Operators manual

KONGSBERG

M3 Sonar™

MultiMode Multibeam Sonar

922-20007001

M3 Sonar
Operators Manual

Document revisions

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About this document

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Document history

Version 1.0	First release Describes M3 Software version 1.0
Version 1.1	Updated drawing images Updated Operation section for M3 Software version 1.1 Updated the Troubleshooting section Updated drawings for the M3 Sonar with SEA CON connector Added information on the coordinate reference
Version 1.2	Minor update to Troubleshooting section Updated the Technical Specifications section Updated Operation section for M3 Software version 1.2B1
Version 1.21	Minor update to Troubleshooting section Minor update to Operation section
Version 1.22	Update Operation section for M3 Software version 1.2 Updated Troubleshooting Section Added cable drawing 436-02391000 Added note about the start-up temperature range to the Technical Specifications Minor updates to the Spare Parts list
Version 1.23	Updated Sonar Head Outline and Installation Drawings in Attachments section Updated Troubleshooting section
Version 1.24	Updated range slider operation. Updated tape measure operation. Added note for annotations of the units of range in converted video file Updated Troubleshooting section Added section describing how to change the Sonar Head Static IP Address Updated Spare Parts list Updated Attachments
Version 1.25	Added outline and wiring drawings for SEA NET version of the M3 Sonar Head (p/n 922-20040000). Updated caution note to install the M3 Sonar Head protective cover when the Sonar Head is not in use or when it is being stored.
Version 1.30	Updated photos and images showing the Sonar Head Guard Ring. Added photos of the Protective Cover. Added Connector Pinouts to the Cable Layout and Interconnections section. Added the max. M3 cable loop resistance to the Interface Specifications section. Updated M3 cable drawing 436-02398000 and spare parts for the new Ethernet connector used in this cable. Added photos for o-ring replacement for the SEA CON CCPL connector. Added supported NMEA format. Added Ethernet beamformed data output Updated software features for M3 release 1.3
Version 1.31	Updated information in troubleshooting section
Version 1.40	Updated software section for M3 software 1.40, profiling release

Feedback

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism. Please send all such – in writing or by Email to:

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1 INTRODUCTION

This manual describes the components for the M3 Sonar system. Instructions are provided here to install and setup the M3 system on an ROV. Operation and maintenance instructions are also provided in this manual.

1.1 M3 Overview

The Kongsberg Mesotech Ltd. M3 Sonar™ is a compact versatile multibeam sonar. The M3 Sonar provides high resolution and easy to interpret images. Detection of small objects out to 150 meters, combined with a 120° wide field of view, permits the operator to see the full underwater picture in real-time.

- Combines the high refresh rate of a conventional multibeam with the image quality comparable to a singlebeam sonar
- Provides wide-angle full range situational awareness with concurrent ultra-short-range imaging with dynamic focusing
- Allows variable vertical beamwidth for optimized obstacle avoidance

1.2 Main Units

The M3 system consists of 3 main units:

- Computer
- Operations Cable and Power Supply
- Sonar Head

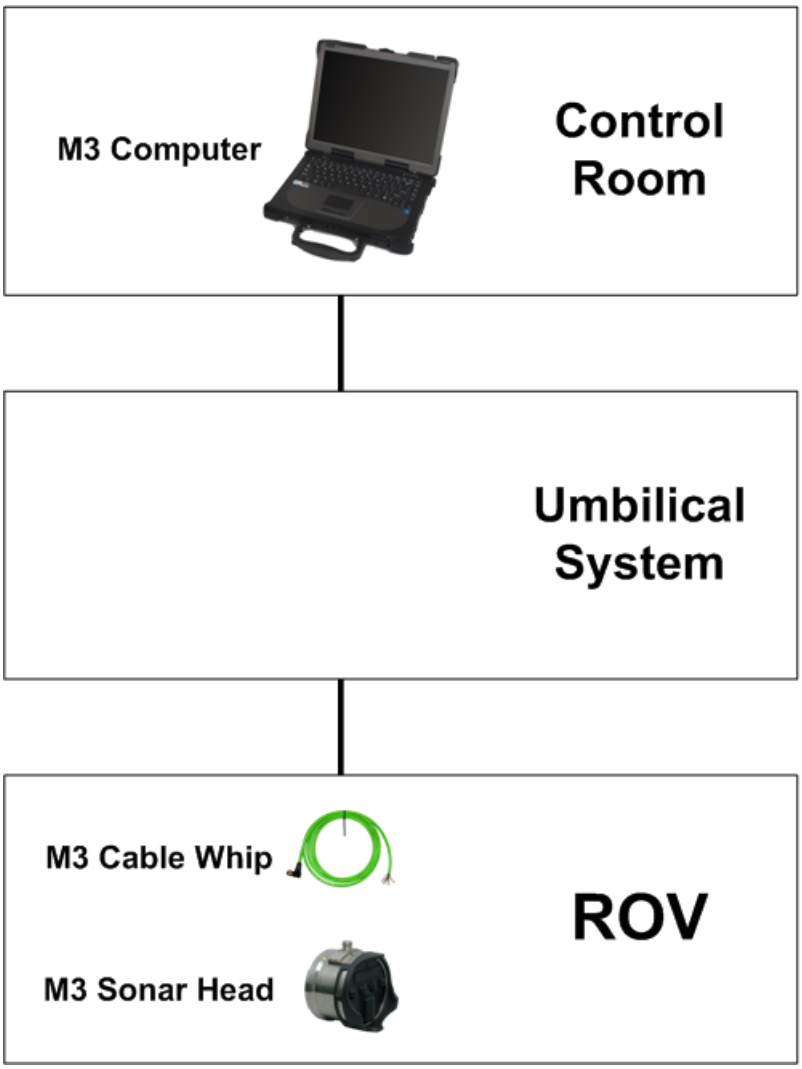


Figure 1. Example system block diagram – ROV configuration

1.2.1 Computer

The Computer runs the M3 software that manages communication with the Sonar Head, performs all beamforming and image processing and presents the sonar imagery for the operator.

1.2.2 Operations Cable and Power Supply

The Sonar Head requires a DC power supply to run. The power is normally supplied by the Remotely Operated Vehicle. A small DC switching supply can be used with the test cable for bench testing and troubleshooting.

1.2.3 Sonar Head

The Sonar Head is installed underwater and transmits and receives an acoustic pulse. The Sonar Head requires DC power from a power supply located near the Sonar Head.

1.2.4 Accessories

The M3 system accessories can be supplied by Kongsberg, the system integrator or the end user. Typical system accessories include:

- Equipment case
- Telemetry extension kits
- Displays
- Mounting brackets
- Rotators
- Accessory kit

1.3 Maintenance

Kongsberg Mesotech Ltd. defines four levels for M3 maintenance manuals. The maintenance levels are:

- A-level (Organizational)
- B-level (Intermediate)
- C-level (Depot)
- D-level (Manufacturer)

The possibility to monitor and diagnose the system from the Manufacturer's office (Kongsberg Mesotech Ltd.) is not included.

Note *This maintenance manual is prepared for the organizational and intermediate level (A-Level and B-Level).*

A-level

A-level operations take place on line. At this level, maintenance tasks consist of periodic checks, visual inspections, cleaning and Replacement of outer parts. A-level personnel will require the technical training and background necessary for maintenance to this level.

The goal of this level is to secure the operational availability and performance of the system.

A-level activities will be performed by the client or contractors.

B-level

B-level operations take place at on line equipment. Activities might be periodic checks and demounting/mounting of defective/repaired parts. Other activities might be visual checks and/or demounting/mounting of on line equipment, where personnel, tools, spares and documentation are adequate for the relevant operation.

The goal of this level is to restore the operational availability of faulty equipment.

B-level activities will be performed by the client or contractors.

C-level

C-level operations take place in a centralized workshop. At this level, maintenance tasks consist of corrective maintenance of Line Replaceable Units (LRU) and modules using Shop Replaceable Units (SRU) and components. Modifications and major overhaul operations are also done at the C-level. C-level is also responsible for the configuration and documentation management.

The goal of this level is to restore the operational availability of the modules, units, boards and LRUs.

C - Level activities will be performed by Kongsberg Mesotech Ltd. or authorized service centers.

D-level

The goal of the D-level is to take care of the maintenance actions that cannot be carried out at the C-level cost-effectively. Normally these are repair and maintenance actions that require the use of expensive or specialized factory level test equipment. Upgrading or modernization and spare parts deliveries are also normal manufacturer tasks that may entail engineering support provided to the C-level workshop.

D- Level activities will be performed by Kongsberg Mesotech Ltd.

1.4 Technical Support

If you require assistance with your M3 Sonar, please contact:

Kongsberg Mesotech Ltd. Phone: +1 604 464 8144

Email: km.sales.vancouver@kongsberg.com

2 QUICK-START

The basic M3 Sonar system consists of:

- Sonar Head
- Operations Cable and Power Supply
- Software

In addition to the basic components, a power supply is required to power the Sonar Head. Figure 2 shows the components required for a bench-test of the M3 System.

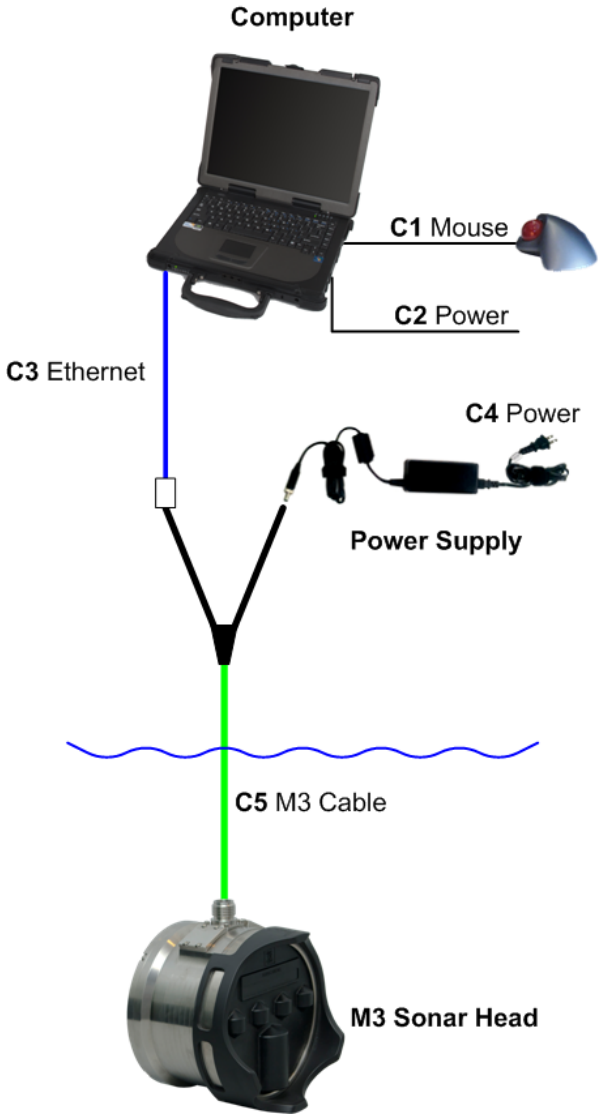


Figure 2.Basic M3 system components required for a bench-test.

2.1 Getting Started

To perform a system check on the M3 components please follow the instructions below.

Install software

1. Insert the M3 software installation CD into the computer.
2. Run **Setup** and apply the default settings during installation

Configure the network settings

3. Open the **Local Area Connection** window and click on **Properties**
4. Select **Internet Protocol (TCP/IPv4)** and click **Properties**
5. Set the computer to **Use the following IP address: 192.168.1.233**
6. Set the **Subnet Mask** to: **255.255.255.0**
7. Leave the **Default Gateway** field blank
8. Click **OK** to apply changes

Start-up and testing the sonar

9. Connect the M3 system components shown in Figure 2 on page 5.
10. Apply AC power to the M3 power supply
11. Run the M3 software
12. Click the **Connect Head** located in the **Setup** menu and the sonar will start pinging automatically once the connection is complete.

Shutdown

13. Before turning off or removing power to the sonar, click on the disconnect button
14. Close the M3 application

3 TECHNICAL SPECIFICATIONS

Please note that Kongsberg Mesotech Ltd. is engaged in continuous developments of its products and reserves the right to alter the system specifications without prior notice.

3.1 Sonar Specifications

- Range: 0.2 to 150 m
- Range Resolution: 1 cm
- Frequency: 500 kHz
- Pulse Types: CW, LFM
- Modes: Variable Vertical Beamwidth, eIQ

Variable Vertical Beamwidth Mode

- Horizontal Field of View: 120°
- Vertical Field of View: 3°, 7°, 15°, 30°
- Angular Resolution: 1.6°
- Update rate: up to 40 Hz

eIQ Imaging Mode

- Horizontal Field of View: 140°
- Vertical Field of View: 30°
- Angular Resolution: 0.95°
- Update rate: up to 10 Hz

Profiling Mode

- Across Track Field of View: 120°
- Along Track Field of View: 3°
- Number of Beams: 256
- Update rate: up to 40 Hz
- Beam spacing: Equiangle

3.2 Interface Specifications

- Communication: Ethernet
- Data Rates: 100/1000 Mbps
- Input Voltage: 12 to 36 VDC
- Input Power: 22 W (Typical)
- Peak Current Draw: 2.7 Amps (at 24 VDC)
- Maximum cable loop resistance for Sonar Head power:
  - 0.1 Ω @ 12VDC
  - 2 Ω @ 24VDC
  - 6 Ω @ 36VDC

  (Values above were measured at +23°C)
- O/S: Windows 7 Professional SP1 or XP Professional SP3

3.3 Environmental

Temperature

- Operation: -2°C to +38°C
- Storage: -40°C to +55°C

Note *The stated operation temperature range is for the Sonar Head in water. The sonar can be powered on and started at temperatures between -20° to +45° C. There is a built-in temperature monitor that will display a software warning message and automatically power down the sonar before it overheats.*

3.4 Mechanical Specifications

500m Depth Rating

- Dimensions:
  - Diameter: 185 mm (7.28”)
  - Depth: 126 mm (4.95”)
- Weight in air: 4.4 kg
- Weight in water: 1.8 kg
- Depth Rating: 500 m

- Connector Type: SEA CON®
- Connector Model: MINK-10-FCRL (Power & Telemetry)

4000m Depth Rating

- Dimensions:
  - Diameter: 185 mm (7.28”)
  - Depth: 140 mm (5.50”)
- Weight in air: 8.2 kg
- Weight in water: 5.1 kg
- Depth Rating: 4000 m
- Connector Type: SEA CON®
- Connector Model: MINK-10-FCRL

3.5 Computer Requirements

Minimum Requirements

- Operating System: Windows XP Professional 32-bit, SP3
- CPU: Intel Core 2 Duo, 3.0 GHz
- RAM: 4 GB
- Graphics Card RAM: 256 MB
- Optical drive: DVD +/-RW
- Network Interface: 100/1000 Mbps
- Hard Drive: 300 GB (30-hours recording avg. data rate)

Recommended

- Operating System: Windows 7 64-bit, SP1
- CPU: Intel i7 quad core, 2.66 GHz
- RAM: 8 GB
- Graphics Card RAM: 256 MB
- Optical drive: DVD +/-RW
- Network Interface: 100/1000 Mbps
- Hard Drive: 1 TB (100-hours recording avg. data rate)

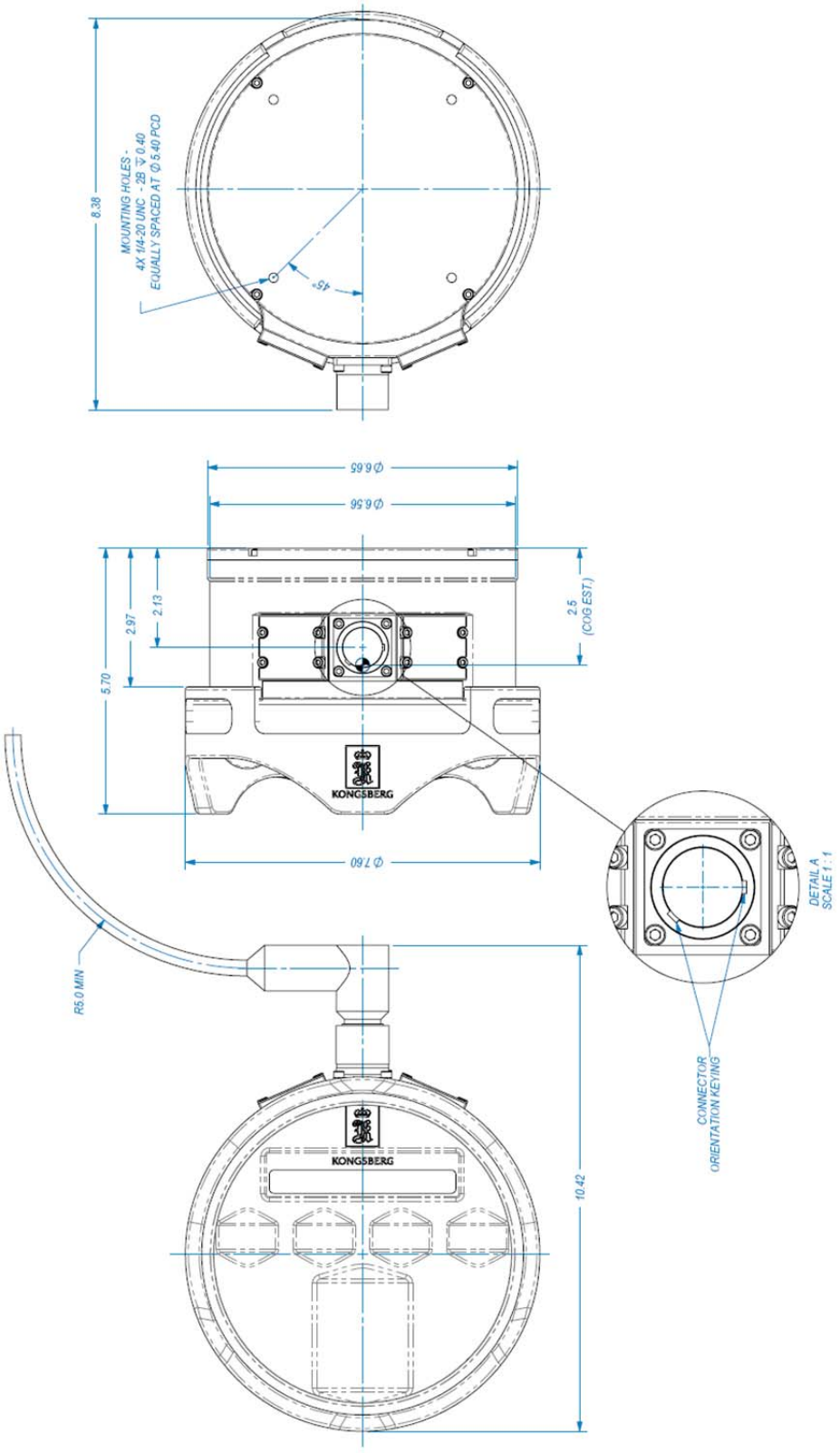


Figure 3. M3 Sonar Head 500m (dimensions are in inches)

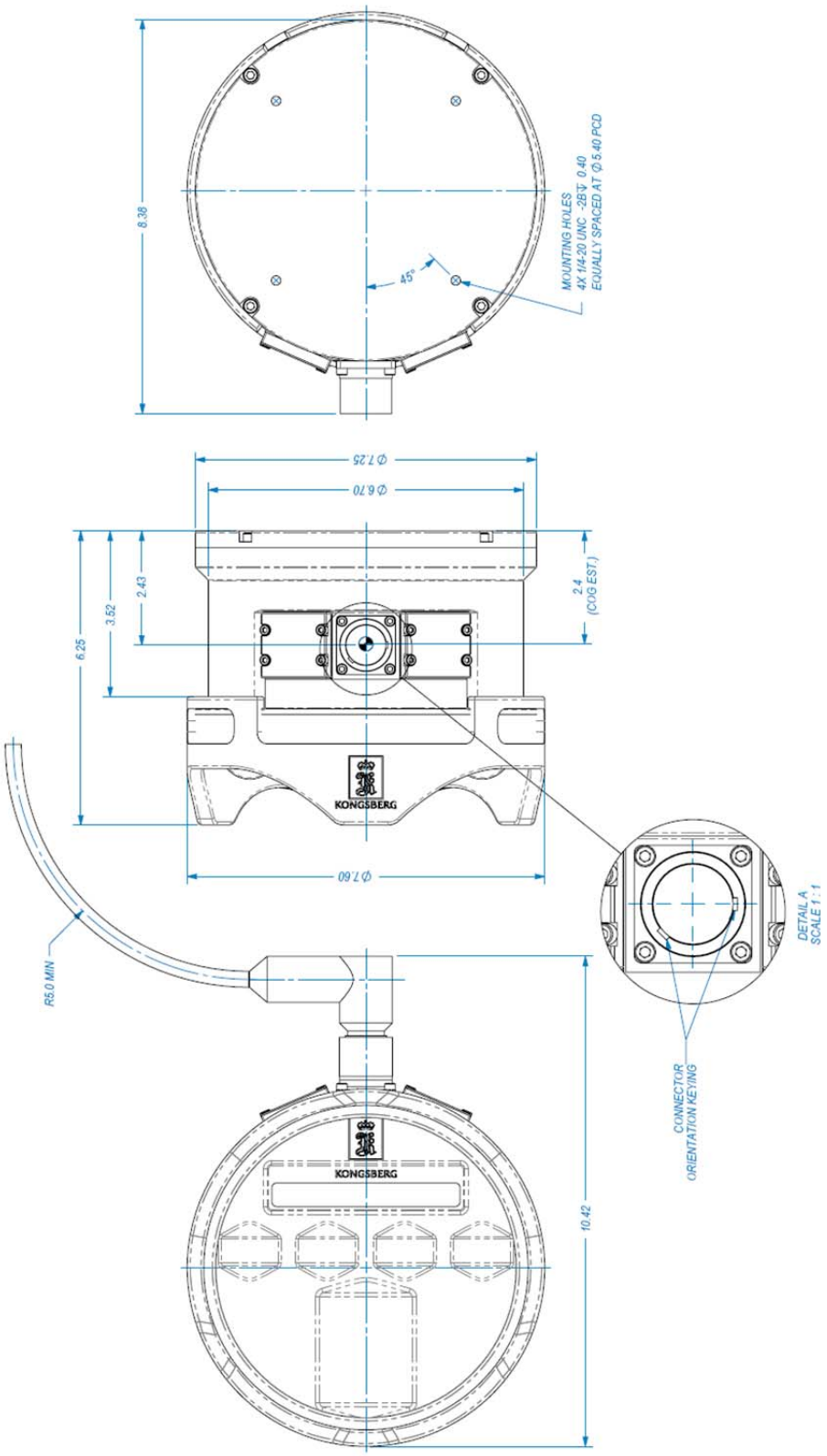


Figure 4. M3 Sonar Head 4000m (dimensions are in inches)

