



## 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<br>Underwater Communication<br>Thermoacoustics in Gas | LBL, SBL, USBL Positioning, Array Element<br>Underwater Sound Recording, Marine Bioacoustic Research<br>Passive Acoustic Monitoring (PAM System) |
|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|

### Specification

|                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|
| <b>The hydrophone is tested in water unless stated otherwise.</b>                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                                       |
| <b>S:</b> Small; <b>FG:</b> Fixed Gain; <b>PG:</b> Programmable Gain; <b>DF:</b> Differential Output; <b>SE:</b> Single Ended Output; <b>BPF:</b> Band Pass Filter; <b>HPF:</b> High Pass Filter; <b>LPF:</b> Low Pass Filter. <b>DW:</b> Deep Water, <b>UMC:</b> Underwater Matable Connector, <b>FFVS:</b> Free-field Voltage Sensitivity, <b>TVR:</b> Transmitting Voltage Response. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |                                       |
| <b>Part Number:</b>                                                                                                                                                                                                                                                                                                                                                                     | BII7041                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | BII7041DF                             | BII7041DW                             |
|                                                                                                                                                                                                                                                                                                                                                                                         | -202 dB V/ $\mu$ Pa $\pm$ 2 dB.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -196 dB V/ $\mu$ Pa $\pm$ 2 dB.       | -198.5 dB V/ $\mu$ Pa $\pm$ 2 dB.     |
| Sensitivity FFVS at 1 kHz:                                                                                                                                                                                                                                                                                                                                                              | Sensitivity Loss over Extension Cable (dB) = $20 \cdot \log[C_h / (C_h + C_c)]$ . Valid for hydrophone without preamplifier.<br>$C_h$ : Hydrophone Capacitance; $C_c$ : Capacitance of Extension Cable. Cable is of 100 pF/meter roughly.                                                                                                                                                                                                                                                                              |                                       |                                       |
| FFVS:                                                                                                                                                                                                                                                                                                                                                                                   | Refer to Graph of <b>FFVS vs. Frequency</b> . Free-field Voltage Sensitivity.                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                       |                                       |
| Usable Frequency in Water:                                                                                                                                                                                                                                                                                                                                                              | 1 Hz ~ 200 kHz<br><b>Minimum Usable Frequency</b> depends on -3dB high pass filter $f_{-3dB} = 1 / (2\pi R_i C_h)$ .<br>$R_i$ : 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/ $\mu$ Pa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |                                       |
| Capacitance $C_h$ at 1 kHz:                                                                                                                                                                                                                                                                                                                                                             | 6.1 nF $\pm$ 10%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1.7 nF $\pm$ 10%                      | 1.1 nF $\pm$ 10%                      |
| Dissipation D at 1 kHz:                                                                                                                                                                                                                                                                                                                                                                 | 0.015                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.015                                 | 0.005                                 |
| Noise Density at $f \ll f_s$ :<br>dB $\mu$ Pa/VHz                                                                                                                                                                                                                                                                                                                                       | 27.8 – $10 \cdot \log f$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30.0 – $10 \cdot \log f$              | 32.2 – $10 \cdot \log f$              |
|                                                                                                                                                                                                                                                                                                                                                                                         | 1. $f$ in kHz; $f_s$ : Resonance Frequency which is close to the frequency of maximum FFVS.<br>2. Noise densities in this datasheet are calculated values with transducer parameters being measured in water.<br>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 <b>Directivity Pattern</b> .<br>$f_{omni} = 33$ kHz. The directivity pattern is omnidirectional ( $\pm 3$ dB) at operating frequency $f < f_{omni}$ .                                                                                                                                                                                                                                                                                                              |                                       |                                       |
