

**Tritech  
SeaKing DFP &  
SeaPrince Profiler  
  
Operators Manual**

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## SEAKING DFP/SFP HEAD INTRODUCTION

The SEAKING Dual Frequency and SEAPRINCE Single Frequency scanning heads operate over a 360 degree scanning field, of frequencies of either 580 or 1100kHz, giving ranges of up to 50m. The heads are available in standard 'Vertical' body configuration, (with tall boot for narrow beam transducer). The heads are able to continuously, or part-scan the full 360 degree sector in either direction. There can be one or more sonar or profiler heads used in a system. The profiler heads can operate in various scan modes depending on user set-up in the SCU.

The transducer head and motor are pressure compensated within an oil-filled semi-rigid boot. The electronics are contained within the body tube in dry air at one atmosphere pressure. The sonar body is machined from aluminium alloy, and has a hard-anodised coating.

A waterblock is fastened to the body tube of the head, and provides a 4000metre rated pressure bulkhead. The 6-way underwater connector is secured to the waterblock fitted to the body tube using four cap screws, this connects to the pins on the PSU/COMMS PCB. An O-ring seals the connector to the waterblock.

The SEAKING DFP and SEAPRINCE SFP heads have the facility for the Time Variable Gain (TVG) slope to be set-up from the SeaKing Surface Control Unit (SeaKing SCU), to specific user requirements.

The SEAKING DFS/DFP and SEAPRINCE SFS and SFP have improved features over the Series 2 Sonar and Profiler heads, these are outlined below.

- **Scan rate**

The SeaKing / Seaprince head can achieve a scan rate of up to 180° per second - the actual physical acoustic limit. The scan rate of the SeaKing range of heads are significantly faster, particularly on short ranges, than the Series 2 head, and may be up to 10 times faster on ranges up to 30 metres irrespective of the scan speed selected. This gives faster target acquisition, and helps in obstacle avoidance.

- **Dual Frequency Operation**

The SeaKing DFP/DFS can use up to two operating frequencies - one giving long range target acquisition characteristics and the other giving shorter range imaging capability. It is effectively two sonars in a single housing. The lower frequency operation is extremely useful for long range target acquisition - again, important when avoiding potential targets. The higher frequency is then used for high definition work.

Each of the two operating frequencies may be offset from the centre frequency e.g. the 580 kHz transducer may be digitally tuned between 560 and 600 kHz. This can be very useful if you have another piece of equipment with a similar operating frequency or if 580 kHz is a harmonic of the operating frequency of another piece of equipment. These frequency alterations are remotely carried out using the SeaKing SCU unit.

- **Protected transducer**

The SeaKing DFS/DFP has a semi-rigid oil-filled plastic boot that offers a much greater protection than previous models, to the sonar transducer if subjected to impact. Should the sonar be impacted the boot can absorb this without damage. If an excessive impact occurs the damage is usually limited to writing-off of a transducer/ motor. The unit has no rotating seals to be damaged or wear.

- **Electrical Connection**

The SEAKING and SEAPRINCE heads use the same 6 way U/W Connector as per Series 2 Sonar Heads.

## HEAD INSTALLATION

The SEAKING DFP and SEAPRINCE SFP heads are supplied with their own waterblock / connector with a length of polyurethane jacketed cable (profiler - 3metres length). Depending on the specification of the system, this cable will either need to be terminated to a suitable connector appropriate to the operators equipment, or may be supplied with a cable assembly to one or more additional connectors.

The waterblock is fastened to the body tube of the head, and provides a 4000metre rated pressure bulkhead. This will protect the electronics from water ingress in case the connector is damaged or fitted incorrectly. The connector may be disconnected from the heads by unscrewing the four securing screws and removing the connector from the waterblock. **It is not necessary to remove the water block when removing the connector or taking the head apart.** Whilst the connector is removed from the head, the blanking plugs supplied should be fitted to prevent the ingress of dirt or moisture.

## SUBSEA SENSOR ELECTRICAL INSTALLATION

The SeaKing range of Subsea Sensors are designed to work from a smoothed DC power supply of 18v-36v DC (Absolute Maximum 36v DC).

