BII7731 Series Broadband Transducer: Low Q_m, Single and Dual Beams.

BII's broadband (low Q_m) transducers are customized with conical beamwidth and operating frequency, and offer flexible, custom-fit solutions to wide bandwidth requirements of underwater and ultrasonic acoustic systems (SONAR, NDT, AE). The transducer consists of single disc element which provide single beam for transmitting and/or receiving.

When the transducer is used to detect acoustic emission (AE) and NDT ultrasonic waves, the couplant (water, gel, grease, oils and commercial couplant) is a necessary material to provide efficient acoustic coupling between the transducer face and the piece under test.

Custom-fit Applications	
Underwater Communication and Telephone	NDT, AE, Process Control, Diagnostics, Material Research, and Air Acoustics
Artificial Acoustic Target, Echo-Repeater Target, Active-Acoustic Target	Synthetic Aperture Imaging and Synthetic Aperture Sequential Imaging
High Resolution Sonar, Chirp/FM Sonar	Pinger/Locator/Transponder/Acoustic Positioning/Tracking
Direction-finding Sonar, Navigation, Obstacle Avoidance	Fishery Sonar, Bioacoustics, Marine Animal Behavior Research

Specification

Broadband Transducer	**BII7731**	**BII7731-IM50Ω**
Resonant Frequency f_s:	Available from 30 to 500 kHz, Custom-fit. In-stock elements: 30, 40, 50, 60, 70, 100, 120, 150, 200, 250, 300, 400, and 500 kHz, ± 2% to ± 10%.	
Transmitting Frequency:	f_s ± 20%*f_s	f_s ± 25%*f_s
	Minimum Transmitting Frequency: None.	Minimum Transmitting Frequency: TBD. To be determined.
Impedance Matching:	No.	Built-in, Impedance matching to 50Ω by default.
	TVR and FFVS variation of a transducer with built-in Impedance Matching Network: 1. When R_{IM} < 1/G, TVR increases, FFVS decreases. Generally, this is true for low frequency transducers. 2. When R_{IM} > 1/G, TVR decreases, FFVS increases. Generally, this is true for high frequency transducers. R_{IM}: Impedance-Matched Resistance such as 50 Ω. G: Transducer Conductance at Operating Frequency.	
Signal Type:	Spike (Negative or Positive), Pulsed SINE, Chirp, PSK, FSK, Pulsed Square Waveform, CW, etc.	
Aperture:	Disc	
Operation Modes:	Transmit and/or Receive Sounds.	
Directivity Pattern:	Conical Beam	
-3dB Beam Width θ_{-3dB}:	Custom-fit. λ: Sounds Wavelength in Load Medium.	
	Main Lobe θ_{-3dB} = 58.9*λ/D, in °. Disc Diameter: D.	
Side Lobe Level:	1. Default: ≤-17.8 dB when θ_{-3dB} < 49°; No side lobe when θ_{-3dB} ≥ 49°. 2. Customized side lobe suppression is available: ≤-30 dB. -3dB beamwidth of main lobe is about 1.1 to 1.28 times larger.	
Free Capacitance C_f:	TBD, to be determined.	N/A
Dissipation D:	TBD, to be determined.	N/A
Quality Factor Q_m at f_s:	Typical 3. Varies from 2.5 to 5.	Typical 3. Varies from 2 to 5.
	-3dB bandwidth $\Delta f = f_s/Q_m$. Qm determines the transient response or the rise and fall rings of steady-state response.	
$\eta_{ea\ at\ fs}$ at f_s:	0.3 to 0.8 in Water, Electroacoustic Efficiency, Load Medium Dependent.	
η_{ea} at f << f_s:	at f << fs, $\eta_{ea} / \eta_{ea\ at\ fs} \approx 0.1225*(k*\Phi D)^2$. Wave Number $k = 2\pi/\lambda$; ΦD = Transducer Diameter.	
	1. Electroacoustic Efficiency η_{ea} is quite low at f << f_s and drops gradually at f > f_s, so it is NOT recommended for transducers to emit high power sounds at frequencies far from f_s. Otherwise, transducer may be damaged by overheating. **2. Transducer can emit low power sounds at frequencies far from f_s. For example, input power $P_i \le \eta_{ea}$*MIPP at f ≤ 0.8*f_s and $P_i \le$ 0.2*MIPP at f ≥ 1.3*f_s.**	
Power Factor at f_s:	0.4 to 0.9.	≥ 0.94
TVR at f_s:	140 to 190 ± 2 dB µPa/V@1m. Transmitting Voltage Response.	140 to 190 ± 2 dB µPa/V@1m for BII7731-IM50Ω. 140 to 190 ± 2 dB µPa/V@1m for BII7731-IM8Ω. 140 to 190 ± 2 dB µPa/V@1m for BII7731-IM5Ω.
Radiation Sound Level SL:	SL = 20*logV_i + TVR, dB µPa@1m. Driving Voltage V_i is in unit of V_{rms}.	
Admittance or Impedance:	TBD, to be determined, or refer to **G-B Graph**.	1. Default: Z = 50*$e^{j\theta}$, in Ω, and Phase Angle |θ| ≤ 20° at fs. 2. Customization.
Driving Voltage V_i at f_s: (V_{imax}: Maximum V_i.)	**Pulsed Driving Signal and Duty Cycle D < 100%:** $V_{imax} = \sqrt{(MIPP/G_{max})}$ or **300 or 600**, whichever is less, in V_{rms}.	**Pulsed Driving Signal and Duty Cycle D < 100%:** $V_{imax} = \sqrt{(MIPP * \|Z\|)}$, in V_{rms}. Z is impedance at fs.
	Continuous Operation at 100% Duty Cycle: $V_{imax} = \sqrt{(MCIP/G_{max})}$, in V_{rms}.	**Continuous Operation at 100% Duty Cycle:** $V_{imax} = \sqrt{(MCIP * \|Z\|)}$, in V_{rms}.
	To achieve higher sound level, built-in impedance matching is recommended to step up driving voltage inside the transducer.	
Input Power P_i:	$P_i = V_i^2$ * G. Refer to **G-B Graph:** G is conductance.	$P_i = V_i^2$ / Z at f_s. Z is impedance at f_s.
MIPP at f_s:	Maximum Input Pulse Power at f_s: $P_i = V_i^2 * G_{max}$ or up to 5000 Watts, whichever is less. TBD, to be determined.	
MPW at MIPP and f_s:	Maximum Pulse Width at MIPP and at f_s. TBD, to be determined.	
MCIP at f_s:	Up to 200 Watts, Maximum Continuous Input Power at f_s. TBD, to be determined.	
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.		
FFVS at f_s:	-195.0 to -170.0, ± 2 dB V/µPa.	-195.0 to -170.0 ± 2 dB V/µPa for BII7731-IM50Ω.

