

## Ultrasonic Air Transducer

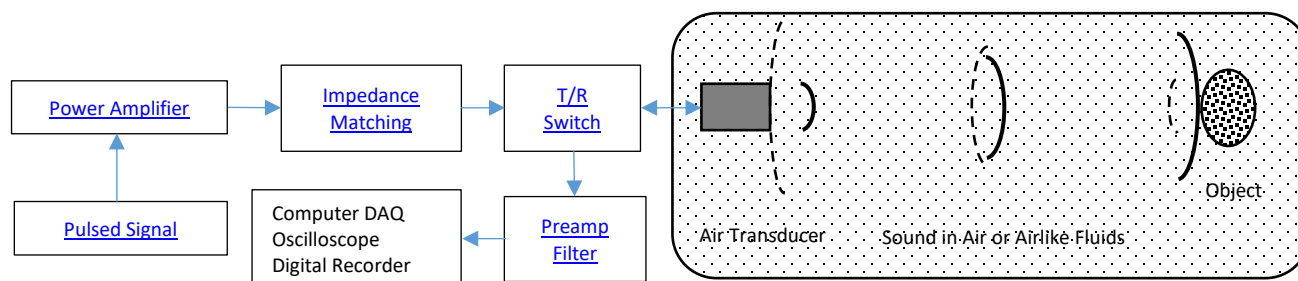
BII7900 series air transducers featuring low to medium  $Q_m$  in air are for air-coupled NDT (Non-destructive Testing), navigation, ranging, measurement and control, and characterization of airlike fluids (gases) and materials such as woods, plastics, rubber, foam, and composites. Water-proofed transducers to withstand 50m water depth is available.

| Typical Applications                                                      |     |     |     |     |     |                                                                                   |     |     |     |     |     |     |      |
|---------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|------|
| Measurands influence propagation time, phase, and attenuation.            |     |     |     |     |     | Measurands influence reflection, refraction, scattering and transmission.         |     |     |     |     |     |     |      |
| Robotics, Proximity Detection, Sound Ranging, Material Study              |     |     |     |     |     | Counting, Monitoring, Remote Control, Alarming, Motion Detection                  |     |     |     |     |     |     |      |
| Level Measurement, Speed Measurement, Leak Detection                      |     |     |     |     |     | Automatic Sizing, Sorting & Positioning of Parts, Ultrasonic Testing and Analysis |     |     |     |     |     |     |      |
| Edge Detection, Web Guiding System, Air-Coupled NDT                       |     |     |     |     |     | Surface/Profile Characterization and Quick Scanning for Quality Control           |     |     |     |     |     |     |      |
| Absorption of Sound in Air at 20°C (68°F), Relative Humidity: 10%, 1 atm. |     |     |     |     |     |                                                                                   |     |     |     |     |     |     |      |
| Frequency (kHz)                                                           | 30  | 40  | 50  | 70  | 100 | 120                                                                               | 150 | 200 | 250 | 300 | 400 | 500 | 1000 |
| Absorption (dB/m)                                                         | 0.3 | 0.4 | 0.5 | 0.7 | 1.8 | 2.5                                                                               | 4.0 | 6.5 | 10  | 16  | 28  | 43  | 200  |

