

FURUNO®



*Complete Angler's Guide to
Marine Transducers*

Table of Contents

- 1-3) Theory of Operation
- 4-5) Mounting Options & Installation tips
- 6-7) Getting the most out of your Fish Finder
- 8-10) Transducer Listings
- 11) Multisensors, Speed and Temperature sensors
- 12) Smart Sensors
- 13-15) FAQ's
- 16) Definitions
- 17) Additional Resources



Pro anglers on the SKA and FLW circuits utilize the 50/200 kHz frequencies to find their winning catch.

Furuno offers a wide range of matched, high performance transducers for our depth sounders. There are transducers available for virtually every type and size of boat. There are also sensors you can install that will accurately read your boat speed and the surface water temperature. Because there are a number of variables in transducer types that can dramatically affect your fish finder's performance, understanding these variables is the key to selecting the right transducer. This book will help you learn about what makes a transducer 'tick.'

FURUNO®

How it works

There are a wide variety of transducer options available for Furuno fish finders, but all of them operate on the same principle. At its most basic definition, a transducer is a device that takes energy from one source, converts that energy into some other form and then delivers that energy to a target, such as a PA system converting sound from a microphone into electrical signals and then delivering that energy to the speakers. In the case of marine transducers, imagine that the same device can act as both the microphone and the speaker. Electricity from the fish finder is applied to the transducer, which sends out an acoustic signal - sound waves - into the water column. The transducer receives the reflected echoes from objects that these sound waves encounter and they are sent as an electrical signal to your fish finder. It is the fish finder's job to process this signal into a picture of the underwater world on your screen.

The Essence of a Transducer

The physical device inside a transducer that creates the sound wave is a piezoceramic disc called the element. The element, when voltage is applied, vibrates - it distorts and reforms its shape in very rapid succession. This vibration occurs at a specific frequency and creates compression waves, or acoustic energy - sound waves. These waves travel outward from the element in a vaguely cone-shaped pattern and encounter targets along the way.

As this acoustic energy encounters targets such as fish or bottom structure, some of the beam will be attenuated (absorbed by the target), some will be reflected back at the transducer as an echo and some will be scattered. As the reflected echoes strike the transducer they cause a minuscule distortion in the shape of the crystal. This distortion of the crystal creates a small fluctuation of voltage, which can be detected and

processed by the fish finder. The end result is an image on your display.

By measuring the time from when the sound wave is generated to when the return echo is received, we can learn the depth at which a target is encountered. The strength of the reflected echo can tell us about the size and density of the target.

Some transducers are referred to as single-element transducers. This means that they contain a single piezoceramic disc that vibrates alternately at 50kHz and 200kHz, utilizing both operating frequencies. Furuno offers a wide range of single-element transducers that are very popular and carry a low price tag.

When greater performance is desired or required, multiple element transducers are available that can significantly enhance the performance and sensitivity of your fish finder. A multiple-element transducer is one in which separate elements vibrate individually at their respective frequencies. Some high-end models utilize seven, nine or even fifteen 50kHz elements along with a large-diameter 200kHz element. The dedicated 200kHz element offers enhanced sensitivity in shallow water, while the greater surface area of the 50kHz array will receive echoes from deeper water with much more clarity and detail.



Many transducers are available with multiple elements for the 50kHz function and a single, large diameter 200kHz element, delivering enhanced performance.

**Shown with High Performance Fairing Block*

Frequency and Beamwidth

Frequency demystified

Frequency refers to the number of sound waves that radiate from a transducer each second. Sound waves are made up of high pressure and low-pressure pulses traveling through a given medium. The wavelength of sound is defined as the distance between two successive high-pressure pulses or two successive low-pressure pulses. For example, when an electrical pulse is applied to a 200kHz transducer the element vibrates at a frequency of 200,000 cycles per second – that is, 200,000 individual sound waves are transmitted from the element each second. Short-wavelength, high frequency transducers produce sharp, crisp images on the fish finder display.

Why use two frequencies?

For recreational and sportfishing applications, the 50/200kHz pairing of frequencies offers an ideal balance of both shallow- and deep-water performance. The 200kHz frequency produces sharp, crisp images in shallow water while 50kHz allows you to “see” much deeper.

Some frequency pairings are more suited to an individual application than others, and for this reason Furuno has always offered the commercial and serious sport fisherman a choice when it comes to selecting frequency pairs for a commercial fish finder. These include 28, 38, 50, 88, 107 and 200kHz.

Beamwidth

The beamwidth of a transducer is a numeric value that describes the effective angle of the sound wave. This value is defined as the total angle between the points at which the acoustic energy has been reduced to half its peak value, commonly referred to as -3dB down points. This value is important because it determines the area in which your fish finder will be able to “see.”

As the frequency increases the beamwidth will become more narrow, similar to focusing the beam of a flashlight. As you adjust the lens, the beam of light focuses and covers a smaller area, delivering more energy on-target. This is more a function of the design of the transducer rather than an inherent property of frequency.

Remember that the lower frequency wavelengths “see” deeper in the water column than higher frequency wavelengths, and so a boost in power is not always necessary to detect fish in deeper water. The lower in frequency that you go, the deeper the echo sounder will see for the same amount of power. You can also increase the fish finders detection

range in all frequencies by using a narrower beam transducer. A narrow beam delivers more energy on-target, resulting in stronger echoes, improved target resolution, and the ability to “see” in deeper water.



This image demonstrates the difference in beamwidth of 50kHz and 200kHz. In this example, the wider 50kHz beam will show returns for fish that the narrow 200kHz beam would have missed.