If using a rectified transformer PSU, the output of the PSU must have a filter capacitor of not less than 470 $\mu$ F, for each head being powered. If an unregulated PSU is used, then make sure that the voltage value measured at the head is in the range 18-36v DC, in power on/off and running conditions. If powering the head(s) down a long lead or umbilical, the maximum recommended loop resistance of the power line must not exceed 10 $\Omega$  for one head, 5 $\Omega$  for two heads, and 3 $\Omega$  for three heads. If the supplied voltage is less than 18v dc the head may not operate correctly.

**Never try to make SeaKing or SeaPrince system heads work down a long cable by increasing the PSU output voltage above 36v DC. A 48VDC PSU Option is available that will allow operation up to 70VDC for long line applications.**

## HEAD SUBSEA INTERCONNECT CABLING

The Underwater Connector supplied is 6 way, the wiring code is shown below.

**NOTE :**

**The numbers shown relate to all schematic diagrams, (not a DIN style format).**

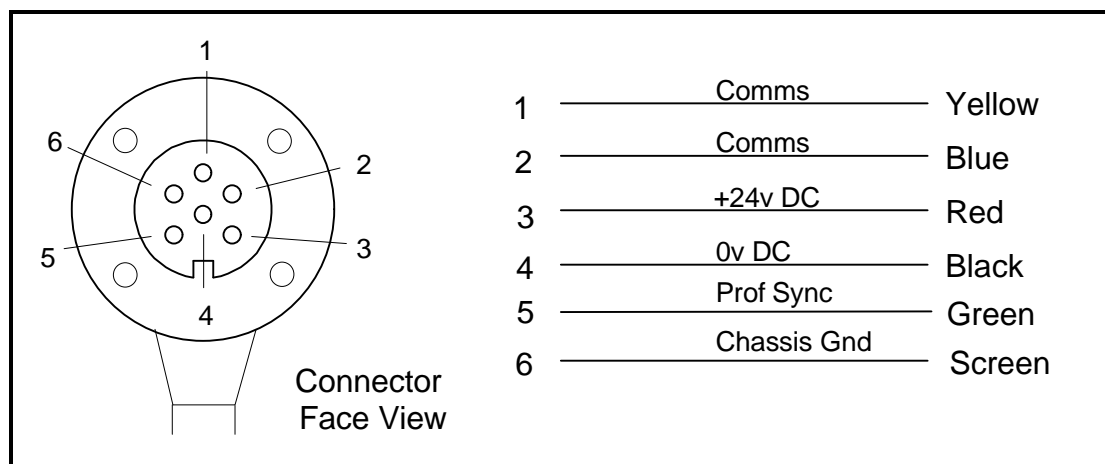


Fig. 1.0 ST 6 Way Underwater Connector Wiring Configuration

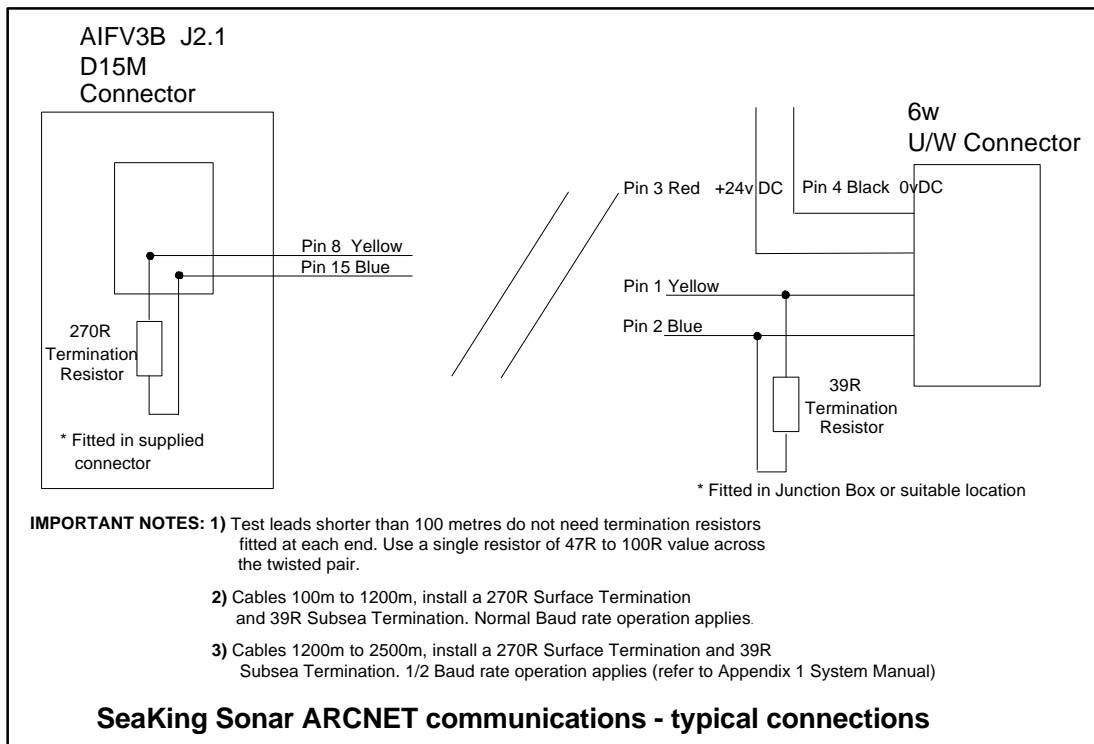


Fig. 1.1 SeaKing Communication Wiring Diagram

## DUAL HEAD PROFILER INSTALLATION

For a dual head installation, the MAIN connector port on each should be connected to a common Communications Pair (pins 1&2) and common Supply and Ground (pins 3&4) from the subsea junction box - See diagram below.