	TBD, to be determined. Free-field Voltage Sensitivity.	-195.0 to -170.0 ± 2 dB V/µPa for BII7731-IM8Ω. -195.0 to -170.0 ± 2 dB V/µPa for BII7731-IM5Ω.
	$Sensitivity\ Loss\ over\ extension\ cable\ at\ f_s\ (dB) = 20 * \log\{(1 + 2\pi f_s C_c/B)/\sqrt{[G^2 + (B + 2\pi f_s C_c)^2]/(G^2 + B^2)}\}$ G: Conductance at f_s; B: Susceptance at f_s; C_c: Capacitance of Extension Cable. Cable is of 100 pF/meter roughly. Please refer to online document **AcousticSystem.pdf** for conversion between G-B and Z-θ, if necessary.	
Receiving Sound Level SL:	SL = 20*logV_o - FFVS, dB µPa. Receiving Voltage V_o is in unit of V_{rms}.	
Operating Depth:	Maximum, 300 m, or 3 MPa Pressure.	
	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 (**THSO**) 3. Thru-hole Mounting with Double O-ring (**THDO**) 4. Bolt Fastening Mounting (Stainless Steel) (**BFMSS**) 5. End-face Mounting (**EFM**) 6. Flange Mounting (**FGM**) 7. Flush Mounting (**FSM**)	
	Please refer to online document **AcousticSystem.pdf** for a complete list of Mounting Options and more details.	
Cable Options:	1. Two Conductor Shielded Cable (**SC**), Rubber or PVC Jacket. SC with Two Conductors for transmit signal; SC with 4 conductors for receive signal. 2. 50 Ω RG58 Coax (**RG58**) 3. 50 Ω RG174/U Coax (**RG174**) 4. 50 Ω RG178/U Coax (RG178) (Operating Temperature Range: -70°C To +200°C) 5. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, ΦD=3.2 mm (**SC32**), up to 200°C, AWG26 Conductors (Not Water-proofed, ONLY for Dry Air Use). 6. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, ΦD=4.0 mm (**SC40**), up to 200°C, AWG20 Conductors (Not Water-proofed, ONLY for Dry Air Use). 7. Two Conductor Unshielded Cable (**USC**)	
	Handling: Do not use the cable to support transducer weight in air and water if the transducer has a mounting part. Do not bend the cable.	
Cable Length:	1. Default: 1 m. 2. Custom-fit.	
Connector Options:	1. Default: Wire Leads (**WL**), for Transmit, Receive Signal, and DC Power Supply. 2. Underwater Mateable Connector (pin) (**UMC**) (Max. Diameter Φ21.5 to Φ35 mm), for Transmit or Receive Signal. 3. MIL-5015 Style (pin) (**MIL**) (Max. Diameter Φ19 to Φ30 mm), for Transmit or Receive Signal. 4. XLR Plug (pin) (**XLR**). (Max. Diameter Φ20.2 mm), for Transmit or Receive Signal. 5. Male BNC (**BNC**) (Max. Diameter Φ14.3 mm), for Transmit or Receive Grounded Signal. **BNC with RG178 Coax**: Service Temperature up to 165°C or 329°F.
	6. 1/8" (3.5mm) TRS Plug (**TRS**) (Max. Diameter Φ10.5 mm), for Receive Signal ONLY. 7. +9VDC Battery Snap (**BS**), +9VDC or +18VDC power supply for Built-in T/R Switch Module. 8. 4mm Banana Plug Pair (Red and Black Color) (**BP**), DC power supply for Built-in T/R Switch Module.	
	Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.	
Physical Size:	Maximum Housing Diameter: ΦD ≤ 168 mm, Height: TBD, To be Determined.	
	Actual length depends on Mounting Parts and/or Add-on Parts such as -TR, -IM, -HT, etc.	
Weight in Air:	≥ 0.55 kg with 10 m cable.	
	Actual weight depends on Mounting Parts, Cable Types and Length, and/or Add-on Parts such as -TR, -IM, -HT, etc.	
Operation Temperature:	1. Default: -10 °C to +60 °C or 14 °F to 140 °F. 2. Bespoke High Temperature Transducer: -10 °C to 120 °C, or 14 °F to 248 °F. Append **-HT** to part number.	
Storage Temperature:	-20 °C to +60 °C or -4 °F to 140 °F.	
Impedance Matching at f_s:	BII6000 Bespoke Impedance Matching between transducers and power amplifiers. Order Separately as standalone devices or append **-IMxxΩ** to the part number for integrating BII6000 into the transducer and specify impedance in Ω at fs. For example, BIIxxxx-IM8Ω: BIIxxxx transducer with built-in Impedance Matching unit as 8Ω load at fs.	
	Phase Angle |θ| of Complex Impedance ≤ 20° at fs.	
TR Switch Module:	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, BIIxxxx-TR: BIIxxxx transducer with built-in T/R Switch Module.	
Temperature Sensor:	1. Default: No built-in temperature sensor. 2. Built-in temperature sensor. Append **-TS** to part number (BIIxxxx-TS) for integrating a temperature sensor in the transducer.	
Power Amplifier:	BII5000 Power Amplifiers for SONAR, NDT, HIFU. Order Separately as standalone devices.	
Potable Transmitter:	BII8030 series portable acoustic transmitters.	
Portable T/R System:	BII8080 series portable transmit and receive systems.	
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/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.		

