

4D Tech Solutions HydroMax™ Manipulator

Design Summary

The HydroMax manipulator is designed to operate effectively on unmanned systems deployed both on land and in the sea. The HydroMax is a cost-effective, ruggedized system that can be used to respond to improvised explosive device (IED), mine and unexploded ordnance threats. The design is modular in nature so that it can be quickly customized to meet specific end-user operational needs and requirements. The HydroMax is fabricated from anodized aluminum and stainless-steel components to withstand the corrosive subsea environment. The system uses an environmentally friendly, low viscosity hydraulic fluid which allows smaller control valves and hydraulic lines to be used than in conventional hydraulic systems, thereby providing a low system weight-to-lift ratio.



HydroMax™ Terrestrial/Subsea Manipulator

Principal Characteristics

Reach:	42 inches
Manipulator Weight:	40 pounds
Hydraulic Power Unit Weight:	20 pounds
Hydraulic Pressure:	1000 pounds per square inch (psi)
Maximum Lift:	60 pounds at 24" from vehicle
Degrees-of-freedom:	5 or 6 (customer specified)

Features

- Modular gripper design to allow for customized attachments.
- Rotary position sensors at shoulder, elbow and wrist to assist in control and position visualization.
- Corrosion resistant; fabricated from anodized aluminum and stainless steel
- Compact stowage to lower a vehicle's center-of-gravity
- Operating envelope designed to accommodate work on or below the ground and seafloor



IED Scenario

HydroMax™ Implementation

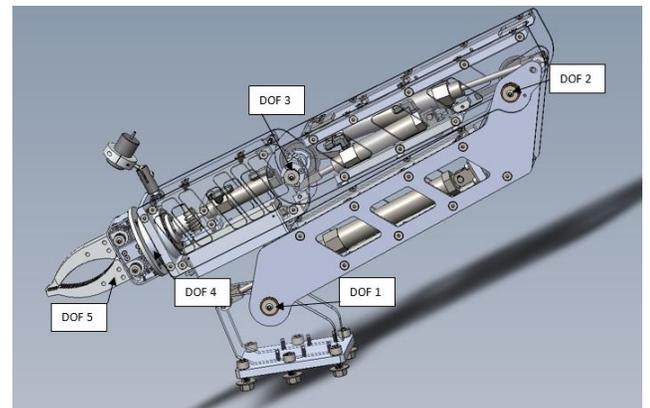
4D Tech Solutions has integrated the HydroMax manipulator onto a 275 lb. Unmanned Ground Vehicle (UGV) that can be used for IED, unexploded ordnance and hazardous material operations. The system's ability to lift and transport a 60-pound weight that is held at a distance of 2 feet in front of the vehicle is shown below. The UGV can be washed down with high-pressure water for chemical, biological, radiological, nuclear and explosive decontamination.



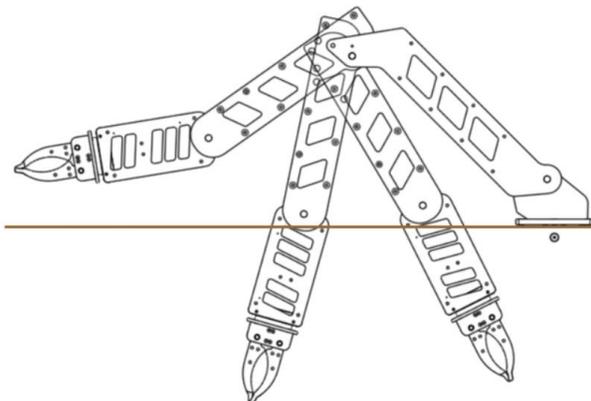
HydroMax™ Manipulator on Unmanned Ground Vehicle

Joint Details/Range of Motion

DOF 1 (shoulder) has a 115-degree range of motion and a rotary position sensor, DOF 2 (elbow) has a 135-degree range of motion and a rotary position sensor, DOF 3 (wrist) has a +/- 45 degrees range of motion and a rotary position sensor. DOF 4 is the wrist rotate joint. It has a continuous 360-degree wrist rotation in both clockwise and counter-clockwise directions, DOF 5 is the gripper. The standard gripper is designed to handle objects up to 6 inches in diameter.



HydroMax™ Degrees-of-Freedom



The HydroMax manipulator's range of motion allows surface and subsurface targets to be prosecuted, making it an ideal tool for operations in the littoral zone where mines and ordnance may be buried or partially buried.