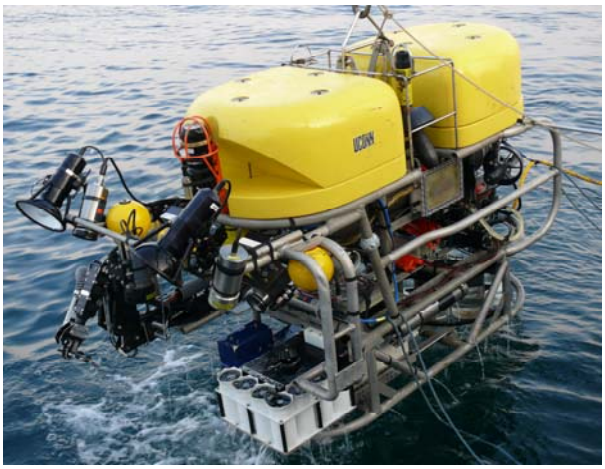
# Kraken2 (K2) 1000 meter ROV Specifications

## General System Characteristics:



The Kraken2 (K2) vehicle is a purpose-built "science class" ROV (remotely operated vehicle) capable of operating to depths of up to 1000 meters. With it's attached tool skid, the K2 vehicle has a combined dry weigh of approximately 2300lbs and measures 39"w x 84"l x 67"h (76"h to the top of the lifting bale). The attachable light bar extends the overall system footprint to approximately 100" in length, excluding all configurable lighting and imaging systems.

The K2 platform uses a dual tether, down-weight system, comprised of a main 1220 meter electro-optic, strength (Kevlar) reinforced umbilical spooled on an oceanographic winch that is coupled to a secondary 45 meter electro-optic flying tether. A variable weight depressor frame, configured between 500-1000 pounds, provides a junction point for this transition as well as isolation between the vehicle's movements and those of the support vessel above.

A modified 20' ISO shipping container provides the primary control environment incorporating all power, control, navigation, and data recording equipment associated with the K2 platform. Along with providing accommodations for the ROV pilot, navigator, and two science personnel, this space also doubles as the primary workshop from which all routine vehicle maintenance is performed.

## Kraken2 Sampling Capabilities:

In order to meet the diverse needs of a science class research platform, the K2 ROV was purposely developed with accommodations to support a wide assortment of scientific sampling, imaging, and data collection devices in various mounting arrangements. In it's current form, the K2 ROV provides the following core capabilities:

- Support for up to two simultaneous hi-definition (HD-SDI) and four standard definition (NTSC) video feeds and up to nine independent video and digital still cameras (HD and SD) configured on the vehicle. Emphasis on application of multiple, simultaneous camera systems for qualitative and quantitative imaging and recording on multiple formats; e.g. Hi-definition video, down-looking video cameras for orthogonal imagery during transects, manipulator camera for imaging in hard to reach spaces, sampling

cameras, and digital still imaging.

- Independent contact closure to support 35mm or similarly triggered devices.
- Support for up to two sets of independently switched parallel laser pairs for size scaling and image calibration (10cm and 20cm typical).
- Support for up to four individually switched lighting circuits (1 to 2 lights per circuit) offering a flexible combination of lighting systems and configurations.
- Heavy duty center-positioned pan/tilt unit with potentiometer feedback to accommodate various imaging, lighting, and scaling systems. Includes logged and user-selectable "home" pan & tilt settings for repeatable transects.
- Provision of independently switched electrical power supply ports in both DC (5, 12, 24V) and AC (120V) to support a range of user supplied subsea sampling tools and sensors.
- Provision of independent serial data ports (RS-232, RS-485, & RS-422) to accommodate a range of data transmission and control requirements.
- Provision of independent Ethernet ports available as an expansion capability.
- 6-Funtion HYDRO-LEK hydraulic manipulator with various claw and wrist attachments (i.e. coral cutter, scoop tool, camera mount, etc.) supporting physical and biological sample collection, device deployment, component recovery, and other manipulative functions.
- Secondary 6-function HYDRO-LEK hydraulic valve pack (+/- 2400PSI) to support science sampling applications and devices.
- Integrated support for one Kongsberg Simrad Mesotech Ltd. Digital sector scanning sonar head with surface controlled interface (1 @ 1500m and 1 @ 6000m).
- Kongsberg Simrad Mesotech Ltd. 1007 Altimeter for accurate altitude measurements and data logging.
- Seabird SBE-19 Plus CTD for independent environmental sampling
- Configurable specialized sampling tools and containers to accommodate physical, chemical and biological sampling requirements; including 1) a 12"w X 36"l X 10"h insulated polypropylene "biobox" mounted to a hydraulic extensible sample tray, designed to keep specimens at ambient water temperatures; 2) "biobox" quiver rack designed to expand the capacity of the insulated biobox with seven, 4" ID sample quivers for discrete samples and/or sediment cores; 3) quiver sample carousel accommodating eighteen 4" ID sample quivers for discrete samples and/or sediment cores (6 full-height cores maximum); 4) an integrated suction sampling system

incorporating a high power, variable speed, bi-directional suction pump and eight (6-1/2 liters) bucket suction sample rotisserie allowing for independent sample collection; 5) 4”x4” mechanically (manipulator) closed stainless steel boxcores; 6) various diameter & length tube/punch cores and quivers; 7) opening/closing detritus samplers; 8) Niskin bottles for water sampling; etc.