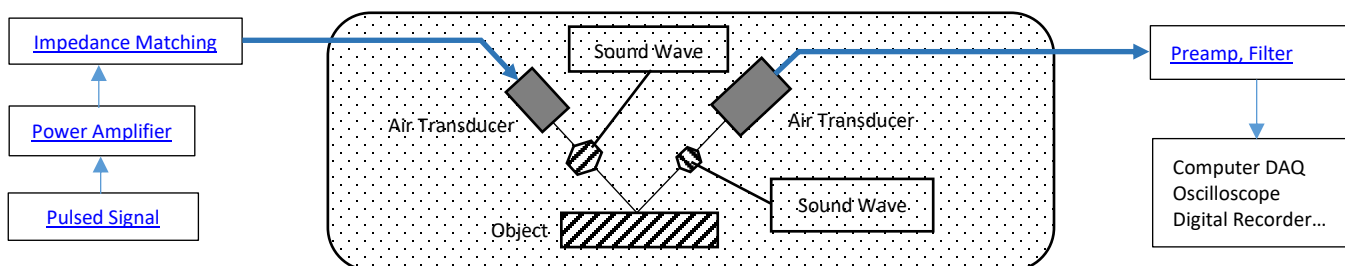
### RELATED PRODUCTS

|                                                          |                                                                       |                                                                    |
|----------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------|
| <a href="#">Power Amplifier</a> for SONAR, NDT, and HIFU | <a href="#">Impedance Matching</a> between Transducers and Amplifiers | <a href="#">Transmit and Receive Switch</a> with Preamp and Filter |
|----------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------|

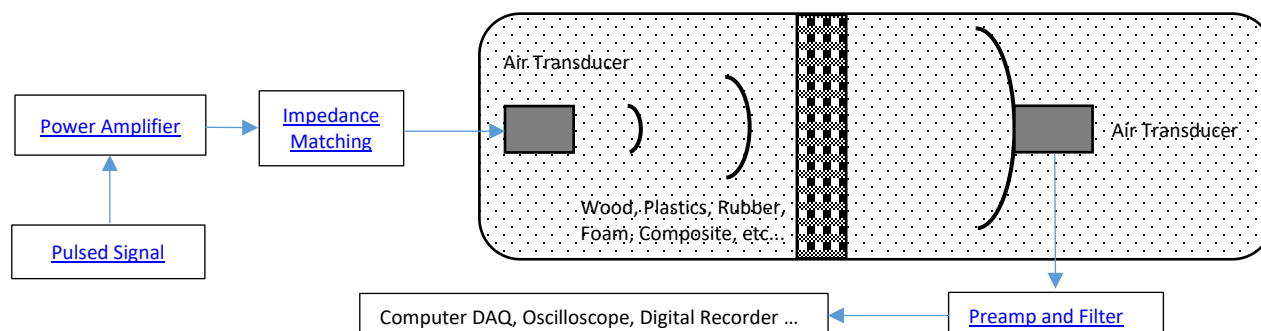
### Pulse-Echo System: SONAR in Air and Airlike Fluids