Wiring Information of a Transducer without T/R Switch.

Transducer Wiring:	Shielded Cable	Coax, BNC.	Underwater Connector	MIL-5015 Connector	XLR Plug
Signal:	White or Red	Center Contact	Contact 2	Contact C	Pin 2
Signal Common:	Black	Shield	Contact 1	Contact B	Pin 3
Shielding and Grounding	Shield	Shield	Contact 3	Contact A	Pin 1

Wiring Information of Temperature Signal.

Temperature Sensor Wiring:	Shielded Cable	Coax, BNC, SMC, SMA	Underwater Connector	XLR Plug	TRS Plug
Signal:	White or Red	Center Contact	Contact 2	Pin 2	Tip
Signal Common:	Black	Shield	Contact 1	Pin 3	Ring
Shielding and Grounding	Shield	Shield	Contact 3	Pin 1	Sleeve

Order Custom-fit Transducers (Projectors) without T/R Switches. A specific option which is not necessary can be ignored.

FH: Free Hanging. **SC for Transmit**: Shielded Cable (Rubber Jacket, 600V) with 2 conductors. **Coax**: 50 Ω Coaxial Cable. **WL**: Wire Leads.

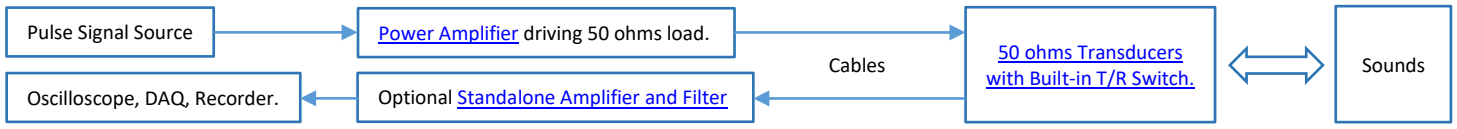
P/N	-fs	-Appendage	-BW	-SLL	-Mounting	-Cable Length	-Cable Type	-Connectors for Transmit Signal and Temperature Sensor
BII7731	Frequency, In kHz.	Default: **None**.	-3dB Conical Beam Width, in°.	Maximum Side Lobe Level, in dB	Default: **FH**.	Default: **10m**.	**SC or Coax**	Default: **WL**.

