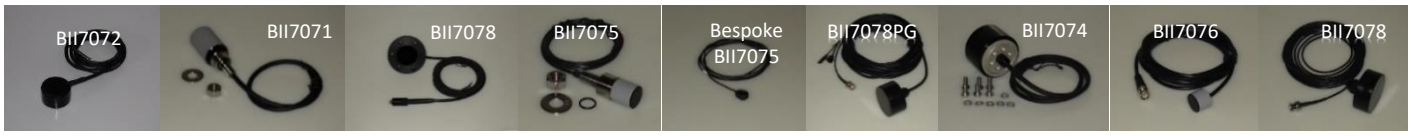


BII7079 Low Noise Hydrophone: Noise Level Below Sea State Zero

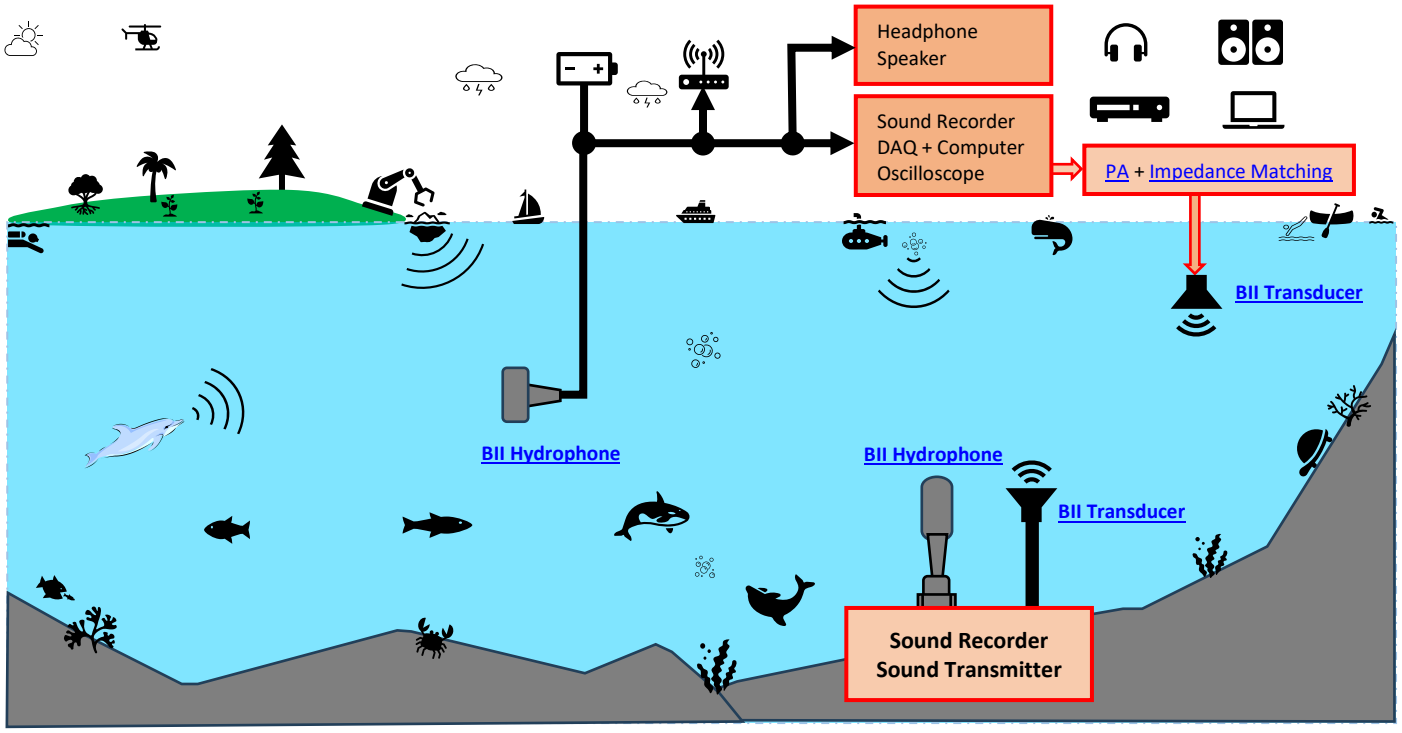
BII7079 Low noise directional hydrophones have conical beams for uses in detection of weak signals, broadband signals, pipeline leaks, and tracking of sound sources underwater. These acoustic sensors are also designed for applications in air to detect acoustic emission and stress waves. (Note: The couplant such as water or gel is a necessary material to provide efficient acoustic coupling between the hydrophone face and the piece under test in air applications.)