Sidelobes

The image to the right illustrates a typical beam pattern. It is a graphic representation of the pattern the acoustic energy takes as it radiates from the transducer. The center cone represents the energy within the -3db down points, what is referred to as the Mainlobe, and is the focus of the transducers energy. In this image we can see that not all of the energy is concentrated within the Mainlobe. Some of the acoustic energy spills out to the sides in what are referred to as Sidelobes, areas outside of the main beam in which a small level of energy is radiated. Since this energy is capable of producing return echoes from objects it encounters, it is possible to receive weak returns from the Sidelobes in shallow water.



Target Masking

Target masking is a phenomenon where acoustic energy from the transducer encounters a ledge which is only partially within the beam. This produces an echo which is sent back to the transducer sooner than the echo returned by either the sea bottom or fish targets. The result is that these fish targets will not be discernible on the fish finder screen. This phenomenon can occur with trenches as well as when traveling over sloping ground.

It is also possible to pick up a second echo from the sea bed, which will show as an echo on the screen at a greater depth than that of the ledge.



Interference

When two or more echo sounders are operating in close proximity and at the same frequency, it is possible for each to receive false returns from the others transducer. In such cases the operator will see noise and clutter, false returns, multiple bottoms or other video anomalies on the screen. This is most common in and around marinas or harbors where there may be multiple fish finders operating at the same frequencies. Furuno fish finders have interference rejection circuitry which should be used in such instances, but use it sparingly to avoid eliminating small targets. Many boaters have found that adding a Furuno Smart Sensor, operating at 235kHz, will ensure a reliable numeric value for depth when their 50/200kHz fish finder suffers from interference.



Mounting Options

Selecting the mounting location

Although it falls outside the scope of this guide to describe all of the details of installation, there are some important points that are true for every transducer installation. Acoustic noise is always present, and these sound waves can interfere with your transducers operation. Ambient (background) noise from sources such as waves, fish and other vessels cannot be controlled. However, carefully selecting your transducers mounting location can minimize the effect of vessel-generated noise from the propeller(s) and shaft(s), other machinery, and other fish finders. The lower the noise level, the higher the gain setting you'll be able to use effectively on your fish finder.

Always select a location where:

- Water flowing across the hull is smoothest with a minimum of turbulence and bubbles
- The transducer will be continuously immersed in water (not applicable for In-Hull models)
- There is a minimum of deadrise angle
- The transducer beam will not be obstructed by the keel or propeller shaft(s)
- There is adequate headroom inside the vessel for the height of the housing, tightening the nuts, and removing the valve assembly and insert

As a rule, no transducer should be located near a water intake or discharge opening, directly aft of any lifting strakes, steps or other obstructions or irregularities in the hull, or behind eroding paint (an indication of turbulence). The flow of water across the transducer face must be as smooth as possible in order to get the best performance while cruising.

Fairing blocks

The purpose of a fairing block is threefold: to compensate for the deadrise of the hull, to reduce drag, and to create a smooth surface for water to flow cleanly and unaerated across the face of the transducer. When a fairing block is correctly installed, boat drag will be minimized and the flow of water over the transducer face will be free of bubbles and turbulence.

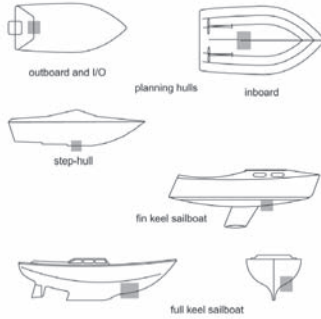
A standard fairing is of a similar shape to its companion transducer. By contrast, a High Performance fairing projects a longer, more streamlined form. This elongated wedge shape cuts the water into two streams which flow along its sides towards the tapered end, where they will smoothly rejoin. The result of a well-installed fairing is excellent fish finder performance above 15 knots.

After the fairing is cut, it must be shaped to the hull as precisely as possible with a rasp or power tool. A tight fit will allow water to flow more smoothly over the transducer. If the transducer is recessed more than 0.5 mm (1/64th inch) inside the fairing, you should either shim the transducer or carefully file or sand the fairing until the two are flush.



Through Hull

Through-hull transducers require that a hole is cut in the hull, so their installation is more involved than a relatively simple transom mount. They are also more difficult to access for periodic cleaning, which they may require more often than a typical transom mount transducer. Owners of trailerable boats with through-hull transducers must be careful not to damage it when launching or loading the boat.

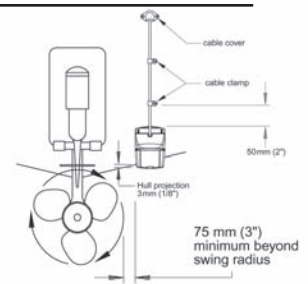


To keep the transducer facing squarely downward into the water column, a fairing block must be used. The fairing block is installed parallel to the flow of water to ensure proper boat handling, and this will not necessarily be the same from hull to hull.

A fair amount of skill is required to achieve a proper through-hull installation. If in doubt, don't go it alone - consult your local Furuno dealer for assistance.

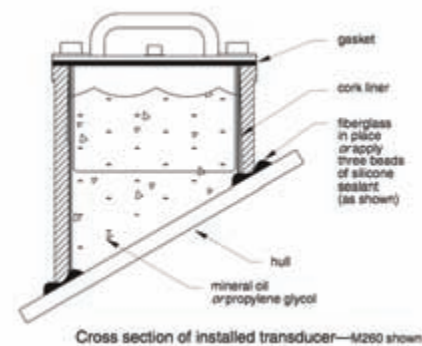
Transom Mount

Transom mounting is the simplest method of transducer installation and is most common among smaller boats. The transducer is installed on the transom, slightly below the waterline. The transducer face should be at a slight angle forward so as to reduce the effects of turbulence and aerated water.



In-Hull or Shoot-Through

A third option when mounting your transducer is referred to as an in-hull, or shoot-through installation. An in-hull transducer is mounted on the inside of the hull. The transducer signal 'shoots through' the fiberglass and so the hull does not require a hole cut in it, although certain hull types may need to be bored out to remove any flotation material. When properly installed the effects of turbulence and aerated water are minimized. Because the transducer face does not touch water, there is no real maintenance involved with an in-hull transducer. These are compelling arguments for shoot-through installations.



These benefits do not come without a price, and that price is performance. The signal *will* experience loss when shooting through the hull material. This means that the performance of your fish finder will suffer. Most modern in-hull transducers are designed to compensate for this loss.

Boats with wood, aluminum or steel hulls will not be able to use in-hull transducers, as these materials act as a very effective barrier against the acoustic signal. Sound waves simply will not propagate through these materials. Only fiberglass boats, with no flotation core, can utilize an in-hull transducer. Fiberglass boats with foam or balsa cores or those with air pockets will need to be 'dug out' so that the face of the transducer touches the fiberglass. This can make installing an in-hull transducer a tricky proposition.

Getting the most out of your Fish Finder

Standard vs. High Performance

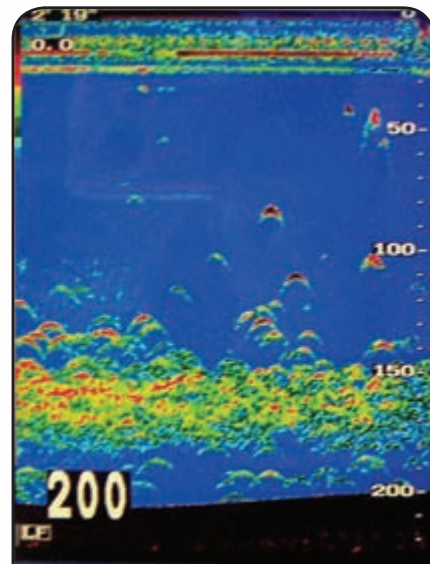
When you purchased your fish finder you made an investment, and to get the most out of that investment you will need to match it with the right transducer. Once you've selected your mounting method (In Hull, Through Hull or Transom Mount), you will need to select the right transducer. The best transducer for your needs will depend on a number of variables but there are some constants that should be considered and we'll go over those now.

Most standard transducers are designed for recreational fish finders and generally have a single element that resonates alternately at 50 and 200 kHz. Although these transducers are effective and inexpensive, greater performance can be had by matching your recreational fish finder with a high-performance transducer. These transducers are rated for a greater power output and contain an array of 50kHz elements along with one or more large-diameter 200kHz elements. An array of 50kHz elements allows for a very tight beam pattern, meaning there will be more energy on-target to produce return echoes. Also, the greater surface area of this array makes the transducer more sensitive to return echoes, enabling greater target resolution on the screen. The same is true of having one large, dedicated 200kHz element - its tighter beamwidth and greater sensitivity create a better performing transducer at all power outputs.

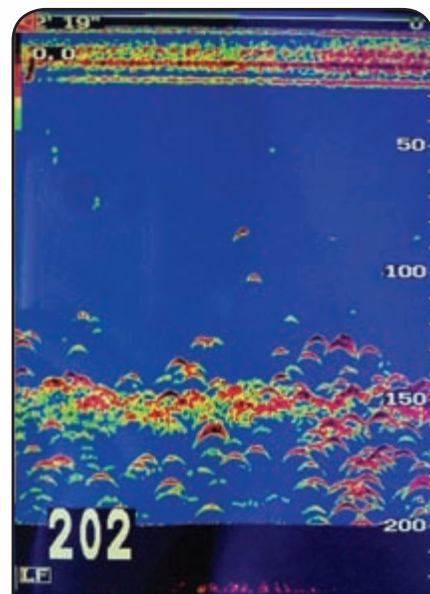
For example, a typical recreational fish finder will output 600 watts of energy and is designed to function with a matching transducer rated at 600 watts. Pairing this fish finder with a high-performance transducer rated at 1,000 watts will drastically improve the performance of your fish finder.



Smart Sensors connect directly to a variety of Furuno equipment, enabling you to upgrade your transducer without sacrificing speed and temperature information.



Above is an actual screen shot of a 600 watt Furuno sounder utilizing the 525ST-MSD, a standard 50/200kHz transducer.



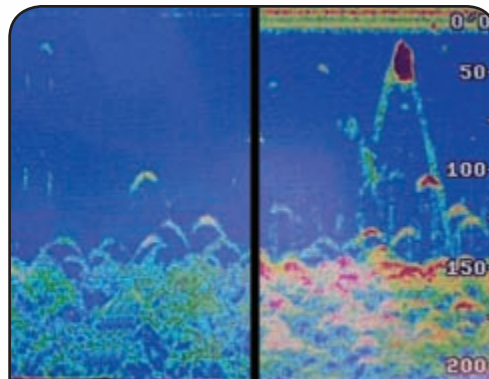
Here is the same 600 watt sounder utilizing the 525T-HDD high performance transducer. The darker color illustrates the enhanced sensitivity available for most sounders.

Output wattage and performance

Higher output power equates to greater depth range, as well as stronger returns on your fish finder screen. The actual depths you can reach with your fish finder will vary depending on a number of factors including salinity, temperature and frequency as well as the quality of the transducer. The following maximum depths are general guidelines:

100W = 400' Max Depth
200W = 500' Max Depth
300W = 600' Max Depth
600W = 800' - 1200' Max Depth
1KW = 1800' - 2500' Max Depth
2KW = 2500' - 4000' Max Depth

As we can see in the image at right, your fish finder can benefit from being matched to a transducer rated for a higher output wattage, but remember that the output wattage must always be less than or equal to the wattage of the transducer. If the echosounder has more output wattage than the transducer is capable of handling, the transducer will be damaged.



Notice the difference in returns between the 600 watt output (left, with 525ST-MSD) and 1,000 watt output (right, with 525T-HDD) from the GP7000F fish finder.

When to use a matching box

Most recreational fish finders have a single connection for your transducer. Because a standard transducer contains one vibrating element that alternates transmission frequency across a single line, only one line is required to send the electrical signal from the fish finder to the transducer and back. Multiple-element transducers always have separate signals for each frequency, and so some high-performance transducers come with a device called a diplexer installed inside the housing. A diplexer takes the electrical signal from the fish finder and distributes it to the individual 50/200kHz arrays. It then combines the returning 50/200kHz signals so that they can be transmitted together across a single line. The result is a high-performance transducer that is able to connect directly to a recreational fish finder, and one that will outperform a standard transducer matched to an identical fish finder.

Not all high-performance transducers contain an internal diplexer. Matching a high-performance transducer and a recreational fish finder will sometimes require a diplexer-like device called a matching box. This is a simple device that separates and recombines the electrical signal. The result is a lower-wattage recreational fish finder capable of operating with the sensitivity and resolution of a more powerful commercial machine.



Broadband Technology

“Broadband” is a term used to describe a method for increasing the available bandwidth (range of frequency) of a transducer element without lessening performance. Increased bandwidth allows for the faster rise and fall times of the acoustic pulse, the by product of which is referred to as ring. This decreased ringing presents a much crisper image on the fish finder screen, allowing for better discrimination of individual bait fish as well as an increase in the ability of the fish finder to differentiate between the sea floor and fish suspended very near to the bottom. Currently, Broadband technology is available in select transducers, in the 200kHz frequency only.

Transducers - 50/200kHz

Transducer Part number	Power Rating	Beam Angle	Housing Type	Plug Type	Mount Type	Cable Length	Temp	Fairing Block	Compatible Models
Dual Frequency 50 & 200 kHz									
520-5MSD	600W	46/10	Bronze	10 Pin	TH	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
520-5PSD	600W	46/10	Plastic	10 Pin	TH	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
520-5PWD	600W	46/10	Plastic	10 Pin	TM	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
520-BLD	600W	45/12	Bronze	10 Pin	TH-LP	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
520-IHD†	600W	45/11	Plastic	10 Pin	IH	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
520-PLD	600W	45/12	Plastic	10 Pin	TH-LP	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
525T-BHD	1KW	50 = 3x5 200 = 15x21	Bronze	10 Pin	TH	10 M	YES	AIR-033-523**	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
525T-BSD	600W	45/12	Bronze	10 Pin	TH	10 M	YES	AIR-033-351 AIR-033-352**	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
525T-LTD/12	600W	45/12 Tilted Element	Bronze	10 Pin	TH-LP	10 M	YES		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
525T-LTD/20	600W	45/12 Tilted Element	Bronze	10 Pin	TH-LP	10 M	YES		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
555-SLD	600W	45/12	SS	10 Pin	TH-LP	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
CA50/200-12M *	1KW	28/8.5	Bronze	NC	TH	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
CA50/200-1T *	1KW	28/8.5	Rubber	NC	C, H, T	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
526T-HDD **, ***	1KW	19/6	Bronze	10 Pin	TH	10 M	YES	AIR-033-391**	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
526T-HDN **, ***	1KW	19/6	Bronze	NC	TH	10 M	YES	AIR-033-391**	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
525T-TMD	1KW	19/6	Urethane	10 Pin	TM	10 M	YES		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
527-IHD ***	1KW	19/6	In Hull	10 Pin	IH	10 M	NO		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
526-IHN ***	1KW	19/6	In Hull	NC	IH	10 M	NO		BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
556T-HDD **, ***	1KW	19/6	SS/Urethane Broadband	10 Pin	TH	10 M	YES	(TBA, included)	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
555T-HDN **	1KW	19/6	SS	NC	TH	10 M	YES	(TBA, included)	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50/200T-R99	2KW	50 = 8x17 200 = 5	Epoxy	NC	TH	10 M	Yes		BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50/200-R199	2KW	50 = 8x17 200 = 5	Epoxy	NC	IH	10 M	NO		BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500

* Must connect to MB100 to use with: BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's

** High Performance Fairing Block included; *** Broadband Transducer (200 kHz function only); † Includes connector for optional Speed/Temp

Legend: W=Watts, KW = Kilowatts, SS = Stainless Steel, NC = No Connector, TH - Thru Hull, TM = Transom Mount, IH = In Hull, LP = Low Profile,