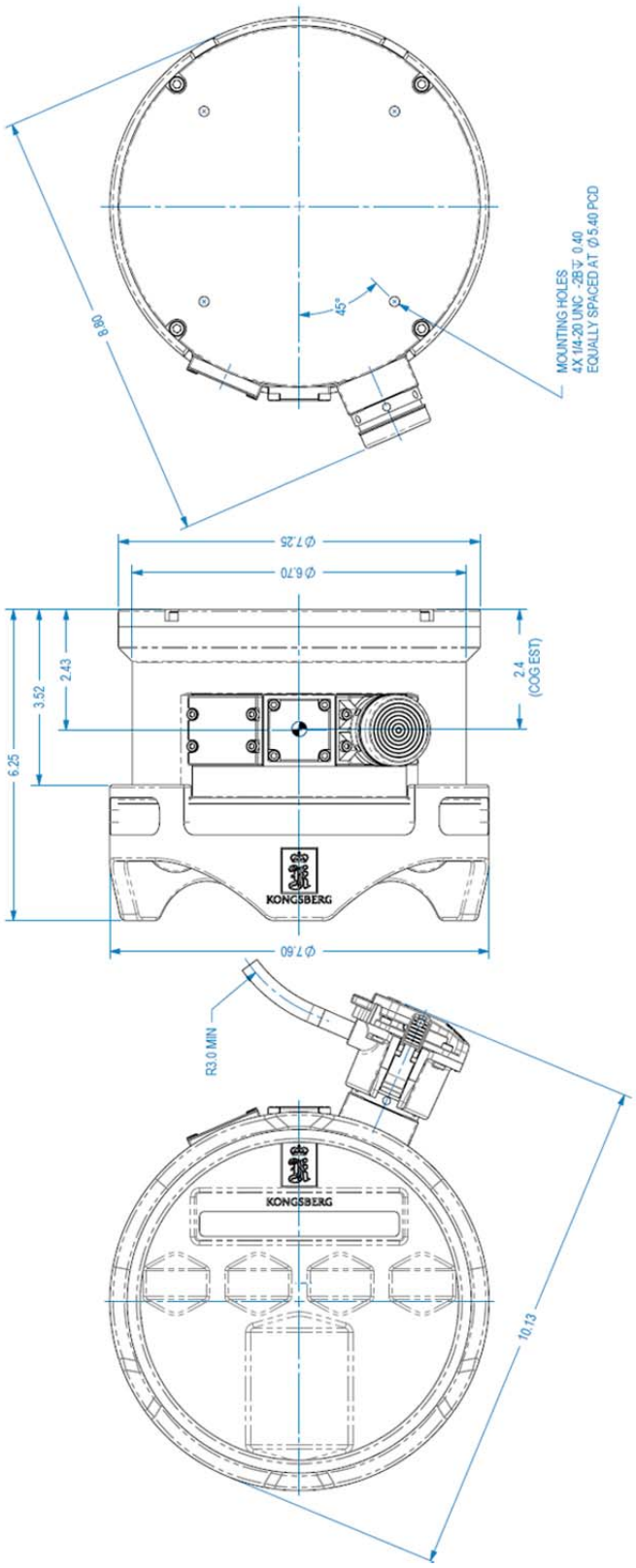


Figure 5. M3 Sonar Head 4000m with SEANET connector (dimensions are in inches)

4 COMPUTER

Figure 6. M3 Computer

Description

The M3 Sonar uses a commercially available computer running Windows operating system. The sonar telemetry is connected to the computer using a standard Ethernet.

4.1 Software

M3 Operator Software

The M3 Operator Software employs a new user interface with simplified controls that sets the sonar operating parameters by selecting an application mode rather than adjusting many complex sonar parameters.

Post Processing Software

The M3 recorded data format is available for developers who wish to perform custom processing of the recorded data.

4.2 Installation

Location

It is recommended the M3 Computer be run in a location with environmental conditions similar to those required for extended human occupation. If a laptop computer is used, it should be located on a desktop at a suitable height and distance for and operator to use.

Caution ***The computer should be kept away from sea-spray and locations where water is expected to splash on the computer.***

Mounting

No specific installation procedures exist for the M3 Computer. However, the unit must be installed properly supported and protected against shock and vibration due to sea conditions.

4.3 Maintenance

The items listed below are preventative maintenance measures that should be followed to help eliminate system down-time due to component failure.

Refer to the computer manufacturer documentation for additional preventative maintenance actions.

A-Level (Organizational)

1. Wipe the display with a slightly moist micro-fiber cloth. Ensure the display is off when the LCD is being cleaned.

Caution ***Do not use solvents on the display or any other part of the plastic laptop computer, it will cause permanent damage to the finish.***

2. Defragment the disk drive weekly using the Windows Disk Defragmentation application
3. Back-up data to an external drive to DVD monthly and after each software upgrade or configuration change
    - Archive Sonar Data (if applicable)
    - Create a disk image using Norton Ghost, Acronis True Image or similar recovery tool
    - Re-image the computer with the base install of operating system (with Windows updates) and the M3 software before each trip to sea.

B-Level (Intermediate)

1. Remove and clean the air filters in the computer. Inspect the fans for excessive dust build-up and use compressed air to blow the dust out of the computer.
2. Replace the Laptop computers with a new model every 3 to 5 years (depending on the brand, model and how the laptop is normally handled).

5 POWER SUPPLY

Description

The M3 Sonar Head requires a DC power supply to operate. Normally the DC voltage is supplied from the ROV where the Sonar Head is mounted. This DC power supply installed on the ROV is not normally supplied with the M3 Sonar.

→ *Refer to the Interface Specifications Section 3.2 on page 8 for more information on the power requirements for the Sonar Head.*

A test cable and power supply can be supplied as an accessory. The M3 test power supply is suitable for running the system when it will not be operated on an ROV. The test power supply uses a 24 VDC switching power supply.

Note

The Sonar Head may pickup noise from some DC switching power supplies. Choose a power supply with a switching frequency that is not at 500kHz +/- 50kHz. The DC switching supply should also not have a harmonic in this range.

6 SONAR HEAD

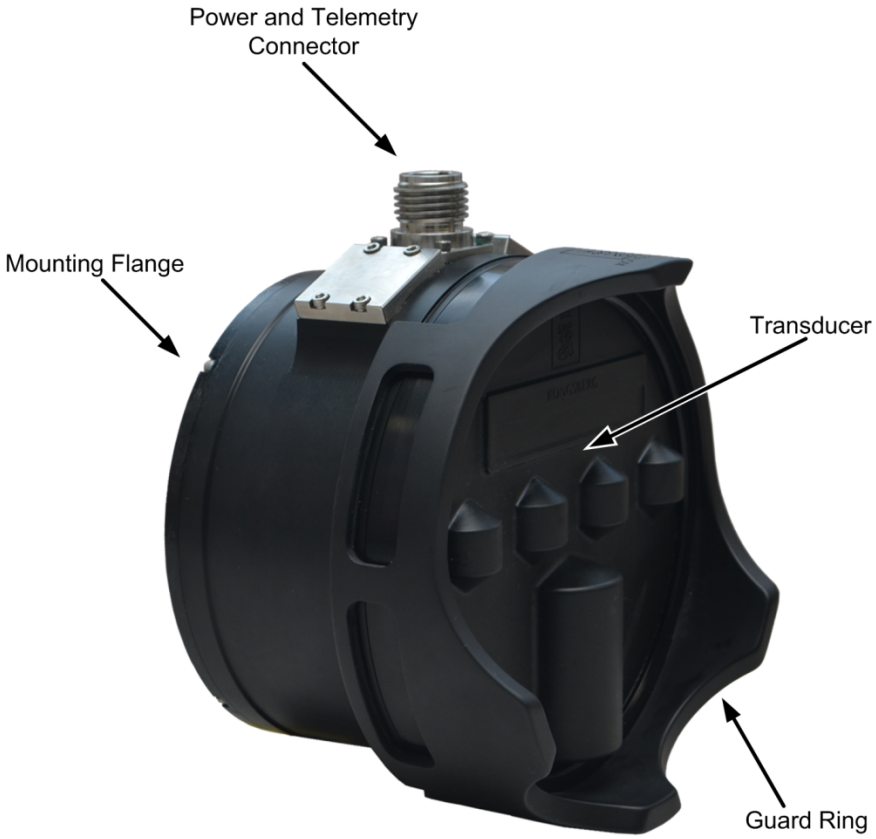


Figure 7. M3 Sonar Head 500m

Description

The M3 Sonar Head consists of the underwater portion of the sonar. The Sonar Head includes transmit and receive transducers and the electronics to generate the transmit pulse and digitize the received signal. The sonar data is sent to the M3 Computer using a standard Ethernet link.

Caution

Ensure the M3 Sonar Head's black polyurethane transducer is protected from impact during handling and deployment. The transducer elements are fragile and may be permanently damaged if mishandled. Ensure the guard ring (p/n 359-01320000) is installed on the Sonar Head at all times. Also ensure the protective cover (p/n 159-05000002) is installed when not in operation or when being stored.

Caution ***The M3 Sonar Head's black polyurethane transducer should not be left exposed to or stored in strong sunlight. Cover the transducer with an opaque material to shield it from the sun. Exposure to Ultra-Violet rays and excessive heat may cause small cracks to appear on the surface of the polyurethane. Also avoid storage near ozone sources (e.g. electric motors).***

Caution ***Clean the M3 Sonar Head's black polyurethane transducer surface using only mild soap or detergent. Use a cloth, sponge or non-abrasive scrub pad to clean the surface. Chemical cleaners such as Acetone may damage the surface of the transducer.***

Note *By default the sonar head is set to a fixed IP address of 192.168.1.234 The IP address.*

6.1 Installation

Location

Location of the sonar head is vital to ensure optimal performance of the system. The Sonar Head must be mounted so that it has a clear view within its coverage sector, i.e. no obstructions are permitted at the operating depth within a minimum ± 25° vertical and ± 80° horizontal with respect to the face of the sonar transducer. It is important that the Sonar Head is mounted so that the water in front of it is not aerated.

Tilt

When installing on an ROV, the Sonar Head should be tilted downward around 8° to 15°. This will improve the detection of the sea-bottom at short range when operating near bottom.

Mounting

There are 4 mounting screw provided on the surface opposite to the Transducer.

→ *Refer to the Attachments (Section 13) for the outline and installation drawings for the Sonar Head. Also see Figure 3 and Figure 4*

Caution ***The threaded mounting screws are only tapped to 0.40-inches depth. Do not use excessive force when tightening the screws or the threads will permanently be damaged.***

Note

For high shock environments, use fasteners with A286 Super Alloy. Fasteners are to be lubricated with anti-seize compound and torqued to 94 in-lb.

Orientation

The Sonar Head should be mounted in either configuration shown below. If it is installed opposite to one of these the image displayed on the sonar screen will appear backwards (objects on the right will appear to the left of the display and visa versa). To correct this enable **Invert Sonar Image** option in the software.

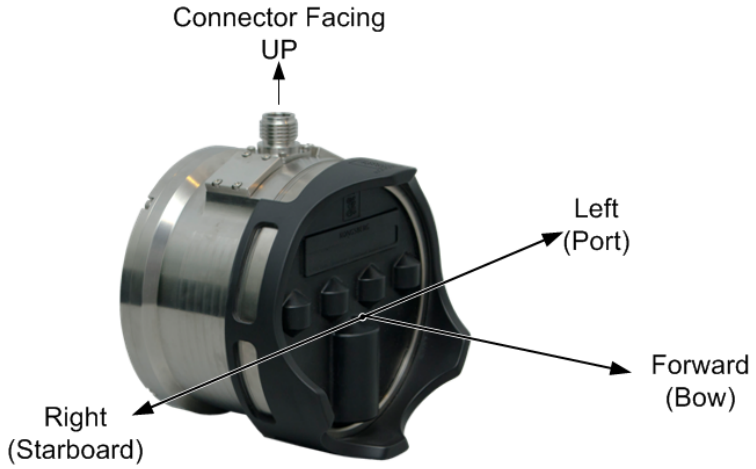


Figure 8. M3 Sonar Head mounted in the forward looking configuration

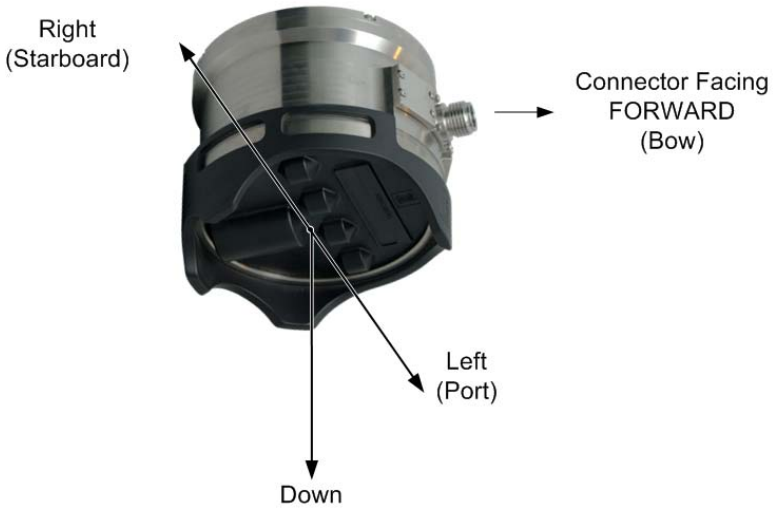


Figure 9. M3 Sonar Head mounted in the downward looking configuration

6.2 Coordinate System

The following M3 Sonar uses the following definition for the coordinate system:

- *Y* = forwards
- *X* = to starboard
- *Z* = pointing upwards.

The coordinate system's Master Reference point is always assumed to be the location of the position sensor and referenced to a depth sensor or a surface vessel at water-level.

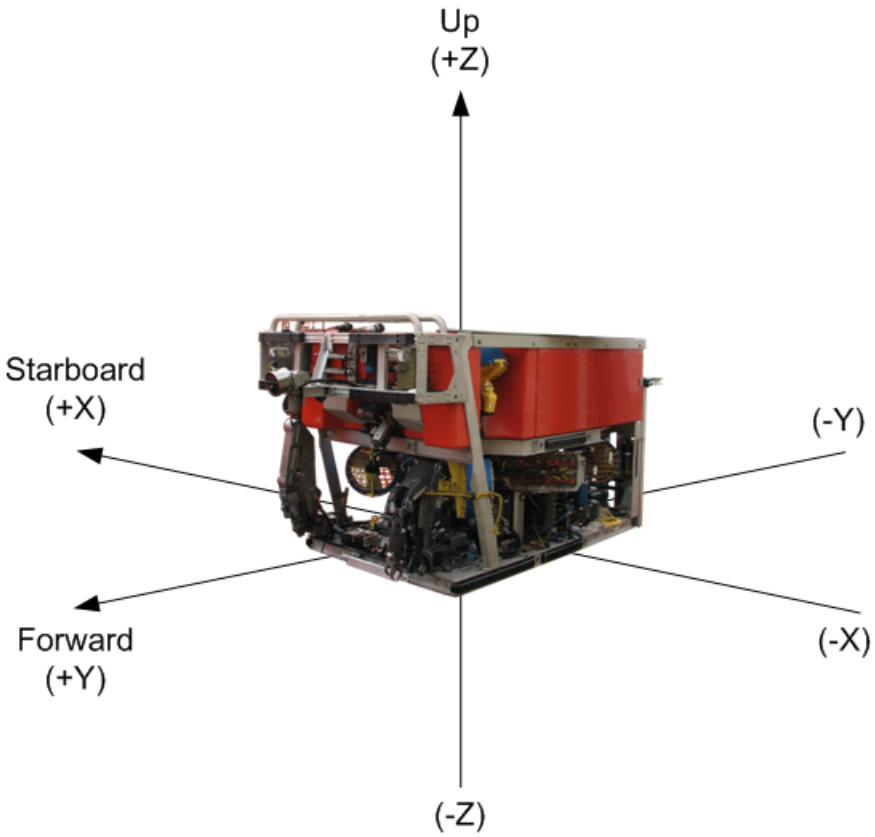


Figure 10. M3 Sonar Coordinate System (X, Y, Z)

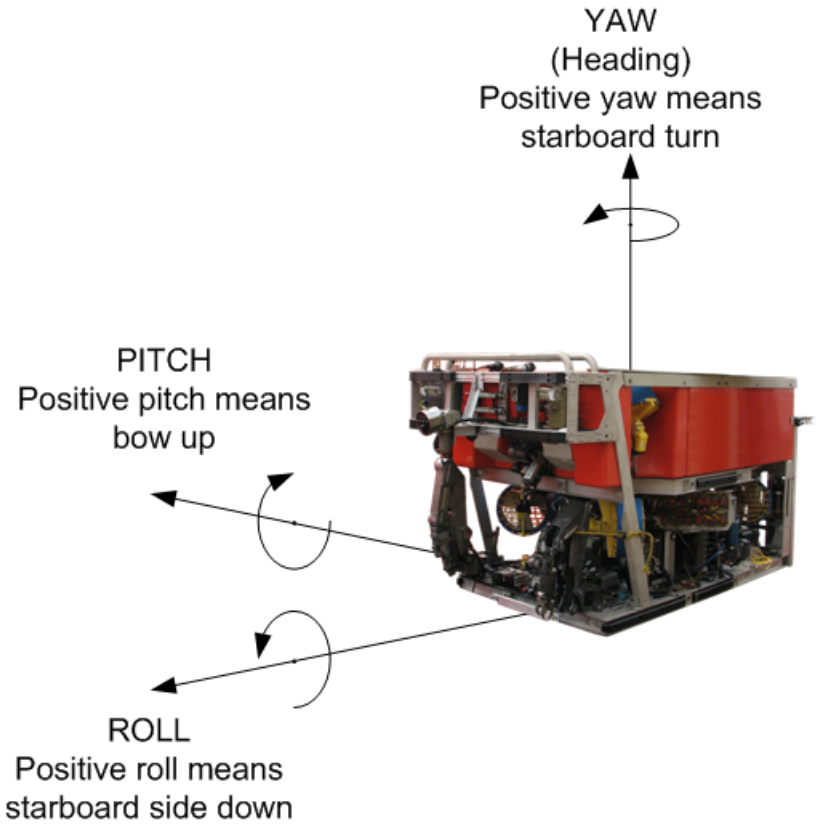


Figure 11. M3 Sonar Pitch, Roll, Yaw Convention

6.3 Component Check

Equipment Required

- M3 Computer
- Ethernet Cable
- Power Supply (12-36 VDC @ 25W)
- M3 Cable with RJ-45 socket

Time Required

- Less than 15 minutes

Setup

1. Connect the required equipment as shown in Figure 11 (page 32) or Figure 12 on (page 33).

Power-On Check

1. Power on the Sonar Head
2. Run the M3 Software
3. Click the **Connect Head** located in the **Setup** menu and the sonar will start pinging automatically once the connection is complete.
4. Verify the Sonar Head status button located on the status bar says **ACTIVE**. Click on the button to open the Head Status window. Confirm that all parameters appear **GREEN**.
5. Verify the Sonar connects and there are no errors shown in the message log (**Display** menu > **Output Message Window**)
6. Close the M3 software application.

6.4 Maintenance

The items listed below are preventative maintenance measures that should be followed to help eliminate system down-time due to component failure.

Level A (Organizational)

1. Thoroughly rinse the sonar head with copious amounts of fresh water each time the sonar is removed from seawater.

2. Ensure the Sonar Head, cables and accessories are dry before storing in the equipment case.
3. Keep the transducer clean and oil free to ensure good coupling to the water. Any foreign objects, marine growth, air bubbles or oily film on the transducer can greatly reduce the sensitivity and performance of the system.
    a. Inspect the transducer for damage
    b. Wash the transducer with a liquid detergent such as dishwashing soap before and after use.
4. Inspect the anodes. Replace if the anodes are severely eroded (approximately 50% or more is depleted).
5. Always put a plastic cap over the underwater connectors on the Sonar Head and cable connector when they are not mated. Ensure the connector is dry by spraying out the connector with compressed air before installing the cap.

Caution

When the Sonar Head underwater connector is not mated to the cable connector, always protect the connector from damage by installing a plastic cap after ensuring the connector is dry. Use compressed air to remove any water that may be trapped in the connector.

Level B (Intermediate)

1. Inspect the deployment cable connected to the sonar head for cuts or other damage. Repair or replace if necessary.
2. Inspect the o-rings in the underwater connector before mating to ensure the o-ring(s) are not missing or dirty. Refer to sections 6.5 (page 24) and 7.6 (page 36) for more information on o-ring maintenance procedures.

6.5 Replacement Procedure

6.5.1 O-Rings

Caution ***Replacing o-rings must only be done by qualified personnel. An improperly installed o-ring can result in catastrophic failure and permanently damage the underwater equipment.***

Equipment Required

- M3 Sonar Head
- M3 Cable with SEA CON connector
- DOIT (Dove-tail O-ring Installation Tool)
- O-ring pick tool
- O-ring grease
- Replacement o-ring
- Swabs
- Isopropyl Alcohol (IPA)

Time Required

- Less than 5 minutes

Procedure

1. Use the Parker o-ring picks to extract the o-rings from the Cable Connector Plugs and Flanged Connector Receptacle.
2. Clean the o-ring surface with Q-Tips and Isopropyl Alcohol. Ensure all dirt, hair and debris is removed from the o-ring surface.
3. Grease the replacement o-ring with a small amount of o-ring grease. Be sure to keep the o-ring free of dirt, hairs or other contaminants.
4. Fit the o-ring back onto the Cable Connector Plug or Flanged Connector Receptacle. Use the SEA CON Dove-tail O-ring Installation Tool (DOIT) to fit the o-ring into the Cable Connector Plug.

→ *Refer to section 7.6 on (page 36) for more instructions on o-ring replacement.*

→ *See the Spare Parts section 12 (page 108) and Tools and Consumables section 12.4 (page 109) for the o-ring part numbers and the extraction tools.*

Cable Connector (SEA CON - CCPL)

Figure 12. Items required for SEA CON CCP o-ring replacement

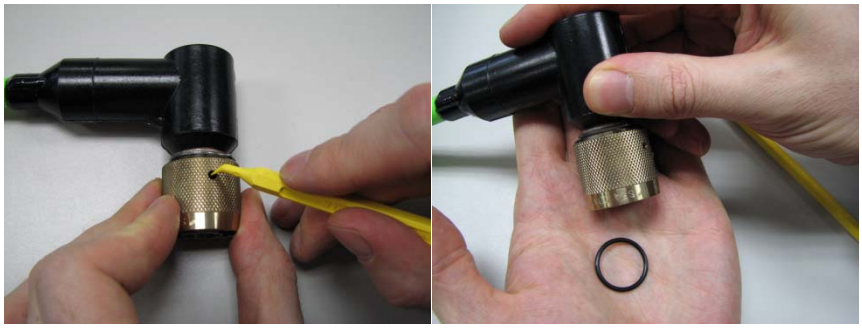


Figure 13. Removing the o-ring from the CCP

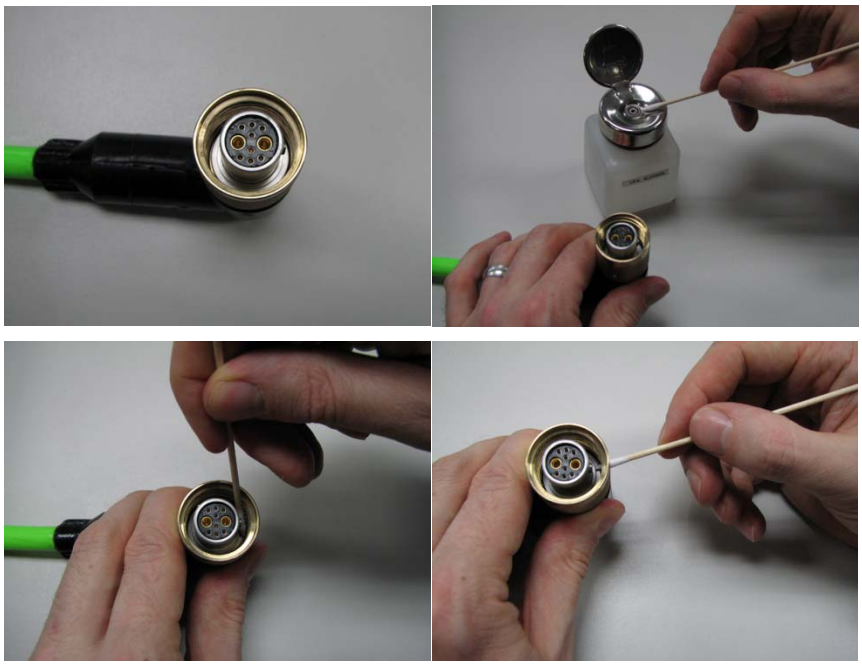


Figure 14. Cleaning the o-ring surface with IPA

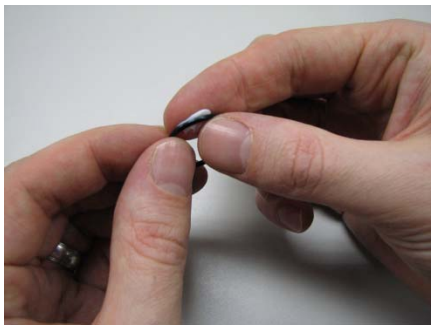


Figure 15. Inspect the o-ring for defects and apply o-ring grease

Figure 16. Fit the o-ring onto the DOIT and slide it to the end

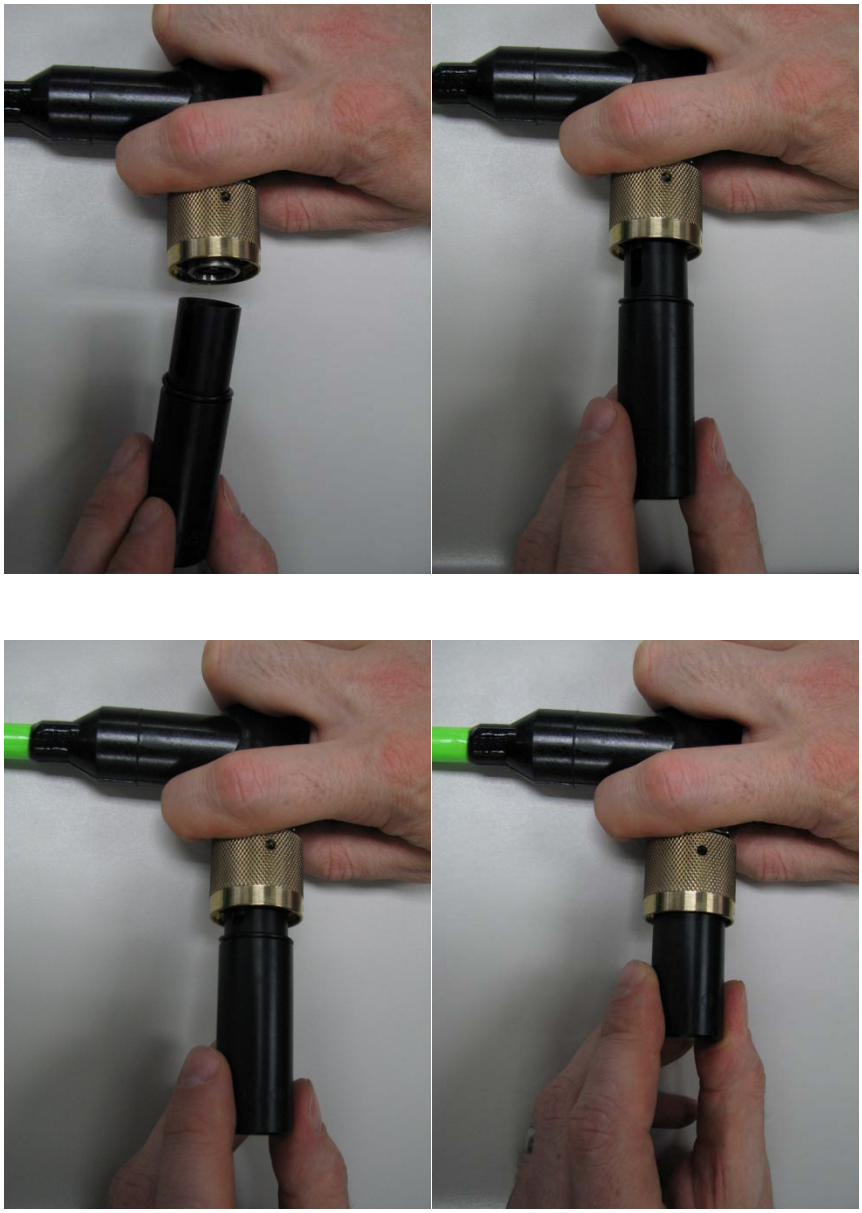


Figure 17. Install the o-ring in the CCP by aligning the key and pressing into the connector.

Note

Rotating the DOIT when pulling it out can help ensure the o-ring stays in place.

6.6 Guard Ring Installation

1. Prepare Guard Ring and Head for installation.

2. Place the Guard Ring on top of the Head, angled as shown.

Note *The location of Kongsberg logo in the center above the middle connector*

3. Install the Guard Ring downwards and position the sides below the Housing's Compression Ring, and clip in place.

4. Note correct installation as shown

6.7 Protective Cover

The protective cover is intended to be used when the sonar is not in operation or when while the Sonar Head is being stored. This cover fits over the Guard Ring and helps to protect the sensitive transducer surface from minor accidental bumps and impacts. This cover also provides some protection from ultraviolet rays from the sun when the ROV is stored on deck.

7 CABLE LAYOUT AND INTERCONNECTIONS

7.1 Introduction

The standard cables used between the M3 system units and between the units and their external devices are shown here.

Note *All cable connections may have to be made in accordance with the guidelines laid down by the local electrical code.*

7.2 Network Configuration

By default the sonar head is set to a fixed IP address of **192.168.1.234**.

→ *Refer to Section 10.7 on page 94 to use the M3 software to discover if the IP address has been changed from the default value.*

7.3 Ethernet Termination and Installation

Cable Termination

Terminating Ethernet cables is very precise work. There is a lot that can go wrong and resulting in less than ideal telemetry quality. The parallel location of wires in the RJ45 connector forms a capacitive plate that is a source for signal coupling or crosstalk. Untwisting the cable pairs increases the cables susceptibility to crosstalk interference. The cable crimping process can crush the conductor pairs causing crosstalk interference.

Suggestions:

- Use CAT5E or CAT6 rated underwater connectors
- Use CAT5E or CAT6 rated patch cords that have been factory tested
- Use CAT5E or CAT6 rated patch panels, connector and sockets
- Do not untwist the cable more than 0.5-inches for CAT5E cables and not more than 0.375-inches for CAT6
- Remove as little cable jacket as possible.

Alien Crosstalk

Alien crosstalk is where the signal from one cable interferers with the signal being carried by another. This can occur when many Ethernet cables are bundled together running long distances, coiled on a spool or looped. Alien crosstalk cannot be eliminated using phase cancellation like other crosstalk that takes place within the cable. This type of crosstalk resembles noise and reduces the quality of the communication link. Alien crosstalk is more of a problem at data rates such as 1000BaseT or higher.

Suggestions:

- Avoid tightly bundling cables together in parallel over long distances
- Avoid using tie-wraps to bundle cables together, and try to separate cables as much as possible. If tie-wraps are used, do not over-tighten. Velcro© cable wraps are recommended instead of tie-wraps and can be easily be reused if rearranging the cable is required.
- Use Category 6A cable. This type of cable has a special core wrap that isolates and protects the core from alien crosstalk.

Ground Loops

Ground loop noise is caused when the equipment is grounded at two or more points that have different potentials. This creates a current path causing electromagnetic interference (EMI). This will appear as rings on the sonar display usually at a constant range. The thickness and intensity of the ring will depend on the EMI generated by the ground loop.

Bend Radius

Always observe the specified cable bend radius. Disturbing the cable geometry can introduce crosstalk interference. As a rule of thumb the bend radius is typically 10-times the cable diameter.

7.4 System Cabling

Cable Layout

The interconnection cables are identified on the system cable connection diagram drawing. Each cable is then listed in the corresponding list, which contains the required cable specifications.

→ *Refer to Figure 11. M3 Basic System Interconnection Diagram – Bench Test (page 32). Also refer to the M3 System Interconnection Diagram – ROV Example in Figure 12 (page 33).*

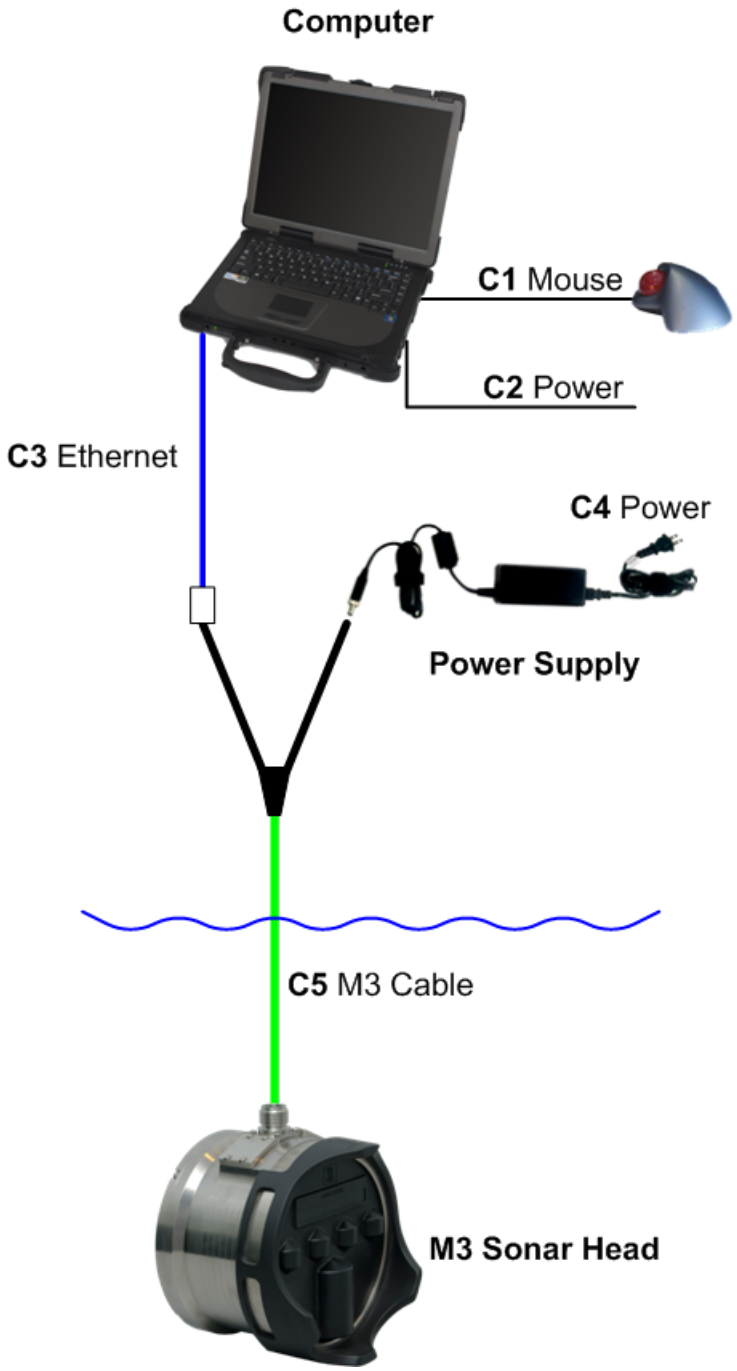


Figure 18. M3 Basic System Interconnection Diagram – Bench Test

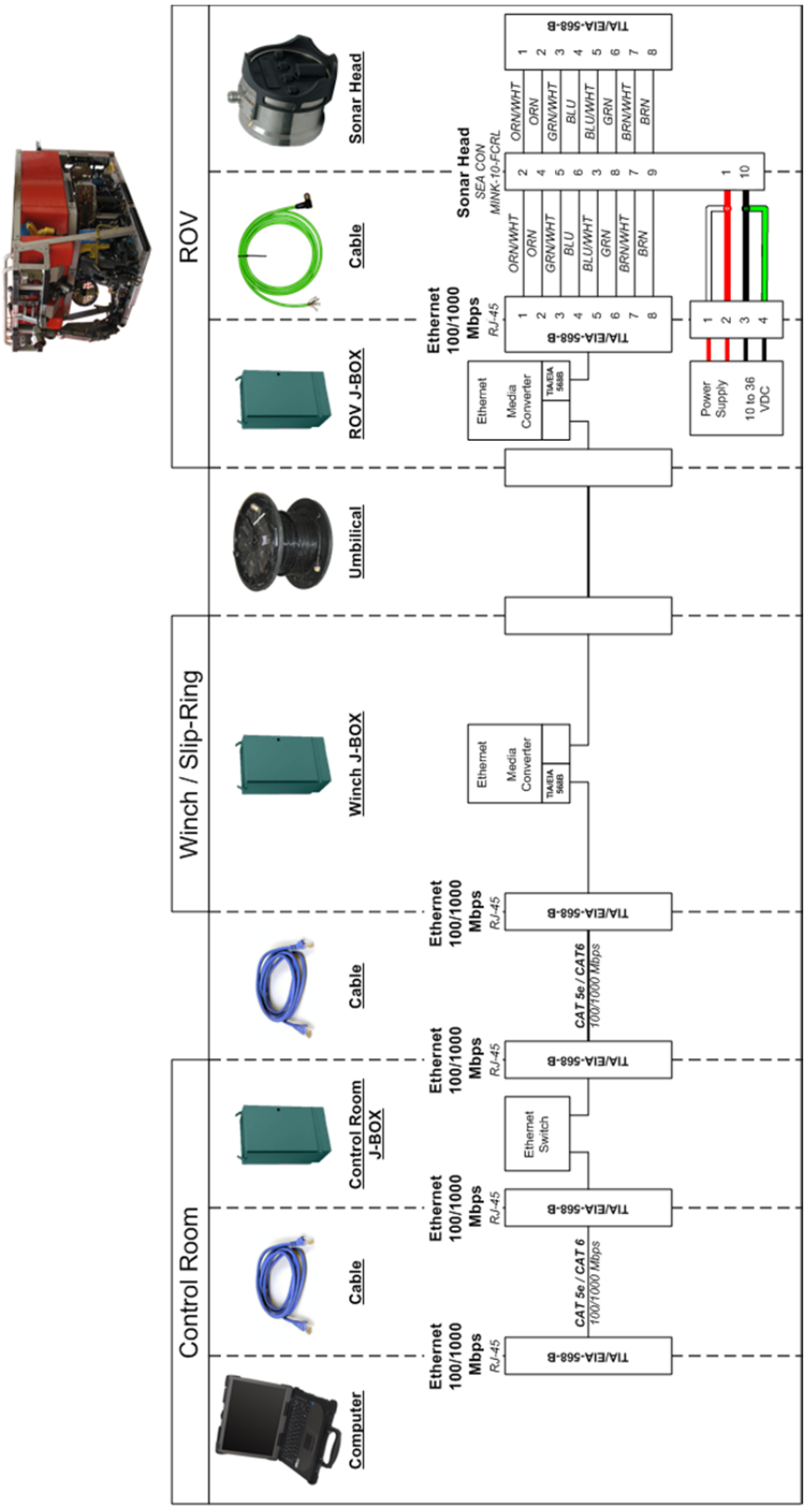


Figure 19. M3 System Interconnection Diagram – ROV Example

7.5 Cable Details

ID	Cable for	Description
C1	Mouse	This cable is a standard mouse cable. It is physically connected to the mouse. It is terminated in a plug suited to fit the computer.
C2	AC-to-DC Power	The laptop computer uses an AC-to-DC power supply. A standard North American style plug is normally supplied with this unit.
C4	AC Power	A standard AC Power cord with a North American style plug is normally shipped with each unit. Other power cord options can be supplied depending on your location.
C3	Ethernet	The sonar telemetry signals and remote power control is made from the M3 Computer to the Sonar Head. A standard CAT5e or CAT6 (straight-through) Ethernet cable with RJ-45 connectors is used for this connection.
C5	M3 Test Cable	This cable is rugged and intended for use underwater and includes both power and telemetry connections for the sonar head. The underwater connector is a dry-mate style and must be mated or unmated at the surface. The power connector supplied is a DC circular connector that will connect to the M3 Test Power Supply. The Telemetry connector has an RJ-45 female socket to connect a standard Straight-Through Ethernet cable to the computer.

7.5.1 Ethernet

The M3 Sonar should use T568B termination for all RJ45 connections.

Note *For 100Base-TX connections only pairs 2 and 3 are required (Orange/Orange-White and Green/Green-White). No cross-over is required.*

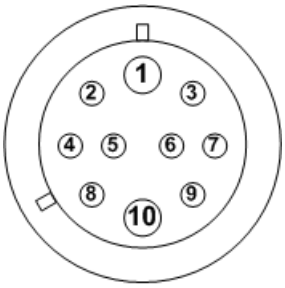
T568B Termination

Pin	Pair	Color
1	2	White/Orange
2	2	Orange
3	3	White/Green
4	1	Blue
5	1	White/Blue
6	3	Green
7	4	White/Brown
8	4	Brown

Figure 20. T568B Termination

7.5.2 Connector Pinout

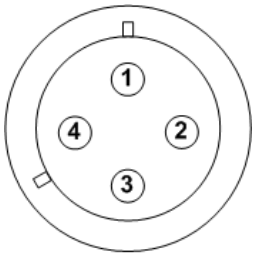
SEACON MINK-10-CCPL: Power & Telemetry



CABLE PIN VIEW

Pin	Function	T468B
1	Pri_Power (+12 to +36 VDC)	-
2	BI_DA+	ORG/WHT
3	BI_DC-	BLU/WHT
4	BI_DA-	ORG
5	BI_DB+	GRN/WHT
6	BI_DC+	BLU
7	BI_DD+	BRN/WHT
8	BI_DB-	GRN
9	BI_DD-	BRN
10	Pri_Power_Return (0 VDC)	-

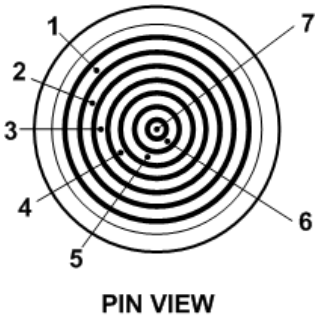
SEACON MIND-4-CCP: Synchronization



CABLE PIN VIEW

Pin	Function	Wire
1	DGND	WHT
2	PRI_SYNC	GRN
3	DRAIN	SHIELD
4	1PPS_SYNC	ORG

SEANET: Power & Telemetry



Pin	Function	T468B
1	Pri_Power (+12 to +36 VDC)	-
2	Pri_Power_Return (0 VDC)	-
3	N/C	-
4	TD-	GRN
5	TD+	GRN/WHT
6	RD-	ORG
7	RD+	ORG/WHT

7.6 M3 Underwater Cable

7.6.1 Underwater Connectors

Sonar Head MINI-CON Connectors

The following procedure details the maintenance requirements for the MINI-CON BCR/L, FCR/L, CCR/L, DSR/L, and PSR/L receptacle connectors. Even though this procedure appears simple, only qualified technicians must perform the maintenance. The major requirements are cleanliness and o-ring replacement. When left mated there is no maintenance. If connectors are periodically unmated SEA CON® recommends a new o-ring be installed.

- Before unmating ensure connectors are free of foreign contaminates. Visually check for and note any damage or abnormalities.
- After unmating visually check for and note any damage, cut o-ring, or abnormalities.
- Remove the radial o-ring. Use caution to avoid damaging o-ring sealing surfaces. Use only the highest quality o-ring extraction tool (available from o-ring distributors).
- Clean any grease, moisture, or foreign particles from o-ring sealing area, o-ring groove, and inside connector. Do not use fluid cleaners as they may wick down onto the o-ring around the connector insert and inhibit its proper function.

- In the event the internal contact surfaces are dirty or have been exposed to water the receptacle must be flushed with distilled or deionized water and thoroughly dried.
- The surface must be dried using a low-pressure (15-25psi) gas stream of dry nitrogen or filtered compressed air (dry nitrogen is preferred). This drying procedure ensures the removal of any small foreign particles
- Electrically test the connector in accordance with the parameters of the system.
- Inspect the replacement o-ring for any damage or abnormalities. Lubricate the o-ring with an appropriate silicone grease or spray and install it using only a high quality o-ring installation tool (available from o-ring sealing distributors). Apply a thin film of an appropriate silicone grease or spray to the o-ring sealing surface. Cover or protect receptacle from foreign contaminates until ready to mate.

→ *Refer to Figure 15. Flanged Connector Receptacle (FCR) used on the M3 Sonar Head.*

Cables with MINI-CON Connectors

The following procedure details the maintenance requirements for the MINI-CON CCP/L, DSP/L, and PSP/L plug connectors. Even though this procedure appears simple, only qualified technicians must perform the maintenance. If connectors are periodically unmated SEA CON® recommends a new o-ring be installed.

