

Spherical Sector Directivity Transducer

BII7760 series transducers are high power spherical sector beam transducers with a wide range of frequencies available (up to 2 MHz) to insonify and listen wide field of interest in water or liquids, or to insonify the R & D subject as ultrasonic sources.

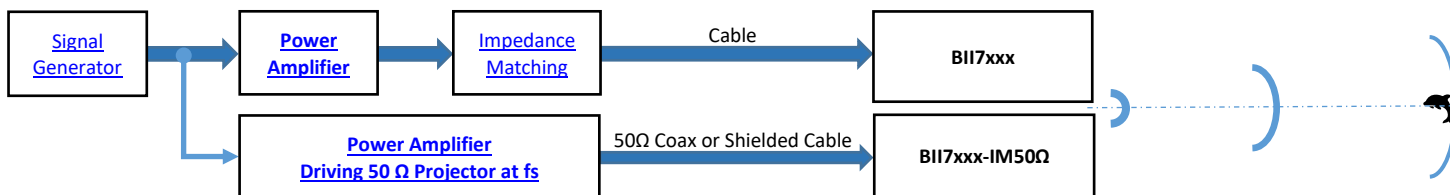


Typical Applications

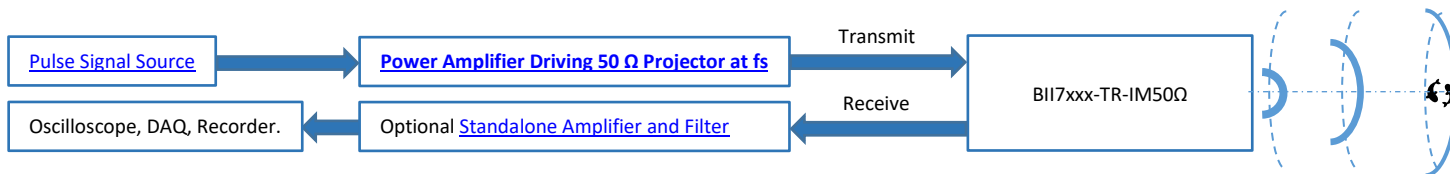
Wide Beam Ultrasonic Source Directional Underwater Communication Navigation/Obstacle Avoidance/Fishery Sonar Pinger/Locator/Transponder

SYSTEM CONFIGURATION (Simplified Flow Charts: Control Signals, DC Power Supplies, etc. are NOT shown.)

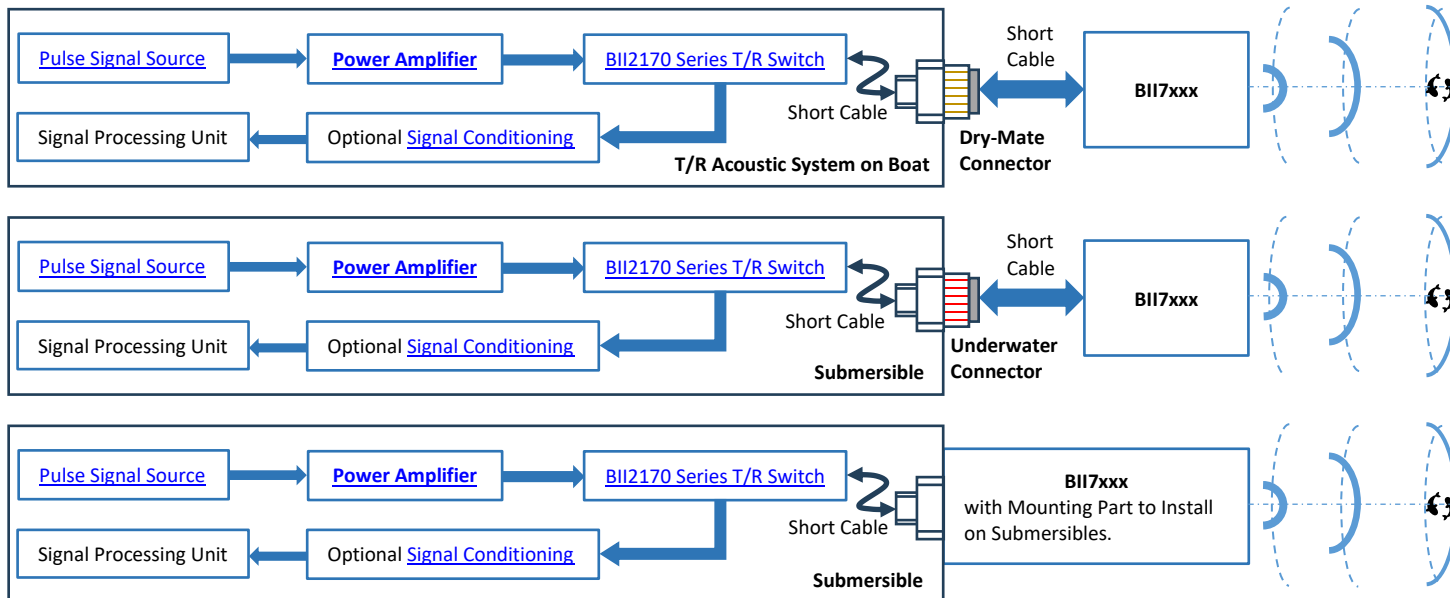
(a) Generation of Underwater or Ultrasonic Sounds with BII7xxx and BII7xxx-IM50Ω.



