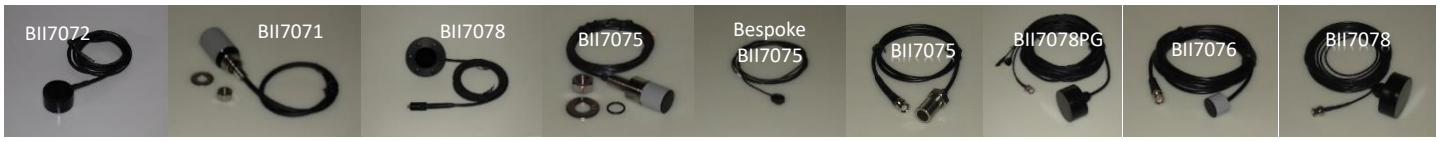
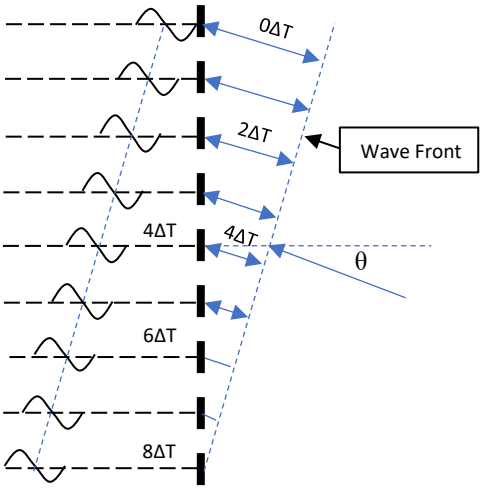


BII7070 Series Directional Hydrophone (Acoustic Sensor) and Planar Array Element

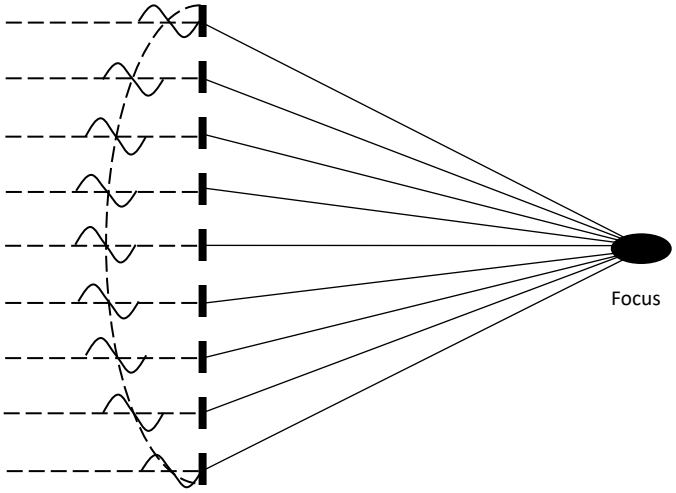
BII's directional hydrophones have conical beams for uses in detection of weak signals, broadband signals, pipeline leaks, and tracking of sound sources underwater. Low noise hydrophone (below sea-state zero) is available for noise measurement. These acoustic sensors are also designed for applications in air to detect acoustic emission and stress waves. (Note: The couplant such as water or gel is a must-have material to provide efficient acoustic coupling between the Hydrophone face and the piece under test in air applications.)

Below the critical frequency fc, the hydrophones are of single beam without side lobes. This feature makes the hydrophone be an ideal candidate for target angle estimation systems or sound source tracking systems. With built-in preamplifiers, the hydrophones have higher sensitivity and can transmit signal over long cable.

