



Aquarian Audio

H3dM Hydrophone User's Guide

H3 product family overview

The H3 uses a unique high-sensitivity, dual-sensor, mechanically-balanced transducer assembly that offers exceptional signal-to-noise performance in the human auditory bandwidth. The fully-shielded design inherently rejects EMI and RFI noise, making it useful in the studio, lab or shop. Its low mass and full polyurethane rubber encapsulant make it highly resistant to damage caused by impact. Its small size allows users to fish it inside of pipes and other tight spaces, making it excellent for leak finding. 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 tooling¹.

The **H3nP** and **H3nB** are sold as passive hydrophones, terminated with 1/4" TS and BNC output plugs respectively. These can be useful with DAQ and test equipment or high-impedance audio preamps. **H3dM and H3dX** configurations include signal conditioning that is built into the hydrophone, which make them compatible with standard consumer and professional microphone circuits. They are identical, other than the output connector. The "d" in the part number designates use of our latest CS6 signal-conditioning board and offers approximately 10dB better sensitivity as compared to legacy parts made with our CS4 board (without the "d" in the part number). Please reference correct manual for each version.

The H3 hydrophone can be optionally assembled with our WT150g sliding stainless steel weight assembly for maintaining negative buoyancy. 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 needed 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 WT150g 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 5cm (2 in.) between hydrophone and weight!

Using the H3dM

The H3dM is terminated with a 3.5mm TRS plug and wired for dual-mono output (output wired to both tip and ring; sleeve contact is ground). The most common application is driving a compact stereo digital recorder. This output configuration will also work with nearly all video cameras and computer sound interfaces² with 3.5mm mic input. **Plug-in power (PIP) is required and may need to be switched on in your device.** When recording with only one hydrophone, direct connection is made to the recorder and both left and right channels will record the same information. If wanting to record true stereo sound with two hydrophones, an adapter is typically needed that breaks out the left and right input channels of the recorder into separate input jacks.

Please note that the 3.5mm jack is used for many kinds of audio connections. **The H3dM will only work with microphone inputs.** The hydrophone plug will fit into auxiliary inputs on powered speakers or marine stereo systems, but these will not provide PIP to the signal conditioning board in the H3dM, nor will they provide adequate gain. This connector is also used with headphone outputs. Also see footnote 2 below. Do not make the assumption that, if the plug fits, the system will work.

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- 1 Aquarian does not guarantee compatibility of rubber and plastic materials used in its hydrophones for anything other than natural aquatic environments. Prospective users should test compatibility with machine coolants and lubricants in production environments.
 - 2 An adapter will be needed for most headset jacks (TRRS jacks that are designed to have a microphone contact as well as headphone outputs). These are common on smart phones, tablets and laptop computers.

Hydrophone care

No special care is required for the H3dM. It is designed to withstand corrosion and the impact of accidental drops, but making an attempt to keep the output plug clean and dry and avoiding unnecessarily rough handling will help 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 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 H3d uses a custom-made cable with a very durable urethane 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 protect the hydrophone in long-term installations.

Specifications

Specifications are dependent upon the audio device to which the H3dM is connected and whether the hydrophone is driving stereo inputs or a single channel. The output impedance of the H3dM is set by the PIP supply from the audio device with which the hydrophone is used. Gain of the signal conditioning amplifier in the H3dM is related to the bias current and input impedance of the mic preamp. High-frequency performance is also limited by the output impedance of the hydrophone and the cable impedance—which is a function of length. For all of these reasons, we do not publish detailed response plots for this design. Please also note that further limitations in your overall system may result from the sampling rate of digital recorders and by the input stage of your audio device's microphone preamp.

Note that there is no standard for plug-in power. Performance can vary significantly. The following specifications are based on typical response when using the H3dM with a compliance voltage of 2.5V and bias resistor of 1.1K Ω (two channels at 2.2K Ω each—2.2mA—typical of many compact digital recorders, including those that we sell).

Sensitivity:	-182dB re: 1V/ μ Pa	(+/- 5dB 20Hz-10KHz)
Useful range:	<10 Hz to >100KHz	(not measured above 100KHz, approximate sensitivity @100KHz = -220dB re: 1V/ μ Pa)
Polar Response:	Omnidirectional	<10KHz
Operating depth:	<80 meters	
Operating temperature:	-10 to 65 Celcius	
Output impedance:	1.1 K Ω	depends on mic preamp
Power:	0.7 mA	(typical)
Minimum PIP req.:	2V, 0.7mA	(compliance voltage, short-circuit current) (the hydrophone will work with lower current, but with very unpredictable gain and greatly-reduced dynamic range) (cable and output plug excluded)
<u>Physical:</u>		
Dimensions:	17mm x 32mm	
Mass:	10 grams	
Specific Gravity:	1.3	