Below the critical frequency fc, the hydrophones are of single beam without side lobes. This feature makes the hydrophone be an ideal candidate for target angle estimation systems or sound source tracking systems. A spatial array of multiple hydrophones can be set up for directional noise-measurement system.

The hydrophones can measure underwater sounds and pressure fluctuations down to 1Hz: Surface Waves (Wave-height Sensor), Turbulences, seismic, ocean traffics, industrial noises, precipitations, biologics, ...

The preamplifier integrated in the hydrophone can drive cable up to 200m without signal loss. Available cable terminals include audio connectors (TRS, XLR), BNC, and underwater mateable connectors. The housing and mounting part are corrosion resistant plastics and/or stainless steels.

Underwater Sound Listening, Recording, and Communication



Typical Applications

Underwater Sounds Recording, Listening, and Communication, Noise Measurement, Marine Bioacoustics, Passive Acoustic Monitoring (PAM System).
Coastal/Offshore Processes, Engineering & Management, Wave-Structure Interaction, Wave-height Sensor, Wave and Tide Recorder/Logger.
Surface Waves, Ocean Turbulences, Hydrodynamics, Marine Geophysics, Battery-Powered Instruments: Sonobuoy, Recorder, Transponder, Acoustic Release...

Questions

How do I set up my professional sound recorders to work with BII Hydrophones?

1. BII hydrophones have their own DC power supply to support **Line Input** of recorders, and **Do NOT** use phantom power 48V which may destroy the hydrophones.
2. **Maximum Input Level (Line Input)** of recorders should be large enough to avoid saturation or clipping during recording.
   Equivalent Input Noise of recorders should be low enough for the recorders to be sensitive to weak signal of the interest.
3. **Sampling Rate** of the recorder should be fast enough to avoid missing high frequency sound of the interest. Generally, the **Sampling Rate** should be at least two times greater than the maximum frequency of sound.
4. Calculate the **memory size of data storage** according to sampling rate, resolution, sampling channels, and recording time, and use suitable recording media.
5. Calculate **battery service life** according to battery power and consuming current.
6. When the cable is greater than 5m, **balanced signal or differential signal** is recommended to be in use over the cable.

How do I playback the recorded sounds in water?

System Setup: Recorder (Recorded Sounds) with **Line or Phone Output** -> Audio Power Amplifiers -> Impedance Matching Device -> Transducers (Projectors).

