Hemispherical Hydrophone

BII7040 Series Hemispherical Hydrophone

The BII7040 series hydrophones provide 60° directivity response approximately at fs 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

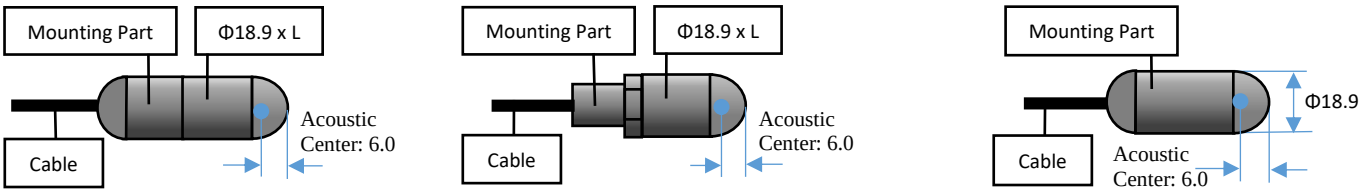
Directional hydrophone, Sonobuoy Underwater Communication Thermoacoustics in Gas	LBL, SBL, USBL Positioning, Array Element Underwater Sound Recording, Marine Bioacoustic Research Passive Acoustic Monitoring (PAM System)

Specification

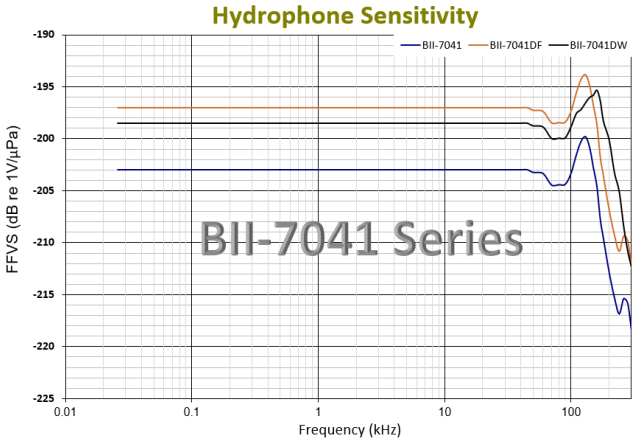
The hydrophone is tested in water unless stated otherwise.			
Part Number:	BII7041	BII7041DF	BII7041DW
Sensitivity FFVS at 1 kHz:	-202 dB V/µPa ± 2 dB.	-196 dB V/µPa ± 2 dB.	-198.5 dB V/µPa ± 2 dB.
	Sensitivity Loss over Extension Cable (dB) = 20*log[C_h/(C_h+C_c)]. Valid for hydrophone without preamplifier. 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 **FFVS vs. Frequency**.		
Usable Frequency in Water:	1 Hz ~ 200 kHz		
	Minimum Usable Frequency depends on -3dB high pass filter f_{-3dB} = 1/(2π$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 ~ 7.8 kHz at -3 dB V/µPa.		
Capacitance C_h at 1 kHz:	6.1 nF ± 10%	1.7 nF ± 10%	1.1 nF ± 10%
Dissipation D at 1 kHz:	0.015	0.015	0.005
Noise Density at f << fs: dB µPa/√Hz	27.8 – 10*log f	30.0 – 10*log f	32.2 – 10*log f
	1. f in kHz; fs: 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 to Hemispherical, Refer to Graph of **Directivity Pattern**. f_{omni} = 33 kHz. The directivity pattern is omnidirectional (±3 dB) at operating frequency f < f_{omni}.		
-3dB Beam Width:	Refer to Graph of **Directivity Pattern**.		
Side Lobe Level:	No side lobes.		
Signal Output Type:	Single Ended	Differential	Differential
Acceleration Sensitivity:	140.2 dB µPa/(m/s²)	140.2 dB µPa/(m/s²)	142.6 dB µPa/(m/s²)
Underwater Projector:	Yes.	No	No
Resonance fs:	135 kHz	N/A	N/A
Quality Factor Qm:	2.8	N/A	N/A
TVR at fs:	137.9 dB µPa/V at 1m.	N/A	N/A
	Approximately, TVR drops 12dB/octave below fs and drops 6dB/octave above fs.		
Maximum Drive Voltage:	300 Vpp	N/A	N/A
Maximum Pulse Length:	100 mS at Maximum Drive Voltage	N/A	N/A
Duty Cycle in Water:	10% at Maximum Drive Voltage; 100% at ≤ 30 Vpp or 10.6 Vrms.	N/A	N/A
Maximum Operating Depth:	300 m	300 m	900 m
	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) 7. Custom-fit Please refer to online document AcousticSystem.pdf for a complete list of Mounting Options and more details.		
Cable Options:	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, ΦD=2.6 mm (SC26) 5. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, ΦD=3.2 mm (SC32), up to 200°C. 6. Shielded Cable with Twisted Pair and PVC Jacket, ΦD=3.6 mm (SC36) 7. Shielded Cable with Twisted Pair and Polyurethane Jacket, ΦD=4.7 mm (SC47)		

	8. Shielded Cable with Rubber Jacket, ΦD=6.5 mm (SC65) 9. Custom-fit.				
Cable Length:	1. Default: 6 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 Φ14.3 mm), for SE ONLY. 3. SMA (Plug, Male Pin) (SMA), Voltage Rating: 335 V_{RMS} Continuous. (Max. Diameter Φ9.24 mm), for SE ONLY. 4. SMC (Plug, Female Socket) (SMC), Voltage Rating: 335 V_{RMS} Continuous. (SMC) (Max. Diameter Φ6.4 mm), for SE ONLY. 5. 1/8" (3.5mm) TRS Plug (TRS35) (Max. Diameter Φ10.5 mm), for SE or DF. 6. XLR (pin) (XLR) (Max. Diameter Φ20.2 mm), for SE or DF. 7. MIL-5015 Style (pin) (5015) (Max. Diameter Φ30 mm with 3 contacts), for SE or DF. 8. LEMO (Plug Male Pins) (LEMO) (Max. Diameter Φ9.5 mm with 3 contacts), for SE or DF. 9. Underwater Mateable Connector (pin) (UMC) (Max. Diameter Φ21.5 to Φ35 mm), for SE or DF. 10. Customized, buyer specifies the connector. (Custom) Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.				
Size:	Φ18.9 x 35 mm, and and actual length depends on Mounting Parts.				
Weight:	≥ 0.2 kg with 6 m 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 HT to part number. Depth Rating at 120 °C, or 248 °F: 100 m.				
Storage Temperature:	-20 °C to +60 °C or -4 °F to 140 °F.				
Wiring of Differential Output:	**Wire Leads**	**Underwater Connector**	**TRS Plug (Balanced Mono)**	**XLR Plug (Balanced Audio)**	
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.	
Wiring of Single Ended Output:	**Wire Leads**	**Underwater Connector**	**BNC/SMA/SMC**	**Coax with Wire Leads**	**TRS Unbalanced mono**
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
Underwater Projector Application: for 50Ω 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.					
Do NOT use the hydrophone as a sound projector in the air otherwise the hydrophone will be damaged.					
Sound Measurement in Air: 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):



Free-field Voltage Sensitivity (FFVS):



Directivity Pattern: