BII7716 Series Underwater Scanning Transducer for 360° View Field in Horizontal Plane

Scanning SONAR Transducer for 360° Search

The Underwater Scanning Transducer is multi-channel cylindrical array projector, and a directional beam is implemented with subarrays for scanning. Typical applications are acoustic positioning, tracking, echo locating, and navigation in horizontal plane in the ocean, rivers, and lakes.

The Scanning SONAR Transducers provide efficient solution to detect and locate fish schools and targets in the horizontal plane about hundreds meters with 360° searching. The transducers have superior performances for use in shallow water and near surface fishing.

The subarray that operator determines sends out a pulse of narrow beam sound in specific directions and receive the echo reflected from targets; or, in passive listening mode, it searches the sounds emitted from sound sources with highly directional beam.

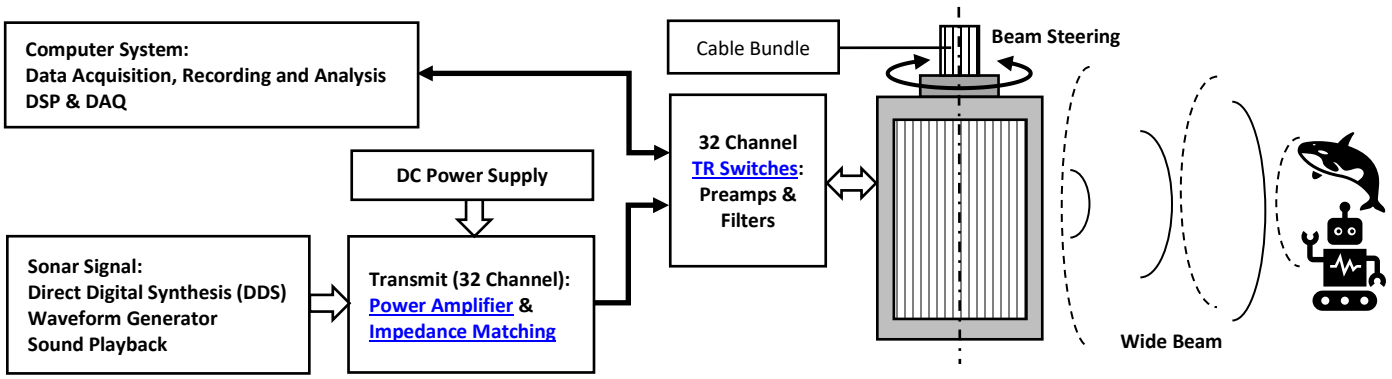
Typical Applications

Scanning Sonar, Obstacle Avoidance, Object/Target Detection and Tracking Fishery Sonar, Communication Underwater Robotic and Vehicle (ROV, AUV, UUV)

Related Products

BII5000 Power Amplifier BII6000 Impedance Matching BII7770 Scanning Transducer with Mechanical Gears BII7660 Multibeam Transducer: Imaging

Tracking, Locating and Navigation:



Specification

Acoustic Transceiver	BII7716/50	BII7716/60	BII7716/70
Frequency fs:	50 kHz	60 kHz	70 kHz
Operation Mode:	1. Pulse-Echo. 2. Scanning horizontally with beam steering electrically.		
Echo Ranging:	200 m to 1000 m, depends on target strength, water depth and propagation loss.		
Pulsed Driving Signal:	Pulsed and burst SINE/Square/Chirp excitation, communication signals.		
Acoustic Aperture:	**Transmit and Receive**: Cylindrical Segment. Determined by operator.		
Array Geometry:	Cylinder		
Element Number N:	32		
Element Spacing:	360°/N = 11.25°		
Element Capacitance:	TBD (To be determined) at 1kHz		
Element Dissipation:	0.005		
Array Orientation:	Slot mark on housing: Receiving Channel# 1. Channel# 1, 2, 3, ... 31, 32 are sequential clockwise in bottom view of the transducer.		
Horizontal Beamwidth:	a. 360° omnidirectional when all array elements are active in parallel. b. Array Beamforming Dependent. Buyer determines the subarray being used to scan. c. Horizontal Beamwidth of Single Array Element: 155° ± 10°		
Vertical Beamwidth:	Generally, 10° to 20°, Custom-fit, fixed. Specify when ordering		
Quality Factor Q_m:	2.2	2.6	3.0
	-3dB Bandwidth = fs/Q_m		
Element TVR at fs:	135 dB µPa/V at 1m	138 dB µPa/V at 1m	143 dB µPa/V at 1m
	TVR depends on vertical beam width.		
Sensitivity at fs:	-184.0, in dB V/µPa	-185.0, in dB V/µPa	-186.5, in dB V/µPa
Driving Voltage/Current:	Each Element: 600 V_{rms} Maximum, 0.36 A Maximum, and limited by MIPP at fs.		
Beam Pattern:	Fan-shaped Directivity, refer to **Directivity Pattern**.		
Side lobes:	a. Horizontal Sidelobe: depend on active sub-arrays. b. Vertical (along-height): ≤ -14 dB.		
Admittance @ fs:	Dependant on customized Vertical Beamwidth.		
MIPP at f_s:	Each Array Element: Maximum Input Pulse Power at f_s: $P_i = V_i^2 * G_{max}$ or 100 Watts, whichever is less.		
MPW at MIPP and f_s:	Each Array Element: 10 Seconds, Maximum Pulse Width at MIPP and at f_s.		
MCIP at f_s:	Each Array Element: 2 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.			
Operating Depth:	300 m maximum		
Mounting Options:	**End Face Mount (O-ring Sealing) (EFMM) for Multi Cables (Cable Bundle)** Material: Anodized Aluminum or Stainless Steel.		

	6 M6x1x12.7mm Threaded Holes, Equal Spacing on 37mm PCD (Pitch Circle Diameter). M6x1x16 Screws and O-ring (IDxCS=Φ48x3 mm): included. Fastening Torque: ≤2.5 Nm. Outside Diameter: Φ60 mm. Warning: Depending on the thickness of mounting wall, proper screw length should be used at buyer's cost. If screw length was too long, internal part of the transducer would be damaged by tightening torque; if screw length was too short, thread of the End-face part would be damaged by transducer weight or tightening torque. Mounting wall thickness T should be: 3.5 mm < T < 6 mm for M6x1x16 Screws. Please refer to online document **AcousticSystem.pdf** for more details on size, tighten torque, thread, mounting holes, etc…
	Mounting part and cable are at top end face of the transducer.
Cable Bundle:	Each Coax for each element (Coax).
	Handling: Do not use the cable to support transducer weight in air and water.
Cable Length:	1 m
Connector:	Wire Leads (WL). Note: wire leads are for dry uses and are not waterproofed.
Size (ΦDxH):	Φ168mm x Height. Height depends on vertical (Along-height) beamwidth. Roughly, Height = 76200/(fs* Along-height Beamwidth) +35 mm. for example, for vertical beam θ_{-3dB} = 15° at 50kHz, Height ≈ 135 mm.
Weight in air:	≥ 8 kg with 1 m cable bundle. 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.
Temperature Sensor:	1. Default: No built-in temperature sensor. 2. Built-in temperature sensor. When ordering, append **TS** to part number for integrating a temperature sensor in the transducer.
Impedance Matching:	BII6000 Bespoke Impedance Matching between transducers and power amplifiers. Order Separately.
WARNING: DANGER — HIGH VOLTAGE on wires. Wires shall be insulated for safety. DO NOT TOUCH THE WIRES BEFORE THE DRIVING SIGNAL IS SHUT DOWN.	
Array Element Wiring:	**Coax Bundle**
Signal	Coax Conductor
Signal Common	Coax Shield

Characteristics of Temperature Sensor Built inside Transducers (Hydrophones and Projectors):

-40 °C to 125 °C NTC Temperature Sensor: Resistance Vs. Temperature

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
-40	197.388	5	22.165	50	4.160	95	1.112
-35	149.395	10	18.010	55	3.539	100	0.976
-30	114.345	15	14.720	60	3.024	105	0.860
-25	88.381	20	12.099	65	2.593	110	0.759
-20	68.915	25	10.000	70	2.233	115	0.673
-15	54.166	30	8.309	75	1.929	120	0.598
-10	42.889	35	6.939	80	1.673	125	0.532
-5	34.196	40	5.824	85	1.455		
0	27.445	45	4.911	90	1.270		

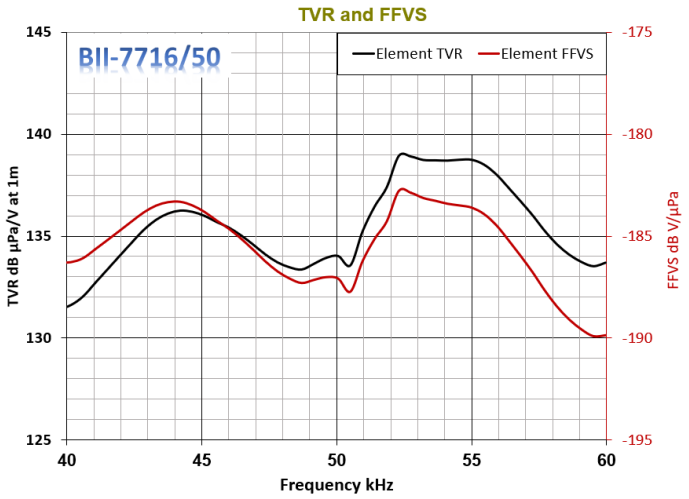
Temperature Sensor Wiring:	**Shielded Cable**
Signal	White or Red Wire
Signal Common	Black Wire
Shielding	Shield.

How to Order

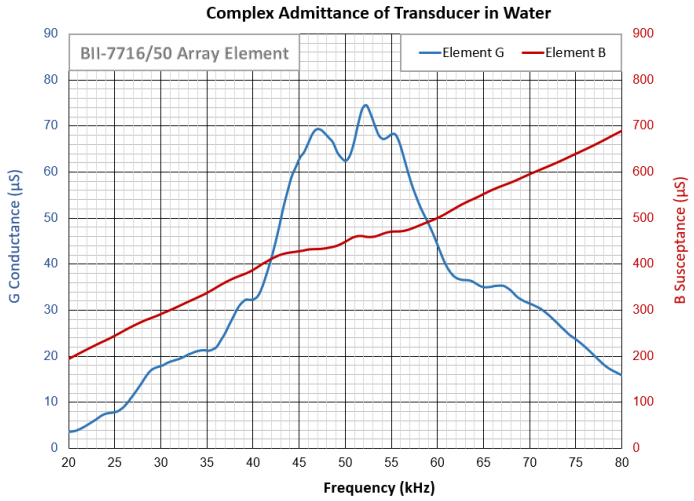
Transducer	**TS or Blank**	**-VBA**
BII7716/50 BII7716/60 BII7716/70	**TS**: Built-in NTC temperature sensor. **Blank**: None.	-3dB Vertical Beamwidth, in °.

Example of Part Number:	**Description**
BII7716/50-15°	BII7716/50, 50kHz transducer, -3dB vertical (along-height) beamwidth: 15°.
BII7716/50TS-15°	BII7716/50, 50kHz transducer with built-in NTC temperature sensor, -3dB vertical (along-height) beamwidth: 15°.

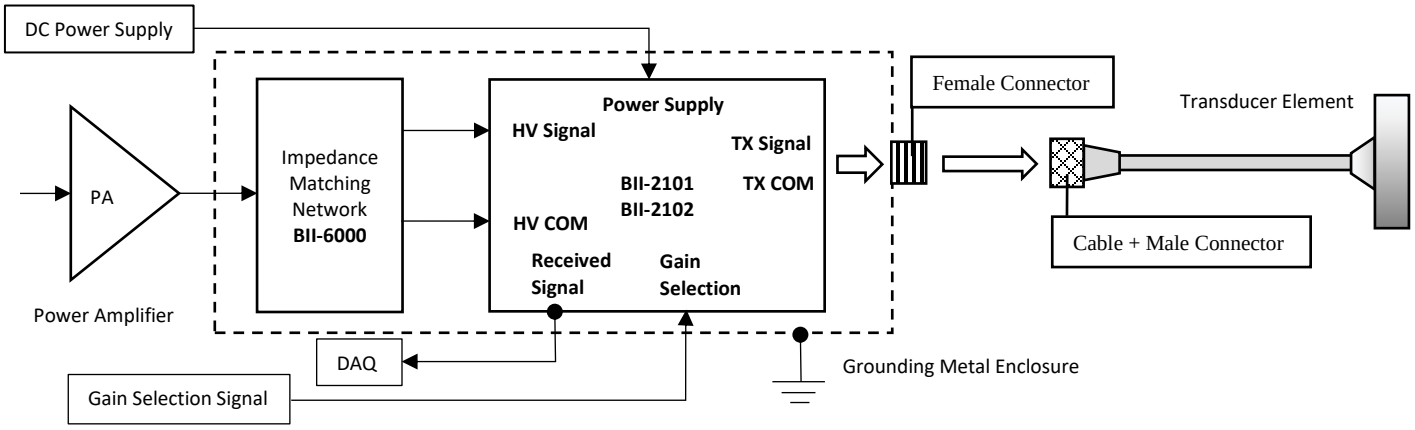
TVR and FFVS

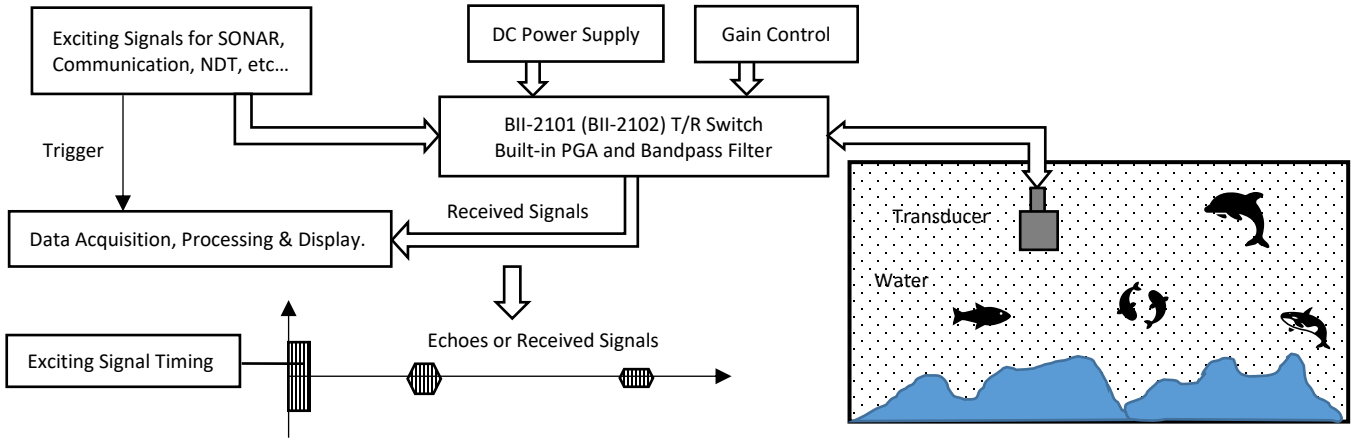


Admittance in Water



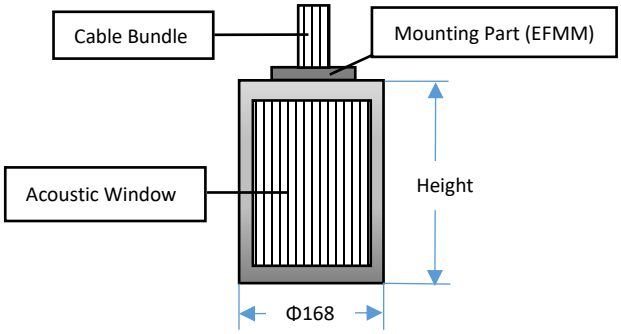
System Block Diagram (Refer to WARNING about the insulation and grounding for operating safety before wiring and assembling the devices.)
HV: High Voltage Source from a Signal Generator, Power Amplifier, or Impedance Matching Unit. **TX**: Driving Signal to a Transducer.



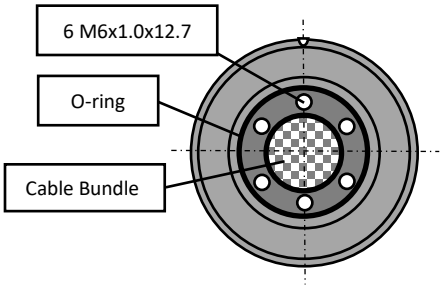


Physical Size (Dimensional Unit: mm), **Illustration only, scale is not 1:1.**

Side View



Top View



Orientation of Array Element from Top View