Example of Part Number:	Description
BII7731-30kHz/30°-BFMSS-1m-SC-UMC	BII7731 Transducer, fs: 30kHz; Conical Beam Angle: 30°; Bolt Fastening Mounting (Stainless Steel); 1m Shielded Cable; Underwater Mateable Connector.
BII7731-100kHz-IM50Ω-10°-30dB-BFMSS-30m-SC-WL	BII7731 Transducer, fs: 100kHz; Built-in Impedance Matching as 50Ω Load at fs; Conical Beam Angle: 10°; Side lobe Level: <-30dB; Bolt Fastening Mounting (Stainless Steel); 30m Shielded Cable; Wire Leads.
BII7731-70kHz-TS-IM50Ω-10°-FH-30m-SC-WL/TRS	BII7731 Transducer, fs: 70kHz; Built-in Temperature Sensor, Built-in Impedance Matching as 50Ω Load at fs; Conical Beam Widths: 10°; Free Hanging; 30m Shielded Cables, Wire Leads for Transmitting Signal, TRS for Temperature Sensor.

Specifications of Built-in T/R Switch for Sound Receiving with Transducer BII7731-TR or BII7731-TR-IMxxΩ.

Receiving Preamp and Filter:	Yes, Fixed Gain Preamp and Bandpass Filter are built inside transducer housing to receive sounds. 1. Avoid saturation caused by strong sounds levels in low frequency range. 2. Avoid signal loss over cable. 3. Avoid signal loss caused by impedance matching network which is built inside transducers.	
Receiving Gain:	1. Default: 40 dB 2. Bespoke: 0 dB to 60 dB.	1. Default: 40 dB 2. Bespoke: 20 to 60 dB.
-3dB Receiving Bandwidth:	1. Default: 2 to 450 kHz. 2. Customized with fs, specify when ordering.	1. Default: 10 kHz to 10 MHz. 2. Customized with fs, specify when ordering.
	Minimum -3dB cut-off frequency of high pass filter: 2 kHz.	
	Band Pass Filter: 1st order, 20/Decade Roll-off.	
Voltage Noise RTI e_n:	7.0 nV/√Hz at default gain.	1.0 nV/√Hz at default gain.
Current Noise RTI i_n:	0.56 fA/√Hz.	1.6 pA/√Hz.
Input Dynamic Range:	≥ 100 dB at 100 kHz Bandwidth.	
Output Signal Type:	Differential	Single-ended
Output Impedance:	10 Ω	50 Ω
Cable Drive Capability:	200 m	1000 m
Cable:	Four Conductor Shielded Cable	Four Conductor Shielded Cable or Two Coaxial cables. Cable type being used is determined by frequency range and cable length.
Connector:	Refer to Connector Options.	
Signal Conditioning:	Standalone Programmable Gain Amplifier and Filters to compensate the loss of sound propagation and spreading. Order separately.	
Power Supply of Receiving Circuit		
Supply Voltage V_s:	+8.5 to +32 VDC	+7.5 to +32 VDC
Current (Quiescent):	6.8 mA	8 mA
Suggested DC Supply:	+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.	
DC Supply Cable:	Two Conductor Shielded Cable if the cable of Receiving Signal is Coax.	
DC Supply Connector:	Refer to Connector Options.	

System Setup of Transmitting and Receiving Sounds.



Wiring Information of Transmitting Sounds of a Transducer with T/R Switch.

Transducer Wiring:	Shielded Cable	Coax, BNC.	Underwater Connector	MIL-5015 Connector	XLR Plug
Signal:	White or Red	Center Contact	Contact 2	Contact C	Pin 2
Signal Common:	Black	Shield	Contact 1	Contact B	Pin 3
Shielding and Grounding	Shield	Shield	Contact 3	Contact A	Pin 1
Please contact us for bespoke wirings of differential transducers such as dipole, quadrupole, multimode rings, and flextensional sources.					

Wiring Information of Receiving Sounds of a Transducer with T/R Switch.

Differential Output:	Wire Leads	Underwater/XLR 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
Single Ended Output:	**Wire Leads**	**BNC Male, 9V Battery Snap**	**Underwater/XLR 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 Shield	Pin 4	XLR Pin 1 and Pin 3	TRS Ring and Sleeve
Shielding	Shield	N/A	N/A	XLR Metal Shell	N/A
4mm Banana Plug Pair: Red Plug for +VDC, **Black Plug** for Common of the DC power supply.					

How to Order Transducers with T/R Switches. A specific option which is not necessary can be ignored.

FH: Free Hanging. **SC for Low Frequency Transmit**: Shielded Cable (Rubber Jacket, 600V) with 2 conductors. **Coax for High Frequency Transmit:** 50 Ω Coaxial Cable. **SC for Low Frequency Receive**: Shielded Cable with 4 conductors. **Coax for High Frequency Receive:** 50 Ω Coaxial Cable. **WL**: Wire Leads. **HPF**: -3dB High Pass Filter Frequency. **LPF**: -3dB Low Pass Filter Frequency. **Cable of Temperature sensor** is two-conductor shielded cable. **Cable of DC Supply** is two-conductor shielded cable in case that receive cable is coax.