Linear (Rectangular) Array Beam Steering



Linear, Annular, and Planar Array Beam Focusing



Typical Applications

Direction-finding Sonar, Tracking of Acoustic Tags LBL/SBL/USBL Positioning System Locating Marker/Pinger/Beacon/Transponder Acoustic Pipeline Leak Detection	Array elements for Array Focusing and Beam Steering Noise Measurement, Bioacoustic Research of Marine Animals Structural Health Monitoring, Acoustic Emission Detection/AE Sensor Monitoring Aquarium/Pool Safety/Alarm System

Specification

Part Number:	BII7075	BII7076	BII7077	BII7078	BII7078DF
Sensitivity at 1 kHz:	-205.5 dB V/μPa ± 2 dB.				-195.5 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.				
FFVS:	Free-field Voltage Sensitivity, Refer to Graph of **FFVS vs. Frequency**.				
Usable Frequency in Water:	1Hz ~ 550kHz at ±3dB V/μPa.				
	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: (-3dB V/μPa)	1Hz ~ 16kHz	1Hz ~ 8kHz	1Hz ~ 6kHz	1Hz ~ 3kHz	1Hz ~ 3kHz
Capacitance C_h:	0.286 nF	0.885 nF	1.351 nF	4.546 nF	1.1 nF
Dissipation:	0.026 @ 1 kHz.				
Receiving Face:	Circular Planar Face				
Directivity Pattern:	Conical Beam				
-3dB Beam Width:	9900°/f(kHz)	4650°/f(kHz)	3200°/f(kHz)	1700°/f(kHz)	1700°/f(kHz)
Frequency f_{-3dBML}:	74 kHz	41 kHz	32 kHz	15 kHz	15 kHz
	f_{-3dBML}: Main Lobe drops -3dB at ±90° normal to acoustic axis.				
Critical Frequency f_c:	180 kHz	100 kHz	78 kHz	36 kHz	36 kHz
	f_c: Side lobes exist in the case of operating frequency f > fc; The hydrophone has no side lobe in the case of f ≤ fc.				
±90° Sidelobe Frequency f_n:	240 kHz	133 kHz	104 kHz	49 kHz	49 kHz
	f_n: First Side Lobes exist at ±90° normal to acoustic axis in the case of operating frequency f = fn.				
Signal Type:	Single Ended				
Acceleration Sensitivity:	143.6 dB μPa/(m/s²) along acoustic axis.				137.6 dB μPa/(m/s²)

	Other direction: 141.0 dB µPa/(m/s²).				
Underwater Projector:	Yes. Do NOT use the hydrophone as a sound projector in the air.				No
Resonance fs:	305 kHz				N/A
TVR at fs (dB µPa/V at 1m):	143.2	155.4	159.3	174.3	N/A
Maximum Drive Voltage:	600 Vpp				N/A
Maximum Pulse Length:	100 mS at Maximum Drive Voltage				N/A
Duty Cycle in Water:	10% at Maximum Drive Voltage. 100% at ≤ 30 Vpp or 10.6 Vrms.				N/A
Sidelobe Level:	1. Default: < -17.8 dB when f > fc; No side lobe when f ≤ fc. 2. Bespoke Sidelobe Suppression is available for BII7074: ≤-30 dB. Main lobe is about 1.1 to 1.28 times wider.				
Depth Rating:	300 m.				
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 AcousticSystem.pdf for a complete list of Mounting Options and more details.				
Cable Orientation:	1. Default: Perpendicular to end face of hydrophone. 2. Customization: Perpendicular to side wall of hydrophone (reducing the overall height), appending **SW** to the part number.				
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)				
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. 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 (ΦDxL):	Φ21x20 mm	Φ27x20 mm	Φ33x20 mm	Φ60x20 mm	Φ60x20 mm
	The hydrophone can be customized to be smaller for uses in air and shallow water (<50m Depth).				
Weight:	100 grams	150 grams	210 grams	550 grams	550 grams
Operation Temperature:	1. Default: -10°C to to 60°C, or 14°F to 140°F. 2. Bespoke High Temperature: -10°C to 120°C, or 14°F to 248°F. Append **HT** to part number.				
Storage Temperature:	-20 to 60 °C, or -4 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

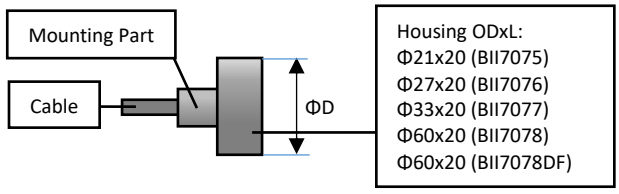
Underwater Projector Application: for 50Ω BNC/SMA/SMC connector, it is buyer's sole responsibility to make sure that the BNC/SMA/SMC shield of the signal source is firmly grounded for operating safety before hooking up transducer/hydrophone to the signal source. Coax with BNC/SMA/SMC is not intended for hand-held use at voltages above 30Vac/60Vdc.

