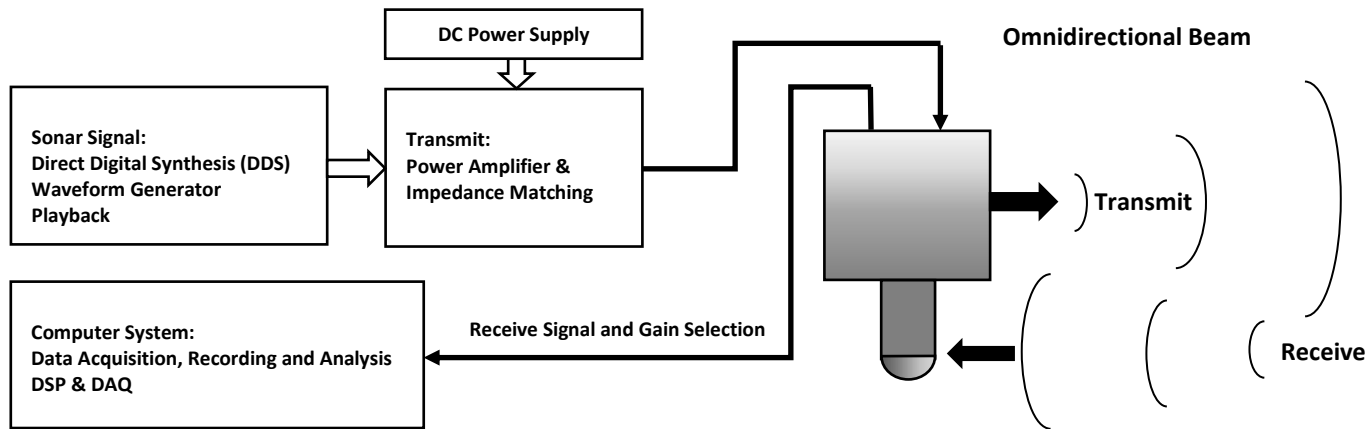


BII-7640 Series Underwater Omnidirectional Transceiver

The underwater acoustic transceiver integrates an omnidirectional projector and an omnidirectional low noise hydrophone. Typical applications include artificial acoustic target which is able to simulate quantitatively the noise, Doppler effect, echo or characteristic sounds of the subjects such as ships, torpedoes, submarines, fish, marine animals, seabed, sub-bottom, etc...

Typical Applications	
Artificial Acoustic Target: Echo-Repeater Target, Active-Acoustic Target Underwater Communication and Modem, Acoustic Release Underwater Acoustic Positioning: Transponder, Responder Tracking of Acoustic Tags/Transmitters in Marine Fisheries and Animals	Underwater Telephone Long Range Sound Transmission Acoustic Deterrent to Marine Animals Marine Animal Behavior Research, Bioacoustic Stimuli & Playback
Related Products	
BII-5000 Series Power Amplifier Sonar Signal Generation Pulse Signal	BII-8030 Series Underwater Acoustic Transmitter BII-8000 Series Listening, Recording, Analysis, Synthesis and Playback

Communication & Artificial Acoustic Target



Specification

Acoustic Transceiver	BII-7641Q	BII-7642	BII-7643	BII-7644	BII-7645	BII-7646
Operating Depth:	500m	300m	300m	300m	300m	100m
Operation Mode:	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) Please refer to online document AcousticSystem.pdf for a complete list of Mounting Options and more details.					
Weight:	≥ 1.5 kg with 10m cable. Actual weight depends on Mounting Parts, Cable Types and Length.					
Operation Temperature:	-10°C to +60°C or 14°F to 140°F.					
Storage Temperature:	-20°C to +60°C or -4°F to 140°F.					
Transmit Unit						
Signal Type:	Pulsed SINE, Chirp, PSK, FSK, Pulsed Square Waveform, CW, Communication Signals, etc.					
Transmitting Face:	Cylinder					
Directivity Pattern:	Toroidal Beam at fs; Omnidirectional at f << fs.					
Beam Width:	$\theta_{H-3dB} \times \theta_{V-3dB}$ (°) = Omni x 80°, Horizontal x Vertical at fs.					
Side Lobe Level:	No side lobes.					
Operating Frequency fs:	40 kHz	30 kHz	14 kHz	8 kHz	6kHz	4.5kHz
Quality Factor Qm:	1.5	1.3	1.5	1.2	3	3
TVR:	Refer to TVR Graph.					
Radiation Sound Level:	SL = 20*logVi + TVR, dB μPa@1m. Driving Voltage Vi is in unit of Vrms.					
Admittance @ fs:	G=0.68mS, B=2.68 mS, (20m SC cable).	G=0.55mS, B=3.72mS. (3m SC cable).	G=0.86 mS, B=3.6mS, (5m SC cable).	G=0.485mS, B=3.213mS, (3m SC cable).	Gmax=0.439mS, B=2.4 mS, (10m SC cable).	Gmax=0.2 mS, B=1.0 mS, (10m SC cable).
Transducer without Impedance Matching Unit						
Maximum Driving Voltage Vdmax in Vrms:	225	300	300	300	450	600
Driving Voltage Vi at fs:	Pulsed Driving Signal and Duty Cycle D < 100%: Maximum Vi, $V_{imax} = \sqrt{(MIPP/G_{max})}$ or V_{dmax} , whichever is less, in Vrms. Continuous Operation at 100% Duty Cycle: Maximum Vi, $V_{imax} = \sqrt{(MCIP/G_{max})}$, in Vrms. To achieve higher sound level, built-in impedance matching is recommended to step up driving voltage inside the transducer.					

Transducer with Impedance Matching Unit						
Driving Voltage V_i at f_s :	Pulsed Driving Signal and Duty Cycle $D < 100\%$: $V_{i,max} = \sqrt{(MIPP * Z)}$, in V_{rms} . Z is impedance with Impedance Matching Unit at f_s . Continuous Operation at 100% Duty Cycle: Maximum V_i , $V_{i,max} = \sqrt{(MCIP * Z)}$, in V_{rms} .					
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 :	250W	400W	300W	240W	240W	200W
MPW at MIPP and f_s :	25s	60s	70s	120s	130s	200s
MCIP at f_s :	60W	95W	100W	130W	150W	150W
MIPP: Maximum Input Pulse Power; MCIP: Maximum Continuous Input Power, MPW: Maximum Pulse Width at MIPP.						
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 $\leq (MIPP * MPW * (120^\circ C - T) / 103^\circ C) / IPP$. T : Water Temperature in $^\circ C$.						
3. Duty Cycle $D \leq MCIP * (120^\circ C - T) / 103^\circ C / IPP$.						
4. Off-time $\geq PW * (1 - D) / D$.						
Cable:	1. Two Conductor AWG20 Shielded Cable (SC), Rubber or PVC Jacket. 2. 50 Ω RG58 Coax (RG58) 3. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, $\Phi D = 3.2$ mm (SC32), up to 200 $^\circ C$, AWG26 Conductors. 4. Shielded Cable with Twisted Pair and Teflon (PTFE) Jacket, $\Phi D = 4.0$ mm (SC40), up to 200 $^\circ C$, AWG20 Conductors. 5. Two Conductor AWG20 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: 10 m. 2. Custom.					
Connector:	1. Default: Wire Leads (WL) 2. Male BNC (BNC) (Max. Diameter $\Phi 14.3$ mm) 3. MIL-5015 Style (pin) (5015) (Max. Diameter $\Phi 30$ mm with 3 contacts) 4. LEMO (Plug Male Pins) (LEMO) (Max. Diameter $\Phi 9.5$ mm with 3 contacts) 5. Underwater Mateable Connector (pin) (UMC) (Max. Diameter $\Phi 21.5$ to $\Phi 35$ mm) 6. Customized, buyer specifies the connector. (Custom) Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.					
Size ($\Phi D \times H$):	$\Phi 42 \times 55$ mm	$\Phi 60 \times 60$ mm	$\Phi 89 \times 50$ mm	$\Phi 114 \times 50$ mm	$\Phi 141 \times 60$ mm	$\Phi 168 \times 60$ mm
Impedance Matching:	BII-6000 Bespoke Impedance Matching between transducers and power amplifiers. Order Separately. Append IM to the part number for integrating BII-6000 in the transducer, and specify impedance in Ω . For example, BII-xxxxIM50 Ω : BII-xxxx transducer with built-in Impedance Matching unit as a 50 Ω load.					
Temperature Sensor:	1. Default: No built-in temperature sensor. 2. Built-in temperature sensor . Append TS to part number (BII-xxxxTS) for integrating a temperature sensor in the transducer.					
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 50 Ω 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.						
Transmitting Wiring with Single Ended Driving Signal						
Wiring:	Two Conductor Shielded Cable	Coax/BNC	Underwater Connector	MIL-5015 Connector		
Transmitting Signal	White or Red	Center Contact	Contact 2	Contact C		
Transmitting Common	Black	Shield	Contact 1	Contact B		
Shielding and Grounding	Shield	Shield	Contact 3	Contact A		
Transmitting Wiring with Differential Driving Signal						
Wiring:	Two Conductor Shielded Cable	Underwater Connector	MIL-5015 Connector			
Transmitting Signal +	White or Red	Contact 2	Contact C			
Transmitting Signal -	Black	Contact 1	Contact B			
Shielding and Grounding	Shield	Contact 3	Contact A			
Receive Unit						
FFVS:	Free-field Voltage Sensitivity (dBV/ μPa), Refer to Graph of FFVS vs. Frequency .					
Pressure Noise Density:	Refer to Graph of Pressure Noise Density , Referred to Input (RTI), in $\mu Pa/\sqrt{Hz}$.					
Usable Frequency:	1 Hz to 90 kHz at ± 3 dB V/ μPa , in Water.					
Preamp Gain (dB):	Programmable Gain Preamp : 1. Default: 0/20/40/60 dB. 2. Customized: 20/40/60/80 dB is available.					
Gain Selection Voltage:	CMOS/TTL Compatible. Logic Low 0: Gain Selection Wire to COM or 0 to +0.8 VDC. Logic High 1: Gain Selection Wire Open or +2.4 VDC to V_s (power supply voltage level). Note: If Digital Outputs or switches are used to select gains, Voltage Protection Rating or Absolute Maximum Voltage Ratings of these devices must be greater than V_s Supply Voltage.					
Built-in Filters:	Bespoke High Pass or Band Pass filter. Specify when ordering. Both ocean ambient noises and the self-noises of electronic devices decrease when frequency increases. It is recommended to choose a built-in high pass filter to reject noises in low frequency range. For example, if you are interested in the signals greater than 200 Hz, you may specify a high pass filter with -3dB cut-off frequency at 100 Hz to improve signal to noise ratio of the signals of the interest.					
Directivity Pattern:	Omnidirectional.					
Beam Width:	$\Theta_{H-3dB} \times \Theta_{V-3dB}$ ($^\circ$): Horizontal x Vertical = Omni x 230 $^\circ$ @ 70 kHz					
Output Type:	1. Default: Single Ended. 2. Bespoke: Differential.					
Maximum Output V_{omax} :	$V_{omax} = \text{Supply Voltage } V_s - 3.4$, in Vpp.					
Overload Pressure Level:	(0 - Sensitivity) or $[20 * \log(V_{omax} / 2.828) - \text{Sensitivity}]$, whichever is less. in dB μPa .					

Acceleration Sensitivity:	103.8 dB μ Pa/(m/s ²) at Acoustic Axis and other directions.
Cable:	Six Conductor Shielded Cable (SC).
Cable Length:	1. Default: 10 m. 2. Custom-fit Cable Length.
Connector:	SE: Single ended Output, DF: Differential Output. 1. Default: Wire Leads (WL) 2. Male BNC (BNC) (Max. Diameter Φ 14.3 mm), for SE ONLY. 3. SMA (Plug, Male Pin) (SMA), Voltage Rating: 335 V _{RMS} Continuous. (Max. Diameter Φ 9.24 mm), for SE ONLY. 4. SMC (Plug, Female Socket) (SMC), Voltage Rating: 335 V _{RMS} Continuous. (SMC) (Max. Diameter Φ 6.4 mm), for SE ONLY. 5. 1/8" (3.5mm) TRS Plug (TRS35) (Max. Diameter Φ 10.5 mm), for SE or DF. 6. XLR (pin) (XLR) (Max. Diameter Φ 20.2 mm), for SE or DF. 7. MIL-5015 Style (pin) (5015) (Max. Diameter Φ 30 mm with 3 contacts), for SE or DF. 8. LEMO (Plug Male Pins) (LEMO) (Max. Diameter Φ 9.5 mm with 3 contacts), for SE or DF. 9. Underwater Mateable Connector (pin) (UMC) (Max. Diameter Φ 21.5 to Φ 35 mm), for SE or DF. 10. +9VDC Battery Snap (BS) (Exclusive to preamplified hydrophone) 11. Customized, buyer specifies the connector. (Custom) Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.
Supply Voltage V _s :	+8.2 to +30 VDC
Suggested DC Supply:	+9 VDC Battery, Marine Battery, Automobile Battery, Fixed DC Linear Power Supply, Not Included. DO NOT use variable power supply whose maximum supply voltage is higher than the rated voltage. DO NOT use switching mode DC power supply.
Current (Quiescent):	10.5 mA
Size (Φ DxH):	Φ 15.8 x 40 mm

Wiring Information of Receiving

Wiring of Single Ended Output:	Wire Leads	9V Battery Snap and Wire Leads	Wire/Cable Buddle	Underwater Connector
+VDC	Red	+9VDC Battery Female Snap	Red Wire	Pin 3
Common	Black	+9VDC Battery Male Snap	Black Wire	Pin 1
Digital Common		Black		
Output Signal	White	White	White wire of Shielded Cable	Pin 2
Output Signal Common	Green	Green	Black wire of Shielded Cable	Pin 4
Digital A0 (Gain Selection)	Blue	Blue	Blue Wire	Pin 6
Digital A1 (Gain Selection)	Yellow or Brown	Yellow or Brown	Yellow Wire	Pin 5
Shielding	Shield	Shield	Shield of Shielded Cable	N/A

Note: Power Supply Common and cable shield must be grounded firmly for safety.

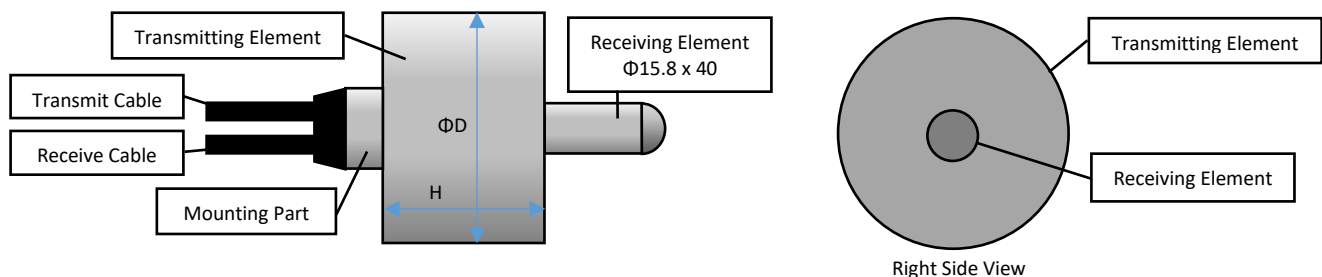
Selecting Sensitivity of Digitally Programmable

Gain Selection Wire A1	Gain Selection Wire A0	Hydrophone Sensitivity
0 (Logic Low)	0 (Logic Low)	FFVS + 0dB V/ μ Pa, or FFVS + 20dB V/ μ Pa,
0 (Logic Low)	1 (Logic High)	FFVS + 20dB V/ μ Pa, or FFVS + 40dB V/ μ Pa,
1 (Logic High)	0 (Logic Low)	FFVS + 40dB V/ μ Pa, or FFVS + 60dB V/ μ Pa,
1 (Logic High)	1 (Logic High)	FFVS + 60dB V/ μ Pa, or FFVS + 80dB V/ μ Pa,