Part Number	-fs	-Appendage	-BW	-Receive Gain	-HPF/LPF of Receiving	-Mounting	-Cable Length	-Cable Type	-**Connector** for signals of Transmit/Receive/DC Supply/Temperature
BII7731	Frequency, In kHz.	Default: **-TR-IM50Ω**	-3dB Conical Beam Width, in°.	Default: **40 dB**	-3dB bandpass Frequencies. **Minimum HPF: 2kHz.**	Default: **FH**.	Default: **10m.**	Default: **SC or Coax**	Default: **WL**.

Example:	Description
BII7731-30kHz-TR-IM50Ω-50°-40dB-2kHz/100kHz-BFMSS-30m-SC-MIL/XLR/BS	BII7731 Transducer, fs: 30kHz; Built-in T/R Switch; Built-in Impedance Matching as 50Ω load at fs; -3dB Conical Beam Width: 50°; Receive Gain: 40dB, Receive Bandpass Filter: 2kHz to 100kHz; Bolt-fastening Mounting (Stainless Steel); 30m Shielded Cable; MIL-5015 Connector for Transmit Signal, XLR for Receive Signal, 9V Battery Snap for DC Supply.
BII7731-50kHz-TS-TR-IM50Ω-10°-40dB-10kHz/100kHz-BFMSS-10m-SC-MIL/XLR/BS/TRS	BII7731 Transducer, fs: 50kHz, Built-in Temperature Sensor, Built-in T/R Switch, Built-in Impedance Matching Network as 50Ω load at fs, -3dB Conical Beam Width: 10°, Receive Gain: 40dB, Receive Bandpass Filter: 10kHz to 100kHz. Bolt-fastening Mounting (Stainless Steel), 10m Shielded Cable, MIL-5015 Connector for Transmit Signal, XLR for Receive Signal, 9V Battery Snap for DC Supply, TRS for Temperature Signal.
BII7731-500kHz-TR-IM50Ω-5°-40dB-0.1MHz/5MHz-FH-3m-RG58-BNC/BNC/BS	BII7731 Transducer, fs: 500kHz, Built-in T/R Switch, Built-in Impedance Matching Network as 50Ω load at fs, -3dB Conical Beam Width: 5°, Receive Gain: 40dB, Receive Bandpass Filter: 0.1MHz to 5MHz. Free Hanging, 3m RG58 Cable, BNC Male Connector for Transmit Signal, BNC Male for Receive Signal, 9V Battery Snap for DC Supply.

Question:

What if the mating connector of my DAQ module or recording device is NOT available from BII?

1. Buyer may order BII products with wire leads, and buyer assembles the mating connector to the cable end.
2. A connector adaptor might be assembled by BII by customization, and BII ships the adaptor to buyer as accessory of the device. Please contact BII for customizations.
3. Many adaptors for standard connectors are available in worldwide electronic suppliers such as BNC to SMA, BNC to SMC, XLR to TRS, etc. Check out your local suppliers.

What are the advantage and disadvantage of a built-in T/R Switch Module comparing to a standalone T/R Switch Module?

A built-in T/R Switch Module amplifies the received signal of the sensing element before the signal is polluted by EMI noises and system ground loop noises, and before it is attenuated by capacitance, inductance, and resistance of cables. But its price is a little bit higher than standalone T/R Switch Module.

Cable and Connector Information for High Power Signals (from Power Amplifier and to Transducers). Non-UL Uses.

	Wire and Cable Types	Ratings of Voltage, Current or Power, and Temperature.
Cable:	AWG18 Wires (**WR**)	3000 Vrms, 10 Arms.
	Two Conductor Shielded Cable (**SC**)	600 Vrms, 5 Arms.
	High Temperature Shielded Cable (**HTSC199**)	600 Vrms, 6 Arms, up to +199°C or 390 °F, Non-waterproof.
	Coax RG58 (50Ω) (**RG58**)	1400 Vrms, 4 Arms.
	Coax RG174/U (50Ω) (**RG174**)	1100 Vrms, 1.6 Arms.
	Coax RG178B/U (50Ω) (**RG178**).	750 Vrms, 0.86 Arms, up to +200°C or 390°F.
Connector:	**Connector Type**	**Ratings of Voltage, Current or Power, and Temperature.**
	1. Wire Leads (**WL**)	Used for Cables or Wires.