AE (Acoustic Emission) Applications: These hydrophones are tested and calibrated in water. It is buyer's responsibility and liability to calibrate and maintain the AE sensors according to the acoustic emission national standards of buyer's country.

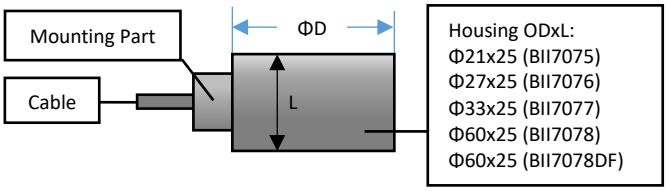
Sound Measurement in Air: The hydrophones can be used to detect sounds in air. the sensitivity in air is same to the one in water in low frequency range.

Physical Size (Dimensional Unit: mm): The overall length varies with mounting parts.

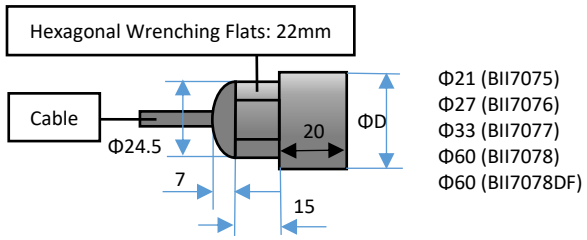
a. General Size information.



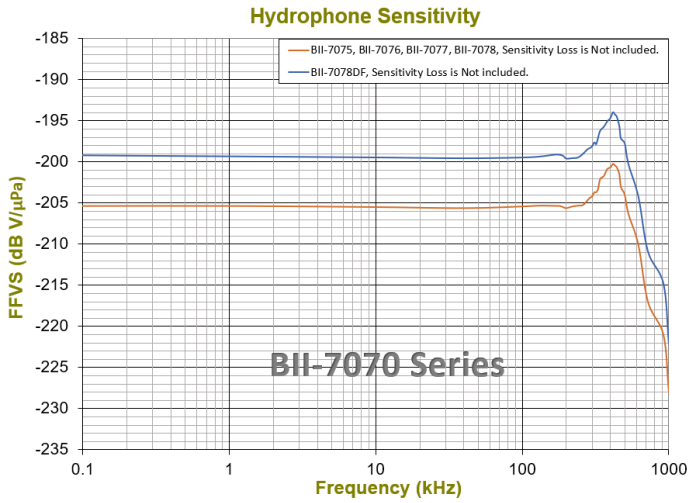
b. Size information of Customized Cable Orientation: Side Wall.



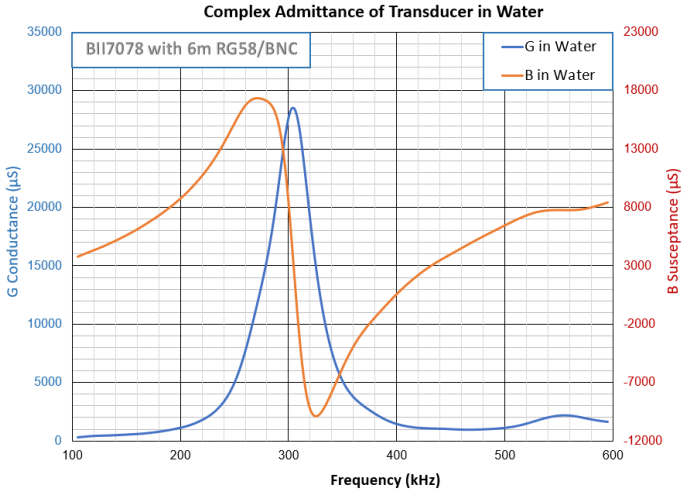
c. Size information of Free Hanging.