Transducers - 50 or 200 kHz

Transducer Part number	Power Rating	Beam Angle	Housing Type	Plug Type	Mount Type	Cable Length	Temp	Speed	Compatible Models
Single Frequency, High Power 200 kHz									
CA200B-5	1KW	8,5	Bronze	NC	TH	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA200B-5S	1KW	8,5	Rubber	NC	C, H, T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA200B-8B	2KW	5,5	Rubber	NC	C, H, T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA200B-82M	2KW	5,5	Bronze	NC	TH	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
Single Frequency, High Power 50 KHz									
CA50B-6B	1KW	28	Rubber	NC	C, H, T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50B-9B	1KW	12 X 28	Rubber	NC	C, H, T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50B-92M	1KW	12 X 28	Bronze	NC	TH	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50B-12	2KW	12 X 12	Rubber	NC	T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50BL-12	2KW	18,5 X 25	Rubber	NC	T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50F-24H	3KW	9 X 13	Rubber	NC	T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA50BL-24H	3KW	13 X 19	Rubber	NC	T	50 Feet	NO	NO	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500



R199 In-Hull

Transducers - Other frequencies

Although the vast majority of fish finders operate at the 50/200kHz, there are many other frequencies available that are utilized almost exclusively in commercial applications. These include 15, 28, 33, 38, 40, 88 and 107kHz. The following is a list of Furuno transducers that operate within these frequencies.

Commercial transducers such as these are generally mounted in tanks or sea chests that are custom-built into the ships hull. Some transducers are designed exclusively for use with Net Sounders, while others are used by commercial fishermen or other high seas vessels that require the most reliable depth sounders available.

Transducer Part number	Frequency	Power Rating	Beam Angle	Housing Type	Plug Type	Mount Type	Cable Length	Compatible Models
CA15F-10	15kHz	2kW	22 x 34	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA15F-4S	15kHz	1kW	28 x 46	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CV102	24 kHz	10kW	9 x 10	Rubber Coated	NP	Tank	30 Meter	FCV10
CA28-B260	28kHz	1kW	24 x 39	Bronz3	NP	TH	10 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28BL-6HR	28kHz	2kW	22 x 32	FRP	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28BL-12HR	28kHz	3kW	16 x 21.5	FRP	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28F-18	28kHz	2kW	17 x 18	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28F-24H	28kHz	3kW	18 x 24	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28F-38M	28kHz	5kW	14	Rubber Coated	NP	Tank	30 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28f-72	28kHz	10kW	12 x 16	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA28F-8	28kHz	1kW	31 x 34	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA33B-6	33kHz	Net Sounder Use Only		Rubber Coated	NP	Tank	30 Meter	Net Sounder Use Only
CA38BL-9HR	38kHz	2kW	20.5 x 20.5	FRP	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA38BL-15HR	38kHz	3kW	12.5 x 21	FRP	NP	Tank	15 Meter	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
CA40B-6B	40kHz	Net Sounder Use Only		Rubber Coated	NP	Tank	30 Meter	Net Sounder Use Only
CA88F-126H	88kHz	5kW	4 x 5	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA88B-10	88kHz	2kW	8	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA88B-8	88kHz	1kW	11	Rubber Coated	NP	Tank	15 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500
CA100B-10R	107kHz	3kW	8 x 13	Rubber Coated	NP	Tank	10 Meter	BBFF3, FCV292, FCV1100, FCV1200, FCV1200BB, FCV1500

Multi Sensors - 50/200kHz

Furuno offers a wide selection of multi sensors for use with our recreational fish finders. Multi sensors, also referred to as triducers, combine standard 50/200 kHz transducers with speed and temperature functions into a single package. The benefit of having a multi sensor is ease of installation, since there is only one unit to be installed that provides depth, speed and temperature functions. Furuno offers a variety of multi sensors that are cost-effective and very efficient for most recreational applications.

Transducer Part number	Power Rating	Beam Angle	Housing Type	Plug Type	Mount Type	Cable Length	Temp	Speed	Fairing Block	Compatible Models
Dual Frequency 200 & 50 kHz Multi Sensors										
525ST-PWD	600W	45/11	Plastic	10 Pin	TM	10 M	YES	YES		BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
525ST-MSD	600W	45/12	Bronze	10 Pin	TH	10 M	YES	YES	AIR-033-428 AIR-033-476** (HSFB included)	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's
525ST-MSD7	600W	45/12	Bronze 7" Stem	10 Pin	TH	10 M	YES	YES	AIR-033-080**	BBFF1, LS4100, LS6100, FCV620, FCV585, GP1650F's, GP1850F's



525ST-PWD



525ST-MSD



525ST-MSD7

Speed & Temp Sensors

Furuno speed and temperature sensors offer highly accurate data for your fish finder or digital temperature display. Unlike Smart Sensors, these sensors require a connection to specific equipment, either as an insert for a matching transducer or as a component of a dedicated system, such as the T-2000 Digital Temperature Display.

Model	Functions	Housing Style
ST-01PTB	Speed and Temperature (+/- 1 degree)	S63 Plastic Clip On (requires Transom Mount Bracket, part # AIR-020-058)
ST-02MSB	Speed and Temperature (+/- 1 degree)	B17 Bronze Thru-Hull
ST-02PSB	Speed and Temperature (+/- 1 degree)	P17 Plastic Thru-Hull
CAT2000/TH	Temperature (+/- 1 degree)	Bronze Thru-Hull