(b) Transmitting and Receiving Underwater or Ultrasonic Sounds with BII7xxx-TR-IM50Ω:



(c) Transmitting and Receiving Underwater Sounds with BII7xxx: **Cables ($\leq xx$ m, Cable C (100pF/m) $\leq 10\%$ Transducer Cf) between Transducers and T/R Switch.**



RELATED PRODUCTS

Power Amplifier for SONAR, NDT, and HIFU	Impedance Matching between Transducers and Amplifiers	Transmit and Receive Switch with Preamp and Filter
--	---	--

Specification

Transducers are tested in water at 20°C unless stated otherwise.							
FG: Fixed Gain; PG: Programmable Gain; DF: Differential Output; SE: Single Ended Output; BPF: Band Pass Filter; HPF: High Pass Filter; LPF: Low Pass Filter.							
f _s : Resonant Frequency; IM: Impedance Matching; η _{ea} : Electroacoustic Efficiency; PF: Power Factor; TVR: Transmitting Voltage Response; SL: Sound Level; FFVS: Free-field Voltage Response, Receiving Voltage Response (RVR), or Voltage Sensitivity; DRP: Directional Response Pattern; HxV: Horizontal x Vertical Beam Angles. SLL: Sidelobe Level; SRD: Sound Ranging Distance along Axis of Main Lobe; Z: Complex Impedance; Z : Impedance Amplitude; θ: Impedance Phase; Y: Admittance; G: Conductance of Admittance; B: Susceptance of Admittance; Q _m : Mechanical Quality Factor; Q _e : Electrical Quality Factor; MIPP: Maximum Input Pulse Power; MPW: Maximum Pulse Width at MIPP and at f _s ; MCIP: Maximum Continuous Input Power. TR: Transmit and Receive; TRSW: Transmit and Receive Switch with built-in low noise preamp and bandpass filter. BW: -3dB Bandwidth or Beamwidth; PND: Pressure Noise Density, LNR: Low Noise Receiver, SC: Signal Conditioning, OPL: Overload Pressure Level.							
Transducer:	BII7762/200		BII7762/400		BII7762/600	BII7760Q/1000	BII7760Q/2000
Applications:	Emit and Receive Sounds						
Pulse-echo System:	Half-duplex or Semiduplex						
Sound Ranging SRD:	Pulse-Echo or Echo Sounding Ranging: refer to Echosounding Ranging vs Target Strength in Ocean . Update in Process.						
Signal Type:	Pulsed SINE, Chirp, PSK, FSK, Pulsed Square Waveform, Continuous Wave, etc.						
Resonant Frequency f _s :	200 kHz		400 kHz		600 kHz	1 MHz	2 MHz
	1. In stock: 100, 120, 150, 200, 250, 300, 400, 500, 600 kHz, 1 MHz, 2 MHz.						
	2. Customized: 100 kHz to 2 MHz.						
Note: untuned transducers can operate at its 3 rd harmonics.							
Quality Factor:	High Q _m	Not Available			≥ 8		
	Low Q _m	≤ 4 to 5			≤ 4 to 5		
	Note	f _s > 500 kHz: Append LQ to Part Number for Low Q _m transducer. For example, BII7760Q/1000LQ is 1MHz transducer with Q _m ≤ 5.					
		f _s > 500 kHz: Append HQ to Part Number for High Q _m transducer. For example, BII7760Q/1000HQ is 1MHz transducer with Q _m ≥ 8.					
TVR @f _s μPa/V@1m	High Q _m	Not Available	Not Available	163.0 dB	165.0 dB	168.3 dB	
	Low Q _m	148.0 dB	151.0 dB	158.5 dB	160.0 dB	164.0 dB	
FFVS @f _s (V/μPa):		-196 dB	-199 dB	-202 dB	-212.5 dB	-216 dB	
Sensitivity Loss over Extension Cable (dB) = 20*log[C _h /(C _h +C _c)]. C _h : Hydrophone Capacitance; C _c : Capacitance of Extension Cable. Cable is of 100 pF/meter roughly. Valid for a transducer without preamplifier.							
-3dB Beamwidth at f _s :	60°	60°	40°	23°	27°		
Customized: up to 60°. Transducer size varies with -3dB Beamwidth, and maximum diameter: 0.25m.							
Main Lobe Fluctuation:	≤ ± 2 dB						
Directivity Pattern:	Spherical Sector						
Side Lobe Level:	≤ -20 dB						
Free Capacitance:	4.8 nF	6.3 nF	7.65 nF	2.0 nF	0.93 nF		
Dissipation:	0.008	0.008	0.005	0.005	0.003		
Admittance at f _s :	G=6.8mS, B=5.6mS.	G=9.0 mS, B=8.5 mS	G=10.1mS, B=15.2mS.	G=19.5mS, B=6.68mS.	G=26.0mS, B=7.0mS.		
Driving Voltage:	≤ 600 V _{rms}	≤ 600 V _{rms}	≤ 600 V _{rms}	≤ 500 V _{rms}	≤ 210 V _{rms}		
	Higher MIPP can be achieved with built-in impedance matching network which amplifies the driving voltage inside transducer.						
MIPP at f _s :	850 W	400W	960 W	470 W	450 W		
MPW at MIPP and f _s :	4 Seconds	3 Seconds	2.0 Seconds	0.62 Seconds	0.35 Seconds		
MCIP at f _s :	20 W	20 W	25 W	7.7 W	9.5 W		
MIPP: Maximum Input Pulse Power at f _s ; MPW: Maximum Pulse Width at MIPP and at f _s ; Maximum Continuous Input Power at f _s .							
How to determine pulse width, duty cycle and off-time with input pulse power (peak power) at f _s :							
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 ≤ (MIPP * MPW*(120°C-T)/103°C)/IPP. T: Water Temperature in °C.							
3. Duty Cycle D ≤ MCIP*(120°C-T)/103°C)/IPP.							
4. Off-time ≥ PW*(1-D)/D.							
Operating Depth:	≤ 100 m	≤ 100 m	≤ 50 m	≤ 50 m	≤ 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. Thru-hole Mounting with Single O-ring (THM-M10, THM-7/16", or THM-5/8".)						
	3. Thru-hole Mounting with Double O-ring (THDO-7/16")						
	4. Bolt Fastening Mounting (Stainless Steel) (BFM-M6, BFM-7/16", or BFM-5/8".)						
	5. Bolt Fastening Mounting (Plastics) (BFMP-M12, or BFMP-NPT3/8".)						
	6. Bolt-Fastening Mounting with Free Hanging (BFM-FH-1/4", BFM-FH-3/8".)						
	7. Free-hanging with Male Underwater Connector (FHUWC-2P, FHUWC-3P.)						
	8. End-face Mounting (EFMS or EFMM.)						
	9. Flange Mounting (FGM-Φ220, FGM-Φ190, FGM-Φ165, FGM-Φ140, or FGM-Φ110.)						
	10. Flush Mounting (FSM-M10, FSM-M14, FSM-M35, FSM-M56.)						
Please refer to online document AcousticSystem.pdf for a complete list of Mounting Options and more details.							
Cable Options:	Transmit Signals:						
	1. Shielded Cable (SC), Rubber Jacket. Two Conductors (AWG20, 600V, 4A.).						
	2. Unshielded Cable (USC), Rubber Jacket. Two Conductors (AWG18, 600V, 10A.).						
	3. 50 Ω RG58 Coax (RG58).						
	4. 50 Ω RG174/U Coax (RG174).						
	5. 50 Ω Coax RG316/U (RG316) (Operating Temperature Range: -50°C To +200°C or -58°F to 392°F).						