- Before unmating ensure connectors are free of foreign contaminates.
- After unmating visually check for and note any damage, cut o-ring, or abnormalities.
- Remove the facial o-ring. Use caution to avoid damaging o-ring sealing surfaces. Use only the highest quality o-ring extraction tool (available from o-ring distributors).
- Clean any grease, moisture, or foreign particles from o-ring sealing area, o-ring groove, and inside connector. Do not use fluid cleaners as they may wick down onto the o-ring around the connector insert and inhabit its proper function.
- In the event the internal contact surfaces are dirty or have been exposed to water the receptacle must be flushed with distilled or deionized water and thoroughly dried.

- The surface must be dried using a low-pressure (15-25psi) gas steam of dry nitrogen or filtered compressed air (dry nitrogen is preferred). This drying procedure ensures the removal of any small foreign particles.
- Electrically test the connector in accordance with the parameters of the system.
- Inspect the replacement o-ring for any damage or abnormalities. Lubricate the o-ring with an appropriate silicone grease or spray and install it using two orange sticks[1]. Apply a very thin film of an appropriate silicon grease or spray to the o-ring sealing surface. Cover or protect cable plug from foreign contaminates until ready to mate.

→ *Refer to Figure 14. Exploded View of a Cable Connector Plug (CCP) Assembly and Figure 16. Cable Connector Plug (CCP) used on the M3 Interconnect Cable.*

Inspect the cable connector plug for deterioration of the stainless steel retaining ring, see drawing below. The hardened stainless retaining ring on the cable-side connector will decay over time. Loss of this part is not catastrophic as it only serves to support the connector locknut during unmating. Without the presence of this ring, the maintenance technician will need to pull on the cable plug when they're unthreading the connector locknut. The retaining ring must be inspected whenever the cables are unmated and replaced if visible deterioration of the material is present.

Note

Titanium Cable Connector Plugs are supplied with a stainless steel retaining ring.

[1] Orange sticks are a non-conductive, soft, and pliable orangewood soldering production aid, approximately 3/16" in diameter and 7" long, available from soldering supply distributors.

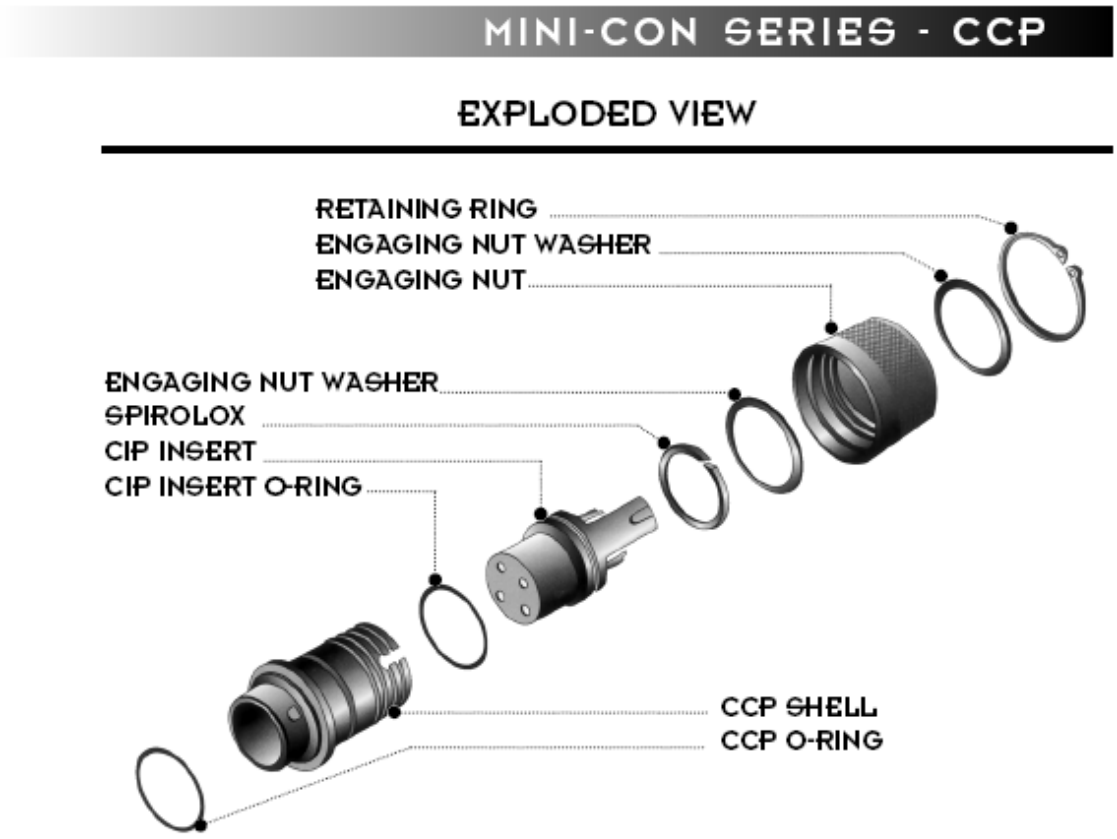
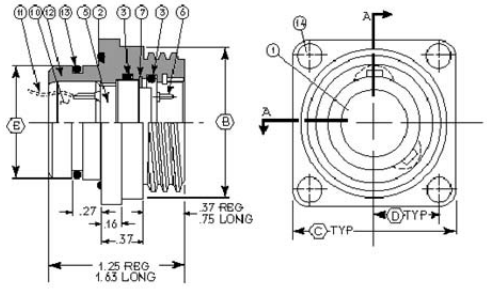


Figure 21. Exploded View of a Cable Connector Plug (CCP) Assembly

FLANGED CONNECTOR RECEPTACLE (FCR)

FCR (MATES TO CCP)



NOTE:
Reference pages 30-26 – 30-29 for pattern availability.

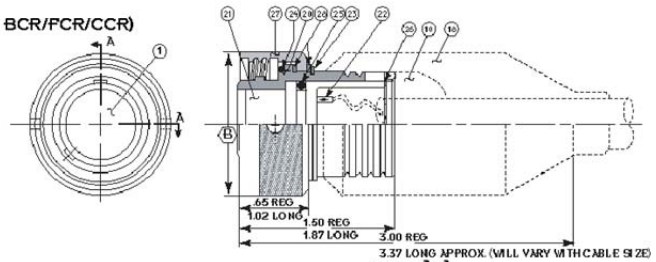
WHEN ORDERING A MIN-FCR YOU RECEIVE: ②③⑤⑥⑦⑫⑬

PART NAME	Ⓑ INCHES	Ⓒ INCHES	Ⓓ INCHES	Ⓔ INCHES	MOUNTING HOLE DIAMETER*	⑬ O-RING	⑦ SPIROLOX	② O-RING	⑭ SOCKET HEAD CAPSCREW	③ O-RING
MING-FCR	1.00	1.12	0.453	0.685	0.689/0.687	2-015	UR50	2-018	4-40 UNC-2A	2-014
MINK-FCR	1.12	1.25	0.510	0.748	0.752/0.750	2-016	UR62	2-019	6-32 UNC-2A	2-016
MINL-FCR	1.25	1.37	0.562	0.873	0.877/0.875	2-018	UR75	2-021	6-32 UNC-2A	2-018
MINM-FCR	1.37	1.50	0.593	0.998	1.002/1.000	2-020	UR81	2-023	8-32 UNC-2A	2-019
MINO-FCR	1.62	1.75	0.723	1.123	1.127/1.125	2-022	UR106	2-026	8-32 UNC-2A	2-023
MINP-FCR	1.75	1.87	0.777	1.248	1.252/1.250	2-024	UR118	2-028	8-32 UNC-2A	2-025
MINQ-FCR	1.87	2.00	0.831	1.373	1.377/1.375	2-026	UR137	2-029	10-24 UNC-2A	2-028
MINR-FCR	2.00	2.12	0.884	1.498	1.502/1.500	2-028	UR150	2-029	10-24 UNC-2A	2-029
MINT-FCR	2.50	2.62	1.043	1.998	2.002/2.000	2-032	UR175	2-034	1/4-20 UNC-2A	2-031
MINU-FCR	2.75	2.87	1.130	2.248	2.252/2.250	2-034	UR200	2-036	1/4-20 UNC-2A	2-033
MINX-FCR	3.50	3.62	1.470	2.748	2.752/2.750	2-038	UR250	2-041	3/8-16 UNC-2A	2-037

Figure 22. Flanged Connector Receptacle (FCR) used on the M3 Sonar Head

CABLE CONNECTOR PLUG (CCP)

CCP (MATES TO BCR/FCR/CCR)



NOTE:
Reference pages 30-26 – 30-29 for pattern availability

WHEN ORDERING MIN-CCP YOU RECEIVE: ⑳㉑㉒㉓㉔㉕㉖㉗㉘

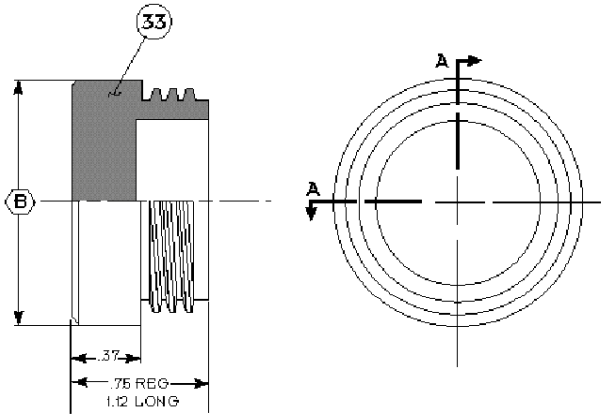
PART NAME	Ⓑ INCHES	㉔ O-RING	㉓ RETAINING RING	㉕ O-RING	㉖ SPIROLOX	R/A HEIGHT INCHES
MING-CCP	1.00	2-015	5100-68	2-013	UR56	2.63/3.00
MINK-CCP	1.12	2-017	5100-78	2-015	UR68	2.63/3.00
MINL-CCP	1.25	2-019	5100-87	2-016	UR75	2.63/3.00
MINM-CCP	1.37	2-020	5100-100	2-018	UR87	2.81/3.18
MINO-CCP	1.62	2-024	5100-118	2-020	UR100	2.81/3.18
MINP-CCP	1.75	2-027	5100-131	2-022	UR112	3.00/3.37
MINQ-CCP	1.87	2-028	5100-150	2-025	UR131	3.00/3.37
MINR-CCP	2.00	2-029	5100-156	2-026	UR137	3.19/3.56
MINT-CCP	2.50	2-032	5100-187	2-029	UR162	varies w/cable
MINU-CCP	2.75	2-033	5100-206	2-023	UR187	varies w/cable
MINX-CCP	3.50	2-038	5100-268	2-033	UR212	varies w/cable

Figure 23. Cable Connector Plug (CCP) used on the M3 Interconnect Cable

PLASTIC SPLASHPROOF RECEPTACLE (PSR)

PSR (MATES TO CCP)
PSRL (MATES TO CCPL)

PART NAME	(B) INCHES
MING-PSR (PSRL)	1.00
MINK-PSR (PSRL)	1.12
MINL-PSR (PSRL)	1.25
MINM-PSR (PSRL)	1.37
MINO-PSR (PSRL)	1.62
MINP-PSR (PSRL)	1.75
MINQ-PSR (PSRL)	1.87
MINR-PSR (PSRL)	2.00
MINT-PSR (PSRL)	2.50
MINU-PSR (PSRL)	2.75
MINX-PSR (PSRL)	3.50

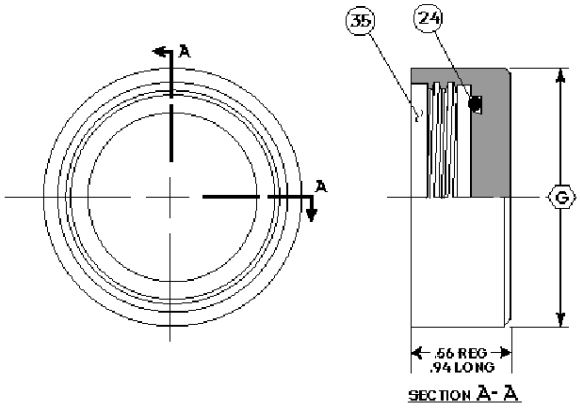


WHEN ORDERING MIN-PSR YOU RECEIVE: (33)
WHEN ORDERING MIN-PSRL YOU RECEIVE: (34)

PLASTIC SPLASHPROOF PLUG (PSP)

PSP (MATES TO BCR/FCR/CCR)
PSPL (MATES TO BCR/FCRL/CCRL)

PART NAME	(G) INCHES	(24) O-RING
MING-PSP (PSPL)	1.06	2-015
MINK-PSP (PSPL)	1.20	2-017
MINL-PSP (PSPL)	1.31	2-019
MINM-PSP (PSPL)	1.44	2-020
MINO-PSP (PSPL)	1.68	2-024
MINP-PSP (PSPL)	1.81	2-027
MINQ-PSP (PSPL)	1.94	2-028
MINR-PSP (PSPL)	2.12	2-029
MINT-PSP (PSPL)	2.62	2-032
MINU-PSP (PSPL)	2.87	2-033
MINX-PSP (PSPL)	3.62	2-038



WHEN ORDERING MIN-PSP OR MIN-PSPL YOU RECEIVE: (24)(35)

30-9 (REV 0304)

SEACON®

Figure 24. Plastic Splashproof Receptacle and Plug (PSR &PSP)

Caution ***Plastic Splashproof Receptacles (PSR) and Plastic Splashproof Plugs (PSP) must be used to protect the connections from water ingress, damage to the pins or sockets, and contamination of dirt or dust. PSPs and PSRs must be used to cover the Sonar Head and Cable connectors whenever they are left unmated.***

Note *Store PSRs and PSPs for the system in a safe place for use during regularly scheduled maintenance or troubleshooting.*

→ *Refer to the spare parts list in Section 12 (page 108) for PSP and PSR part numbers for the sonar head and cable.*

7.6.2 O-ring replacement

→ *Refer to Sonar Head Replacement Procedures, Section 6.5.1, page 24.*

8 INSTALLATION CHECKS

Warning **These checks must be completed before any power is switched onto the system.**

8.1.1 Visual Inspection of Items

Scope

After the physical installation has been carried out, all the system units must be visually checked to ensure that the M3 units have been installed correctly. You must satisfy yourself that the units have been mounted in the correct locations, correctly orientated (eg. the right way up) and are correctly secured.

Inspections

M3 Sonar Computer

Perform a close visual inspection of the M3 Computer according to the following procedure:

1. Check that the unit is installed properly, secured, and that it is suitably oriented to enable easy operation.
2. Check that the units are not damaged.
3. Check that the air vents are not blocked.

Power Supply

Perform a close visual inspection of the M3 Power Supply.

1. Check that the unit is installed in the correct location, and it is suitably oriented to enable easy connection to the deployment cable and for maintenance.
2. Check that the unit is not damaged.

8.1.2 Electrical Checks

Scope

This section of the manual contains the test procedures for the M3 system's power and signal cables.

Cabling

Visual Cable Inspection

Refer to the cable plans and interconnection diagrams, and check all power and interconnection cables. Any locally fitted plugs and connectors should also be checked to ensure that the correct types have been used for the specific locations. (Sealed or spark-proof connectors in areas where flammable gasses may accumulate, etc..)

Ensure that all cable connections have been made according to the cable plan, and that all connections are tight and secure. Ensure that all cables are correctly laid in conduits, or are otherwise protected according to the regulations and recommendations laid down by the vessel's registering authority. Ensure all protective covers are fastened correctly.

Cable Connections and Continuity

After the cable connections have been completed and the visual inspection has been carried out, all the cable cores must be checked for correct connection and continuity. Refer to the cable plans and interconnection diagrams, and check all interconnection cables. Any locally fitted plugs and connectors must be checked for shorts or open circuits. Ensure all cable connections have been made according to the cable plan, and that all connections are tight and secure.

The check procedure will require two engineers equipped with two-way communication devices; one will require continuity test equipment, while the other will require a suitable shorting strap.

Follow the check procedure below for each cable core:

1. Position yourselves one at each end of the cable to be checked. Good communications must be established between you and your assistant.
2. Ensure that the cable to be tested is not connected to any power source.
   - If a cable terminates in a plug at the unit, the test will be more easily conducted if the plug is disconnected.
3. Select one pair of cable cores, and check that the cores are connected to the correct terminals in the unit.
4. Connect your continuity tester to the two terminals in question and check the continuity.

- If a low resistance exists between the two cores, this may indicate the cores are connected to circuits or units with low internal resistance. If this is the case, disconnect the cores from the terminal block and test again.
- The resistance should be nearing open circuit.

5. Tell your assistant to short the two cores together. Repeat the previous test.
   - The resistance should be 0 (zero) ohms.
6. Tell your assistant to remove the shorting strap.
   - Check that the resistance reaches open circuit again.
7. Check each core's resistance to ground, and each core's resistance to all the other cores in the cable.
   - All results should be close to open circuit.
8. Assuming the test results are correct, the cores must be reconnected to the terminal block (if they had been removed), and the terminals checked to ensure they are tight.
9. On completion, move on to the next pair of cores and repeat the tests until the entire cable has been checked.

Operational Voltages

Check that the operational voltages on the equipment match the power available on the vessel.

8.1.3 Final Checks

After installation, but before leaving port for the sea trials, the following checks must be done:

10. Check that the specified sacrificial anodes have been mounted.
11. Check that all system units have been fastened properly and that all nuts and bolts have been tightened properly.
12. Check that the data from the motion sensor, the heading sensor and the positioning system are correctly read by the M3 software and that the values are reasonable.
13. Check that the sonar is producing a reasonable sonar image.

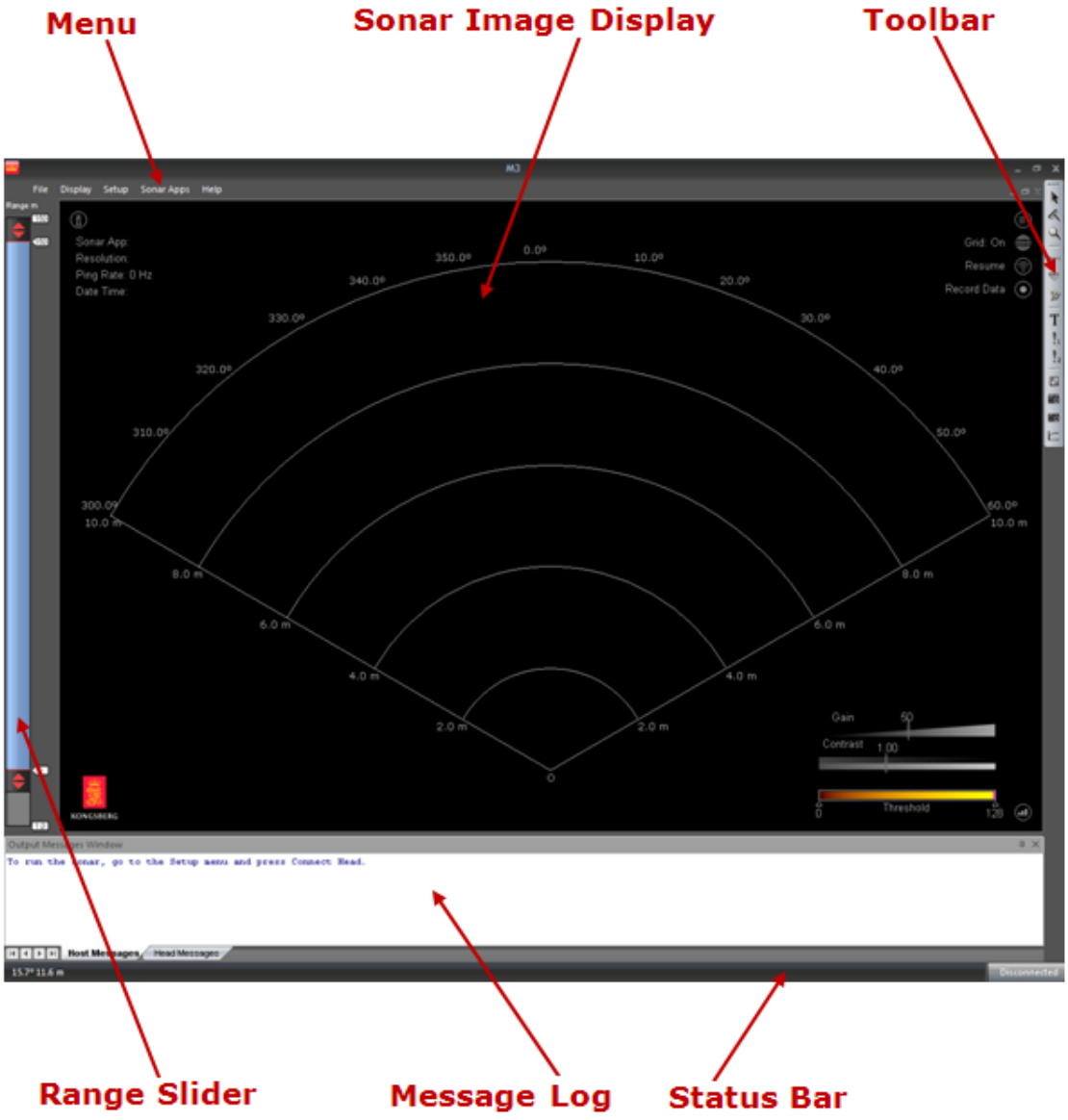
9 OPERATION

The M3 software user interface provides basic but powerful control over the sonar. The operator controls have been simplified to permit adjustment of:

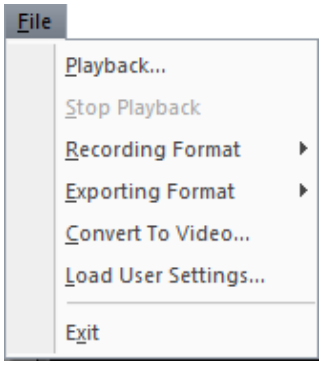
- Sonar App mode
- Sonar display range
- Display gain adjustment
- Display contrast adjustment

9.1 User Interface

The M3 software user interface contains the following modules.