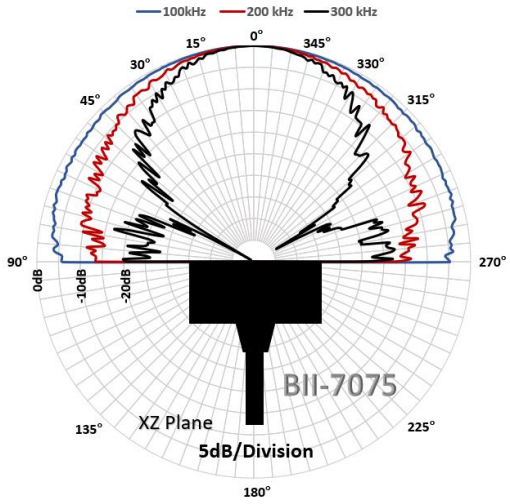
FFVS (Free-field Voltage Sensitivity):

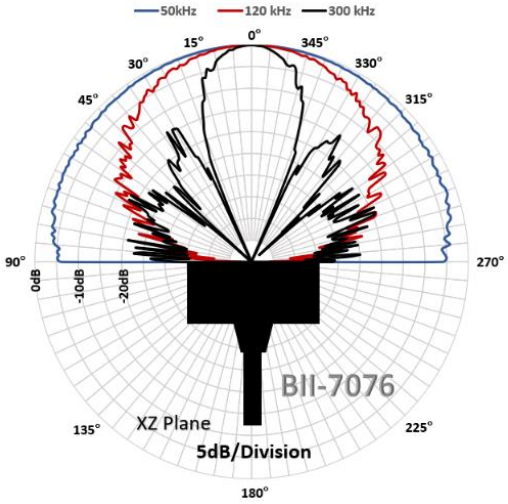


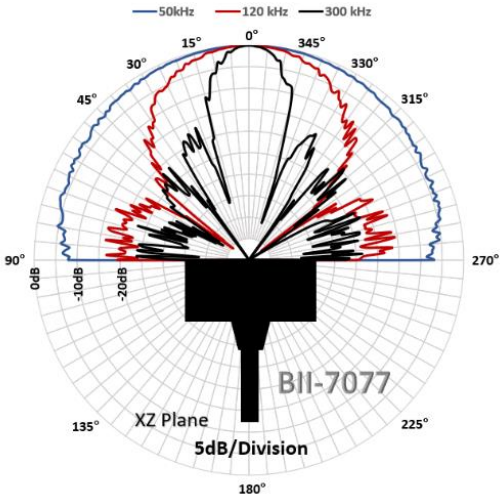
Admittance:

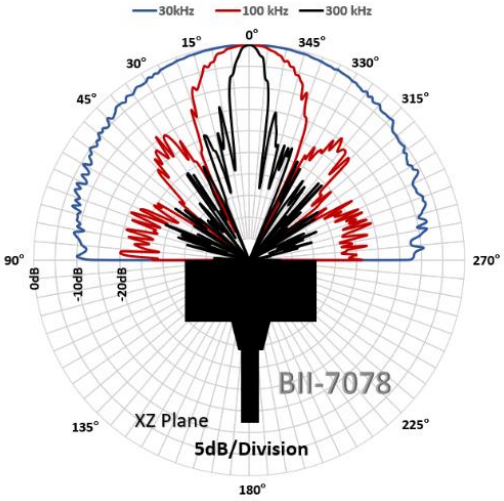


Directivity Pattern:






50kHz
120 kHz
300 kHz
0°
15°
30°
45°
345°
330°
315°
90°
270°
0dB
-10dB
-20dB
BII-7077
XZ Plane
5dB/Division
135°
225°
180°


30kHz
100 kHz
300 kHz
0°
15°
30°
45°
345°
330°
315°
90°
270°
0dB
-10dB
-20dB
BII-7078
XZ Plane
5dB/Division
135°
225°
180°