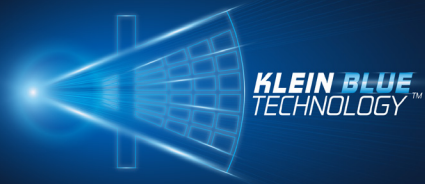


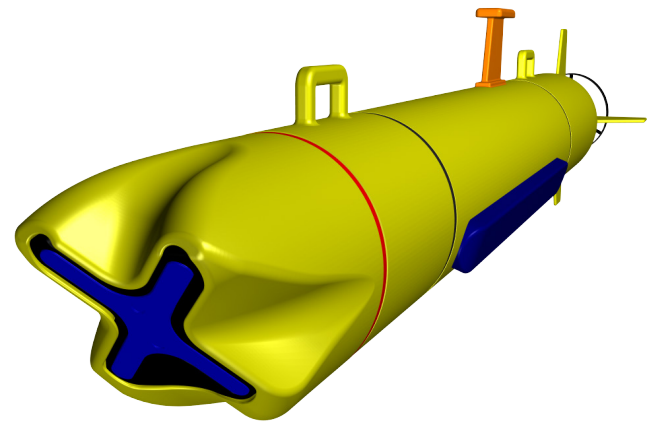
# KLEIN $\mu$ MA-X (MicroMA-X)

NADIR IMAGING SONAR FOR AUV/ROV



Klein Marine Systems is pleased to offer the first Nadir Imaging Sonar for both the commercial and military unmanned vehicle markets. The  $\mu$ MA-X is a highly scalable, modular system which integrates easily to most AUV/ROV vehicles. The system utilizes Klein's next generation  $\mu$ Engine which is a robust, compact, low-power architecture which uses Klein BLUE technology to provide superior imaging performance.

Traditional side scan sonar systems suffer from a nadir gap in the center of the image directly under the path of the vehicle. The  $\mu$ MA-X system fills that gap and, when paired with conventional side scan, eliminates the need for overlapping survey lines to achieve 100% coverage. For AUV's, this translates into extended mission durations, or shorter times to cover the same area. The key discriminator of the  $\mu$ MA-X is the ability to produce high-quality imagery of the nadir area that is comparable to the traditional side scan imagery. This allows for the data acquired by the system to be fed directly into existing Automatic Target Recognition (ATR) software allowing for automated detection and recognition of targets of interest.



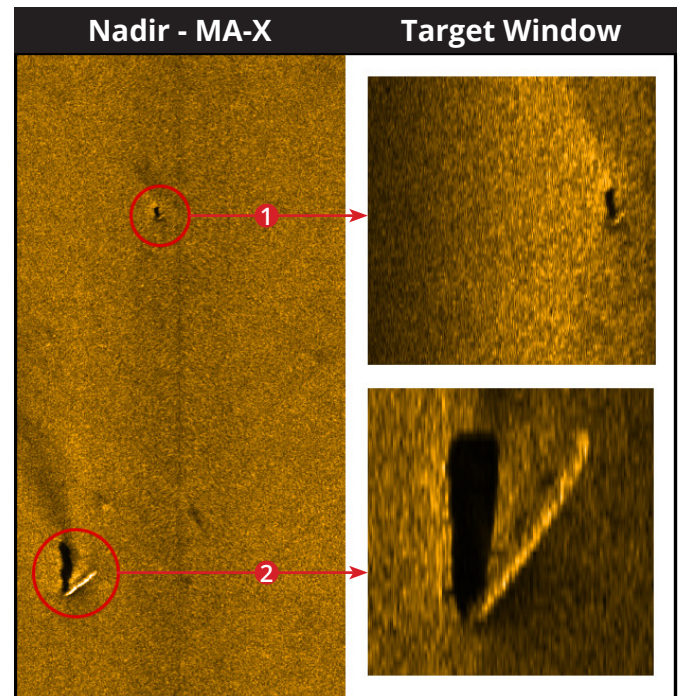
## Key Features:

- Complete nadir coverage
- Easy to integrate
- 40% increase in survey efficiency\*
- Hi-resolution imagery – 850kHz
- Broadband CHIRP technology
- Interpretation characteristics equal to SSS (grazing angle/shadow high contrast)
- Compatible with ATR systems
- Hydrodynamic low-drag design
- Highly scalable

\*When paired with Side Scan Sonar

## Straightforward Integration:

- Wet or dry configurations using a vehicle specific collar, shroud and cable kit for AUV's
- Universal mounting kit for ROV's
- +24VDC with remote power control
- Ethernet data interface
- User selectable output data format (SDF/XTF)
- Internal motion sensor standard
- 1PPS for time synchronization
- Triggering in/out to support ping cycle control and external synchronization with other sensors



1. Mine-like object
2. Torpedo standing proud off the seabed

Klein **BLUE TECHNOLOGY**<sup>™</sup> represents innovations in transducer, signal conditioning and processing design producing unmatched image quality and range performance.