| -3dB Beam Width:                                                                                                                                                                                                                                                                                                                                                                        | Refer to Graph of <b>Directivity Pattern</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                       |
| Side Lobe Level:                                                                                                                                                                                                                                                                                                                                                                        | No side lobes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                       |                                       |
| Signal Output Type:                                                                                                                                                                                                                                                                                                                                                                     | Single Ended                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Differential                          | Differential                          |
| Acceleration Sensitivity:                                                                                                                                                                                                                                                                                                                                                               | 140.2 dB $\mu$ Pa/(m/s <sup>2</sup> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 140.2 dB $\mu$ Pa/(m/s <sup>2</sup> ) | 142.6 dB $\mu$ Pa/(m/s <sup>2</sup> ) |
| Underwater Projector:                                                                                                                                                                                                                                                                                                                                                                   | Yes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | No                                    | No                                    |
| Resonance $f_s$ :                                                                                                                                                                                                                                                                                                                                                                       | 135 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | N/A                                   | N/A                                   |
| Quality Factor $Q_m$ :                                                                                                                                                                                                                                                                                                                                                                  | 2.8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | N/A                                   | N/A                                   |
| TVR at $f_s$ :                                                                                                                                                                                                                                                                                                                                                                          | 137.9 dB $\mu$ Pa/V at 1m.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | N/A                                   | N/A                                   |
|                                                                                                                                                                                                                                                                                                                                                                                         | Approximately, TVR drops 12dB/octave below $f_s$ and drops 6dB/octave above $f_s$ .                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                       |                                       |
| 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;<br>100% at $\leq 30$ 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. Default: Free Hanging (FH).<br>2. Free-hanging with Male Underwater Connector (FHUWC-2P, FHUWC-3P).<br>3. Thru-hole Inch Mounting with Single O-ring Sealing (THM-7/16").<br>4. Thru-hole Inch Mounting with Double O-ring Sealing (THDO-7/16").<br>5. Bolt Fastening Mounting (Plastics) (BFMP-NPT3/8").<br>6. Bolt Fastening Mounting (Stainless Steel) (BFM-7/16", or BFM-5/8").<br>Please refer to online document <a href="#">AcousticSystem.pdf</a> for a complete list of Mounting Options and more details. |                                       |                                       |
| Cable Options:                                                                                                                                                                                                                                                                                                                                                                          | SE: Single Ended Output Hydrophones. DF: Differential Output Hydrophones.<br>1. Default: Coax RG174/U, $\Phi D=2.8$ mm (RG174), (SE).<br>2. Coax RG58/U, $\Phi D=4.9$ mm (RG58), (SE).<br>3. Shielded Cable with Polyurethane Jacket, $\Phi D=2.6$ mm (SC26), (SE).<br>4. Shielded Cable with PUR or Rubber Jacket, $\Phi D=\Phi 4.7$ to $\Phi 6.5$ mm (SC47 to SC65), (SE or DF).<br>Use with Underwater Connector 3 pins UMC3P = MCOM3M + OMBMC + MCDLS-F, <b>Depth Rating: 300 m.</b>                               |                                       |                                       |