9.1.1 Menu



File Menu

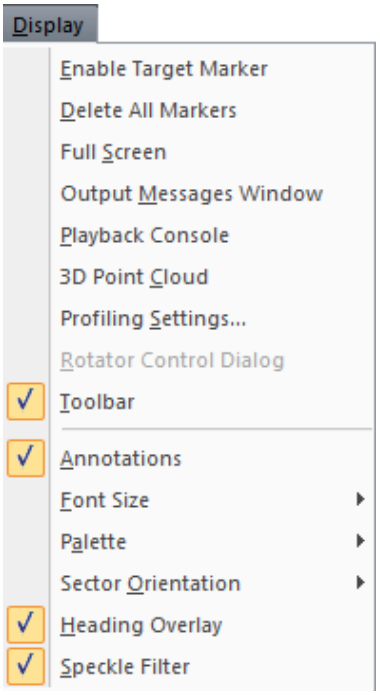
The M3 software user interface provides basic but powerful control over the sonar. The operator controls have been simplified to permit adjustment of:

- **Playback:** Opens an MMB or IMB recorded file
- **Stop Playback**: Stops playback of the current file
- **Recording format:** MMB (Raw data) or IMB (Beamformed data)
- **Exporting format:**
  - PMB: M3 propriatery profiling data format
  - XYZ: ASCII point cloud format for M3 rotator 3D profiling data
  - ALL: M3 profiling data format in Kongsberg EM datagram standard
- Convert **To Video:** Converts an MMB or IMB file to a video file (AVI or MP4 format).

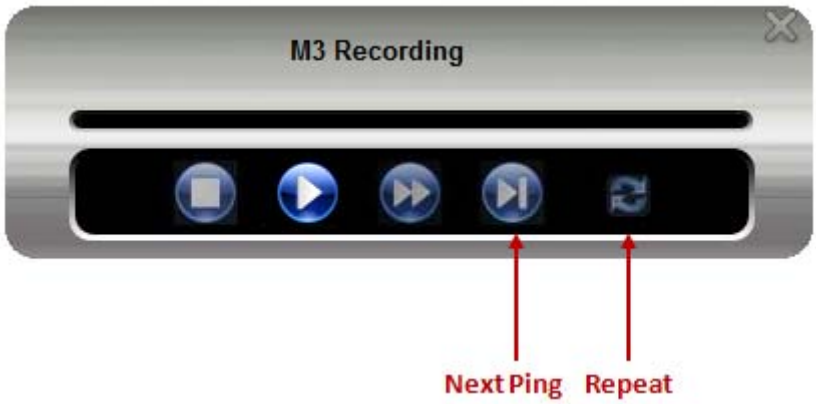
→ *See section 9.2 Converting files to video format on page 67 for details.*

- **Load** User **Settings:** After installing the new version of the software, the user can import the user settings from the previous version by loading “UsersInfo.xml” file from the previous version’s folder KML\M3_Vxxxx\bin\Settings

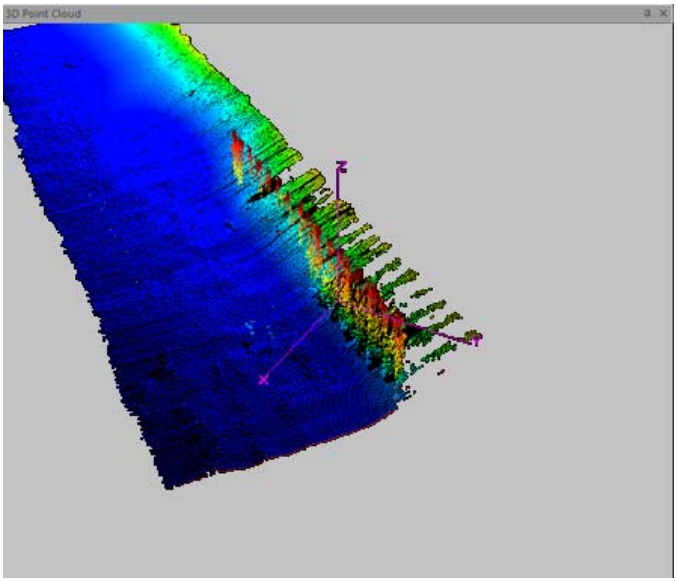
Display Menu



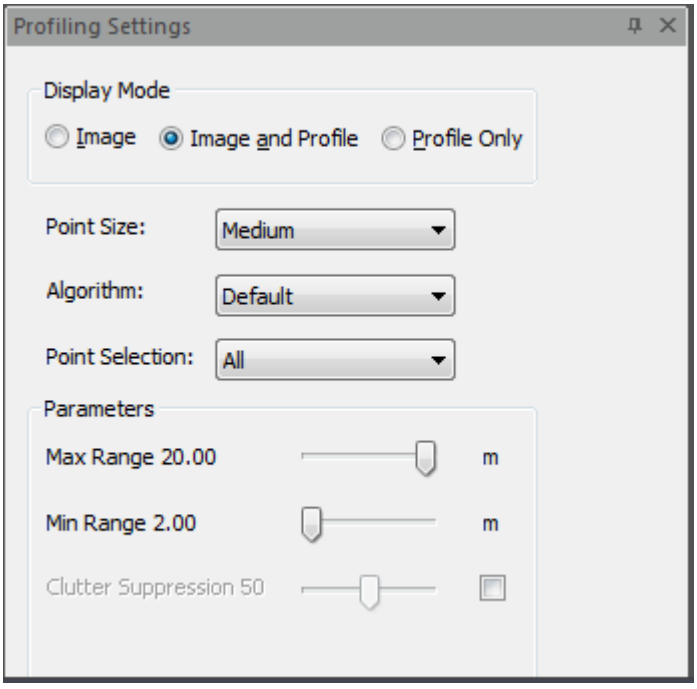
- **Enable Target Marker:** Enable/Disable Target Marker function. See section 9.15 Using Target Marker on page 101 for details.
- **Delete All Markers:** used to delete all the target markers on the screen.
- **Full Screen:** To enable full screen display. Press ESC to exit full screen mode.
- **Output Messages Window:** Enable or disable message window.
- **Playback Console:** To play, pause, fast-forward, and stop the playback. Use "next ping" button to play one ping at a time, press repeat button to restart from the beginning of the file when the playback reaches the end of the file.



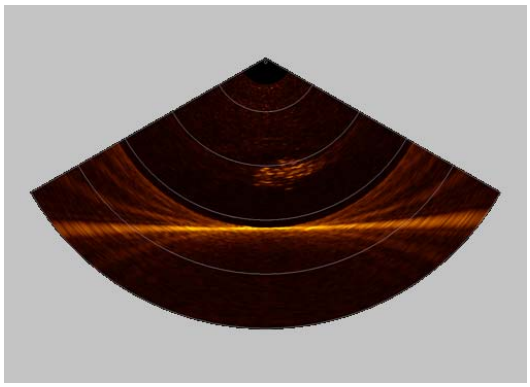
- **3D Point Cloud: d**isplay the 3D point cloud window. The 3D point cloud window is used to observer the real-time 3D point cloud data for quality assurance purpose. The following controls can be used in the 3D Point Cloud window:
  - **Zoom in / out:** mouse scroll button
  - **Rotate:** press and hold mouse left button and move the mouse
  - **Clear the point cloud:** double ckick the mouse right button



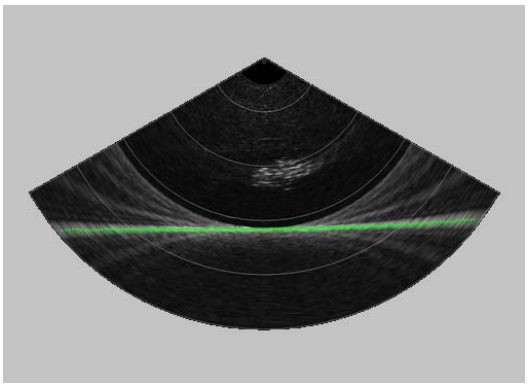
- **Profiling Settings:** display the profiling settings window.



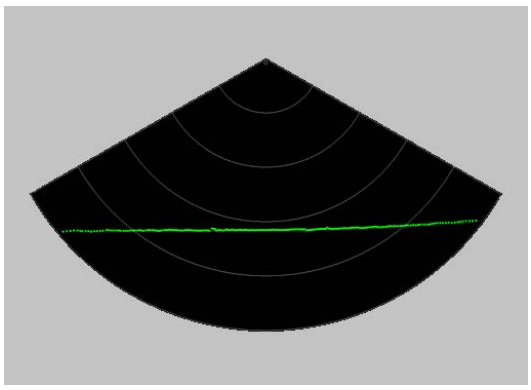
– **Display Mode "Image"**, choose to display image only



– **Display Mode "Image and Profile"**, choose to display image plus the profile points



– **Display Mode "Profile Only"**, choose to display profile points only

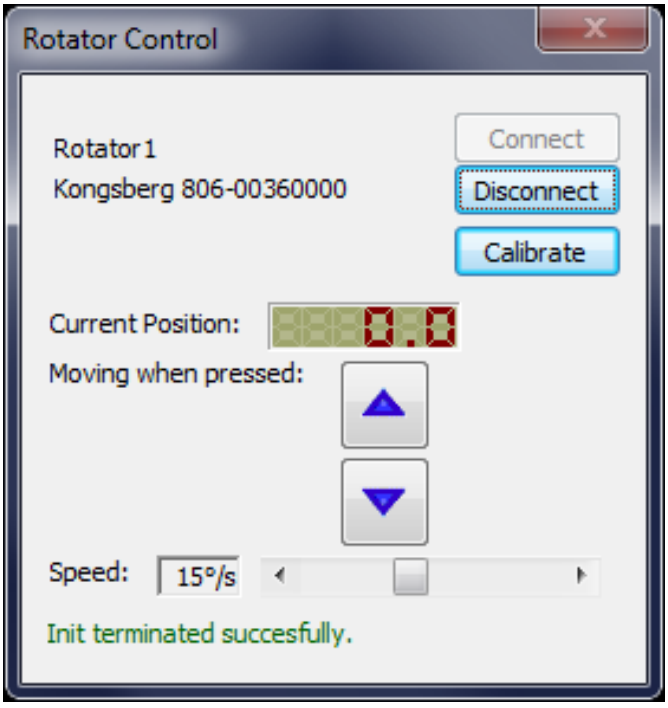


– **Point Size:** Select Small, Medium or Large profile point size on the display.

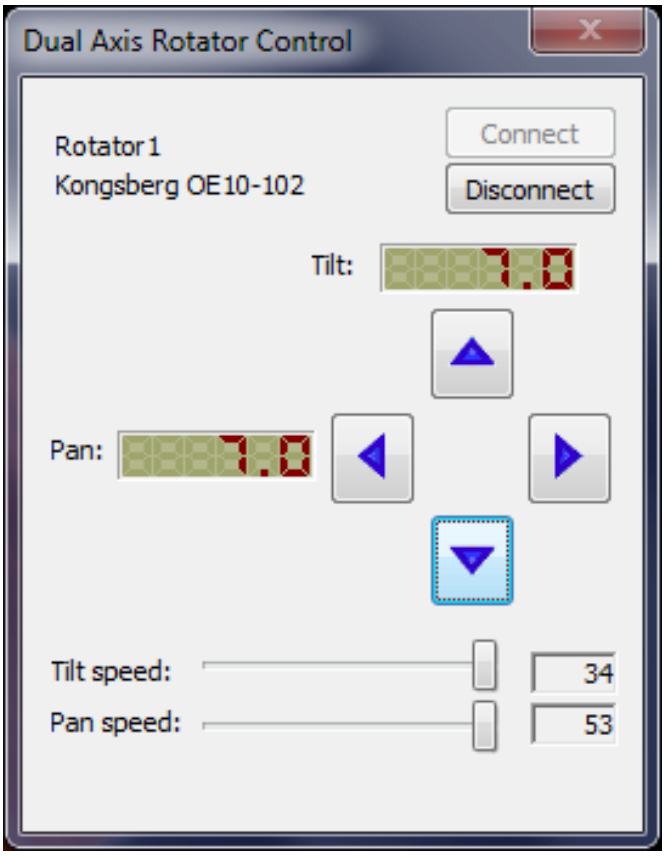
– **Profiling Algorithm - Default:** Optimal profiling algorithm selected by default.

- **Profiling Algorithm - Split Beam:** Split Beam algorithm will improve the point detection to sub degree accuracy at low grazing angle with the compromise of lower ping rate.
- **Point Selection - Nearest:** display the profile point closest to the sonar transducer origin.
- **Point Selection - Strongest:** display the qualified profile point with the strongest signal return.
- **Point Selection – All:** display all profile points.
- **Parameters - Max Range:** the upper range limit of the profile point. There's no profile detected above this range.
- **Parameters - Min Range:** the lower range limit of the profile point. There's no profile detected below this range.
- **Parameters - Clutter Suppression:** this is a option to remove the number of detected noise profile points. By default, the system will automatically adjust the clutter suppression. User can override this setting by enable the check box, and choose the clutter suppression percentage from 0 to 100, 0 means no clutter suppression, 100 means suppress all the detections.

- **Rotator Control Dialog:** Used to enable or disable the rotator control dialog when sonar head and rotator are connected.
  - Rotator Control for Single-Axis rotator.

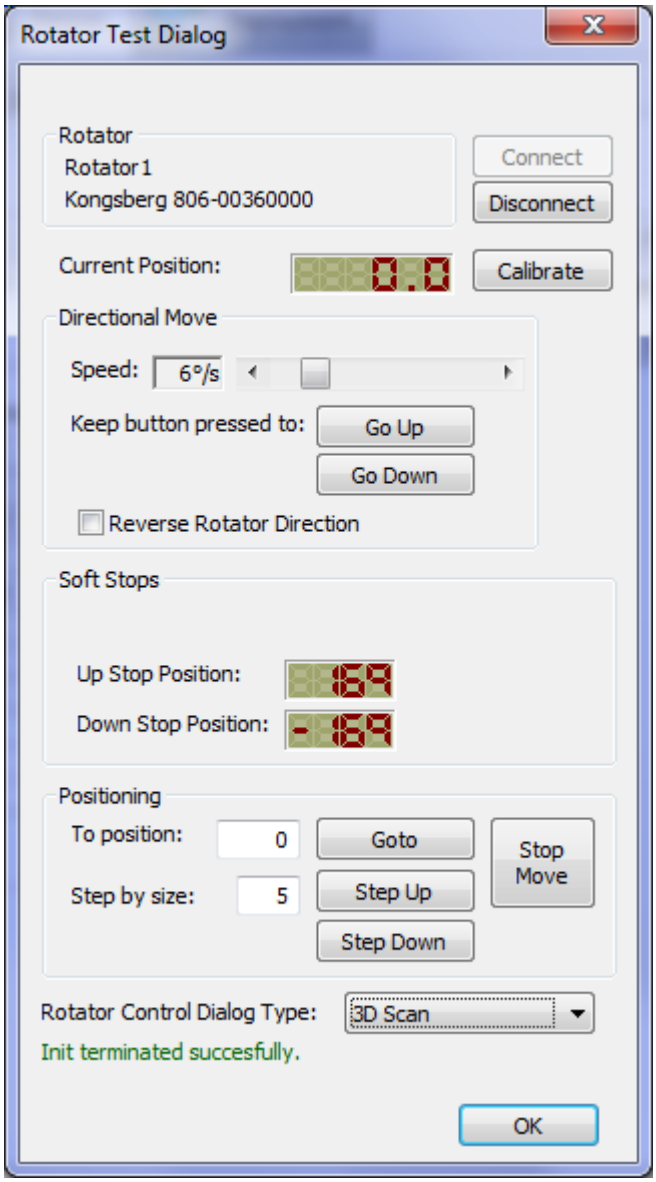


– Rotator Control for Dual-Axis rotator.

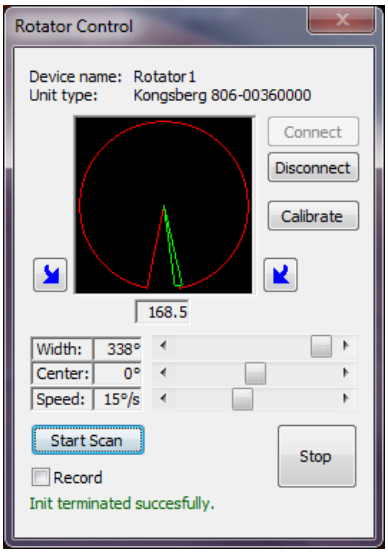


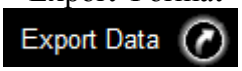
- Perform a 3D scan using precision rotator (806-00360000)
  – Add Kongsberg 806-00360000 rotator to the system and choose “3D scan” dialog type in the “Rotator Test Dialog”.

→ *See section Rotators Setup on page 79 for details*



– Connect the sonar head from Menu “Setup” -> “Connect”.
– The 3D Scan Rotator Control Dialog should be displayed.



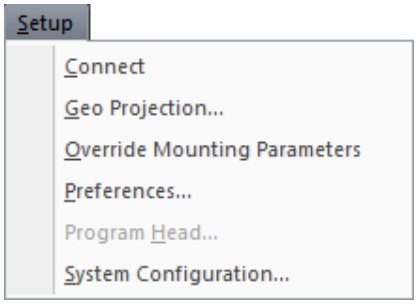
  - Select “Width” for the rotator 3D scan coverage.
  - Select “Center” for the center of the rotator 3D scan coverage.
  - Set the rotator speed. The slower speed, the higher angular resolution.
  - Check “Record” and click “Start Scan”.
  - The software should move the rotator to one side of the sector, start the scan and recording, stop the scan and recording when finish.
  - To export the 3D scan into a XYZ ASCII file, select menu “File” -> ”Export Format” -> “Profile Point Cloud (XYZ), and click 

button on the Menu Widget.

- **Toolbar:** Enable or disable Toolbar.
- **Annotations:** Enable or disable bearing and range annotations on the sonar image display.
- Font Size: Select font size Normal or Large.
- **Palette:** Select the display Palette from one of the following palettes:
  - Copper
  - SIMRAD 1
  - SIMRAD 2
  - SUNRAD 3
  - Gray

- **Sector Orientation:** Change the sonar image display orientation heading to 0, 90, 180 and 270 degree.
- **Heading Overlay:** To use heading for the sonar bearing overlay.
- **Speckle Filter:** Enable or disable the speckle filter. Speckle Noise is the grainy "salt-and-pepper" pattern present in the Sonar image. It is particularly visible in high resolution images, and is a normal part of the image. The purpose of Speckle Filtering is to reduce the Speckle noise in areas that are fairly uniform (such as a sandy sea floor). At the same time, the Speckle Filter is designed to retain edges and features, preserving subtle but distinguishable details, such as thin linear features and point targets.

Setup Menu



- **Connect:** to Connect the sonar head
- **Geo Projection:** to configure coordinate system.

→ *See section 9.4 Configure coordinate system on page 68 for details*

- **Preferences:** to setup the system preferences such as unit of measure, sound velocity, time format etc.

→ *See section 9.5 Configure system preferences on page 69 for details.*

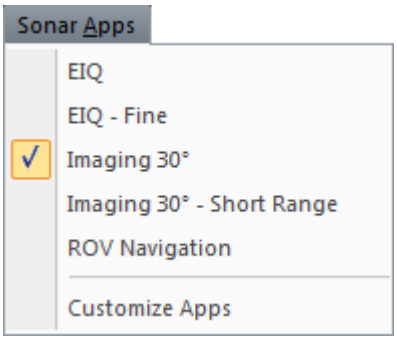
- **Program Head:** to program the M3 sonar head, such as changing the sonar head IP address and upgrade firmware etc., when a M3 sonar head is connected.

→ *See section 9.6 Program Head on page 72 for details.*

- **System Configuration:** to open the System Configuration pages.

→ *See section9.7 System Configuration on page 76 for details.*

Sonar App Menu



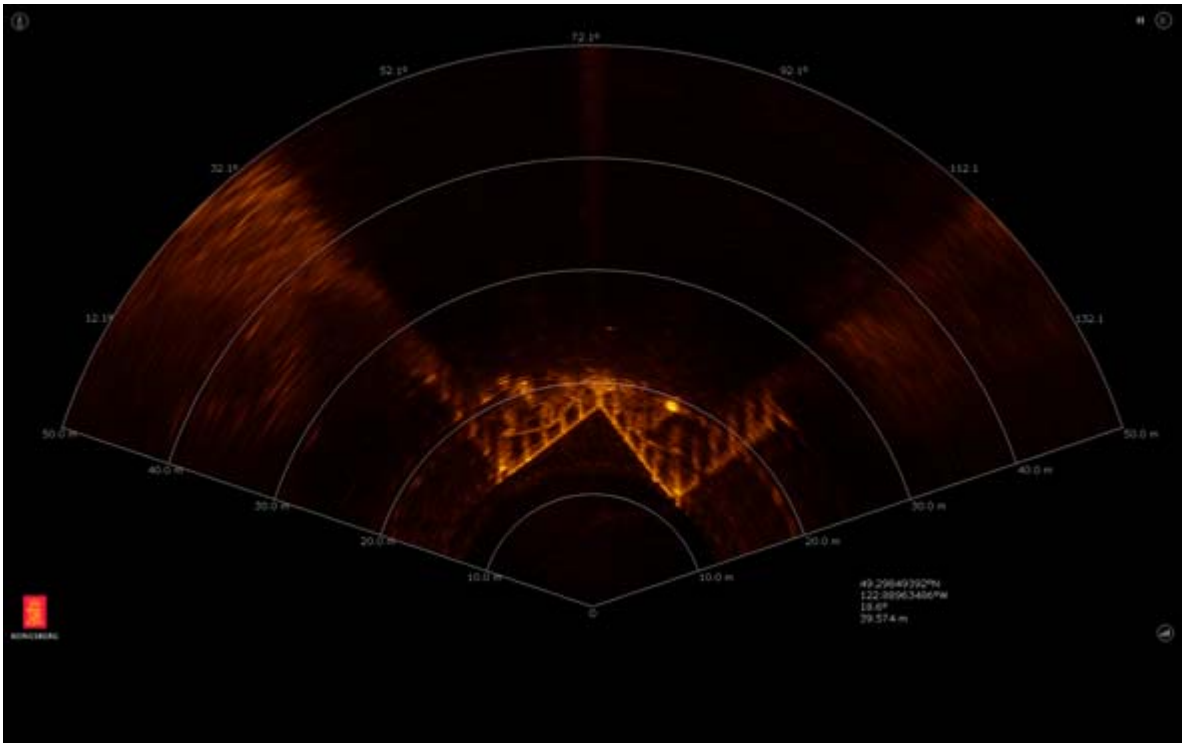
To select pre-defined application modes.

