

# **BII7140 Series Acoustic Array Elements**

Acoustic Elements for underwater and ultrasonic (air) Arrays, Streamers, Beacons, and Positioning. These acoustic elements feature small size, low cost and easy integration, and are ready to be assembled in discrete arrays such as linear (broadside, end-fire, Mills Cross), planar and 3-D arrays to implement different acoustic applications. Depending on the operating frequency, these elements can be treated as Points, Lines or Rectangle Aperture in array signal processing. Beam steering, array focusing, bearing measurement, side-lobe suppression, and user-defined beam pattern (broad or narrow) can be achieved by complex weighting (Digital or FFT Beamforming) technique. Differential output and shielded twisted pair cable provide great EMI noise rejection over long cable. Multiple elements can be combined in series or parallel to make up an array distributing hundreds meters in field.

BII manufactures Omnidirectional (Toroidal) Beam Elements and Planar Array Elements for Linear and Planar Array.

### **Typical Applications:**

Oil-filled Streamer Element/Towed Array/Seabed Array	Acoustic Beacons: Pingers, Tags and Remote Tracking; Acoustic Positioning
Monitoring Seismic Sources/Airgun/Watergun/Seismology	Array Focusing and Beam Steering, Vector Hydrophone Element
Passive Acoustic Monitoring System (PAM System), Sonobuoy	Marine Seismic Detector/Exploration/Borehole Seismic

## Linear (Rectangular) Array Beam Steering





Linear, Annular, and Planar Array Beam Focusing

### **Underwater Arrays**





# Benthowaye Instrument Inc.

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**Underwater Sound Solutions** 