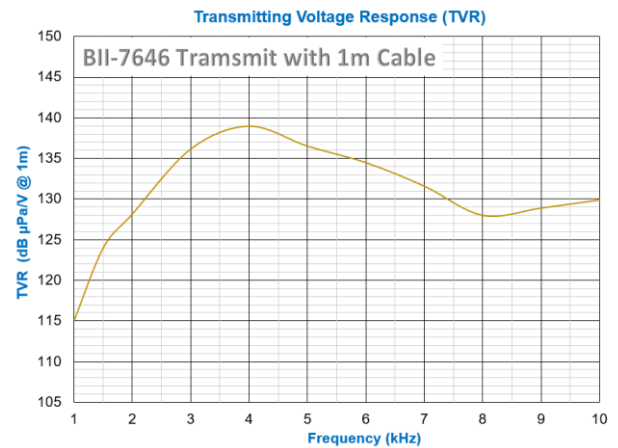
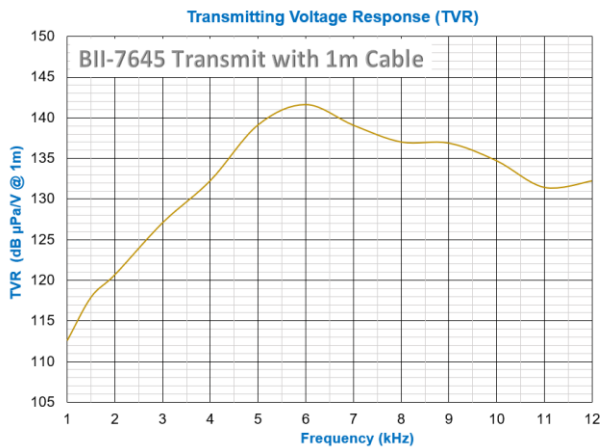
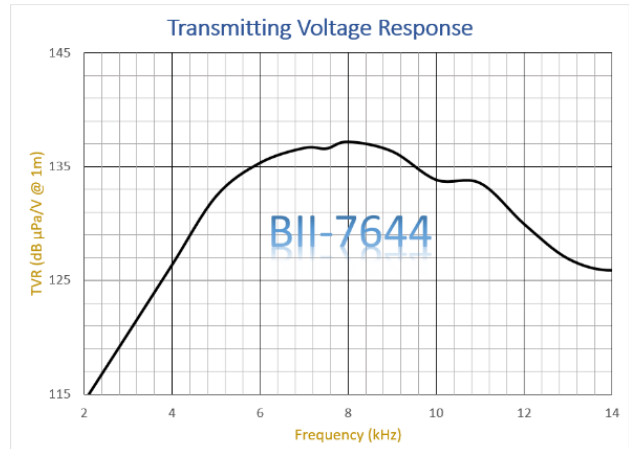
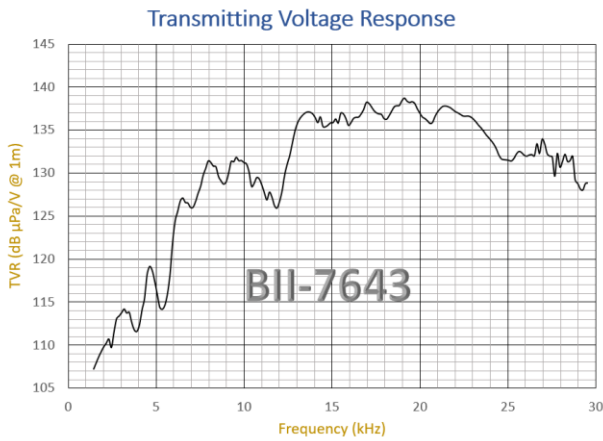
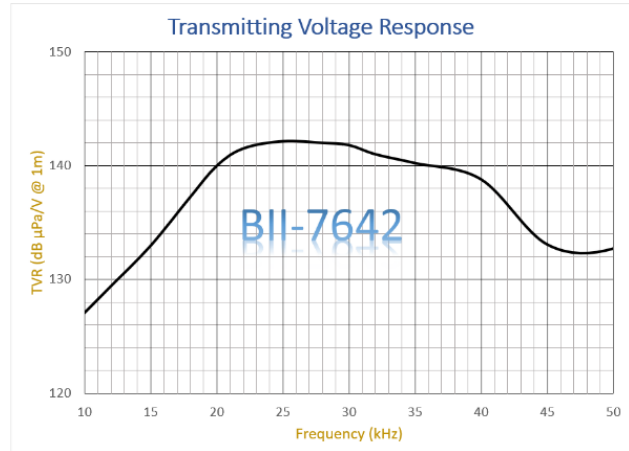
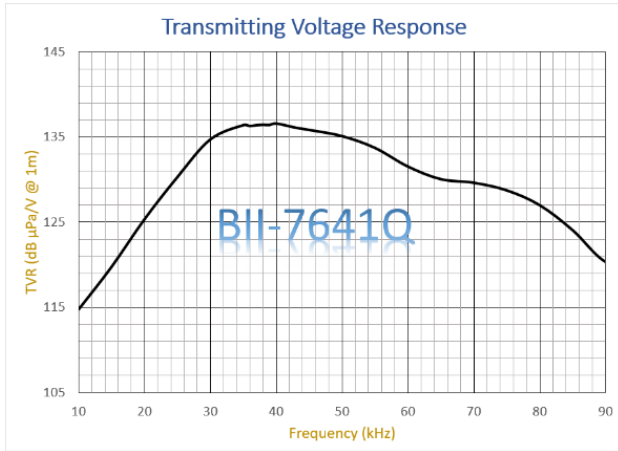
How to Order BII-7640 Series Transducers (if a parameter is not used, please leave it in blank)

