### Preamplifier Datasheet

The BII-1020 series enables a two-pin (two-wire) piezoelectric sensor solution for detecting underwater sounds and NDT & AE ultrasounds. Two packages are available: PCB and water-proofed potted unit (300 m depth rating underwater).

#### Features
- Two-wire input, two-wire output
- Low power, wide range of power supply
- Custom gain, high pass, low cut-off frequency

#### Typical Applications
- Plug-in/Phantom/Line Powering Digital Recording
- Ultrasonic (NDT, AE) Preamplifiers
- Signal Transmission over Two-wire Cable, Coax and BNC

#### Specification

<table>
<thead>
<tr>
<th>Preamplifier</th>
<th>Power Supply</th>
<th>Supply Voltage</th>
<th>Quiescent Current</th>
<th>Gain</th>
<th>Maximum Input</th>
<th>Low Pass f-3dB (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BII-1021</td>
<td>Plug-in Power</td>
<td>+2.5 to +36VDC@R=330Ω</td>
<td>360μA</td>
<td>0dB (R=330Ω)</td>
<td>6.2dB (R=680Ω)</td>
<td>10dB (R=1.0kΩ)</td>
</tr>
<tr>
<td>BII-1022</td>
<td>Plug-in Power</td>
<td>+2.5 to +36VDC@R=220Ω</td>
<td>770μA</td>
<td>0dB (R=220Ω)</td>
<td>3.4dB (R=330Ω)</td>
<td>9.3dB (R=680Ω)</td>
</tr>
<tr>
<td>BII-1023</td>
<td>Phantom Power</td>
<td>+4VDC or P48</td>
<td>780μA</td>
<td>29.1dB (R=6.8kΩ)</td>
<td>2200/L@R=330Ω</td>
<td>1100/L@R=680Ω</td>
</tr>
<tr>
<td>BII-1024</td>
<td>Phantom Power</td>
<td>+4VDC or P48</td>
<td>380μA</td>
<td>25.7dB (R=6.8kΩ)</td>
<td>3500/L@R=220Ω</td>
<td>2500/L@R=330Ω</td>
</tr>
<tr>
<td>BII-1027</td>
<td>Voltage Amplifier</td>
<td>same to BII-1021</td>
<td>360μA</td>
<td>Same to BII-1021</td>
<td>360μA</td>
<td>Same to BII-1021</td>
</tr>
<tr>
<td>BII-1028</td>
<td>Voltage Amplifier</td>
<td>same to BII-1022</td>
<td>770μA</td>
<td>Same to BII-1022</td>
<td>770μA</td>
<td>Same to BII-1022</td>
</tr>
<tr>
<td>BII-1029</td>
<td>DC Power Supply</td>
<td>refer to BII-1021/2/3/4</td>
<td>N/A</td>
<td>refer to BII-1021/2/3/4</td>
<td>N/A</td>
<td>refer to BII-1021/2/3/4</td>
</tr>
</tbody>
</table>

- **Input Type:** Single Ended.
- **Input Impedance:** Default: 22 MΩ; Bespoke up to 1 GΩ.
- **Input Noise Voltage:** 5 nV/V at 1kHz.
- **Input Current Noise:**
  +9 VDC Supply: 1.8 fA/VHz at 25 °C; 8.9 fA/VHz at 85 °C.
  +12 VDC Supply: 2.4 fA/VHz at 25 °C; 9.8 fA/VHz at 85 °C.
  +18 VDC Supply: 8.9 fA/VHz at 25 °C; 11.6 fA/VHz at 85 °C.
- **High Pass Filter:** Default: 2 Hz; Bespoke, specify when ordering.
- **Low Pass Filter:** Default: refer to "Low Pass f-3dB (kHz)" in the table above. Bespoke, specify when ordering.
- **Output Type:** Single Ended.
- **Maximum Output:** Maximum Input * Gain.
- **Output Impedance:** 10 Ω.
- **Cable Load Drive:** Up to 100 m, Frequency Dependent, refer to "Low Pass f-3dB (kHz)" in the table above.

