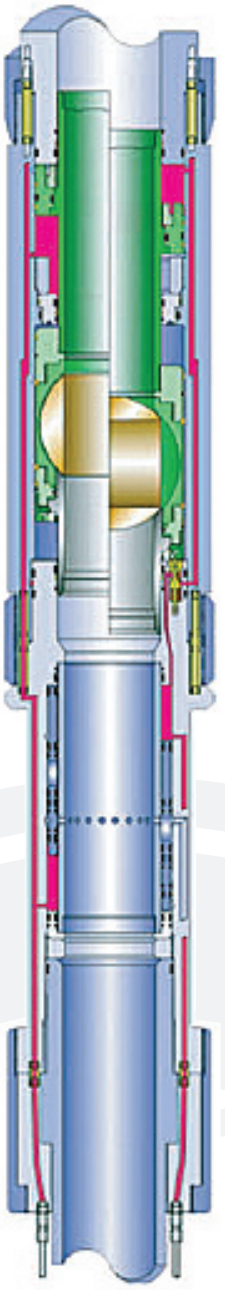
## Benefits:

- 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
- 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

# ELSA®-HP (High Pressure)

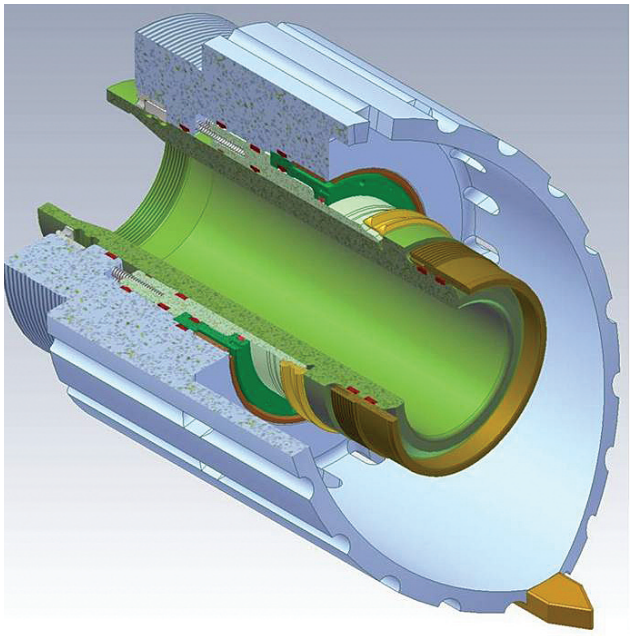
## The Retainer Valve

| Technical Specifications: | |
|---|---|
| Standards | API 6A - specification for wellhead and christmas tree equipment |
| | API 14A - specification for subsurface safety valveequipment |
| Service | NACE MR0175 / ISO 15156 - materials for use in $H_2S$ - containing environments in oil and gas production |
| 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 | 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 |
| Pressure Differential Support Facility From Above | 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 (Nom) | 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) |

# ELSA®-HP (High Pressure)

## 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

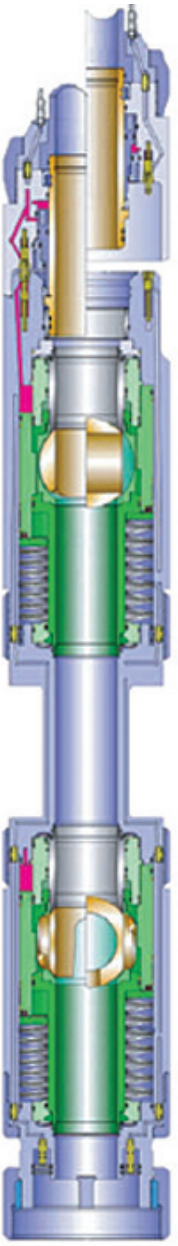
To facilitate the pressure testing of the landing string above the upper ball latch retrieval tool profile (LRT)

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

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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| Service | NACE MR0175 / ISO 15156 - materials for use in $H_2S$ - containing environments in oil and gas production |
| 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 | 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 (862 bar) |
| Differential Pressure from below (Max) | 15,000 psi (1,034 bar) |
| Hydraulic Control Working Pressure | 10,000 psi (690 bar) |
| Through Bore Hydraulic Control pressure | 15,000 psi (1,034 bar) |
| Overall Length (approx) | 142.022" (3607mm) |
| Outside Diameter (Max) | 18.635" (473mm) |
| Internal Diameter (Nom) | 6.045" (153mm) |
| Through Bore Hydraulic Line | 17 |
| Working Pressure for chemical injection ports (max) | 15,000 psi (1,034 bar) |
| Coil Tubing Cutting Capability - 2.00 in x 0.205 in WT (139ksi yield) | |
| Weight Approximately | 7685 lbs (3486 kg) |