	2. 50Ω BNC (**BNC**), Bayonet Lock. Panel Mount or In-line. In-line BNC: Input uses Pin, output uses Socket. Panel Mount BNC: Both Input and Output use BNC Jacks.	500Vrms, 316W. -65°C to 165°C, or -53.9°F to 329°F. Used for Grounded Signal with Metal Enclosures or Coax Cables.
	3. MIL-5015 Type Connector (**MIL**), Thread Fastening. Panel Mount or In-line. Input uses Pin, output uses Socket.	500Vrms, 13 A; Up to +125°C or 257°F, or, 900Vrms, 13 A; Up to +125°C or 257°F. Used for Metal Enclosures or Shielded Cables.
	4. XLR Connector (**XLR**), Positive Latchlock. Panel Mount or In-line. Input uses Pin, output uses Socket.	133Vrms, 15 A; -25°C to +75°C or -13°F to +167°F. Used for Metal Enclosures or Shielded Cables.
	5. Underwater Mateable Connector (**UMC**), Thread Fastening. Panel Mount or In-line. Input uses Pin, output uses Socket.	600Vrms, 10A. Waterproof, IP68. Used for Metal Enclosures or Shielded Cables.
	~~6. SMA (Plug, Male Pin) (**SMA**). Thread Fastening. In-line.~~	~~Voltage Rating: 335 VRMS Continuous. (Max. Diameter Φ9.24 mm).~~ ~~Up to 155°C or 311°F.~~
	~~7. SMC (Plug, Female Socket) (**SMC**). Thread Fastening. In-line.~~	~~Voltage Rating: 335 VRMS Continuous. (Max. Diameter Φ6.4 mm).~~ ~~Up to 155°C or 311°F.~~
	~~8. LEMO (Plug Male Pins) (**LEMO**). Push-Pull Fastening.~~ ~~Panel Mount or In-line.~~	~~900 V (AC), 1270 V (DC), 8A, (Max. Diameter Φ9.5 mm with 3 contacts).~~ ~~Temp (min / max) -55°C / +250°C.~~

How to choose cable and connector for BII devices: Driving Voltage V_{drive} (V_{rms}) = $\sqrt{RMS\ Power * \frac{G}{G^2+B^2}}$.

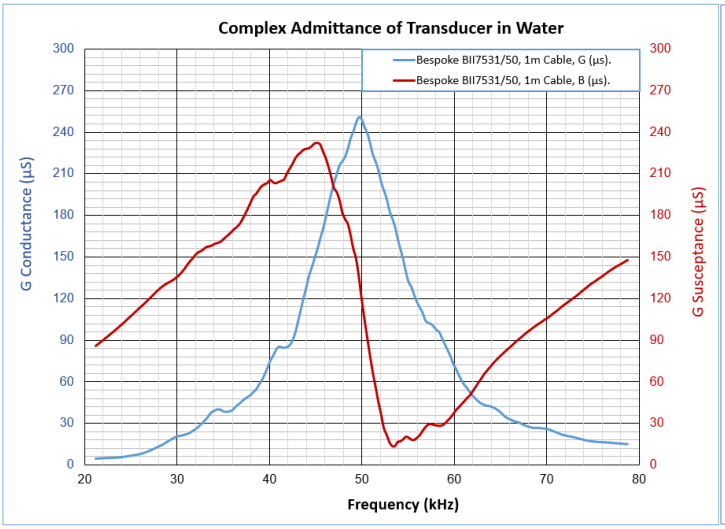
BII lists G-B data at fs and/or the graph of G-B vs Frequency in online datasheet.

Case 1. Deliver 1000 Wrms to 3 kΩ transducer at f_s. Note: $G/(G^2+B^2)$=3 kΩ is the resistive load of the transducer in load medium at f_s.
Driving voltage to transducer $V_{drive} = \sqrt{1000 * 3000}$ = 1732 V_{rms}. The current to 3 kΩ transducer $I_{drive} = V_{drive}/R_L$ = 1732Vrms/3000Ω = 0.57733 A_{rms}.
Therefore, AWG18 Wire and Wire leads are suitable.

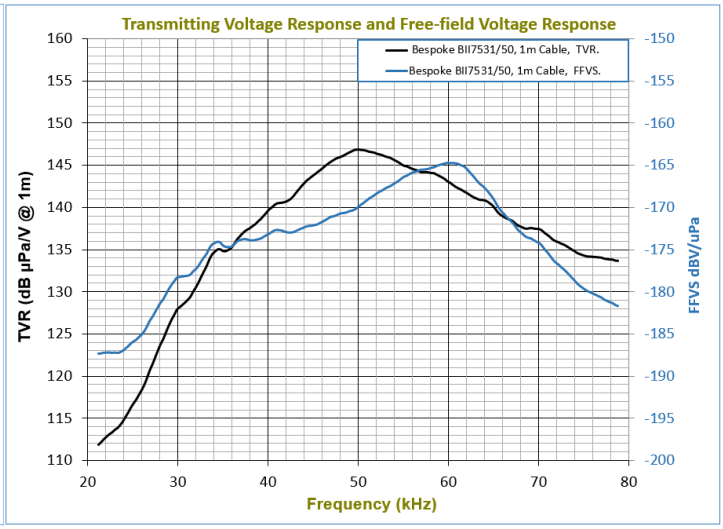
Case 2. Deliver 500 Wrms to 300 Ω transducer at f_s. Note: $G/(G^2+B^2)$=300 Ω is the resistive load of the transducer in load medium at f_s.
Driving voltage to transducer $V_{drive} = \sqrt{500 * 300}$ = 387.3 V_{rms}. The current to 300 Ω transducer $I_{drive} = V_{drive}/R_L$ = 387.3Vrms/300Ω = 1.291 A_{rms}.
Therefore, Two Conductor Shielded Cable and MIL-5015 Type Connector or Underwater Mateable Connector (UMC) are suitable.