Pin 5 of the connector is allocated as a Dual Head Sync. line on the profiler. This is in common with the pin 5 of Series-2 Profiler heads. The pin 5 of the Master must link through to the pin 5 of the Slave to enable Scan and Ping Synchronization between heads. The pin 5 line of the profilers **MUST** be isolated and not linked through to the pin 5 of any other devices such as Sonars or Bathymetric bottles that are attached to the same network.

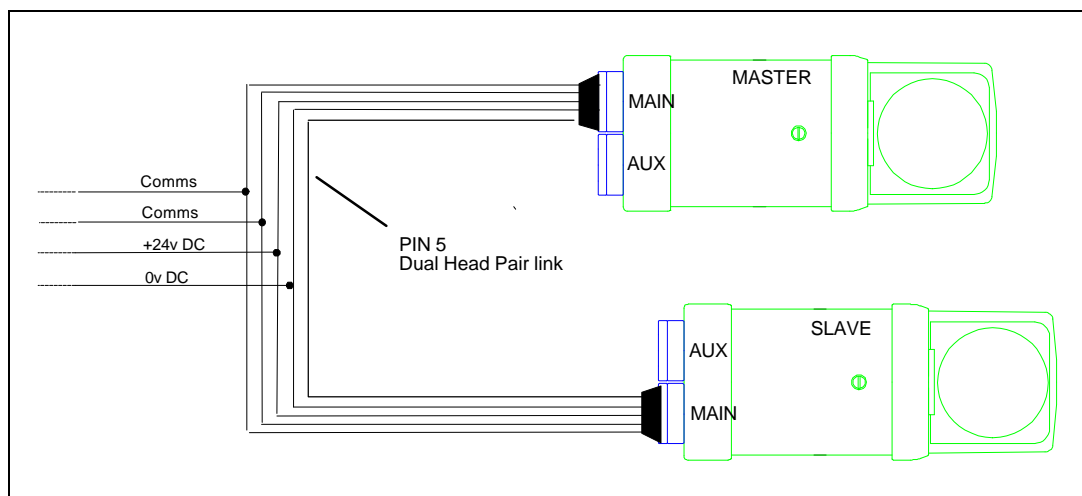


Fig. 1.2 Dual Head System interconnect diagram

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## SEAKING COMMUNICATION CONFIGURATION

All SEAKING systems communicate using 'ARCNET' multi-drop, networked communications on the twisted cable pair. It is possible to interface the ARCNET to wideband multiplexor systems, contact Tritech for details.

**IMPORTANT NOTE: The 'ARCNET' does require a surface and subsea termination resistor to be fitted at each end of the umbilical. Normally this is supplied fitted within the D connector at the surface, and is left for the user to fit at the subsea end in a convenient 'J' box. This is the easiest system to adopt when using multiple sensors on the network. However if just one device is in use it may be more convenient to fit the resistor inside the subsea unit. Devices fitted with a termination resistor should be appropriately labelled, but the user can check by measuring the resistance between pins 1 and 2 on the water block connector.**

The SEAKING SCU, sonar and profiler heads cannot be used with RS-232 / RS-485 AIF Cards as used in earlier WINSON based SCU-3 systems, and must be used with AIF-SEAKING ARCNET (AIFBV3) Cards.

