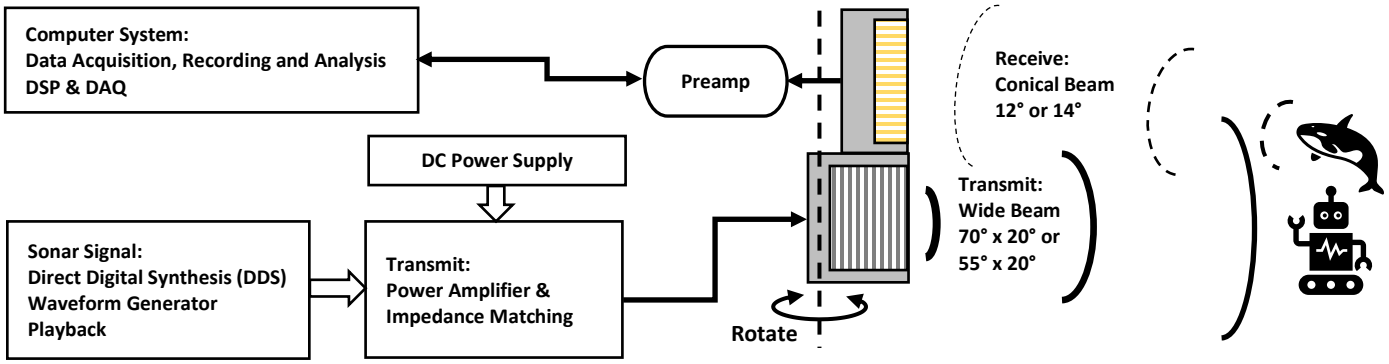
BII-7646 Series Underwater Scanning Transducer

The Underwater Scanning Transducer integrates a wide beam projector and a narrow beam low noise directional hydrophone for scanning SONAR. Typical applications are acoustic positioning, tracking, echo locating, and navigation in horizontal or vertical plane in the ocean, rivers, and lakes.

Tracking, Locating and Navigation:

Receive Signal and Gain Selection



Specification

Acoustic Transceiver	BII-7646/50	BII-7646/60
Acoustic Aperture:	**Transmit**: Cylindrical Segment. **Receive**: Circular Piston.	
Operation Mode:	1. Pulse-Echo. 2. Scanning horizontally or vertically with mechanical rotation.	
Operating Depth:	300 m maximum 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. Bolt Fastening Mounting (Stainless Steel) (BFMSS) 3. End-face Mounting for Multi-Channel (EFMM) Please refer to online document **AcousticSystem.pdf** for a complete list of Mounting Options and more details.	
	the mounting part and cable are at rear face of the transducer for easy rotation.	
Size:	Refer to **outline drawings**.	
Weight in air:	10 kg with 10 m cable.	9 kg with 10 m 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 (Projector) Module		
Housing:	Cylindrical Segment.	
Pulsed Driving Signal:	Pulsed and burst SINE/Square/Chirp excitation, CW, Communication Signals.	
Transmit Frequency fs:	50 kHz	60 kHz
Quality Factor Q_m:	5.0	4.0
	-3dB Bandwidth = f_s/Q_m	
TVR at fs:	159 dB µPa/V at 1m	165 dB µPa/V at 1m
Driving Voltage/Current:	a. Without Impedance Matching: 600 V_{rms} Maximum, 4 A_{rms} Maximum. b. With built-in impedance matching: depends on the matched load, and limited by maximum pulse power of the transducer. The info is enclosed in the datasheet with the shipment. To achieve higher sound level, built-in impedance matching is recommended to step up driving voltage (deliver more power) inside the transducer.	
Transmitting Face:	Curved Face of Cylindrical Segment.	
Beam Pattern:	Fan-shaped Directivity, refer to **Directivity Pattern**.	
Beam Width θ_{-3dB} (°):	Horizontal x Vertical = H x V= θ_{-3dB} = 70° x 20°.	Horizontal x Vertical = H x V= θ_{-3dB} = 55° x 20°.
	Customization of the beam angle is available.	
Side lobes:	Refer to **Directivity Pattern**.	
Admittance @ fs:	Gmax = 8mS, B = 1.23mS, no impedance matching.	Gmax = 10mS, B = 1.36mS, no impedance matching.
MIPP at f_s:	Maximum Input Pulse Power at f_s: $P_i = V_i^2 * G_{max}$ or 3000 Watts, whichever is less.	
MPW at MIPP and f_s:	0.05 Seconds, Maximum Pulse Width at MIPP and at f_s.	
MCIP at f_s:	100 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.		
Cable:	1. Two Conductor Shielded Cable (SC), Rubber or PVC Jacket, AWG20 Conductor. 2. 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.	
Cable Length:	1. Default: 1 m. 2. Custom.	
Transmit Connector:	1. Default: Wire Leads (WL) 2. MIL-5015 Style (pin) (5015) (Max. Diameter Φ30 mm with 3 contacts)	

	3. Underwater Mateable Connector (pin) (UMC) (Max. Diameter Φ21.5 to Φ35 mm) Note: Underwater Mateable Connector is for uses underwater. Other connectors and wire leads are for dry uses and are not waterproofed.
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-xxxxIM50Ω: BII-xxxx transducer with built-in Impedance Matching unit as a 50 Ω load.

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.

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

Receive (Sensing Element) Module

Housing:	Circular Piston	
Sensitivity:	-184.0, in dB V/µPa, at operating frequency fs.	
Frequency Range:	1 Hz to 100 kHz	
Beam Pattern:	Conical	
Beam Width θ_{-3dB} (°):	14° at 50 kHz	12° at 60 kHz
Side lobes:	< -26 dB	
Input Noise Density:	Refer to **Pressure Noise Density** (RTI, referred to the input). Note: The effect of Bandpass filter of preamp to noise density is NOT considered. The bandpass filter of preamp DOES NOT affect the **Pressure Noise Density** of the pass band.	
Cable:	Two Conductor Shielded Cable (SC)	
Cable Length:	0.2 m	
Connector:	1. **Free Hanging or Bolt-fastening Mounting**: Underwater Mateable Connector (Pin) to preamplifier module. 2. **End-face Mounting**: circular connector (Pin, **Dry Use ONLY**) to preamplifier module.	
Wiring:	**Underwater Mateable Connector (pin)**	**Circular Connector (pin) (Dry Use ONLY)**
Signal	Contact 2	Contact C
Signal Common	Contact 1	Contact B
Shielding	Contact 3	Contact A

Preamplifier Module

Preamplifier Gain:	20, 50 dB	
Total Sensitivity:	-184.0 + Preamp Gain, in dB V/µPa, at operating frequency fs.	
Frequency Range:	-3 dB Frequency: 20 to 70 kHz for fs of 50kHz	-3 dB Frequency: 30 to 80 kHz for fs of 60kHz
Input Connector:	1. **Free Hanging or Bolt-fastening Mounting**: Underwater Mateable Connector (Socket) to Receive (Sensing Element) module. 2. **End-face Mounting**: Circular Connector (Socket, **Dry Use ONLY**) to Receive (Sensing Element) module.	
Input Cable Length:	0.15 m	
Overload Pressure Level:	20*log(Vomax/2.828) – Sensitivity, in dB µPa.	
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 to Vs.	
Output Type:	Differential	
Maximum Output:	V_{omax} = (Supply Voltage Vs – 3.4), in Vpp.	
Output Cable:	Six Conductor Shielded Cable (SC)	
Output Cable Length:	1. Default: 1 m. 2. Custom-fit Cable Length up to 200 m.	
Output Connector:	Output Connector or wire is to be wired to user's DAQ (Data Acquisition) module. 1. Default: Wire Leads (WL) 2. XLR (pin) (XLR) (Max. Diameter Φ20.2 mm). 3. MIL-5015 Style (pin) (5015) (Max. Diameter Φ30 mm with 3 contacts). 4. LEMO (Plug Male Pins) (LEMO) (Max. Diameter Φ9.5 mm with 3 contacts). 5. Underwater Mateable Connector (pin) (UMC) (Max. Diameter Φ21.5 to Φ35 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.	
Supply Voltage Vs:	+8.0 to +30 VDC. +12 or +18 VDC is recommended. **Warning: DC supply voltage exceeding the +32 VDC damages preamplifier module beyond repair.**	
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 rated voltage. DO NOT use switching mode DC power supply.	
Current (Quiescent):	16 mA	
Size:	ΦD x Length = Φ21 x 130 mm	
Weight:	≥ 0.2 kg, depends on connectors and output cable length.	