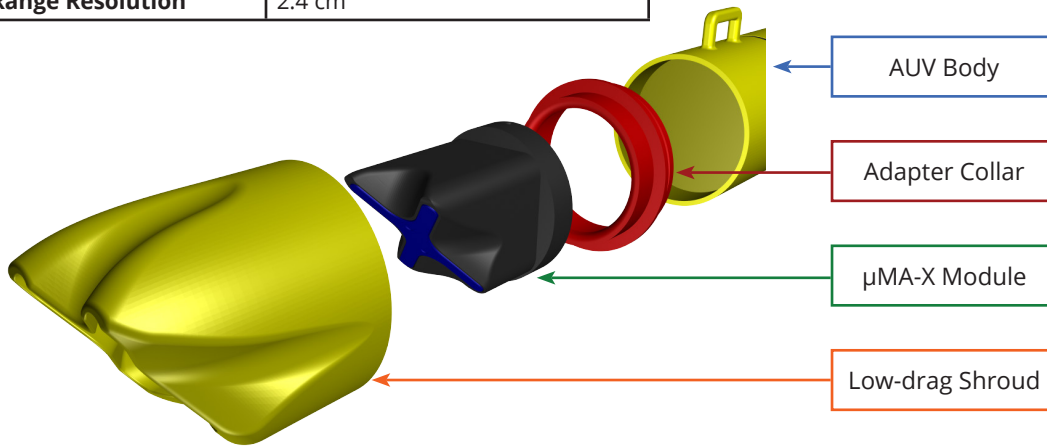


## NADIR IMAGING SONAR FOR AUV/ROV

### Specifications:

| $\mu$ MA-X Sonar Specifications   |                                 |
|-----------------------------------|---------------------------------|
| <b>Technology</b>                 | Single Beam                     |
| <b>Frequency</b>                  | 850 kHz (Nadir $\mu$ MA-X)      |
| <b>Pulse Type</b>                 | FM CHIRP                        |
| <b>Horizontal Beam Width</b>      | 0.5°                            |
| <b>Max Swath Width (Per Side)</b> | 25 m                            |
| <b>Output Data Format</b>         | SDF or XTF or Both - Selectable |
| <b>Input Voltage</b>              | 18-28VDC                        |
| <b>Power Consumption</b>          | <20W (6W Standby)               |
| <b>Range Resolution</b>           | 2.4 cm                          |

| $\mu$ MA-X General Specifications |  |
|-----------------------------------|--|
| <b>Construction</b>               | Aluminum   |
| <b>Body Length (Max/Min)</b>      | 7-10"  |
| <b>Weight Range</b>               | 10 lbs in Air / Neutral in Water (Vehicle Dependent)   |
| <b>Depth Rating</b>               | 300 m  |
| <b>On-board Sensors</b>           | Pitch, Roll, Internal Temperature, Leak Detect   |
| <b>Options &amp; Accessories</b>  | Adapter Collar, Vehicle Specific Outer Shell, Re-usable Carry Case, Laptop with SonarPro® Software |



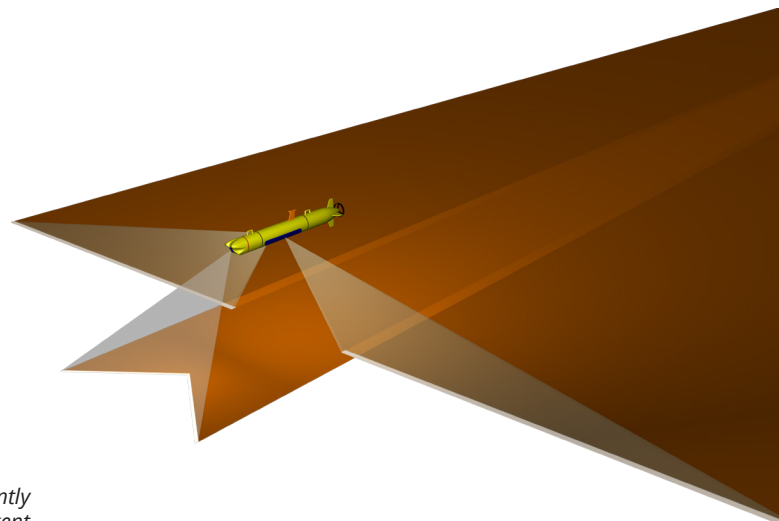
### Adaptable to Multiple AUV's

- $\mu$ MA-X can be scaled to fit larger or smaller diameter vehicles
- Available as module or complete nose-cone assembly

### Options & Accessories:

- Adapter collar
- Vehicle specific outer shroud
- Reusable carry case
- ROV mounting kit
- Laptop with SonarPro® software installed

Please feel free to contact us if you would like to see more examples of  $\mu$ MA-X imagery.



*Klein Marine Systems is deeply committed to customer support. We are currently servicing valued customers in 80 countries and relying on a network of competent International Representatives to meet and exceed the service needs of our customers around the world. We provide 24 hour / 7 day a week support.*

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