	6. 50 Ω RG178/U Coax (RG178) (Operating Temperature Range: -70°C To +200°C or -94°F to 392°F). 7. Shielded Cable, Twisted Pair, Teflon (PTFE) Jacket, ΦD=3.2 mm (SC32), up to 200°C, 600V, 0.8A, Not Water-proofed. 8. Shielded Cable, Twisted Pair, Teflon (PTFE) Jacket, ΦD=4.0 mm (SC40), up to 200°C, 600V, 4A, Not Water-proofed. Receive Signals: ONLY for BII7xxx-TR-IM50Ω. 1. Fixed FFVS: Shielded Cable (SC), Rubber or PVC Jacket. Four Conductors (AWG24 or AWG26/28). 2. Programmable FFVS: Shielded Cable (SC), Rubber or PVC Jacket. Six Conductors (AWG24 or AWG26/28), 3. Programmable FFVS: Cable Bundles (CB), Rubber or PVC Jacket. 4C SC (AWG24 or AWG26/28) + 2C SC (AWG24). 4. Programmable FFVS: Cable Bundles (CB), Rubber or PVC Jacket. 4C SC (AWG24 or AWG26/28) + RG58 or RG174 Coax. Handling: Do not use cable to support transducer weight in air; Always use mounting part if any; Do not bend the cable.				
Cable Length:	1. Default: 1 m. 2. Custom.				
Connector Options:	Transmit Signals: 1. Default: Wire Leads (WL). 2. (1). Underwater Mateable Connector (2 pins) (UMC2P) (1.1). Transducer Power ≥ 800 W rms: IL2M + Locking Sleeve: DLSA-M, Max. Diameter Φ35.5 mm. (1.2). Transducer Power < 800 W rms: MCIL2M + Locking Sleeve: MCDLS-F, Max. Diameter Φ22 mm. (2). Underwater Mateable Connector (3 pins) (UMC3P) (2.1). Transducer Power ≥ 800 W rms: IL3M + Locking Sleeve: DLSA-M, Max. Diameter Φ35.5 mm. (2.2). Transducer Power < 800 W rms: MCIL3M + Locking Sleeve: MCDLS-F, Max. Diameter Φ22 mm. Note: Underwater Mateable Connectors (UMC) is from well-known global manufacturers. Its part number is listed in quote in detail. 3. MIL-5015 Style (3 pin) (MIL3P) (Max. Diameter Φ19 to Φ30 mm). 4. XLR Receptacle with 3 Male Pins (XLR3P), (Max. Diameter Φ20.2 mm). 5. DIN Receptacle with 3 Male Pins (DIN3P), (Max. Diameter Φ17 mm). 6. Male BNC (BNC) (Max. Diameter Φ14.3 mm), for Transmit or Receive Grounded Signal. BNC with RG178 or RG316 Coax: Service Temperature up to 165°C or 329°F.				
	Receive Signals: ONLY for BII7xxx-TR-IM50Ω. Signal Connectors for Fixed FFVS: (1). Default: Wire Leads (WL). (2). Underwater Mateable Connector (4 pins) (UMC4P) (Max. Diameter Φ22 mm). Locking Sleeve: MCDLS-F. (3). XLR Receptacle with 4 Male Pins (XLR4P), (Max. Diameter Φ20.2 mm). (4). DIN Receptacle with 4 Male Pins (DIN4P), (Max. Diameter Φ17 mm). (5). XLR Receptacle with 3 Male Pins (XLR3P) for Signals, (Max. Diameter Φ20.2 mm). (6). DIN Receptacle with 3 Male Pins (DIN3P), (Max. Diameter Φ17 mm). (7). 1/8" (3.5mm) TRS Plug (TRS) (Max. Diameter Φ10.5 mm). Signal Connectors for Programmable FFVS: (1). Default: Wire Leads (WL). (2). Underwater Mateable Connector (6 pins) (UMC6P) (Max. Diameter Φ22 mm). Locking Sleeve: MCDLS-F. (3). XLR Receptacle with 6 Male Pins (XLR6P), (Max. Diameter Φ20.2 mm). (4). DIN Receptacle with 6 Male Pins (DIN6P), (Max. Diameter Φ17 mm). (5). XLR Receptacle with 3 Male Pins (XLR3P) for Signals, (Max. Diameter Φ20.2 mm). (6). DIN Receptacle with 3 Male Pins (DIN3P), (Max. Diameter Φ17 mm). (7). 1/8" (3.5mm) TRS Plug (TRS) (Max. Diameter Φ10.5 mm). Gain Selection (or FFVS Selection) Connectors for Programmable FFVS: (1). Default: Wire Leads (WL). (2). Male BNC (BNC). (3). DIN Receptacle with 3 Male Pins (DIN3P), (Max. Diameter Φ17 mm). Connectors for DC Power Supply: (1). None, Both DC Supply and Receiving Signal share one connector. (2). Wire Leads (WL). (3). +9VDC Battery Snap (BS). +9V or +18VDC Power Supply. (4). 4mm Banana Plug Pair (Red and Black Color) (BP).				
	Underwater Mateable Connectors are for underwater uses. Other connectors/wire leads are for dry aerial uses and are not waterproofed.				
	1. BNC: "Bayonet Neill–Concelman" is a miniature quick connect/disconnect radio/audio frequency connector used for coaxial cable. Fastening Type: Bayonet Lock. 2. XLR: Employed for balanced audio and DC or AC power signal interconnections, 3 to 7 contacts. Fastening Type: Latch Lock. 3. MIL: MIL-5015 Style Connectors, interconnection solution for high power signals. -55°C to +125°C, Fastening Type: Threaded. Dry Uses. 4. UMC: Underwater Mateable Connectors, interconnection solution for high power or weak signals. Fastening Type: Threaded. Underwater Uses. 5. DIN: Electrical cylindrical connectors, 3 to 14 contacts, Φ20mm diameter, used for audio, RF, digital, and DC or AC power signals. Fastening Type: Threaded. 6. 3.5mm (1/8") TRS stand for Tip, Ring, and Sleeve, miniature, quick connect/disconnect, audio frequency connector for shielded cable. Fastening Type: None.				
Size ΦDxH (mm):	Φ60 x 35	Φ60 x 35	Φ60 x 35	Φ27 x 35	Φ27 x 35
Weight:	1. Length L ≥ 35. Actual length depends on Mounting Parts. 2. Transducer size varies with customized -3dB Beamwidth.				
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.				
IM at f _s :	1. Default 50Ω Impedance Matching: -IM50Ω. BIIxxxx-IM50Ω: BIIxxxx transducer with built-in Impedance Matching Network as 50Ω load at f_s. For example, BII7760/200-IM50Ω: BII7760/200 transducer with built-in Impedance Matching Network as 50Ω load at f_s. 2. Bespoke BII6000 Impedance Matching between transducers and power amplifiers. Order Separately as standalone devices. Phase Angle θ of Complex Impedance ≤ 20° at f_s.				

