

## Hemispherical Hydrophone

### BII7040 Series Hemispherical Hydrophone

The BII7040 series hydrophones provide 60° directivity response approximately at  $f_s$  resonance, which is designed to detect known sound sources with wide beam angle and provide omnidirectional directivity response in low frequency range in which the wavelength is much greater than the physical size of the hydrophone. With Hemispherical Hydrophones, noises at certain directions are reduced, and maximum response to signals is at acoustic axial direction. Hemispherical hydrophones are optimum wide beam acoustic receiving apertures for being installed on underwater platforms.

### Typical Applications

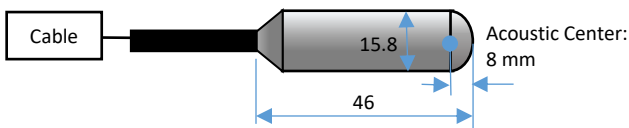
Directional hydrophone, Sonobuoy Underwater Communication Thermoacoustics in Gas	LBL, SBL, USBL Positioning, Array Element Underwater Sound Recording, Marine Bioacoustic Research Passive Acoustic Monitoring (PAM System)
--	--

### Specification

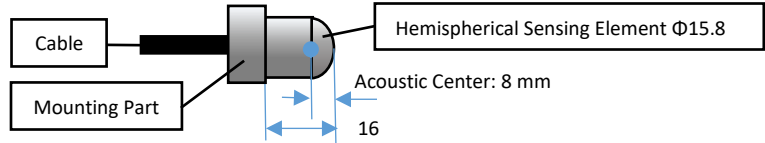
Part Number:	BII-7044	BII-7044DF
Sensitivity FFVS at 1 kHz:	-203.5 dB V/ $\mu$ Pa + Sensitivity Loss over Cable. Variation: $\pm 2$ dB.	-198.5 dB V/ $\mu$ Pa + Sensitivity Loss over Cable. Variation: $\pm 2$ dB.
	Sensitivity Loss over Extension Cable (dB) = $20 \cdot \log[C_h / (C_h + C_c)]$ . Valid for hydrophone without preamplifier. $C_h$ : Hydrophone Capacitance; $C_c$ : Capacitance of Extension Cable. Cable is of 100 pF/meter roughly.	
Free-field Voltage Sensitivity:	Refer to Graph of <b>FFVS vs. Frequency</b> .	
Usable Frequency in Water:	1 Hz ~ 250 kHz.	
	<b>Minimum Usable Frequency</b> depends on -3dB high pass filter $f_{-3dB} = 1 / (2\pi R_i C_h)$ . $R_i$ : Input Resistance or Impedance of Preamp. $C_h$ : Capacitance of hydrophone at 1 kHz.	
Usable Frequency in Air:	1 Hz ~ 9 kHz at -3dB V/ $\mu$ Pa	
Capacitance $C_h$ at 1 kHz:	3.5 nF $\pm 10\%$ without cable.	0.54 nF $\pm 10\%$ without cable.
Dissipation D at 1 kHz:	0.004	
Noise Density at $f \ll f_s$ : dB $\mu$ Pa/ $\sqrt$ Hz	30.7 – $10 \cdot \log f$	31.3 – $10 \cdot \log f$
	1. $f$ in kHz; $f_s$ : Resonance Frequency which is close to the frequency of maximum FFVS.	
	2. Noise densities in this datasheet are calculated values with transducer parameters being measured in water.	
	3. As hydrophones works with preamps or data acquisition modules, total noise density is determined by all noise sources. Generally, the total noise density is much higher than the ones stated in this datasheet.	
Directivity Pattern:	Omnidirectional at Low Frequency to 60° at High Frequency, Refer to Graph of <b>Directivity Pattern</b> .	
-3dB Beam Width:	Refer to Graph of <b>Directivity Pattern</b> .	
Side Lobe Level:	No side lobes or $\leq -17.7$ (dB)	
Signal Output Type:	Single Ended	Differential
Acceleration Sensitivity:	140.5 dB $\mu$ Pa/( $m/s^2$ )	
Underwater Projector:	Yes.	NO
	Do NOT use the hydrophone as a sound projector in the air otherwise the hydrophone will be damaged.	
Resonance $f_s$ :	165 kHz	N/A
TVR at $f_s$ :	Xx dB $\mu$ Pa/V at 1m.	N/A
	Approximately, TVR drops 12dB/octave below $f_s$ and drops 6dB/octave above $f_s$ .	
Maximum Drive Voltage:	450 Vpp	N/A
Maximum Pulse Length:	100 mS at Maximum Drive Voltage	N/A
Duty Cycle in Water:	10% at Maximum Drive Voltage. 100% $\leq 30$ Vpp or 10.6 Vrms.	N/A
Maximum Operating Depth:	350 m and limited by the cable length if the cable has wire leads or a non-waterproof connector.	
Mounting Options:	1. Free Hanging (FH) 2. Free-hanging with Male Underwater Connector (FHUWC) 3. Thru-hole Mounting with Single O-ring (THSO) 4. Thru-hole Mounting with Double O-ring (THDO) 5. Bolt Fastening Mounting (Plastics) (BFMP) 6. Bolt Fastening Mounting (Stainless Steel) (BFMSS) Please refer to online document <a href="#">AcousticSystem.pdf</a> for a complete list of Mounting Options and more details.	
	1. Coax RG174/U (RG174) (for Single Ended Output ONLY) 2. Coax RG178/U (RG178) (for Single Ended Output ONLY), up to 200°C. 3. Coax RG58/U (RG58) (for Single Ended Output ONLY) 4. Shielded Cable with Polyurethane Jacket, $\Phi$ D=2.6 mm (SC26) 5. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, $\Phi$ D=3.2 mm (SC32), up to 200°C. 6. Shielded Cable with Twisted Pair and PVC Jacket, $\Phi$ D=3.6 mm (SC36) 7. Shielded Cable with Twisted Pair and Polyurethane Jacket, $\Phi$ D=4.7 mm (SC47) 8. Shielded Cable with Rubber Jacket, $\Phi$ D=6.5 mm (SC65)	
Cable Length:	1. Default: 0.15 m. 2. Custom-fit Cable Length.	
Connector:	SE: Single ended Output, DF: Differential Output. 1. Default: Wire Leads (WL)	