RS-232/RS-485 Series 2 Sonar, Profiler and other heads cannot be directly used with SEAKING systems, contact Tritech or local agent for details.

## GROUND FAULT MONITORING EQUIPMENT

The power supply within SEAKING subsea heads includes an electrically isolated DC-DC converter front end, There is a small capacitive connection to the sonar chassis which should not noticeably affect any impressed current ground fault indicator (GFI) equipment

## MECHANICAL INSTALLATION

***Although the sonar and profiling heads are rugged, they should be handled with care, particularly the connector and transducer heads. It is strongly recommended that a substantial guard is fitted over the scanning heads to protect the transducer and drive electronics from impact damage.***

A SEAKING DFP or SEAPRINCE SFP head should be secured by clamping on the cylindrical body section such that the transducer head is unimpeded or shielded. Any metallic clamps should be electrically insulated from the sonar body by means of rubber or plastic strips or mount brackets of at least 3 mm thickness and extending at least 3 mm beyond the clamp boundary to reduce any galvanic corrosion effect. Non-metallic clamps are preferable : if metallic clamps are used ( especially if they are other than aluminium ) they should be painted or lacquered with at least two or three coatings. Brass or bronze materials should be avoided unless they have an aluminium content as their copper content causes serious corrosion problems when in proximity to aluminium components.

Care should be taken to mount profiling heads to ensure that they are mounted as close to the true horizontal as possible in relation to the trim position of the vehicle. The front filling plug and red LED should be pointed directly downwards in the case of profiling sonars. This is important since errors in the head alignment can give rise to unreliable results.

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## USING THE DFP / SFP PROFILER

On completion of installation of the profiler(s) on a vehicle, they can be tested in air by powering up the system and observing that the red LED illuminates as the head scans through the ahead direction.

The Profiler heads can be run in Single or Dual head modes. The head has a minimum lockout range of 0.3 metres and will not display returns below this range. The lockout value can be adjusted in the Profiler 'Tools' menu accessible through the 'Spanner' icon on the Profiler screen display area.

A dual head system will have 2 individual heads connected, each with separate node numbers; typically 20(Master) and 21(Slave). The head which is programmed with the lowest node number of the pair is effectively the Master (or controlling head). Both nodes can be run in single head operation. The head enable flags (Master and Slave) in the Profiler 'Tools' menu can be used to enable/disable heads on the network. With only the Node 21, Slave head connected to the network, the Slave flag should be enabled and the Master flag should be disabled in the 'Tools' menu - and vice-versa for a Master head only connected. If a head is enabled and is not physically connected, an error status message will flash on-screen to inform the operator that a profiler head has not been detected. Any unconnected heads should therefore be disabled to prevent interruptions.

A Synchronization link is setup between a Dual Head pair on the pin 5 line. When pin 5 is linked, the Master head is responsible for taking control of the pair and establishing Scan and Ping syncs if these have been enabled in the Profiler 'Tools' menu.

Experience with the profiler(s) will enable the operator to be able to quickly and effectively set the "Gain" control to maximise the performance capabilities of the head. An Adaptive Gain Control is provided in the 'Tools' menu to further optimise performance. This control should be switched off when working in close environments such as Test-tanks. In open conditions, the AGC function can become a very useful tool. The operator can set a base Gain using the 'Gain' dial and then not worry about adjusting this control when conditions start to vary slightly. The AGC will auto increment/decrement the Gain level to a pre-determined optimum level.

The "Threshold" control is not functional for profiling applications.

There are 4 range resolutions available; Low, Medium, High and Ultimate, selected from the Main Menu. As you increase the resolution from Low to Medium to High to Ultimate, the sonar display will plot more points within the scan. Adjusting the resolution will vary the mechanical step size from 1.8° to 1.35° to 0.9° to 0.45° as resolution is increased. Use of a lower resolution will give faster scan speeds, but with coarser detail.

The Time Variable Gain (TVG) SLOPE may be adjusted to improve sonar return balance on longer ranges. Only use the SLOPE control after setting the main gain control to achieve good results close to the profiler head.