### Pulse-Reflection System in Air and Airlike Fluids



### Pulse-Transmission System: Information Transmission through Air, Airlike Fluids, and DUT (Device Under Test).



## Specifications

| Q: Lumped System Quality Factor, $\lambda$ : Wavelength, D: Aperture Diameter.                                                                                                                                                                                                                                                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       | Best Axial Resolution $\approx 0.95Q \cdot \lambda$ . |          |              | Near Field Length $N = D^2 / (4\lambda)$ .         |         |                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|-------|-------------------------------------------------------|----------|--------------|----------------------------------------------------|---------|----------------------|
| Rayleigh Distance $= \pi D^2 / (4\lambda)$ .                                                                                                                                                                                                                                                                                   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       | Fraunhofer Zone Distance $= 2.3D^2 / (4\lambda)$ .    |          |              | Angle of Divergence $= \sin^{-1}(1.22\lambda/D)$ . |         |                      |
| TVR (transmitting Voltage Response) unit: dB $\mu$ Pa/V@1m; FFVS (Free Field Voltage Sensitivity) unit: dB V/ $\mu$ Pa. BW: Beamwidth. SR: Sensing Range of echoes, a distance range along the acoustic axis of the transducer. fs: Series (Motional) Resonance Frequency where the maximum efficiency and greatest TVR exist. |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| MIPP: Maximum Input Pulse Power; MCIP: Maximum Continuous Input Power; MPW: Maximum Pulse Width; Gp: Conductance in Parallel.                                                                                                                                                                                                  |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| Air Transducer                                                                                                                                                                                                                                                                                                                 | fs (kHz) | D (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | BW (-3dB) | SR (m)       | TVR   | FFVS                                                  | MIPP (W) | MPW (Second) | MCIP (W)                                           | Gp (mS) | Size: mm $\Phi$ ODxH |
| BII7900H/500                                                                                                                                                                                                                                                                                                                   | 500      | $\Phi$ 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4.5°      | 0.16 to 1.0  | 126.5 | -195.0                                                | 65       | 0.6          | 0.2                                                | 0.870   | $\Phi$ 21x20         |
| BII7900H/400                                                                                                                                                                                                                                                                                                                   | 400      | $\Phi$ 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5.6°      | 0.13 to 1.0  | 127.2 | -193.0                                                | 70       | 0.8          | 0.2                                                | 0.620   | $\Phi$ 21x20         |
| BII7900H/300                                                                                                                                                                                                                                                                                                                   | 300      | $\Phi$ 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7.5°      | 0.10 to 1.0  | 129.0 | -190.5                                                | 80       | 1.0          | 0.2                                                | 0.280   | $\Phi$ 21x22         |
| BII7900H/250                                                                                                                                                                                                                                                                                                                   | 250      | $\Phi$ 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 9.0°      | 0.11 to 1.2  | 128.0 | -183.8                                                | 120      | 0.7          | 0.2                                                | 0.110   | $\Phi$ 21x25         |
| BII7900H/200                                                                                                                                                                                                                                                                                                                   | 200      | $\Phi$ 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 9.4°      | 0.10 to 1.5  | 126.9 | -182.5                                                | 290      | 0.8          | 0.2                                                | 0.071   | $\Phi$ 21x30         |
| BII7900Q/150                                                                                                                                                                                                                                                                                                                   | 150      | $\Phi$ 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 8.5°      | 0.15 to 2.0  | 128.0 | -181.3                                                | 780      | 0.58         | 0.28                                               | 0.300   | $\Phi$ 27x35         |
| BII7901/120                                                                                                                                                                                                                                                                                                                    | 120      | $\Phi$ 23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 8.3°      | 0.19 to 2.5  | 126.8 | -182.2                                                | 1200     | 0.684        | 0.36                                               | 0.603   | $\Phi$ 33x37         |
| BII7901Q/100                                                                                                                                                                                                                                                                                                                   | 100      | $\Phi$ 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7.3°      | 0.28 to 3.0  | 127.9 | -183.6                                                | 2400     | 0.770        | 0.50                                               | 0.711   | $\Phi$ 42x40         |
| BII7901H/70                                                                                                                                                                                                                                                                                                                    | 70       | $\Phi$ 37                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 8.8°      | 0.26 to 5.0  | 123.2 | -184.6                                                | 3700     | 0.950        | 0.56                                               | 0.392   | $\Phi$ 48x45         |
| BII7902/50                                                                                                                                                                                                                                                                                                                     | 50       | $\Phi$ 49                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 9.2°      | 0.31 to 10.0 | 121.6 | -187.5                                                | 7500     | 1.100        | 0.74                                               | 0.285   | $\Phi$ 60x55         |
| BII7903/40                                                                                                                                                                                                                                                                                                                     | 40       | $\Phi$ 74                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7.8°      | 0.55 to 13.0 | 118.5 | -182.7                                                | 18000    | 1.282        | 1.13                                               | 0.353   | $\Phi$ 89x60         |