The following is a list of imaging and lighting systems currently available from NURTEC for direct integration on the K2 platform:

1. *Insite Pacific Zeus+ Hi-Definition video camera, depth rated to 6000 meters (Ikegami HL40 camera w/ Fujinon lens)
2. Kongsberg OE14-502 Hi-Definition video camera, depth rated to 6000 meters
3. Two Insite Pacific 3-chip, standard definition broadcast quality video cameras, two available (Aries 3000m & Atlas 4000m rated)
4. Four Insite Pacific Aurora standard definition, wide single chip video cameras
5. Kongsberg OE14-408 10MP Digital Still Camera with OE11-442 Underwater Flashgun
6. Insite Pacific Scorpio Plus 3 mega-pixel digital still camera (6000 meter rated) with twin electronic strobes (3000 meter rated)
7. Photosea 35 mm film camera with strobe
8. Five Nuytco HMI lights (4– 200 watt, 1-600 watt), for daylight quality (5600o K) lighting
9. Deep Sea Power & Light 2000 lumen LED Multi-SeaLite unit
10. Two Deep Sea Systems International OceanLED 5800 lux lights
11. Five Deep Sea Power & Light Quartz Halogen Multi-SeaLite units

* Owned by University of Mississippi and available on an individual request basis only

**Tracking & Navigation Systems:**

1. ORE Trackpoint II Ultrashort Baseline (USBL) tracking system for general relative vehicle tracking and positioning.
2. Winfrog Integrated Navigation System (INS) incorporating USBL tracking offsets, vessel GPS, vessel Gyro, vessel fathometer, K2 heading, depth, and altitude. Along with providing for basic vehicle navigation the Winfrog INS also provides the ability to integrate multibeam and side scan sonar geo-tiffs to serve as basemaps and aid in pilot navigation, exploration and research efficiencies as well as the ability to continuously log ROV and ship navigation and sensor data, provided to scientists in text-readable format.

**Major Support Equipment:**

The following is a list of all major items used in support of the Kraken2 (K2) ROV:

1) Kraken2 (K2) ROV w/tool skid: 48"W x 96"L x 72"H ~ 2,300 lbs
2) ROV Control Van: 8'W x 20'L x 8-1/2'H ~ 12,000 lbs max.
3) Oceanographic Winch: 8'W x 6-1/2'D x 6-1/2'H ~ 5,500 lbs
4) Hydraulic Pressure Unit (HPU): 56-1/2"W x 41"D x 75"H ~ 1,750 lbs
5) Sheave for Umbilical: 36" diameter x 15"W

6) ROV Depressor Frame: 22"W x 45"L x 50-1/2"H ~ 1,050 lbs
7) Deck Storage Totes (quantity 4): 43"L x 28"W x 20"H ~ stackable on deck

**Power Requirements:**

1) The ROV control van is wired for 208VAC Three Phase and has a maximum load of 80 Amps at 120 Volts, or 80 * 120 = 9600 VA per leg. For three legs, the total is 3 * 9600 = 28800 VA or 28.8 kVA.

   The actual load under realistic conditions is typically on the order of 75A max. An isolation transformer can be provided to accommodate 460VAC if 208 is unavailable. The transformer is approximately 36"W x 24"D x 36"H ~ 550lbs in weight. The K2 ROV is powered from the control van so no additional power is required for this unit.

2) The HPU is wired for 208VAC Three Phase although it can accommodate either 208VAC Three Phase or 460VAC Three Phase power ~ whichever is readily available. In practice, this unit is typically supported by a 100A, 208VAC Three Phase service capable of handling the peak starting power of this unit (see below).

   The three-phase motor for the HPU is rated at 30 horsepower (HP) with an efficiency of 92.4% or 24.2 kVA with the motor running at rated load. The motor nameplate lists it as a code letter "G" motor which would have a peak starting power is between 5.6 and 6.29 kVA per HP. Assuming an average (5.6 + 6.29) / 2 = 5.95 kVA per HP. Then, for a 30 HP motor the peak starting power is 5.95 * 30 = 178.5 kVA.

**For more information on capabilities, pricing and availability, please contact our Technical Director, Kevin Joy (860-405-9112, kevin.joy@uconn.edu).**