



## HNA Hydrophones

The HNA series needle hydrophones are the result of an extensive development to combine good spatial resolution with the ability to withstand high acoustic intensities such as encountered in mapping HIFU acoustic fields. Its ruggedness also opens possibilities for use inside tissue or phantoms.

### Features

- Rugged
- Small size
- Broadband
- Very stable

### Technical Specifications

	<b>HNA-0400</b>
<b>Frequency range (<math>\pm 6\text{dB}</math>)</b>	1-10 MHz
<b>* EOC Nominal Sensitivity [nV/Pa]</b>	70
<b>* EOC Nom. Sens. [dB re 1V/uPa]</b>	-263
<b>Effective Diameter</b>	400 $\mu\text{m}$
<b>Capacitance</b>	80 pF
<b>Max. Operating Temperature</b>	50 °C

\* EOC ("end of cable") is the open-circuit output sensitivity of the hydrophone. Calibration with an amplifier can be determined from the gain and input impedance of the amplifier.

Provided with traceable calibration 1-20 MHz at 50 KHz intervals. For other calibrations available visit our web site.

The HNA hydrophone can withstand very high pressures (see reverse) but damage is caused by inertial cavitation and not incident field pressure per se. The same incident pressure may be safe or result in cavitation depending on water purity, gas content, temperature, agitation, and many other factors. The user is advised to watch for and avoid exposing this device to inertial cavitation.

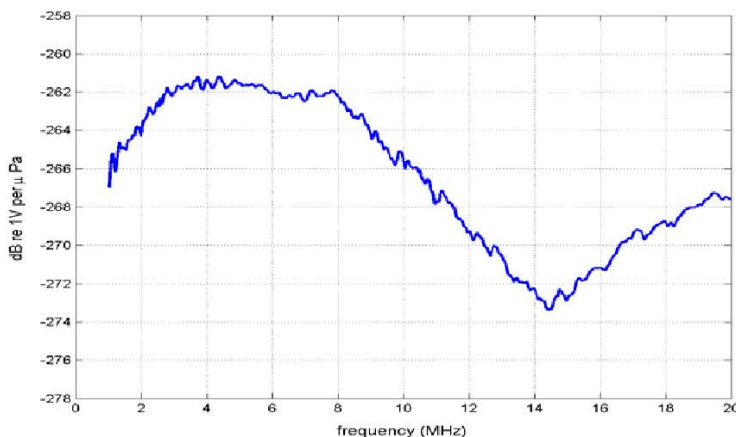
Specifications are subject to change without notice.



HNA Hydrophone

## Typical Sensitivity Plot

Note that HIFU fields may contain significant harmonics beyond the frequency range in which the hydrophone's response is specified.



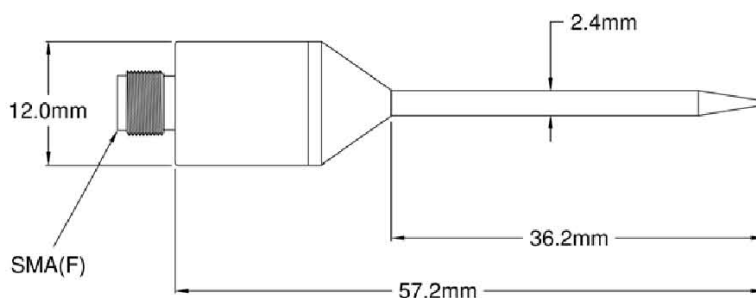
## Durability

Each HNA hydrophone is "stress-tested" prior to sale by exposing it to a high-intensity ultrasound field for one hour, and verifying that it survives without any changes either in appearance or in its spectral response between 1 and 20 MHz.

The stress test conditions are provided at the focus of a 1.5 MHz source, operated at 50% duty cycle in deionized, degassed water at 23C. This provides an exposure intensity of 715 W/cm<sup>2</sup> temporal-average and 1430 W/cm<sup>2</sup> pulse-average, corresponding to 15 MPa peak compressional and 3.7 MPa rarefactional pressure.

Further details can be found in "HIFU Transducer Characterization Using a Robust Needle Hydrophone", Proceedings of the International Society for Therapeutic Ultrasound, Oxford, UK, Aug. 29- Sept 2, 2006—in press—please contact Onda for a copy of this paper.

## Mechanical Specifications



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