Specification

Part Number:	BII7079FGDF	BII7079FGSE	BII7079PGDF	BII7079PGSE
Sensitivity FFVS @ 1 kHz:	(-184 + Preamp Gain) dB V/µPa. Variation: ± 2 dB.			
Free-field Voltage Sensitivity:	Bespoke, Refer to Graph of **FFVS vs. Frequency**.			
Pressure Noise Density:	Refer to Graph of **Pressure Noise Density**, Referred to Input (RTI), in µPa/√Hz**.**			
Usable Frequency in Water:	1 Hz ~ 70 kHz at ±3dB V/µPa.			
Usable Frequency in Air:	1 Hz ~ 3 kHz at -3dB V/µPa			
Bespoke Preamp Gain (dB):	Fixed Gain Preamp: 1. Default: 20 dB. 2. Customized: 10 to 60 dB available.		Programmable Gain Preamp: 1. Default: 20, 50 dB. 2. Bespoke combination of two gains from 10 to 60 dB.	
Gain Selection Voltage: (Programmable Gain Preamp)	N/A		CMOS/TTL Compatible Logic Low 0: Gain Selection Wire to COM or 0 to +0.8 VDC. Logic High 1: Gain Selection Wire Open or +2.4 VDC to V_s.	
Built-in Preamp:	Yes, Low Noise Preamp.			
Built-in Filter:	1. Default: -3dB Bandpass Pass Filter 1 Hz to 150 kHz. 2. Bespoke High Pass or Band Pass filter. Specify when ordering.			
	Both ocean ambient noises and the self-noises of electronic devices decrease when frequency increases. It is recommended to choose a built-in high pass filter to reject noises in low frequency range. For example, if you are interested in the signals greater than 200 Hz, you may specify a high pass filter with -3dB cut-off frequency at 100 Hz to improve signal to noise ratio of the signals of the interest.			
Receiving Face:	Circular Planar Face			
Directivity Pattern:	Conical Beam, Refer to **Graph of Directivity Pattern**.			
-3dB Beam Width:	1700°/f(kHz)			
Frequency f_{-3dBML}:	15 kHz, f_{-3dBML}: Main Lobe drops -3dB at ±90° normal to acoustic axis.			
Critical Frequency f_c:	36 kHz, f_c: Side lobes exist in the case of operating frequency f > fc; The hydrophone has no side lobe in the case of f ≤ fc.			
±90° Sidelobe Frequency f_n:	49 kHz, f_n: First Side Lobes exist at ±90° normal to acoustic axis in the case of operating frequency f = fn.			
Sidelobe Level:	1. Default: < -17.8 dB when f > fc; No side lobe when f ≤ fc. 2. Bespoke Sidelobe Suppression is available upon request: ≤-30 dB. Main lobe is about 1.1 to 1.28 times wider.			
Output Type:	Differential	Single Ended	Differential	Single Ended
	To reject Electromagnetic Interference (EMI) over long cable, the differential (balanced) output is recommended.			
Maximum Output V_{omax}:	V_{omax} = (Supply Voltage Vs - 4) Vpp.		(Supply Voltage Vs – 3.4) Vpp.	
Overload Pressure Level:	184 or [20*log(V_{omax}/2.828) – Sensitivity], whichever is less. in dB µPa.			
Acceleration Sensitivity:	152.7 dB µPa/(m/s²) along acoustic axis. Other direction: 142.5 dB µPa/(m/s²).			
Maximum Operating Depth:	50 m, limited by the cable length if the cable has wire leads or a non-waterproof connector.			
Mounting Options:	1. Default: Free Hanging (**FH**) 2. Free-hanging with Male Underwater Connector (**FHUWC**) 3. Thru-hole Mounting with Single O-ring (**THSO**) 4. Thru-hole Mounting with Double O-ring (**THDO**) 5. Bolt Fastening Mounting (Plastics) (**BFMP**) 6. Bolt Fastening Mounting (Stainless Steel) (**BFMSS**) 7. End Face Mount (O-ring Sealing) (**EFMS**) Please refer to online document AcousticSystem.pdf for a complete list of Mounting Options and more details.			
Cable Orientation:	1. Default: Perpendicular to end face of hydrophone. 2. Customization: Perpendicular to side wall of hydrophone (Generally, this is used to reduce the overall length of ydrophone), Appending **SW** to the part number.			
Cable:	Four Conductor Shielded Cable (SC)		Six Conductor Shielded Cable (SC)	
Cable Length:	1. Default: 10 m. 2. Custom-fit up to 200 m.			
Connector:	**SE**: Single ended Output, **DF**: Differential Output. 1. Default: Wire Leads (**WL**) 2. Male BNC (**BNC**) (Max. Diameter Φ14.3 mm), for SE ONLY. 3. SMA (Plug, Male Pin) (**SMA**), Voltage Rating: 335 V_{RMS} Continuous. (Max. Diameter Φ9.24 mm), for SE ONLY. 4. SMC (Plug, Female Socket) (**SMC**), Voltage Rating: 335 V_{RMS} Continuous. (SMC) (Max. Diameter Φ6.4 mm), for SE ONLY. 5. 1/8" (3.5mm) TRS Plug (**TRS**) (Max. Diameter Φ10.5 mm), for SE or DF. 6. XLR (pin) (**XLR**) (Max. Diameter Φ20.2 mm), for SE or DF. 7. MIL-5015 Style (pin) (**MIL**) (Max. Diameter Φ30 mm with 3 contacts), for SE or DF. 8. Underwater Mateable Connector (pin) (**UMC**) (Max. Diameter Φ21.5 to Φ35 mm), for SE or DF. 9. +9VDC Battery Snap (**BS**)			
	Gain Seletion Wires are of wire leads. Buyer may assemble connector to wires of **Gain Selection**.			
	Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.			
Current (Quiescent):	16 mA	13 mA	16 mA	12 mA
Supply Voltage Vs:	+7.5 to +32 VDC.			
Suggested DC Supply:	+9 VDC 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 rated voltage. DO NOT use switching mode DC power supply.			
Size:	Φ60 x 30 mm. Actual length depends on Mounting Parts.			
Weight:	≥ 0.8 kg with 10m cable. Actual weight depends on Mounting Parts, Cable Types and Length.			
Operation Temperature:	-10°C to +60°C or 14°F to 140°F.			
Storage Temperature:	-20°C to +60°C or -4°F to 140°F.			

