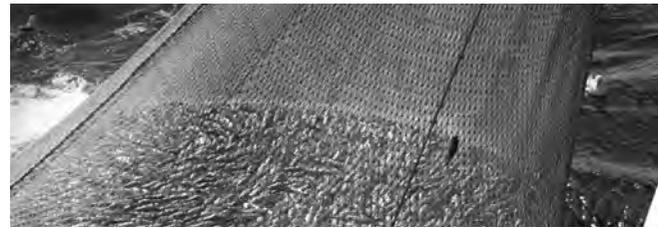


SIMRAD

General Catalog

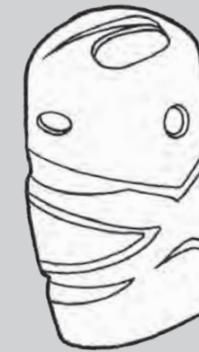
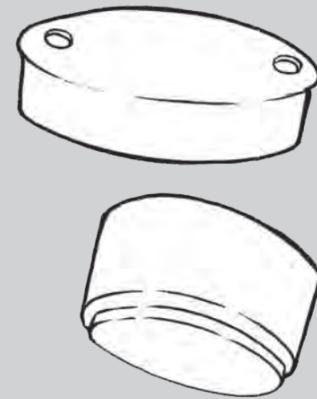
FISHERY PRODUCTS



TECHNOLOGY FOR SUSTAINABLE FISHERIES

TRANSDUCERS

Transducers are the core of all of SIMRAD products. Naturally, a transducer is a part of an echosounder, an important part, but it is also in all of our other products too, sonars, sensors, hydrophones, etc. Because of this SIMRAD designs and produces our own transducers in order to secure the best performance in all our products.

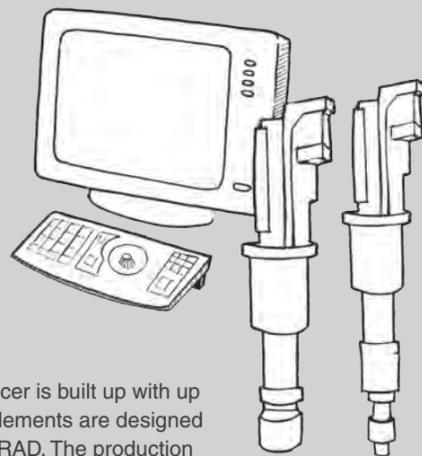
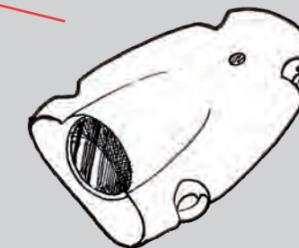


PX MULTISENSOR

Wireless trawl sensors communicate acoustically to the vessel and between sensors. To be able to do this a transducer is needed to convert electrical signals into acoustic signals and vice versa. Small transducers in various frequencies are then placed inside the net sensor. Also, under the vessel a hydrophone is placed to be able to communicate with the sensor. A hydrophone is only listening for echo, it is not transmitting anything.

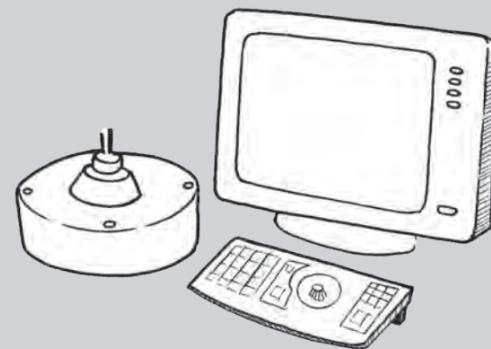
PI SENSOR

The PI Sensor is a single function sensor that communicates wireless to the vessel. The PI Sensor is the toughest sensor on the market and is rated for depth down to 1800 m. The PI Sensor communicates through a hydrophone (only listening) that is mounted below the vessel. The communication distance is more than 2000 m. The PI Sensor comes in various configurations including Seine Sounder, Depth, Catch and temperature.



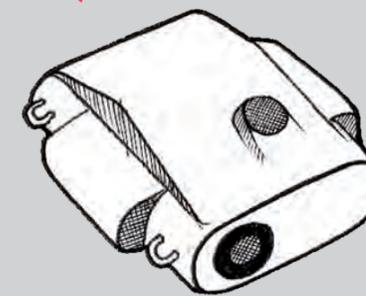
SONARS

In sonars, the transducer is built up with up to 480 elements. All elements are designed and produced by SIMRAD. The production of a sonar transducer is complex and takes about 3 days to make. Each of the elements is then connected by cable to the transceiver.



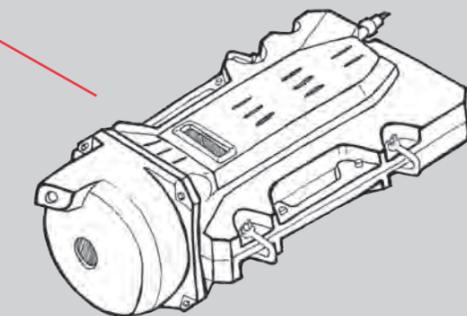
ECHOSOUNDERS

A good transducer makes a good echosounder. SIMRAD produces a variety of transducers spanning from 12 kHz to 333 kHz, Single and Split Beam and for commercial fishery and fishery research. SIMRAD uses only ceramics and composite material in our transducers and the production is done using the latest in ceramic cutting machines and production facility.



ITI SENSOR

Wireless trawl sensors communicate acoustically to the vessel and between sensors. To be able to do this a transducer is needed to convert electrical signals into acoustic signals and vice versa. Small transducers in various frequencies are then placed inside the net sensor. Also, under the vessel a transducer is placed to be able to communicate with the sensor. The ITI System can position each sensor in Lat/Long. To do this it needs a Split Beam transducer under the vessel.



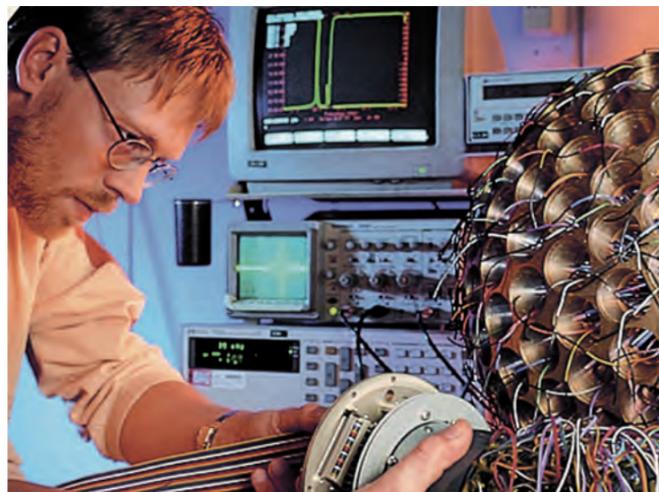
TRAWL SONARS

Third wire system giving real time information of the trawl opening. SIMRAD invented the third wire trawl sonar back in the 80's and is today a vital tool for all pelagic and semi pelagic trawlers. SIMRAD has both scanning trawl sonars and multibeam real time trawl sonars. A trawl sonar is monitoring the opening of the net giving information about fish entry and trawl behaviour. Of course this too has a SIMRAD transducer inside!



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SIMRAD

MORE THAN 65 YEARS OF INNOVATION

SIMRAD's slogan is "Technology for sustainable fisheries" and we live by this slogan every day. SIMRAD believes that a sustainable fishery worldwide is the only right way to survive. By sustainable we mean a healthy take out of the world fish stocks as well as an efficient and profitable fishery for the fisherman. SIMRAD believes that technology is an important factor to achieve this. Products that we believe have contributed to a sustainable fishery are Echosounders with a Split Beam technology: this makes it possible to catch the right size fish. Catch monitoring instruments: this will reduce the impact of a trawl on the fauna, catch the right fish at the right time for better quality, catch the right species and disregard by-catch before it is taken to the surface. These and many more reasons will help obtaining a sustainable and profitable fisheries in many years to come.

Efficiency and profitability mean sustainable fishery. SIMRAD believes that an efficient fishing vessel will save the environment in many ways. One is saving fuel and therefore the CO² emission is reduced since the vessel spends less time on the sea. Efficiency is key to become profitable, however other factors are also important. Catching the right size of fish for example, will give the fisherman a better price and ensure that he is not catching small non reproductive fish, cutting off the lifeline to the future. The right species is another important factor. To be able to see what species of fish enters your trawl and to be able to guide not wanted fish out will save the environment. To be able to make an early decision of what school to catch will save the environment as the vessel will not travel more than strictly needed. All this is possible by using technology made by SIMRAD, and we will not stop here. Our goal is to always improve, in performance as well as with ground breaking technology.

PHILOSOPHY AND VALUES

A tool must work every time you need it and this is the foundation of our design work. We know, after 65 years in the same business, what it takes to make a reliable, high performance affordable tool to the fisherman.

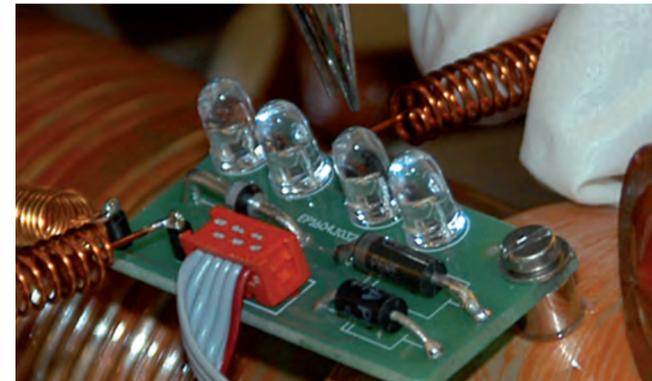
One of our defined values is innovative and this is the basic of the SIMRAD soul. We always strive to find new ways to make every day at sea easier, more profitable and sustainable. This is why SIMRAD is still in the business after more than 65 years. We understand that what we make is a tool for the fisherman, a tool to become better, more profitable and selective. For us, efficiency is the same as sustainable. We believe that if the fisherman can conduct a more selective fishery he will become more profitable. Therefore, in all we do, we have this in mind and we strive to make our product fit into this vision. An echosounder can always become better with higher resolution, more accuracy in measuring the size and the holy grail: more species identification capabilities. The same with a sonar and our sensors will also fit into this philosophy by ensuring a better control of the net, selective methods in a trawl, both size of fish and species. Our engineers, whether it is hardware, software or signal processing, work every day to find new ways to make state of the art technology available to the fisherman.



DETERMINED

We are known for our drive and persistence. We always strive to meet our customers' expectations. We set ambitious goals for ourselves and we are driven towards them with a clear and constant focus.

WHAT WE START, WE FINISH. WE DO NOT GIVE IN.



INNOVATIVE

Always performing better is a vital part of who we are. We constantly innovate and implement improvements in all parts of our business - from our products, through our processes, to our customers' experiences.

WE RELENTLESSLY PURSUE IMPROVEMENTS, NEW IDEAS AND NEW SOLUTIONS.



RELIABLE

Our customers and partners can trust SIMRAD to deliver, always. Dealing with SIMRAD means dealing with reliable people, a reliable corporation and reliable products. SIMRAD is a responsible organization characterized by integrity and concern for health, safety and the environment.

WE ARE RELIABLE PEOPLE. WE ARE RESPONSIBLE CITIZENS.



COLLABORATIVE

Collaboration is fundamental to our business. We exchange ideas among ourselves, with our suppliers and partners, and we cooperate closely with our customers. We work as teams, we share knowledge and we value team success - to the benefit of our customers and our own competitiveness.

WE COLLABORATE AS INDIVIDUALS AND AS AN ORGANIZATION.

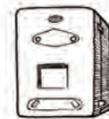


HISTORY

SIMRAD was founded in 1947 by Mr. Willy Simonsen. The name SIMRAD derives from “SIMonsen RADio” and, as the name indicates, it all started with radios. But this shortly developed into echosounders and sonars. Today SIMRAD is recognized all over the world for premium performance products and manufactures sonars, echosounders and net monitoring equipments.

The SIMRAD brand name is owned by the Kongsberg Group, a Norwegian technology company. The Kongsberg Group has a strong position in the maritime sector through its company Kongsberg Maritime (KM), where the SIMRAD brand name is sold from.

KM manufactures products like Dynamic Positioning, MRUs (Motion Reference Units), high accuracy GPS positioning systems, Engine control systems, Bridge Navigation systems as well as all the SIMRAD products.



1951
First SIMRAD Echosounder

1947
SIMRAD foundation

1957
First SIMRAD Sonar

1965
First trawl eye (FH, cable based)

1968
First sonar with hydraulic hoist (SU)



1975
First sonar with color screen and true motion display

1976
First catch sensor (FA100, “Simrad egg”)

1984
First Omni with vertical and 90° tilt on sonar (SX202)

Full digital signal processing introduced

1985
First echosounder with Split Beam (ES380)

1989
First 140dB dynamic range echosounder

First spherical sonar transducer (SR240)



1991
First trawl positioning system (ITI)

1992
First Trawl Sonar (FS3300)

1996
First multi frequency sonar (SP270)

2002
First composite transducer

2007
Fishery sonar with Hyperbolic FM technology (SX90)



2012
PX MultiSensor

2015
PX TrawlEye

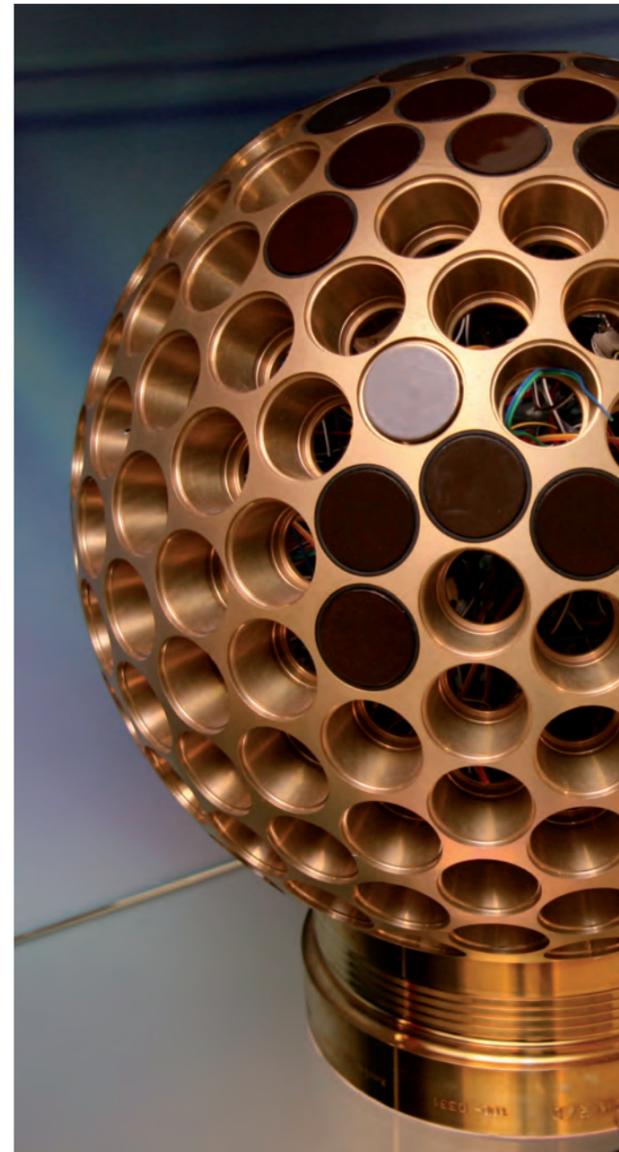
2015
Multibeam sonar (FM90)

2016
First composite sonar (SC90)

FISHFINDER TRANSDUCERS

SIMRAD is one of the very few producers of transducers. The transducer is an important part of an echosounder's performance. A transducer is the combination of a microphone and a loudspeaker, all in

one. The transducer is converting electrical energy into sound waves and vice versa. What you see on the echosounder screen is actually echoes from transmitted sound.



FROM ELECTRICITY TO SOUND

The transducers' ability to convert electrical energy into sound depends on how it is built. The better it converts, the better the transducer is (and the echosounder performs better). There are several ways to make a transducer, with different materials that can be used. Today, ceramics is the best material to use seen from a performance view. Other materials such as nickel or ferrite has a lower price but will not convert electrical energy as efficient as the more costly ceramic material. Also, the way the material has been used in the production also matters to the final performance. The latest on the scene is to produce the transducers by using a "composite" technology. The advantages are that the transducer has an efficiency of up to 75%, meaning if you put 1000w into the transducer 750w comes out into the water. The same conversion is valid when the signal comes back and it is vital for detection of weak targets even when using low powered transceivers.

Also, the transducer needs to be designed in such way that it will not ring when not wanted to. Like a church bell continues to ring after one beat, the transducer needs to shut of immediately after one ping in order not to disturb the next ping. SIMRAD's design and choice of material ensures a ring free transducer.



SINGLE BEAM, SPLIT BEAM AND WIDEBAND TRANSDUCERS

"We are at the forefront of performance through innovative design and a unique production technology"

KJELL GJESTAD
Value Chain Manager

SIMRAD makes a wide specter of transducers and hydrophones to fit various echosounders frequency and configuration. We can divide the transducers in three categories:

SINGLE BEAM TRANSDUCERS

A Single Beam transducer will give you the normal information expected from an echosounder, like a school of fish, depth to bottom, separation of target from bottom, etc. It is still a must to have a

high quality transducer to get a good picture on the echosounder. SIMRAD has many Single Beam transducers and some have a dual frequency configuration, like 50/200 kHz or 38/200 kHz.

SINGLE BEAM TRANSDUCERS					
MODEL	PART NUMBER	FREQUENCY	POWER	OPENING ANGLE	MATERIAL
38-7	KSV-082776	38 kHz	2kW	7°	Ceramic
38-9	KSV-203635	38 kHz	1,5kW	9°	Ceramic
50-7	KSV-203635	50 kHz	1kW	7°	Ceramic
120-25-E	KSV062615	120 kHz	1kW	10°	Ceramic
COMBI-D	KSV-203004	38/200 kHz	1kW	13°x21° and 7°x7°	Ceramic
COMBI-D	KSV-203005	50/200 kHz	1kW	10°x16° and 7°x7°	Ceramic
COMBI-C	KSV-202192	38/200 kHz	1kW	13°x21° and 7°x7°	Ceramic
COMBI-C	KSV-202193	50/200 kHz	1kW	10°x16° and 7°x7°	Ceramic
COMBI-W	KSV-208845	38/200 kHz	1kW	31°x31° and 31°x31°	Ceramic/Composite

SPLIT BEAM TRANSDUCERS

A Split Beam transducer is made to send out one beam and receive in three or four. The return echo is then analyzed and it enables the user to see the size of the fish before catching it.

SIMRAD commercialized this technology in 1984 with its ES380 echosounder. Today the ES80 has become the bench mark for Split Beam echosounders.

SPLIT BEAM TRANSDUCERS					
MODEL	PART NUMBER	FREQUENCY	POWER	OPENING ANGLE	MATERIAL
ES18	KSV-088694	18 kHz	2kW	11°	Ceramic
ES38-10	KSV-202714	38 kHz	1,5kW	10°	Ceramic
ES38B	KSV-074531	38 kHz	4kW	7°	Ceramic
ES70-11	KSV-110280	70 kHz	1kW	11°	Ceramic
ES70-7C	KSV-203678	70 kHz	1kW	7°	Composite
ES120-7C	KSV-204580	120 kHz	1kW	7°	Composite
ES200-7C	KSV-203003	200 kHz	1kW	7°	Composite

WIDEBAND TRANSDUCERS

A Wideband transducer is a transducer that can transmit on a wide frequency range, for example 50-110 kHz, 100-160 kHz or 160-300 kHz. This means you only need 3 transducers under your vessel to cover a frequency range of 50-300 kHz. To make a transducer that is capable of doing this, composite technology is the best suited material to use. All SIMRAD wideband transducers are produced with composite material.

With the SIMRAD wideband transducers it is possible to make sweep transmissions (sending out starting at a low frequency and go up), chirp transmissions (FM transmission where the echosounder transmits a signature of several frequencies) and also just sending on several discrete frequencies, one at the time. This opens up a whole new world in interpretation of the echo. Maybe in the future we will be able to have a species identification echosounder...

WIDEBAND TRANSDUCERS					
MODEL	PART NUMBER	FREQUENCY	POWER	OPENING ANGLE	MATERIAL
ES70-7C	KSV-203678	50 - 110 kHz	1kW	7°	Composite
ES120-7C	KSV-204580	100 - 160 kHz	1kW	7°	Composite
ES200-7C	KSV-203003	160 - 300 kHz	1kW	7°	Composite

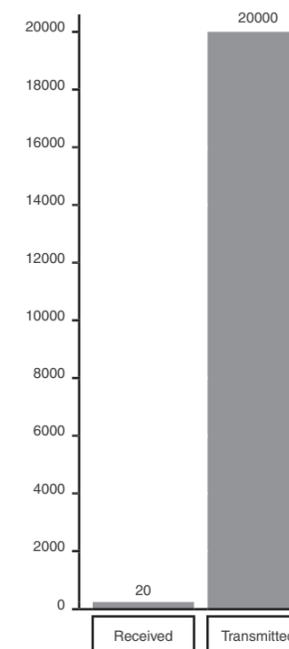
It is possible to combine a wideband transducer with a Single Beam or Split Beam transducer.

SIMRAD is one of even fewer making wideband transducers using the composite technology. At the SIMRAD's factory, transducers are designed using only the best skills in hydro acoustics available using the latest theories of

sound propagation in water as well as the latest materials and production methods. Our factory uses modern robots with the latest cutting edge technology for optimum results. The factory has been on a constant improvement program in order to follow the development in this new production technology.

DID YOU KNOW...?

SIGNAL STRENGTH



The signal returned by a 10 cm length sardine is around 10.000 times smaller than the transmitted by the echosounder. This relationship between signal strength is not easily understandable unless we use a logarithmic scale.

The DECIBEL is the logarithmic unit used to illustrate the relationship between two signals.

$$\text{Relation in dB} = 10 \log (TS1 / TS2)$$

In the case of the 10 cm sardine the Target Signal Strength would be:

$$\text{Target Strength} = 10 \log (20/20.000) = -40\text{dB}$$

In our echosounders the colour changes every 3dB step. An increase of 3dB in the Target Strength means that the signal received is double the strength.

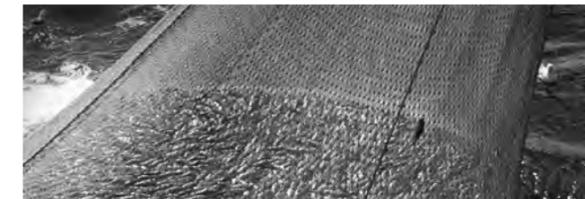


A 0dB Target Strength means that the target returns back all the received energy.

SONARS



ECHOSOUNDERS



CATCH MONITORING
SYSTEMS



FROM THE BRIDGE!





"Our sonars are based on:

- Efficient transducers with*
- Clean beams and*
- Complex signals with advanced signal processing*

We at SIMRAD design and produce all of this ourselves and by that we have full control of the product"

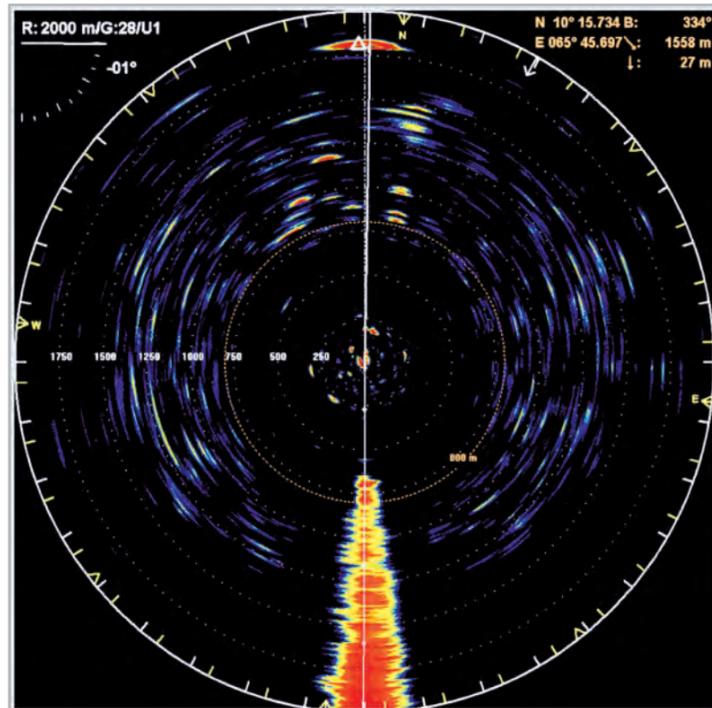
OLE BERNT GAMMELSEATER
Product Manager
Sonars & Echosounders

SONARS

Already a success!

The first sonar introduced to the commercial fishing fleet was in 1952. The first vessel was a Norwegian fishing vessel called "Ramoen". This was the world's first sonar for the commercial fishing fleet. Soon after, SIMRAD made the "Basdic", where the operator manually directed the transducer in all directions. More than 5000 was sold of the "Basdic" sonar.

Since then, SIMRAD has been first with a number of revolutionary features, such as going from paper sonar to CRT, from black&white to color, from CRT to LCD, vertical view, spherical transducer, etc, etc. Today, the sonar family has grown to include 4 different sonars: SU90, SX90, SC90 and the revolutionary SN90 Seine Sonar and SN90 Trawl Sonar.



SU90 Sonar Ultimate!