## SEAKING DFP PROFILING SONAR OPERATING NOTES

### Screen Display and Controls

The Main Areas of the Profiler Display are identified below:

The screenshot shows the Tritech 'SeaKing' DFP Profiler software interface. The main display area is a blue grid with a red crosshair. The interface includes a toolbar at the top left, a display header at the top, and a control panel on the right. The control panel features several analog-style gauges for Gain (39%), Range (4m), Dnn (0°), Width (360°), and Slope (150). Below the gauges are buttons for Menu, Log, and Hold. The status bar at the bottom displays 'No Aif', 'Rat N/A', '03-Oct-1996 15:38:16', and 'Log Percent'. The interface is annotated with red boxes and arrows pointing to various components:

- Profiler Toolbar
- 'Tools' menu (Spanner Icon)
- Profiler Pause
- Range Scale
- Low/High Frequency (DFP Only)
- Resolution
- Main Sonar Controls
- Display Header
- Cursor Co-ordinates
- Pipetracker interface display
- 'Menu' Options
- 'Log' Options
- Screen Freeze



## SETTING UP THE PROFILER CONFIGURATION

These Profiler Setup controls are automatically remembered if the Sonar system is shut down using the 'Exit' command prior to powering off. Click the Toolbar 'Spanner' Icon to access setup options.

**Reset Controls** Close

Metres  Inverted Head

Ch 1  More Options

F Reset

Operating Range Units M=Metres, Ft=Feet, Yd=Yards, Fm=Fathoms. Click this control to cycle through available Range Units.

Disable this control if profiler is mounted boot forward. Enable 'Inverted Head' ('x') if transducer is mounted reversed.

Enable 'More Options' check box to display less frequently used flags in bottom menu, such as 'Pipetracker' and 'Manual Trigger'.

Operating Frequency Adjust Slide Bar. Allows the sonar operating frequency to be shifted by +/- 20kHz. 'F Reset' button resets frequency to normal.

Scan Direction select. 'Scan Right' and 'Scan Left' to scan in one direction only. 'Alternate Scan' will scan L->R, R->L, alternately.

Adaptive Gain Control. Applies automatic refining of manual Gain setting. Switch off to apply manual Gain control setting only. AGC will always act on the maximum received echo and as a result the '1'st Return' check box will de-activate when

'1'st Return' (Disabled when AGC on). If 'on' will sample and plot the first peak received echo. The next step and ping is then activated immediately. When 'off', samples are taken over full range and first peak echo plotted (default ON, for faster scans).

Positional setup (X, Y and R offsets) of Master & Slave heads.

'En Master' and 'En Slave' - Switch on/off Master and Slave heads. Switch off any heads that are not connected to the network to prevent interruptions.

'Manual Trigger' enable. When 'ON', the 'Trig' button will be active on the profiler display bar and the profiler(s) will switch to standby mode. Depressing the 'Trig' button will trigger the head to complete one full scan.

'Maximum Return' (Disabled when '1'st Ret' on). Plots the maximum (strongest) echo received. This control is particularly useful in cluttered test tank operations where tank wall echoes are stronger than detectable clutter echoes.

Dual Head Controls (normally 'ON' for DHP application). 'Scan Sync' synchronizes Master and Slave at scan start. 'Ping Sync' enables alternate pinging between heads (to be used when overlapping scans will cause interference).

When 'ON', Slave direction is taken as the mirror of the Master scan direction setting.

Pipetracker Serial Input. Display on/off and input of pipe diameter

AGC Threshold. Adjustable by +/- 15db to increase / decrease level of AGC applied.

(Individual Freq.) Lockout Ranges. Echoes received below this value are ignored.  
580kHz >400mm  
1210kHz >200mm

Scan Right Set Posn

AGC On  En Master

1'st Ret  En Slave

Grid On  Manual Trig.

Scan Sync

Ping Sync

Mirror Slave  MaxRet

Pipetracker 500 mm Dia.

Lockout 400mm

AGC Threshld +0

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## MAINTENANCE OF THE SEAKING HEAD

There are no user-serviceable parts in the sonar or profiling heads and no components requiring routine maintenance.

It is recommended that profiling heads are rinsed down with fresh water after each dive and especially if the unit is not going to be used for extended periods. Although the anodised aluminium components are very resistant to corrosion, using fresh water is a simple way of minimising the chance of corrosion.

Wherever possible, avoid any prolonged exposure to extreme climatic and weathering conditions to reduce any ageing effects on the protective boot and connectors.

## TROUBLE SHOOTING

### Symptoms:

#### *1 Continuous Status "No Comms" message.*

This indicates that there is no communication with the device flagged.

(Suffix "M" is Master profiler, Suffix "S" is Slave profiler)

Check the power and communications links to the Profiler head for continuity and for correct polarity, voltage and ensure that the power supply can provide sufficient current to power all devices.

If a cable flood is suspected, then the conductors will need to be insulation tested; the sonar heads and SEAKING SCU must be disconnected as described in the Service Manual. ***This is especially critical if a cable insulation tester is used to check resistance between conductors, as serious damage to the Scanning/Profiling heads and SEAKING SCU will occur if the correct procedure is not followed.***

#### *2 Continuous Status "Version Unknown" message, with no audible alarm*

Click the profiler 'Tools' (spanner icon) and check Master and /or Slave heads enabled.

#### *3 Other Status Messages.*

Refer to the SEAKING SCU Head Status Codes

#### *4 Profiler head rotates but no data points plotted*

Check the gain control is responding and not set at a minimum.

Listen to profiler head in air. If it "clicks" audibly then the transmitter circuit is OK.

Click the Profiler 'Tools' menu (Spanner Icon) - [Reset Controls] button to return to default system settings.

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## SEAKING SCU Head Status Codes

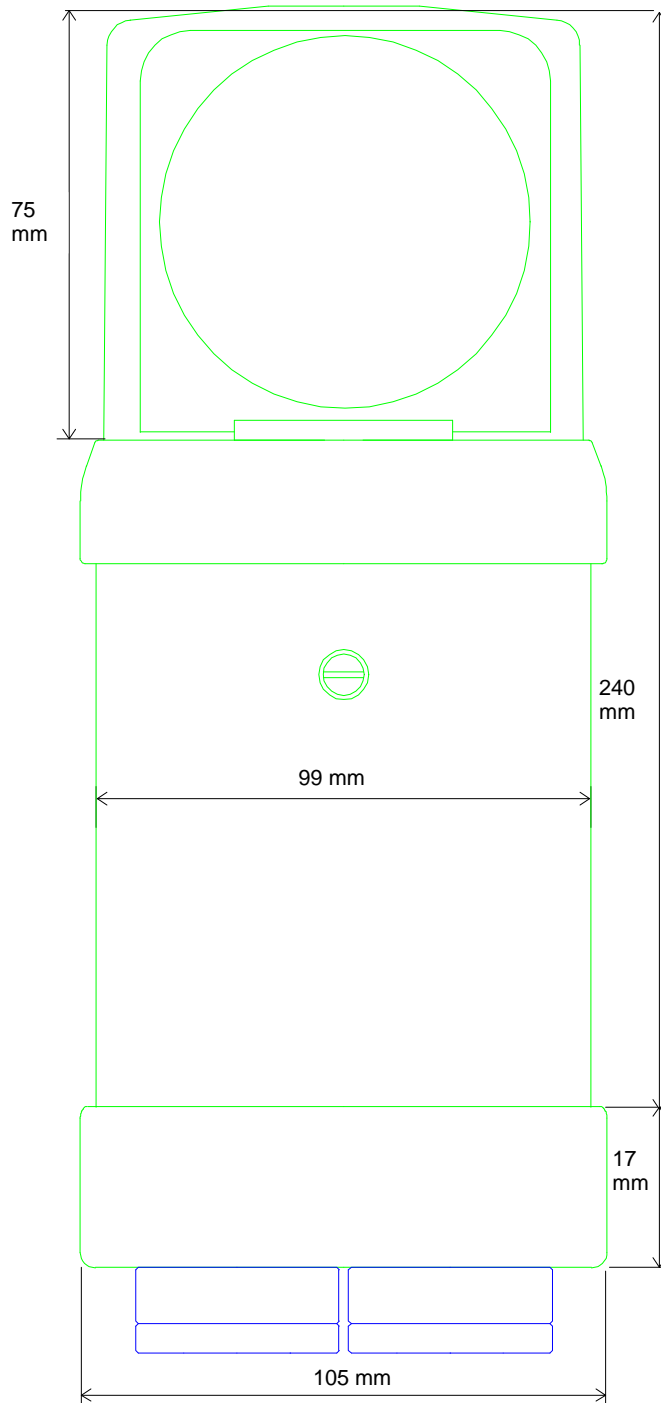
<b>Code</b>	<b>Possible Reason or Fault giving Error Code</b>
Version Unknown	Sonar or Profiler head not powered up, or comms fault.
Busy	Head is centring on power-up, or head has lost centre during scan.

## Ground Fault Monitoring Equipment

The power supply within SEAKING DFS sonar and DFP profiler heads includes an electrically isolated DC-DC converter front end, There is a small capacitive connection to the sonar chassis which should not noticeably affect any impressed current ground fault indicator (GFI) equipment SEAKING DFS Sonar Head Data Sheet

## SEAKING DFP SPECIFICATION

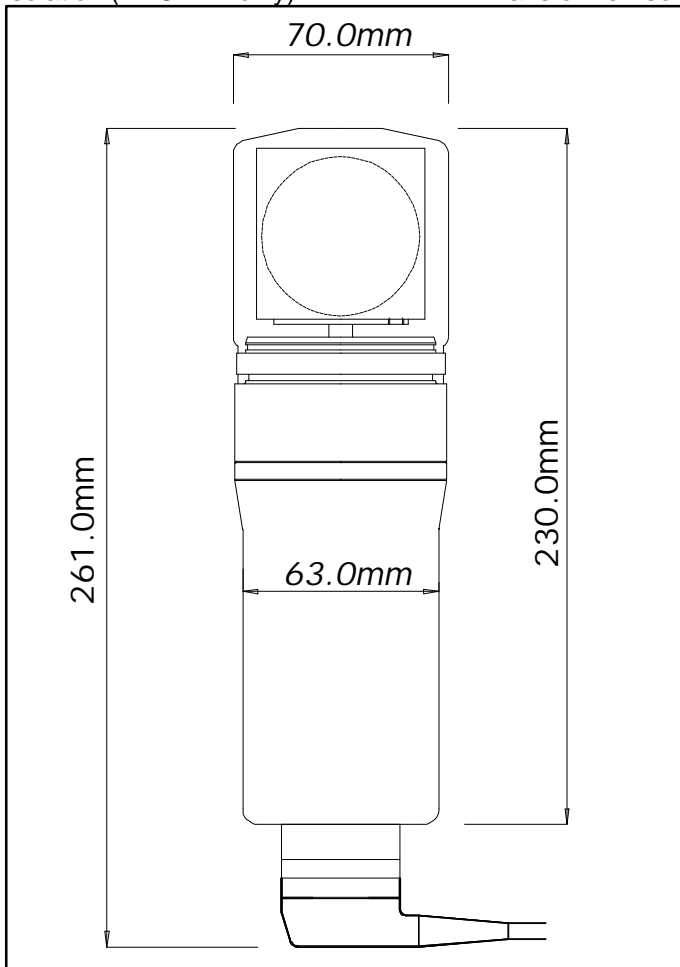
Overall length	242 mm
Body tube diameter	99 mm
Maximum diameter	105 mm
Weight in air	3.0 kg
Weight in water	1.4 kg
Frequency	See configuration sheet
Range resolution	+/- 1mm
Mechanical resolution	<0.45°
Maximum range	300m
Scan size	Variable up to 360°
Depth rating	4000 m
Materials	Aluminium alloy - HE30, RPU
Finish	Hard anodised Black
Operating temperature	-10°C to +35°C
Storage temperature	-20°C to +50°C
Power requirements	18v-36v DC (Abs. Max. 36v DC) @ 6VA.
Data communications	ARCNET multi-drop
Drive capability (ARCNET only)	2,200 m
Isolation (ARCNET only)	Transformer Isolated 1500v MIN



*Fig. 1.3 Dimensions of SeaKing DFP Profiler Head*

## SEAPRINCE SFP SPECIFICATION

Overall length	230 mm
Body tube diameter	63 mm
Maximum diameter	70 mm
Weight in air	1.3 kg
Weight in water	0.5kg
Frequency	See configuration sheet
Beam Size	1.4° conical
Mechanical resolution	<0.45°
Range resolution	± 1.4 mm
Minimum range	0.4 m
Maximum range	30m
Scan size	Variable up to 360°
Depth rating	4000 m
Materials	Auminium alloy - HE30, RPU
Finish	Hard anodised Black
Operating temperature	-10°C to +35°C
Storage temperature	-20°C to +50°C
Power requirements	18v-36v DC (Abs. Max. 36v DC) @ 6VA.
Data communications	ARCNET multi-drop
Drive capability (ARCNET only)	2,200 m
Isolation (ARCNET only)	Transformer Isolated 1500v MIN



Dimensions of Seaprince Single Frequency Profiler Head