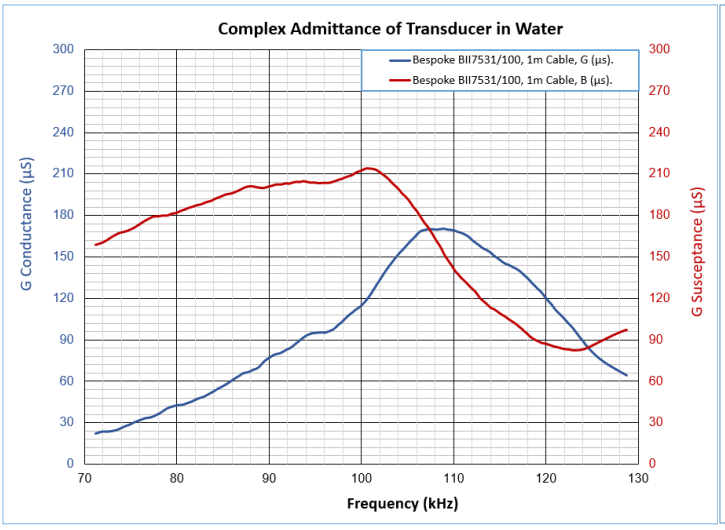
Case 3. Deliver 300 Wrms to 50 Ω transducer at f_s.
Driving voltage to transducer $V_{drive} = \sqrt{300 * 50}$ = 122.5 V_{rms}. The current to 50 Ω transducer $I_{drive} = V_{drive}/R_L$ = 122.5Vrms/50Ω = 2.45A_{rms}.
Therefore, 50Ω RG58 Coax and BNC are suitable.