	2. Male BNC (BNC) (Max. Diameter $\Phi 14.3$ mm), for SE ONLY. 3. SMA (Plug, Male Pin) (SMA), Voltage Rating: 335 V <sub>RMS</sub> Continuous. (Max. Diameter $\Phi 9.24$ mm), for SE ONLY. 4. SMC (Plug, Female Socket) (SMC), Voltage Rating: 335 V <sub>RMS</sub> Continuous. (SMC) (Max. Diameter $\Phi 6.4$ mm), for SE ONLY. 5. 1/8" (3.5mm) TRS Plug (TRS35) (Max. Diameter $\Phi 10.5$ mm), for SE or DF. 6. XLR (pin) (XLR) (Max. Diameter $\Phi 20.2$ mm), for SE or DF. 7. MIL-5015 Style (pin) (5015) (Max. Diameter $\Phi 30$ mm with 3 contacts), for SE or DF. 8. Underwater Mateable Connector (pin) (UMC) (Max. Diameter $\Phi 21.5$ to $\Phi 35$ mm), for SE or DF. Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.				
Size:	$\Phi D = \Phi 15.8$ mm, Length $\geq 16$ mm and actual length depends on Mounting Parts.				
Weight:	$\geq 0.1$ kg with 6m cable. Actual weight depends on Mounting Parts, Cable Types and Length.				
Operation Temperature:	1. Default: -10 °C to +60 °C or 14 °F to 140 °F. 2. Bespoke High Temperature Transducer: -10 °C to 120 °C, or 14 °F to 248 °F. Append <b>HT</b> to part number. <b>Depth Rating at 120 °C, or 248 °F: 100 m.</b>				
Storage Temperature:	-20°C to +60°C or -4°F to 140°F.				
<b>Wiring of Differential Output:</b>	<b>Wire Leads</b>	<b>Underwater Connector</b>	<b>TRS Plug (Balanced Mono)</b>	<b>XLR Plug (Balanced Audio)</b>	
Signal +	White or Red	Pin 2	Tip, Positive/Hot	Pin 2, Positive/Hot.	
Signal -	Black	Pin 1	Ring, Negative/Cold	Pin 3, Negative/Cold.	
Common & Shielding	Shield	Pin 3	Sleeve, Ground/Common	Pin 1, Cable Shield/Chassis Ground.	
<b>Wiring of Single Ended Output:</b>	<b>Wire Leads</b>	<b>Underwater Connector</b>	<b>BNC/SMA/SMC</b>	<b>Coax with Wire Leads</b>	<b>TRS Unbalanced mono</b>
Signal	White or Red	Pin 2	Center Contact	Coax Center Contact	Tip
Signal Common	Black	Pin 1	Shield	Coax Shield	Ring & Sleeve
Shielding	Shield	Pin 3	Shield	Coax Shield	Ring & Sleeve
<b>Underwater Projector Application:</b> for 50 $\Omega$ BNC/SMA/SMC connector, it is buyer's sole responsibility to make sure that the BNC/SMA/SMC shield of the signal source is firmly grounded for operating safety before hooking up transducer/hydrophone to the signal source. Coax with BNC/SMA/SMC is not intended for hand-held use at voltages above 30Vac/60Vdc.					
<b>Do NOT use the hydrophone as a sound projector in the air otherwise the hydrophone will be damaged.</b>					
<b>Sound Measurement in Air:</b> The hydrophones can be used to detect sounds in air. The sensitivity in air is same to the one in water in low frequency range.					