→ *See section 9.8 Select the Sonar App Mode on page 86 for details.*

9.1.2 Sonar Image Display Window

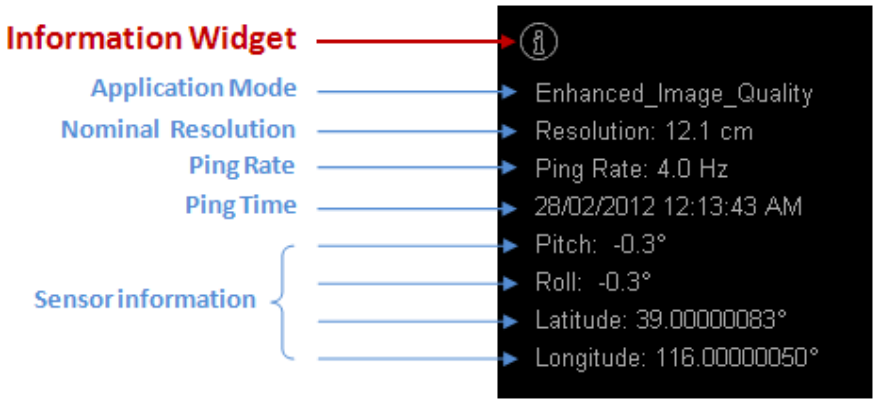
The sonar image display window contains the following items:

- Sonar image
- Range grid
- Range and bearing annotations



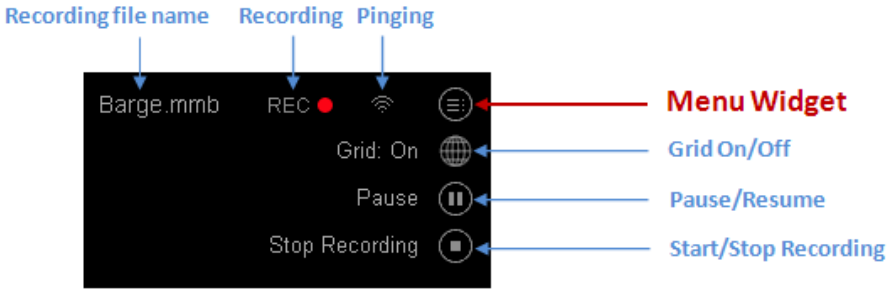
On-screen Information Widget

On the top-left corner of the sonar image screen. Click to expand or collapse. It displays the current Sonar App mode, nominal resolution, ping rate and ping time.



On-screen Menu Widget

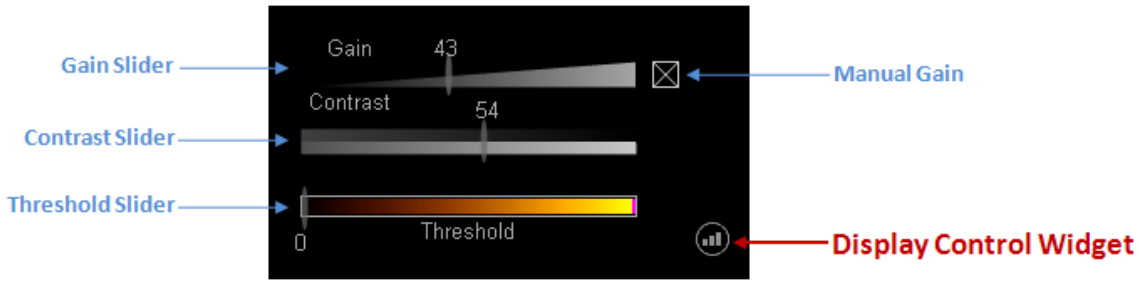
On the top-right corner of the sonar image screen. Click to expand or collapse.



- Click Grid On/Off icon to toggle the sonar image range grid on or off
- Click Pause/Resume icon to pause/resume pinging if sonar head is connected, to pause/resume playback if replaying a recorded file.
- Click Start/Stop Recording icon to start or stop the data recording. The recording can be done when connecting a sonar head or replaying recorded files.
- The "Recording" status indicates the recording is on. Click to stop recording.
- The "Pinging" status indicates the sonar head is ping or paused. Click to toggle Pause and Resume.

On-screen Display Control Widget

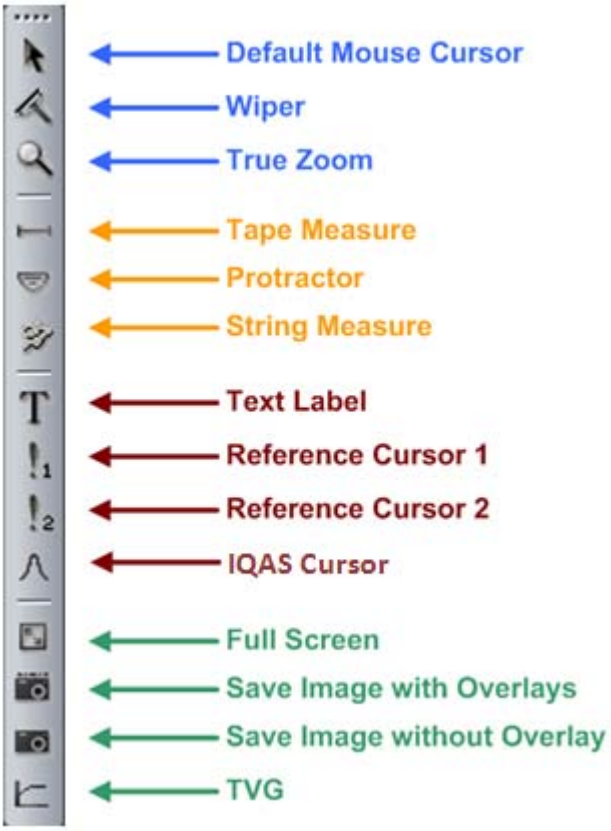
On the bottom-right corner of the sonar image screen. Click to expand or collapse.



- Check “Manual Gain” to use Gain slider to adjust the display gain from 0 to 100
- Uncheck “Manual Gain” to let the system adjust gain automatically.
- Use Contrast slider to adjust the display contrast from 1 to 100
- Use Threshold slider to adjust the display threshold from 0 to 128

9.1.3 Toolbar

The Toolbar provides the quick access of the following functions:



The Measurement Tools

- **Tape Measure:** Used to measure the length of a target by clicking the left mouse button at the beginning of the target, keeping the left mouse button down, dragging the mouse to the end of the target. The length and bearing of the target is displayed dynamically. If a persistent measurement is desired, press and hold the right mouse button at the beginning of the target, move the mouse to the end of the target, release the right mouse button. After the measurement is complete, drag the measurement overlay away to any position on the screen which is easily legible.

- **Protractor:** Used to measure the angle between two lines; a baseline and a line intersecting the baseline and at an angle to it. To use the protractor:

    1. Move the tool to the first point on the image where you want to start the baseline and click once.

2. Move the tool to the second point on the image where you want to end the baseline and click once more.
3. Movement of the tool now draws a line perpendicular to the baseline. Move the tool to adjust its length and the point at which it intersects the baseline. Click once more to lock the baseline end of the line in place.
4. Move the tool again to adjust the length and angle of the arm. Click for a fourth and final time to lock it in place.

- **String** Measure**:** Used for area and perimeter measurement. To use the string measure:

1. Click mouse with string tool icon on the point that you want to measure as start point.
2. Move to the second point, then click mouse.
3. Repeat the previous step to all the points that you want to include.
4. Double click on the last point, and then the result of area and perimeter will be displayed.
5. Click and drag the text box to the desired position and release it.

Notations

- **Text** label**:** Used for comments. Drag to any point on the screen to label that point with a text box overlay. To enter new text or change the existing text, simply double click on the text box. Click and drag the text box to the desired position and release it.


- Reference **Cursor 1 and 2:** Cross-hair type markers that can be placed on the sonar image to mark a point of interest. It gives the range and bearing from the origin. If both cursor 1 and cursor 2 are placed on the sonar image, the delta range and bearing between the cursor 1 and 2 are also displayed.

- **IQAS (**Image **Quality Analysis System) Cursor:** click to enable the IQAS cursor and open the IQAS dialogs.

→ *Refer to Section 9.13 Image Quality Analysis System (IQAS)on page 96 for details.*

Other

- Default Mouse Cursor

- **Wiper:** Used to delete existing measurement overlays explained above. Left click on each item you wish to delete.

- **True Zoom:** Used to open up to 4 true zoom windows when running a sonar head. The images in the true zoom windows are acquired separately using high resolution sampling parameters and adequate transmit pulses. At run-time, if zoom windows are opened, the zoom window data will be recorded for replay. During playback, if the zoom window data is recorded, the zoom window will pop up automatically.

- **Full Screen:** Used to enable or disable full screen mode.
- **Saving sonar still images:** Used to capture a sonar image to a PNG file with the one following options:

  – Save Image with Overlays

  – Save Image without Overlays

- The saved images are located in the folder defined in the Preferences settings.

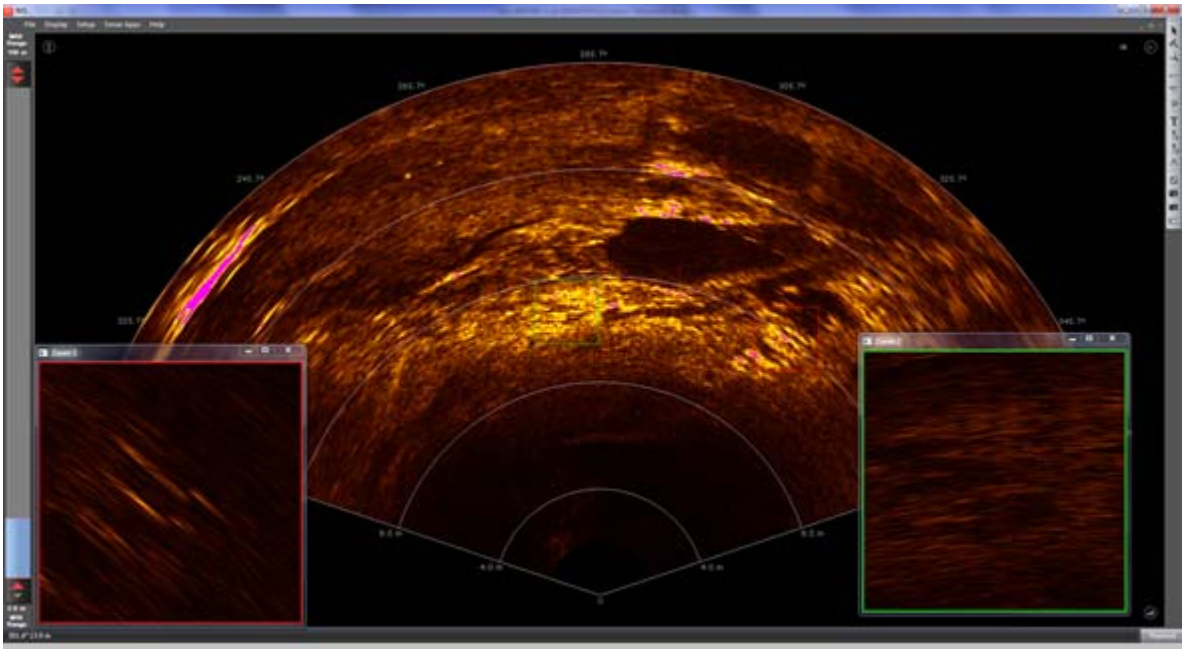
→ *Refer to Section 9.5.5 File saving properties on page 72 for details.*

- **TVG:** It is recommended that the Time Varying Gain (TVG) is left set at its default value.

→ *Refer to Section 9.8.3 on page 90.*

Using Reference Cursor 1 and 2 in Zoom Window to make accurate measurements

1. Open 1 or 2 Zoom windows on the interested targets.
2. Select Cursor 1 or 2 and drop to the zoon overlay on the main screen. The cursor will appear in the Zoom window.
3. Make fine adjustment in the zoom window to make accurate measurement.



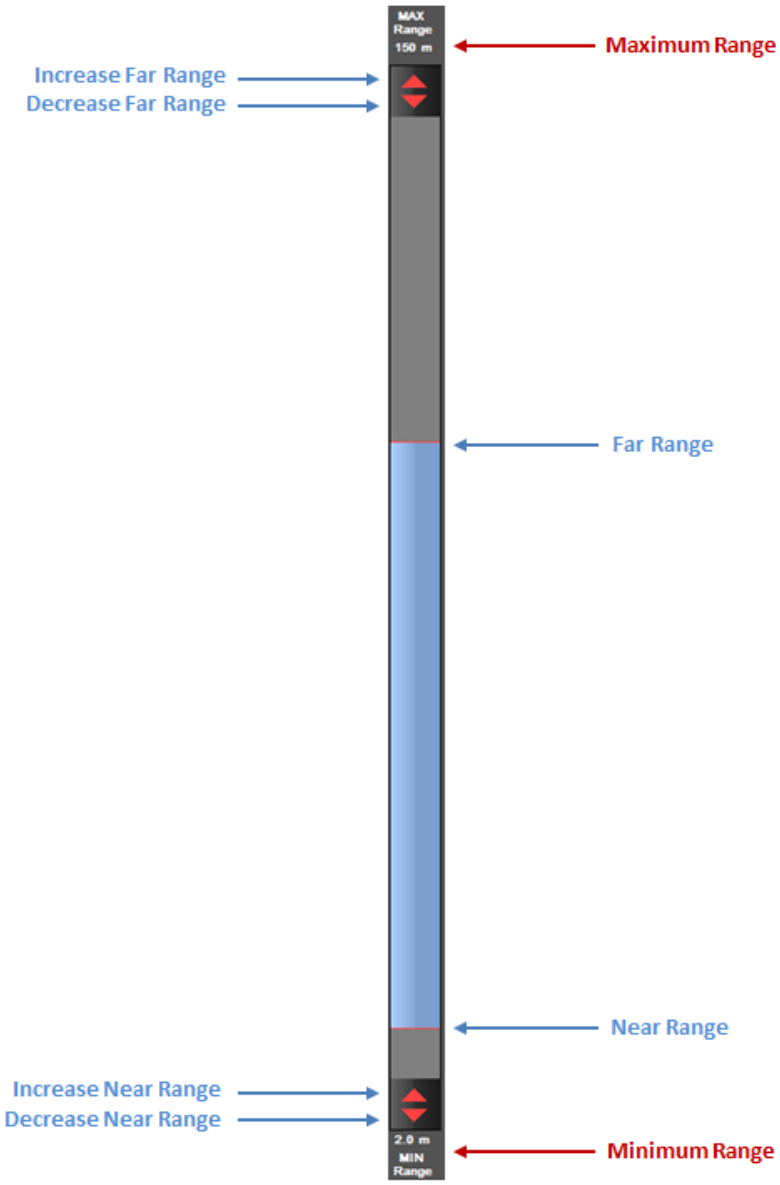
9.1.4 Range Slider

Range slider displays current operation range information for the current selected Sonar App mode.

→ *See section 9.8 Select the Sonar App Mode to learn more about the mode's detail on page 86.*

- **Maximum Range:** the maximum range limit of the current selected Sonar App mode.
- **Minimum Range:** the minimum range limit of the current selected Sonar App mode.
- **Far Range:** the range of the current sonar image far end
- **Near Range:** the range of the current sonar image near end

After clicking an arrow of the slider, the adjustment direction of the range change is set. Clicking anywhere in the slider's grey area will go to the next range in that direction.



9.1.5 Message Log

The Message Log Window displays the system message logs.

- Host Messages: messages logged by the M3 software.
- Head Messages: messages logged by the M3 sonar head and uplinked to the M3 software.

9.1.6 Status Bar

The Status Bar can be show/hide through Menu Display | Status Bar

- On the bottom left, the status bar displays the range and bearing of the current mouse position.

- On the bottom right, the status bar displays the status for the following functions:
  - **GeoTiff:** turns green when Auto-Save GeoTiff is turned ON.

→ *See section 9.14 Saving GeoTiff files on page 98 for details about saving GeoTiff file.*

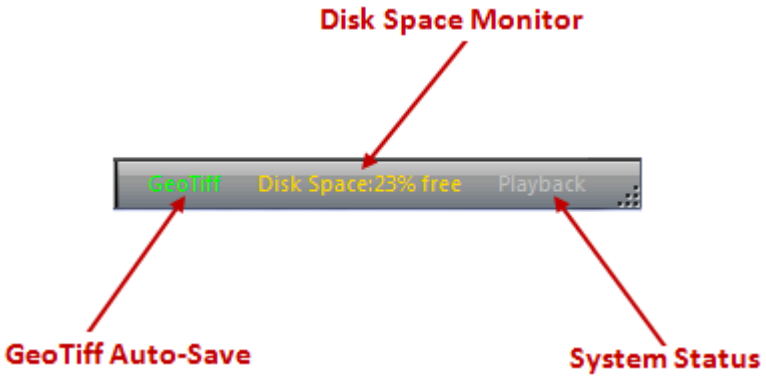
  - **Disk Space:** disk space monitor, used to control the sonar data recording.
  - **System Status:**

    Inactive: system is inactive, not running sonar head, not in playback.

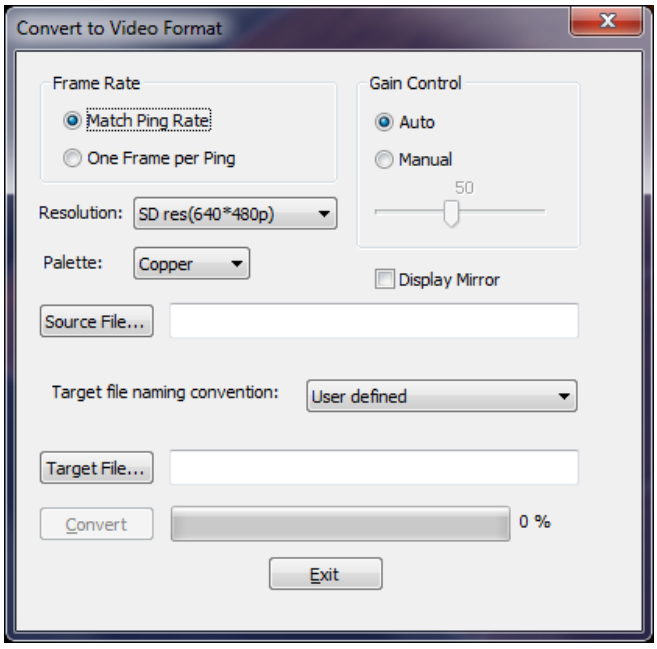
    Connected: system is connected to a sonar head.

    Playback: system is replaying a recorded file.

    Reconnecting: lost communication with the sonar head, the software is trying to reconnect to the sonar head.



9.2 Covert recording files to video format



- Frame Rate:
  - **Match Ping Rate:** The converted video frame time matches the ping time.
  - **One Frame per Ping:** Each video frame is converted from each sonar ping data.
- **Resolution:** There are 3 resolution selections for the converted video, 640 x 480, 1280 x 720, and 1920 x 1080. The higher resolution requires higher conversion time and result larger video files.
- **Gain Control:**
  - **Auto:** Gain is automatically adjusted during the video conversion.
  - **Manual:** Use manually selected gain to convert to video file.
- Select MMB or IMB source sonar data file, and then select AVI or MP4 target video file. Click "Convert" to start conversion.

Note

The annotations of the units of range (meters or feet) displayed in the converted video file will be the same as currently configured in the M3 software. See section 9.5.1 Select the units of measure and sound velocity to change the unit of measure.

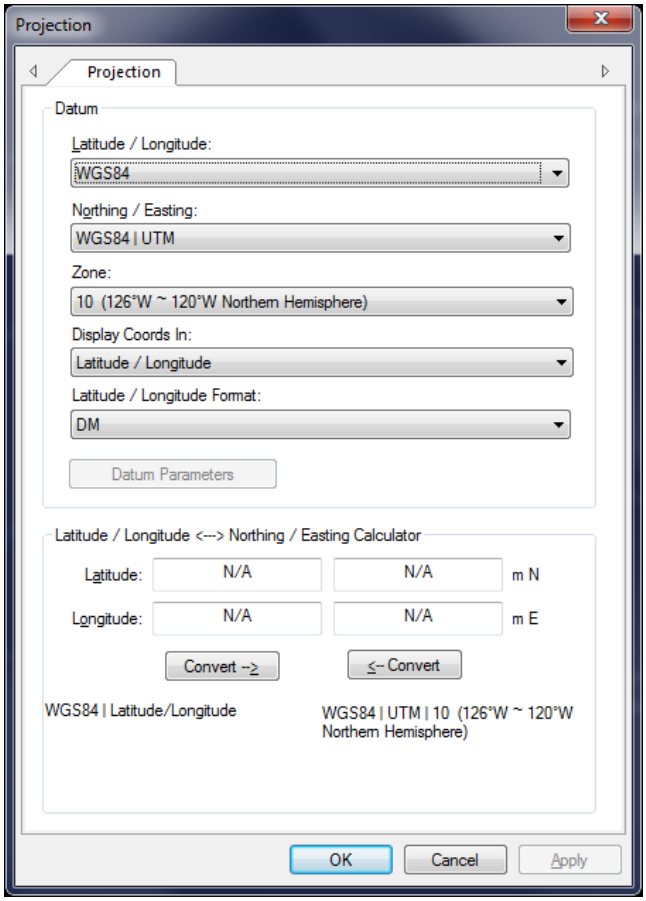
9.3 Connect the Sonar Head

To connect to the sonar head, select “Connect Head” from the “Setup” menu.

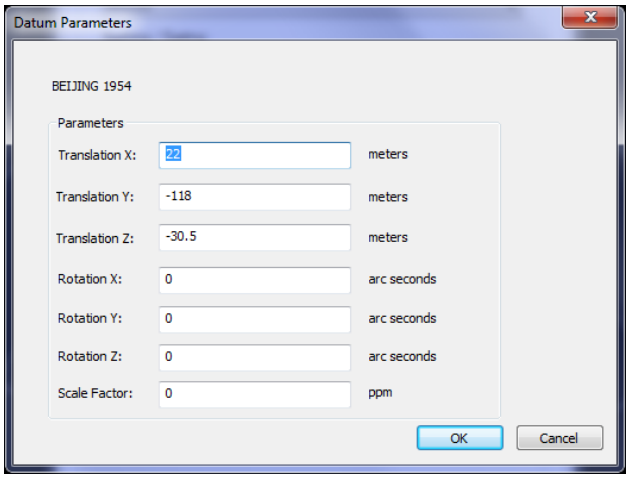
9.4 Configure coordinate system

To configure the coordinate system, select “Geo Projection” from the “Setup” tab.