#### Suggested DC Supply:
- Plug-in, Phantom and Line Power supply of a digital recorder.
- +9VDC Battery, Marine Battery, Automobile Battery, Fixed DC Linear Power Supply, Not Included.
- DO NOT use variable power supply whose maximum supply voltage is higher than the above rated voltage.
- DO NOT use switching mode DC power supply.

- **Suggested Cable:** Coax and shielded cable. Not included.

<table>
<thead>
<tr>
<th>Package</th>
<th>Coated PCB with 5 cm wires and wire leads.</th>
<th>Potted Unit with Solder Pins, water-proofed, 300 m depth rating underwater.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating Temperature:</strong></td>
<td>-40 to 85 °C or -40 to 185 °F</td>
<td><strong>Storage Temperature:</strong></td>
</tr>
<tr>
<td><strong>Size:</strong></td>
<td>BII-1021, BII-1022</td>
<td><strong>Size:</strong></td>
</tr>
<tr>
<td><strong>Coated PCB:</strong></td>
<td>LxWxH: 16.5x8.9x5 mm for High Pass Filter ≥ 12Hz; 16.5x8.9x7.5 mm for High Pass Filter ≥ 2Hz; 16.5x8.9x12 mm for High Pass Filter ≥ 1Hz.</td>
<td><strong>Coated PCB:</strong></td>
</tr>
<tr>
<td><strong>Weight:</strong></td>
<td>1.5 gram (coated PCB)</td>
<td><strong>Weight:</strong></td>
</tr>
</tbody>
</table>

**Note:** Refer to Wiring.
Voltage Noise Density Referred to Input (RTI):

**BII-1020 Series**

How to Order BII-1021, BII-1022, BII-1023, BII-1024:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Preamplifier</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-3 dB High Pass Frequency, in kHz</td>
<td>PCB: Coated PCB; PU: Potted Unit (300 m Depth Rating).</td>
</tr>
</tbody>
</table>

**Example:**

- **Description:**
  - **BII-1021-2Hz-PCB:** BII-1021, -3 dB High Pass Filter: 2 Hz, Coated PCB.
  - **BII-1021-2Hz-PU:** BII-1021, -3 dB High Pass Filter: 2 Hz, Potted Unit (300 m Depth Rating).

How to Order BII-1027, BII-1028:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Gain</th>
<th>BPF</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in dB</td>
<td>-3 dB Band Pass Frequencies, in kHz</td>
<td>PCB: Coated PCB</td>
</tr>
</tbody>
</table>

**Example:**

- **Description:**
  - **BII-1027-20dB-10Hz/100kHz-PCB:** BII-1027, 20 dB Gain, -3 dB Band Pass Filter: 10 Hz to 100 kHz, Coated PCB.

Wiring with Coax or Shielded Cable.

- **Hydrophone, NDT, AE Sensor**
  - **BII-1021**
  - **BII-1022**
  - **BII-1023**
  - **BII-1024**

- **Piezo Element**

- **Cable L**
  - **Coupling Capacitor ≥ 10 μF**
  - Fed-through Resistor R
  - Output Signal to DAQ
  - DC Power Supply
  - Remote Powering

Wiring to Digital Recorder:

- **Hydrophone, NDT, AE**
  - **BII-1021**
  - **BII-1022**
  - **BII-1023**
  - **BII-1024**

- **Coax or Shielded Two-wire Cable with Audio Plug**

- **Digital Recorder With Plug-in/Phantom/Line Powering**

Wiring to Remote Power Supply:

- **Hydrophone, NDT, AE**
  - **BII-1021**
  - **BII-1022**
  - **BII-1023**
  - **BII-1024**

- **Coax or Shielded Two-wire Cable**

- **BII-1029 Remote Power Supply**
Low Noise Low Power Hydrophone

BII-1027, BII-1028 Wiring

PCB Wiring

Remote Power Supply

Potted Unit (300 m Depth Rating):