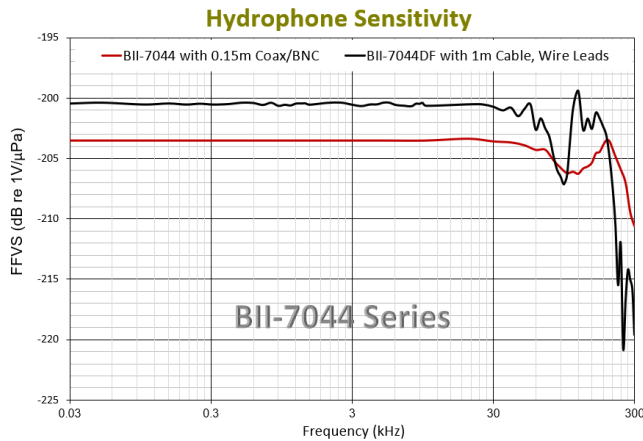
Physical Size (Dimensional Unit: mm) of Free Hanging:



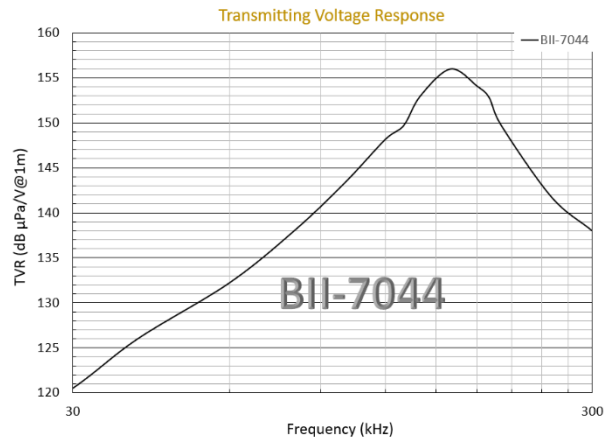
Physical Size (Dimensional Unit: mm) with Mounting Part:



Free-field Voltage Sensitivity (FFVS):



Transmitting Voltage Response (TVR):



Directivity Pattern

