Communication Transducer

Communication Transducer: 50° Wide Conical Beam Angle, No Sidelobes, Long Distance Communication.

BII7600 series communication transducers are broadband to transmit and receive communication signals and cover wide field of the interest underwater and support directional communication in vertical and horizontal planes up to 2.5 km underwater. They have no sidelobes to avoid spurious echoes or source sounds from uninterested directions. Besides, the transducers can be used as array elements for user-defined large planar/cylindrical/spherical arrays.

Typical Applications

Pinger/Beacon/Transponder/Positioning	Communication/Telemetry	Navigation/Obstacle Avoidance	Control/Alarm/Security System	Array Element

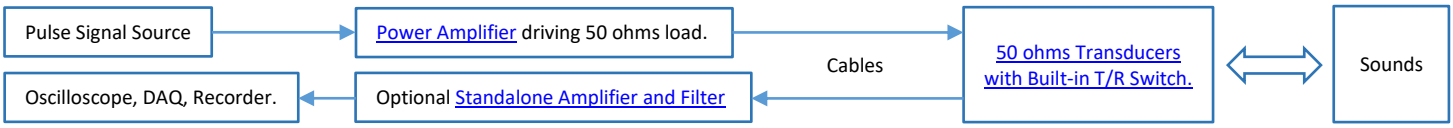
Specifications

FFVS: Free-field Voltage Sensitivity, in dB V/µPa, **TVR**: Transmitting Voltage Response, dB µPa/V@1m. **Gp**: Conductance of the Transducer.						
Parametric Transducer	**BII7600Q/100**	**BII7601/70**	**BII7601Q/60**	**BII7601H/50**	**BII7602/38**	**BII7602H/30**
Communication Distance:	≥ 200 m	≥ 400 m	≥ 600 m	≥ 1 km	≥ 1.5 km	≥ 2.5 km
Resonant Frequency fs:	100 kHz	70 kHz	60 kHz	50 kHz	38 kHz	30 kHz
Signal Type:	1. Pulsed FSK, Chirp-type FSK, Frequency Hopping, DSSS, PSK, CDMA/DSSS, and other communication signals. 2. SINE/Chirp Pulses, Amplitude-modulated SINE/Chirp Pulses, Continuous Arbitrary Signals.					
Radiation Face:	Circular Plane					
Directivity Pattern:	Conical Beam at fs, Refer to Graph of Directivity Pattern.					
-3dB Beam Width:	50° at fs					
Side Lobe Level:	No side lobes					
Quality Factor Q_m:	3.0. Note: -3dB bandwidth $\Delta f = f_s/Q_m$. Q_m determines the transient response or the rise and fall rings of steady-state response.					
$\eta_{ea\ at\ fs}$ at f_s:	0.1 to 0.4 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. **2. Transducer can emit low power sounds at frequencies far from f_s such as input power $P_i \le \eta_{ea}$ * MIPP at $f \le 0.8*f_s$ and $P_i \le 0.2$ * MIPP at $f \ge 1.3*f_s$.**					
Power Factor at f_s:	0.6 to 0.9					
TVR at f_s:	140.0	137.0	135.5	136.4	137.0	138.0
Radiation Sound Level SL:	SL = 20*logV_i + TVR, dB µPa@1m. Driving Voltage V_i is in unit of V_{rms}.					
Admittance at fs:	G = 87 µS	G = 165 µS	G = 86 µS	G = 90 µS	G = 107 µS	G = 168 µS
Driving Voltage V_i at f_s:	**Transducer without Impedance Matching Unit**			**Transducer with Impedance Matching to be 50Ω**		
	Pulsed Driving Signal and Duty Cycle D < 100%: Maximum V_i, $V_{imax} = \sqrt{(MIPP/G_{max})}$ or 600, whichever is less, in V_{rms}.			**Pulsed Driving Signal and Duty Cycle D < 100%:** Maximum V_i, $V_{imax} = \sqrt{(MIPP * \|Z\|)}$, in V_{rms}. Z is impedance at fs.		
	Continuous Operation at 100% Duty Cycle: Maximum V_i, $V_{imax} = \sqrt{(MCIP/G_{max})}$, in V_{rms}.			**Continuous Operation at 100% Duty Cycle:** Maximum V_i, $V_{imax} = \sqrt{(MCIP * \|Z\|)}$, 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, G_{max} is maximum G at f_s.					
MIPP at f_s:	300 Watts	500 Watts	400 Watts	400 Watts	500 Watts	600 Watts
	Maximum Input Pulse Power at f_s: $P_i = V_i^2 * G_{max}$ or MIPP Watts, whichever is less.					
MPW at MIPP and f_s:	7 Seconds	9 Seconds	10 Seconds	20 Seconds	18 Seconds	20 Seconds
	Maximum Pulse Width at MIPP and at f_s.					
MCIP at f_s:	5 Watts	8 Watts	10 Watts	10 Watts	15 Watts	20 Watts
	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.						
FFVS at f_s:	-187.0	-180.5	-181.0	-181.0	-182.0	-181.0
	$FFVS\ Sensitivity\ Loss\ over\ extension\ cable\ at\ f_s\ (dB) = 20 * \log\{\left(1+\frac{2\pi f_s C_c}{B}\right)/\sqrt{[G^2+(B+2\pi f_s C_c)^2]/(G^2+B^2)}\}$ 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. **FFVS**: Free-field Voltage Sensitivity, dB V/µPa.					
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 and 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:	1. Two Conductor Shielded Cable (SC), Rubber or PVC Jacket. 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. 6. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, ΦD=4.0 mm (SC40), up to 200°C, AWG20 Conductors.