TR Switch:	BII2100 Transmitting & Receiving Switch Module with Built-in Preamp and Bandpass Filter. Order Separately as standalone devices or append -TR to the part number for integrating BII2100 into the transducer. For example, BII760/200-TR: BII760/200 transducer with built-in T/R Switch Module.
Amplifier:	BII5000 Power Amplifiers for SONAR, NDT, HIFU. Order Separately as standalone devices.
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.	
for 50Ω BNC connector, it is buyer's sole responsibility to make sure that the 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.	

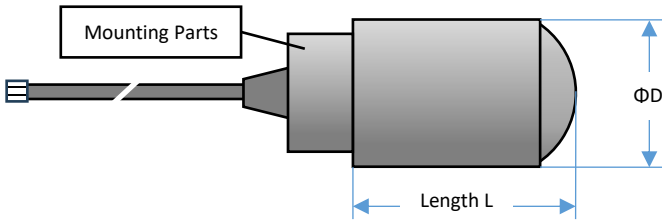
Transducer Wiring:

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

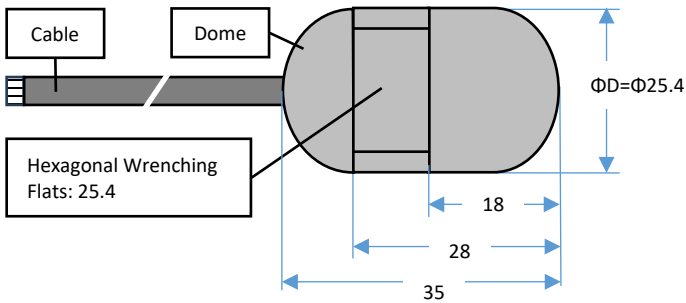
How to Order Customized Transducers. Ignore the parameter for default value or option if it is not needed for your application.

Part Number	/f _s	-IM50Ω	-BW	-Q _m	-Mounting	-Cable Length	-Cable	-Connector
Transducer	in kHz	Impedance Matching	-3dB Beamwidth	Default: LQ	Refer to specs.	in meter	Refer to specs.	
Example of Part Number:		Description						
BII7760/200kHz-40°-FH-10m-SC-WL		BII7760 transducer, 200kHz, -3dB Beamwidth: 40°, Free Hanging, 10m Shielded Cable, Wire Leads.						
BII7760Q/1000LQ-FH-10m-SC-WL		BII7760 transducer, 1000kHz, low Q _m , Free Hanging, 10m Shielded Cable, Wire Leads.						
BII7760Q/1000HQ-FH-10m-SC-WL		BII7760 transducer, 1000kHz, high Q _m , Free Hanging, 10m Shielded Cable, Wire Leads.						
BII7760IM50Ω/200kHz-40°-FH-10m-SC-WL		BII7760 transducer, built-in Impedance Matching unit as 50Ω load, 200kHz, -3dB Beamwidth: 40°, Free Hanging, 10m Shielded Cable, Wire Leads.						
BII7760TSIM50Ω/200kHz-40°-FH-10m-SC-WL		BII7760 transducer, built-in temperature Sensor, built-in Impedance Matching unit as 50Ω load, 200kHz, -3dB Beamwidth: 40°, Free Hanging, 10m Shielded Cable, Wire Leads.						

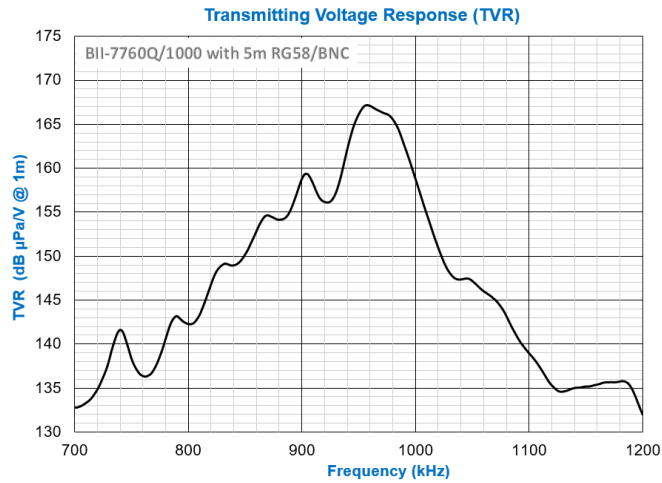
General Physical Size, Dimensional Unit: mm.



