

SenTURIAN

Large-bore subsea landing string electrohydraulic operating system

APPLICATIONS

- Reservoir access from a floating vessel
- Subsea completion installations
- Well testing and cleanup

BENEFITS

- Reduced rig-up time and ease of handling from short subsea assembly
- Enhanced safety from rapid well shut-in and disconnect

FEATURES

- Ability to operate from any type of floating vessel in water depths up to 15,000 ft [4,572 m]
- Compatibility with all SenTREE* systems
- Subsea control via PC
- Subsea instrumentation based on Schlumberger digital gauge system
- Hydraulic actuator benchmarking using high-accuracy flowmeters
- Graphical user interfaces (GUIs) for real-time subsea feedback
- Client-specific monitoring screens viewable via Internet browser
- Built-in 120/240 V AC power conditioner and uninterruptible power supply for reliability
- Integrated emergency shutdown (ESD) for full well control
- Pressure-balanced accumulators
- Compatibility with Muzic* wireless telemetry

For equipment verification and fast-acting control

The compact SenTURIAN* large-bore subsea landing string electrohydraulic operating system features a flexible, modular design and simple operation, providing up to 50% rig-time savings during handling. Designed to operate from dynamically positioned vessels in all subsea wells, including deepwater, high pressure, and high temperature, this highly adaptable system allows customization and upgrades to meet project-specific requirements.

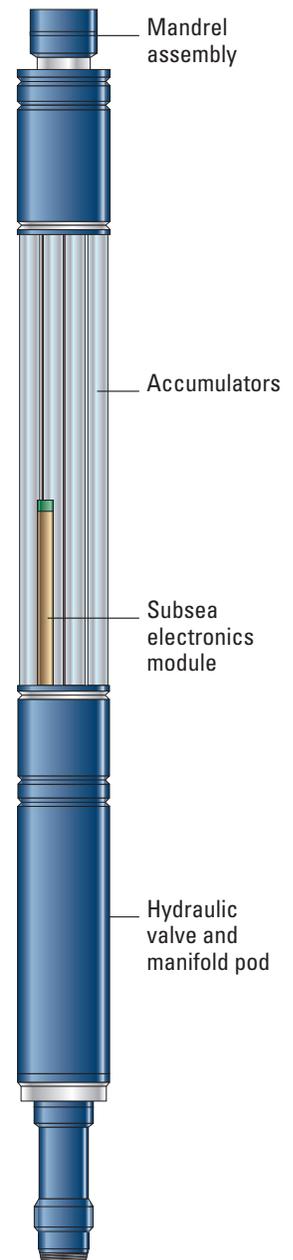
The modular system employs an innovative type of electrohydraulic communication and is compatible with all Schlumberger subsea landing string systems. The operating system is ideally suited for installation landing string applications, providing telemetry feedback and verification of subsea and downhole equipment functionality and integrity. It can also be used for cleanup landing string operations during exploration and appraisal or development, providing full well control and equipment verification.

The SenTURIAN system allows full operation of SenTREE equipment, tubing hanger running tools, and below-tubing hanger functions, lubricator valves, and surface flow heads. This fast-acting operating system has programmable emergency shutdown (ESD) levels, which can be configured to shut in a well and unlatch the landing string in less than 15 s.

The modular design of the SenTURIAN system enables compliance with ISO 13628-7 standards by providing electronic redundancy and pressure readout for each subsea function.

The electronic redundancy feature includes fully redundant electric control, and the pressure readout provides multiple pressure transmitter and flowmeter functionality, allowing triple-point verification of valve actuation (i.e., electrical contact, pressure reading, and flow measurement).

The SenTURIAN operating system is the world's first in-riser operating system designed and certified in accordance with IEC 61508 SIL 2 reliability specifications for safety-related systems. This design approach sets a new industry benchmark for reliability of in-riser electrohydraulic operating systems.



SenTURIAN system.

Subsea Control Module

Working pressure (borehole), psi [MPa]	10,000 or 15,000 [69 or 103]
Test pressure (borehole), psi [MPa]	12,500 or 18,750 [86 or 129]
Max. subsea hydrostatic pressure, psi [MPa]	7,500 [52]
Hydraulic working pressure, psi [MPa]	5,000 and 10,000 [34 and 69]
Max. operating temperature, degF [degC]	275 [135]
Max. design depth, ft [m]	15,000 [4,572]
Max. torque, lbf.ft [N.m]	40,000 [54,233]
Fluid service	H ₂ S (NACE MR0175)

Master Control Station, Umbilical Reeler, and Hydraulic Power Unit

Output hydraulic pressure, psi [MPa]	7,500 and 12,500 [52 and 86]
Air supply (rig air), psi [MPa]	120 [0.8]
Operating temperature, degF [degC]	-4 to 122 [-20 to 50]
Master control station electric power supply	120/240 V AC autoselect
Hydraulic power unit power supply	380/440 V AC, 50/60 Hz, 3-phase
Umbilical reeler	Hydraulic and electrical live centers
Hazardous classification	
Hydraulic power unit, reeler, and flowhead control panel	ATEX [†] Zone 1
Master control station	ATEX Zone 2

[†] ATmosphere EXplosibles

Weight and Dimensions

Subsea control module chassis	
Length, ft [m]	22 [6.71]
ID, in [mm]	8.875 [225]
OD, in [mm]	18.56 [471]
Weight, lbm [kg]	6,700 [3,040]
Inner control mandrel	
Length, ft [m]	26.8 [8.18]
ID, in [mm]	
At 10,000 psi	7.30 [185]
At 15,000 psi	6.38 [162]
Weight, lbm [kg]	
At 10,000 psi	2,432 [1,103]
At 15,000 psi	3,308 [1,500]

Third-Party Certification

SenTURIAN control system	TÜV [†] to IEC 61508, SIL2 ISO 13628-7 design standards
Skids and lift frames	DNV [‡] 2.7-1 offshore containers
Wellbore pressure	DNV witness/API 5CT

[†]Technischer Überwachungs Verein
[‡]Det Norske Veritas