ST-01PTB



ST-02-MSB



ST-02PSB



CAT2000-TH

Smart Sensors

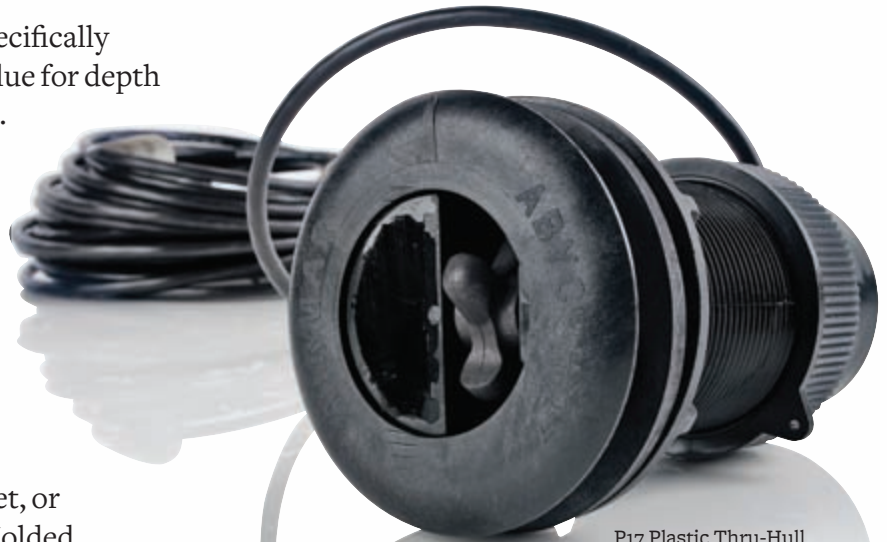
If you are looking for a solution to show you precision depth in water as shallow as 2 feet and temperature changes as minute as 2/100^{ths} of a degree, then the Furuno Smart Sensor is the answer.

What is a Smart Sensor

Furuno Smart Sensors are transducers specifically designed to give an accurate numerical value for depth instead of drawing an image on the screen.

Smart Sensors are available in a variety of housing styles and can be transom or thru-hull mounted on the vessel. Processing of the return echoes is accomplished by circuitry within the transducer housing and the information is then output as NMEA0183 information - electronic text that can be interpreted and displayed by a variety of Furuno electronics such as GPS, chart plotters, NavNet, or our popular RD30 NMEA data repeater. Molded, waterproof 7-pin connectors connect directly to these and many other Furuno products.

In addition to incredibly accurate depth readings in water as shallow as 2 feet, some Smart Sensors offer a surface water temperature function with a tolerance of +/-1 degree. For those who require even greater accuracy, there are precision models available that are able to sense temperature changes as minute as 2/100^{ths} of a degree.



P17 Plastic Thru-Hull

Model	Functions	Housing Style
235DT-PSE	Depth and Temperature (+/- 1 degree)	P17 Plastic Thru-Hull
235DST-PSE	Depth, Speed and Temperature (+/- 1 degree)	P17 Plastic Thru-Hull
235DT-MSE	Depth and Temperature (+/- 1 degree)	B17 Bronze Thru-Hull
235DST-MSE	Depth, Speed and Temperature (+/- 1 degree)	B17 Bronze Thru-Hull
235DHT-MSE	Depth and Precision Temperature (+/- 0.02 degree)	B17 Bronze Thru Hull
235DHT-LMSE	Depth and Precision Temperature (+/- 0.02 degree)	B122 7" Bronze Thru Hull
235DST-PWE	Depth, Speed and Temperature (+/- 1 degree)	P66 Plastic Transom Mount

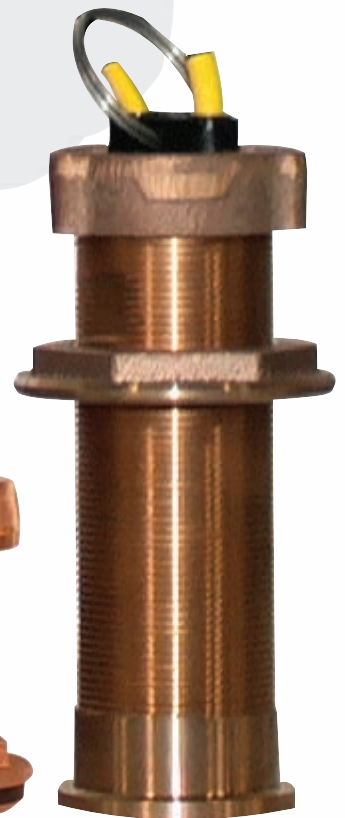


P66 Plastic Transom Mount

All Smart Sensors operate at 235 kHz, so they will never interfere with your fish finder's performance.



B17 Bronze Thru-Hull



B122 7" Bronze Thru-Hull

Transducer FAQ's

We've gathered a list of some of the most frequently asked questions about transducers and provided the answers in this section. If you have a question that is not answered in this book, you can visit us on the web at www.Furuno.com and click on Support. You can browse through answers to questions, or search for your answer by model, topic or keyword. If you can't find the answer you're looking for, you can send an Email directly from our web site to our technical support staff. A knowledgeable technician will respond with your answer, generally within 48 hours.

Q: My transducer needs to be cleaned frequently. Is there any type of paint I can use to prevent barnacles, algae and marine growth from fouling it?

A: There are several manufacturers of anti-fouling marine paint. These paints are available from marine supply stores. Furuno recommends spray-on Transducer Paint from Pettit Paints .
(www.PettitPaint.com)

Q: Do I need a backing block inside the hull?

A: Yes, you do need a backing block. After the fairing block is cut, the remaining section becomes the backing block, which provides a level surface for tightening the nuts.

Q: I have a transom mount transducer with my sounder. It works, but I know the readings are often wrong.

A: The location of the transducer is the most important factor for a successful installation. You can check to see if the transducers location is optimal by performing the following test on the water.