- Select a datum for Latitude and Longitude.
- Select a datum for a Northing/Easting projection.
- Select a Zone for a Northing/Easting projection.
- Select the sonar display coordinates either in Latitude/Longitude or Northing/Easting.
- Select the Latitude/Longitude format in D (Degree), DM (Degree, Minute) or DMS (Degree, Minute, Second)

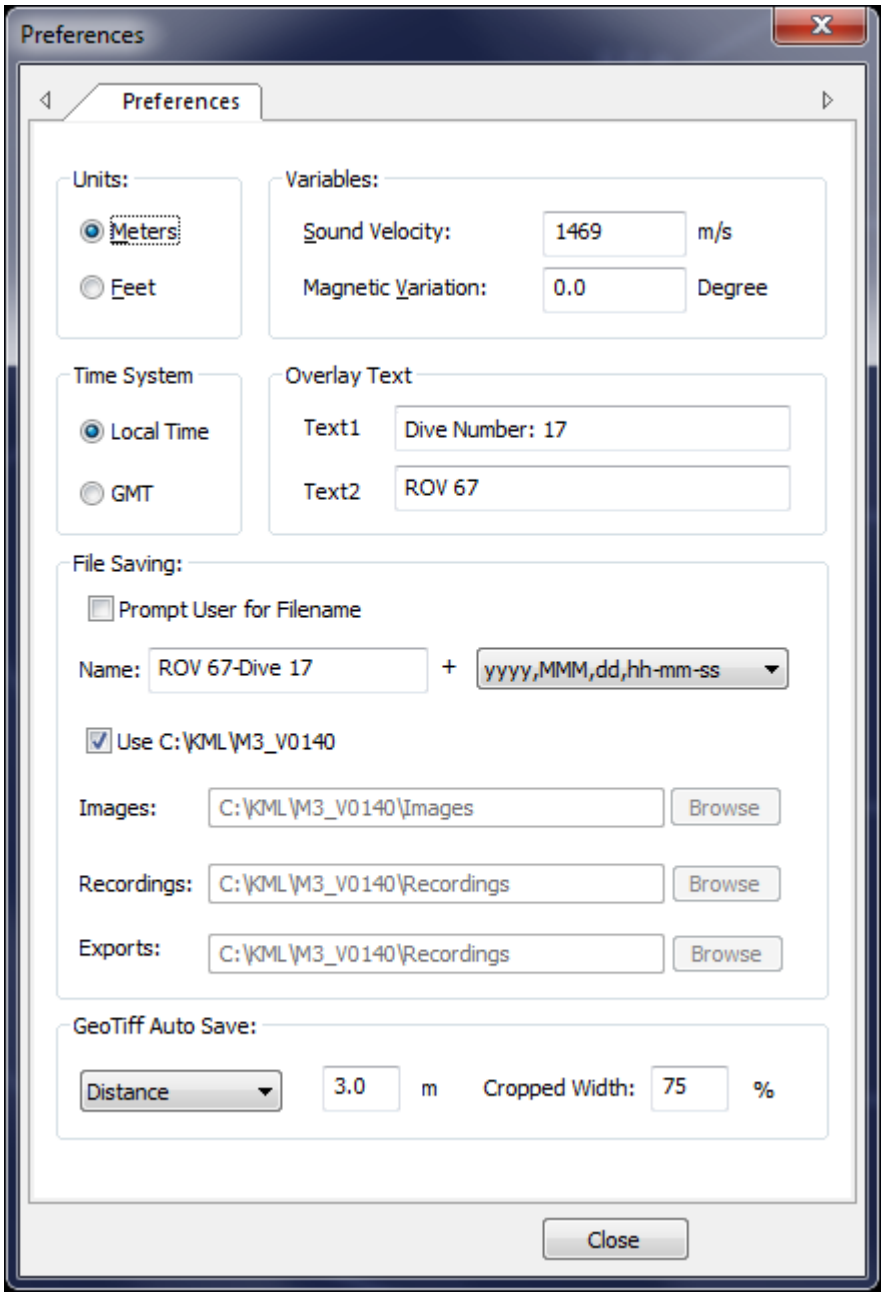


Note *7 Datum Parameters are adjustable when selecting Beijing1954 datum.*



9.5 Configure system preferences

To configure the system preferences, select “Preferences” from the “Setup” menu.



9.5.1 Select the units of measure and sound velocity

The units of measure for distance can be selected in Meter or Feet (us-feet) in the “Environment” page. The default sound velocity set to the system is 1469 m/s.

9.5.2 Set Magnetic Variation

Magnetic Variation: if using magnetic heading sensor, enter local magnetic variation to this box to get true heading.

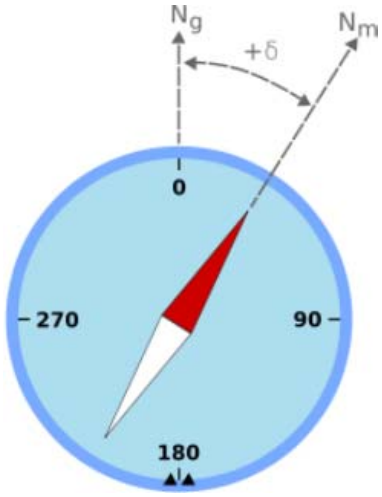
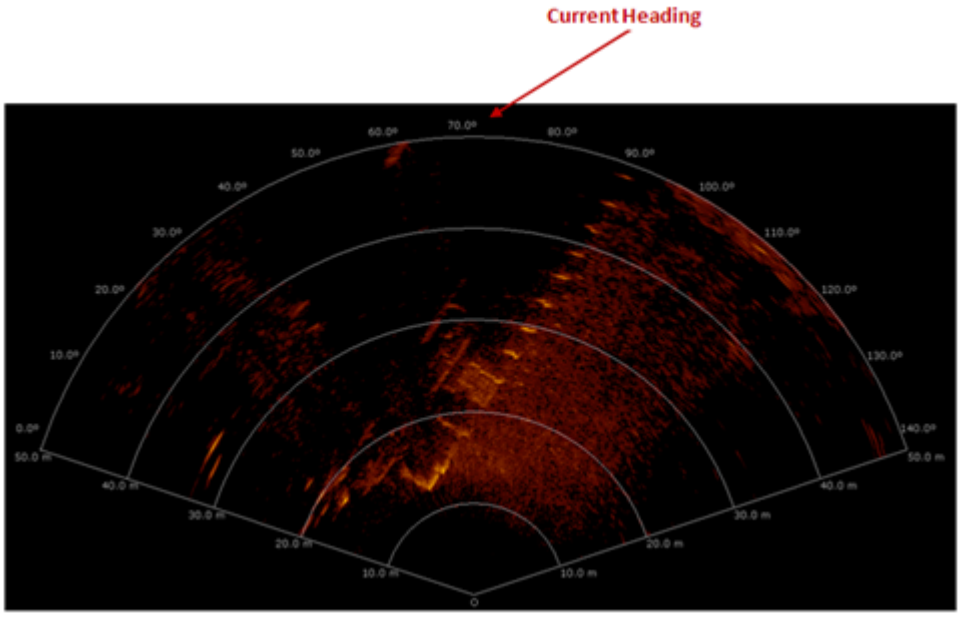


Figure 25. Magnetic Variation

Example of magnetic variation showing a compass needle with a "positive" (or "easterly") variation from geographic north. (www.wikipedia.org)



9.5.3 Set time system

Choose “Local Time” or “GMT” to set the time displayed on the sonar image screen and used to automatically create the recording files and image files.

9.5.4 Overlay Text

There are 2 overlay text fields provided for the user to enter information about the installation, operation, setup or other information that may be useful to the operator or a person who will review recorded data and screenshots. The text overlay is stored in the recording data files and screenshots. This data is displayed on playback if it is configured during the time of the recording.

9.5.5 File saving properties

The Default file saving properties allows the user to select the path that screenshots images, recorded sonar data record files and exported profile data record will be saved to.

The user can set the default file name to automatically assign the current time and date that a file was recorded or screenshot taken. There is also a **Name** field that allows the user to customize the file name. The name will be added to the filename in front of the time/date stamp (e.g. Dive Number 17, ROV 67,2013,Mar27,13-08-37.mmb). The user also can choose not add the time/date stamp by selecting **None**. By selecting None, a sequential number will be added after the Name field (e.g. Drop,.mmb, Drop,(0).mmb, Drop,(1).mmb, Drop,(2).mmb, etc...)

9.5.6 GeoTiff Auto Save

See section 9.14 Saving GeoTiff files on page 98 for details about saving GeoTiff file.

9.6 Program Head

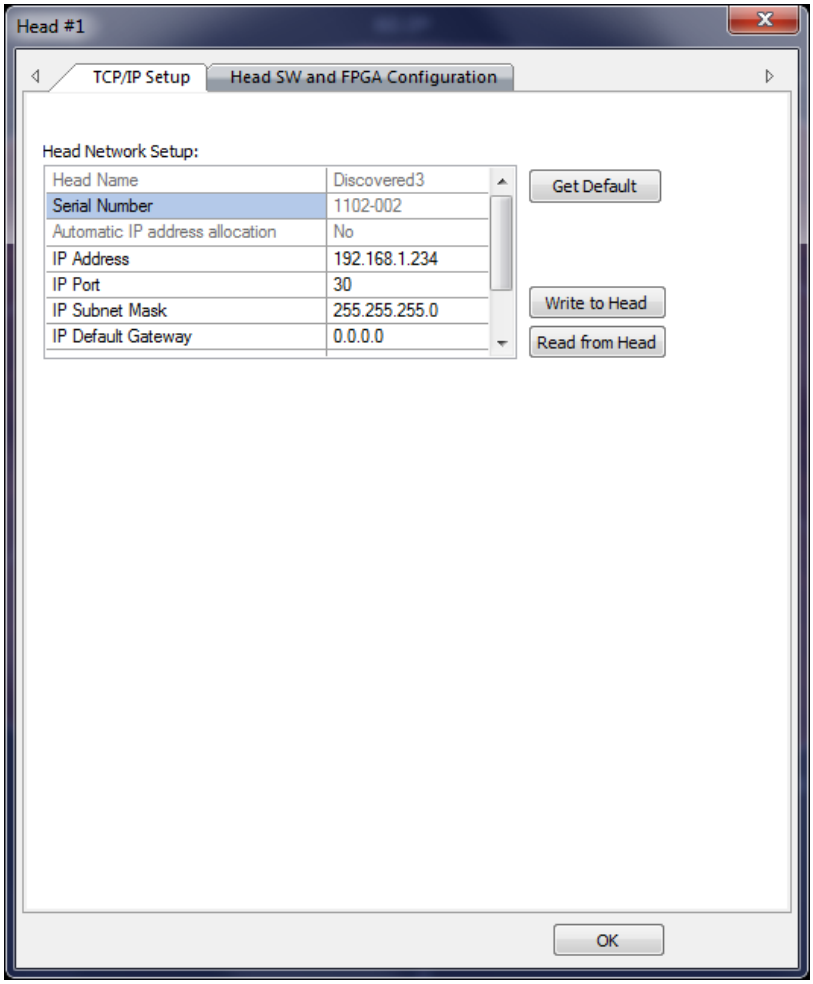
To program the M3 sonar head, connect the sonar head from “Setup” menu and then pause the sonar head from pinging. The “Program Head” menu should be enabled when the sonar head is paused.

Caution ***This section is intended for advanced users.***

9.6.1 TCP / IP Setup

The "TCP/IP Setup" page is intended to program the IP address and the IP port of the M3 sonar head in various network environments. The factory default IP address of the M3 sonar head is 192.168.1.234, Port number is 30.

To change the sonar head IP address, in the TCP/IP Setup tab, click "Read from Head" to get the information from the sonar head, edit the IP Address, Port, Subnet Mask, Default Gateway fields, and click "Write to Head"



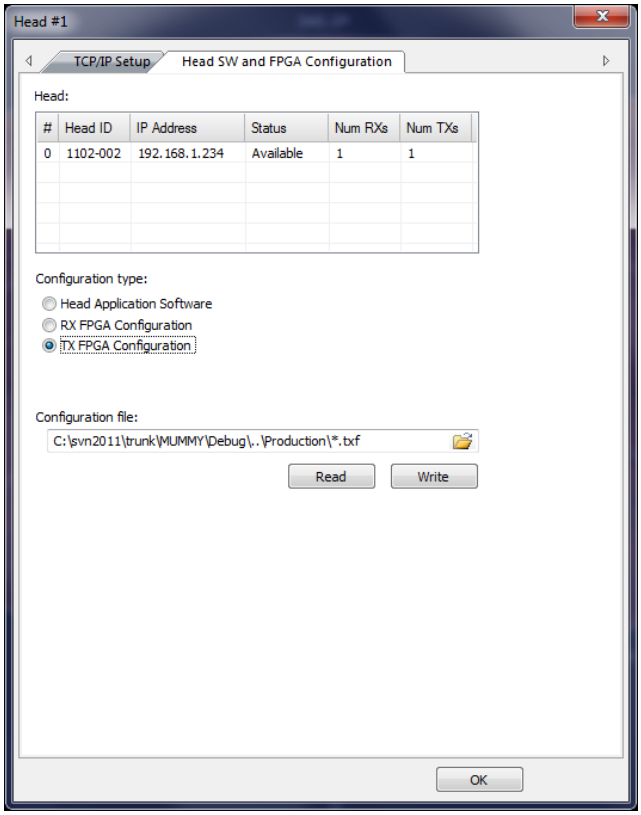
9.6.2 Upgrading the Sonar Head software and firmware

Procedure

1. Power on sonar head and connect the sonar head from menu Setup -> Connect Head.

2. Select menu Help -> About SonarGui , check the current version for Rx HW, Rx SW, Tx HW, Tx SW and make a record.

3. Stop pinging by pressing the **Pause** icon on the Widget Menu.
4. Bring up the System Configuration Dialog by selecting menu **Setup -> System Configuration**. Select the **Head SW and FPGA Configuration Page**



5. Bring up the System Configuration Dialog by selecting menu **Setup** -> System **Configuration**. Select the **Head SW and FPGA Configuration Page**.

6. Select one the **Configuration types** and browse to the folder that contains the upgrade files.
7. Press **Write** button and press **Yes** in the popup dialog to start the upgrade process.
8. Press **Cancel** or **Stop** to cancel the upgrade process. The sonar head software and firmware will NOT be changed.
9. Disconnect the head from menu **Setup -> Disconnect Head**. Recycle the power to the sonar head and connect again. Check the head software and firmware version again from the **About** dialog box to confirmed the upgrade.

Note *The version of RX HW and RX SW have to be the matched pair*

9.7 System Configuration

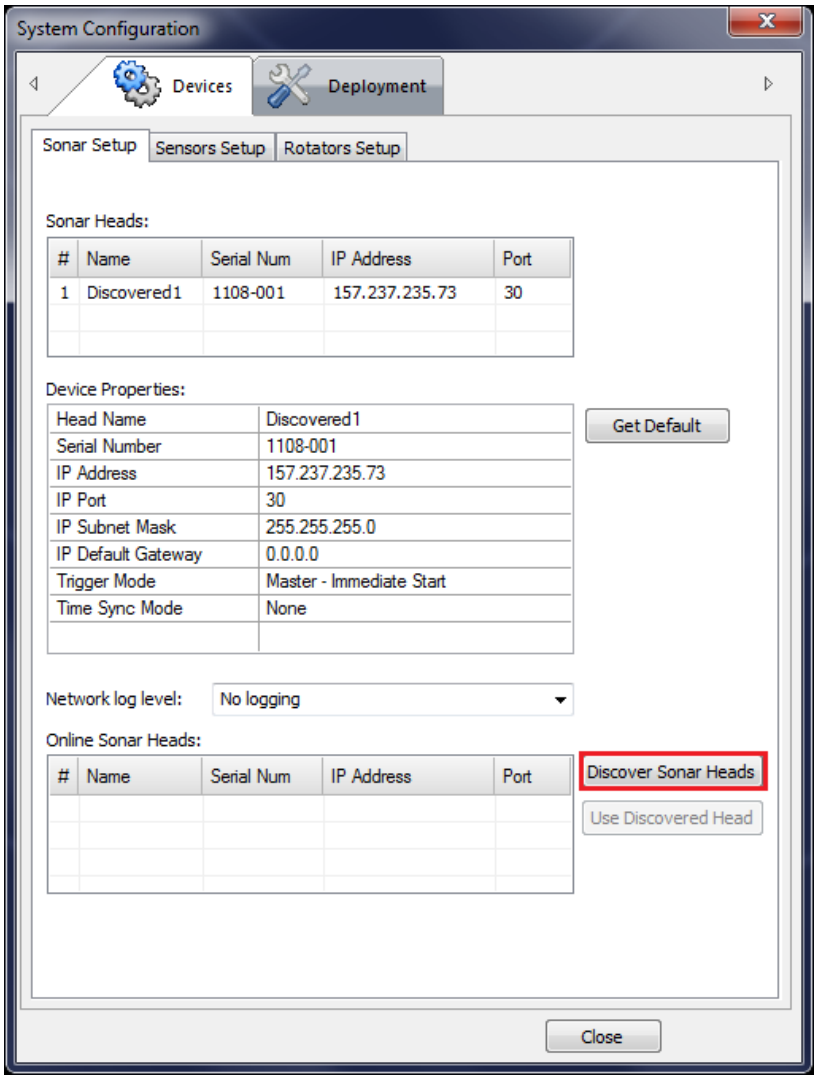
Select “System Configuration” from the “Setup” menu to open the System Configuration pages:

9.7.1 Sonar Setup

Use Sonar Setup page to enter the IP address and other network settings for connecting a Sonar Head.

Discover Sonar Heads

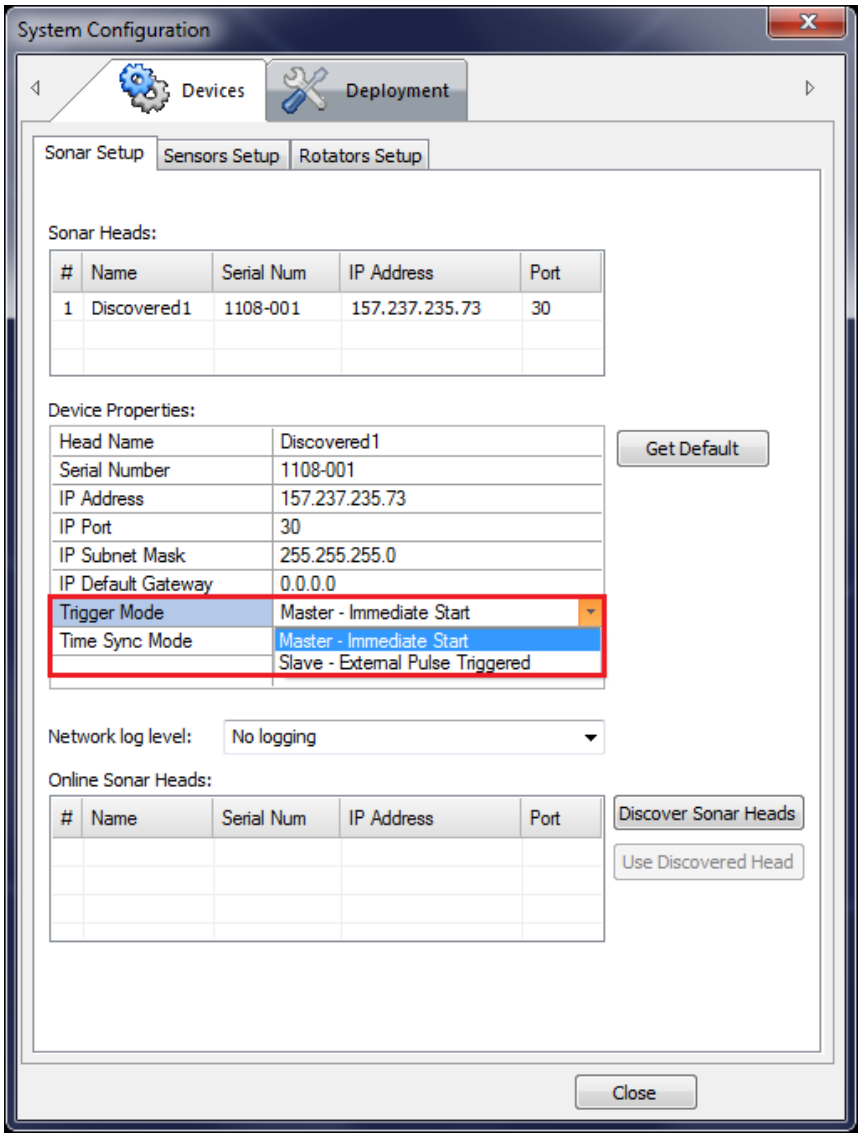
If the sonar IP address is unknown, use the “Discover Sonar Heads” button to discover the sonar head on the network. Then click “Use Discovered Head” to accept the discovered head.



Setup Synchronization

Setup the M3 Trigger Mode to synchronize between M3 sonar heads or with other acoustic devices to avoid interference. In the Sonar Setup page, select “Master – Immediate Start” mode if using the M3 to output a synchronization pulse when sonar head is pinging to trigger other acoustice devices; select “Slave – External Pulse Triggered” mode if using M3 as in slave mode, triggered by other acoustic devices.

If the M3 is set to “Slave – External Pulse Triggered” mode, when connecting M3, the M3 will not transmit until an external trigger pulse is received.