When high performance is the only criteria, such as long range, high resolution, narrow beam high source level, the SU90 is the sonar for you. We have made no compromises, only had performance in mind when designing the sonar.

SIMRAD SU90 SONAR

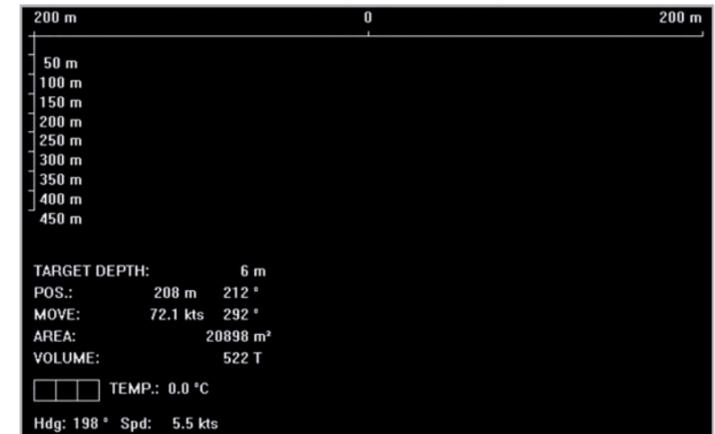
The SU90 Sonar is made with no compromises. The number of channels has been increased by 50% compared to the SX90 Sonar giving the sonar an even better performance in selectivity and range. Its operational frequency is 20 to 30 kHz. The narrow opening angle (4,9° at 30 kHz) and the increased source level (3dB) makes the SU90 the most powerful and highest resolution low frequency sonar on the market today.

The narrow beam makes the SU90 even more ideal for searching fish close to the bottom or close to the surface at long ranges. Also it will give a far better vertical view with less "bottom climbing" that is seen on sonars with a wider beam. The SU90 is equipped with the celebrated signal processing seen on the SX90 such as Hyperbolic FM transmission giving the user a clutter free picture with very high resolution in range.

The higher source level (3dB higher than SX90) will increase the detection range and enhance the detected echoes in general. How much longer range is almost impossible to calculate as temperature layers, salinity, bottom hardness, target strength and sea conditions will never be the same for a good comparison. However, the sonar will have a longer range than the SX90.

**HIGH POWER.
HIGH RESOLUTION.
NARROW BEAM.
NO COMPROMISE.**

The SU90 is the latest omni sonar from SIMRAD. It is the 4th generation windows operated sonar. SIMRAD will now have two low frequency sonars on the market, the highly acclaimed SX90 and the new implacable SU90 for customers who place performance before price.

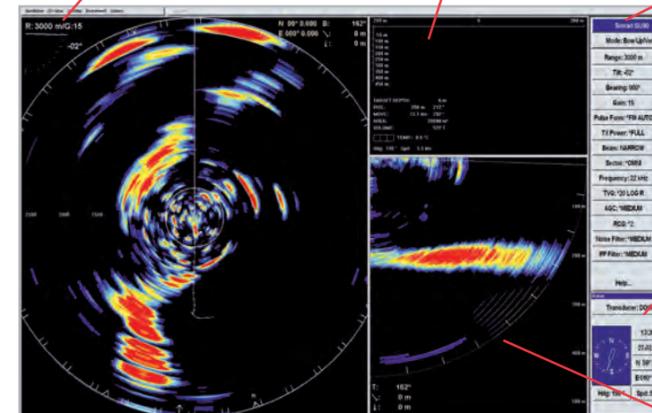


TILT AND GAIN

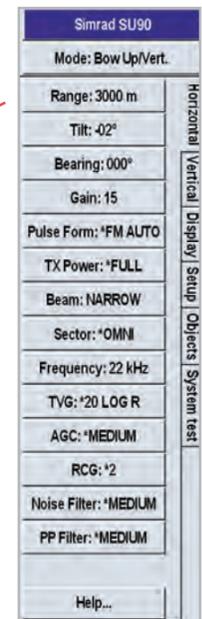
This part gives information of the tilt of the horizontal beam and gain setting.

PURSE SEINE AND TARGET INFORMATION

This window will display information from depth sensors, show target depth and estimated school size.



Navigation information and hull unit position information.



THE MENU

The menu is the same as on all SIMRAD Sonars, easy to use and well organized with the most needed functions easy available. You can choose up to 12 different languages.



HORIZONTAL AND VERTICAL BEAMS

The combination of vertical and horizontal presentations show you the schools of fish both from above and from the side at the same time. It is not necessary to go over the target to see the vertical distribution on the echosounder.



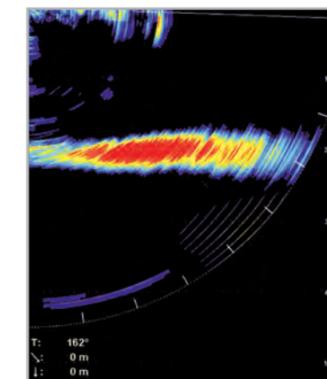
BOW UP/180° VERTICAL

The vertical slice is made "tippable", and by selecting a 60° tip angle (or less), a full 180° coverage is obtained. The tip angle can be adjusted from +10 to -90°. This mode is ideal when you are trawling for fish on deep water.



BEAM STABILIZATION

When the beam stabilizer is activated, both the horizontal and vertical beams are electronically stabilized for roll and pitch. The full circle beam stays on the target independent of the vessel movement, even in rough seas.

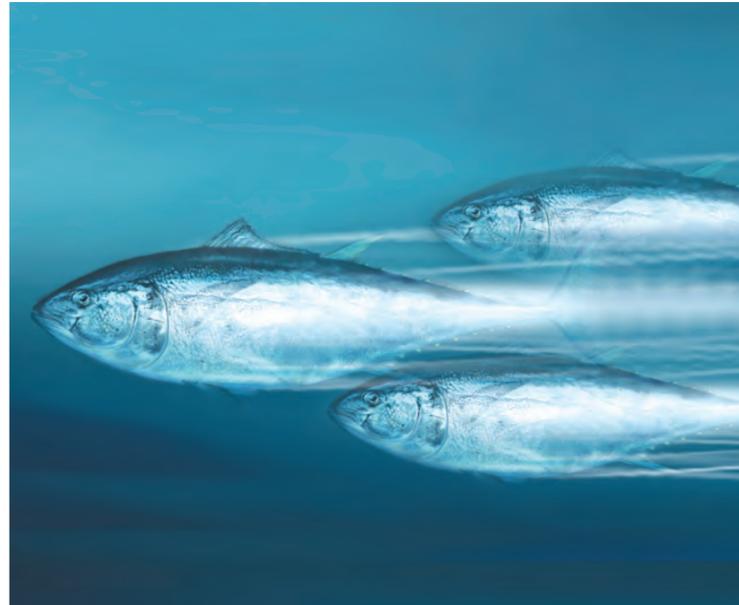


The vertical view. On the SU90 the vertical view is even more useful as the narrow beam will avoid "climbing bottom" problem found on sonars with wider beams. This is extra beneficial when searching for fish close to the bottom.

**USER SELECTABLE
FREQUENCIES BETWEEN
20 - 30 kHz PREVENT
INTERFERENCE FROM
OTHER VESSELS**

The SX90 is a low frequency, high-definition, long range sonar that utilizes the latest high-end computer to process data from the transducer. The SX90 is specially designed for vessels where high resolution combined with long range is needed. With the state of the art processor there are several unique possibilities for advanced signal processing. Three different vertical beam widths, single or dual vertical view and 180° tiltable vertical view are available. At 30 kHz operating frequency, the vertical beam width is only 7,1°.

The Simrad SX90 Sonar offers unique features such as full circle beam stabilization for easier fish detection in poor weather and 11 different sonar operating frequencies with 1 kHz separation to avoid interference from other sonars. The long range and higher definition of the SX90 will improve your catching abilities and help to make better use of your time at sea. Great emphasis has been placed on giving the best possible overview in the search and catch situation. In addition, full screen echo presentation, resizable windows, off center, zoom and dual operation are standard functions on all sonar models. You can evaluate one school while tracking two other targets, giving you full control of schools and net from detection to catch.



**Multi frequency
20 to 30 kHz!**

Fishing in the same area as others can be a challenge as other vessels might have sonars transmitting on the same, or close to the frequency you are using. With multi frequency from SIMRAD you are able to tune your sonar for maximum performance and avoid interference from other vessels. With 11 different frequencies with 1 kHz separation, interference is no longer a problem.

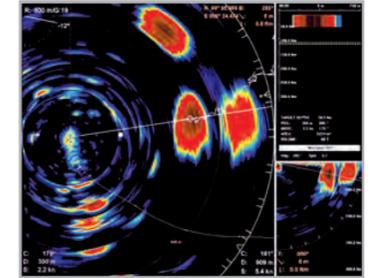
Only a wideband transducer can be used to be able to transmit and receive at such a wide spread band of frequencies. SIMRAD designs and produces our own transducers for this purpose.

**SCREEN RECORDINGS FROM
SIMRAD SX90 SONAR**



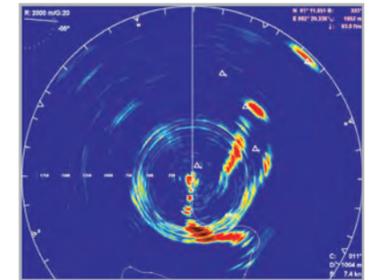
HERRING

On this picture, the sonar has detected three schools of herring. The skipper has decided to catch the school with highest density. The closest school has the most density. The sonar is in "Automatic Target Tracking" mode and shows the track from the school and vessel. In the lower left corner numbers show the school's traveling course and speed. (2,2 knots and 179°)



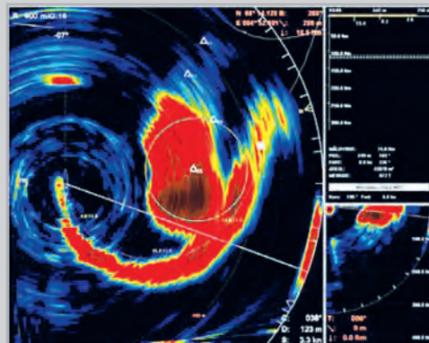
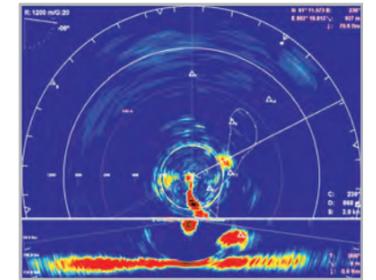
MACKEREL

School of mackerel detected at 40° starboard and marked as "6". Sonar is operated in "Bow Up" mode with "Full Screen". Range is 2000 meter and tilt is set at 5°. Range to school is 1952 meter and depth is indicated to be 93 fathoms saying that the mackerel school is on the bottom. Echoes between the mackerel and the vessel is wake from pair trawlers coming towards the vessel.



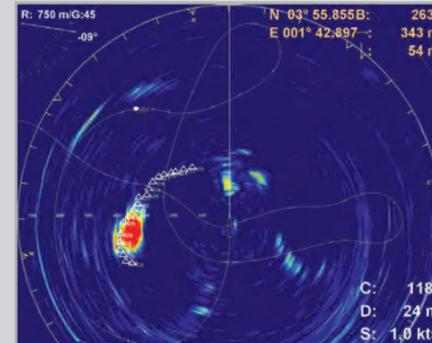
MACKEREL

This is later in the same scenario as above. The vessel is close to the school of mackerel only about 250 meters away. "Bow Up/180° Vertical" is used. The vertical view shows the school at about 50 fathoms depth. The variation in bottom shows uneven spots with hard and soft bottom.



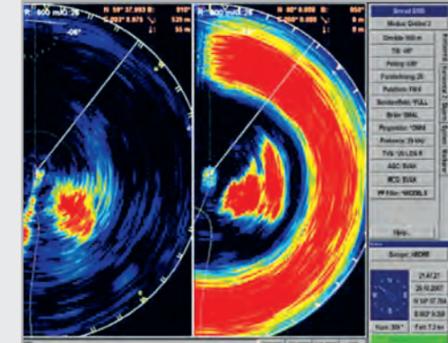
OFF CENTER PRESENTATION

Offset the vessel to any screen position and enlarge the echoes for more detailed information.



FULL SCREEN PRESENTATION

In full screen presentation, the echo presentation will be extended to cover the entire display area.



"TWO SONARS IN ONE"

In the dual mode, each sonar presentation can be set up as if you were using two different sonars simultaneously. Individual frequencies, tilt angles, ranges, gain and filters can be used.

SC90, THE WORLD'S FIRST COMPOSITE OMNI SONAR

As the industry first, again, SIMRAD presents the SC90 composite sonar. The composite omni transducer is a result of SIMRAD's continuous improvement of its transducer design, material and production method.

The composite transducer is more complicated to produce than traditional transducers with large investments in the production line. Today, SIMRAD has one of the most sophisticated transducer production line and design department in the industry.

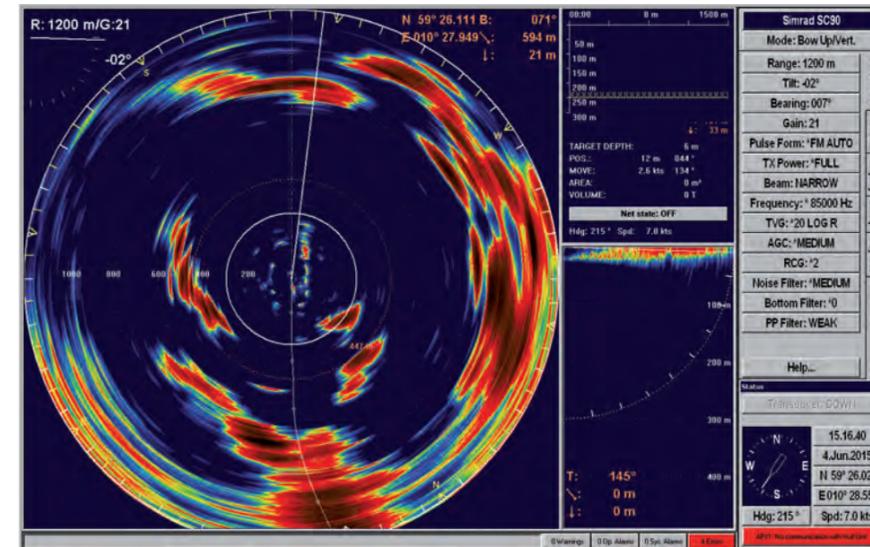
The advantage in a composite transducer is first and foremost the efficiency compared with other materials and production methods. More of the power put into the transducer during transmission is converted to sound in water and more is also converted back to electricity with the return echo. The more efficient a transducer is the more powerful the equipment connected to it will be.

A composite transducer will also be able to transmit on a wider frequency band, giving many future possibilities for the SC90 to transmit on several frequencies and also wideband chirp transmission.

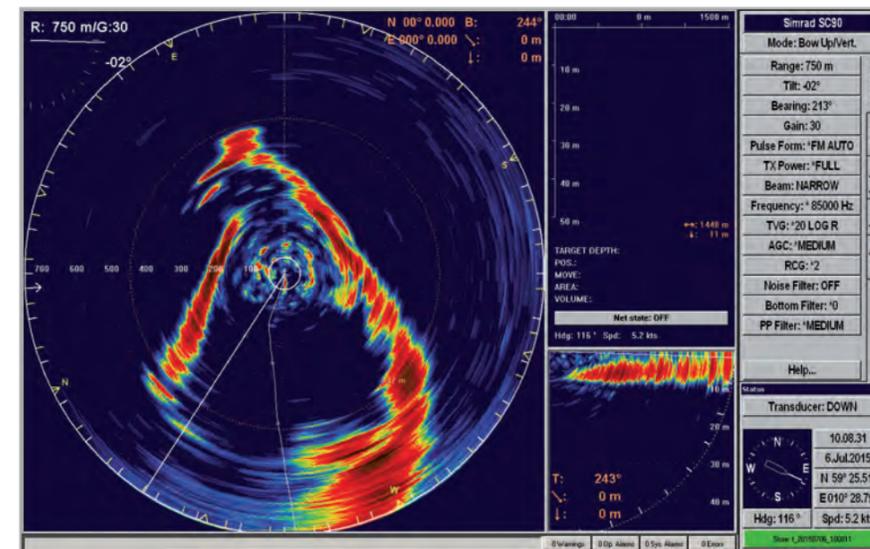
The SC90 is a 85 kHz mid frequency sonar with high efficiency, high power transmission. The SC90 is ideal for fish like Tuna, Mackerel, Herring and fish close to surface, bottom or close to the vessel. It comes with all the standard Simrad features such as FM transmission, fully 360° stabilized, vertical view, easy operation, dual mode, 60° tilt and clutter free picture.

If you have today a Simrad SH90 sonar, the upgrade path is short and easy. A change of transducer, computer and transceiver PCBs (printed circuit boards) are all that is needed avoiding the change of the big and heavy hull unit, transceiver cabinet, cabling, etc. This fits right into the long SIMRAD strategy for our existing customers; if you have a Simrad sonar it should always be as easy and cost efficient as possible to have the latest development and technology regardless when you bought the sonar.

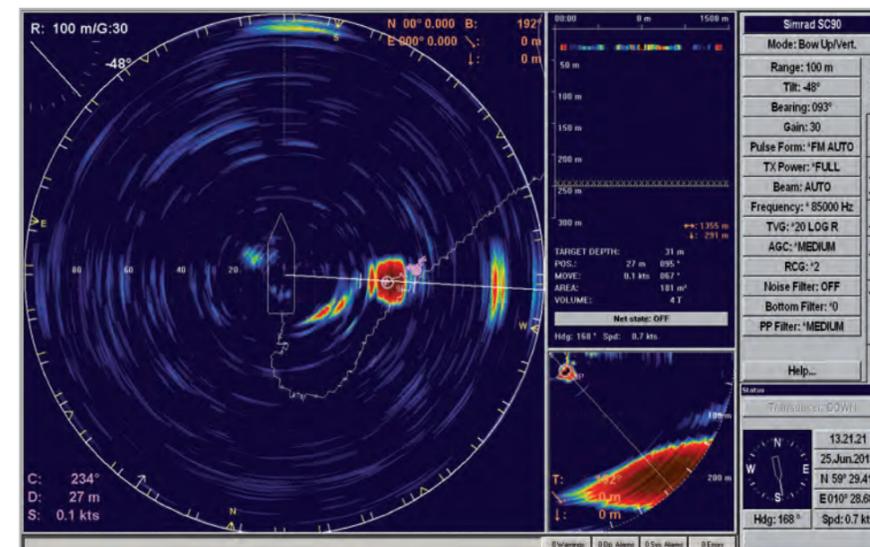
The SC90 makes a perfect partner to the low frequency sonars SX90 or SU90. Follow the school from long range all the way into the vessel. With the range capabilities of the SC90 it is also a perfect backup if something happens to the low frequency sonar, like impact to the transducer or strike by the purse seine wire.



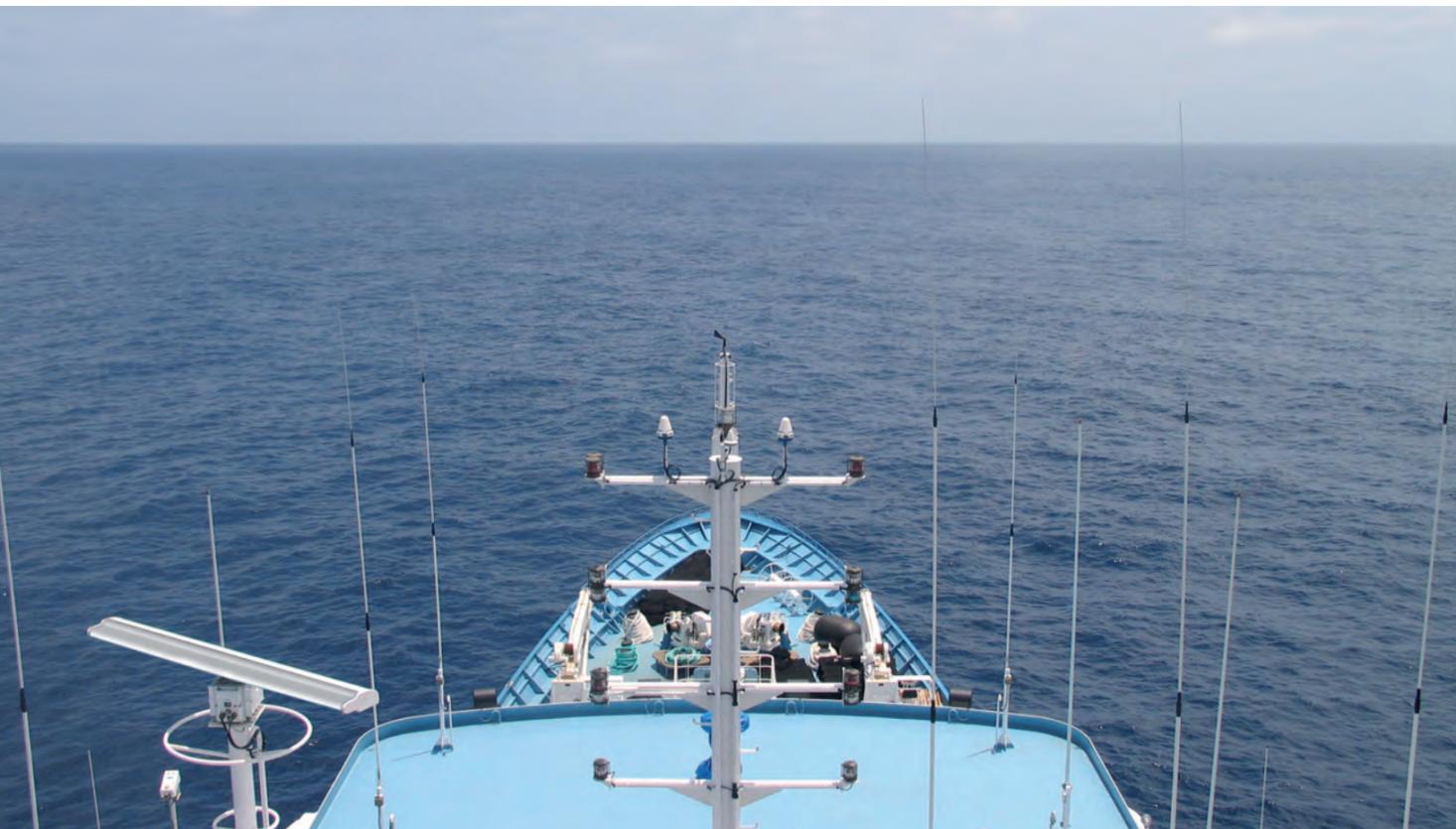
The SC90 has range capabilities that will make it a perfect back-up sonar as well as a stand-alone search sonar. Combined with a low frequency sonar you will be able to follow the school all the way in to the vessel. The resolution on the SC90 is unmatched for the frequency and the composite transducer will give you all the power needed to detect even the weakest targets.



The completely noise free capability of the SC90 makes it easy to see wanted targets and avoid spending time interpreting the sonar picture. Even in shallow water, the picture is clean and easy to understand.



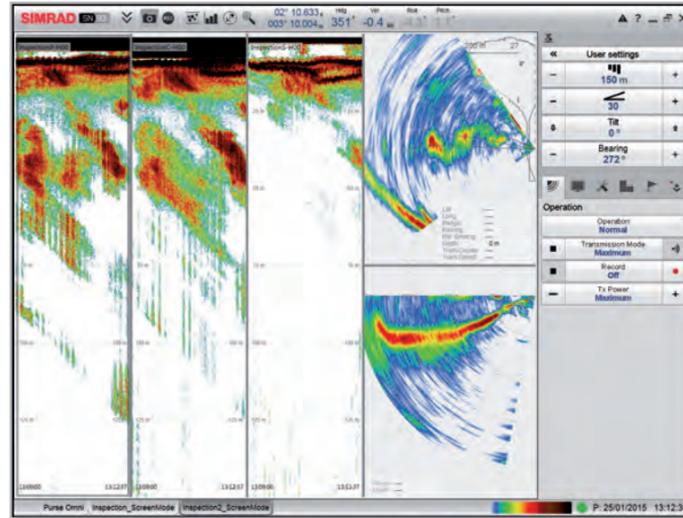
In short range, which is the reason to have a second sonar, the sharp well defined echoes due to the very high resolution are important. Like in the case to the left, it is very useful to have a well defined "backside" of the school, especially for purse seiners, in order to get a general feeling of the size of the school before setting the net.



SIMRAD SN90 SEINE SONAR. THE ULTIMATE TOOL FOR PELAGIC FISHING!

The new and revolutionary SN90 Sonar is one of the latest developments from SIMRAD. With the SN90 the user will get full control over the setting of the seine without having to care about retracting the hull unit. The SN90 transducer is installed without a retractable hull unit to the side of the keel facing the purse seine. The 256 individual beams have a horizontal coverage area of 160° and the vertical beam width is typically 6° (varies with the frequency from 5° to 8°). The beams are tiltable from 0° down to 90°.

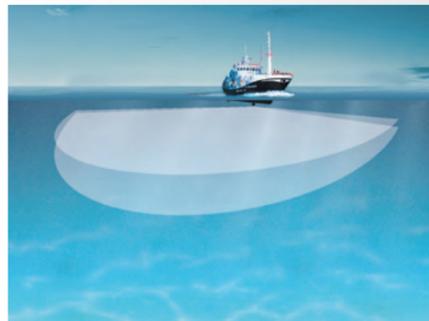
In addition to this, three steerable inspection beams of 5°x5° can be used for more detailed inspection of a school like observing fish behaviour, target strength and biomass. This will enable the fisherman to run alongside a school of fish and observe, like a horizontal echosounder, and analyze the school without passing over it. Fish avoidance is then minimized and more information about the fish in the school will reduce the bycatch, unwanted species in addition to catch the correct size and conduct volume estimation of the school before setting the net.



Three inspection beams can be trained and tilted individually while maintaining the overview with the horizontal fan and vertical slice.



Installed looking to the port side of the vessel together with horizontal looking ES70 echosounders previously installed.



The SN90 has a 160° fan that is tiltable from 0° down to 90°. This will enable to see the purse seine during the whole setting of the net.



The SN90 has one vertical slice that can be trained in any direction within the fan. This will give full control of the edges of the school during setting of the net.



The SN90 has three individually steerable inspection beams that can be trained and tilted with any frequency between 70 and 110 kHz. The inspection beam will give a detailed high resolution echogram.

SIMRAD SN90 TRAWLING SONAR. THE ULTIMATE TOOL FOR ANY TRAWLER!

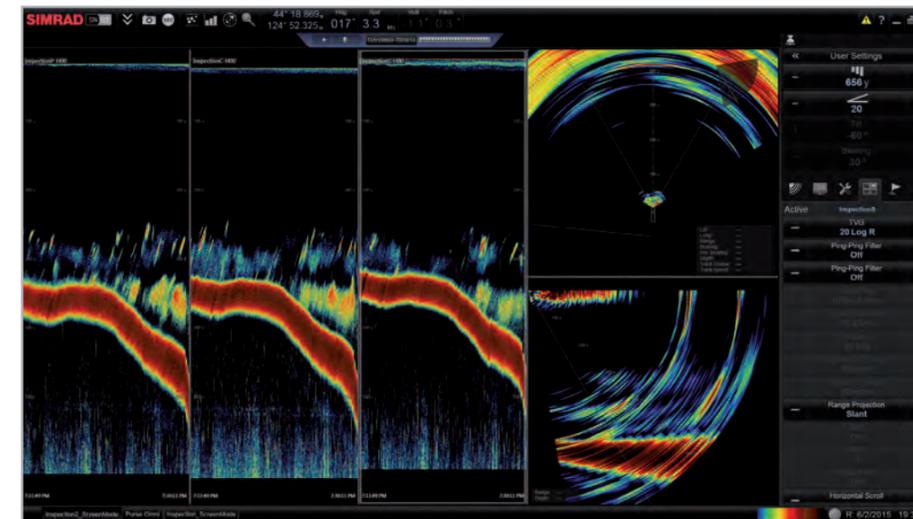
The new Simrad SN90 can also be configured as a forward looking multibeam sonar for trawlers. The unique flexibility of the SN90 enables it to be used at almost any fishery depending on how the transducer is installed. Mounted forward looking the SN90 can be used as a trawling sonar. The display software is oriented forward during installation. The SN90 transducer is fixed to the hull or bulb like a regular echosounder's transducer, only pointing forward.

No hoist unit is needed making it a space saving installation. The sonar beams are pointing forward only

in a 120° swath, taking the propeller noise out of the equation.

A full vertical slice as well as three inspection split beams can be individually trained and tilted to the users' need. Stack the three beams on top of each other or spread them out to inspect to any side.

The SN90 is a chirp wideband sonar transmitting and receiving between 70-110 kHz.



The picture on the left is taken from Alaska Pollock fishery. Three beams are used to inspect in three directions showing a detailed echogram of Pollock and plankton in front of the vessel.



This picture shows the SN90 installed in the bulb looking forward. This installation is perfect for bottom trawlers as well as pelagic trawlers. The beams can be tilted all the way down to 90° from surface. No hull unit or protruding transducers.

SONARS SPECIFICATIONS

	SX90	SU90	SN90	SC90
PROCESSING UNIT				
Voltage	110/220 VAC			
Consumption	5 A			
Processor type	ENIX4	ENIX4	ENIX8	ENIX4
Operating system	Windows XP			
Display output	Dual			
Serial interface I/O	Four serial ports			
Ethernet interface	Two			
Display resolution	1280 x 1024			
Operating ranges	150 to 4500 m*	150 to 4500 m*	50 to 2000 m	50 to 2000 m

TRANSCIEVER UNIT				
Voltage	110/220 VAC			
Consumption	750 VA	750 VA	400 VA	750 VA
Operating Frequency	20 to 30 kHz (1 kHz step)	20 to 30 kHz (1 kHz step)	70 to 110 kHz	85 kHz
Modulation	CW and Hyperbolic FM	CW and Hyperbolic FM	CW and Hyperbolic FM	CW and Hyperbolic FM

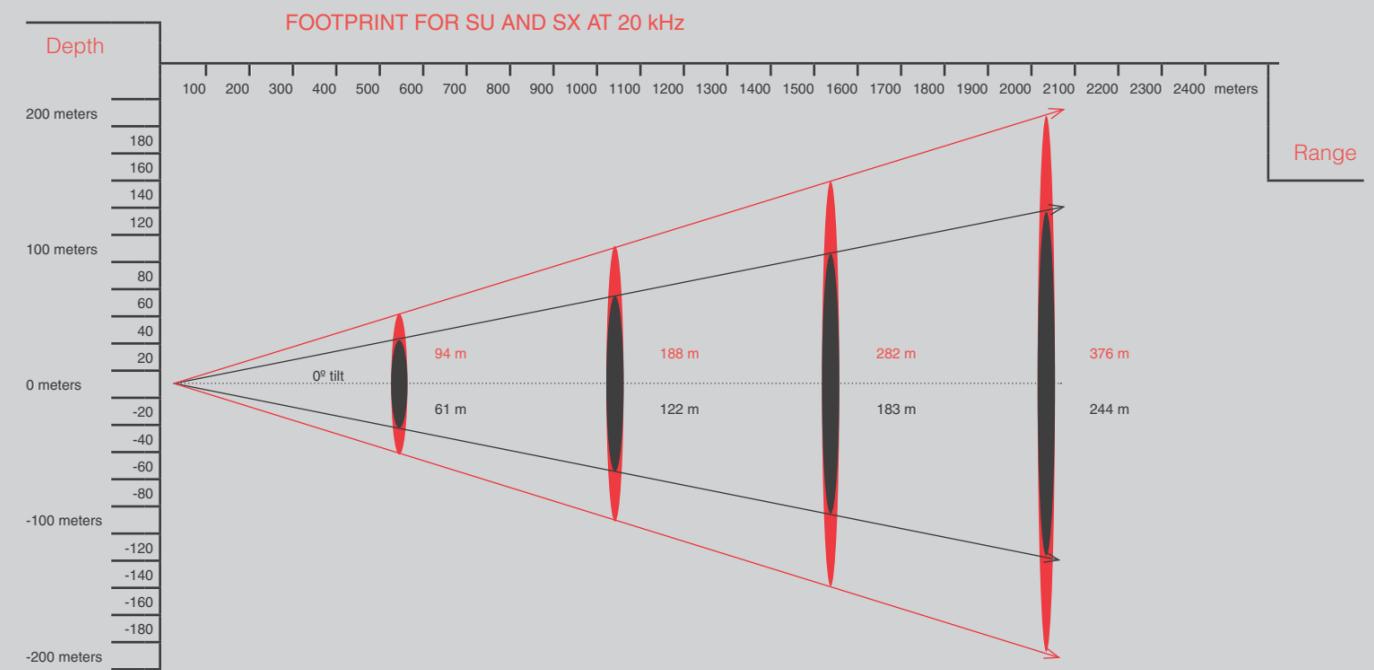
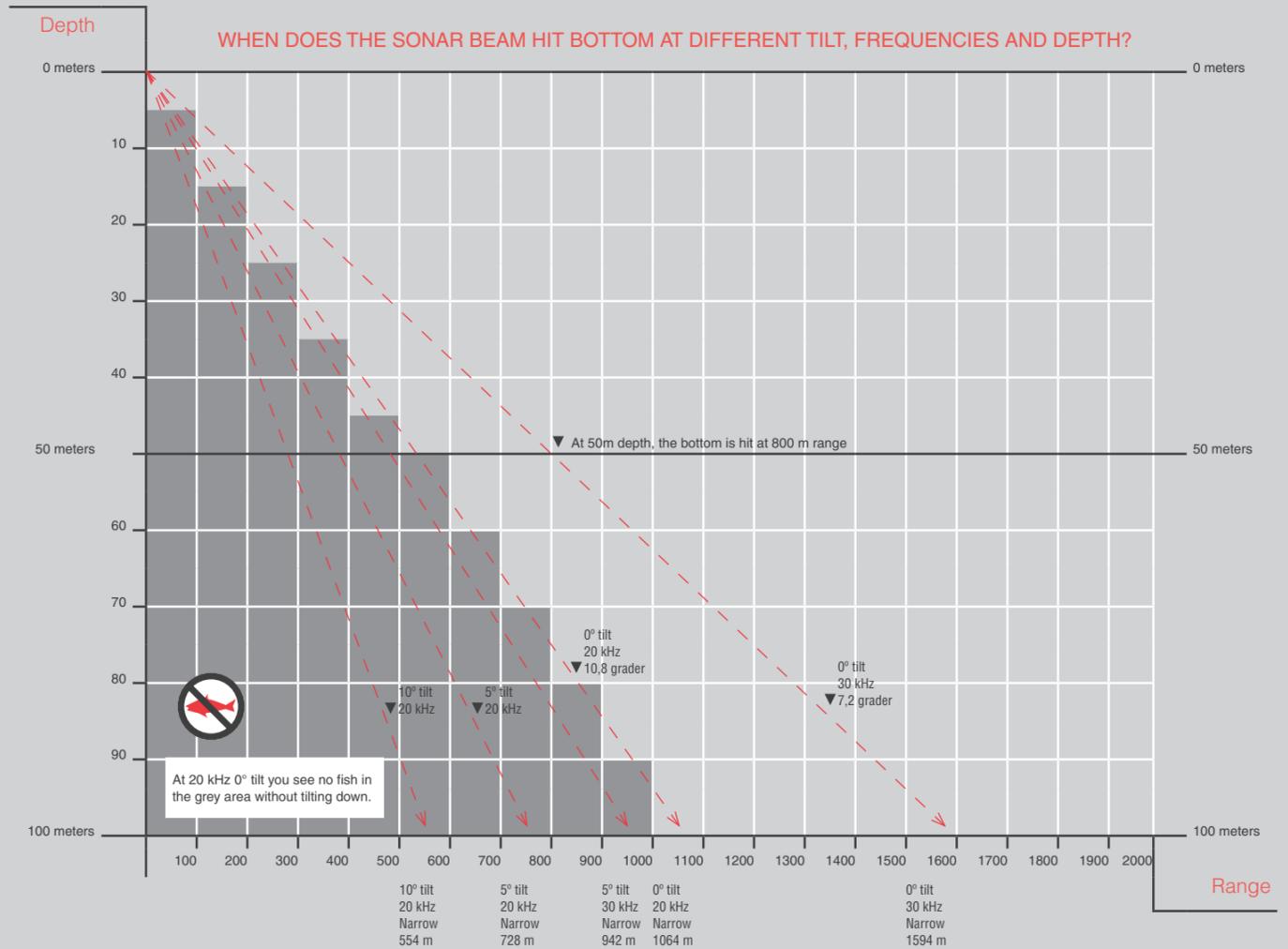
BEAM				
Horizontal coverage	Omni	Omni	160°	Omni
Vertical Tilt	+10° to -90°	+10° to -90°	+10° to -60°	+10° to -90°
Vertical beam width	See table below	See table below	6,0°	8,0°
Transceiver channels	256	384	256	480
Pitch & Roll Stabilisation	Included			
External Pitch & Roll interface	MRU Kongsberg Seatex format (Optional)			
Scientific Data Output	Optional			

HULL UNIT				
Voltage	230/380/440 VAC 3 Phase	230/380/440 VAC 3 Phase	N/A	230/380/440 VAC 3 Phase
Consumption	3000 VA - 1100VA	3000 VA - 1100VA	N/A	1100 VA
Selectable Transducer Position	Yes	Yes	N/A	Yes
20 knots hull unit	Yes	No	N/A	Yes
1.6m Transducer lowering	SX93 Hull Unit	SU93 Hull Unit	N/A	N/A
1.2m Transducer lowering	SX92 Hull Unit	SU92 Hull Unit	N/A	N/A
1m Transducer lowering	SX95 Hull Unit	N/A	N/A	Yes

*Optional extended range 6000 to 8000 m, requires export license in selected countries.

OPENING ANGLES ON SX AND SU SONARS

	SX90			SU90		
	WIDE	NORMAL	NARROW	WIDE	NORMAL	NARROW
20 kHz	14,8°	11,0°	10,7°	10,7°	7,8°	7,2°
21 kHz	14,1°	10,5°	10,2°	10,2°	7,4°	6,9°
22 kHz	13,5°	10,0°	9,7°	9,7°	7,1°	6,5°
23 kHz	12,9°	9,6°	9,3°	9,3°	6,8°	6,3°
24 kHz	12,3°	9,2°	8,9°	8,9°	6,5°	6,0°
25 kHz	11,8°	8,8°	8,6°	8,6°	6,2°	5,8°
26 kHz	11,4°	8,5°	8,2°	8,2°	6,0°	5,5°
27 kHz	11,0°	8,1°	7,9°	7,9°	5,8°	5,3°
28 kHz	10,6°	7,9°	7,6°	7,6°	5,6°	5,1°
29 kHz	10,2°	7,6°	7,4°	7,4°	5,4°	5,0°
30 kHz	9,9°	7,3°	7,1°	7,1°	5,2°	4,8°



BASIC SONAR THEORY

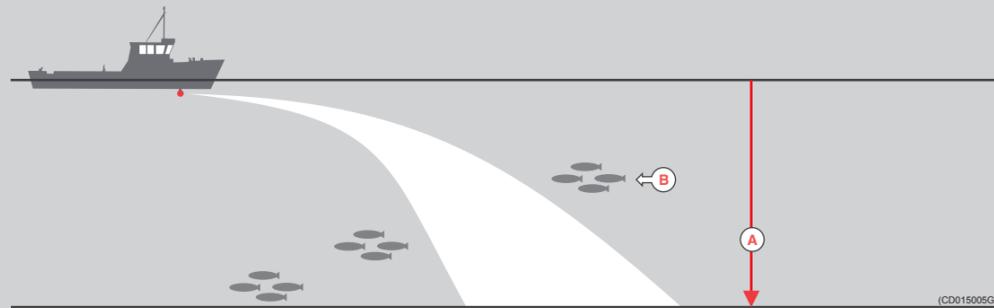
A sonar can sometimes be a challenging tool to operate. There are never two days at sea that are the same, weather, water temperature, bottom conditions, fish behavior, temperature layers, plankton layers, ships noise, sonar settings etc all influence the performance of a sonar.

The horizontal transmission of sound is defined by SIMRAD as a sonar. If transmitted vertically, then it is defined as an echosounder. Sending sound vertically is not as challenging as sending it horizontally and therefore an echosounder performance can be compared from day to day or between vessels. On a sonar this is not true.

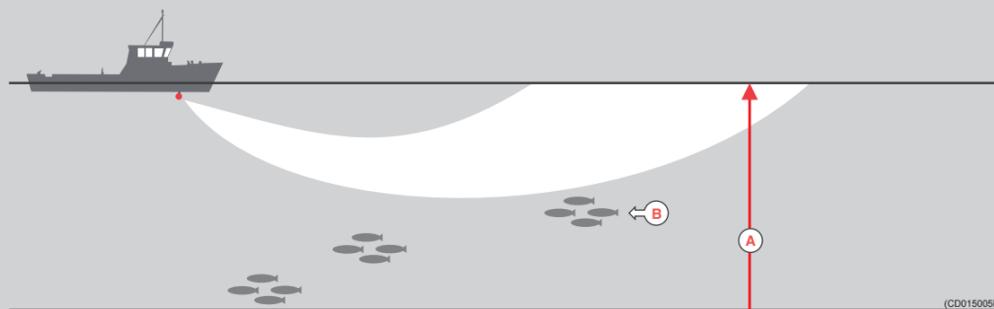
Even between vessels fishing on the same fishing grounds, sonar can perform differently. Ship's noise, electrical and/or acoustic, is different from vessel to vessel, transducer installation is different from vessel to vessel, filter settings and general sonar operation is different from vessel to vessel and will affect the sonar performance.

On this page we have made some illustrations to consider when operating a sonar. There are many more but these are the most common ones that will change from day to day and between vessels.

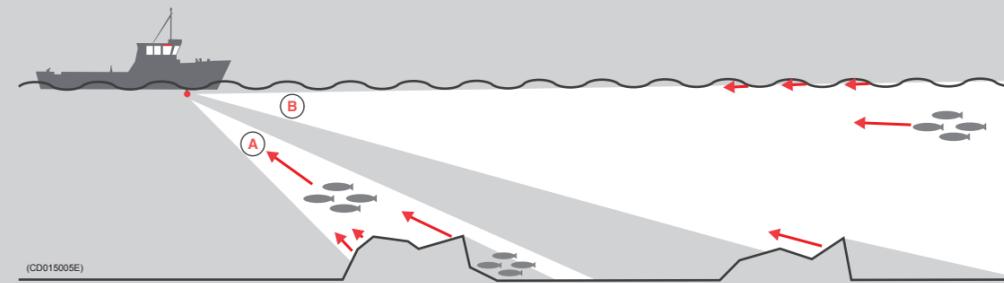
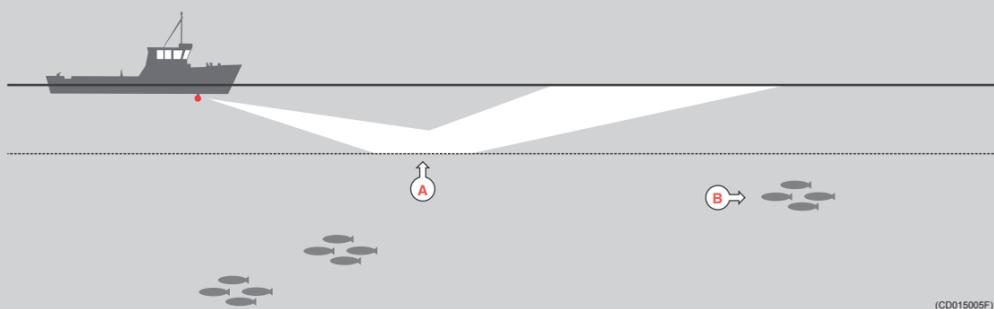
With decreasing temperature (A) the beam will bend towards the bottom shortening the range (B).



With increasing temperature (A) the beam will bend towards the surface shortening the range (B).



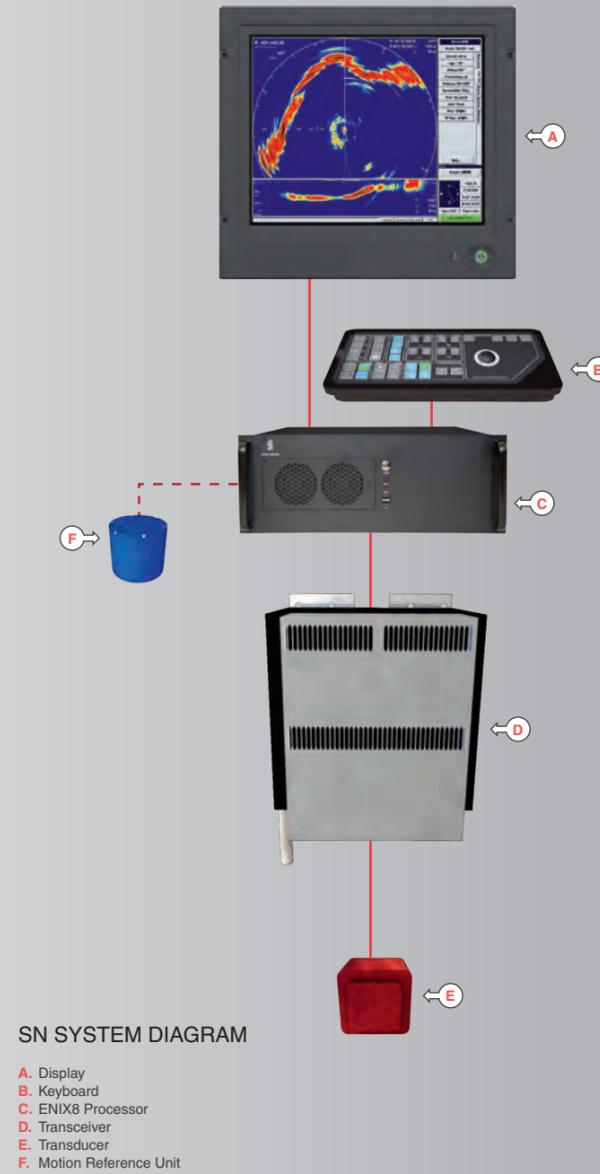
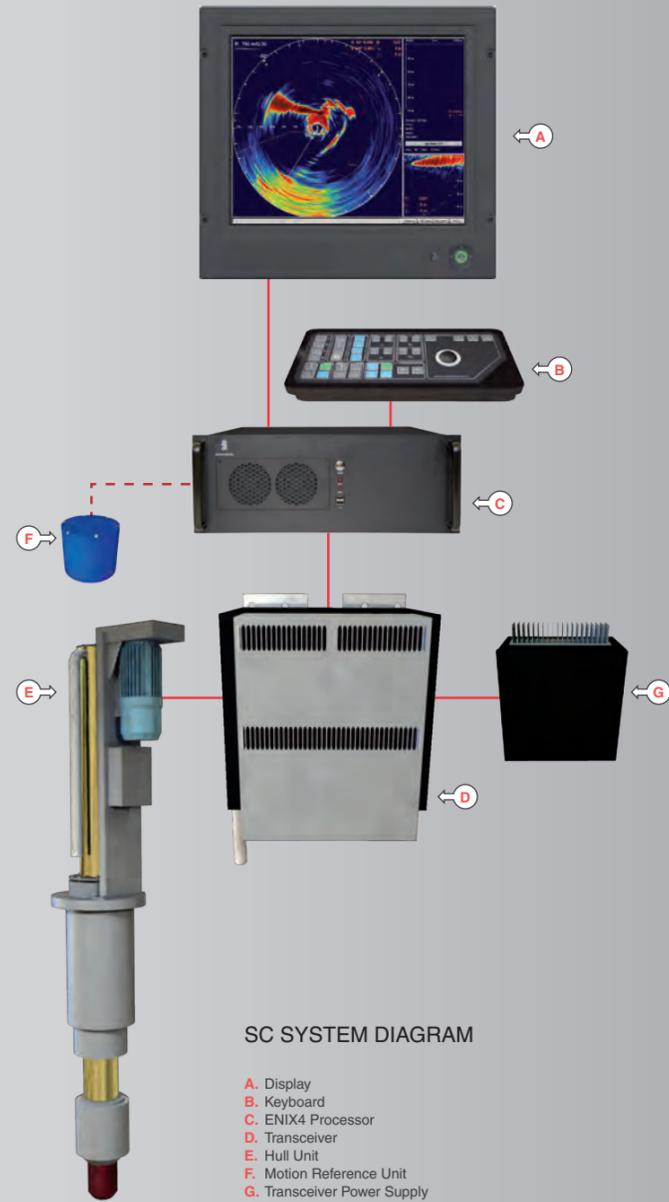
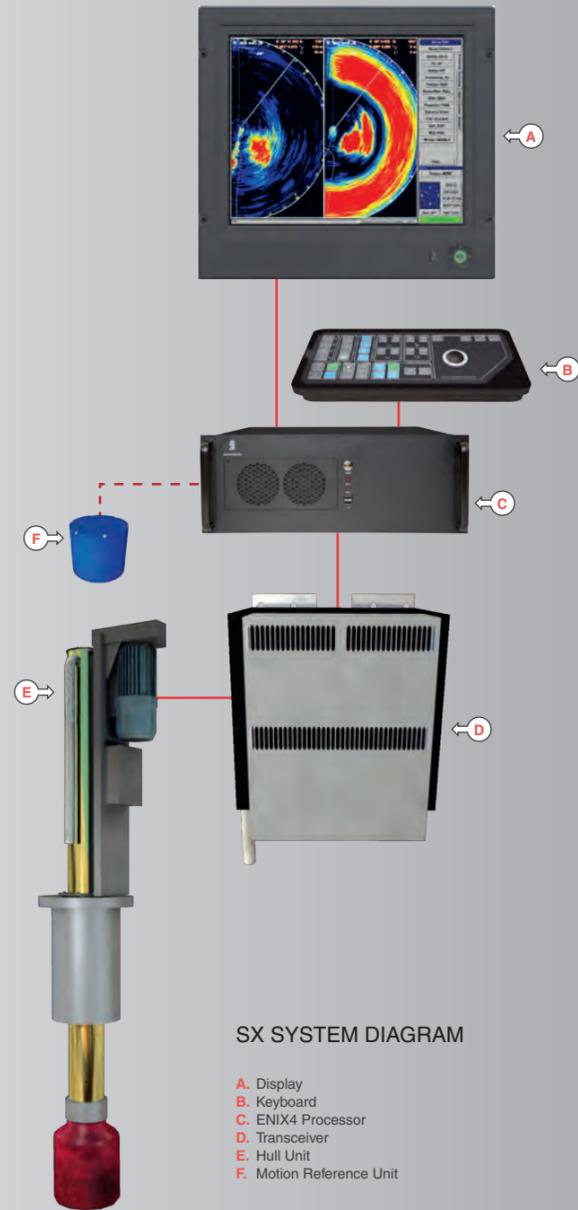
With a temperature layer (A) the beam can create a "sound channel" and increase the range (B) on certain tilt angles.



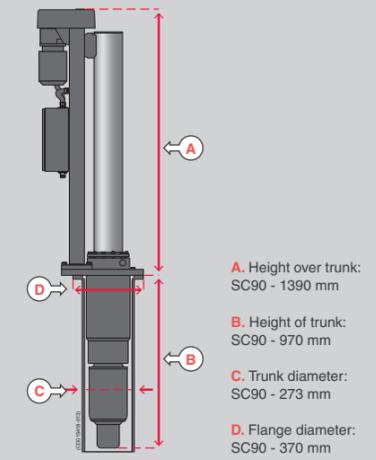
Depending on the tilt, echoes from other than fish will be detected. Bottom and surface is among those which generate the most echoes. Sometimes if weather is rough it is difficult to separate fish from surface echo and sometimes if fish is close to bottom or the bottom is rocky it is difficult to separate fish from bottom. A Simrad Sonar has the best filter available (RCG) to assist in separating fish from unwanted echo.

Propeller noise is caused by cavitation as illustrated in below picture. A clean propeller will still cavitate but much less than a propeller with marks and damages. Also, a large propeller will cavitate much less than a small due to the lower RPM.

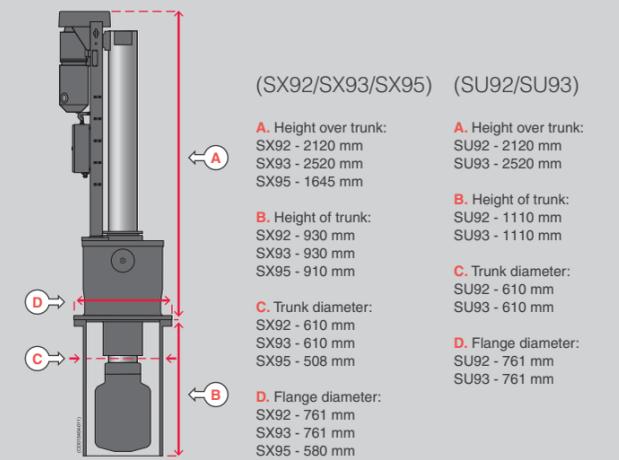




**HULL UNIT
SC**



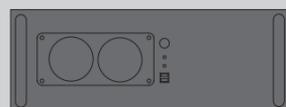
**HULL UNIT
SX - SU**



PROCESSOR UNIT

Width: 600 mm
Height (with shock absorbers): 410 mm
Depth: 640 mm
Weight: 24 kg

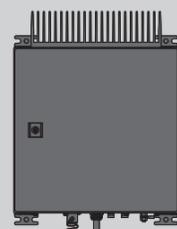
(Shipping dimensions)



POWER SUPPLY UNIT

Width: 600 mm
Height (with heatsink and brackets): 410 mm
Depth: 220 mm
Weight: 22 kg

(Shipping dimensions)



OPERATING PANEL

Width: 320 mm
Height: 230 mm
Depth: 51 mm
Weight: 4 kg

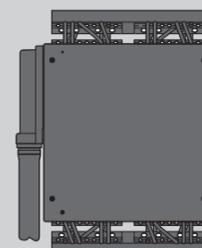
(Shipping dimensions)



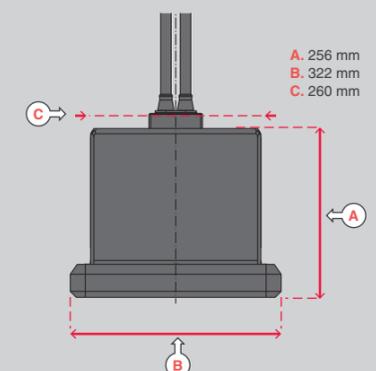
TRANSCIVER UNIT

Width: 670 mm
Height: 760 mm
Depth: 580 mm (Excluding climate door)
Weight: 108 kg

(Shipping dimensions)



**TRANSDUCER
SN**





"Based on experience from our scientific echosounders we make

- Wideband and high efficiency transducers

- electronics with large dynamic range and

- SW implementing the latest in acoustic theory.

We at SIMRAD design and produce all of this ourselves and by that we have full control of the product."

OLE BERNT GAMMELSEATER

Product Manager

Sonars & Echosounders

ECHOSOUNDERS

Take fishfinding to the next level

Professional mariners around the world rely on SIMRAD electronics to deliver a safer and more profitable time at sea.

The new professional range of SIMRAD fishfinders offers a choice of models from 12 kHz to 333 kHz.

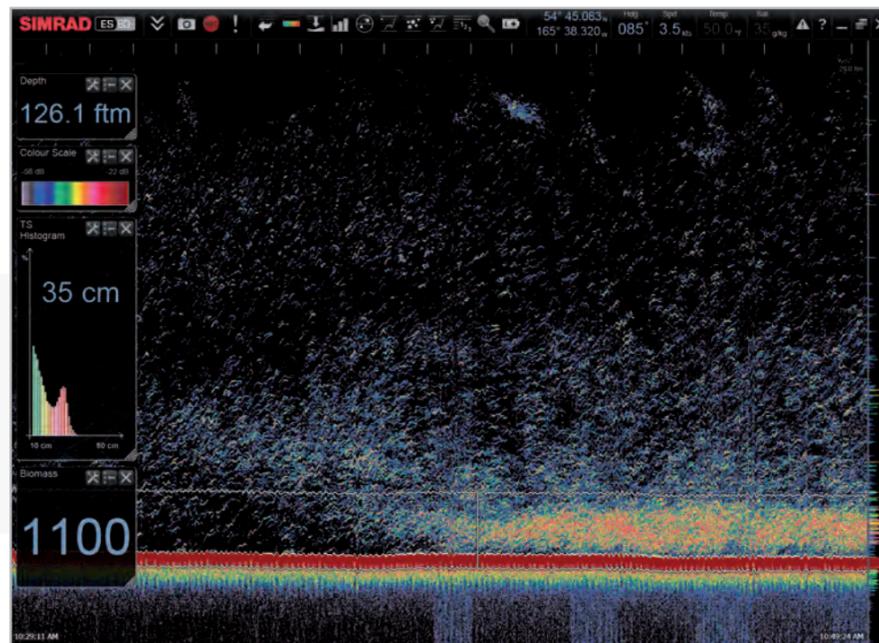
High power, advanced receiver technology and effective SIMRAD transducers ensure a detailed, clear and positive graphic depiction of the seabed and of single fish.

ES80 ECHOSOUNDER

SIMRAD has manufactured fish finders for more than 65 years and has 25 years of experience using Split beam technology. The first Split beam fish finder, a 38 kHz model, came on the market in 1984, quickly followed by a 70 kHz model. Today, SIMRAD has a wide range of frequencies from 18 kHz, used for detecting deep water species, up to 333 kHz used for measuring plankton. The Simrad ES80 is the fifth generation Split beam fish finder where the latest in computer and signal processing technology is used to satisfy the

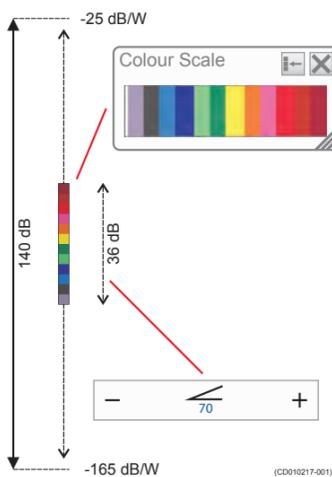
increasing need from our demanding customers: "Top performance at any depth and easy to operate".

The ES80 is a wideband echosounder able to operate at a frequency range of 10-500 kHz. With a suitable broadband transducer, the ES80 can sweep (chirp) in a range of frequencies giving increased resolution on longer range. Also, the ES80 will have a TS response curve making it easier to determine the species you are looking at.



The ES80 delivers unprecedented resolution on all ranges. This example underlines the statement, details make the difference and give the user much more information to take the correct decision. Both economically and environmentally.

DID YOU KNOW...?



The ES80 echosounder has a dynamic range of 140 dB. This means that the sounder can receive both very strong and very weak echoes. Actually, the ES80 will detect echoes from plankton to whales, bottom on most depths, and present the information free from distortion.

Naturally, we cannot present all these echoes on the display simultaneously, as this would create a mess of colours. So we create a 36 dB section and give each colour a 3 dB (12 colours) or 0,5 dB strength (64 colours).

The colour range goes from grey to brown. Grey is used for the weakest echoes, while

the strongest echoes are brown. All echoes stronger than brown will still be brown, while echoes weaker than grey will not be shown.

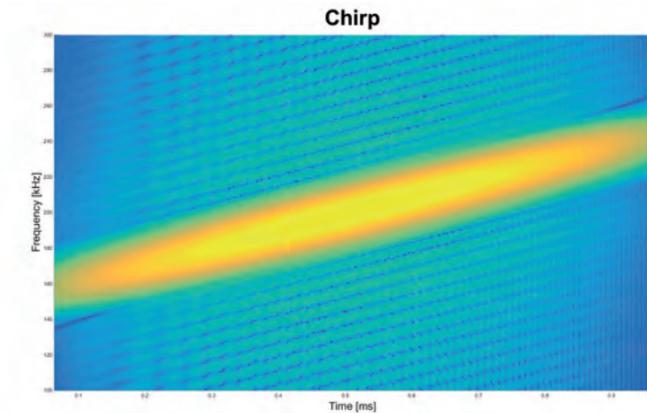
As a comparison, our old echosounders ES380 and ET100 had -using analogue TVG- a dynamic range corresponding to approximately 65 dB. The old paper sounders had a dynamic range of 12 dB in their printouts using the "colours" from light grey to black.

The dynamic range in the ES80 colour presentation is thus a lot larger; 24 dB or 250 times.

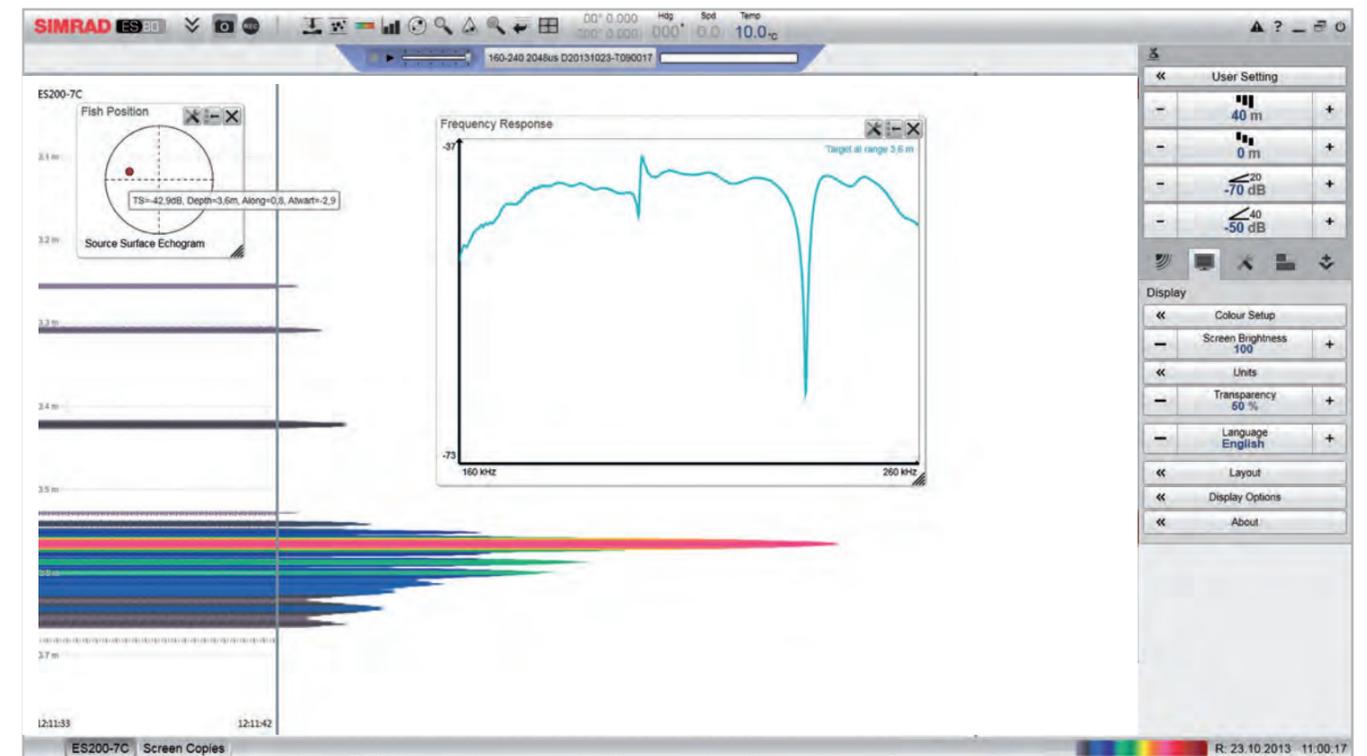
WIDEBAND ECHOSOUNDERS

The new series of ESs have wideband capabilities. That means that you can transmit a signal that varies in frequency across the transmission. The most common way to operate the sounder is to use linear FM, or chirp. In an ES80 chirp transmission you utilize the effective frequency band of your transducer, starting low and continuing higher until you reach the frequency where the transducer efficiency drops off.

but still spans over a large bandwidth and might be better suited for such environments. The ES80 has this capability and, as the SW continues to be developed, new functions would be available.



Due to advanced matched filtering techniques you can correlate the returned signal with what you sent out, and the result is improved range resolution of single targets. The improved range resolution is obtained when you have targets that are in comparable size. When you have very weak targets in the near vicinity of strong ones, such as small fish close to bottom, you might want to use a different pulse shape. A dolphin's click is shorter,



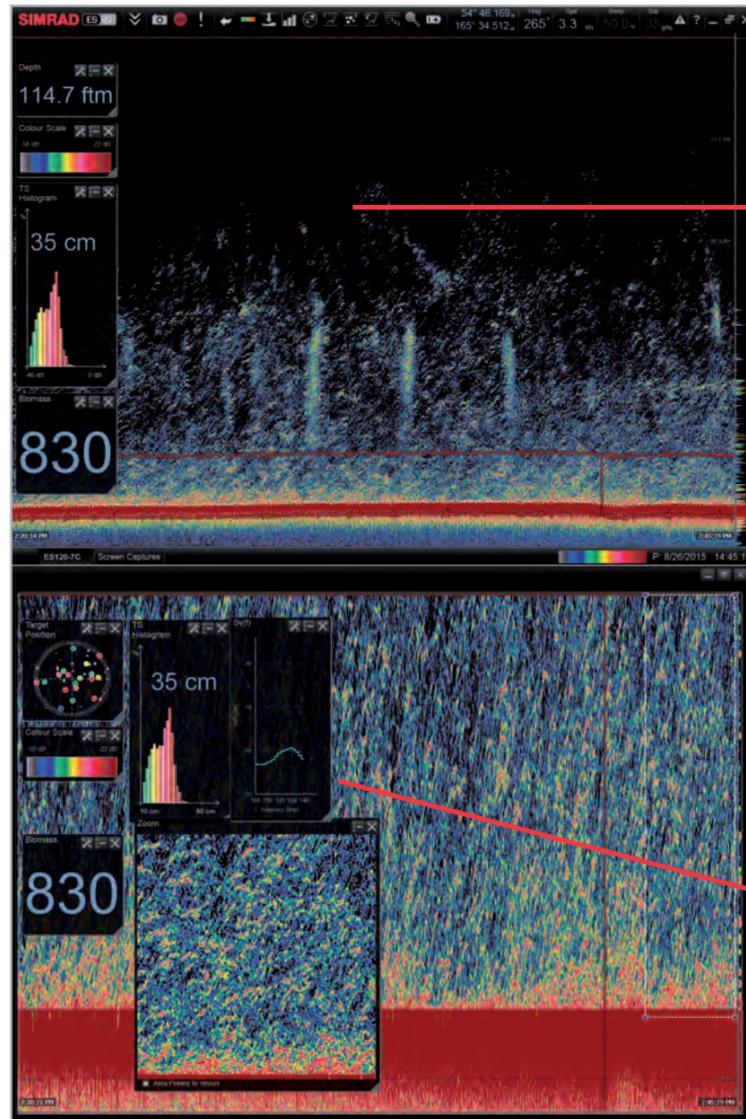
Range resolution and target ID are improved. Echo from a 38,1 mm tungsten sphere is measured, and you can clearly see how the target strength changes with frequency. This frequency response is unique to this particular

target, and corresponds well with the theoretical curves. Resolution is excellent, and you can clearly see the knot on the fishing line where the suspended sphere is attached to the line, around 10 cm from the sphere itself.

ES80 DETAILS MAKE THE DIFFERENCE

The ES80 comes standard with digital CW transmission. This is the transmission form that has been used since SIMRAD, as the industry first, digitized the echosounder back in the mid 80's. Then it is possible to add a FM transmission module to the system, making the ES80 a true chirp echosounder. The advantage of chirp is that it is possible to transmit with a very short pulse length at very long ranges giving maximum resolution. What determines a good chirp echosounder, is how long range it gets on the shortest pulse.

In addition to this, with the long experience SIMRAD has making scientific echosounders, the ES80 also has a calibrated real time TS (target strength) curve. This will give the user information about the target strength and frequency response of the return echo. Having a system with multiple frequencies, it is now easier to determine the species you are fishing by comparing the target frequency response on different frequencies.



The ES80 has unprecedented performance with very high resolution on long ranges using a composite transducer. All the popular functions from the previous ES70 have been implemented plus more unique features.

The Sv curve (power vs. frequency) will give you the target strength of what you are passing over. Knowing that most species have a "frequency signature" this can be a very helpful tool to identify what species you are looking at. This, along with the size distribution, biomass indication and extreme resolution on all ranges enable a profitable and sustainable fishery.

WIDEBAND TRANSCIVER (WBT)

The Wideband Transceiver (WBT) is designed for applications where performance is the top priority. The WBT has four 500 W channels that can either work independently with single beam transducers, or together with a split beam transducer.

The WBT transceiver is capable of operating on entire band from 10 kHz to 500 kHz, only limited by the transducer's bandwidth. The WBT is operated by the ES80 SW, and depending on the settings it can be used either in narrowband or wideband mode. The WBT itself is capable of doing CW, FM and also user defined signals.



ABOUT TRANSDUCERS

In general any Simrad transducer can be used with the ES80, as long as it operates within the 10-500 kHz band. However, the effective bandwidth will vary with transducers.

The Simrad composite transducers have more bandwidth than transducers based on the tonpizl elements. Because of that, for frequencies of 50 kHz and higher we always recommend these with an ES80 system.



ES80 FISHFINDER KEY POINTS

DID YOU KNOW...?

You can combine Single and Split Beam frequencies in one system.

ES80 SINGLE BEAM MODELS

- 8 different frequencies: 12, 18, 27, 38, 50, 70, 120, and 200 kHz
- Separate on screen window for:
 - “Zoom view”
 - “Depth”
 - “Color threshold”
 - “Bottom hardness” (Option)
 - “Fish Biomass” (Option) from:
 - Zoom window
 - Surface view
 - Bottom view
- Unlimited number of personal settings
- Optimized pulse length with range
- Seamless auto range
- Change in “Gain” settings applies to the entire screen
- New bottom detector for improved fish detection close to the bottom and on slopes
- Six frequencies on the screen
- 24 hours “On screen history”
- Color threshold can be adjusted for individual frequencies
- 64 or 16 colors
- Optimized for widescreen
- Own display area for Bottom Expansion, Pelagic expansion or Trawl area
- Operation menu in local language
- Transceivers with single or dual frequencies
- Transmit Power up to 500 W
- A – Scope on demand
- Depth marker
- On screen readout of Lat/Long, Heading, Speed and Temperature
- Interface to Simrad Catch Monitoring Systems and Sonars (display trawl lines and/or depth information)
- Screen speed adjusted for Ping rate, Distance or Time
- Screen capture function
- Raw data recordings with export

Options:

- Calculation of Biomass
- Calculation of Bottom Hardness
- Heave compensation

ES80 SPLIT BEAM MODELS

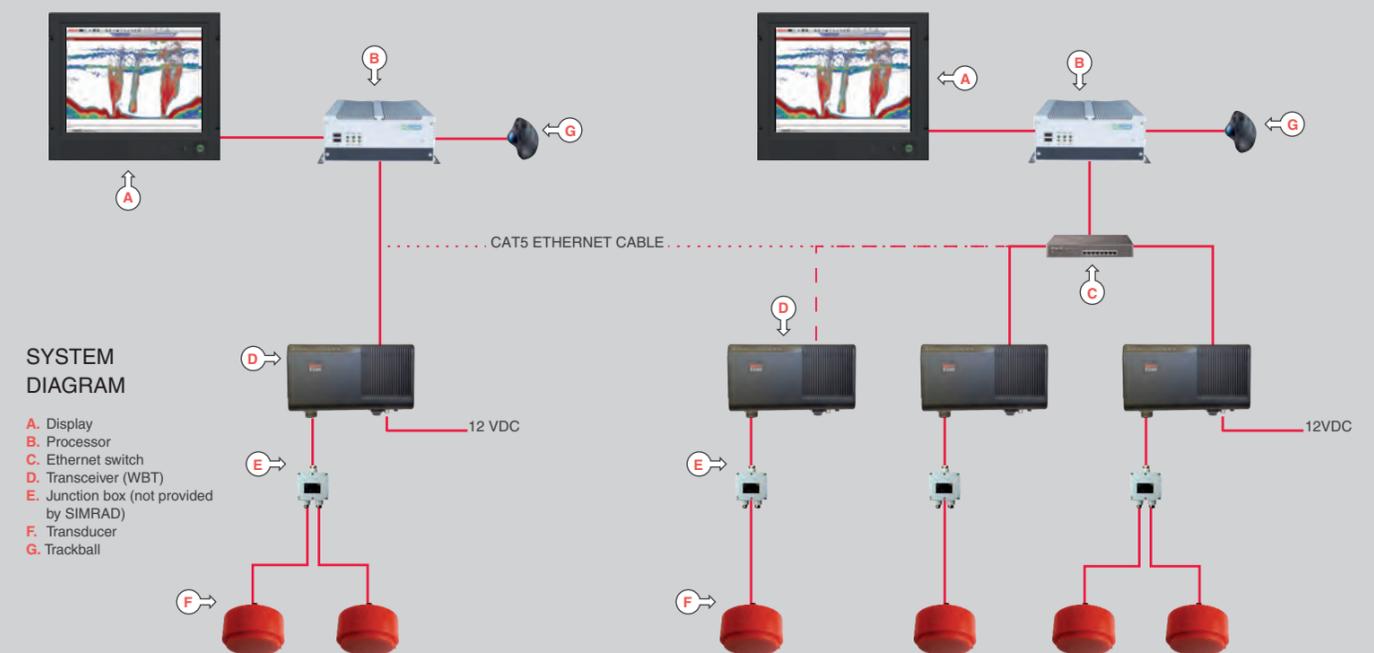
- 5 different frequencies: 18, 38, 70, 120 and 200 kHz
- Fish size and biomass from:
 - On screen “Zoom window”
 - Surface view
 - Bottom view
- Echogram with corrected fish size presentation
- The “Peak value” and “Number of samples” in “Fish size window”
- Independent settings for measuring fish size range
- New “Cone view” with “Single fish indications”
- Separate on screen windows for:
 - Zoom view
 - Fish size
 - Fish plot
 - Depth
 - Cone view
 - Color threshold
 - Bottom hardness (Option)
 - Calculation of Biomass
- Unlimited number of personal settings
- Optimized pulse length with range
- Seamless auto range
- Change in “Gain” settings applies to the entire screen
- New bottom detector for improved fish detection close to the bottom and on slopes
- Six frequencies on the screen
- 24 hours “On screen history”
- Color threshold can be adjusted for individual frequencies
- 64 or 16 colors
- Optimized for widescreen
- Own display area for Bottom Expansion, Pelagic expansion or Trawl area
- Operation menu in local language
- Transceivers with single or dual frequencies
- Transmit Power up to 2 kW
- A – Scope on demand
- Depth marker
- On screen readout of Lat/Long, Heading, Speed and Temperature
- Interface to Simrad Catch Monitoring Systems and Sonars (display trawl lines and/or depth information)
- Screen speed adjusted for Ping rate, Distance or Time
- Screen capture function
- Raw data recordings with export

Options:

- Calculation of Bottom Hardness
- Heave compensation

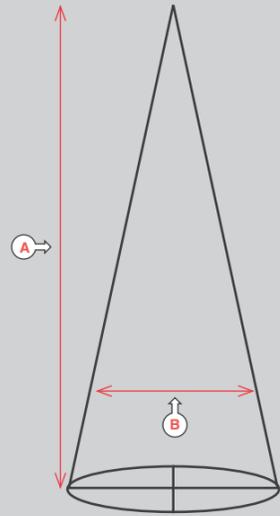
ECHOSOUNDERS SPECIFICATIONS

	ES80 SINGLE BEAM	ES80 SPLIT BEAM
Operational frequency transceiver	10-500 kHz	
Operational mode	Active, Passive	
Transmit mode	CW, Chirp	
Pulse duration (depends on frequency)	64-16384 µs	
Split beam capability	Yes	
Max. number of channels per transceiver	4	
DC voltage	12V	
AC voltage	100-240V	
Average power consumption active	20 W	
Power consumption inactive	4 W	
Requires processing unit during operation	Yes	
Ethernet interface	Yes	
Data Format	RAW (Complex)	
Built-in multiplexer	No	
TRANSCIEVER UNIT		
Voltage	12 VDC	
Consumption	100 W	
Interface Input	Navigation, Motion sensor, Annotation, TX synchronization and Temperature	
Interface Output	Survey Line, Remote power and TX synchronization	
Ethernet interface	One	
SOFTWARE OPTIONS		
Biomass	Optional	Included
Fish sizing	N/A	Included
Bottom hardness	Optional	
FM Transmission	N/A	Optional



Note! In Split Beam configuration only one transducer can be connected to the WBT

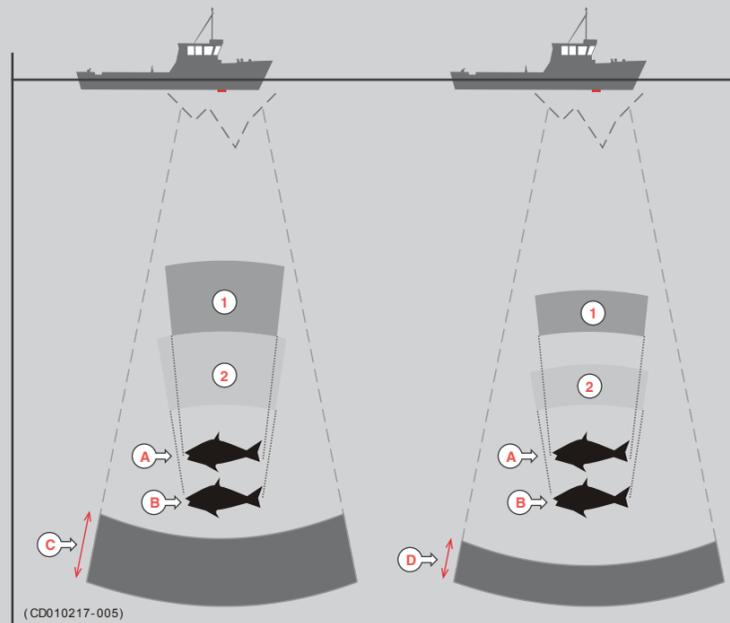
FOOTPRINT ON DIFFERENT TRANSDUCER BEAMWIDTHS



A	B															
	Meters	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
	Feet	33	66	98	131	164	197	230	262	295	328	361	394	426	459	492
	Fathoms	5	11	16	22	27	33	38	44	49	55	60	66	71	77	82
7°	Meters	1	2	4	5	6	7	9	10	11	12	13	15	16	17	18
	Feet	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
10°	Meters	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26
	Feet	6	11	17	23	29	34	40	46	52	57	63	69	75	80	86
13°	Meters	2	5	7	9	11	14	16	18	21	23	25	27	30	32	34
	Feet	7	15	22	30	37	45	52	60	67	75	82	90	97	105	112
30°	Meters	5	11	16	21	27	32	38	43	48	54	59	64	70	75	80
	Feet	18	35	53	70	88	105	123	141	158	176	193	211	228	246	264

ES80 RESOLUTION ON VARIOUS FREQUENCIES (METRIC MEASURE)

	64µS	128µS	256µS	512µS	1024µS	2048µS	4096µS	8192µS	16384µS
12 kHz					75 cm	150 cm	300 cm	600 cm	1200 cm
18 kHz				40 cm	75 cm	150 cm	300 cm	600 cm	
27 kHz				40 cm	75 cm	150 cm	300 cm	600 cm	
38 kHz			20 cm	40 cm	75 cm	150 cm	300 cm		
50 kHz		10 cm	20 cm	40 cm	75 cm	150 cm			
70 kHz		10 cm	20 cm	40 cm	75 cm	150 cm			
120 kHz		10 cm	20 cm	40 cm	75 cm				
200 kHz	5 cm	10 cm	20 cm	40 cm	75 cm				
333 kHz	5 cm	10 cm	20 cm	40 cm	75 cm				



The left vessel uses a long pulse duration (C). As you can see, this causes the echoes from the two fishes (A) and (B) to merge.

The right vessel uses a shorter pulse duration (D), and the two fishes will then appear as two separate echoes on the echogram.

Thus, short pulses will provide the best resolution and separation of individual fishes, but the echosounder is more sensitive to noise.

Two targets need to be min. 1/2 pulse length apart, in order to be seen as two targets. This can be measured in cm. (table above).

DETECTION DEPTHS

FREQUENCY			12 kHz	18 kHz	38 kHz			50 kHz		70 kHz		120 kHz		200 kHz					
TRANSDUCER			12-16/60	ES18-11	ES38B	ES38-10	Combi-D	Combi-W	50-7	Combi-D	ES70-11	ES70-7C	ES120-7C	120-25	ES200-7C	Combi-D	Combi-W		
Meters	Feet	Fathoms																	
100	320	55																	
200	640	109																	
300	960	164																	
400	1280	219																	
500	1600	273																	
600	1920	328																	
700	2240	383																	
800	2560	437																	
900	2880	492																	
1000	3200	547																	
1100	3520	601																	
1200	3840	656																	
1300	4160	711																	
1400	4480	765																	
1500	4800	820																	
2000	6400	1093																	
2500	8000	1367																	
3000	9600	1640																	
3500	11200	1914																	
4000	12800	2187																	
4500	14400	2460																	
5000	16000	2734																	
5500	17600	3007																	
6000	19200	3280																	
6500	20800	3554																	
7000	22400	3827																	
7500	24000	4101																	
8000	25600	4374																	
8500	27200	4647																	
9000	28800	4921																	
9500	30400	5194																	
10000	32000	5467																	
10500	33600	5741																	
11000	35200	6014																	
11500	36800	6288																	
12000	38400	6561																	



Note: For TS = -32dB in salt water 35ppt and 10° C at 38 kHz this relates to a cod of length 60cm. Bottom Sb = -30dB/m²



"Our goal is to set a new standard in catch monitoring, whether it is a wireless sensor or with cable. We believe the first example of this is the versatile PX MultiSensor"

THOR BÆRHAUGEN
Product Manager
Catch Monitoring Systems

CATCH MONITORING SYSTEMS

Incredible sensor system!

Fishermen all over the world rely on information from the PI50, ITI and FS Systems every day. Information about door spread and door stability, catch volume in cod end and height of trawl is vital to be efficient on a trawler.

On a purse seine you get information about net depth, distance to bottom, sinking rate and thermo clines. The PI Sensors are made in titanium and shock absorbing material to put up with the rough environment. The PX MultiSensor is made with aluminium housing and stainless steel lid for cost effectiveness. Simrad Catch Monitoring System gives you full control from setting to catch thus enabling you to be more profitable.

FULL CONTROL FROM SETTING TO CATCH

The Simrad PI receiver comes in two versions PI50 and PI60. The PI50 is a 6 channel receiver able to present 6 readings. Either from 6 PI sensors or 3 PX sensors sending two readings each. The PI60 receiver is a 10 channel receiver able to present 10 readings. Both receivers are small and cost effective units with one hydrophone input. To display the sensor data the PI50/60 can be connected to either the PI50 software or the new and graphical TV80 software.

The TV80 will accept unlimited number of PI50/60 receivers connected for unlimited sensor data readings while the PI50 software will only accept one receiver connected. The PI50/60 receiver will accept data from current sensors in the PI and PX family (except the PX TrawlEye). Next generation of the PX sensors will only be available on the SR70 receiver.

The PI50/60 receiver can work together with the SR70 receiver using the TV80 software.



ACTIVE HYDROPHONE WITH EXCELLENT SENSITIVITY

Active hydrophones have pre-amplifiers built-in. SIMRAD offers three different active hydrophones:

PURSE SEINE HYDROPHONE

The hull mounted hydrophone for purse seining operations has a 90° horizontal beam and a 30° vertical beam to provide the PI50 with optimal reception from the sensors on a purse seine.

This specific beam pattern is especially suited for purse seining and the wide coverage area reduces the need for careful alignment.

TRAWL HYDROPHONE

The hull mounted hydrophone for trawling operations has a 50° horizontal beam and a 30° vertical beam to provide the PI50 with optimal reception from the sensors on a bottom or pelagic trawl.

This specific beam pattern is especially suited for trawling and the wide coverage area reduces the need for careful alignment.

SR70 THE NEW TRAWL SENSOR RECEIVER GENERATION

Knowing the fishing gear behaviour is a need to perform an efficient fishery. This requires getting as much information as possible from the wireless sensors. In the last years we have seen wireless sensors with the ability to measure more than one parameter. This is particularly important when installing sensors on the trawl doors, because the possible effect on its hydrodynamic performance.

The new SR70 receiver uses a new type of communication protocol, compatible with the new Simrad sensor generation, like the new PX TrawlEye, able to send much more information than before, with a higher data rate too.

Depending of the fishing requirements, we need to install more than one hydrophone to receive the wireless sensors. With a single receiver system, the hydrophones must be switched to check where we can get a better communication link. The SR70 has four parallel receivers built-in, allowing a simultaneous reception without any need of switches.



PORTABLE HYDROPHONE

A portable hydrophone is also available. It is designed as a temporary measure until a fixed hydrophone can be installed at the vessel's next planned dry docking. It has an omnidirectional beam and a 50 meter integrated cable.

The cable is sheathed in polyurethane providing robust external protection to compliment its 150 kg tensile strength.

The cable is supplied on a reel for convenient retrieval and storage, and is equipped with a plug for easy attachment to the Receiver Unit.



ALL IN ONE, LIKE A SWISS KNIFE

The skipper can choose up to two, from 8 available functions, through a user friendly software program in any Windows™ computer.

The 8 functions are built into the sensor and can be easily programmed by the user.

The way to use or combine the different functions is only limited by the skipper's imagination.

AVAILABLE FUNCTIONS

- Height
- Distance
- Roll
- Pitch
- Depth
- Catch
- Temperature
- Geometry



NEW HIGH CAPACITY LI-ION BATTERY

The PX MultiSensor benefits from the latest technology in batteries, having the best compromise of capacity, charging time and safety.

The new battery design, together with the improved power management in the PX MultiSensor, will provide up to 150 hours working at 15s data update.

The charging pins have been moved to the bottom of the sensor, from previous designs where the sensor was charged using the fastening lugs.



FLEXIBLE AND COST EFFECTIVE SENSOR

The PX MultiSensor housing has four high performance ceramic transducers built in. One of them is used to establish the uplink with the PI receiver, from the other three, only two can be used at once, offering the following possibilities:



PX MULTISENSOR DOWN AND SIDE

When combining spread with Height or Depth (acoustic) then the PX D&S should be selected.

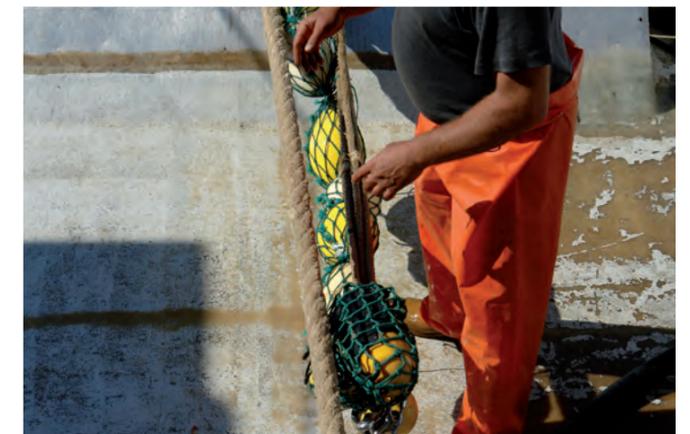
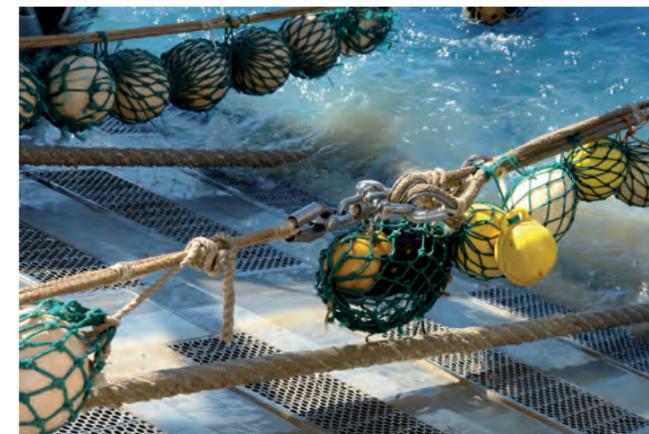
The common functions like; Pitch, Roll, Catch, Depth (pressure) and Temperature are also available in the PX D&S MultiSensor.

PX MULTISENSOR DOWN AND FRONT

When combining geometry with any other measurement, then the PX D&F should be selected.

The common functions like; Pitch, Roll, Catch, Depth (pressure) and Temperature are also available in the PX D&F MultiSensor.

In case the customer wants to change the sensor configuration between D&S and D&F, it could be done through the nearest SIMRAD authorized distributor.



**Remember:
Port door is
always the
reference!**

WIRELESS ECHOSOUNDER FOR PELAGIC AND BOTTOM TRAWLS

Place the Simrad PX TrawlEye on the headrope of your bottom trawl, or in the intermediate section of your pelagic trawl to provide a crisp and detailed presentation of the fish in the trawl, bottom condition and gear status.

The Simrad PX TrawlEye provides real time echogram from the trawl via a wireless link. In addition to the high resolution echogram the PX TrawlEye sends up the battery status so you can plan when to charge the sensor.

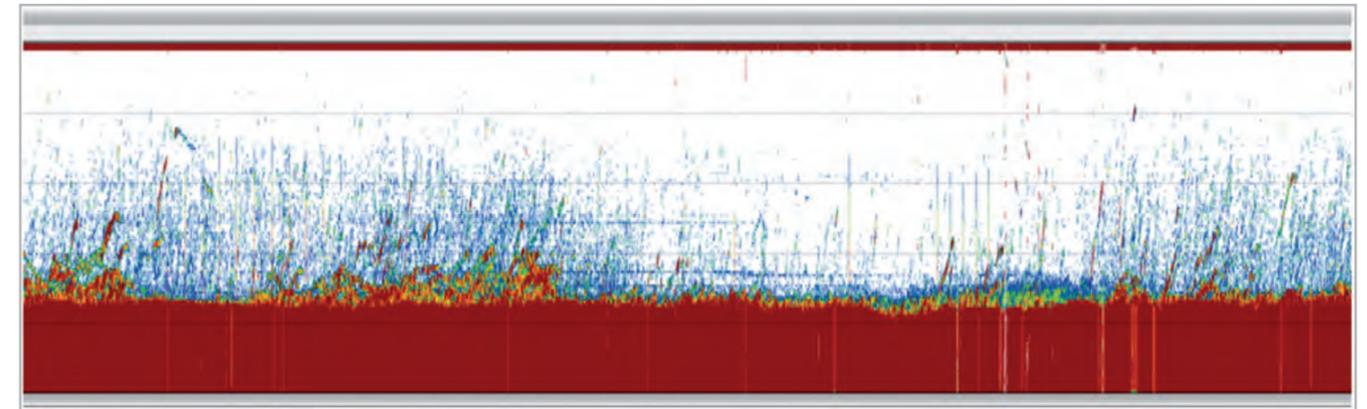
To ensure long range communication and optimum alignment between sensor and vessel the PX TrawlEye also sends up roll and pitch information. By knowing the sensor's roll and pitch angle you are able to detect if you have a bad alignment and or if the TrawlEye was tangled in a mesh or similar while shooting your trawl.

The TrawlEye can be received through the PI Hydrophone or even non-Simrad types,

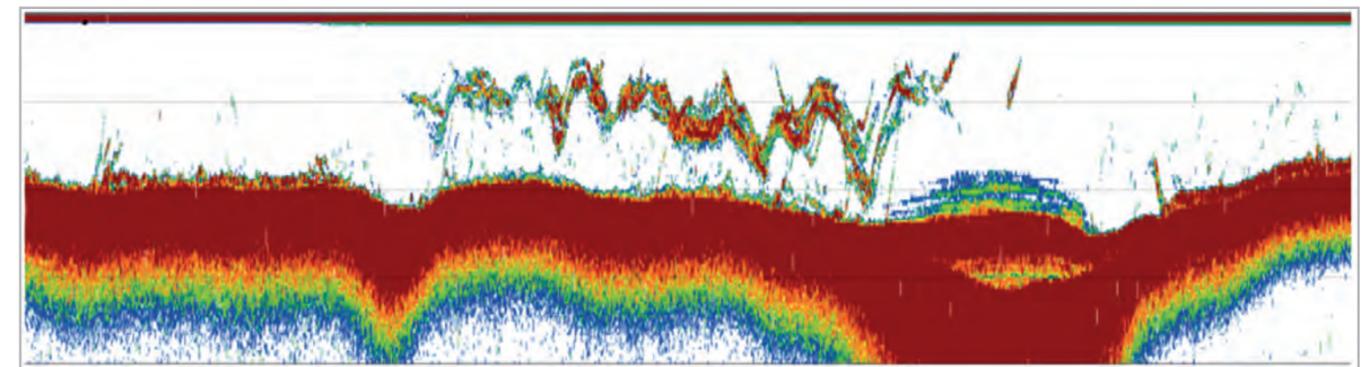
provided that the frequency is similar. The PX TrawlEye cannot be received on the PI50 or PI60 receiver, you need a dedicated receiver; SR70.

The PX TrawlEye is equipped with a composite echosounder transducer enabling advanced LFM pulses; Linear Frequency Modulation, also called chirp.

The PX TrawlEye can be configured to suit various fisheries by programming it with the bridge computer and changing pulse length, pulse type, sounder gain, echo range, communication power, etc.

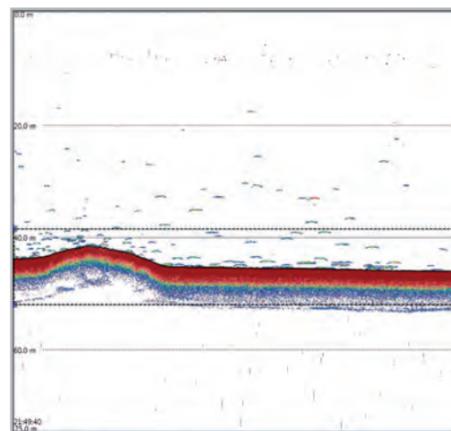


High resolution echogram from shrimp trawling. Both fish and shrimps are seen entering the trawl.



High resolution echogram from shrimp trawling with 10 m opening at depth 200 m. Towing speed 1,6 kts

DID YOU KNOW...?



The TrawlEye has a unique function that enables you to pick out an area and focus on it with high resolution.

The echogram is built up with data from 100 cells in the vertical plane. It is 100 cells regardless of the range. So, if the range is 100m then the cells are 1m high, if the range is set to 10m then the cells are 10cm each. This means that you get much higher resolution of the zoomed area.

It is similar to phasing the echosounder only it needs to be done before setting the net.

PX DEPLOYMENT PACK

The PX Deployment Pack offers a fast and safe way to mount the PX TrawlEye on your gear.

The PX Deployment Pack is designed to provide easy access and replacement of the PX TrawlEye, whilst still ensuring a safe and sturdy installation. The unit is made from hard plastic. The base frame is equipped with several mounting holes, which allows you to secure the deployment pack to the gear in a manner that you feel comfortable with. The frame also incorporates carrying handles.

Two metal latches, one on each side, secures the lid in its closed position. The latches are locked to the frame to secure the sensor when deployed.

The PX Deployment Pack is very easy to open. Remove the safety devices you have chosen to use, and swing out the two latches. When the lid is open (as shown), the PX TrawlEye can be lifted out and replaced.



THE NEXT GENERATION SENSOR SOFTWARE

The TV80 is the SIMRAD response to the skippers who want to see all relevant information about their fishing operation in one place.

The TV80 can be interfaced simultaneously with all the Simrad Trawl Systems, ITI, Plxx, FSxx and the newest SR70. This feature will provide an easy update path for SIMRAD customers, despite of the system they are using or want to use. In addition to the data supplied by Simrad Trawl Systems, the TV80 will accept data from other sources like; GPS receivers, echosounders, heading sensors, winch sensors, etc.

When fishing, the skipper wants to notice any change or trend in the relevant data from the fishing gear and/or the navigation, and he wants that just with a quick look on the screen. This has been the focus of the TV80 software designers. The challenge, to be as flexible as

the current systems are, with multi-function sensors that can be located in several positions of the fishing gear and with the variety of applications that the same sensor could offer in different fisheries. However, at the same time, the TV80 is easy to setup and operate.

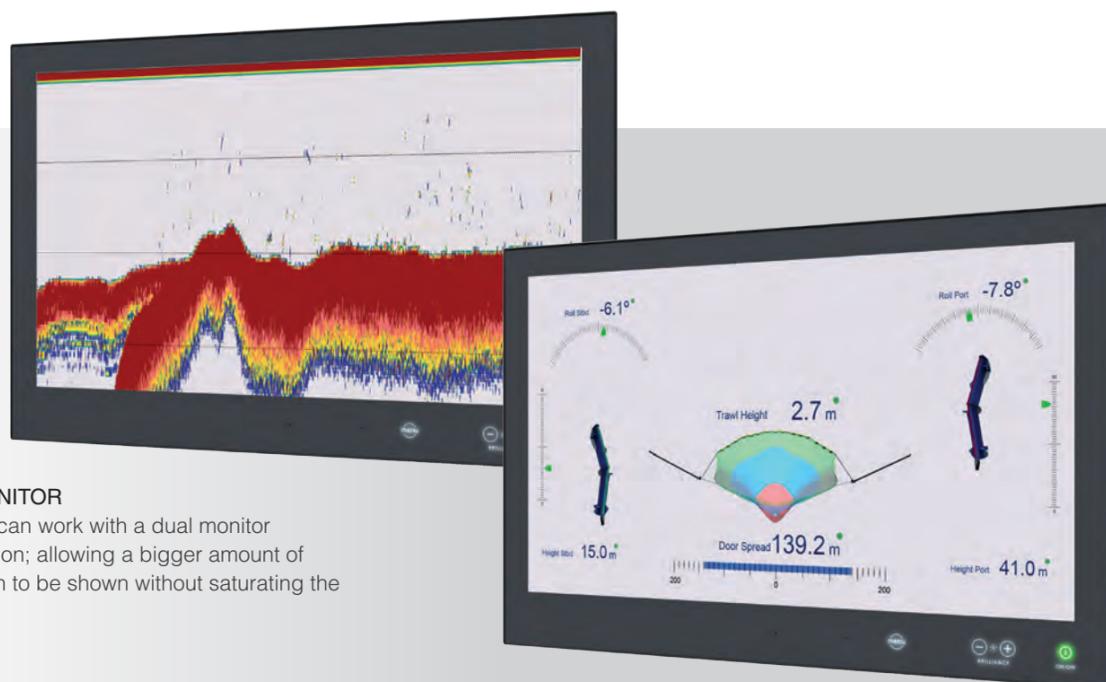
Simultaneous Trawl Eye echogram from different hydrophones
The SR70 receiver has four hydrophone inputs. Depending on the sea conditions and the relative position of the fishing gear against the vessel, the sensor reception is better from a particular hydrophone. The source of the trawl eye echogram could be selected with one click, but an interesting feature is to have several echograms on the screen working with different hydrophones. The user can switch to this predefined screen and check what is the best hydrophone to work with.

FLEXIBLE SCREEN SETUP

When using the TV80 for the first time, the user will find several predefined views that will work without any need for configuration.

The user can choose to split the TV80 screen in two, three or four sections. Loading to each section a pane,

selected from a built in library. Nevertheless, for those users who want to create their own screen setup, the TV80 has a built in designer to create new panes following the user preferences.



DUAL MONITOR

The TV80 can work with a dual monitor configuration; allowing a bigger amount of information to be shown without saturating the screen.

DATA RECORDING

The TV80 will record all the telemetry data received automatically every 60 seconds. This data will be available to export or

replay. The user can record manually the telemetry with bigger rate and add other data, like TrawlEye echograms.

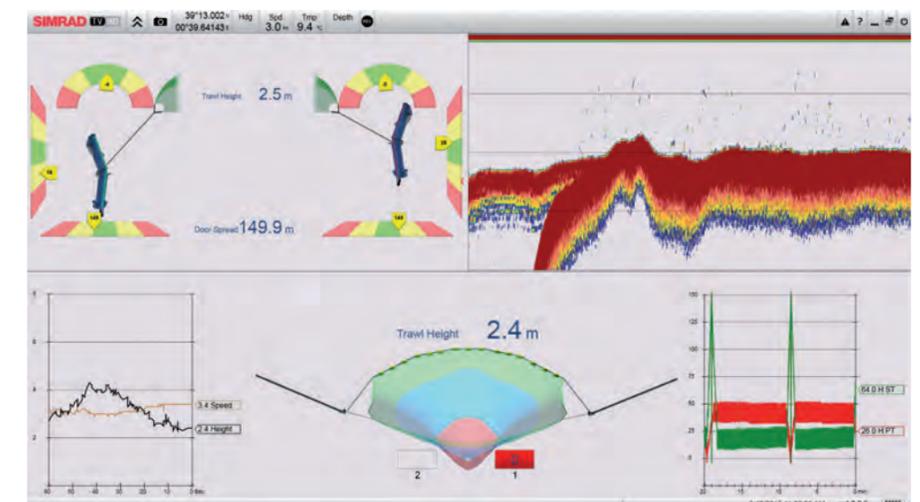


The TV80 SW allows for a flexible design of trawl performance and environmental sensor inputs. Coupled with the many inputs from the PX MultiSensors, this provides for a flexible trawl monitoring system providing complete overview for the user.

The recorded data can be exported in text CSV format which could be directly imported by Excel (TM) or any database management software. This example shows an Excel screenshot showing some data from the scientific interface. This makes it easy to analyse trends and overall trawl performance resulting from changes in trawl design or vessel operation.

FREQUENCY SPECTRUM

The acoustic communication link between the receiver and the sensors could be challenging in a fishing vessel, due to propeller, pumps, compressors and other electric systems on board generating noise. When we receive this kind of noise in the same frequency where the sensor is communicating with the receiver, the result is unstable or even no data readings. The TV80 has a built-in spectrum analyzer that shows the signals coming through each hydrophone. With this advanced tool, the user will be able to identify the noise and find the cleanest frequencies. Programming the communication channel of the sensors in the "quiet" frequencies will assure a stable data readings from the sensor.



SIMRAD ITI

Simrad ITI is a complete wireless trawl positioning and monitoring system designed to improve control and efficiency in pelagic and bottom trawling.

Small, robust, battery powered sensors mounted

on the trawl transmit important information to the vessel on request.

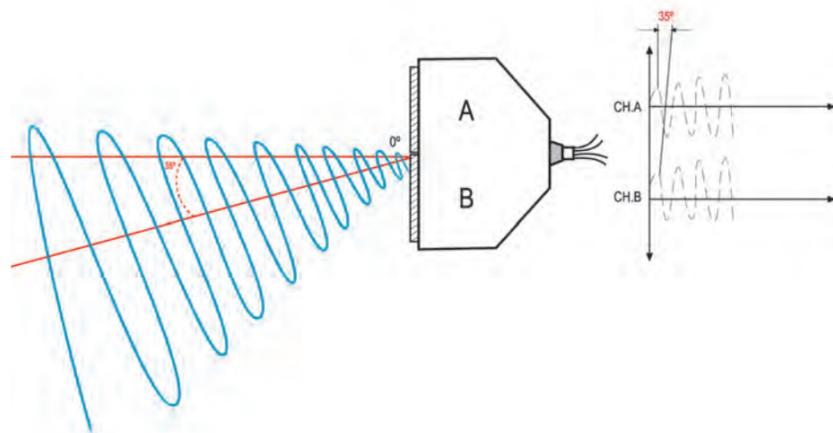
Simrad ITI allows the skipper to monitor the exact position of the gear and what is happening in and around the trawl, providing crucial information for effective, profitable and responsible fishing.

UNIQUE SPLIT BEAM TECHNOLOGY

Even it was released in the 90's, the ITI System is still today the only Trawl Monitoring System with distance and angle measurement to the sensors.

Using the Split Beam technology, the ITI is able to determine the angle from the transducer center line to the trawl sensors with high accuracy.

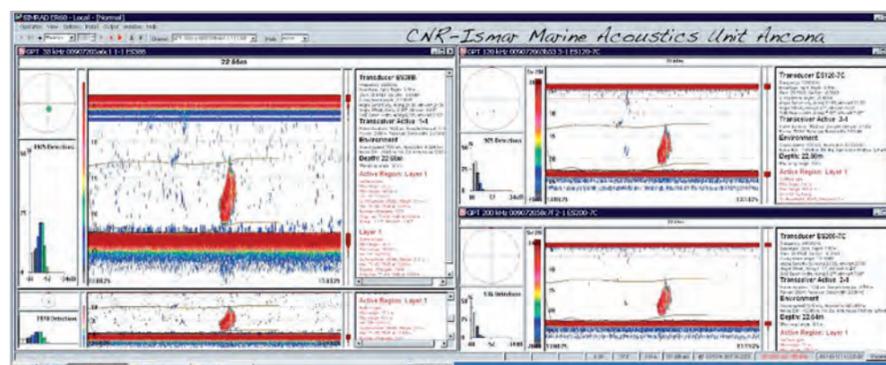
To obtain the distance to the sensors the ITI System uses a two way communication system.



INTERFACING WITH OTHER SIMRAD SYSTEMS

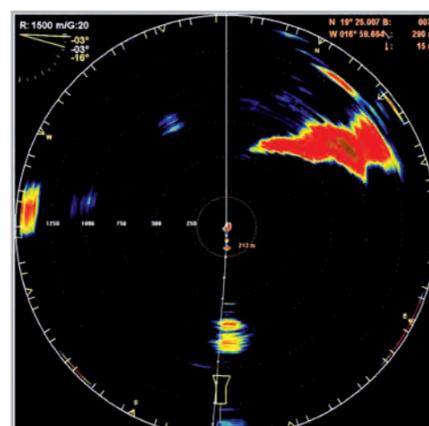
Connecting the ITI System to any of the Simrad sonars the skipper will have the position of the trawl in the sonar picture, having a full 3D control of the fish school detected until it comes into the trawl.

When the ITI is connected to a Simrad Echosounder, the headrope and footrope can be displayed over the echosounder echogram.



Simrad EK60 Echosounder receiving data from ITI height sensor. Note that both headrope and footrope are shown on the EK60 screen to ensure that the trawl is in the right depth against the fish school previously detected.

Picture courtesy of Research Institute CNR-ISMAR, Italy.



School of sardines close to enter into the trawl of a pelagic vessel in Mauritania. SX93 Sonar connected to the ITI System.

ITI, WHEN THE POSITION OF THE TRAWL IS NEEDED

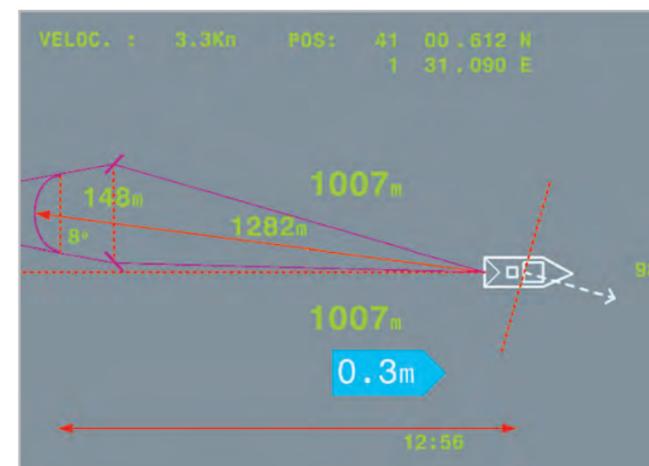
In some fisheries the ability to know the geographical position of the trawl makes the difference. Especially trawling through irregular seabed. It is extremely important to know when the trawl doors start to decent or climb a hill, because the skipper should control carefully the vessel speed to avoid that the trawl either starts flying or get stuck in the mud.

SOMETIMES YOU CAN'T RELY ONLY ON YOUR EYES

Every skipper is convinced to know the side of the vessel where the trawl is. Just a quick view to the warps and that's it.

Not always what you see in the warps is giving you the right information. In the following picture the ITI System shows clearly that the trawl is in the port side of the vessel. Looking at the warps the skipper will confirm it. They are pointing to the port side.

Imagine that the trawl should pass close to a wreck located in the starboard side of the vessel. The skipper will pass the vessel close to the wreck with the idea that the trawl comes from the port side safely.



When we look at the geographical position of the fishing gear, we can see that the skipper was right, the trawl is in the port side of the vessel, if we look at the heading of the bow. But regarding to the actual track of the trawl over the ground, it is passing on the starboard side of the vessel track.



If we come back to the case of the wreck in the starboard side of the vessel, the most probable consequence will be to get the net passing over it, exactly what the skipper was trying to avoid.

FM90 MULTIBEAM TRAWL SONAR

SIMRAD invented the “3rd wire” trawl sonar back in the early 80’s. Back then nobody could foresee the impact this has had to the pelagic and semi pelagic fishing industry. Imagine back then, nobody had a “3rd wire” winch and nobody had handled this type of equipment before, making the learning curve steep. But as with everything, if you see the benefit with something, you go the extra mile to be able to benefit from it. For the pelagic and semi pelagic industry the trawl sonar is so important that you will not go out fishing without it.

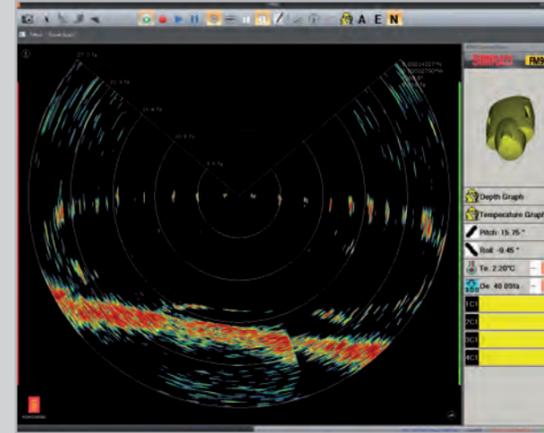
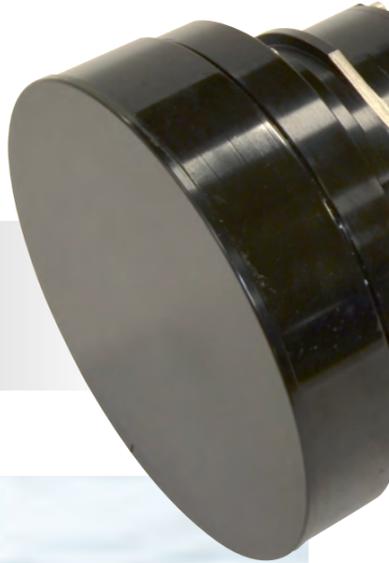
Traditionally the trawl sonar has been a scanning search light sonar installed in the vertical plane. The advantage with a search light sonar is the resolution, the disadvantage is its real time capabilities. It takes time to scan a trawl opening and time is valuable. The FM90 will instantly give you a picture of the net opening and fish enter. The challenge up until now has been the ability to detect fish and the net geometry when the net is getting closer to the bottom. The FM90 has solved this using all the multibeam technology and knowledge within the SIMRAD organization.



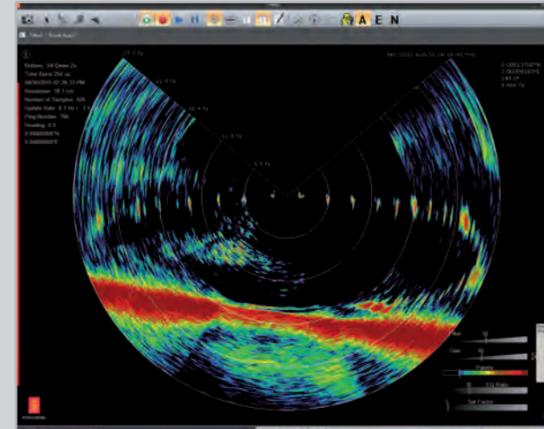
FM90 TRAWL UNIT

The FM90 Deployment Pack has a yellow top and black bottom to confirm correct orientation prior to launching and to assist in visual sighting during recovery. It also has improved hand holds to assist handling even with gloves on. The strain relief can be accessed using standard tools without opening the entire Deployment Pack and the unit is quick filling and draining.

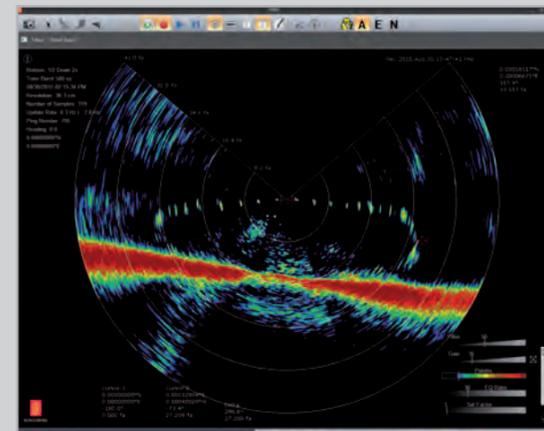
The transducer of the FM90 has no moving parts thus being less vulnerable to damage and less maintenance is needed.



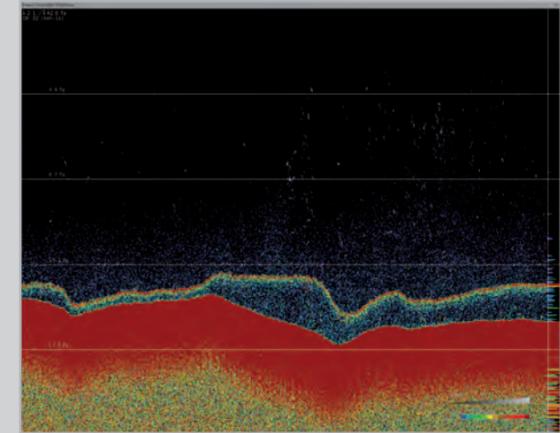
This picture shows Pollock in Alaska. Notice the trawl is actually touching bottom on starboard but on the echosounder it looks like the trawl is off the bottom. This is only truly possible with a multibeam trawl sonar. A traditional search light trawl sonar could lose this information as it takes too long time to draw the picture.



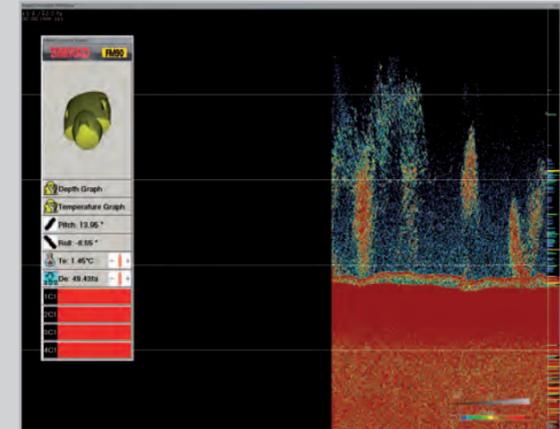
This picture shows Pollock in Alaska. Here the net is almost on the bottom and still the contour of the net is easily seen along with fish entering the trawl opening. Again, the trawl is touching bottom on the starboard side while port side is clear of the bottom.



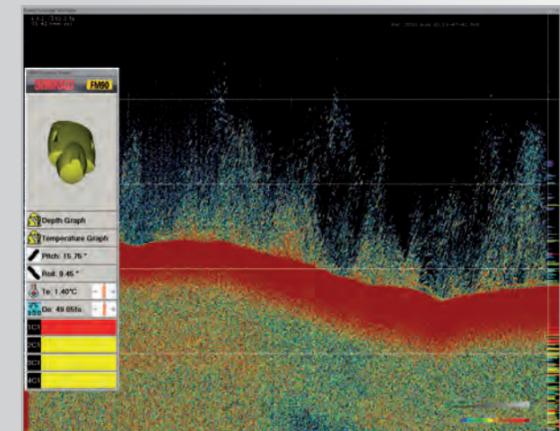
In the above picture the net is solid on the bottom and still the net geometry and fish entrance is easily seen.



This part is the 200 kHz down looking echosounder. The line above the bottom is the footrope of the trawl. It is easy to see fish escaping below the footrope.



On the down looking echosounder fish entering the trawl opening is easily seen with great details. Also, notice the footrope almost touching bottom. Here four catch sensors have been triggered and it's time to haul!



THE NEW TRAWL SONAR PLATFORM COMBINES THE BEST OF TWO WORLDS

The new Simrad FS Trawl System provides the full picture of the trawl by utilizing the ultimate FS third wire system with integrated PI Sensors. This sophisticated solution enables the fisherman to have full control of any type of trawl fishery.

The system provides real-time images from the trawl sonar head and the data from the PI Sensors to the bridge, thus maximizing the quality of the catch and increasing efficiency at sea.

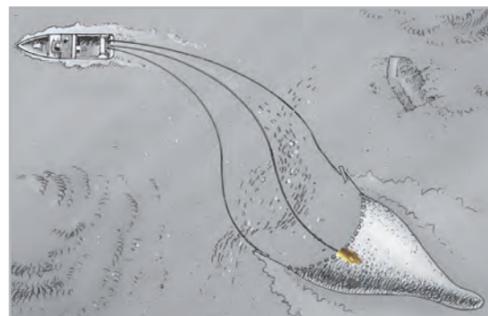


FS70 TRAWL UNIT

The FS70 trawl housing unit is designed for the harshest environments and for withstanding the extreme forces encountered when shooting a trawl. However, it is easy to handle and the Hyper yellow colour makes it easy to see even in the dark.



A major benefit of the third wire integration with PI Sensors is to prevent loss of communication with the trawl as the vessel is changing course or in heavy sea conditions.



Pitch: 8.6°	
Roll: 2.7°	
126.3 m	
6.6 °C	
2C	*
3C	*
4C	0:
5S	29.75 m < 0.58
6S	28.5 m > -0.42



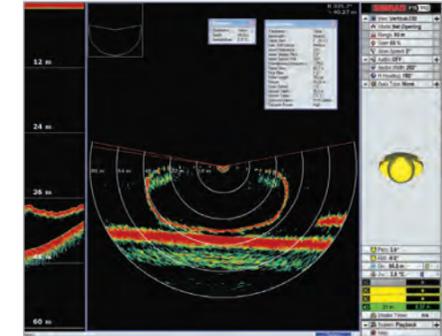
PI AND PX SENSOR INFORMATION

The PI and PX Sensors provide information about the filling rate of fish in the cod end, door spread, roll, pitch, depth and height.

EXTRA FLEXIBLE TRAWL SONAR SYSTEM

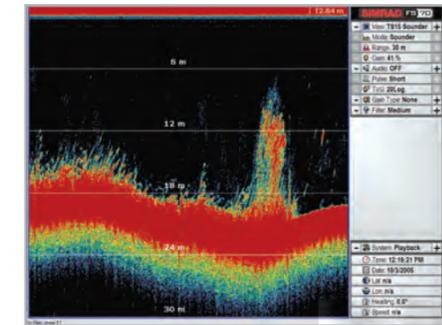
The Simrad FS70 full screen presentation in a polar sounder mode indicates the position of the trawl close to the bottom and shows the opening of the net by displaying the Cursors 1 and 2.

In addition, the sounder display provides an accurate depth of the bottom and to the foot rope. The operator can monitor up to 6 catch indicators, (if programmed at 40 kHz) indicating the amount of fish being caught by the trawl and the time when the sensors were activated.

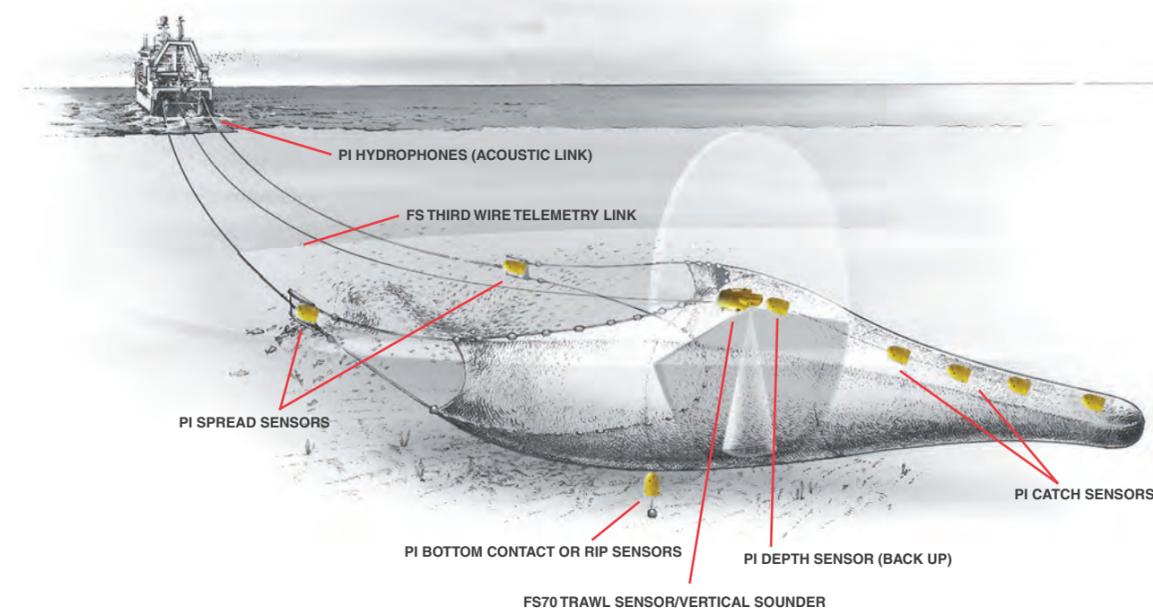


Simrad FS70 full screen display mode.

The Simrad FS70 200 kHz sounder provides a real time picture of the trawl opening and position relative to the bottom. In addition to the high resolution sounder, the operator can control the descent of the trawl during the set by monitoring the position of the foot rope and the bottom.



Simrad FS70 Sounder display mode.



TRAWL SENSORS SPECIFICATIONS

	PI			PX			ITI		
	DEPTH	CATCH	SEINE SOUNDER	DOWN&SIDE	DOWN&FRONT	TRAWLEYE	SPREAD	COMBI	TRAWL EYE
Communication Frequency	43,5-49,5 kHz	40-70 kHz	43,5-49,5 kHz	43,5-49,5 kHz	25-49 kHz		27-33 kHz	27-33 kHz	27-33 kHz
Echosounder / Transverse working frequency	N/A		70 kHz	70 kHz	200 kHz		104 kHz	104 kHz	120 kHz
Maximum Communication Distance	2500 m			2500 m	2000 m ⁽³⁾		2500 m		
Depth Rating	1800 m ⁽¹⁾			1400 m ⁽⁴⁾	1400 m ⁽⁴⁾		1800 m		

UPDATE RATES

	PI	PX	ITI
Slow	5,5 s. approx.		2/4/8 s.
Normal	14 s. approx.	15 s.	1,1 s.
Fast	34 s. approx.		0,5 s.

MAXIMUM BATTERY LIFE

	PI	PX	ITI
With one measurement (hours)	100	150	100
With two measurements (hours)	N/A	N/A	80

CHARGING TIME

	PI	PX	ITI
Up to 70% of total capacity (hours)	1	3	2
Up to 100% of total capacity (hours)	4	3	3

WEIGHT

	PI	PX	ITI
In Air	4,3 kg	4,3 Kg	7 Kg
In Water	1,5 kg	1,5 kg	2,7Kg

	PI	PX	ITI
Door Spread Maximum Range		600 m	N/A
Geometry Maximum Range		N/A	600 m
Acoustic Depth / Height Maximum Range		100 m	100 m

(1) Except PI D300 which is 1000 m.

(2) Depending on the number of sensors activated, their distance to the vessel and the interrogation rate selected by the user.

(3) Depending on sea conditions, noise level, sensor alignment, output power.

(4) Note: depth lid only goes to 1000 meters

(5) Depending on output power and update rate.

PX COMBINATIONS

	DOWN&SIDE (D&S)			DOWN&FRONT (D&F)		
	STANDARD LID	DEPTH/TEMP LID	CATCH LID	STANDARD LID	DEPTH/TEMP LID	CATCH LID
Spread	■	■				
Twin Spread	■	■	■			
Spread Height	■	■	■			
Spread Depth		■				
Geometry				■	■	■
Roll/Pitch	■	■	■	■	■	■
Roll/Spread	■	■	■	■	■	■
Pitch/Spread	■	■	■	■	■	■
Depth/Temp		■			■	
Catch			■			■
Catch/Roll			■			■
Catch/Pitch			■			■
Catch/Temp			■			■
Height	■	■	■	■	■	■
Height/Roll	■	■	■	■	■	■
Height/Pitch	■	■	■	■	■	■
Height/Depth (Trawl)		■			■	
Height/Temp		■			■	

Note: Port Door is the reference.

TRAWL UNITS SPECIFICATIONS

	PI50	FS70	ITI
PROCESSING UNIT			***
Voltage	110/220 VAC	110/220 VAC	110/220 VAC
Consumption	5 A.	5 A.	90 W
Processor type	Standard PC computer	Standard PC computer	Built in
Operating system	Windows™ XP, Vista, 7	Windows™ XP, Vista, 7	
Display output	Single	Dual	Single
Serial interface I/O	One RS232	One RS232	Four NMEA ports
Ethernet interface	One	One	Optional
Display resolution	Standard XGA	Standard XGA	VGA 680x512 (Hs 29,45kHz - Vs 57Hz)

TTM / BRIDGE UNIT

	PI50	FS70	ITI
Voltage		110/220 VAC	
Consumption		5 A.	
Communication link		With third wire	

WIRELESS SENSORS TX/RX UNIT

	PI50	FS70	ITI
Voltage	24 VDC **	(Built in the Deployment package)	*
Consumption	250 mA.		
Hydrophone connection	1	Up to 2 (Fore and Aft)	Up to 3 - Automatic selection
Hydrophone type	Single Beam with preamplifier	No	2 Way Split Beam
Frequency range	43,5-49,5 kHz	40 kHz or 70 kHz	27-33 kHz
Serial interface I/O	1 RS232		4 NMEA ports
Ethernet interface	1		Optional
Bearing to sensor measurement	No	No	Yes
Distance to sensor measurement	No	No	Yes
Maximum range to sensors ***	2500 m.	2500 m.	4000 m.
Sensor compatibility	PS, PI, PX, FA701	PS, PI, PX, FA701	ITI
RX Channels	6	6	10
Sensor types	Depth, Temperature, Spread, Catch, Rip, Height, Pitch angle, Roll angle, Geometry, Bottom contact, Seine sounder	Depth, Spread, Catch, Rip, Height, Pitch angle, Roll angle, Bottom contact, Seine sounder	Depth, Temperature, Spread, Catch, Height, Grid angle, Trawl eye

UNDERWATER UNIT

	FM90	FS70	PX TRAWLEYE
DEPLOYMENT PACK			
Material	Polyurethane with S.S. Fasteners	Polyurethane with S.S. Fasteners	Polyurethane with S.S. Fasteners
Dimension L x W x H in cm.	84 x 41 x 30	79 x 43 x 27	49,5 x 35,5 x 17
Weight (complete system in air)	35,5 Kg	28 Kg	12,5 Kg

TRAWL SONAR HEAD

	FM90	FS70	PX TRAWLEYE
Head type	Multibeam with down/up sounder	Analog Vertical with Echosounder	Wireless
Vertical transducer frequency	200 kHz	120 kHz or 330 kHz	200 kHz
200 kHz/120 kHz Head Beam width ****	3° x 20°	5° to 40°	N/A
Up Sounder/330 kHz Head Beam width *****	25° x 20°	1,9° to 20°	N/A
Echosounder frequency	200 kHz	200 kHz	200 kHz
Echosounder transducer beam width	10° x 20°	10° x 20°	33°
Depth rating	2000 m.	2000 m.	1000 m.
Sensors built-in	Depth, Temperature, Pitch and Roll	Depth, Temperature, Pitch and Roll	Roll/Pitch

* Built in the processing unit.

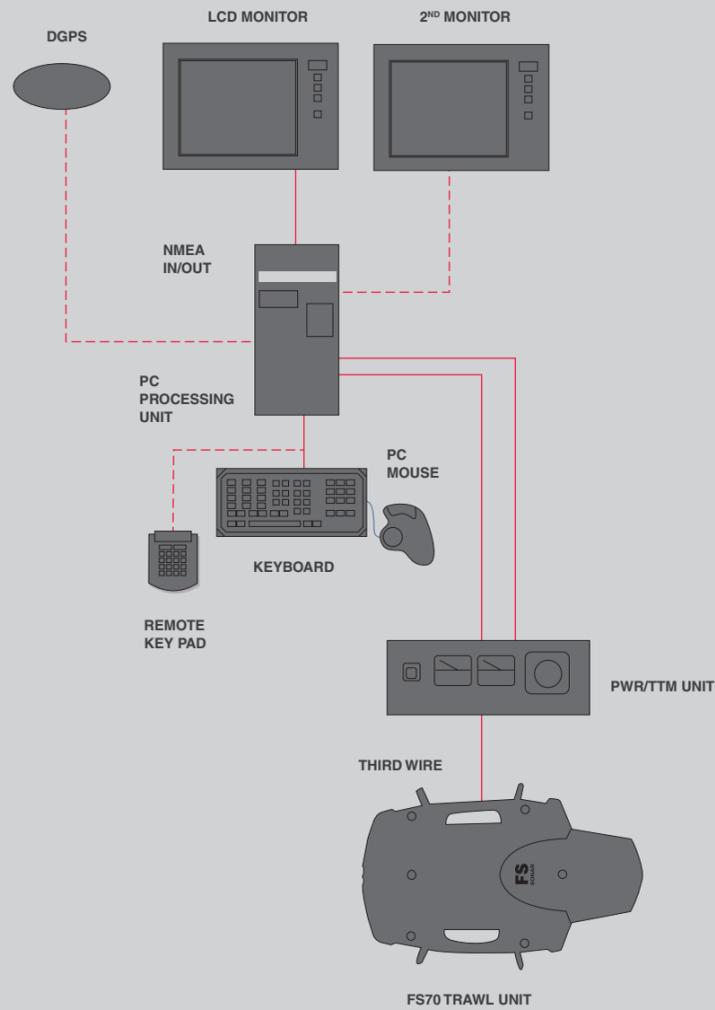
** 115/230 VAC to 24 VDC Adaptor included with the delivery.

*** Detection range depends on transducer installation, ambient noise level, temperature gradient and sensor alignment.

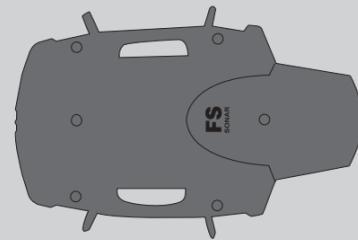
**** 200 kHz Head Beam width for FM90. 120 kHz Head Beam width for FS70 and PX TrawlEye.

***** Up Sounder Beam width for FM90. 330 kHz Head Beam width for FS70 and PX TrawlEye.

FS70 EXPANDED CONFIGURATION

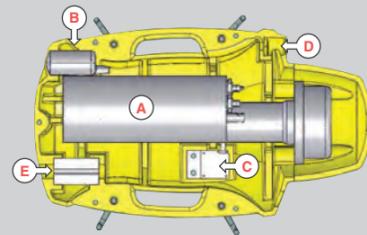


FS70 TRAWL UNIT



Width: 790 mm
Height: 430 mm
Depth: 270 mm
Weight: 28 kg

FS70 TRAWL UNIT

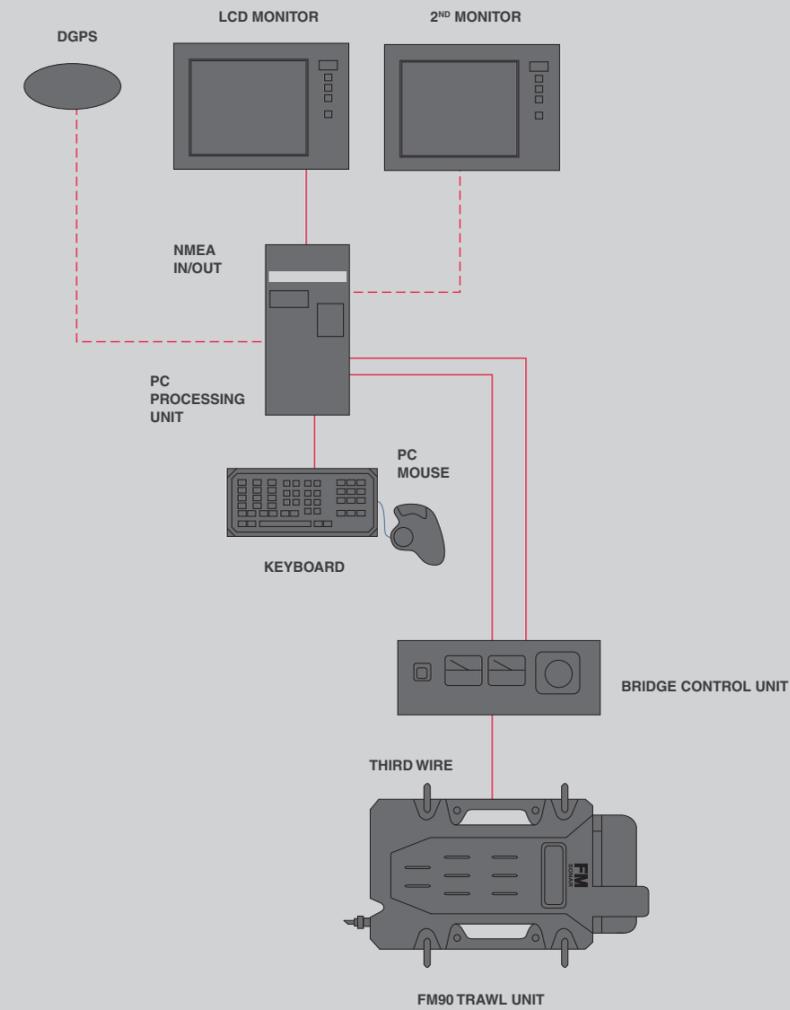


- A. Sonar head
- B. Receiving hydrophone (PI, PX, FA701)
- C. Echosounder transducer
- D. Receiving hydrophone (PI, PX)
- E. Cable strain relief

FS70 HEAD



FM90 EXPANDED CONFIGURATION



FM90 TRAWL UNIT



Width: 410 mm
Height: 300 mm
Length: 840 mm
Weight: 35,5 kg

FM90 TRAWL UNIT



- A. Sonar head
- B. Receiving hydrophone (PI, PX)
- C. Receiving hydrophone (PI, PX)
- D. Cable strain relief

FM90 HEAD



SIMRAD PI50 SYSTEM TYPICAL CONFIGURATION



SYSTEM DIAGRAM

- A. Display
- B. Keyboard and trackball
- C. Processor
- D. PI50 Receptor
- E. Hydrophones Selector
- F. Hydrophones
- G. PX MultiSensor
- H. Sensors charger
- I. PX Configurator

SIMRAD ITI SYSTEM TYPICAL CONFIGURATION



SYSTEM DIAGRAM

- A. Display
- B. Keypad
- C. Transceiver
- D. Transducer
- E. Trawl Sensor
- F. Doors Sensor
- G. Sensors charger



FROM THE BRIDGE!

SIMRAD a global brand!

Fishing is different depending on where it is. Species, fishing gear, vessels are all different. SIMRAD is present in all main fisheries globally and on the following pages are some examples of our products in practical use around the world. On many vessels there are several of SIMRAD products installed, Sonar, Echosounder, and Catch Monitoring Systems have for several decades been the trusted friend on vessels around the world.

FACTS

ALASKA POLLOCK
(Theragra chalcogramma)



Alaska pollock or walleye pollock is a species of the cod Family Gadidae. Alaska pollock is a semipelagic schooling fish widely distributed in the North Pacific with largest concentrations found in the eastern Bering Sea.

While related to the common Atlantic pollock species of the same Family, the Alaska pollock is not a member of the same Pollachius genus. Rather, recent research suggests that it is

more closely related to Atlantic cod, and that Alaska pollock should be moved back to genus Gadus in which it was originally described as Gadus chalcogrammus.

Furthermore, Norwegian pollock (Theragra Finnmarchica), a rare fish of Norwegian waters, is likely the same species as the Alaska pollock.



Bering Sea

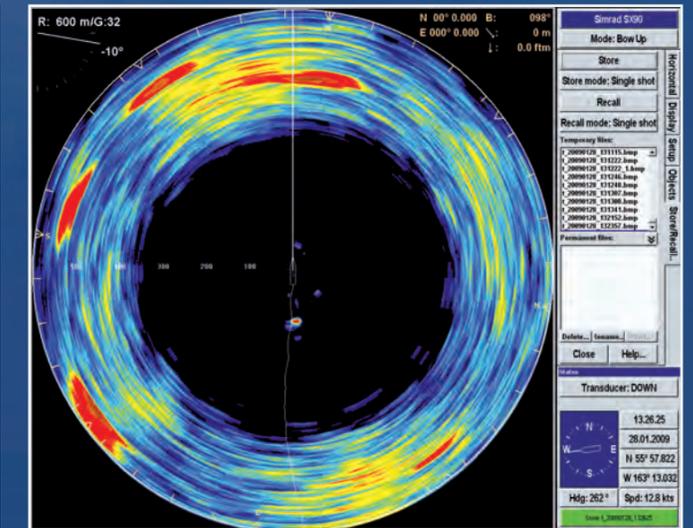
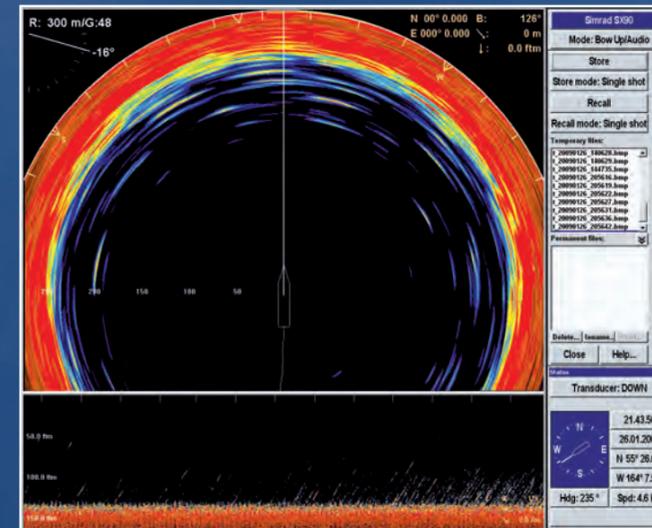


Pelagic/Semi pelagic trawling

During evening the Pollock is starting to disperse and we get what is commonly called "Salt'N'Pepper". This is more difficult to see on a sonar, but the SX90 has an echosounder mode where it can be shown. Notice the lower part of the sonar screen, this is the returned echoes from the Audio line (the white line in the horizontal picture).

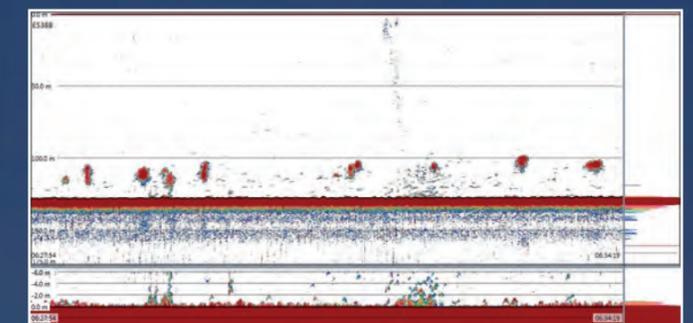
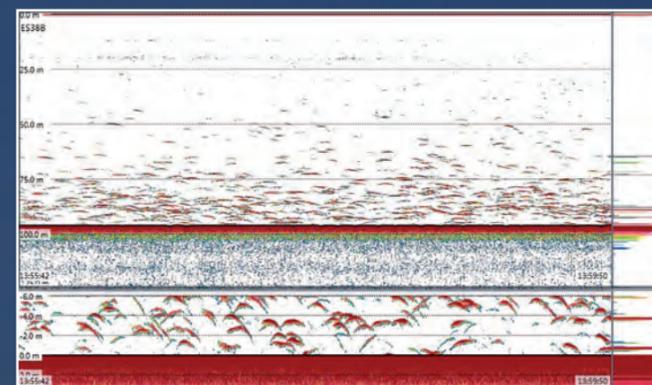
During the day, the Pollock will school up and we get what is called "Cherries".

The fish is then seen easier on longer ranges and the operator can operate with a smaller tilt angle. In the picture shown, the fish is seen "inside the bottom" as the sonar beam will hit bottom before the fish. The SX90 still will display the echoes in an easy to see manner.



The screen capture below is from the ES70 and shows the Pollock as it is about to "land" on the ocean floor. It is still dispersed but about to gather together and during the day it will school up in "Cherries"

The below picture shows the classical "Cherrie" formation that the Pollock forms during the day.



Picture from a bridge during Pollock fishery in Alaska. The picture shows an evening/night time situation when the Pollock is dispersed into "Salt and Pepper". The SX90 Sonar to the far left and the ES Echosounders to the far right.



FACTS

SAITHE
(Pollachius virens)

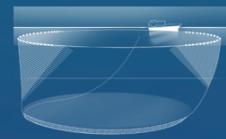


Pollachius virens is a species of marine fish in the Pollachius genus. Together with Pollachius pollachius it is generally referred to in the U.S. as Pollock. Other names include the Barents blues (separate from bluefish), coalfish (or coley) and saithe in the UK.

It is common in the northern parts of the Northern Atlantic, including the Bay of Biscay. Adults can grow up to 130 cm (51 in) and weigh up to 32 kg (71 lb); the species is of great commercial value to fisheries. The fish can be found close to the shore, particularly in rocky areas but larger examples tend to be found around off-shore wrecks and reefs.



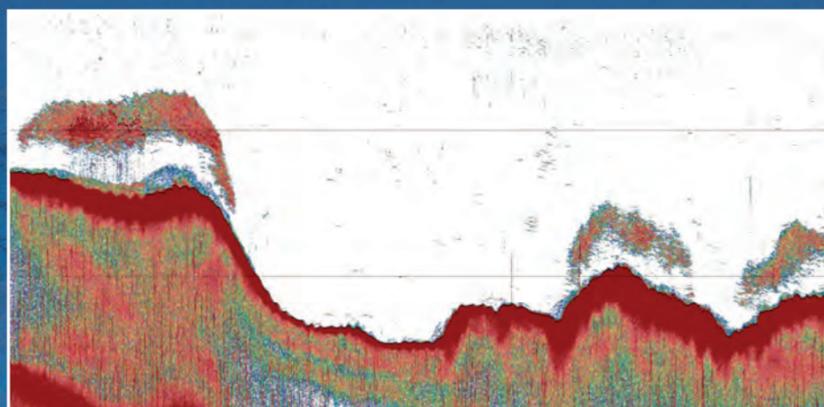
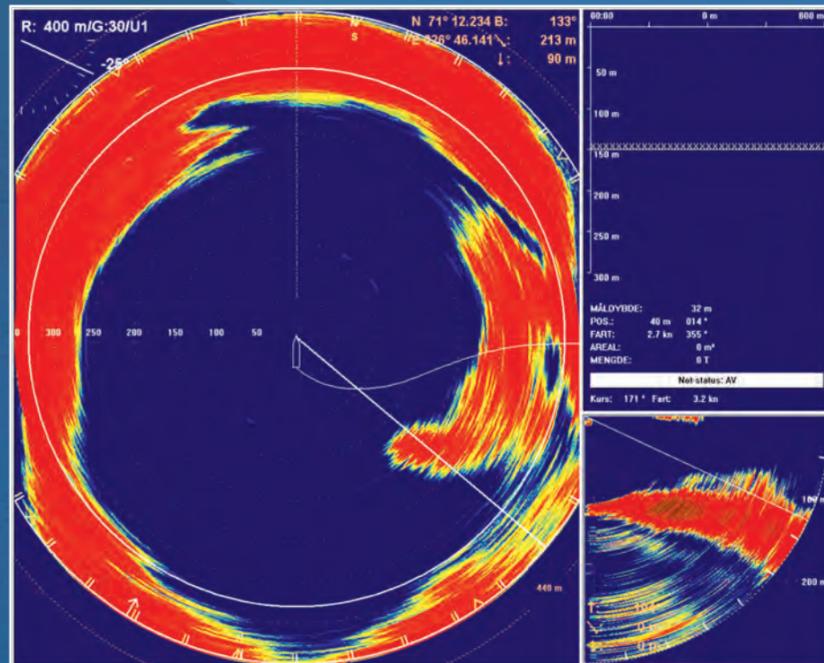
Barents Sea



Purseining

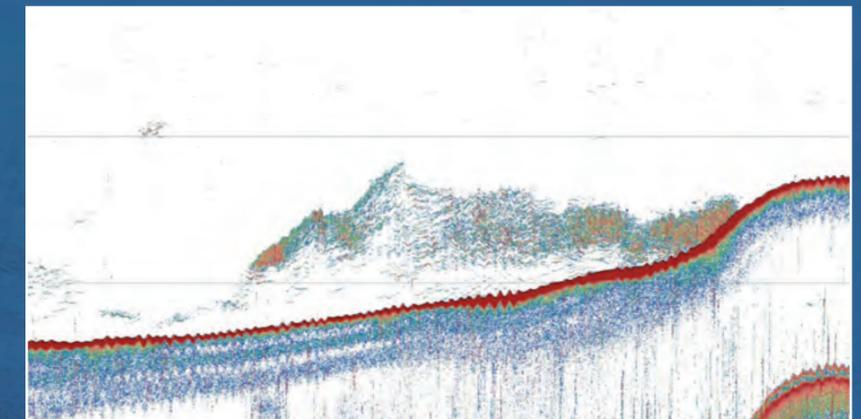
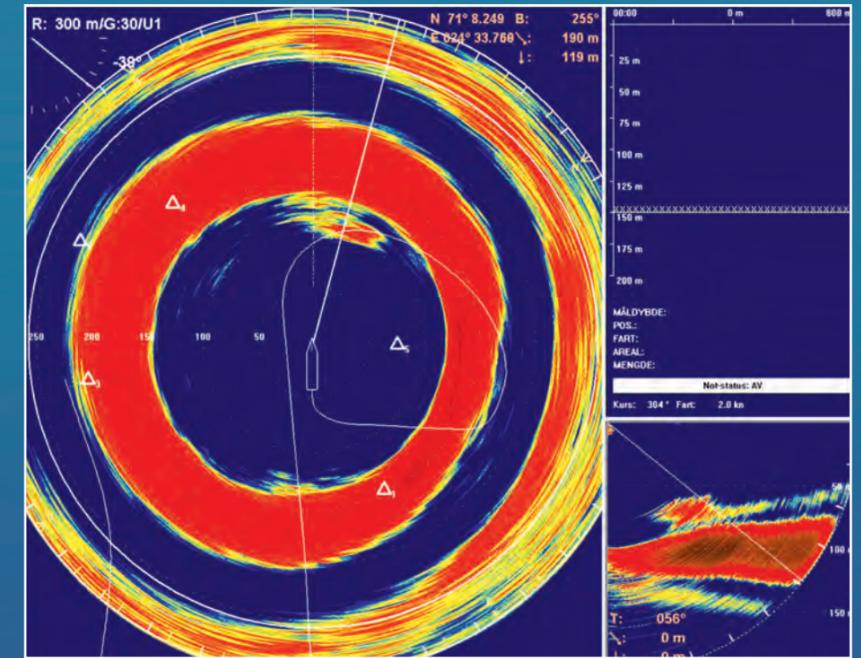


Bottom trawling



Saithe often schools up on rocky and curvy bottom. In addition it likes to stay close to the bottom. This makes it a challenge to see on a sonar as separating fish from bottom becomes difficult. The SH90 has high resolution and a vertical view that makes it ideal for this fishery.

The two pictures on the left are from the same situation, top picture is the SH90 Sonar and bottom picture is the ES70 Echosounder running on 70 kHz. The Saithe is located on the tops as this is where the current shifts and bait can be found.



Sometimes the Saithe will disperse but still stay close to the bottom. This is seen on the pictures above, the top picture is SH90 and the bottom is the ES70 running on 70 kHz. Notice the importance of a vertical view on the sonar.

SIMRAD
SH
SONAR

SIMRAD
ES
ECHOSOUNDER

FACTS

Tuna often travel in schools with similarly sized companions. They sometimes school with other tuna species and mixed schools of small yellowfin and skipjack tuna, in particular, are commonplace. They are often associated with various species of dolphins or porpoises, as well as with larger marine creatures such as whales and whale sharks. They also associate with drifting flotsam such as logs and pallets, and with fish aggregation devices (FADs).

YELLOW FIN
{*Thunnus albacares*}



The yellowfin tuna is among the larger tuna species, reaching weights of over 400 pounds (180 kg), but is significantly smaller than the Atlantic and Pacific bluefin tunas, which can reach over 1,000 pounds (450 kg), and slightly smaller than the bigeye tuna and the southern bluefin tuna.

BIG EYE
{*Thunnus obesus*}



Bigeye tuna vary up to 250 centimetres (98 in) in length. Its maximum weight probably exceeds 400 pounds (180 kg), with the all-tackle angling record standing at 392 pounds (178 kg). They are large, deep-bodied, streamlined fish with large heads and eyes. The pectoral fins are very long, reaching back as far as the second dorsal fin.

SKIP JACK
{*Katsuwonus pelamis*}



Skipjack commonly reaches fork lengths up to 80 centimetres (31 in) and a weight of 8-10 kilograms (18-22 lb). Its maximum fork length is 108 cm (43 in) and maximum weight is 34.5 kg (76 lb). It has no scales, except on the lateral line and the corselet (a band of large, thick scales forming a circle around the body behind the head).



Tropical waters



Purse seining

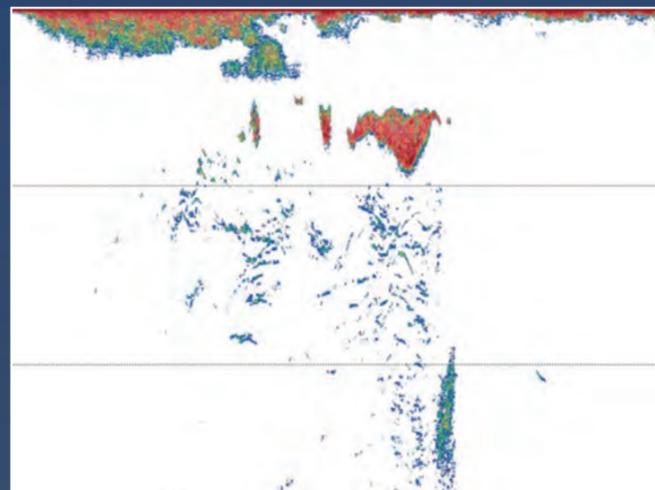


When Tuna is mixed with bait, the sonars (even the high frequency models) are not able to distinguish between them. Only a focussed beam with high resolution can give the skipper an accurate information of the school composition.

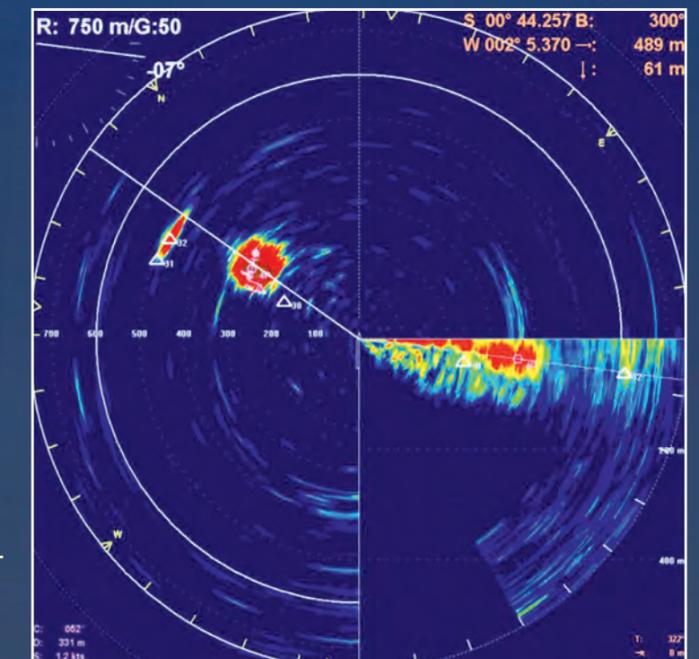
The ES70, with transducers installed looking to the sides is the perfect tool to evaluate the schools and decide which one is the best to catch.

DISCRIMINATE BAIT AND TUNA

Tuna tends to aggregate underneath any shadow generated by natural or artificial drifting objects called FADs (Fishing Aggregating Devices). Sometimes they are also aggregating underneath some bait schools, appearing in the sonar as a big school. For the skipper the main concern is to know what is the quantity of tuna mixed with bait. Sonar does not discriminate and passing over the school to evaluate the composition with the echosounder is not an option. In the picture you can see this typical situation where a side looking mounted transducer gives a clear idea of how much tuna is together with the bait.



SIMRAD
ES
ECHOSOUNDER



SIMRAD
SH
SONAR

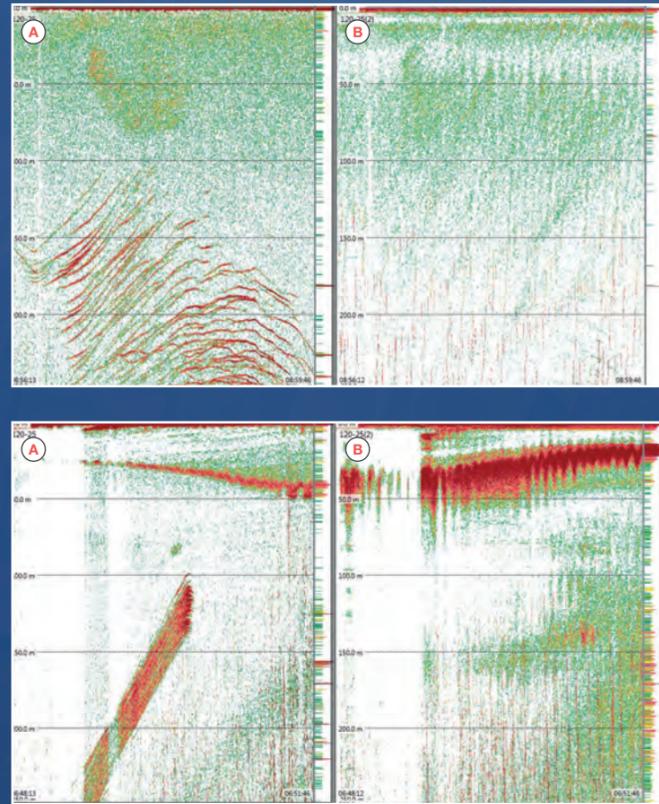
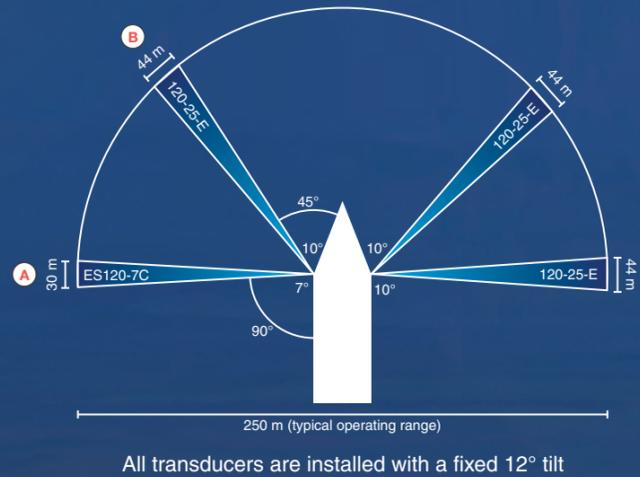
DON'T LOSE THE CONTACT WITH THE TUNA SCHOOL
Fishing Tuna generates a lot of stress onboard. Tuna can swim really fast and requires a lot of expertise and technique to intercept the school in the right moment and position.

In the evaluation phase, the Simrad echosounders, with transducers installed side looking, will provide a clear information of the school composition. In the catch phase, the side looking echosounders will keep detecting the school and, when the sonars should be hoisted for security, the skipper will see if Tuna is still inside the net.

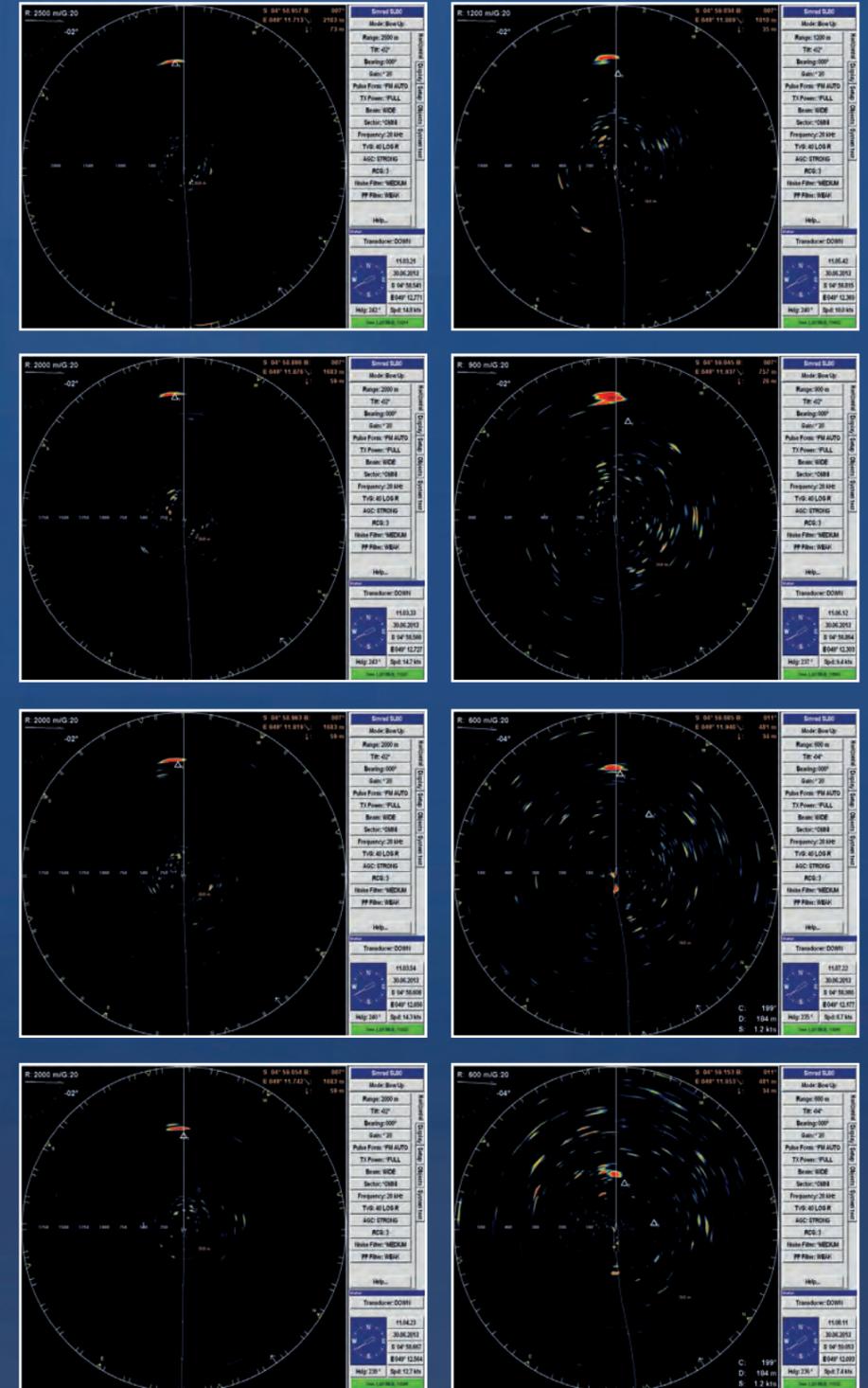
In the upper picture the school is analyzed to verify that this is Yellowfin tuna (screen to the left).

In the bottom picture we see the school escaping the net as it charges toward the vessel to escape through the opening before the net closes (screen to the left).

TRANSDUCER INSTALLATION

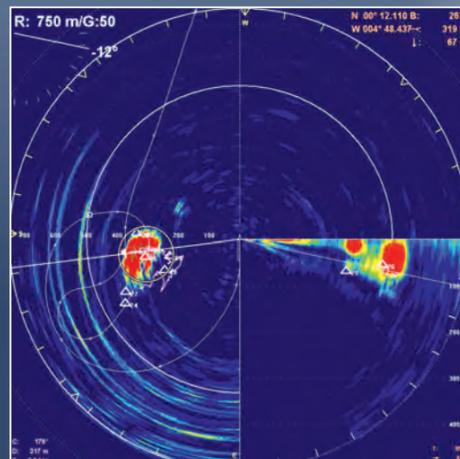


Pictures to the right are taken from the first installation of the SU90 in tuna. The vessel "Artza" here follows a school of Yellowfin tuna from detection to catch. This is the strong advantage with the SU90, long range detection combined with superior short range detection.

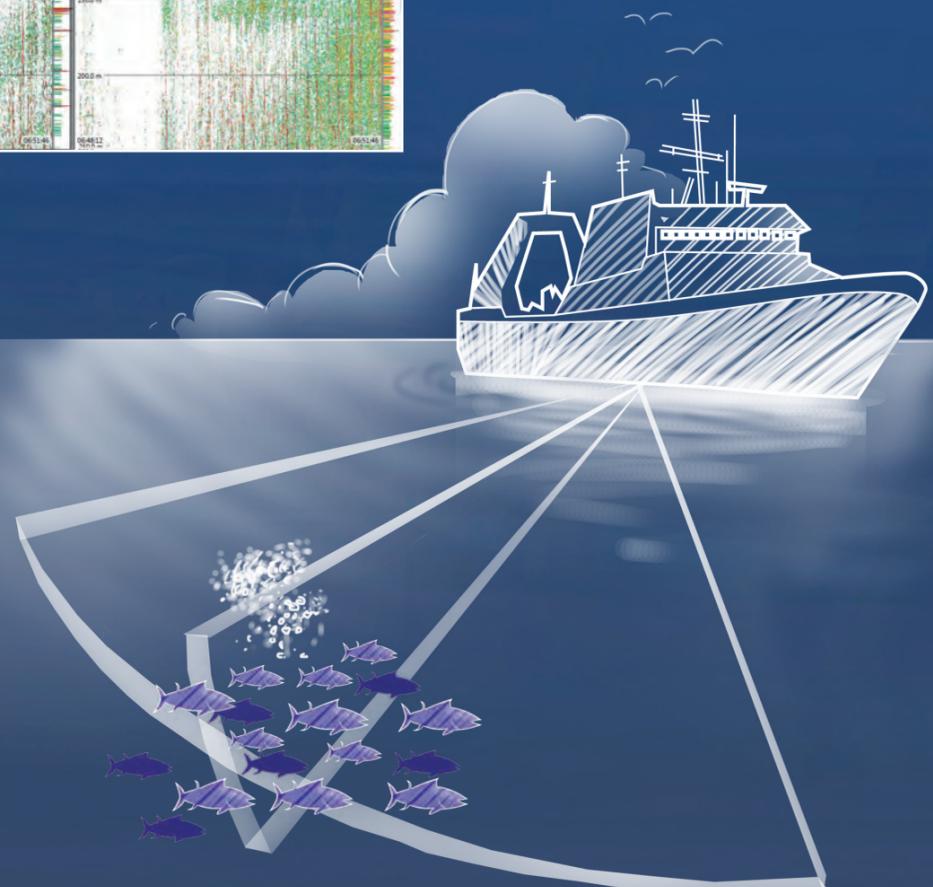


NARROW VERTICAL BEAM
When several schools of tuna are detected around the vessel, its very important to analyse which is the best one to catch.

In the picture there are two schools in the vertical slice, the closest to the vessel has 50m depth, the other one has 100m depth. Tilting the omni beam, the skipper can also analyse the horizontal area of each school. Under this conditions its extremely usseful to have a narrow vertical beam to see one school at the time. With a wider vertical beam both schools would be presented in the omni mode as one larger school.



This is specially good when the tuna is under the wake. With the SC90 Sonar the tuna can be shown in any condition.



FACTS

ATLANTIC MACKEREL
(Scomber Scombrus)

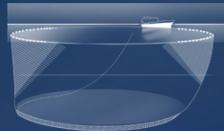


The Atlantic mackerel, is a pelagic schooling species of mackerel found on both sides of the North Atlantic Ocean. The species is also called Boston mackerel, or just mackerel.

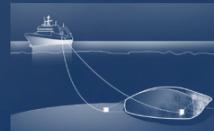
Male and Female Atlantic mackerel grow at about the same rate, reaching a maximum age of about 20 years and a maximum fork length of about 47 centimeters (9 in). Most Atlantic mackerel are sexually mature by the age of three years.



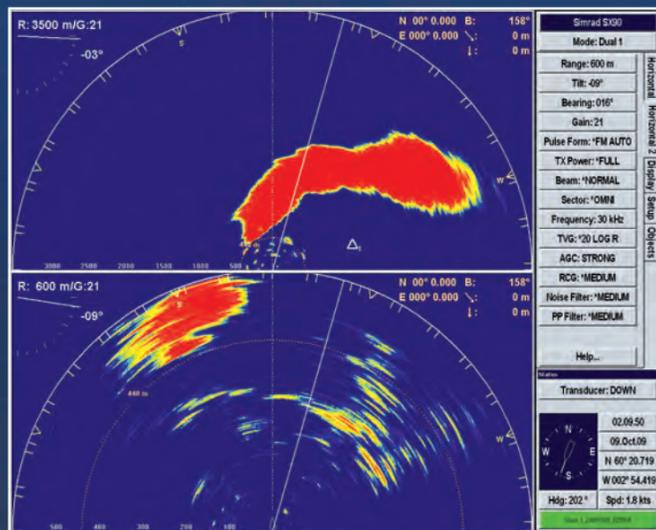
North Sea



Purse seining



Pelagic trawling



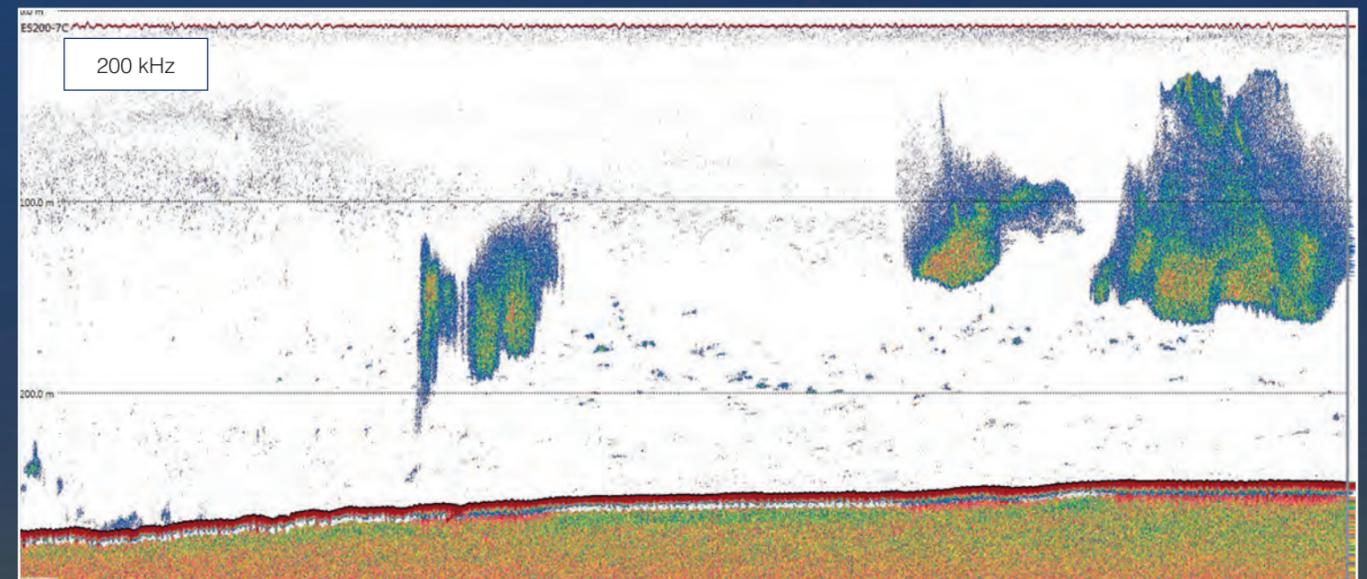
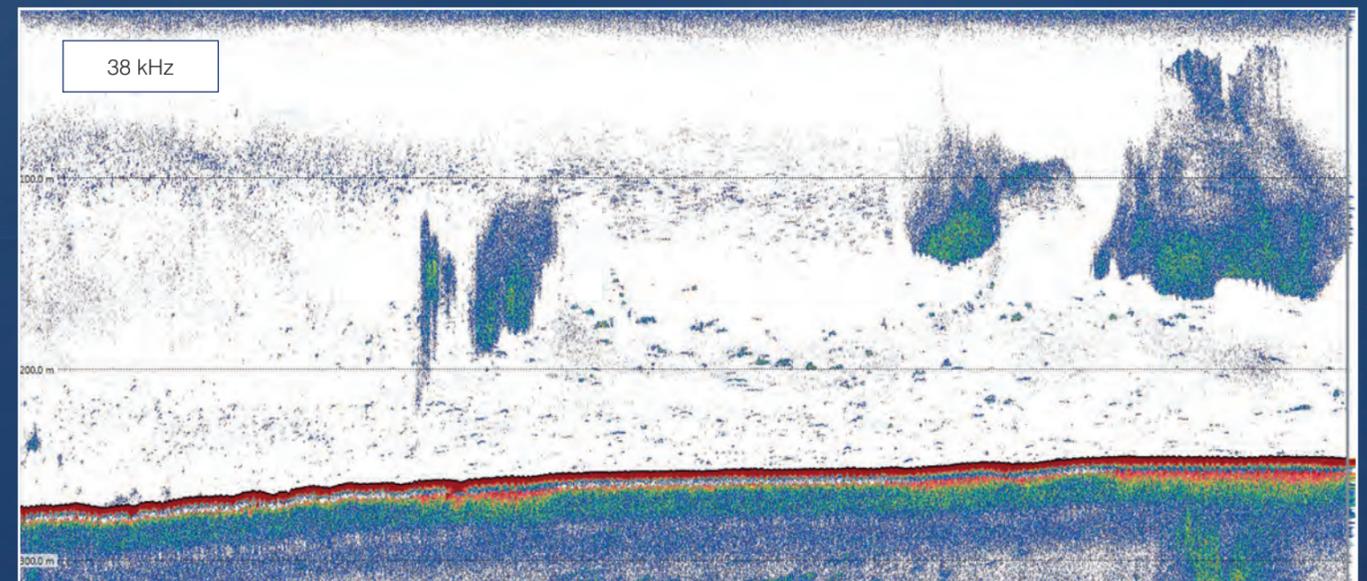
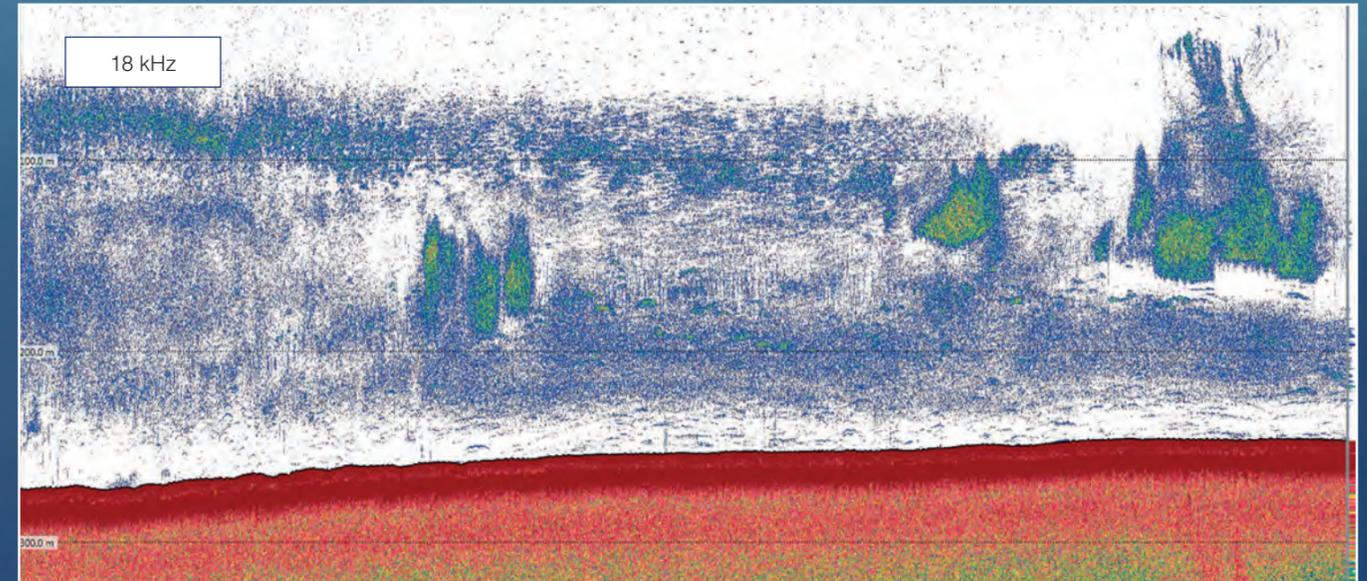
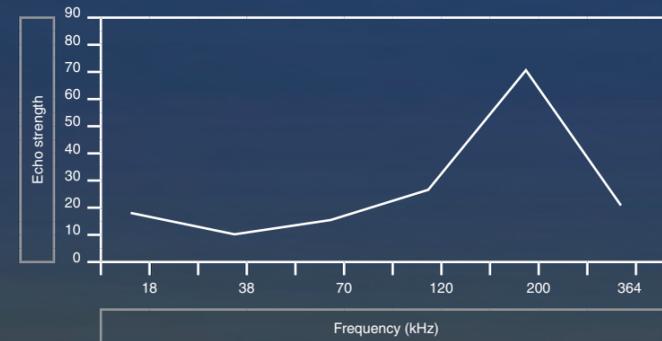
Picture showing a Mackerel school estimated to be about 200,000 ton detected on a SX90 Sonar in the North Sea.

Every fish species has their own frequency “signature”.

The example to the right is Mackerel in the North Sea shown on an ES70 echosounder with three different frequencies, 18 kHz, 38 kHz and 200 kHz. On 18 kHz the Mackerel is not shown as strong as on the 200 kHz but the feed that the Mackerel eat are shown. Mackerel does not have a swim bladder and thus it will be more resonant on higher frequencies.

More frequencies will give you more information and more information makes it easier to conduct efficient, profitable and sustainable fishery.

FREQUENCY RESPONSE CURVE FOR MACKEREL



FACTS

GAS PIPELINE FROM SPAIN MAINLAND TO THE BALEARIC ISLANDS

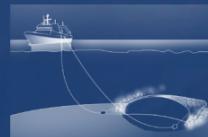
The installation of a gas pipeline in 2008 from Spain mainland to the Balearic Islands meant a challenge for the Mediterranean trawling fleet operating over it.

Simrad Spain was addressed to design and carry out a way of preserving this handicraft production despite the great technological installation. The key point was to avoid that this pipeline interfered with normal fishing activity by trapping or damaging the trawl or the pipeline.

This has been a pioneering project where 115 vessels were outfitted, in less than 4 months, with a tailor-made system to prevent damage and to ensure a complete online surveillance of the fishing activity surrounding the pipeline.



Mediterranean Sea



Bottom trawling



PROVIDING SOLUTIONS TO THE INDUSTRY

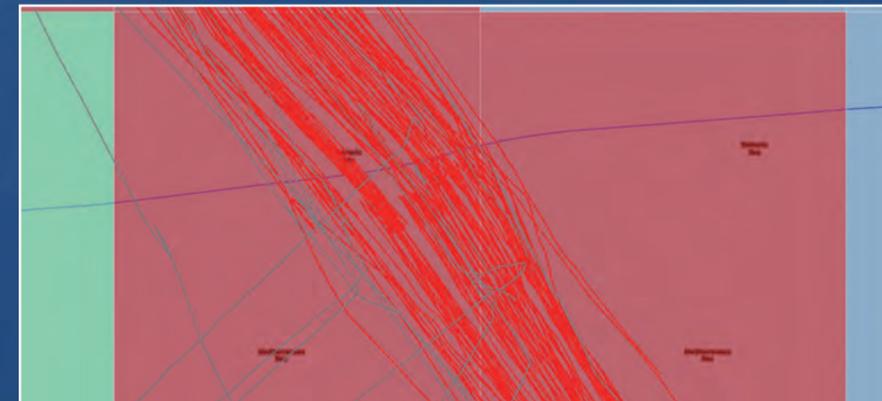
In 2008 the SIMRAD office in Spain delivered 115 ITI Systems to the bottom trawling fleet, operating over a recently installed gas pipeline between Balearic Islands and Spain mainland.

The trawlers make the trawl jump over the pipeline everytime they cross it, avoiding any potential damage caused by the daily impact of the trawl doors in the same pipeline sections. Every time they jump, the gas company compensates the fisherman for the time they are not fishing.

The ITI System is providing to the skippers the position of the trawl doors and the net against the pipeline. Every operation is recorded

and sent daily to a server where the jump is analyzed and validated. Since then, the gas company has full control of each cross over the pipeline. The best we can say is that after thousands of crosses over the pipeline, there have not been any single impact over it and the system is running at full satisfaction both for the fishermen and the gas company.

The ITI System was complemented with a 3D plotter, a black box data logger with internet connection, a heading sensor and a set of trawl doors for each vessel. The gas company was responsible of buying all the system and maintain it for the pipeline life.



Track of crosses (red lines) over the pipeline (blue line) in one month around one nautical mile section of the pipeline.



Full day Telemetry received from the ITI with one jump.

The orange line shows the pipeline position, blue light line is the height of the trawl, blue dark line is the depth of the trawl doors, green line in top is the warp length. Everything measured by ITI Sensors.

SIMRAD
ITI
SYSTEM



SUPPORT

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