Become familiar with your sounder's performance at a speed of 4kn (5MPH). Gradually increase the boat speed and watch the gradual decline in performance. If the decline is sudden (not gradual), identify the boat speed at which the onset occurred. Return the boat to this speed. Then gradually increase speed while making moderate turns in both directions. Note if the performance improves while the boat is turning toward the transducer side. If so, the transducer is probably in aerated water or coming out of the water. You probably need to adjust the transducer's position.

Try the following, one at a time in the order given:

- Increase the transducer's angle in the water. A transducer works better with the trailing edge sitting lower than the leading edge. When the back of the sensor is tilted downward, water pushes against the face of the transducer. In the case of a multisensor, a downward tilt ensures that the paddlewheel also stays in contact with the water. You may need to add a plastic shim to obtain a sufficient angle.
- Move the transducer deeper into the water in increments of 1/8 inch (3mm).
- On boats capable of speeds above 40 MPH (35kn), move the transducer up on the transom in increments of 1/8 inch (3mm).
- If all else fails, move the transducer closer to the centerline of the boat. Repair unused screw holes.

Q: What type of housing should I choose for my transducer?

A: The type of housing you select depends on the hull where it will be installed:

- A plastic housing is recommended for fiberglass or metal hulls only. Never install a plastic thru-hull sensor in a wood hull, since swelling of the wood may overstress the plastic and cause a fracture.
- A bronze housing is recommended for fiberglass or wood hulls only. Never install a bronze housing in a metal hull, because electrolytic corrosion will occur.
- A stainless steel housing is recommended for metal hulls to prevent electrolytic corrosion.
- Never install a metal housing in a vessel with a positive ground system.

Transducer FAQ's

continued ...

Q: What is the best place to install a transducer on my hull?

A: It is different for each style hull, however there are general guidelines. Choose a location where:

- The water flowing across the hull is smoothest with a minimum amount of bubbles and turbulence (especially at high speeds)
- The transducer will be in contact with the water continuously
- There is minimum of vessel generated “noise” from engines, generators, gears, and pumps
- There is minimum deadrise angle
- The transducer beam is not blocked by the keel or propeller shaft(s)
- There is adequate headroom inside the vessel for the height of the housing and tightening the nut(s)

Do not mount the transducer in an area of turbulence or bubbles. There is often turbulence near water intake or discharge openings and behind strakes, fittings, or hull irregularities. Do not install behind eroding paint, because it is an indication of turbulence.

Q: What is the relationship between the output wattage of the echosounder and the performance of the transducer?

A: This is similar to an amplifier and a speaker relationship. The echosounder output wattage must always be less than or equal to the wattage of the transducer. If the echosounder has more output wattage than the transducer is capable of, the transducer will become damaged.

As far as results are concerned, higher output power equates to greater depth range.

Typically:

600W = 800' - 1200' Max Depth

1KW = 1800' - 2500' Max Depth

2KW = 2500' - 4000' Max Depth

Other factors such as frequency and element/s used also affect maximum depth capability.

Q: Can transom mount transducers be installed on either the starboard side or port side of the boat?

A: We recommend mounting a transom mount transducer on the starboard side on single drive boats. The location should be a minimum of 3” from swing radius of the propeller. Starboard mounting assures minimal aeration from the turbulence of the propellers, which can degrade performance.

Q: What is the best type of transducer mounting for a stepped hull?

A: Choose a thru hull transducer. The steps on the underside of the hull create a lot of aeration. For a transducer to work, it must be mounted just in front of the first step before the source of aeration.

Note: A transom mount transducer should never be installed on a stepped hull. When mounted on the transom, the transducer receives all of the aerated water generated by the step(s). A transom mount will perform poorly above 9-12 MPH (8-10kn).

Q: What is a high performance fairing?

A: A high-performance fairing improves both a sounder's and a boat's performance when traveling at speeds above 17MPH (15kn). A high-performance fairing is much longer than its companion transducer. The elongated streamlined shape cuts smoothly through the water. The results are less aerated water flowing across the transducer's face and less boat drag.

Q: What is the right transducer for a metal hull?

A: Two different metals in contact with each other in water allow electricity to flow between them. The resulting decomposition is known as electrolytic corrosion. A plastic transducer housing is the best choice for small aluminum vessels, such as bass boats and runabouts. For larger metal hulls [above 25 feet (8m)], we recommend using a stainless steel housing. However, it must be isolated from the metal hull with a plastic sleeve to prevent electrolytic corrosion. A bedding compound alone will not ensure that electrolytic corrosion is prevented.

A metal transducer must be isolated from a metal hull to avoid electrolytic corrosion that will cause the transducer, propeller and/or hull to decompose. After installation, check that the vessel's bonding or grounding system is working. Be sure the anodes are sufficient and in good condition. To verify that your transducer housing is properly isolated from your metal hull, use an ohm meter. Connect one lead of the meter to a spot on the hull that is bare metal - not painted. Connect the second lead to the metal transducer housing-again bare metal. Check several spots for readings. If the ohm meter measures a low resistance, the transducer housing is not sufficiently isolated, and the isolation procedure needs to be repeated.

Q: What type of liquid do I use to fill my in-hull base/tank?

A: Mineral oil or castor oil should be used to fill an in-hull base/tank. These are thick liquids making them less prone to aeration. They do not evaporate as quickly as water and can also handle high power levels. We have also recently approved non-toxic antifreeze/coolant (propylene glycol) as an adequate solution to fill an in-hull base/tank. This solution is preferred on installations where the base/tank is installed with silicone.

Q: Will a fairing affect the performance and top-speed of my boat?

A: The size of the transducer will have some affect on the top-speed of the boat. However if you use a high-performance fairing, the loss will be minimal. Some people report a decrease of one or two knots. Generally, a 30 foot (10m) or longer boat will see almost no speed loss.

Q: Can I cut my transducer cable?

A: Yes, the transducer cable can be cut. However, if the transducer came with a connector do not cut it off. The molded on connector is waterproof. You need to cut and splice the cable away from the connector using Airmar's splash-proof Junction Box. The connections will not corrode and the strain relief grommets are water resistant and have excellent cable retention. Please note that cutting the cable or removing the connector, except when using Airmar's junction box, will void the sensor warranty. You can buy a junction box and splice kit from Gem Electronics.

Gem Electronics

Phone: 843-394-3565 Fax: 843-394-3736.

Q: Why does my depth sounder fail when I reach moderate speed?

A: If a sounder works fine at slow speeds but gradually loses the bottom as the vessels speed increases, it is an indication that aerated water is flowing over the transducer. Rather than relocate a thru-hull transducer, try installing it with a high-performance fairing. High-performance fairings are designed to improve a sounder's performance at speeds above 17MPH (15kn). It is much longer than its companion transducer. The elongated streamlined shape cuts smoothly through the water, so there is less aerated water flowing over the transducer's face.

Q: Is there an easy way to determine the bottom coverage of my transducer?

A: Visit our web site at www.Furuno.com and go to **Products - Transducers**. Enter your transducer's beam angle and any depth into our Transducer Beam Angle Calculator, and it will instantly generate for you an accurate number for bottom coverage.

Definitions

Acoustic: Relating to sound and sound waves.

Acoustic Property: The ability of a material to carry sound through it.

Acoustic Window: That part of the transducer through which the ultrasonic vibrations from the piezoceramic assembly travel to water.

Air Bladder: An organ in a fish which allows it to adjust to changes in water pressure at different depths.

Amplitude: The degree of intensity (pressure) of a sound wave. If we could hear the sound wave, amplitude would be its 'loudness.'

Array: A series of elements in a transducer.

Beamwidth: The diameter of a circle in which 50%-70% of the sound waves emitted by the transducer are concentrated.

Cone Angle: The measurement of beamwidth in degrees. indicates how large an area is covered by a transducer's soundbeam.

dB: Abbreviation for decibel, a unit for measuring the power of a sound wave.

Echosounder: An instrument comprised of a display screen and electronic circuitry used to interpret information from the transducer and display it in a readable format.

Frequency: The number of complete cycles or vibrations that occur within a specific time frame, typically one second. Usually measured in Hertz.

Hertz: A measure of one cycle or complete vibration per second.

In-Hull: The method of installing a transducer by attaching it to the inside of the hull.

Multisensor: A combination of three sensing devices (depth, speed and temperature) in a single housing.

Phased Array: A series of piezoceramic elements in a transducer, typically wired to allow them to fire in time delayed sequence so the echosounder can electronically steer the array.

Piezoceramic Element: A material made of crystals with positive and negative charges.

Resolution: The sounders ability to show fine detail and to discriminate between individual objects.

Sidelobes: Portion of the acoustic image that lies outside of the main sound beam.

Sonar: Derived from the words Sound Navigation and Ranging. An apparatus that uses reflected sound waves to detect and locate objects underwater.

Thru-Hull: A method for installing a transducer through a hole in the hull.

Transducer: A device that changes electrical energy to acoustic energy and back again.

Transom Mount: A method of installing a transducer on the back (transom) of the boat.

Ultrasonic: Sound waves of high frequency (above 20,000 Hertz) that cannot be heard by humans.



Additional Resources



www.Furuno.com:

Visit our web site at www.Furuno.com for the most up-to-date information on the entire line of Furuno products. Have a question that needs an answer? Click on support and browse through our extensive library of frequently asked questions. You can also ask our knowledgeable Technical Support staff a question and receive an answer via e-mail.



www.Airmar.com:

AIRMAR Technology Corporation is the leading manufacturer and OEM supplier of marine transducers, sensors, and instruments for the recreational and professional markets. Visit the Airmar web site at www.Airmar.com if you are looking for technical data or detailed specifications for a wide variety of transducers and smart sensors.



Authorized Furuno Dealers:

Your local Furuno dealer is perhaps your most valuable resource when it comes to answering questions about the electronics that are right for you. To find your nearest Furuno dealer, simply go to our web site at www.Furuno.com and click on Dealer Locator. Enter in your zip code and you will receive a complete list of Furuno dealers in your area.



After 35 years of awards, how can our Fishfinders get any better?

Go digital with Furuno and find out!



NEW! FCV585 - 1kW OR 600W
DUAL-FREQUENCY 50/200 KHZ
8.4" SUNLIGHT VIEWABLE LCD



NEW! FCV620 - 600W
DUAL-FREQUENCY 50/200 KHZ
5.6" SUNLIGHT VIEWABLE LCD

CATCH EVEN MORE FISH WITH OUR NEW DSP TECHNOLOGY!

You've probably heard about digital fish finders, but aren't quite sure what the difference is. The main difference is the filtering capabilities and auto adjustments. Our new DSP (Digital Signal Processing) technology adjusts the picture by filtering out items that you don't need to see, while enhancing the fish targets! But even the best digital filter won't help unless you start with a solid base, such as Furuno's renowned fish finder technology. Anyone who knows fishing will tell you that if you want the best fish finder, you need to go with Furuno. You'll wonder how you ever managed without it!

RADAR FISH FINDERS SONAR NAVIGATION COMMUNICATION AUTOPILOTS SOFTWARE

www.Furuno.com

FURUNO[®]
The most trusted name in marine electronics!