AE (Acoustic Emission) Applications: These hydrophones are tested and calibrated in water. It is buyer's responsibility and liability to calibrate and maintain the AE sensors according to the acoustic emission national standards of buyer's country.
Sound Measurement in Air: The hydrophones can be used to detect sounds in air. The sensitivity in air is same to the one in water in low frequency range.

Wiring Information of Hydrophones with Fixed-gain Preamps:

Wiring of Single Ended Output:	**Wire Leads**	**BNC Male/SMA/SMC and 9V Battery Snap**	**Underwater Connector**	**XLR Plug and 9V Battery Snap**	**TRS Plug and 9V Battery Snap**
+VDC	Red	Female Snap	Pin 3	Battery Female Snap	Battery Female Snap
Common	Black	Male Snap	Pin 1	Battery Male Snap	Battery Male Snap
Signal	White	Center Pin or Contact	Pin 2	XLR Pin 2	TRS Tip
Signal Common	Blue, Green, or Yellow	BNC/SMA/SMC Shield	Pin 4	XLR Pin 1 and Pin 3	TRS Ring and Sleeve
Shielding	Shield	N/A	N/A	XLR Metal Shell	N/A
Wiring of Differential Output:	**Wire Leads**	**Underwater Connector**		**XLR + 9V Battery Snap**	**TRS + 9V Battery Snap**
+VDC	Red	Pin 3	Battery Female Snap		Battery Female Snap
Common	Black	Pin 1	Battery Male Snap		Battery Male Snap
Signal+	White	Pin 2	XLR Pin 2		TRS Tip
Signal-	Blue, Green or Yellow	Pin 4	XLR Pin 3		TRS Ring
Signal Common	N/A	N/A	XLR Pin 1		TRS Sleeve
Shielding	Shield	N/A	XLR Metal Shell		N/A

Wiring Information of Hydrophones with One-bit Programmable Gain Preamps:

