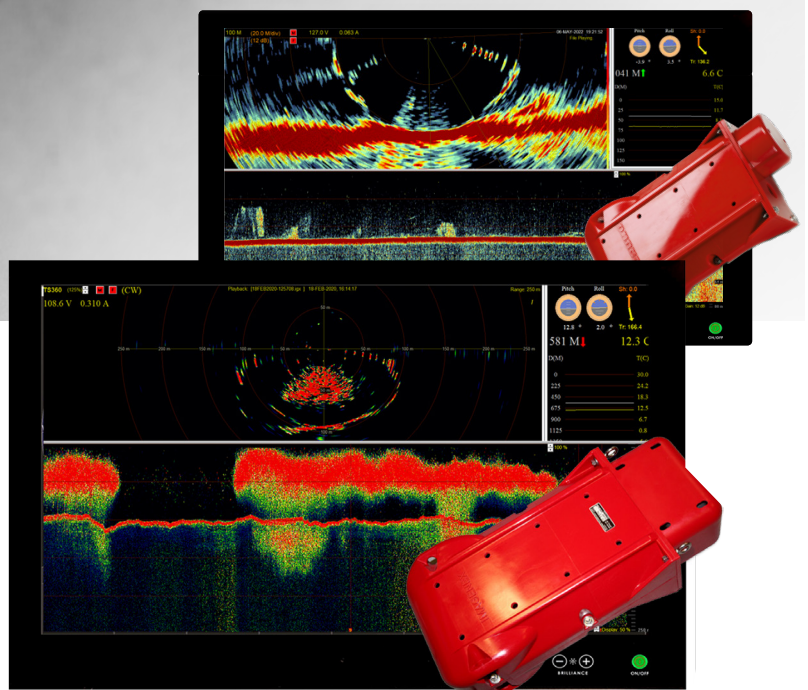


## Trawl Sonar

Omni sonar TS-360

Stepping sonar TS-332



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# Real-time 360° Trawl Sonar

## TS-360

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High resolution presentation combined with a 360° view allows the entire net opening and its surroundings to be observed in real time.

#### TS-360 MONITORING FEATURES

The TS-360 trawl sonar display provides an excellent real-time overview of the trawl opening and its surroundings. The echo presentation is sharp and detailed. A nuanced colour scale is used to present the density of the school of fish, providing an intuitive understanding of its size and movement.

#### BOTTOM SEPARATION

The foot rope echoes are clearly separated from the bottom echoes, providing the possibility for better adjustment of the trawl, whether it is to increase catch when fish is observed to escape under the foot rope, or to avoid more catch when the trawl is full.

#### INTEGRATED ECHO SOUNDER

The TS-360 trawl sonar has a shared multibeam transducer for the trawl sonar and the integrated echo sounder. Benefiting from the inherent characteristics of multibeam technology the echo sounder beam width can be adjusted from 10 to 40 degrees and can easily be set in any desired direction.

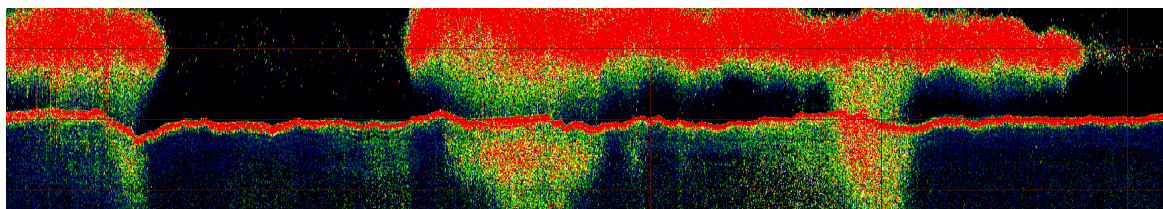
#### AUTOMATIC ROLL STABILISATION

Automatic roll stabilisation can be activated and used to direct the sonar beam to constantly point downwards, even if the trawl and thus the trawl sonar is in constant motion. Stabilisation is crucial when you want to monitor the position of the trawl relative to the seabed. Also, if the sonar head is skewed this feature will rectify the presentation.

#### COMPATIBLE FISH FINDING INSTRUMENTS

Both TS-360 and TS-332 can export depth data to a connected echo sounder. The Furuno FSS-3BB and the Furuno FCV-38 are both compatible.

