Introduction

This hydrophone uses a unique high-sensitivity, dual-sensor, mechanically balanced transducer assembly that offers exceptional signal-to-noise performance in the human auditory range. It is very durable and can interface directly with a charge amplifier or high-input-impedance voltage amplifier. It has a smaller size and much lower specific gravity than the HDP-H1A hydrophone and thus can be inserted into pipes and other tight spaces, making it excellent for leak finding. Its low mass and full polyurethane rubber encapsulant make it highly resistant to damage caused by impact.

To maintaining negative buoyancy underwater, it is assembled with a 150g sliding stainless steel weight on the cable. There are several advantages to placing the weight on the cable rather than building it into the hydrophone. When the hydrophone is dropped, the cable flexes and absorbs any stress from impact, making the hydrophone more durable. The weight can be moved if need to allow insertion into a pipe. Both of these attributes are especially useful to the leak finding specialist. Moving the weight away from the hydrophone dampens acceleration noise that is transmitted down the cable from handling and it also minimizes response irregularities caused by material resonances and sound reflections. It can also be used for mounting a shroud tube to minimize flow noise over the hydrophone. To move the weight, turn the black plastic thumbscrew counter-clockwise to loosen the internal rubber compression sleeve and slide the weight where needed. Wet the cable if this is difficult. Secure again by turning the thumbscrew clockwise. Be Advised: Finger-tighten thumbscrew only and always leave a minimum spacing of 5 cm between hydrophone and weight!

Though designed primarily for underwater listening and leak finding, it is also useful as a waterproof microphone for tool room applications, such as monitoring cutting in waterjet and other CNC tooling.

The hydrophone is passive. There is no preamp or impedance buffer circuit within it. The advantages are that the hydrophone remains as simple and low cost as possible, it does not require any power supply, and it offers a very wide dynamic range. It can work under either charge mode or high impedance voltage mode.

BNC plug version (default)
Low Noise Cable: 6m (default)

1/4" TS plug version
Low Noise Cable: 6m (default)

Specifications

Transducer Type	Dual Plate Bender
Frequency Range	20Hz~10kHz (±5dB)
Sensitivity	-192dB re: 1V/μPa (Typical) (i.e. 2.5×10^{-4} V/Pa)
Useful Frequency Range	(<10Hz) ~ (>100kHz)

	(Sensitivity ≈ -230dB re: 1V/μPa @ 100kHz)
Capacitance	15nF (Typical)
Charge Sensitivity	3.8 pC/Pa (Typical)
Operating Depth	<80m
Size	Φ17mm × 32mm
Weight	10g
Specific Gravity	1.3
Added Weight	150g
With Built-In Preamp	No
Polar Response	Omnidirectional (horizontal)
Connector	BNC (default, 1/4" TS connector version available on request)

Important Notice: The hydrophone has not been individually calibrated. Only the nominal values are provided. Their use in absolute sound level measurement is thus not recommended (Please check our other products instead).

Used under Charge Mode

When the hydrophone is used with a charge amplifier followed by a data acquisition device, such as CAMP-2G05, the underwater sound level measurement range will be determined by the sensitivity and measurement range of the hydrophone as well as the full-scale input charge and signal-to-noise ratio of the data acquisition device. For example, if the charge sensitivity of the hydrophone is 3.8 pC/Pa and the full-scale measurement range of the charge data acquisition device is 250 pC, then the maximum underwater sound level measurable would be: $20\times\log_{10}((250/1.414)/3.8/(1\times10^{-6})) \approx 153$ dB, where 1.414 is used to convert peak value to RMS value, and 1×10^{-6} Pa is the 0 dB reference in water. If the charge data acquisition device has multiple full-scale charge ranges (e.g. VT CAMP-2G05): 250pC, 500pC, 1nC, 2.5nC, 5nC, 10nC, 25nC, 50nC, 100nC, 250nC, 500nC, 1μC, then the maximum underwater sound level measurable would be 153dB, 159dB, 165dB, 173dB, 179dB, 185dB, 193dB, 199dB, 205dB, 213dB, 219dB and 225dB, respectively.

The advantage of using a charge amplifier is that the signal will not be attenuated by cable capacitance unlike the case of a voltage amplifier. A charge amplifier usually has an ultra low high-pass cutoff frequency, thus the extremely low frequency noise of the hydrophone resulting from the movement by towing or waves may get through.

Used under High Impedance Voltage Mode

It is possible to use the hydrophone with a high-input-impedance voltage amplifier followed by a data acquisition circuit, such as a DSO which usually has an input impedance equal to or greater than 1MΩ. The higher the input impedance and the shorter the cable, the lower the high-pass cutoff frequency. For this hydrophone with a cable length of 6m, the cutoff frequency can be estimated by:

$$f_c = 1/(0.000000094\times R)$$

where R is the input impedance of the voltage amplifier. For example, if R=1MΩ, the f_c=10.6Hz.

Voltage sensitivity is normally given with the default cable length. If the voltage sensitivity of the hydrophone is 2.5×10^{-4} V/Pa and the full-scale measurement range of the voltage data

acquisition device is 0.01V, then the maximum underwater sound level measurable would be: $20\times\log_{10}((0.01/1.414)/0.00025/(1\times10^{-6}))\approx 149$ dB.

It can also be used with an audio amplifier or a sound card with a high impedance (HiZ) input.

Maintenance

No special care is required for the hydrophone. It is designed to withstand corrosion from seawater and the impact of accidental drops. Although it is quite tough for what it is, but note that it is a sensitive instrument. Avoid throwing it into the water, or any other activity that may result with an impact to the hydrophone. Try to keep the output plug clean and dry and avoid unnecessarily rough handling to ensure the long-term stability of the product. It is best NOT to store the hydrophone in a waterproof enclosure. Doing so will trap moisture, salts and minerals that are left on the hydrophone and cable after deployment and prematurely corrode the output plug. Making an extra effort to coil the cable neatly when retrieving the hydrophone will help avoid problems with tangles as the cable ages. Most importantly, protect the cable from cuts and abrasions! The hydrophone uses a custom-made cable with a very durable PU jacket. However, it is also designed to be compact and flexible. Kinking the cable, walking on it, or dragging it over a sharp or abrasive surface may damage the cable sheath and eventually cause the hydrophone to fail. Both aquatic and terrestrial animals may attack the cable in an unattended application. Using some kind of cable conduit, such as plastic tubing, can help to protect the hydrophone in long-term installations.