|                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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|                                                                                                                                                                                                                                                                                                                                                                              | <p>5. Default: Shielded Cable with Twisted Pair and PVC Jacket, <math>\Phi D=3.6</math> mm (SC36), (DF).</p> <p>6. Shielded Cable with Twisted Pair and PVC Jacket, <math>\Phi D=6.0</math> mm (SC60), (DF).</p> <p>7. Shielded Cable with Twisted Pair and Polyurethane Jacket, <math>\Phi D=4.7</math> mm (SC47), (DF).</p> <p>8. Coax RG316/U, <math>\Phi D=2.5</math> mm (RG316) up to 200°C, (SE).</p> <p>9. Coax RG178/U, <math>\Phi D=1.8</math> mm (RG178) up to 200°C, (SE).</p> <p>10. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, <math>\Phi D=3.2</math> mm (SC32), up to 200°C. <b>Non-waterproof, for dry use ONLY, (DF).</b></p> <p>11. Two-conductor High Temperature Shielded Cable: -94 to 302°F (-70° to 150° C), <math>\Phi D=5.1</math> mm (HTSC150), (DF or SE).</p> <p>12. Original Two Conductor Unshielded Cable (USC) for Underwater Connector 2 pins MCIL2M + MCDLS-F. <b>Depth Rating: 950 m.</b></p> <p>13. Original Three Conductor Unshielded Cable (USC) for Underwater Connector 3 pins MCIL3M + MCDLS-F. <b>Depth Rating: 950 m.</b></p> <p>Differential/balanced signals over shielded twisted pair cable is recommended to reject Electromagnetic Interference (EMI).</p> <p>Underwater Mateable Connectors are for underwater uses. Other connectors/wire leads are for dry aerial uses and are not waterproofed.</p>                                                              |
|                                                                                                                                                                                                                                                                                                                                                                              | <p>1. <b>BNC</b>: "Bayonet Neill–Concelman" is a miniature quick connect/disconnect radio/audio frequency connector used for coaxial cable. Fastening Type: Bayonet Lock.</p> <p>2. <b>XLR</b>: Employed for balanced audio and DC or AC power signal interconnections, 3 to 7 contacts. Fastening Type: Latch Lock.</p> <p>3. 3.5mm <b>TRS</b> stand for Tip, Ring, and Sleeve, miniature, quick connect/disconnect, audio frequency connector used for shielded cable. Fastening Type: None.</p> <p>4. <b>DIN</b>: Electrical cylindrical connectors, 3 to 14 contacts, <math>\Phi 20</math>mm diameter, used for audio, RF, digital, and DC or AC power signals. Fastening Type: Threaded.</p> <p>5. <b>UMC</b>: Underwater Mateable Connectors, interconnection solution for high power or weak signals. Fastening Type: Threaded. Underwater Uses.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Cable Length:                                                                                                                                                                                                                                                                                                                                                                | <p>1. Default: 6 m.</p> <p>2. Custom-fit Cable Length.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Connector:                                                                                                                                                                                                                                                                                                                                                                   | <p>SE: Single ended Output, DF: Differential Output.</p> <p>1. Default: Wire Leads (WL).</p> <p>2. Male BNC (BNC), Max. Diameter <math>\Phi 14.3</math> mm, for SE ONLY. <b>BNC with RG178 Coax: Service Temperature up to 165°C or 329°F.</b></p> <p>3. XLR Receptacle with 3 Male Pins (XLR3), Max. Diameter <math>\Phi 20.2</math> mm, for SE or DF.</p> <p>4. 1/8" (3.5mm) TRS Plug (TRS), Max. Diameter <math>\Phi 10.5</math> mm, for SE or DF.</p> <p>5. DIN Receptacle with 3 Male Pins (DIN3), (Max. Diameter <math>\Phi 17</math> mm). for SE or DF.</p> <p>6. Underwater Mateable Connector UMC2P and UMC3P are made by global manufacturers, buyer may search online to get detailed specs of these connectors from their manufacturers. Available in-stock options (the customized is available upon request):</p> <p>2 pin (UMC2P = MCIL2M + MCDLS-F.), Max. Diameter <math>\Phi 21.5</math> to <math>\Phi 35</math> mm, for SE. <b>Depth Rating: 950 m.</b></p> <p>3 pin (UMC3P = MCIL3M + MCDLS-F.), Max. Diameter <math>\Phi 21.5</math> to <math>\Phi 35</math> mm, for SE or DF. <b>Depth Rating: 950 m.</b></p> <p>3 pin (UMC3P = MCOM3M + OMBMC + MCDLS-F.), Max. Diameter <math>\Phi 21.5</math> to <math>\Phi 35</math> mm, for SE or DF. <b>Depth Rating: 300 m.</b></p> <p>Underwater Mateable Connectors are for underwater uses. Other connectors/wire leads are for dry uses and are not waterproofed.</p> |
| Size:                                                                                                                                                                                                                                                                                                                                                                        | $\Phi 18.9$ x 35 mm, and actual length depends on Mounting Parts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Weight:                                                                                                                                                                                                                                                                                                                                                                      | $\geq 0.2$ kg with 6 m cable. Actual weight depends on Mounting Parts, Cable Types and Length.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Operation Temperature:                                                                                                                                                                                                                                                                                                                                                       | <p>1. Default: -10 °C to +60 °C or 14 °F to 140 °F.</p> <p>2. Bespoke High Temperature Transducer: -10 °C to 120 °C, or 14 °F to 248 °F. Append <b>HT</b> to part number.</p> <p><b>Depth Rating at 120 °C, or 248 °F: 100 m.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Storage Temperature:                                                                                                                                                                                                                                                                                                                                                         | -20 °C to +60 °C or -4 °F to 140 °F.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Array Design Service:                                                                                                                                                                                                                                                                                                                                                        | Line (Linear) Array, Rectangular Planar Array, and Circular Planar Array design: Side Lobe Level <b>SLL</b> , -3dB Beam Angle $\theta_{-3dB}$ , Array Element Spacing <b>d</b> ; Array Element Number <b>N</b> ; Beam Steering, <b>FFVS</b> loss, and mutual effects among these parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <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.                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**How to Order Standard Hydrophones.** BII Keeps **Standard Products** in Stock (**Green Color**), Non-stock Products are in **Black Color**.