www.benthowave.com

# Specifications of Omnidirectional (Toroidal) Beam Directivity Elements

Acoustic Array Ele	ment		DU7442	1	1				
Amortura Siza (MD)		BII7141	BII/142	BII7143	BII7144	BII7145	BII7146	BII7147	BII7148
Aperture Size (ΦDxL, mm):		Ф9.5x8	Ф9.5x8	Ф9.5x8	Ф9.5x8	Ф9.5x8	Φ7.5x7	Ф6х5	Ф4x4
		-202±2	-201±2	-207±2	-205±2	-185±2	-185±2	-206±2	-210±2
ensitivity@1kHz: Sensitivity L			ss over Extensior	n Cable (dB) = 2	20*log[C <sub>h</sub> /(C <sub>h</sub> +C	<sub>c</sub> )]. C <sub>h</sub> : Hydrophor	e Capacitance; C	: Capacitance of	Extension Cable.
(dBV/μPa)		Shielded cable	e is of 100pF/met	er roughly.					
		For example,	sensitivity of a BI	I7143 with 100m cable ≈ -207.0 + 20*log (13.4nF/(13.4nF+10nF) = -211.84 dBV/μPa.			э.		
Sensitivity Matchin	ng:	Tolerance: a.	±2.0 (Default); b.	±1.0; c. ±0.5; d.	±0.3; e. ±0.1; i	n dB V/μPa.			
(at 1kHz)		1. Sensitivity i	is tested at 1kHz.	2. Hydrophones	s whose sensitiv	vity variations are	out of specified to	olerance are reje	cted.
In Water:			0.1Hz~1	120kHz		1Hz~140kHz	1Hz~180kHz	1Hz~230kHz	10Hz~350kHz
Usable In Air:		L	0.1Hz ~ 9kHz			1Hz ~ 9kHz	1Hz ~ 10kHz	1Hz ~ 12kHz	10Hz ~ 15kHz
Frequency	Minimum I	Jsable Frequen	cy depends on -3	dB high pass filt	$\operatorname{er} f_{\operatorname{-3dB}} = 1/(2\pi F)$	R <sub>i</sub> C <sub>h</sub> ).			
(±30B V/µPa)	Ri: Input Re	sistance or imp	edance of Pream	p. C <sub>h</sub> : Capacitan	ce of nydropho	ne at 1 KHZ.	converse of datas	tion - 0.06 Hz	
Canacitanco@1kH:		2 92pE	$\frac{1200}{1.5\text{p}}$			0.27nE		0.65pE	0.24pE
Capacitance@1kHz, ±10%:		0.011	1.5IIF	15.411	0.005	0.2711F	0.1211	0.005	0.005
Dissipation@1kHz:		33 1–10logf	31.0–10logf	33.0–10logf	35 3–10logf	24.0–10logf	27.6–10logf	31.4–10logf	34.4–10logf
		1 f in kHz: fs:	Resonance Frequ	iency which is c	lose to the free	uency of maximu	m FF\/S	51.4 10l0gi	54.4 1010gi
Noise Density at f <	<< fs:	2. Noise dens	ities in this datash	heet are calcula	ted values with	transducer paran	neters being meas	sured in water.	
dB µPa∕√Hz		3. As hydrop	hones works wit	h preamps or (	data acquisition	n modules, total	noise density is o	determined by al	l noise sources.
		Generally, the	e total noise dens	ity is much high	er than the one	es stated in this da	itasheet.		
Output Signal Type	e:	Diffe	erential	Single	-Ended	Single	Ended	Differential	
Sensing Element:			Shiel	ded		Unshi	ielded	Shielded	
Unshielded sensing	g elements p	ick up EMI nois	e if any in air and	shallow water.	Electronic filter	s are recommend	led in subsequent	signal processing	g circuit.
Acceleration Sensit	tivity:	400.0	100 6	115.2	120.2	400.4	102.4	111.0	115.0
(dB µPa/(m/s²)		109.2	109.6	115.2	129.2	108.4	103.4	111.0	115.0
Underwater Project	ctor:		No		Yes. Do NOT	drive projectors ir	ı air.	Ν	lo
Resonance fs: (±5%	%)		N/A		120kHz	100kHz	130kHz	N	/A
Quality factor Qm	at fs:		N/A		4.0	2.7	2.7	N	/A
Maximum Drive Vo	oltage:		N/A		300 Vrms.			N	/A
Maximum Pulse Width:		N/A 100 mS					N	/A	
Iviaxiiiiuiii Puise vv	lath:		,		Juty Cycle: N/A 10% at Maximum Drive Voltage. N/				
Maximum Duty Cy	vcle:		N/A		10% at Maxir 100% at 10.6	num Drive Voltage Vrms.	2.	N	/A
Maximum Pulse w Maximum Duty Cy TVR at fs (dB μPa/)	vcle: V@1m):		N/A N/A		10% at Maxir 100% at 10.6 134.6	num Drive Voltage Vrms. 137.0	e. 133.5	N	/A /A
Maximum Pulse w Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern:	vidin: vcle: V@1m):	Omnidirectio	N/A N/A nal in low frequen	icy range, Toroi	10% at Maxir 100% at 10.6 134.6 dal in high freq	num Drive Voltage Vrms. 137.0 uency range. Refe	e. 133.5 Ir to graph of <b>Bea</b> l	N N m Pattern.	/A //A
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation	natn: rcle: V@1m): : n:	Omnidirection > 500 MΩ at 9 1. Default:	N/A N/A nal in low frequen 500 VDC.	icy range, Toroi	10% at Maxir 100% at 10.6 134.6 dal in high freq	num Drive Voltage Vrms. 137.0 uency range. Refe	e. 133.5 Ir to graph of <b>Bea</b> i	N M Pattern.	/A /A
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins:	rdtn: rde: V@1m): : n:	Omnidirection > 500 MΩ at 5 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential	N/A N/A nal in low frequer 500 VDC. or Single Ended C or Single Ended C od Output: Coax R od Output: Coax R or Single Ended C or Single Ended C	Licy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Dutput: Three A Dutput: Solder J	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) WG26 Wires ( <i>A</i> Pins on Both En	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit	e. <u>133.5</u> r to graph of <b>Bea</b> r mm, TPU Jacket) (: (DD=3.6mm, PVC et by default or Te b gold finish (D1)	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon	request) ( <b>WR</b> )
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins:	rdtn: rcle: V@1m): : n:	Omnidirection > 500 MΩ at 5 1. Default: Differential Differential Single Ende 3. Differential 4. Differential	N/A N/A nal in low frequer 500 VDC. or Single Ended C or Single Ended C or Output: Coax R od Output: Coax R or Single Ended C or Single Ended C I or Single Ended C I or Single Ended C	Licy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Dutput: Three A Dutput: Solder I 2d; un to 100m	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>A</i> Pins on Both En	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6 Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit	e. <u>133.5</u> r to graph of <b>Bea</b> r mm, TPU Jacket) ( (ΦD=3.6mm, PVC et by default or Te h gold finish, Φ1x	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon (5 mm. (SP)	/A //A request) ( <b>WR</b> )
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins: Cable/Wire Length Electrical Leads:	natn: rcle: V@1m): : n: :	Omnidirection > 500 MΩ at 9 1. Default: Differential Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi	N/A N/A nal in low frequer 500 VDC. I or Single Ended C or Single Ended C d Output: Coax R d Output: Coax R d Output: Coax R l or Single Ended C 1 or Single Ended C LSm. 2. Customize ire Leads (WL). 2.	icy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Dutput: Solder I ad: up to 100m. Solder Pins ( <b>SP</b>	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) WG26 Wires ( <i>A</i> Pins on Both En	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit	e. 133.5 r to graph of <b>Bea</b> mm, TPU Jacket) (: (ΦD=3.6mm, PVC et by default or Te h gold finish, Φ1x	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon 5 mm. (SP)	/A //A request) ( <b>WR</b> )
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins: Cable/Wire Length Electrical Leads: Mounting Options:	natn: v@1m): : n: : n:	Omnidirection > 500 MΩ at 9 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging	N/A N/A nal in low frequer 500 VDC. l or Single Ended ( d Output: Coax R d Output: Coax R d Output: Coax R l or Single Ended ( I or Single Ended ( L5m. 2. Customize ire Leads (WL). 2. (FH)	icy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b>	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct: d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit (BNC).	e. 133.5 r to graph of <b>Bea</b> mm, TPU Jacket) (: (ΦD=3.6mm, PVC et by default or Te h gold finish, Φ1x	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon 5 mm. (SP)	/A //A request) (WR)
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins: Cable/Wire Length Electrical Leads: Mounting Options:	natn: v@1m): : n: : :	Omnidirection > 500 MΩ at 9 1. Default: Differential Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging 300 m	N/A N/A nal in low frequer 500 VDC. l or Single Ended ( d Output: Coax R d Output: Coax R d Output: Coax R l or Single Ended ( I or Single Ended ( I 5m. 2. Customize ire Leads (WL). 2. (FH) 500 m	icy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b>	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct: d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male (	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit (BNC).	e. 133.5 r to graph of <b>Bea</b> r mm, TPU Jacket) (: (ΦD=3.6mm, PVC et by default or Te h gold finish, Φ1x 950 m	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon 5 mm. (SP)	/A //A request) (WR)
Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins: Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth:	natn: v@1m): : n: : :	Omnidirection > 500 MΩ at 9 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging 300 m	N/A N/A nal in low frequer 500 VDC. I or Single Ended ( or Single Ended ( d Output: Coax R ed Output: Coax R d Output: Coax R I or Single Ended ( I or Single Ended ( I or Single Ended ( I or Single Ended ( I Single	icy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b> 300 m ne cable has wir	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct: d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male ( re leads or a no	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit (BNC).	e. 133.5 r to graph of <b>Bea</b> mm, TPU Jacket) (: (ΦD=3.6mm, PVC et by default or Te h gold finish, Φ1x 950 m nector.	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon 5 mm. (SP)	/A //A request) (WR)
Maximum Duty Cy Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins: Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth: Housing Size (Cable	rcle: V@1m): : n: : : e & Wire):	Omnidirection > 500 MΩ at 9 1. Default: Differential Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging 300 m Limited by the ΦD x Length	N/A N/A nal in low frequer 500 VDC. I or Single Ended ( or Single Ended ( d Output: Coax R ed Output: Coax R d Output: Coax R I or Single Ended ( I or Single Ended (	icy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b> 300 m ne cable has win	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male ( 	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit (BNC).	e. 133.5 r to graph of <b>Bea</b> mm, TPU Jacket) (: (ΦD=3.6mm, PVC et by default or Te h gold finish, Φ1x 950 m nector. Φ11x25	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon (5 mm. (SP)	/A //Α request) ( <b>WR</b> ) Φ7.5x16
Maximum Duty Cy Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth: Housing Size (Cable Overall Size (Solder	rcle: V@1m): : n: : e & Wire): r Pins):	Omnidirection > 500 MΩ at 9 1. Default: Differential Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging 300 m Limited by the ΦD x Length = ΦD x Length =	N/A N/A nal in low frequer 500 VDC. I or Single Ended ( or Single Ended ( d Output: Coax R ed Output: Coax R d Output: Coax R d Output: Coax R l or Single Ended ( I o	icy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b> 300 m ne cable has wir	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male ( 	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit BNC).	<ul> <li>133.5</li> <li>r to graph of Bear</li> <li>mm, TPU Jacket) (:</li> <li>(ΦD=3.6mm, PVC</li> <li>et by default or Te</li> <li>th gold finish, Φ1x</li> <li>950 m</li> <li>nector.</li> <li>Φ11x25</li> <li>Φ12.6 x 30</li> </ul>	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon (5 mm. (SP) 09.5x18	/A //Α request) ( <b>WR</b> ) Φ7.5x16 N/A
Maximum Duty Cy Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth: Housing Size (Cable Overall Size (Solde	rcle: V@1m): : n: : e & Wire): r Pins):	Omnidirection > 500 MΩ at 9 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging 300 m Limited by the ΦD x Length = 9 grams	N/A N/A nal in low frequer 500 VDC. I or Single Ended ( or Single Ended ( or Output: Coax R ed Output: Coax R or Single Ended ( I or Single Ended (	ncy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b> 300 m he cable has win	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male ( re leads or a no	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit (BNC).	<ul> <li>133.5</li> <li>r to graph of Bear</li> <li>mm, TPU Jacket) (:</li> <li>(ΦD=3.6mm, PVC</li> <li>et by default or Te</li> <li>th gold finish, Φ1x</li> <li>950 m</li> <li>nector.</li> <li>Φ11x25</li> <li>Φ12.6 x 30</li> <li>10 grams</li> </ul>	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon (5 mm. (SP) 09.5x18 N/A 7 grams	/A //Α request) ( <b>WR</b> ) Φ7.5x16 N/A 6 grams
Maximum Duty Cy Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wiring/Pins: Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth: Housing Size (Cable Overall Size (Solder Weight (in air):	rcle: V@1m): : n: : : e & Wire): r Pins):	Omnidirection > 500 MQ at 9 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: 0.1 1. Default: Wi Free Hanging 300 m Limited by the ØD x Length = 9 grams Actual weight	N/A N/A nal in low frequer 500 VDC. I or Single Ended ( or Single Ended ( or Single Ended ( or Single Ended ( l or Single Ended	ncy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Three A Output: Solder I ad: up to 100m. Solder Pins ( <b>SP</b> 300 m he cable has win he cable has win	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male ( re leads or a no	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ΦD=2.6 Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy wit BNC).	<ul> <li>133.5</li> <li>r to graph of Bear</li> <li>mm, TPU Jacket) (:</li> <li>(ΦD=3.6mm, PVC</li> <li>et by default or Te</li> <li>h gold finish, Φ1x</li> <li>950 m</li> <li>nector.</li> <li>Φ11x25</li> <li>Φ12.6 x 30</li> <li>10 grams</li> </ul>	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon 5 mm. (SP) D9.5x18 N/A 7 grams	/A //Α request) (WR) Φ7.5x16 N/A 6 grams