Wiring of Differential Output:	**Wire Leads**	**Underwater Connector**	**XLR + 9V Battery Snap**	**TRS + 9V Battery Snap**
+VDC	Red	Pin 3	Battery Female Snap	Battery Female Snap
Common	Black	Pin 1	Battery Male Snap, XLR Pin 1.	Battery Male Snap, TRS Sleeve.
Digital Common	Yellow or Brown	Pin 5	Yellow or Brown	Yellow or Brown
Digital A0 (FFVS Selection)	Blue	Pin 6	Blue	Blue
Output Signal+	White	Pin 2	XLR Pin 2	TRS Tip
Output Signal -	Green	Pin 4	XLR Pin 3	TRS Ring
Shielding	Shield	N/A	XLR Metal Shell	N/A
Wiring of Single-Ended Output:	**Wire Leads**	**Underwater Connector**	**XLR + 9V Battery Snap**	**TRS + 9V Battery Snap**
+VDC	Red	Pin 3	Battery Female Snap	Battery Female Snap
Common	Black	Pin 1	Battery Male Snap, XLR Pin 1.	Battery Male Snap, TRS Sleeve.
Digital Common	Yellow or Brown	Pin 5	Yellow or Brown	Yellow or Brown
Digital A0 (FFVS Selection)	Blue	Pin 6	Blue	Blue
Output Signal	White	Pin 2	XLR Pin 2	TRS Tip
Output Signal Common	Green	Pin 4	XLR Pin 3	TRS Ring
Shielding	Shield	N/A	XLR Metal Shell	N/A
Selecting Sensitivity of One-bit Digitally Programmable				
FFVS Selection Wire A0	**Hydrophone Sensitivity FFVS at 1kHz.**			
0 (Logic Low)	-184 + 20 dB V/µPa			
1 (Logic High)	-184 + 50 dB V/µPa			

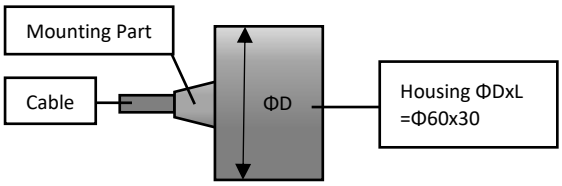
How to Order Hydrophones. FG: Fixed Gain; **PG:** Programmable Gain; **DF:** Differential Output; **SE:** Single Ended Output. **HPF**: High Pass Filter; **LPF**: Low Pass Filter.

Hydrophone	**-Gain**	**-HPF/LPF**	**-Mounting**	**-Cable Length**	**-Connectors for Signal/Gain/DC Supply**
BII7079FGDF BII7079FGSE BII7079PGDF BII7079PGSE	Preamp Gain in dB. Default: Fixed Gain: 26dB. Programmable Gain: 20, 50dB.	-3dB Filter Frequency, in kHz. Default: 1Hz to 150kHz.	Refer to Options. Default: Free Hanging.	in meter. Default: 10m.	Refer to Options. Default: Wire Leads.

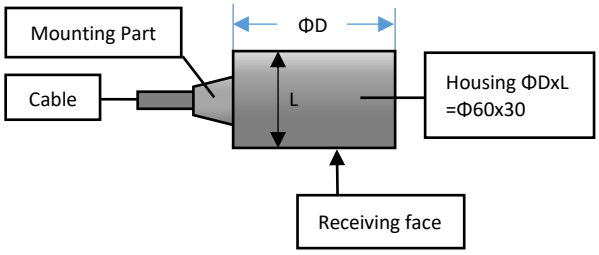
Example of Part Number:	Description
BII7079FGDF	BII7079FGDF Hydrophone with default options on Gain, Filter, Mounting, Cable Length and Connector.
BII7079FGSE-20Hz/60kHz-THSO-0.6m	BII7079FGSE Hydrophone with default Gains, Bespoke Bandpass Filter: 20Hz to 60kHz; Thru-hole Mounting with Single O-ring (THSO), 0.6m Shielded Cable, Default Wire Leads for signal and DC Supply.
BII7079FGDF-10Hz/100kHz-100m-XLR/BS	BII7079FGDF Hydrophone, Default Gain, Bespoke Bandpass Filter: 10Hz to 100kHz; Default Mounting, Bespoke 100m Shielded Cable, 3-pin XLR Plug for Signals, +9V Battery Snap for DC Supply.
BII7079PGDF	BII7079PGDF Hydrophone with default options on Gain, Filter, Mounting, Cable Length and Connector.
BII7079PGSE-30m-BNC/WL/WL	BII7079PGSE Hydrophone with default options on Gain, Filter, and Mounting, 30m shielded Cable, BNC Male for Signal, Wire Leads for Gain Selection, Wire Leads for DC supply.
BII7079PGDF-100m-XLR	BII7079PGDF Hydrophone, Default Gain, Filter, and Mounting, 100m Shielded Cable, 6-pin XLR Plug for Signal, Gain Selection, and DC supply.