Transducer	TS	IM	-Z	-HP/LP	-Mounting	-Cable Length	-Connector
BII-764x	Temperature Sensor	Impedance Matching	Matching Impedance in Ω at fs or BII Power Amplifier	Receiving Bandpass Filter in kHz	Refer to specs.	in meter	Refer to specs.
Example of Part Number:			Description				
BII-7642-1Hz/90kHz-THSO-0.1m-WL			BII-7642 Transducer, Receiving Band Pass Filter: 1Hz to 90kHz, Thru-hole Mounting (Single O-ring), 0.1m Cable, Wire Leads.				
BII-7642IM-50 Ω -1kHz/50kHz-FH-20m-WL			BII-7642 Transducer, Built-in Impedance Matching for 50 Ω at fs; Receiving Band Pass Filter: 1kHz to 50kHz, Free Hanging, 20m Cable, Wire Leads.				
BII-7642TSIM-BII-5061-0.1kHz/70kHz-FH-20-WL			BII-7642 Transducer, Built-in Temperature Sensor, and Built-in Impedance Matching for BII-5061 Power Amplifier at fs; Receiving Band Pass Filter: 0.1kHz to 70kHz, Free Hanging, 20m Cable, Wire Leads.				

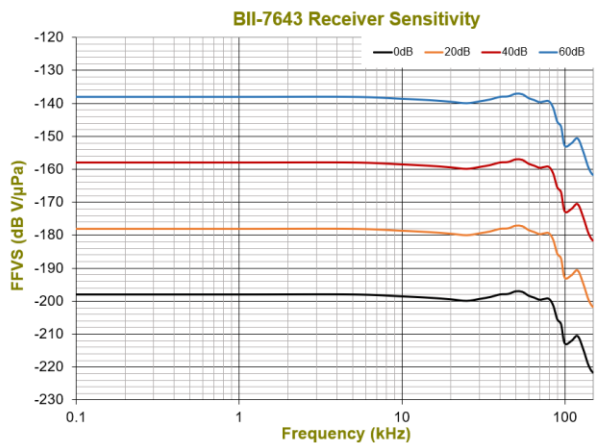
Physical Size (Dimensional Unit: mm)



Transmitting Voltage Response (TVR):



Free-field Voltage Sensitivity (FFVS):



Pressure Noise Density (RTI, referred to the input)