| BII7904/30                                                                                                                                                                                                                                                                                                                     | 30       | $\Phi$ 99                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 7.8°      | 0.72 to 20.0 | 115.6 | -180.2                                                | 26000    | 2.046        | 1.50                                               | 0.291   | $\Phi$ 114x75        |
| 1. Reference standard of Decibel Scales is 1 $\mu$ Pa rms.                                                                                                                                                                                                                                                                     |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| 2. SR (Sensing Range) listed above is measured at BII laboratory with low noise T/R Switch, low noise 40/60dB gain preamp and stainless-steel plate at 17°C, 60% humidity and no air current. SR varies with field conditions such as humidity, temperature, air currents, target strength, etc...                             |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| 3. Transducer length listed above is water-proofed for with 50m depth underwater. The length of a bespoke transducer without waterproof is 15mm shorter.                                                                                                                                                                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| Loading Medium:                                                                                                                                                                                                                                                                                                                |          | The loading medium which the transducer is immersed in MUST be non-corrosive and/or non-flammable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |              |       |                                                       |          |              |                                                    |         |                      |
| Pulse Driving Signal:                                                                                                                                                                                                                                                                                                          |          | Voltage Spike (Negative or Positive), pulsed and burst SINE/Square/Chirp excitation, pulsed communication signals.<br>Warning: ONLY pulsed signals can be used to drive these transducers. Please determine the pulse width, duty cycle and input pulse power before putting the transducer in service. Otherwise, the transducer shall be damaged beyond repair.                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| How to determine pulse width, duty cycle and off-time with input pulse power (peak power) at fs:                                                                                                                                                                                                                               |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| 1. Determine the input pulse power (IPP, peak power) with sound intensity required by the project. IPP MUST be less than MIPP.                                                                                                                                                                                                 |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| 2. Pulse Width $\leq (MIPP * MPW * (120^\circ C - T) / 103^\circ C) / IPP$ , and Pulse Width $\leq 100$ mS, whichever is less. T: air and airlike fluids temperature in °C.                                                                                                                                                    |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| 3. Duty Cycle $D \leq MCIP * (120^\circ C - T) / 103^\circ C / IPP$ , and Duty Cycle $D \leq 1\%$ , whichever is less.                                                                                                                                                                                                         |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| 4. Off-time $\geq PW * (1 - D) / D$ .                                                                                                                                                                                                                                                                                          |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |           |              |       |                                                       |          |              |                                                    |         |                      |
| Bespoke Transducers:                                                                                                                                                                                                                                                                                                           |          | The -3dB beam width and operation frequency can be customized. Contact BII for details.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |              |       |                                                       |          |              |                                                    |         |                      |
| fs Tolerance:                                                                                                                                                                                                                                                                                                                  |          | $\pm 10\%$ Typical.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |              |       |                                                       |          |              |                                                    |         |                      |
| Third Harmonic:                                                                                                                                                                                                                                                                                                                |          | 2.8 fs $\sim$ 3.2 fs; Transducers can operate at 3 fs and an impedance matching network at 3 fs should be ordered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |           |              |       |                                                       |          |              |                                                    |         |                      |
| Quality Factor Qm:                                                                                                                                                                                                                                                                                                             |          | 3 to 8. Note: -3dB bandwidth $\Delta f = fs / Qm$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |              |       |                                                       |          |              |                                                    |         |                      |
| Aperture:                                                                                                                                                                                                                                                                                                                      |          | Circular Plane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |              |       |                                                       |          |              |                                                    |         |                      |
| Beam Pattern:                                                                                                                                                                                                                                                                                                                  |          | Conical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |              |       |                                                       |          |              |                                                    |         |                      |
| Side Lobes:                                                                                                                                                                                                                                                                                                                    |          | $\leq -20$ dB for one way, $\leq 40$ dB for two-way (pulse-echo).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| Radiation Sound Level:                                                                                                                                                                                                                                                                                                         |          | Radiation Sound Level SL = $20 * \log V_i + TVR$ , dB $\mu$ Pa@1m. Driving Voltage Vi is in unit of Vrms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |              |       |                                                       |          |              |                                                    |         |                      |
| Admittance (G and B):                                                                                                                                                                                                                                                                                                          |          | Listed in the datasheet of a specific transducer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| Driving Voltage Vi at fs:                                                                                                                                                                                                                                                                                                      |          | Maximum Vi, Vimax = $\sqrt{(MIPP / G_{max})}$ or 600, whichever is less, in Vrms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| Input Power Pi:                                                                                                                                                                                                                                                                                                                |          | $P_i = V_i^2 * G$ . G is conductance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |              |       |                                                       |          |              |                                                    |         |                      |
| FFVS at fs:                                                                                                                                                                                                                                                                                                                    |          | Refer to the table, in dB V/ $\mu$ Pa, Free-field Voltage Sensitivity.<br><br>$Sensitivity Loss over extension cable at fs (dB) = 20 * \log \{ (1 + 2\pi fs C_c / B) / \sqrt{[G^2 + (B + 2\pi fs C_c)^2] / (G^2 + B^2)} \}$<br>G: Conductance at fs; B: Susceptance at fs; Cc: Capacitance of Extension Cable. Cable is of 100 pF/meter roughly.                                                                                                                                                                                                                                                                                                                                                                     |           |              |       |                                                       |          |              |                                                    |         |                      |
| Receiving Sound Level:                                                                                                                                                                                                                                                                                                         |          | Receiving Sound Level SL = $20 * \log V_o - FFVS$ , dB $\mu$ Pa. Receiving Voltage Vo is in unit of Vrms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |           |              |       |                                                       |          |              |                                                    |         |                      |
| Free Capacitance:                                                                                                                                                                                                                                                                                                              |          | Listed in the datasheet of a specific transducer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| Dissipation:                                                                                                                                                                                                                                                                                                                   |          | Listed in the datasheet of a specific transducer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| Housing:                                                                                                                                                                                                                                                                                                                       |          | 1. <b>Plastics for -40°C to +75°C (-40°F to +167°F)</b> : resists attack by acids, alkalis, salt solutions and most other chemicals. There is no risk of corrosion when exposed to naturally corrosive conditions. They will not rust or corrode from electrochemical and galvanic environment. Solvents shall not be used with air transducers, such as hydrochloric acid, isopropyl alcohol, ethyl lactate, acetone, xylene, Iso hexanes, mineral spirits, etc...<br>2. <b>316 Stainless Steel for -40°C to 140°C (-40°F to 284°F)</b> .                                                                                                                                                                           |           |              |       |                                                       |          |              |                                                    |         |                      |
| EMI Shielding:                                                                                                                                                                                                                                                                                                                 |          | The active element is NOT shielded inside housing. When the transducer works as a sound receiver, its signal conditioning circuit should have high-pass or band-pass filters to reject EMI noise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |              |       |                                                       |          |              |                                                    |         |                      |
| Waterproof:                                                                                                                                                                                                                                                                                                                    |          | 1. Water-proofed for 50 m water depth for standard transducer of -40°C to +75°C (-40°F to +167°F).<br>2. No water-proofed for high temperature transducer -40°C to 140°C (-40°F to 284°F).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |           |              |       |                                                       |          |              |                                                    |         |                      |
| Mounting Options:                                                                                                                                                                                                                                                                                                              |          | 1. Default: Free Hanging (FH)<br>2. Thru-hole Mounting with Single O-ring (THM-M10, THM-7/16", or THM-5/8".)<br>3. Thru-hole Mounting with Double O-ring (THDO-7/16")<br>4. Bolt Fastening Mounting (Stainless Steel) (BFM-M6, BFM-7/16", or BFM-5/8".)<br>5. Bolt Fastening Mounting (Plastics) (BFMP-M12, or BFMP-NPT3/8".)<br>6. Bolt-Fastening Mounting with Free Hanging (BFM-FH-1/4", BFM-FH-3/8".)<br>7. Flange Mounting (FGM- $\Phi$ 220, FGM- $\Phi$ 190, FGM- $\Phi$ 165, FGM- $\Phi$ 140, or FGM- $\Phi$ 110.)<br>8. Flush Mounting (FSM-M10, FSM-M14, FSM-M35, FSM-M56.)<br>Please refer to online document <a href="#">AcousticSystem.pdf</a> for a complete list of Mounting Options and more details. |           |              |       |                                                       |          |              |                                                    |         |                      |

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| <b>Cable Options:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>1. Shielded Cable (<b>SC</b>), Rubber or PVC Jacket.<br/>SC with Two Conductors for transmit signal; SC with 4 conductors for receive signal.</li> <li>2. 50 <math>\Omega</math> RG58 Coax (<b>RG58</b>).</li> <li>3. 50 <math>\Omega</math> RG174/U Coax (<b>RG174</b>).</li> <li>4. 50 <math>\Omega</math> Coax RG316/U (<b>RG316</b>) (Operating Temperature Range: -50°C To +200°C or -58°F to 392°F).</li> <li>5. 50 <math>\Omega</math> RG178/U Coax (<b>RG178</b>) (Operating Temperature Range: -70°C To +200°C or -94°F to 392°F).</li> <li>6. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, <math>\Phi</math>D=3.2 mm (<b>SC32</b>), up to 200°C, AWG26 Conductors (Not Water-proofed, ONLY for Dry Air Use).</li> <li>7. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, <math>\Phi</math>D=4.0 mm (<b>SC40</b>), up to 200°C, AWG20 Conductors (Not Water-proofed, ONLY for Dry Air Use).</li> <li>8. Two Conductor Unshielded Cable (<b>USC</b>) for Underwater Connector 2 Pins or 3 Pins.</li> </ol> <p><b>Handling: Do not use the cable to support transducer weight in air if the transducer has a mounting part. Do not bend the cable.</b></p>                                                                                                                                                                                                                                                                  |
| <b>Cable Length:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ol style="list-style-type: none"> <li>1. Default: 1 m. 2. Custom.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Connector Options:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ol style="list-style-type: none"> <li>1. Default: Wire Leads (<b>WL</b>), for Transmit, Receive Signal, and DC Power Supply.</li> <li>3. MIL-5015 Style (3 pin) (<b>MIL3P</b>) (Max. Diameter <math>\Phi</math>19 to <math>\Phi</math>30 mm).</li> <li>MIL-5015 Style (4 pin) (<b>MIL4P</b>) (Max. Diameter <math>\Phi</math>19 to <math>\Phi</math>30 mm).</li> <li>4. XLR Receptacle with 3 Male Pins (<b>XLR3P</b>), (Max. Diameter <math>\Phi</math>20.2 mm), for SE or DF.</li> <li>XLR Receptacle with 4 Male Pins (<b>XLR4P</b>), (Max. Diameter <math>\Phi</math>20.2 mm), for SE or DF.</li> <li>5. DIN Receptacle with 3 Male Pins (<b>DIN3P</b>), (Max. Diameter <math>\Phi</math>17 mm), for SE or DF.</li> <li>DIN Receptacle with 4 Male Pins (<b>DIN4P</b>), (Max. Diameter <math>\Phi</math>17 mm), for SE or DF.</li> <li>6. Male BNC (<b>BNC</b>) (Max. Diameter <math>\Phi</math>14.3 mm), for Transmit or Receive Grounded Signal.<br/><b>BNC with RG178 Coax: Service Temperature up to 165°C or 329°F.</b></li> <li>7. 1/8" (3.5mm) TRS Plug (<b>TRS</b>) (Max. Diameter <math>\Phi</math>10.5 mm), for Receive Signal ONLY.</li> <li>8. +9VDC Battery Snap (<b>BS</b>), +9VDC or +18VDC power supply for Built-in T/R Switch Module.</li> <li>9. 4mm Banana Plug Pair (<b>Red</b> and <b>Black Color</b>) (<b>BP</b>), DC power supply for Built-in T/R Switch Module.</li> </ol> <p><b>Note: connectors and wire leads are for dry uses and are not waterproofed.</b></p> |
| <b>Size:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Listed in the datasheet of a specific air transducer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Weight:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $\geq 0.05$ kg with 1 m cable. Actual weight depends on Mounting Parts, Cable Types and Length.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Service Temperature:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ol style="list-style-type: none"> <li>1. Default: -40°C to +75°C (-40°F to +167°F).</li> <li>2. Bespoke: -40°C to 140°C (-40°F to 284°F) are available. Append <b>HT</b> to part number. Contact BII for details.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Storage Temperature:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -20 °C to +60 °C or -4 °F to 140 °F.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Power Amplifier:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>BII5000</b> Series Power Amplifier, Order Separately, or Third-party's power amplifiers such as 50 $\Omega$ RF power amplifiers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Impedance Matching:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>BII6000</b> Bespoke Impedance Matching between transducers and power amplifiers. Order Separately. Append <b>IM</b> to the part number for integrating BII6000 in the transducer, and specify impedance in $\Omega$ . For example, BIIxxxx-IM50 $\Omega$ : BIIxxxx transducer with built-in Impedance Matching unit as a 50 $\Omega$ load.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>T/R Switch:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>BII2100</b> Transmitting & Receiving Switching, Not Included, Order Separately as a standalone devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Temperature Sensor:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ol style="list-style-type: none"> <li>1. Default: No built-in temperature sensor.</li> <li>2. Built-in temperature sensor. Append <b>TS</b> to part number (BIIxxxxTS) for integrating a temperature sensor in the transducer.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p><b>WARNING: DANGER — HIGH VOLTAGE on wires. Wires shall be insulated for safety. DO NOT TOUCH THE WIRES BEFORE THE DRIVING SIGNAL IS SHUT DOWN. Cable shield must be grounded firmly for safety.</b></p> <p>for 50<math>\Omega</math> 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.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**How to Order BII790x and BII790x-IM50 $\Omega$ .** The default options are for stock items which are regularly available.

| <b>FH:</b> Free Hanging. <b>SC for Transmit:</b> Shielded Cable (Rubber Jacket, 600V) with 2 conductors. <b>Coax:</b> 50 $\Omega$ Coaxial Cable. <b>WL:</b> Wire Leads. |                          |                                                                                                                                                                             |                        |                                                                                                                  |                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <b>Underwater Mateable Connector UMC2P is fixed with 0.6m unshielded cable (USC).</b>                                                                                   |                          |                                                                                                                                                                             |                        |                                                                                                                  |                                                           |
| Part Number                                                                                                                                                             | -Appendage               | -Mounting                                                                                                                                                                   | -Cable Length          | -Cable Type                                                                                                      | -Connector for signals of Transmit and Temperature Sensor |
| BII790x<br>BII790x-IM50 $\Omega$                                                                                                                                        | Default:<br><b>None.</b> | Default:<br><b>FH, BFM-FH-1/4"</b> , or<br><b>BFM-FH-3/8"</b> .                                                                                                             | Default:<br><b>1m.</b> | <b>SC</b> for low frequency signal.<br><b>USC</b> for UMC2P Connector.<br><b>Coax</b> for high frequency signal. | Default: <b>WL.</b>                                       |
| <b>Example:</b>                                                                                                                                                         |                          | <b>Description</b>                                                                                                                                                          |                        |                                                                                                                  |                                                           |
| BII7901/120-FH-1m-SC-WL                                                                                                                                                 |                          | BII7901/120 Transducer, Free Hanging, 1m Shielded Cable, Wire Leads.                                                                                                        |                        |                                                                                                                  |                                                           |
| BII7901/120TS-FH-1m-RG178-BNC/BNC                                                                                                                                       |                          | BII7901/120 Transducer, Built-in Temperature Sensor, Free Hanging, 2x1m RG178 Coax, BNC for Transmit and BNC for Temperature Sensor.                                        |                        |                                                                                                                  |                                                           |
| BII7901/120-IM50 $\Omega$ -TS-FH-1m-RG178-BNC/BNC                                                                                                                       |                          | BII7901/120 Transducer, Impedance matching to be 50 $\Omega$ , Built-in Temperature Sensor, Free Hanging, 2x1m RG178 Coax, BNC for Transmit and BNC for Temperature Sensor. |                        |                                                                                                                  |                                                           |