| Hydrophone Part Number               | -Mounting Part               | -Cable Length                                                                                                                        | -Cable Type         | -Connector Type      |
|--------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------|
| BII7041DF                            | FH, BFMP-NPT3/8".            | 10 m (32.8 ft)                                                                                                                       | SC36 or SC60        | WL, TRS, XLR3, DIN3. |
|                                      | FH, BFM-7/16", BFM-5/8".     | 0.6 m (2 ft)                                                                                                                         | SC47 to SC65        | UMC3P.               |
|                                      | THM-7/16".                   | 0.6 m (2 ft)                                                                                                                         | SC36                | WL.                  |
| BII7041                              | FH, BFMP-NPT3/8", BFM-7/16". | 20 m (65.6 ft)                                                                                                                       | RG174 Coax          | WL, BNC.             |
|                                      | FH, BFM-7/16", BFM-5/8".     | 0.6 m (2 ft)                                                                                                                         | SC60, SC65, or USC. | UMC2P, UMC3P.        |
|                                      | THM-7/16".                   | 0.6 m (2 ft)                                                                                                                         | RG174 Coax          | WL.                  |
| BII7041DW                            | FH, BFM-5/8".                | 0.6 m (2 ft)                                                                                                                         | USC                 | UMC2P, UMC3P.        |
| <b>In-Stock Examples:</b>            |                              | <b>Description</b>                                                                                                                   |                     |                      |
| BII7041DF-FH-10m-SC60-XLR3           |                              | BII7041DF Hydrophone, Free Hanging, 10m Shielded Cable with Twisted Pair <b>SC60</b> , XLR3.                                         |                     |                      |
| BII7041DF-BFMP-NPT3/8"-10m-SC60-XLR3 |                              | BII7041DF Hydrophone, Bolt-fastening Mounting: BFMP-NPT3/8", 10m Twisted-Pair Shielded Cable <b>SC60</b> , XLR3.                     |                     |                      |
| BII7041DF-FH-0.6m-SC65-UMC3P         |                              | BII7041DF Hydrophone, Free Hanging, 0.6m Shielded Cable <b>SC65</b> , 3-pin Underwater Mateable Connector UMC3P.                     |                     |                      |
| BII7041DF-BFM-5/8"-0.6m-SC65-UMC3P   |                              | BII7041DF Hydrophone, Bolt-fastening Mounting BFM-5/8", 0.6m Shielded Cable <b>SC65</b> , 3-pin Underwater Mateable Connector UMC3P. |                     |                      |
| BII7041DF-THM-7/16"-0.6m-SC36-WL     |                              | BII7041DF Hydrophone, Thru-Hole Mounting THM-7/16", 0.6m Shielded Cable <b>SC36</b> , Wire Leads.                                    |                     |                      |
| <b>Non-stock Examples:</b>           |                              | <b>Description</b>                                                                                                                   |                     |                      |
| BII7041DF-FH-30m-SC60-XLR3           |                              | BII7041DF Hydrophone, Free Hanging, 30m Shielded Cable with Twisted Pair <b>SC60</b> , XLR Receptacle with 3 Male Pins.              |                     |                      |
| BII7041-HT-FH-6m-RG178-BNC           |                              | BII7041 Hydrophone, Service Temperature: -10°C to 120°C (14°F to 248°F). Free Hanging, 6m RG178 Coax, BNC Male.                      |                     |                      |
| BII7041DW-FHUWC-3P                   |                              | BII7041DW Hydrophone, Free-hanging with Male Underwater Connector FHUWC-3P.                                                          |                     |                      |

#### Wirings

| Differential Output: | Wire Leads   | UMC3P, UMC3S, FHUWC-3P. | DIN3  | TRS               | XLR3                 |
|----------------------|--------------|-------------------------|-------|-------------------|----------------------|
| Signal +             | White or Red | Pin 2 or Socket 2       | Pin 3 | Tip, Positive/Hot | Pin 2, Positive/Hot. |

|                      |              |                         |                  |       |                       |                       |
|----------------------|--------------|-------------------------|------------------|-------|-----------------------|-----------------------|
| Signal -             | Black        | Pin 1 or Socket 1       |                  | Pin 1 | Ring, Negative/Cold   | Pin 3, Negative/Cold. |
| Common & Shielding   | Shield       | Pin 3 or Socket 3       |                  | Pin 2 | Sleeve, Ground/Common | Pin 1, Shield/Ground. |
| Single Ended Output: | Wire Leads   | UMC3P, UMC3S, FHUWC-3P. | UMC2P, FHUWC-2P. | DIN3  | BNC/SMA/SMC           | Coax with Wire Leads  |
| Signal               | White or Red | Pin 2 or Socket 2       | Pin 2            | Pin 3 | Center Contact        | Coax Center Contact   |
| Signal Common        | Black        | Pin 1 or Socket 1       | Pin 1            | Pin 1 | Shield                | Coax Shield           |
| Shielding            | Shield       | Pin 3 or Socket 3       | N/A              | Pin 2 | Shield                | Coax Shield           |

## Question:

**What if the mating connector of my DAQ module or recording device is NOT available from BII?** A bespoke connector adaptor might be assembled by BII and BII ships the adaptor to buyer as accessory of the device. Please contact BII for customizations. Many adaptors for standard connectors are available in worldwide electronic suppliers such as BNC to SMA, BNC to SMC, XLR to TRS, etc. Check out your local suppliers.

**What if the connector of my analyzer (instrument) is SMA or SMC Connector?** Buyer may order a SMA (or SMC) to BNC (Male) adaptor from local electronic distributors in buyer's country. BII may ship the adaptor as accessory of the device if buyer requests when ordering. **By default, BII does NOT supply the adaptor as accessories.**

**Is impedance matching necessary between hydrophones/sensors and preamplifiers/Recorders/Analyzers?** It is NOT necessary to do impedance matching in low frequency range applications in which electromagnetic wave lengths are much greater than the cable length. High frequency transducers such as NDT pulsing transducers need 50Ω impedance matching among transducers, cables, and analyzers/digitizers.

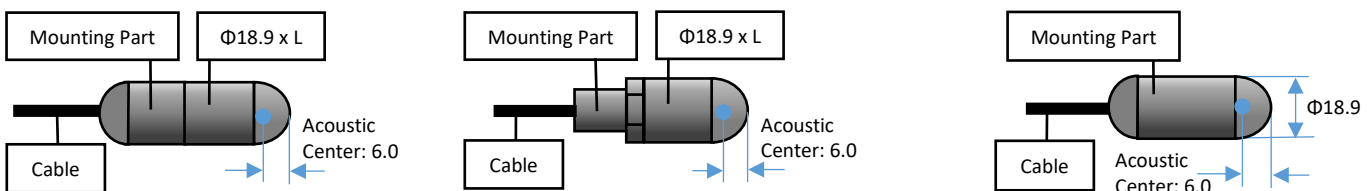
**My acoustic sensors generate differential signals in MHz range, are TRS connectors suitable for my applications?** BII's test shows TRS connectors (Plug and Jack) of BII preamps can be used up to 20 MHz. Test Conditions: TRS Jack with 0.2m cable and TRS plug with 1m cable. Oscilloscope: 1MΩ | 20pF, Signal Source: DDS Signal Generator.