	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.
Connector Options:	1. Default: Wire Leads (**WL**), for Transmit, Receive Signal, and DC Power Supply. 2. Male BNC (**BNC**) (Max. Diameter Φ14.3 mm), for Transmit or Receive Signal. **BNC with RG178 Coax**: Service Temperature up to 165°C or 329°F. 3. MIL-5015 Style (pin) (**MIL**) (Max. Diameter Φ19 to Φ30 mm), for Transmit or Receive Signal. 4. XLR Plug (pin) (**XLR**), Rating: 133 VRMS, 15A. (Max. Diameter Φ20.2 mm), for Transmit or Receive Signal. 5. 1/8" (3.5mm) TRS Plug (**TRS**) (Max. Diameter Φ10.5 mm), for Receive Signal ONLY. 6. Underwater Mateable Connector (pin) (**UMC**) (Max. Diameter Φ21.5 to Φ35 mm), for Transmit or Receive Signal. 7. +9VDC Battery Snap (**BS**), +9VDC or +18VDC power supply for Built-in T/R Switch. 8. 4mm Banana Plug Pair (Red and Black Color) (**BP**), DC power supply for Built-in T/R Switch. Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.
Size ΦDxH (mm):	Φ27x40 | Φ33x45 | Φ42x50 | Φ48x65 | Φ60x60 | Φ73x65 1. Actual length H depends on Mounting Parts. 2. Diameter can be customized to meet spacing specs of an array.
Weight in Air:	0.12 kg | 0.2 kg | 0.4 kg | 0.7 kg | 0.9 kg | 1.1 kg Weight is with 0.15 m cable. Actual weight depends on Mounting Parts, Cable Types and Length.
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:	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. 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.
TR Switch with Preamp and filter:	BII2100 Transmitting & Receiving Switch. 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.
Impedance Matching and TR Switching:	Integrating Impedance matching network and T/R switch into transducer by append -TRIMxxΩ to the part number. For example, BIIxxxx-TRIM50Ω: BIIxxxx transducer with a built-in T/R Switch and an impedance matching network as a 50Ω load at fs.
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.
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.	
Specifications of Built-in T/R Switch for Sound Receiving with Transducer BII760x/xx-TR or BII760x/xx-TRIMxxΩ.	
Preamp and Filter:	Yes, Fixed Gain Preamp and Filter are built inside transducer housing. 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.
Preamp Gain:	1. Default: 40 dB 2. Bespoke: 0 dB to 60 dB. | 1. Default: 40 dB 2. Bespoke: 20 to 60 dB.
-3dB Bandwidth:	1. Default: 1 Hz to 450 kHz. 2. Customized. Specify when ordering. | 1. Default: 100 kHz to 10 MHz. 2. Customized. Specify when ordering. 1. **Reduce Noise**. 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. 2. **Avoid Saturation**. When there are strong low frequency noises, disturbances, and/or vibrations, resulting from rough surface waves and/or mechanical movements of the platform, it is recommended to specify a high pass filter to avoid hydrophone saturation in these low frequency ranges.
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.
Band Pass Filter:	1st and/or 2nd order, 20/Decade to 40 dB/Decade Roll-off.
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		
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 a Transducer without T/R Switch. Cables will be labelled with #1, #2, #3, #4, #5 …for multiple arrays inside a transducer.

Single Ended Signal:	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 Transmitting Sounds of a Transducer with T/R Switch.

Single Ended Signal:	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 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.					

Wiring Information of Temperature Signal.

Single Ended Signal:	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

How to Order Transducers without T/R Switches. The default options are for stock items which are regularly available.

FH: Free Hanging. **SC for Transmit**: Shielded Cable (Rubber Jacket, 600V) with 2 conductors. **Coax**: 50 Ω Coaxial Cable. **WL**: Wire Leads.					
Part Number	**-Appendage**	**-Mounting**	**-Cable Length**	**-Cable Type**	**-Connector for signals of Transmit and Temperature Sensor**
BII7600 Series	Default:	Default:	Default:	**SC** for low frequency signal.	Default: **WL**.