Physical Size (Dimensional Unit: mm): The overall length varies with the length of the built-in preamplifier and mounting parts.

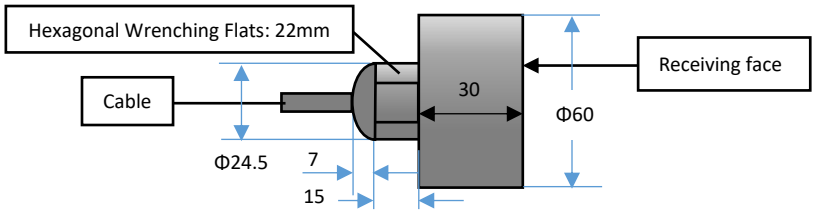
a. General Size information.



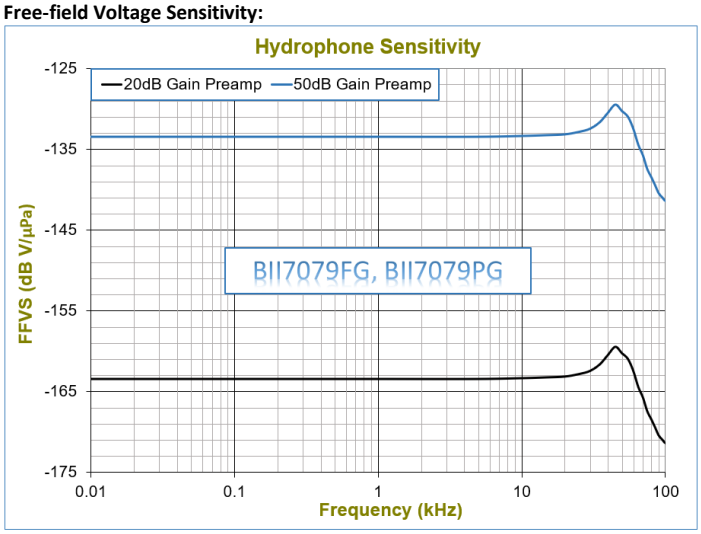
b. Size information of Customized Cable Orientation: Side Wall.



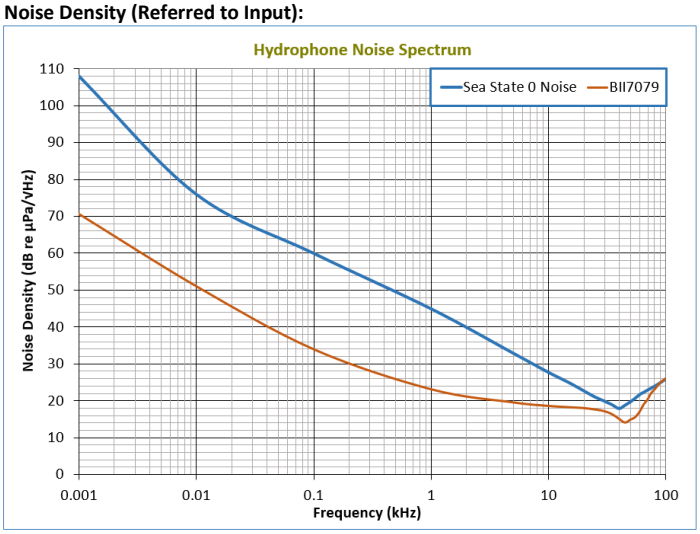
c. Size information of Free Hanging.



Free-field Voltage Sensitivity:



Noise Density (Referred to Input):



Directivity Pattern: