Understanding Transducer Specifications

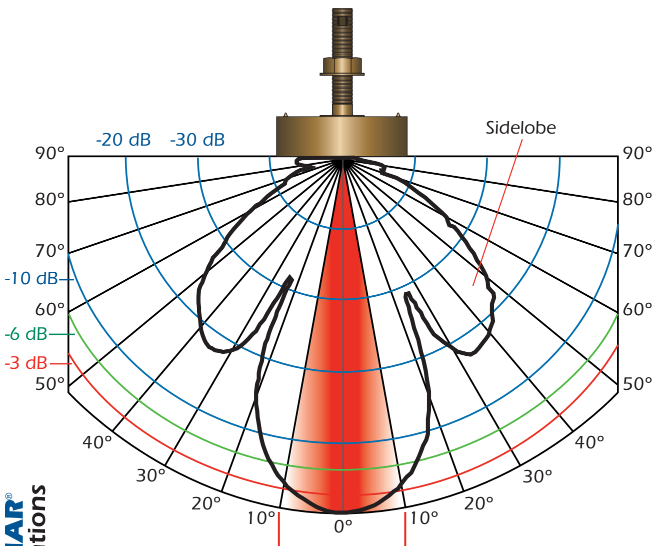
RMS Power vs Peak-To-Peak Power

All Airmar transducers are measured in RMS power as opposed to peak-to-peak power ratings. Peak-To-Peak power ratings are eight times higher than RMS power, which can trick the consumer into thinking their echosounder and transducer are more powerful than they really are. For example, if transducer manufacturer L advertises 4,000 Watts peak-to-peak power, this is only 500 Watts RMS power. See the chart below for typical Airmar transducers and their power ratings in both RMS and Peak-To-Peak.

RMS Power		Peak-To-Peak Power
250 W RMS	=	2,000 W Peak-to-Peak
600 W RMS	=	4,800 W Peak-to-Peak
1,000 W RMS	=	8,000 W Peak-to-Peak
2,000 W RMS	=	16,000 W Peak-to-Peak

Beamwidth

Airmar measures transducer beamwidth at -3 dB. Other transducer manufacturers measure their beams at -6 dB and -10 dB, stating the beam is wider than it really is at -3 dB. For example, the image below shows a beamwidth of 20° at -3 dB (see the red line). If the same transducer is measured at -6 dB, the beamwidth increases to 30° (see the green line).



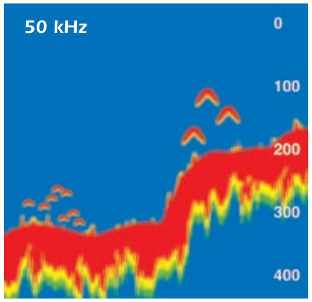
Broadband vs Non-Broadband

Airmar Transducers with a "Q" of less than 8 are considered "Broadband". Airmar's definition of "Broadband" is a wide frequency band in which the transducer can operate between a high and a low-frequency value—for example 33 kHz to 60 kHz. Broadband performance results in faster rise and fall times which generate a distinctly crisp acoustic pulse.

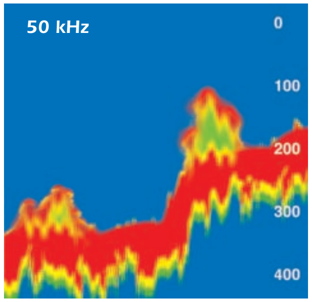
With this technology, transducer ringing is diminished and the Q is usually lower than 8. The crisp pulses allow for superior detection of tightly spaced fish and also fish suspended very close to the sea floor. When used for navigation purposes, broadband transducers also do a better job of imaging the bottom at all depths, especially very shallow-water.

Because broadband transducers have a bandwidth that covers a continuous frequency spectrum, future fishfinders can be made 'tunable' so fishermen can 'dial in' the best frequency for the target fish species or conditions. For example, Airmar's 2 kW R209 can operate anywhere between 130 kHz and 210 kHz. This allows a range of custom performance possibilities. Tuning a higher frequency will increase the target resolution of small fish, and the narrower beam will reduce side lobes in areas with fast-changing water depths. Lowering the frequency results in a wider beam and better deep-water performance. In summary, Broadband Technology has the potential to change the way fishfinders are designed and unlock new levels of fishfinder performance in the future.

Broadband Transducer Imaging



Non-Broadband Transducer Imaging



"Q"

A Transducer's quality factor, "Q" describes the amount of ringing the ceramic element or elements undergo when power is applied to the transducer. Think of a church bell analogy—as the bell is struck it vibrates rapidly and then the vibration will gradually stop. Most competitor's recreational transducers have an average Q between 25 and 35. Airmar Q values range from 1 to 30, depending on models. The lower the "Q" number the less ringing in the transducer and the better the performance. Less ringing greatly improves individual fish separation along with bottom imaging in rapidly changing water depths such as ledges and offshore canyons.

Transmitting Voltage Response

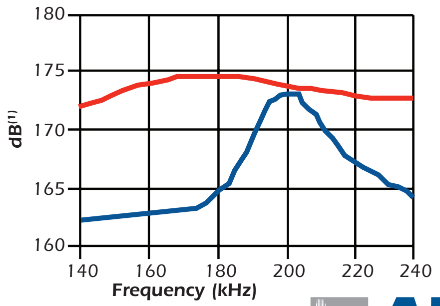
Transmitting Voltage Response (TVR) is computed using Receiving Voltage Response and Impedance. The unit of measure for TVR is dB relative to 1 micropascal per volt at a distance of 1 meter (3').

Receiving Voltage Response

Receiving Voltage Response (RVR) is measured typically by applying 200 V peak-to-peak to the transducer under test, pointing it at a nearly perfect reflector, and measuring the echo amplitude as a function of frequency. The unit of measure is dB relative to 1 Volt per micropascal.

Figure of Merit

This graph is a summation of TVR and RVR and provides a measure of two-way performance. A transducer whose figure of merit response has a wide bandwidth is generally preferred over a transducer with a narrow bandwidth. The former usually rings less and offers most consistent performance over the transducer's range of frequency tolerance.



This **Broadband** transducer has a flat response and can run across the entire frequency range.

This **Non-Broadband** transducer peaks its performance at 200 kHz and drops off sharply at frequencies before and after.

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AIRMAR® Specifications

Understanding Transducer Specifications

What is a Transducer?

A good fishfinder depends on an efficient transducer to send and receive signals. The transducer is the heart of an echosounder system. It is the device that changes electrical pulses into sound waves or acoustic energy and back again. In other words, it is the device that sends out the sound waves and then receives the echoes, so the echosounder can interpret or "detect" what is below the surface of the water.

Echosounder

B744V transducer

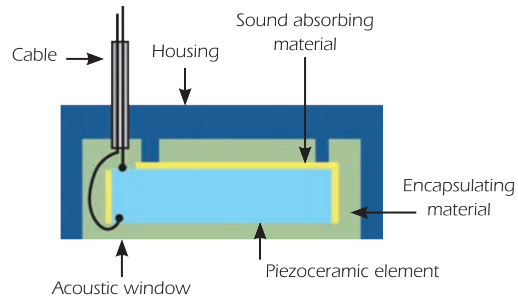
How Does a Transducer Work?

The easiest way to understand how a transducer functions is to think of it as a speaker and a microphone built into one unit. A transducer receives sequences of high voltage electrical pulses called transmit pulses from the echosounder. Just like the stereo speakers at home, the transducer then converts the transmit pulses into sound. The sound travels through the water as pressure waves. When a wave strikes an object like a weed, a rock, a fish, or the bottom, the wave is reflected. The wave is said to echo—just as your voice will echo off a canyon wall. When the reflected sound wave returns the transducer acts as a microphone. It receives the sound wave during the time between each transmit pulse and converts it back into electrical energy. A transducer will spend about 1% of its time transmitting and 99% of its time quietly listening for echoes. Remember, however, that these periods of time are measured in microseconds, so the time between pulses is very short. The echosounder can calculate the time difference between a transmit pulse and the return echo and then display this information on the screen in a way that can be easily understood by the user.

What Goes into the Making of a Transducer?

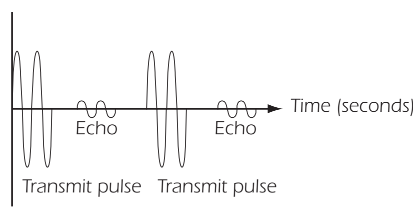
The main component of a depth transducer is the piezoceramic element. It is the part that converts electrical pulses into sound waves, and when the echoes return, the piezoceramic element converts the sound waves back into electrical energy. Piezoceramic elements are most often in a disk form, but they may also be in the shape of a bar or a ring. A transducer may contain one element or a series of elements linked together called an array. A transducer is made up of six separate components:

- Piezoceramic element or an array of elements
- Housing
- Acoustic window
- Encapsulating material
- Sound absorbing material
- Cable



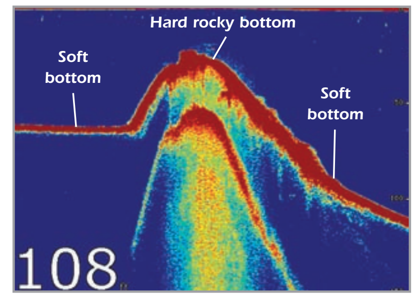
How Does a Transducer Know How Deep the Water is?

The echosounder measures the time between transmitting the sound and receiving its echo. Sound travels through the water at about 1,463 m/s (4,800 ft/s), just less than a mile per second. To calculate the distance to the object, the echosounder multiplies the time elapsed between the sound transmission and the received echo by the speed of sound through water. The echosounder system interprets the result and displays the depth of the water in feet for the user.



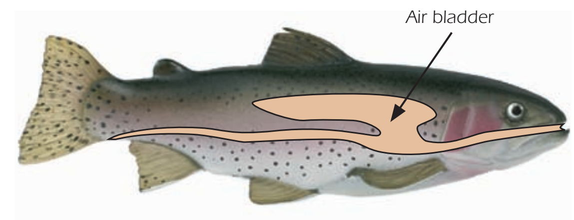
How Does a Transducer Know What the Bottom Looks Like?

As the boat moves through the water, the echoes of some sound waves return more quickly than others. We know that all sound waves travel at the same speed. When a sound wave in one section of the sound field returns more quickly than another, it is because the wave has bounced off something closer to the transducer. These early returning sound waves reveal all the humps and bumps in the underwater surface. Transducers are able to detect whether a bottom is soft or hard and even distinguish between a clump of weeds and a rock, because the sound waves will echo off of these surfaces in a slightly different manner.



How Does a Transducer Detect Fish?

The transducer can detect fish, because it senses the air bladder. Almost every fish has an organ called an air bladder filled with gas that allows the fish to easily adjust to the water pressure at different depths. The amount of gas in the air bladder can be increased or decreased to regulate the buoyancy of the fish. Because the air bladder contains gas, it is a drastically different density than the flesh and bone of the fish as well as the water that surrounds it. This difference in density causes the sound waves from the echosounder to bounce off the fish distinctively. The transducer receives the echoes and the echosounder is able to recognize these differences. The echosounder then displays it as a fish.



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