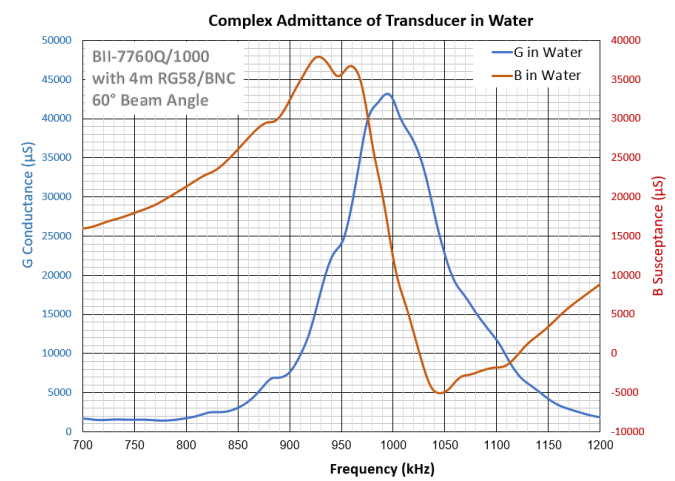
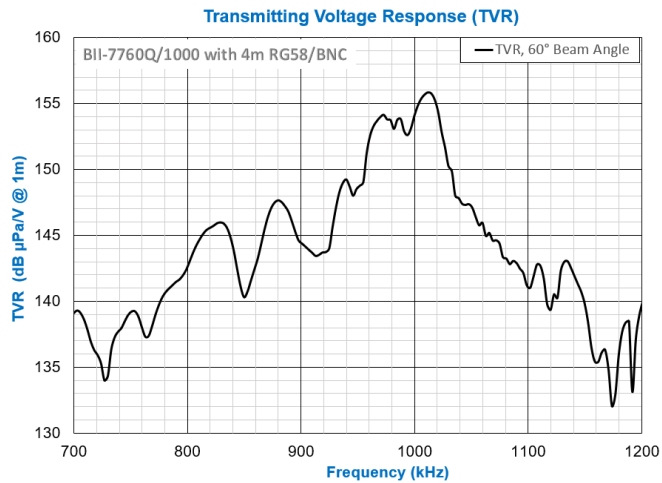
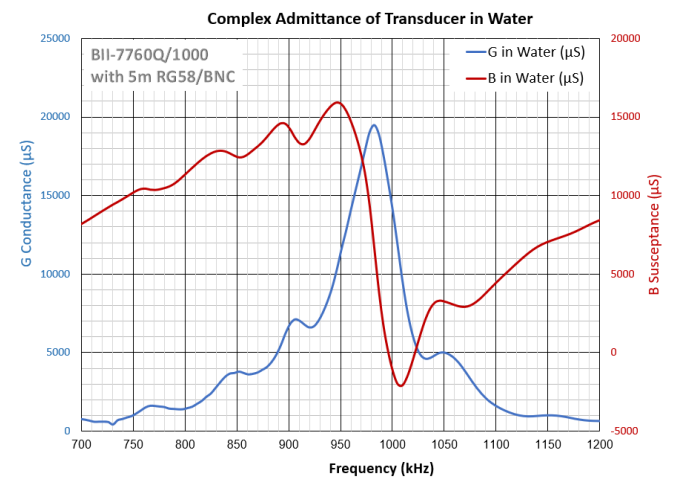
Physical Size of BII7760Q/1000 Free Hanging. Dimensional Unit: mm.



TVR (Customized High $Q_m \geq 8$)



Admittance: (Customized High $Q_m \geq 8$)



Directivity Pattern (Customized):