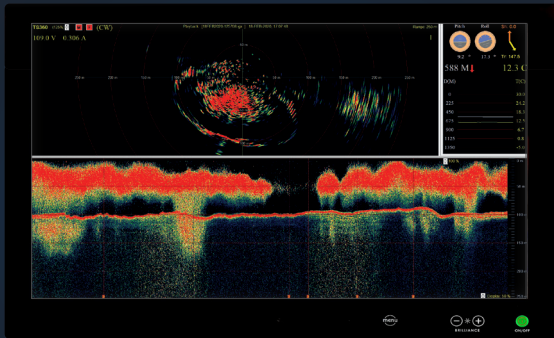
When connected to an echo sounder, the depth of the trawl's head line and foot rope is graphically displayed in the echogram. The visual presentation makes it easier to assess the position of the trawl relative to detected fish and to adjust the trawl for optimal catch.



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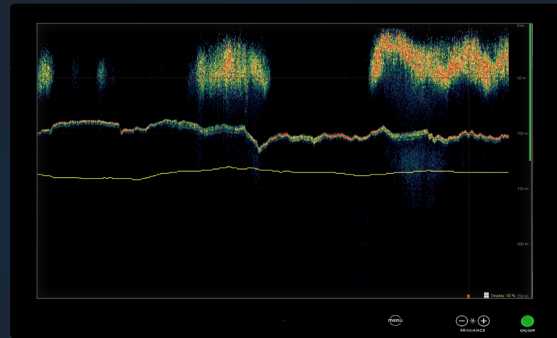
## TRAWL SONAR TS-360 – REAL-TIME 360° OVERVIEW

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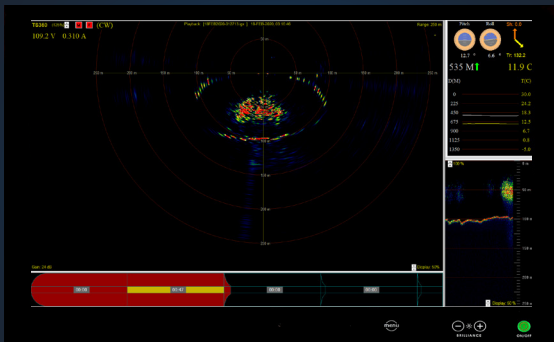
### REAL-TIME OVERVIEW OF THE TRAWL OPENING

The detection range extends well beyond the trawl opening. Any echoes from fish are presented with high precision, while noise is suppressed. The result is a clean and well-defined image of the trawl opening and fish both inside and outside of the trawl opening.



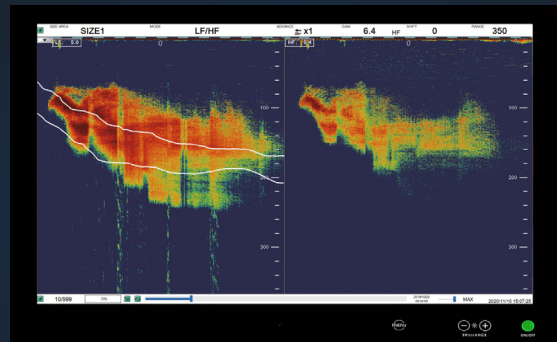
### TWO-SCREEN OPTIONS

The split screen solution allows for presentation of both the sonar and the echo sounder display, either as a split view on the same screen or as dedicated views on separate screens.



### PRESENTATION OF CATCH SENSOR STATUS

As the trawl is filled the catch sensors' triggers are released. The presentation of each catch sensor changes from yellow to red and thereby provides a visual indication of the trawl's filling rate.



### INTERGRATE TRAWL SONAR AND ECHO SOUNDERS

Both the TS-360 and the TS-332 can integrate with the Furuno echo sounders FSS-3BB and FCV-38 for presentation of the trawl head line and foot rope.



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# 360° Stepping Sonar

## TS-332

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The high/low frequency echo sounder and multiple options for integration make trawl sonar TS-332 a versatile solution for trawl fishing.

### STEPPING SONAR

The TS-332 trawl sonar is a stepping sonar with a full 360° capability. Preferred sector size and step width between 0.3° and 2.4° is set by the user. The high-resolution, roll stabilised presentation, provides all the necessary details to sustain trawling despite changing bottom conditions.

### HIGH/LOW FREQUENCY ECHO SOUNDER

The TS-332 high/low frequency echo sounder makes this model suitable for several types of fisheries. The 260 kHz frequency/10° cone beam is ideal for bottom trawling. The high-resolution presentation provides valuable information of seabed conditions and a distinct presentation of the trawl's foot rope. The 120 kHz frequency/20° cone beam has a longer detection range preferable for pelagic trawls with larger net openings.