Maximum Duty Cy Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth: Housing Size (Cable Overall Size (Solder Weight (in air): Operation Temper	rdtn: rcle: V@1m): : n:	Omnidirection > 500 MΩ at ! 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: Wi Free Hanging 300 m Limited by the ΦD x Length = 9 grams Actual weight 1. Shielded Ca 2. AWG26 Wi 3. RG178 Coa	N/A N/A N/A nal in low frequer 500 VDC. I or Single Ended ( d Output: Coax R d Output: Coax R d Output: Coax R l or Single Ended ( I S00 m e cable length if ti = 012.6 x 25 mm = 012.6 x 30 mm depends on Cabl able and RG174 C res: -10°C to +105 x and Solder Pins:	ncy range, Toroi Dutput: Shielde Dutput: Shielde G174/U (ΦD=2. G178/U (ΦD=1 Output: Shielder G178/U (ΦD=1 Output: Solder I ad: up to 100m. Solder Pins (SP 300 m he cable has wir e Types and Ler oax: -10°C to +7 ;°C or 14°F to 22: -10°C to +120°	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conducto d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>I</i> Pins on Both En ). 3. BNC Male ( 	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (ФD=2.6r Conductor Cable ( AWG26, PVC Jacke ds: Brass alloy with BNC). n-waterproof con 158°F. 8°F.	2. 133.5 r to graph of <b>Bea</b> mm, TPU Jacket) ( (ΦD=3.6mm, PVC et by default or Te th gold finish, Φ1x 950 m nector. Φ11x25 Φ12.6 x 30 10 grams	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon (5 mm. (SP) 09.5x18 N/A 7 grams	/A //Α request) ( <b>WR</b> ) Φ7.5x16 N/A 6 grams
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Maximum Duty Cy Maximum Duty Cy TVR at fs (dB µPa/\ Directivity Pattern: Electrical Insulation Cable/Wire Length Electrical Leads: Mounting Options: Maximum Depth: Housing Size (Cable Overall Size (Solder Weight (in air): Operation Temper- Storage Temperatu Customization: Wiring of Differen Signal + Signal - Common & Shieldi Wiring of Single Er	rature: tial: ting mded:	Omnidirection > 500 MQ at 9 1. Default: Differential Single Ende 2. Single Ende 3. Differential 4. Differential 1. Default: 0.1 1. Default: 0.1 1. Default: Wi Free Hanging 300 m Limited by the $\Phi D x Length =$ 9 grams Actual weight 1. Shielded Ca 2. AWG26 Wi 3. RG178 Coa -20°C to +60°C Please contact <b>Two Conduct</b> White or Red Black Shield <b>Two Conduct</b>	N/A N/A nal in low frequer 500 VDC. I or Single Ended ( or Shielded Cable or Shielded Cable	Dutput: Shielde Dutput: Shielde Dutput: Shielde G174/U (ФD=2. G178/U (ФD=1 Output: Shielde G178/U (ФD=1 Output: Shielde G178/U (ФD=1 Output: Shielde G178/U (ФD=2 G178/U (ФD=2 G178/U (ФD=2 G178/U (ФD=2 G178/U (ФD=2 G178/U (ФD=2 G178/U (ФD=2 G178/U (ФD=2) G178/U (ФD=2)	10% at Maxir 100% at 10.6 134.6 dal in high freq d Two Conduct d <b>Twisted</b> Two .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG174</b> ) .8mm) ( <b>RG178</b> ) AWG26 Wires ( <i>P</i> Pins on Both En ). 3. BNC Male ( Pins on Both En ). 3.	num Drive Voltage Vrms. 137.0 uency range. Refe or Cable (DD=2.6r Conductor Cable ( AWG26, PVC Jacked ds: Brass alloy with BNC). n-waterproof con 158°F. 8°F. c acoustic project: So Pin Pin Pin Co	2. 133.5 r to graph of Bear mm, TPU Jacket) ( (ΦD=3.6mm, PVC et by default or Te th gold finish, Φ1x 950 m nector. Φ11x25 Φ12.6 x 30 10 grams s. Ider Pins n 1 n 3 n 2 wax with Wire Lear	N m Pattern. SC26) Jacket) (SC36) flon Jacket upon (5 mm. (SP) 09.5x18 N/A 7 grams ds Sold	/A /A request) (WR) Φ7.5x16 N/A 6 grams er Pins
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For 50Ω BNC Male connector, it is buyer's sole responsibility to make sure that the (female) BNC shield of the signal source is firmly grounded for operating safety before hooking up transducer/hydrophone to the signal source. Coax with BNC is not intended for hand-held use at voltages above 30Vac/60Vdc Sound Measurement in Air: The hydrophones can be used to detect sounds in air. Receiving sensitivity in air is same to the one in water in low frequency range.

## How to Order

Hydrophone	-Cable Length	-Cable	-Connector	-Sensitivity Matching Tolerance		
Part Number	in meter	Refer to Options	Refer to Options	Refer to Options. in dB V/ $\mu$ Pa, at 1kHz.		
Example of Part Number:	Description					
BII7141-0.15m-SC36-WL-2dB	BII7141 Hydrophone, 0.15m Shielded Twisted Cable ( $\Phi$ D=3.6mm), Wire Leads. Sensitivity Matching Tolerance: ±2.0 dB.					
BII7141-1m-AWG26-WL-1dB	BII7141 Hydrophone, 1m AWG26 Wires (Three 1m wires), Wire Leads. Sensitivity Matching Tolerance: ±1.0 dB.					
BII7143-50m-RG174-BNC-1dB	BII7143 Hydrophone, 50m RG174 Coax with BNC male. Sensitivity Matching Tolerance: ±1.0 dB.					

#### Physical Size (Dimensional Unit: mm):





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Specifications of Planar Array	Elements (Conical B	eam)					
Acoustic Planar Array Element	BII7149 BII7070 Series Planar Array Element						
Typical Applications:	Linear and Planar Array.						
Aperture Size:	Length x Width = 6.5 x 6.5 mm, Square Planar Aperture.						
	-205.5 + Sensitivity I	oss over the cable, dB V/μPa	. Variation: ± 2 dB.				
Sensitivity @ 1kHz:	Sensitivity Loss over	r Extension Cable (dB) = $20*10$	$Og[C_h/(C_h+C_c)].$	:			
. –	For example, sensitivity of a BII7149 with 1m cable $\approx$ -205.5 + 20*log (0.286nF/(0.286nF+0.1nF) = -208.1 dBV/µPa.						
	For example, sensiti	vity of a BII/149 with 1m cab	$le \approx -205.5 + 20*log(0)$	.286nF/(0.286nF+0.1nF) = -2	.08.1 dBV/μPa.		
Sensitivity Matching:	1. Sensitivity is tested at 1kHz. 2. Hydrophones whose sensitivity variations are out of specified tolerance are rejected.						
Ruilt in Proomalifian	1. Sensitivity is tested at 1kHz. 2. Hydrophones whose sensitivity variations are out of specified tolerance are rejected.						
Built-In Preamplifier:	No. Standalone prea	Implifier is available by separa	ate order to drive long	cable.			
	In water: 10 Hz ~ 5						
	In Air: $10 \text{ Hz} \sim 16 \text{ Km}$	1z, IN -30B V/μPa.			e vele vete		
Usable Frequency:	Minimum Llashla Fr	Usable frequency of an array is limited by geometry tolerance of installation comparing to sound wavelength.					
	B: Input Posistanco	equency depends on -30B mg	$G_{2}$ gripass filter 1-3dB = 1/(	ZIRich).			
	When a BII7149 and	of Impedance of Preamp. $C_h$ .	are used to detect sou	inds -2dP high pass froquen	$c_{\rm V}$ of dotaction = 2.81 Hz		
Canaditance C. @ 1kHz:	0 296 pE ±10%	a $\underline{\text{Bit preamp}}$ of $R_i = 200 \text{ M}_2^2$		inus, -sub nigh pass nequen			
Capacitance Ch @ IKHZ.	0.280 IF ±10%						
Dissipation @ 1kHz:	0.026						
	44.6 – 10*log f	and the second second second second					
Noise Density at f << fs:	1. T IN KHZ; TS: Reson	ance Frequency which is close	e to the frequency of r	maximum FFVS.	a d ta constant		
dB μPa/√Hz	2. Noise densities in	this datasheet are calculated	values with transduce	er parameters being measure	ed in water.		
	3. As hydrophones	works with preamps or data	acquisition modules,	total hoise density is deter	mined by all noise sources.		
Output Signal Type:	Single Ended	hoise density is much higher	than the ones stated in	i this udidsheet.			
Chielding of Consists Flowerty	Single Ended						
Shielding of Sensing Element:	Shielded	auia. Oth an dina atiana 141.0	at dD Da // /a?)				
Acceleration Sensitivity:	143.6 along acoustic	axis; Other direction: 141.0,	at dB μPa/(m/s <sup>-</sup> ).				
Underwater Projector:	Yes. Do NOT use pro	jectors in air to avoid damage	е.				
Resonance Frequency fs:	420 ± 5% kHz						
Quality factor Qm at fs:	3.5						
Maximum Drive Voltage:	1. Default: 300 Vrms	s. 2. Customized to 600 Vrms.					
Maximum Pulse Width:	100 mS						
Maximum Duty Cycle:	10% at Maximum Di	rive Voltage. 100% at 10.6 Vrr	ms.				
TVR at fs (dB μPa/V@1m):	≤ 150.0						
Directivity Pattern:	Conical Beam						
-3dB Beam Width:	9900°/f(kHz)						
Electrical Insulation:	> 500 MΩ at 500 VD	С.					
Mounting Options:	Free Hanging (FH)						
Operating Depth:	Maximum: 300 m or	3 MPa pressure and limited	by the cable length if t	he cable has wire leads or a	non-waterproof connector.		
Housing Size:	$\Phi D x Length = \Phi 12.$	6 x 20 mm					
Weight (in air):	10 grams, Actual we	ight depends on Cable Types	and Length.				
	1. Coax RG174/U (Φ	D=2.8mm) ( <b>RG174</b> ).					
	2. Coax RG178/U (ΦD=1.8mm) ( <b>RG178</b> ).						
Cable:	3. Two AWG26 Wire	s (AWG26, PVC Jacket by def	ault or Teflon Jacket u	pon request) ( <b>WR</b> ).			
	4. Shielded Twisted	Two Conductor Cable (ΦD=3.	.6mm, PVC Jacket) ( <b>SC</b>	36).			
	5. Shielded Two Con	ductor Cable (ΦD=2.6mm, TF	PU Jacket) ( <b>SC26</b> )				
Cable Length:	1. Default: 1 m. 2. C	ustomized: up to 20 m.					
	1. Default: Wire Lea	ds ( <b>WL)</b>					
	2. Male BNC ( <b>BNC</b> ) (	Max. Diameter Φ14.3 mm).					
	3. SMA (Plug, Male I	Pin) ( <b>SMA</b> ), Voltage Rating: 33	35 VRMS Continuous.	(Max. Diameter Φ9.24 mm).			
Connector:	4. SMC (Plug, Femal	e Socket) ( <b>SMC</b> ), Voltage Rati	ng: 335 VRMS Continu	ious. (SMC) (Max. Diameter (	Ф6.4 mm).		
	5. 1/8" (3.5mm) TRS	Plug (TRS35) (Max. Diameter	r Φ10.5 mm).				
	6. Underwater Mate	able Connector (pin) ( <b>UMC</b> ) (	Max. Diameter Ø21.5	to Φ35 mm).			
	Note: Underwater N	Nateable Connector is for use	es underwater. Other	connectors and wire leads a	are for dry uses and are not		
	waterproofed.						
	1. Shielded Cable an	d RG1/4 Coax: -10°C to +/0°C	_ or 14°F to 158°F.				
Operation Temperature:	2. AWG20 WIRES: -10 C t0 +100 C 01 14 F t0 221 F. 3. RG178 Coav: -10°C to +120°C or 14°F to 248°F						
	S. NOT76 CUax10 C (0 +120 C 0) 14 F (0 246 F. Note: Limited by connector service temperature if any						
	Note: Limited by cor	inector service temperature i	ir any.				
Storage Lemperature:	-20°C to +60°C or -4°F to 140°F.						
Customization:	Please contact BII to customize BII7140 series for your specific acoustic projects.						
Single Ended Output:	Wire Leads	Underwater Connector	BNC/SMA/SMC	Coax with Wire Leads	TRS Unbalanced mono		
Signal	White or Red	Pin 2	Center Contact	Coax Center Contact	Тір		
Signal Common	Black	Pin 1	Shield	Coax Shield	Ring & Sleeve		
Shielding	Shield	Pin 3	Shield	Coax Shield	Ring & Sleeve		
WARNING for Projector Applicat	tions: DANGER — HIGH	I VOLTAGE on wires. Wires s	hall be insulated for s	afety. DO NOT TOUCH THE \	WIRES BEFORE THE DRIVING		
SIGNAL IS SHUT DOWN. Cable sh	ield must be grounded	I firmly for safety.					
For $50\Omega$ BNC Male connector, it	is buyer's sole respons	ibility to make sure that the (	female) BNC shield of	the signal source is firmly gr	ounded for operating safety		
before hooking up transducer/h	, ydrophone to the signa	ll source. Coax with BNC is no	t intended for hand-h	eld use at voltages above 30	Vac/60Vdc.		
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Sound Measurement in Air: The hydrophones can be used to detect sounds in air. Receiving sensitivity in air is same to the one in water in low frequency range.

#### How to Order

Hydrophone	-Cable Length	-Cable	-Connector	-Sensitivity Matching Tolerance		
BII7149	in meter	Refer to Options	Refer to Options	Refer to Options. in dB V/µPa, at 1kHz.		
Example of Part Number:	Description					
BII7149-1m-RG174-BNC-2dB	BII7149 Hydrophone, 1m RG174/U Coax Cable, BNC Male, Sensitivity Matching Tolerance: ±2.0 dB.					
BII7149-1m-RG174-WL-1dB	BII7149 Hydrophone, 1m RG174/U Coax Cable, Wire Leads. Sensitivity Matching Tolerance: ±1.0 dB.					

## Physical Size (Dimensional Unit: mm):

The cylinder surface of the element can be used for clamps or jigs to position the element. To avoid damaging element surface:

1. The clamping force should be less than 5 N.

2. The surfaces of the clamps or jigs must be smooth and do not have any sharp and spike.



