



ROBOTICS

Leading the charge in robotic systems designed to maximize workforce potential in unstructured environments by increasing safety and productivity.

Precision and Safety in Underwater Manipulation

GUARDIAN® Sea Class Underwater Robot

The Sarcos Guardian® Sea Class underwater robot is designed to provide human-like manipulation capabilities in complex and often dangerous underwater environments.

- ▶ Expands utility and scope for inspection-class remotely operated vehicles (ROVs) by enabling light-work capabilities, such as:
 - Rudder, prop, and shaft inspection and obstruction clearing
 - Surface cleaning (biofouling removal)
 - Cutting lines and cables, drilling, and affixing lift balloons during salvage missions
 - Damage inspection with light debris clearing
- ▶ Reduces the need to put divers into the water for inspection and light-work missions
- ▶ Can stay submerged at 300m working depth indefinitely
- ▶ Flexible, dual-armed system with 7-function manipulators enhances station-keeping while operating tools with precision and dexterity
- ▶ Integrated grippers with autonomous tool grasping capabilities enable use of multiple hand tools, manipulation of objects, and interaction with the environment
- ▶ Unique controller design enables easy teleoperation of the manipulators and underwater vehicle with optional autonomous and semi-autonomous control
- ▶ Lightweight, two-person portable design allows for ease of operation and deployment with minimal training requirements
- ▶ Modular design enables integration with existing inspection-class underwater vehicles



Features

- › 1000m+ working depth capability, 300m standard
- › Electronically driven, energy-saving system
- › Lightweight, two-person portable design
- › Dual-arm configuration featuring 7-function manipulators each (6 degrees of freedom (DoF) gripper per arm)
- › Two-fingered grippers with autonomous, tool-grasping capabilities for quick tool changes
- › HD camera equipped at end of each arm provides topside operator with real-time, first-look assessment capabilities and situational awareness of the workspace
- › Neutral buoyancy improves ROV /manipulator balance and control¹
- › Sealed, pressure-compensated design protects the electrical system from water ingress and contamination
- › Multi-level corrosion management system
- › Open architecture supports robot operating system (ROS/RO S2) communication protocols
- › Designed to integrate with existing inspection-class ROVs
- › Teleoperated control
- › Autonomous and semi-autonomous capable (optional)
- › Customizable payloads and end effectors

Industries & Applications:

The Guardian Sea Class underwater manipulation robot is uniquely equipped to enhance diver relief and light-work tasks in challenging underwater conditions in a wide variety of industries, including:

- Oil & Gas: Offshore Oil & Gas platform inspection, maintenance & repair (IMR)
- Energy: Traditional, hydro, and offshore renewable power plant IMR
- Shipyards & maritime: Ship maintenance, underwater inspection in lieu of dry dock (UWILD), non-destructive testing (NDT) inspections
- Ports, Harbors, Piers: Port security, underwater contraband detection & inspection
- Construction: Underwater survey, welding, and IMR of bridges and infrastructure
- Salvage & Emergency Response: First-look assessment and prep
- Defense: Underwater discarded military munitions & unexploded ordnance



Sarcos Guardian® Sea Class Technical Specifications

Specifications	
Underwater Manipulators	Two 7-function manipulator arms with integrated grippers • Shoulder yaw • Shoulder pitch • Elbow pitch • Elbow roll • Wrist pitch • Wrist roll (continuous) • Two-fingered gripper
Operator Controls	• Ruggedized tablet controller (interfaces with ROV Operator Control System/OCS) • Harness-type “imitative movement” controller + hand controllers (simultaneously controls manipulators and ROV navigation)
Pressure Balance	Oil-filled system provides positive pressure relative to the surrounding environment
Subsea Depth	1,000 meters+ (300 meters standard)
Lift Capacity	16.5 lb / 7.5 kg per arm underwater
Reach	35.75 in / 908 mm per arm
High Vision System	HD cameras integrated into end of manipulator arms (x2)
Compatibility	Open architecture supports ROS communication protocols
ROV Integration	Guardian Sea Class manipulators are available for integration on various ROV platforms
Power	Manipulators powered by tether or batteries from the ROV (Topside OCS powered by single AC power from ROV OCS to manipulator OCS)
Operating Time	Tethered power source: continuous runtime
Water Resistance Rating	100 atmospheres (ATM)



¹ Manipulators are designed for neutral buoyancy at each link, enabling them to maintain a state of buoyancy and control regardless of configuration.

* The images in this brochure show the Guardian Sea Class robot attached to a VideoRay Defender ROV.



See how Sarcos Robotics
can transform your workplace
safety and efficiency.

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