**Wirings for Transducer and Temperature Sensor if any.**

| Wiring:                 | Two Conductor Shielded Cable | Coax/BNC/SMA/SMC | Underwater Connector | MIL-5015 Connector |
|-------------------------|------------------------------|------------------|----------------------|--------------------|
| Signal                  | White or Red                 | Center Contact   | Contact 2            | Contact C          |
| Signal Common           | Black                        | Shield           | Contact 1            | Contact B          |
| Shielding and Grounding | Shield                       | Shield           | Contact 3            | Contact A          |

**Maintenance and Operations of BII Air Transducers.**

|                            |                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cooling Transducer:</b> | Forced air cooling is NOT necessary. It is not needed but would be helpful to mount the transducer with good thermal conductive metals. |
| <b>Cleaning Surface:</b>   | The dust and moisture on transducer radiation face must be removed with soft cloth before driving the transducer.                       |

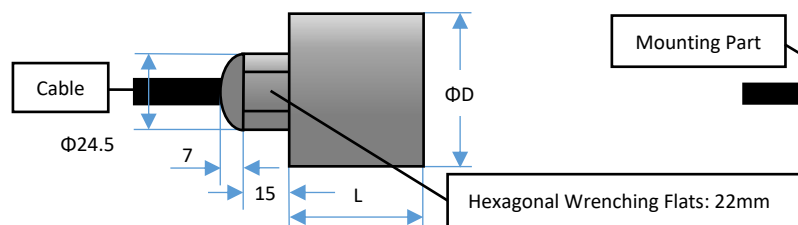
**Characteristics of Temperature Sensor: -40 °C to 250 °C NTC Temperature Sensor: Resistance Vs. Temperature**

| Temp. (°C) | Resistance (kΩ) | Temp. (°C) | Resistance (kΩ) | Temp. (°C) | Resistance (kΩ) | Temp. (°C) | Resistance (kΩ) |
|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| -40        | 204.7           | 35         | 6.944           | 110        | 0.7483          | 185        | 0.1439          |
| -35        | 154.4           | 40         | 5.830           | 115        | 0.6603          | 190        | 0.1313          |
| -30        | 117.6           | 45         | 4.918           | 120        | 0.5840          | 195        | 0.1202          |
| -25        | 90.44           | 50         | 4.166           | 125        | 0.5176          | 200        | 0.1103          |
| -20        | 70.15           | 55         | 3.545           | 130        | 0.4598          | 205        | 0.1015          |
| -15        | 54.87           | 60         | 3.028           | 135        | 0.4093          | 210        | 0.0937          |
| -10        | 43.27           | 65         | 2.596           | 140        | 0.3651          | 215        | 0.0868          |
| -5         | 34.39           | 70         | 2.234           | 145        | 0.3263          | 220        | 0.0807          |
| 0          | 27.53           | 75         | 1.929           | 150        | 0.2923          | 225        | 0.0754          |
| 5          | 22.2            | 80         | 1.671           | 155        | 0.2624          | 230        | 0.0706          |
| 10         | 18.02           | 85         | 1.451           | 160        | 0.2361          | 235        | 0.0665          |
| 15         | 14.72           | 90         | 1.265           | 165        | 0.2128          | 240        | 0.0628          |
| 20         | 12.10           | 95         | 1.105           | 170        | 0.1923          | 245        | 0.0597          |
| 25         | 10.00           | 100        | 0.9679          | 175        | 0.1742          | 250        | 0.0570          |
| 30         | 8.311           | 105        | 0.8500          | 180        | 0.1581          |            |                 |

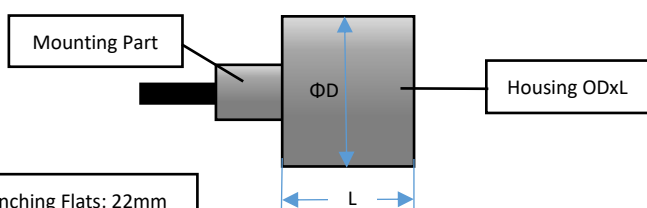
**Physical Size (Dimensional Unit: mm):** The overall length varies with the length of mounting parts. Please refer to online information of mounting options.

**1. Cable goes out of the device from the end face.**

**a. Size information of Free Hanging.**

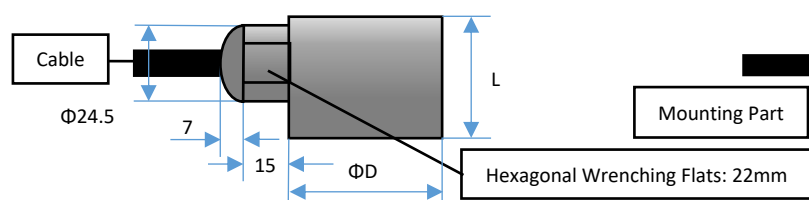


**b. General Size information.**



**2. Cable goes out of the device from the side wall.**

**a. Size information of Free Hanging.**



**b. General Size information.**