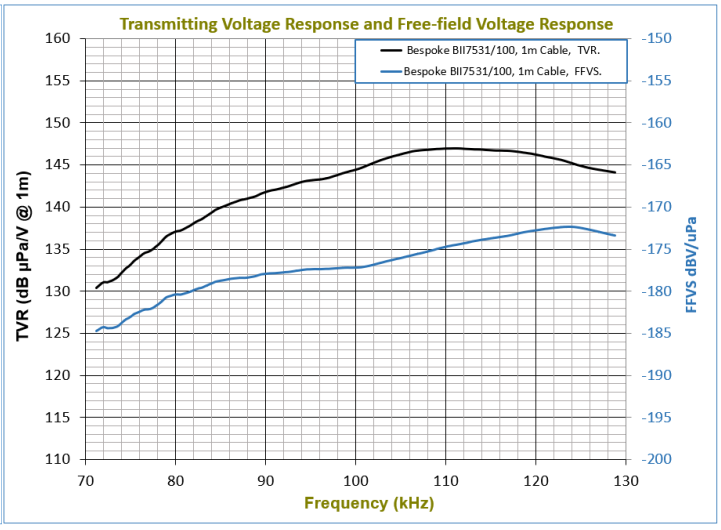
Admittance G-B

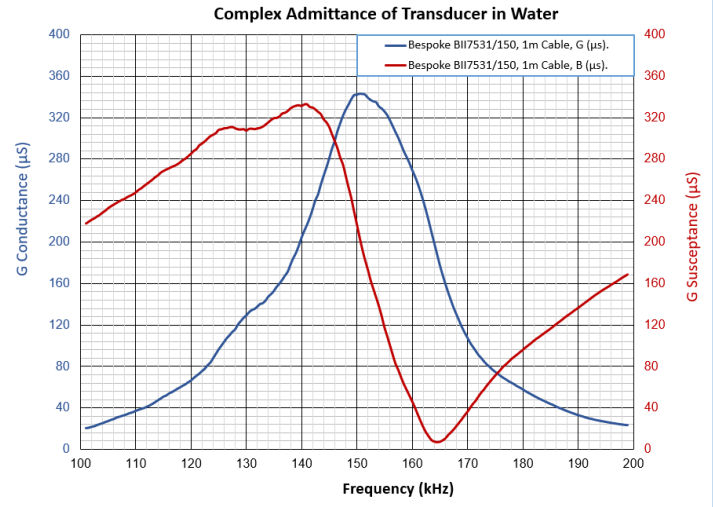


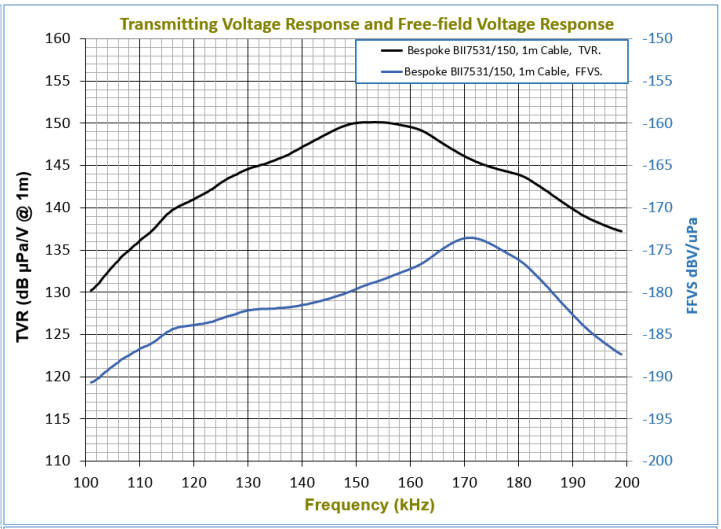
TVR and FFVS

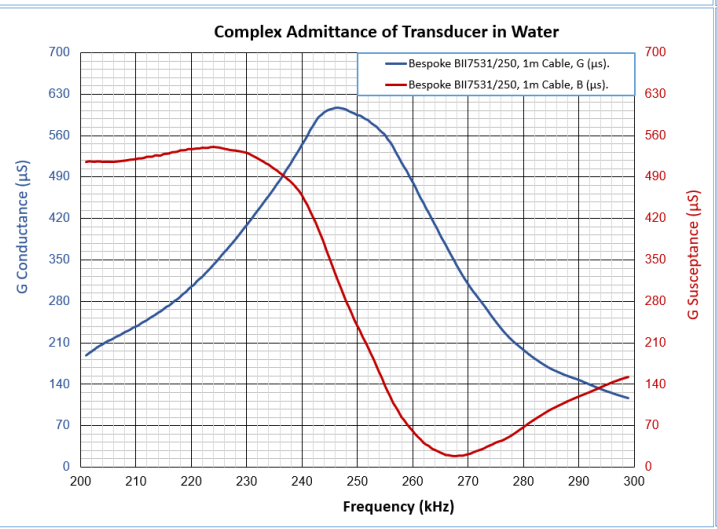


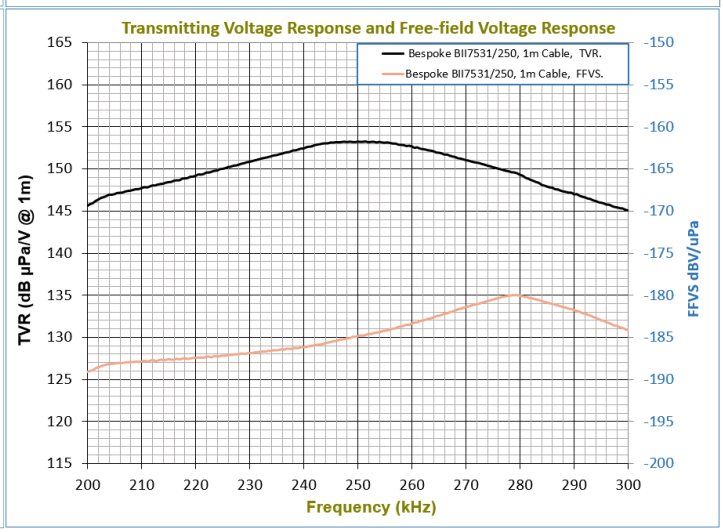




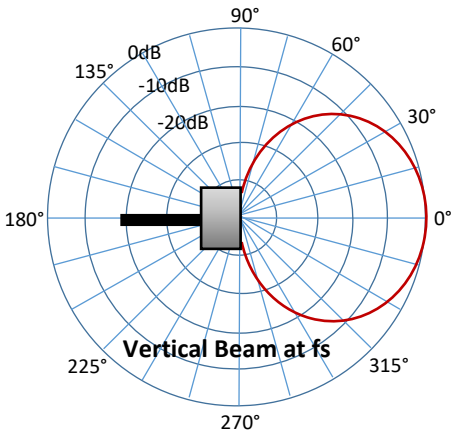


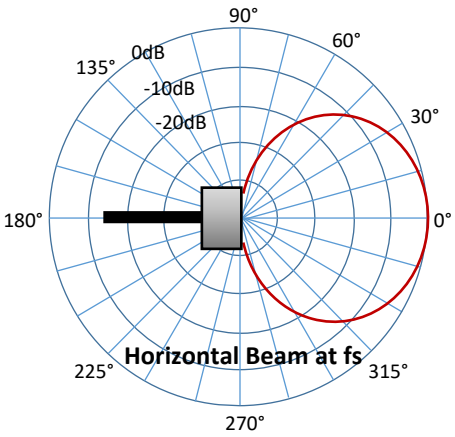






Directivity Pattern. illustration ONLY.





Physical Size (Dimensional Unit: mm)