Wiring Information with One-bit Programmable Gain Preamps:

Output Wiring of Differential Output:	**Wire Leads**	**Underwater Connector/MIL-5015/LEMO**	**XLR + 9V Battery Snap**
+VDC	Red	Pin 3	Battery Female Snap
Common	Black	Pin 1	Battery Male Snap, XLR Pin 1.
Digital Common	Yellow or Brown	Pin 5	Yellow or Brown
Digital A0 (FFVS Selection)	Blue	Pin 6	Blue
Output Signal+	White	Pin 2	XLR Pin 2

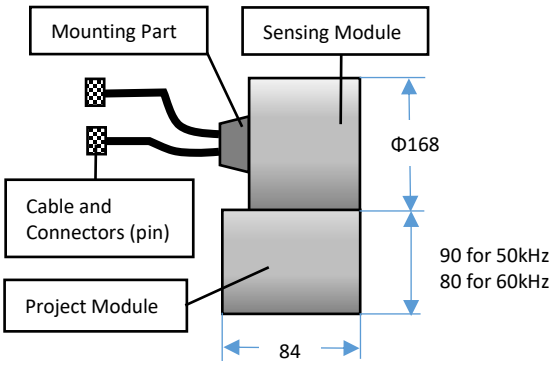
Output Signal -	Green	Pin 4	XLR Pin 3
Shielding	Shield	N/A	XLR Metal Shell
Selecting Sensitivity of One-bit Digitally Programmable			
FFVS Selection Wire A0	**Hydrophone Sensitivity FFVS at 1kHz.**		
0 (Logic Low)	-184.0 + 20 dB V/µPa		
1 (Logic High)	-184.0 + 50 dB V/µPa		

How to Order (If a parameter is NOT used, please leave it in blank.)

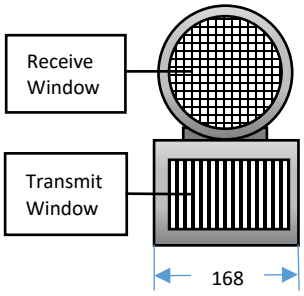
Transducer	**-IM**	**/Z**	**-BA**	**-Mounting**
BII-7646/50 BII-7646/60	Impedance matching	Matching Impedance in Ω at fs or BII Power Amplifier	Transmit Beam Angle, HxV, in °	Refer to the specs.
	-Cable Length	**/Connector**	**-Output Cable Length**	**/Output Connector**
	Transmit, in meter	Transmit, Refer to the specs.	Receive, in meter	Receive, Refer to the specs.
Example of Part Number:		**Description**		
BII-7646/50-FH-20m/WL-20m/WL		BII-7646/50, 50kHz transducer, Free Hanging, Transmit Cable: 20m, Wire Leads; Receive Cable: 20m, Wire Leads.		
BII-7646/50-IM/BII-5062-70°x16°-BFMSS-20m/5015-20m/WL		BII-7646/50, 50kHz transducer, Built-in Impedance matching unit to match BII-5062 Power Amplifier, Transmit Beam Angle: HxV=70°x16°, Bolt-fastening Mount (Stainless Steel), Transmit Cable: 20m, MIL-5015 Male Connector; Receive Cable: 20m, Wire Leads.		

Physical Size (Dimensional Unit: mm), Illustration only, scale is not 1:1.

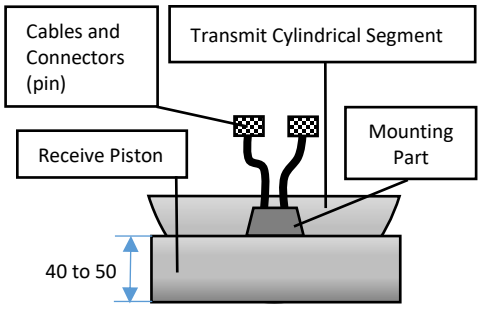
Side View

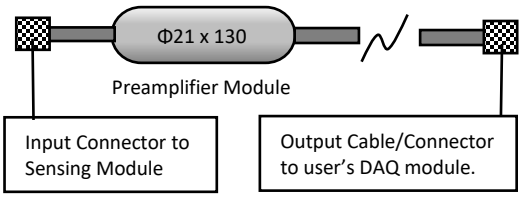


Front Face View

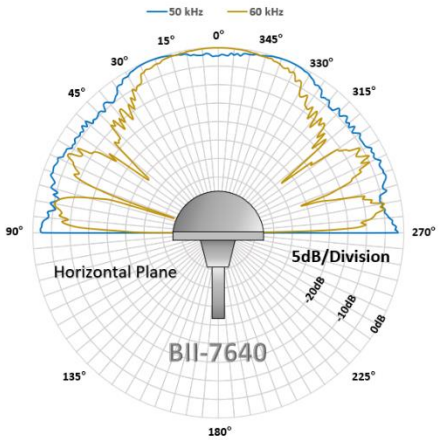


Top View

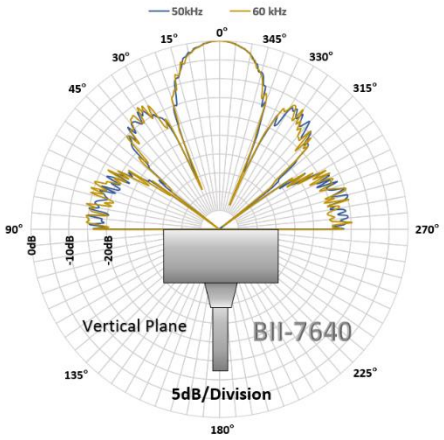


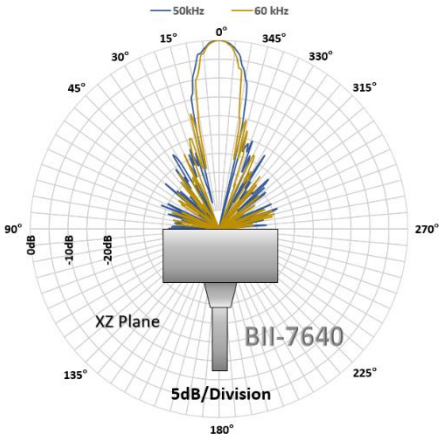


Transmit Directivity Pattern

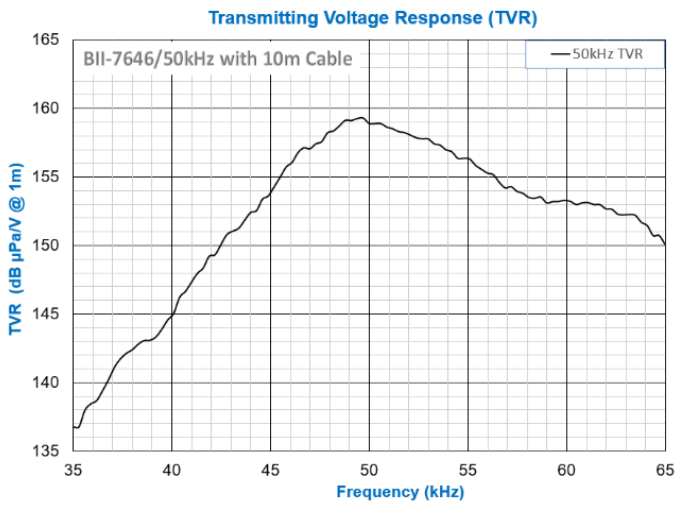


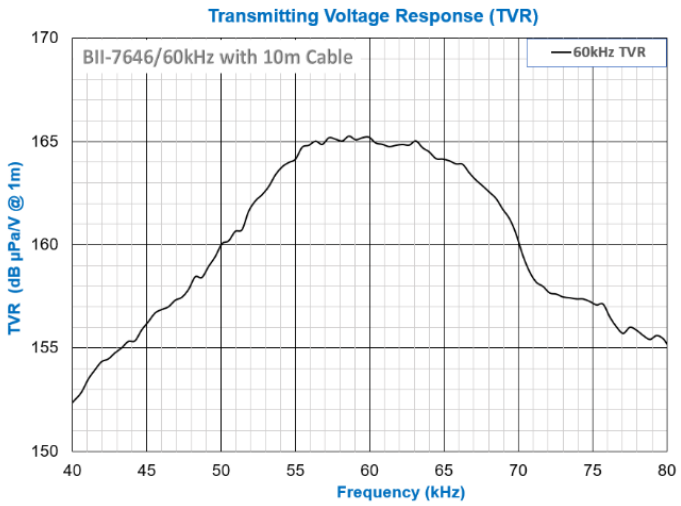
Receive Directivity Pattern



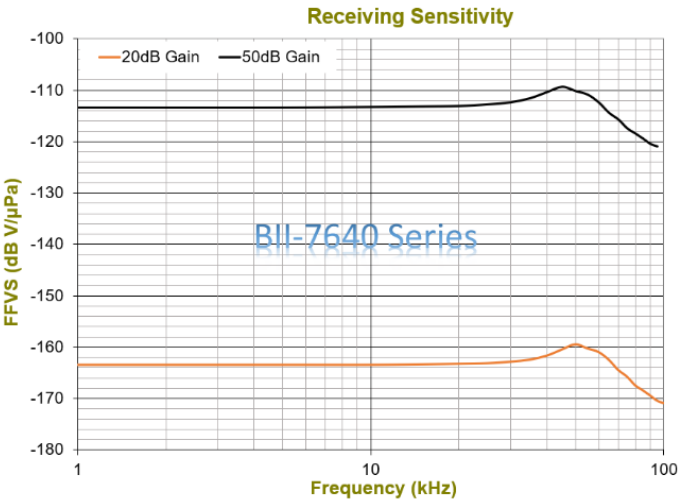


TVR Transmitting Voltage Response.





Free-field Voltage Sensitivity (FFVS):



Pressure Noise Density of Receive (RTI, referred to the input):