	None.	**FH**.	**10m**.	**Coax** for high frequency signal.	

Example:	Description
BII7601/70-BFMSS-0.3m-SC-UMC	BII7601/70 Transducer, Bolt Fastening Mounting (Stainless Steel) (BFMSS), 0.3m Shielded Cable, Male Underwater Mateable Connector.
BII7601/70-HT-FH-6m-RG178-BNC	BII7601/70 Transducer, Service Temperature: -10 °C to 120 °C, or 14 °F to 248 °F. Free Hanging, 6m RG178 Coax, BNC Male.
BII7601/70-IM50Ω-FH-20m-RG58-BNC	BII7601/70 Transducer, Built-in Impedance Matching Network as 50Ω load at fs, Free Hanging, 20m RG58 Coax, Male BNC.
BII7601/70-IM8Ω-FH-10m-SC-XLR	BII7601/70 Transducer, Built-in Impedance Matching Network as 8Ω load at fs, Free Hanging, 10m Shielded Cable, XLR Plug.
BII7601/70-TS-IM8Ω-FH-10m-SC-WL/TRS	BII7601/70 Transducer, Built-in Temperature Sensor, Built-in Impedance Matching Network to 8Ω at fs, Free Hanging, 10m Shielded Cable, Wire Leads for Transmit Signal, TRS for Temperature Signal.

How to Order Transducers with T/R Switches. The default options are for stock items which are regularly available.

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	**-Appendage**	**-Receive Gain**	**-HPF/LPF**	**-Mounting**	**-Cable Length**	**-Cable Type**	**-Connector for signals of Transmit/ Receive/DC Supply/Temperature**
BII7600 Series	Default: **TRIM50Ω**	Default: **40 dB**	-3dB Receive bandpass Frequencies.	Default: **FH**.	Default: **10m.**	Default: **SC or Coax**	Default: **WL**.

Example:	Description
BII7601/70-TR-IM50Ω-40dB-100Hz/200kHz-BFMSS-10m-SC-MIL/XLR/BS	BII7601/70 Transducer, Built-in T/R Switch, Built-in Impedance Matching Network as 50Ω load at fs, Receive Gain: 40dB, Receive Bandpass Filter: 100Hz to 200kHz. Bolt-fastening Mounting (Stainless Steel), 10m Shielded Cable, MIL-5015 Connector for Transmit Signal, XLR for Receive Signal, 9V Battery Snap for DC Supply.
BII7601/70-TS-TR-IM50Ω-40dB-100Hz/200kHz-BFMSS-10m-SC-MIL/XLR/BS/TRS	BII7601/70 Transducer, Built-in Temperature Sensor, Built-in T/R Switch, Built-in Impedance Matching Network as 50Ω load at fs, Receive Gain: 40dB, Receive Bandpass Filter: 100Hz to 200kHz. 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.

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 and a standalone T/R Switch?

A built-in T/R Switch amplifies the received signal of the sensing element before the signal is polluted by EMI noise, and before it is attenuated by cable capacitance, inductance, and resistance.

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.

How to choose cable and connector for BII devices: Driving Voltage V_{drive} (V_{rms}) = $\sqrt{Power * R_L} = \sqrt{Power/G}$. R_L: Resistance of a transducer in load medium at f_s. G: conductance at fs: **R_L = 1/G at fs**. BII lists G-B data at fs and/or the graph of G-B vs Frequency in online datasheet.

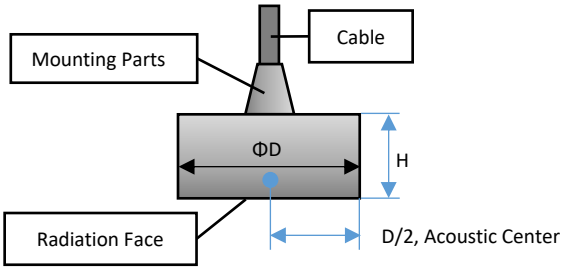
Case 1. Deliver 1000 Wrms to 3 kΩ transducer at f_s. Note: the 3 kΩ is the resistance of the transducer in load medium at f_s.
Driving voltage to transducer V_{drive} = $\sqrt{1000 * 3000}$ = 1732 V_{rms}. The current to 3 kΩ transducer $I_{drive} = V_{drive}/R_L$ = 1732Vrms/3000Ω = 0.57733 A_{rms}.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

Case 2. Deliver 500 Wrms to 300 Ω transducer at f_s. Note: the 300 Ω is the resistance 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.

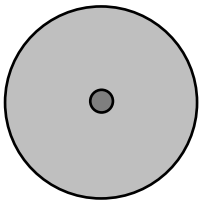
Physical Size (Dimensional Unit: mm)

Front View



Cable-out Layout

Top View



Directivity Pattern: