



# ORION

## Underwater Utility Survey

### INTRODUCTION

The Orion underwater utility survey system brings the power of model-based processing to cable and pipeline Depth of Burial (DOB) surveys. The method is based on the optimization of data from multiple sensors against a physical model of the magnetic field expected from a utility line carrying an AC tone (actively applied or passively present). System accuracy is estimated and presented in real-time. Magnetic field distortion due to co-linear underwater conductors can occur when multiple pipelines share a right of way, or multiple wind farm power cables are closely spaced at landfall. The Orion system self-identifies these errors and presents them as confidence intervals on the measured Depth of Burial. In the 4 or 6 sensor configuration, Orion can decouple this distortion from the target pipeline or cable, resulting in a more accurate Depth of Burial estimate, with an improved confidence interval.



The Orion sensor array only needs to be brought in the approximate vicinity of the utility line to calculate a relative position. Using at least two 3D magnetic field sensors, a triaxial accelerometer and digital compass, Orion identifies the horizontal offset, vertical depth, tone current strength and yaw

angle to the buried utility regardless of its position and relative orientation in the radiated magnetic field.

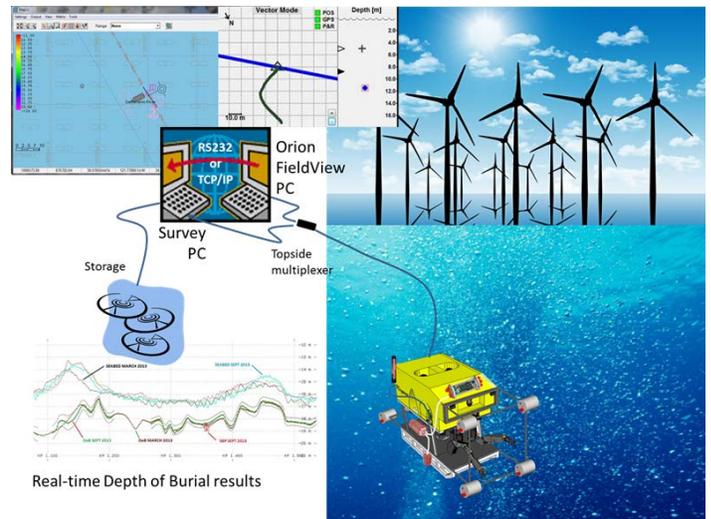
Orion can be controlled and interrogated using standardized NMEA commands over a serial data link using RS485/RS232 protocol. System control and data acquisition over a ROV local area network is also supported. Interfaced with suitable survey navigation software, the vessel skipper can steer the vessel along the direction of the utility or across the cable or pipeline. The latter method would be preferred when current conditions impede the vessel to navigate in the direction of the cable or pipe.

### REMOTE POSITIONING SENSING

Regardless of relative orientation or position to the cable or pipeline, Orion continuously provides estimates of horizontal offset, vertical depth and depth of burial, and impressed AC current.

### DEPLOYMENT

The Orion system can be ROV mounted or deployed in a towed or fixed-hull set-up. For deeper cable and pipeline mapping projects in larger bays or on the continental shelf, the system can be towed over or positioned above the seabed by depressor wing or mounted on a carbon-fiber sled, respectively. On a vessel with a non-ferrous hull, the fixed set-up can be used in waters only a few meters deep enhancing accuracy since the positioning error of the Orion sensor frame relative to the vessel is minimized.



## DEPTH OF BURIAL

In combination with bathymetric seabed data obtained from a terrain model, Orion altimeter, or vessel depth sounder, the difference between bottom and utility depth can provide depth of cover accompanied by a 95% confidence interval.

## FREQUENCY

The Orion features a narrowband filtering engine that provides quadrature demodulated magnetic field strengths. In this way, possible magnetic noise sources are eliminated. Orion can perform three simultaneous DOB detections. For example, this permits tracking a 50 Hz tone at the same time as an actively applied tone on a targeted power cable, or one survey can capture up to three targeted cables or pipelines in one pass.

## STONE GENERATOR

For tone injection a portable tone generator is available with user selectable AC current level and frequency (20-1000 Hz).

SPECIFICATIONS	
<b>System</b>	
<i>Power dissipation</i>	10 Watt maximum (exclusive of RS232 peripherals)
<i>Power supply</i>	8-30 VDC / 2W, plus up to 5A for peripherals
<i>Host I/O</i>	RS232 or RS485 NMEA messages, or Ethernet telegrams
<i>FieldSens View software</i>	Orion setup and local view of cable tracking; provided on DVD-ROM
<i>Cable position output rate</i>	Up to 10 per second
<i>Depth rating</i>	2000 meters
<i>Sensor Platforms</i>	ROV, vessel fixed, towed wing or sled
<i>Synchronization</i>	Standalone, or synchronizes to applied PPS
<i>Max. survey speed</i>	2 knots
<i>Warranty</i>	1 year
<b>E-Pod</b>	
<i>3D Magnetic Sensors</i>	Accepts 2, 4, or 6 sensors at arbitrary orientation and relative positions
<i>Simultaneous Targeted Lines</i>	1, 2, or 3; with return current mitigation
<i>Simultaneous Frequencies</i>	1, 2, or 3 (any combination of passive / active tones)
<i>Operating frequencies (Hz)</i>	10 ≤ frequency ≤ 3200, in steps of 1 Hz
<i>Magnetic Heading</i>	± 2° (max error in conversion of offset to Easting, Northing)
<i>Pitch, Roll</i>	± 0.2° (auto-leveling)
<i>Pressure gauge</i>	Standard range: 15 Bar (135 meters), or special order
<i>Physical material and size</i>	Anodized Aluminum, 40 L x 17 D cm (including connectors)

<i>Power dissipation</i>	3 Watt (exclusive of RS232 peripherals)
<i>E-Pod attachment</i>	2 pins with 75 cm long, heavy duty 100 Kg cable ties
<i>USB software updates</i>	Micro-USB to Subcon MCB4M provided with the system
<b>Sensors</b>	
<i>AC magnetic field sensitivity (noise floor)</i>	1 mA/m @ 100 Hz
<i>Minimum detectable AC magnetic field strength for target positioning</i>	10 mA/m @ 100 Hz
<i>Maximum measurable AC magnetic field before saturation</i>	250 A/m (Note: option available for sensors with capability of 800 A/m)
<i>Gradiometer pipeline centerline tracking range</i>	10 cm: range 3 m 40 cm: range 4 m 120 cm: range 6m
<i>Recommended calibration interval</i>	3 years
<i>Physical material and size</i>	Machined acetal, 18 L x 15 D cm
<i>Sensor attachment</i>	2 pins with 75 cm, 100 Kg cable ties
<i>Power dissipation per sensor</i>	1 Watt
<b>Depth of Burial</b>	
<i>RMS Confidence</i>	Based on bottom depth from optional altimeter
<i>Maximum radial distance to utility</i>	10 m (1.5 m sensor spacing)
<i>Depth accuracy (1σ)</i>	0.05m + 5% of radial distance to target
<i>Offset accuracy (1σ)</i>	0.05m + 5% of radial distance to target
<b>System Options</b>	
<i>Number of sensors</i>	2, 4, or 6
<i>HSS software</i>	HYPACK, EIVA, QPS, or none (customer supplied)
<i>Transmitter</i>	150W active transmitter (32 Hz – 640 Hz)
<i>Towed sled, cable, and topside interface box</i>	35 or 60 meter data cable, free-flying sled that also land on the bottom
<i>Customer supplied items</i>	Survey computer, Orion FieldView computer, and geospatial positioning method via USBL, GNSS, etc.

**IMPORTANT:** All specifications contained herein are subject to change without notice.

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