### TWO-SCREEN OPTIONS

The TS-332 features a split view/two-screen solution. This allows for sonar presentation of the net opening

and fish echoes, and at the same time echo sounder presentation, to closely monitor the trawl's position and the filling of the trawl.

### COMBINE TS-332 WITH TS-360

Vessels that operate in diverse fisheries will benefit from the capabilities of both the TS-332 and the TS-360. Therefore, combining these two models is made easy by allowing them to share the same processor and power supply.

### SONAR INTEGRATION

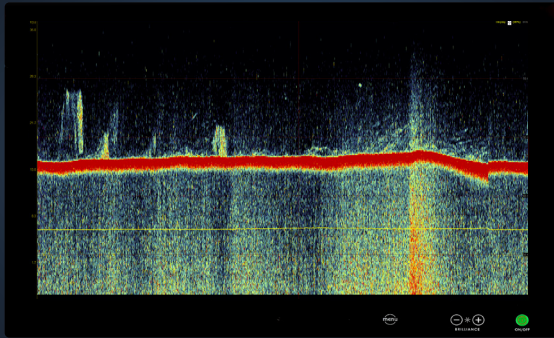
Both the TS-332 and the TS-360 can integrate with Furuno 3D sonar F3D-S. Both sonars export depth data of the trawl sonar head and the height of the net opening, measured as the distance between the trawl sonar head and the foot rope. This will be presented as H DPT, head line depth, and H-F, head line to foot rope, in the F3D-S data window. In addition, H and F is presented in the vertical section as dedicated depth lines.



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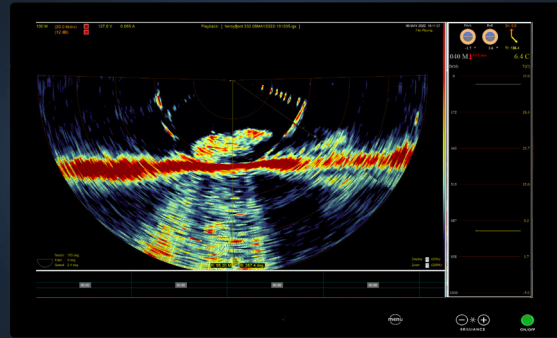
## TRAWL SONAR TS-332 – STEPPING SONAR

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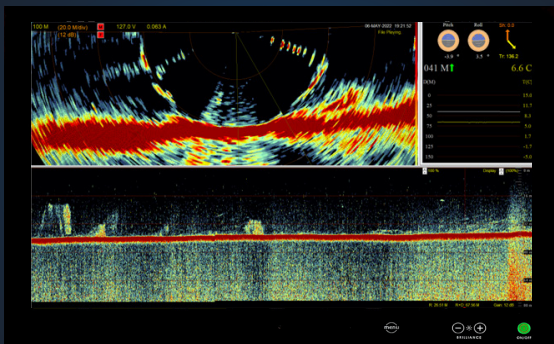
### HIGH-RESOLUTION SEABED PRESENTATION

The high-resolution presentation provides valuable information of the seabed condition and fish located close to the bottom.



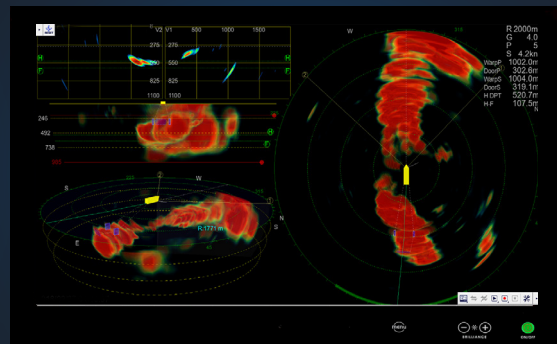
### DETAILED INFORMATION

The stabilised, high-resolution presentation provides all the necessary details to sustain trawling despite changing seabed conditions.



### SPLIT VIEW / TWO-SCREEN PRESENTATION

The TS-332 features both a split view and a two-screen sonar and echo sounder presentation.



### INTEGRATE THE TRAWL SONAR WITH 3D SONAR F3D-S

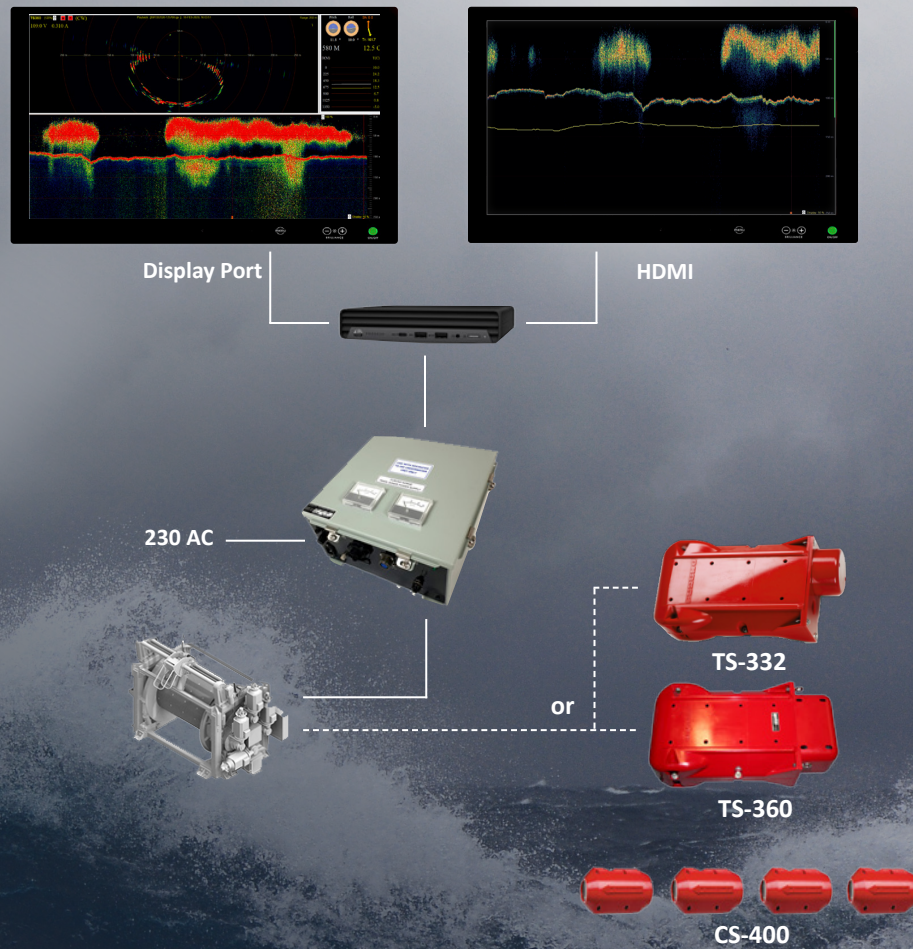
Both the TS-332 and the TS-360 can integrate with the Furuno low frequency sonar FSV-25's 3D module F3D-S, in order to display trawl depth information.



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## TRAWL SONAR TS-360 / TS-332 CONNECTION DIAGRAM

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## TRAWL SONAR UNDERWATER UNITS

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The underwater units consist of the rugged and low maintenance sonar head and a maximum of four connected catch sensors.

The sonar head can be attached directly to the trawl or optionally placed in a specially designed cage, for improved performance.



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## CATCH SENSOR CS-400

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Catch sensors can be connected to the TS-360 and the TS-332. A maximum of four sensors are supported. The signals from the catch sensors are transmitted wirelessly to the trawl sonar. CS-400 is rugged and user friendly with at least 1500 hours operating time before battery change. Batteries are replaced with commercial batteries D/LR20.



## TRAWL SONAR TS-360 HARDWARE SPECIFICATION

### UNDERWATER UNIT

Frequency:	120 kHz
Transducer beam width (nominal):	Receive: 360° x 20° Transmit: 360° x 20°
Effective beam width:	3°
Beams:	720
Range resolution:	0.2 % of range
Min. detectable range:	0.5 meter
Max. operating depth:	2000
Processor interface:	SHDSL. Ethernet to 2-wire copper extender

#### Cable requirements:

Max. loop resistance:	100 ohm
Max. attenuation:	20 Db / 100 kHz
Max. cable length:	3000 meter

#### Connector:

Subconn BCR2002M bulkhead connector with full rugged stainless steel shell and improved water blocking for the power / signal cable.

#### Power supply:

130 VDC at less than 30 W (nominal)

#### Voltage / current monitor:

Voltage and current are measured in the underwater unit and displayed on screen.

#### Weight:

In air:	~ 25.4 kg (56 lbs)
In water:	~ 8.2 kg (18 lbs)

#### Materials:

6061-T6 Aluminum, 300 Series  
Stainless steel, polyurethane and PVC

### EQUIPMENT LIST

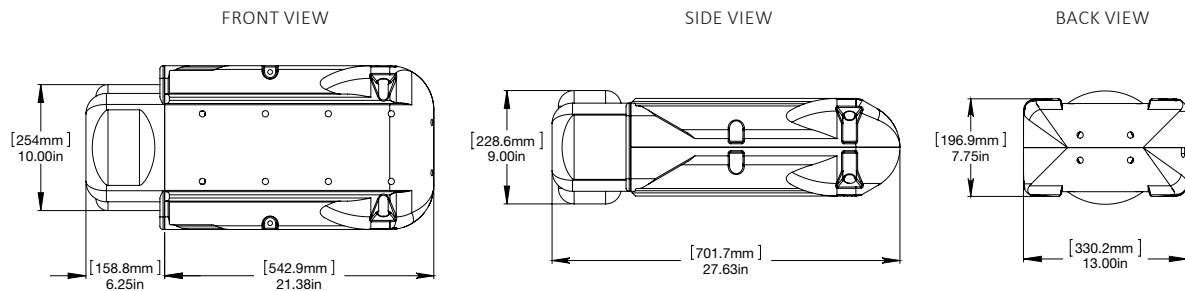
- Underwater unit
- Power supply / interface box
- Processor
- Trawl sonar software
- Track ball

### OPTIONS

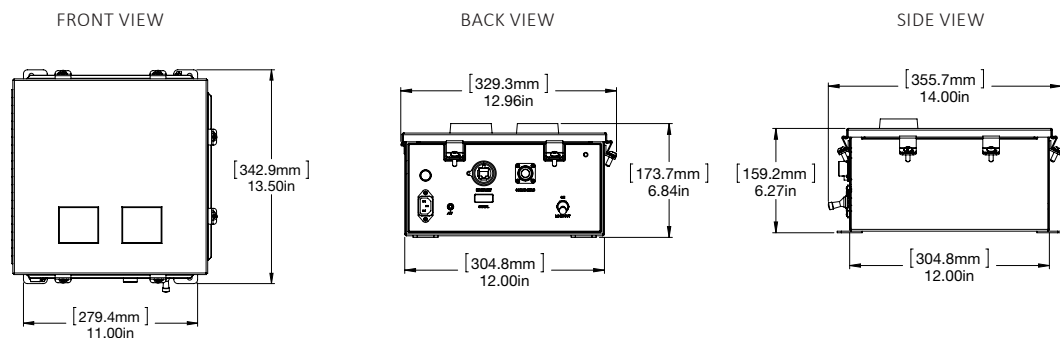
- Underwater unit cage
- Catch Sensors CS-400
- Monitors

## TS-360 DIMENSIONS

### UNDERWATER UNIT



### POWER SUPPLY / INTERFACE BOX



## TRAWL SONAR TS-332 HARDWARE SPECIFICATION

### UNDERWATER UNIT

Vertical scanning sonar

Frequency: 330 kHz  
 Ranges in meters: 10, 20, 30, 40, 50, 60, 80, 100, 150, 200, 250 (or equivalent feet or fathoms)

Sector size: 360°  
 Scan step: 0.3°, 0.6°, 0.9°, 1.2°, 2.4°

Max. operating depth: 2000 meter

Echo sounder

Frequency (switchable): 120 kHz /20° cone beam  
 260 kHz /10° cone beam

Ranges in meters: 10, 20, 30, 40, 50, 60, 80, 100, 150, 200, 250, 300 (or equivalent feet or fathoms)

Catch sensor receiver

Beam with: 70° conical  
 Frequency: Unit1: 69.75 kHz/70.25 kHz ± 50 kHz  
 Unit2: 72.25 kHz/72.75 kHz ± 50 kHz  
 Unit3: 74.75 kHz/75.25 kHz ± 50 kHz  
 Unit4: 77.25 kHz/77.75 kHz ± 50 kHz

Processor interface: SHDSL. Ethernet to 2-wire copper extender

Cable requirements

Max. loop resistance: 100 ohm  
 Max. attenuation: 20 Db / 100 kHz  
 Max. cable length: 3000 meter

Connector

Subconn BCR2002M bulkhead connector with full rugged stainless steel shell and improved water blocking for the power / signal cable.

Power supply

130 VDC at less than 10 W (nominal)

Voltage / Current Monitor:

Voltage and current are measured in the sonar head then displayed on screen.

Weight

In air: ~ 20.4 kg (45 lbs)  
 In water: ~ 6.2 kg (14 lbs)

Materials

6061-T6 Aluminum, 300 Series  
 Stainless steel, polyurethane and PVC

### EQUIPMENT LIST

Underwater unit  
 Power supply / interface box  
 Processor  
 Trawl sonar software  
 Track ball

### OPTIONS

Underwater unit cage  
 Catch Sensors CS-400  
 Monitors

## TS-332 DIMENSIONS

### UNDERWATER UNIT