**Can 3.5mm (1/8") TRS be configured for single-ended signal of a hydrophone/transducer which does not have built-in preamplifier?** Yes, the preamp with differential-input TRS can accept single-ended signals from hydrophones/transducers whose TRS wiring should be like followings: **TRS Tip:** Signal. **TRS Ring and Sleeve:** Both terminals are soldered together for Signal Common and Shielding. Common and shielding should be "one-point" contact.

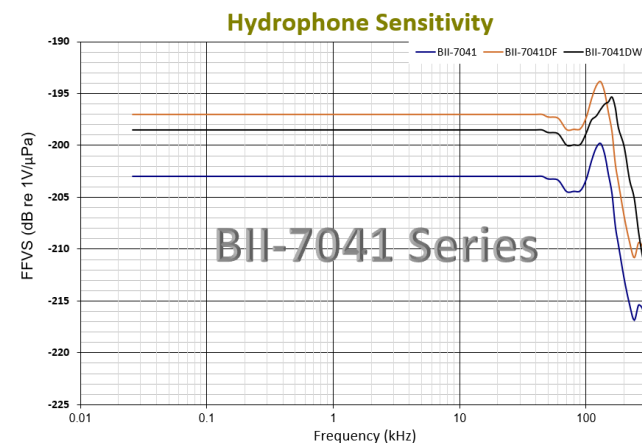
**Can BII explain why the capacitance of my hydrophone/transducer affect high pass filtering?** (1). Hydrophone/transducer is high impedance devices in low frequency range. Its simplified complex impedance =  $j/(2\pi f C_h)$ ,  $C_h$  is the capacitance of hydrophone/transducer,  $f$  is frequency in Hz. This impedance is in series with preamp  $R_i$  and can reach several MΩ to hundreds MΩ depending on  $C_h$  and  $f$ . (2). Most high-performance operational amplifiers (IC chips) can use input resistors  $R_i$  up to 1 to 200 MΩ to avoid bumping into saturation issue.

**Can BII explain more on Single-ended (SE) and Differential (DF) measurement?** (1). **SE hydrophone + coax + BNC/SMA/SMC** is compatible to most instruments such as oscilloscope, signal generators, and DAQ modules, etc.. Quick setup of SE measuring system and low cost with coax/BNC are the significant merits besides 50Ω matching in MHz range measurement. The shortcomings are weak rejection on common-mode noise and inductive coupling of EMI. (2). **DF hydrophone + Twisted-Pair Shielded Cable + WL/TRS/XLR/DIN** is compatible to most audio recording and analyzing instruments, etc.. Efficient rejection of common mode noises and inductive coupling noise of EMI are the significant merits, especially over the long cable. The shortcomings are higher costs on hydrophones, cables, and differential signal processing circuits such as differential preamp and differential DAQ modules.

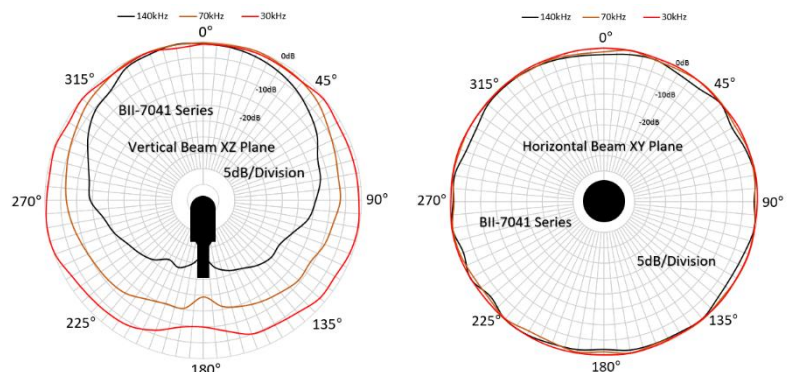
## Physical Size (Dimensional Unit: mm):



## Free-field Voltage Sensitivity (FFVS):



## Directivity Pattern:



## Simple Array Consisting of Hydrophones.

"Figure 8" Pattern of a Dipole (Pressure-Gradient).

Cardioid Pattern

Linear Array with BII Discrete Hydrophones