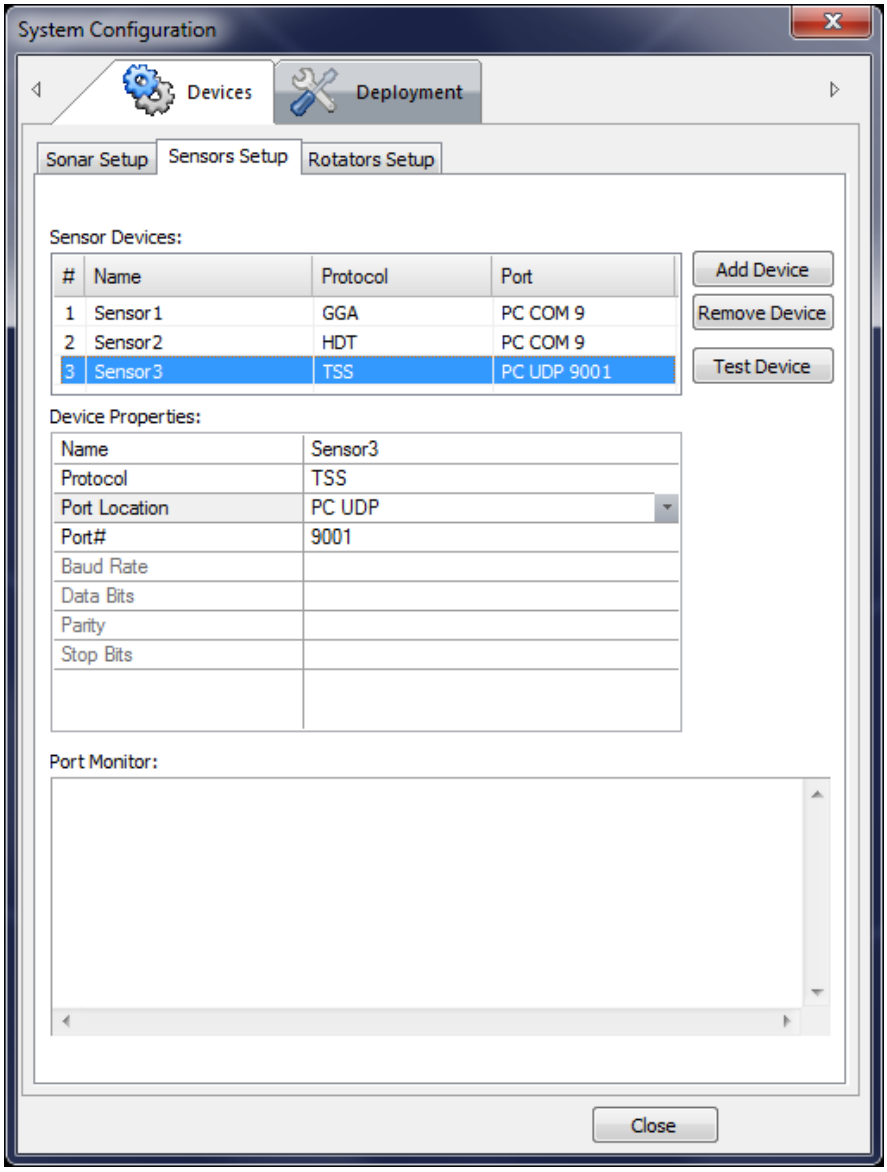
9.7.2 Sensors Setup

The M3 Software supports the following NMEA standard sensor input:

- HDM, HDT, HDG, GGA, GGK, GLL, DBT, DPT

The M3 Software also supports the following non-NMEA sensor input:

- TSS



Procedure

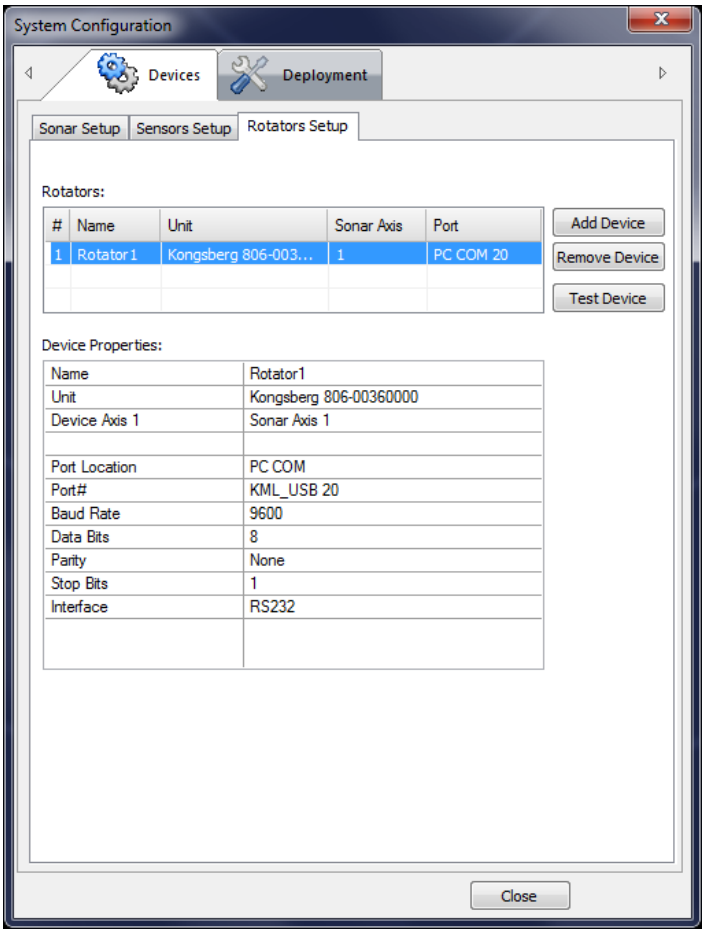
To enable sensor data to the M3 system:

1. Connect the sensor to a PC COM port, to the M3 auxiliary serial port, or UDP socket
2. Click “Add Device” to add a sensor
3. Select the Protocol from the protocol list.
4. If selecting COM Port, choose Baud Rate and other serial port settings.
5. If selecting UDP port , enter a UDP socket port to match the UDP sensor socket port.
6. Click “Test Device” to observe the sensor data in the Port Monitor window.

9.7.3 Rotators Setup

The M3 Software supports the following Rotator devices:

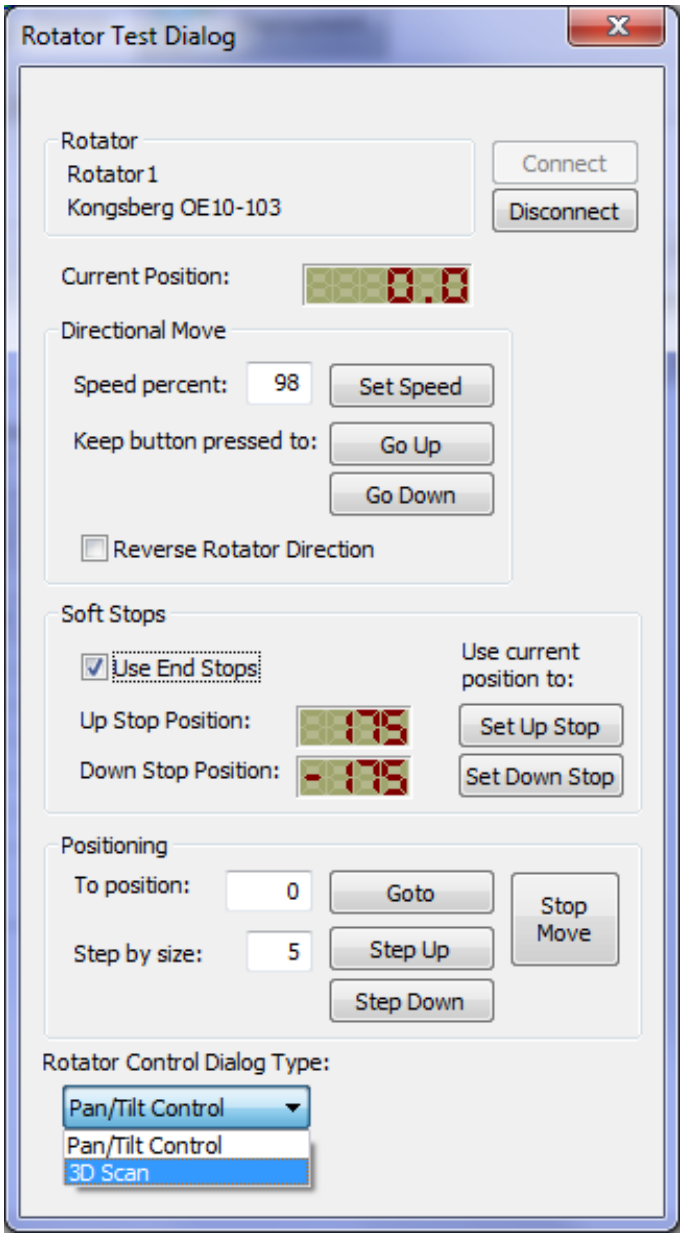
- Kongsberg OE 10-102: Dual-Axes Pan and Tilt unit
- Kongsberg OE10-103: Single-Axis Pan unit
- Kongsberg Mesotech 806-00360000: Single-Axis high precision Pan unit.



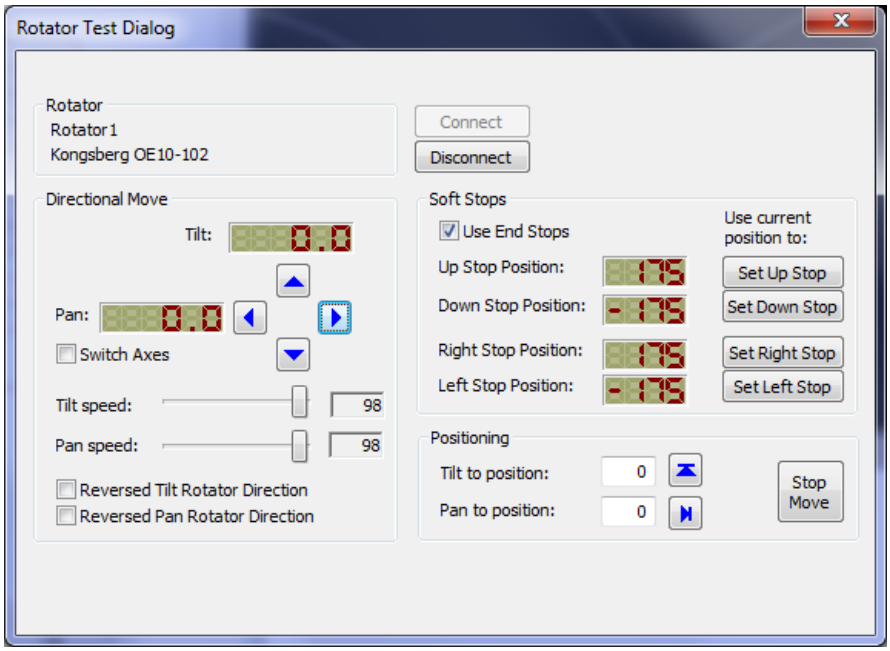
Procedure

To add a rotator to the M3 system:

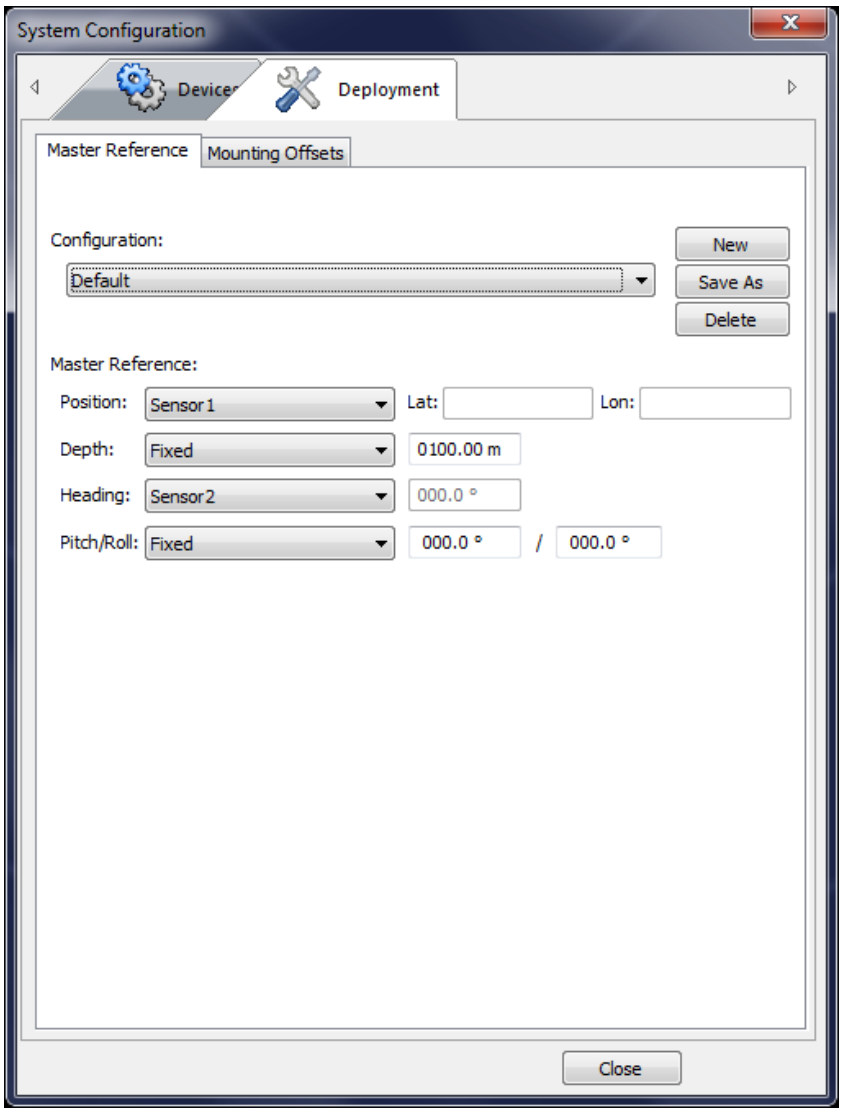
1. Connect the rotator to a PC COM port or through M3 auxiliary serial port.
2. Click “Add Device” to add a rotator.
3. Select the supported rotator model, Port Location, Baud Rate and other port settings.
4. Click “Test Device” to open the Rotator Test Dialog to test the rotator.
5. If a Single-Axis rotator is configured, the following test dialog will appear to test all the Single-Axis rotator functions.
6. A single-axis rotator can be used for simple pan/tile operation or 3D scan. Select “Rotator Control Dialog Type” here to determine the run-time rotator control function.


Rotator Test Dialog
Rotator
Rotator 1
Kongsberg OE10-103
Connect
Disconnect
Current Position:
0.0
Directional Move
Speed percent:
98
Set Speed
Keep button pressed to:
Go Up
Go Down
Reverse Rotator Direction
Soft Stops
Use End Stops
Use current position to:
Up Stop Position:
175
Set Up Stop
Down Stop Position:
-175
Set Down Stop
Positioning
To position:
0
Goto
Stop Move
Step by size:
5
Step Up
Step Down
Rotator Control Dialog Type:
Pan/Tilt Control
Pan/Tilt Control
3D Scan

If a Dual-Axes rotator is configured, the following test dialog will appear to test all the Dual-Axis rotator functions.



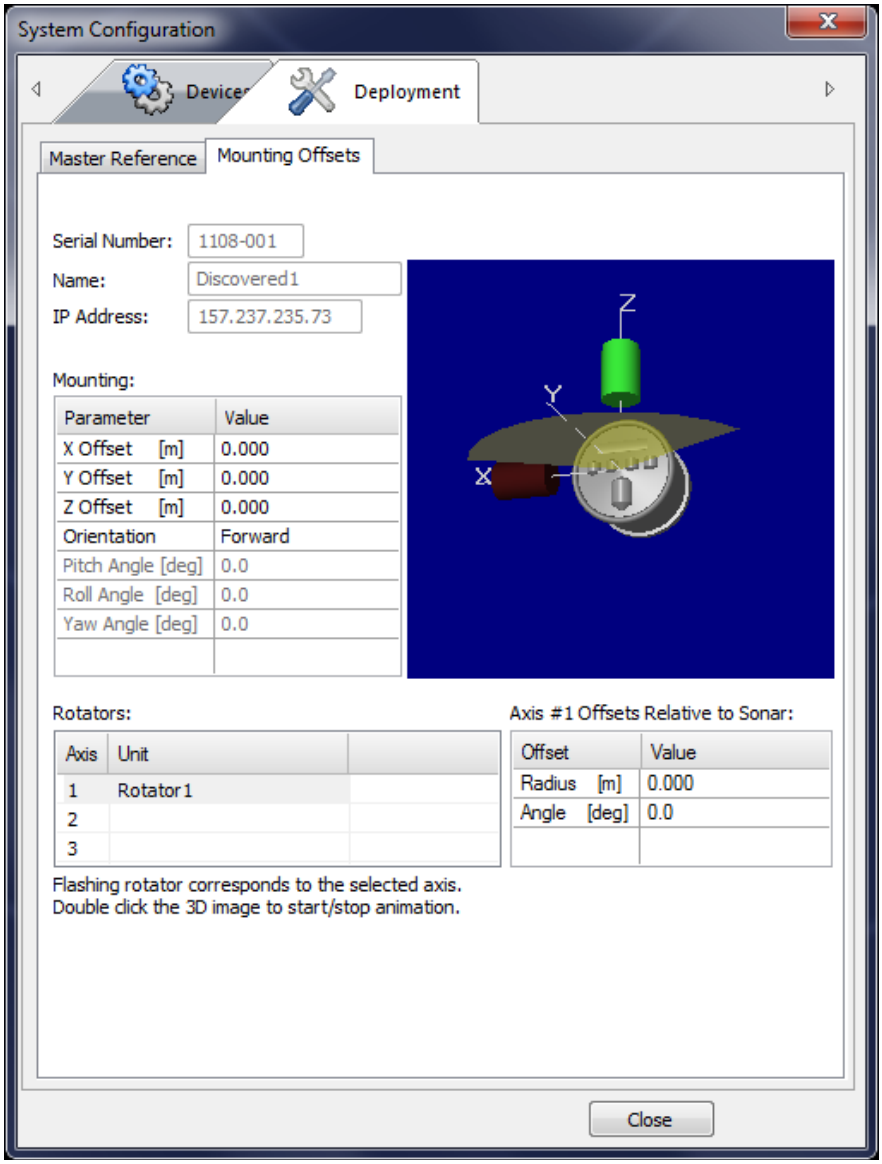
9.7.4 Master Reference



From the Master Reference page to select or create a configuration:

- Select Fixed Position or a configured GPS sensor for position reference.
- Select Fixed Depth or a configured depth sensor for depth reference.
- Select Fixed Heading or a configured heading sensor for heading reference.
- Select Fixed Pitch/Roll or a configured pitch/roll sensor for pitch/roll reference.

9.7.5 Mounting Offsets



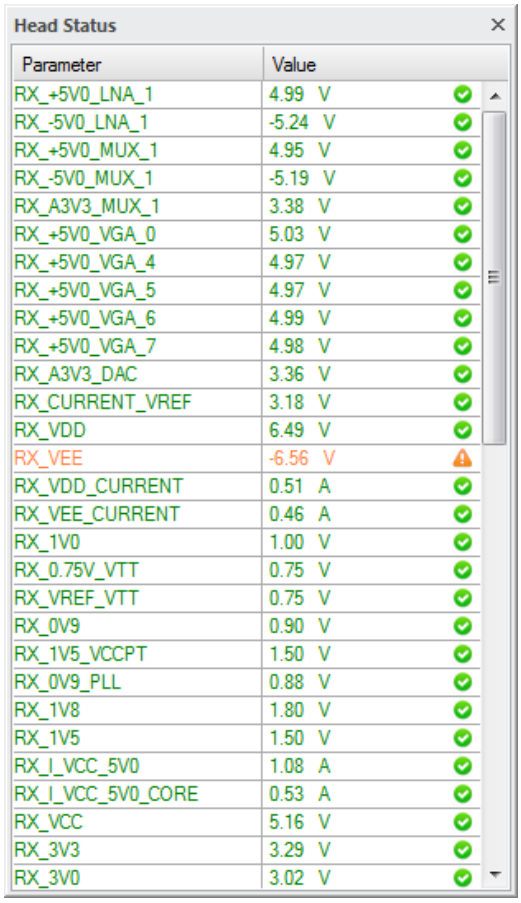
From the Mounting Offsets page to enter the offset information including:

- The sonar mounting X, Y, Z and Pitch, Roll, Yaw offsets
- The rotator mounting radius and angle relative to the sonar

9.7.6 Monitoring the Sonar Head status

Click the lower right corner of the status bar to active the system connection status dialog.

Click on the M3 Sonar to activate the "Head Status" page. The "Head Status" page reports the current sonar head currents and voltages for troubleshooting purpose.

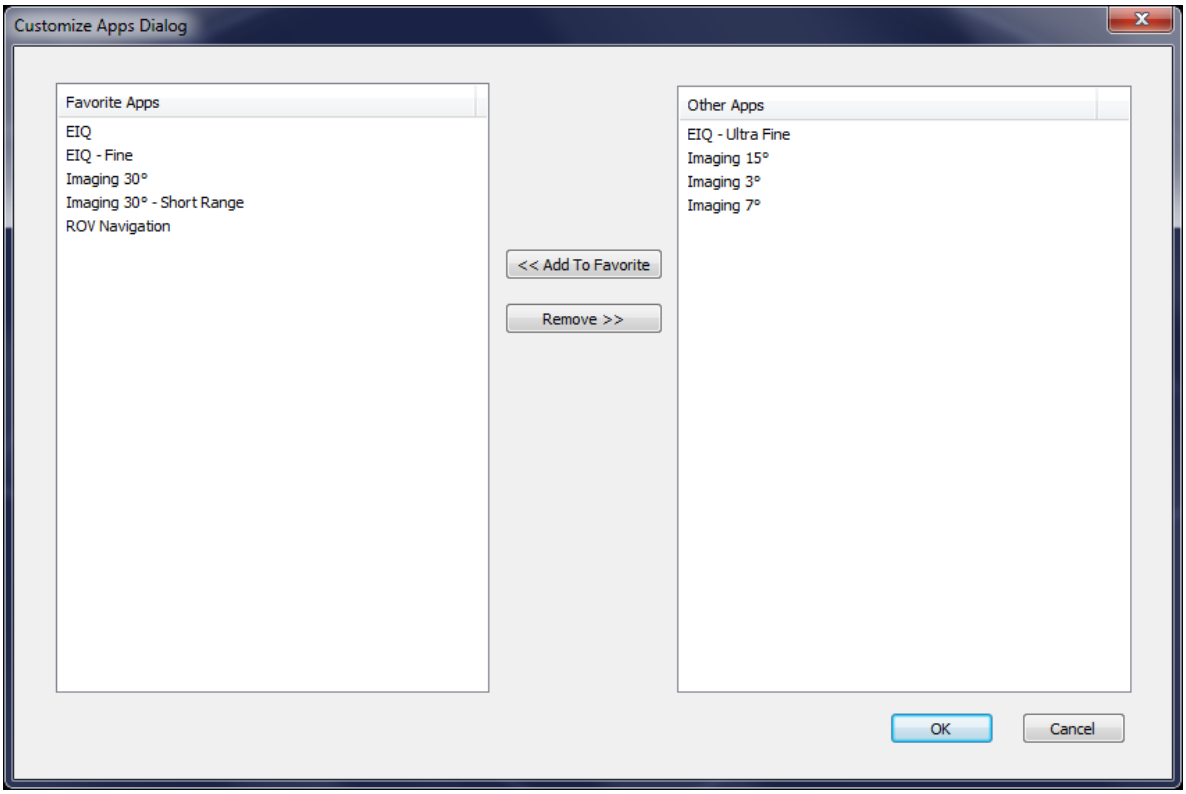


9.8 Selecting the Sonar App Mode

The M3 software provides 5 pre-defined Sonar App modes in the default Sonar Apps Menu.

To select an application mode in the M3 software, click Sonar App menu and select one of the modes under the menu.

To customize the Sonar App Menu, select “Customize Apps”, and add or remove the application names between Favourite and Other Apps. Click OK to accept the changes.



Imaging

Sonar App Names	**Imaging 30°,** **Imaging 15°,** **Imaging 7°,** **Imaging 3°**
Range	1m to 150m
Angular Resolution	1.6° x 30°, 1.6° x 15° 1.6° x 7° 1.6° x 3°
Pulse Type	CW and LFM
Description	This mode is intended to provide long range Navigation into the work site. The highest pulse power is used and pulse durations are used to get reliable long range detection. The trade-off is a reduction in the ping rate, partially due to the long range, and partially to maintain power consumption within reasonable limits.

Enhanced Image Quality

Sonar App Names	**EIQ** **EIQ – Fine** **EIQ – Ultra Fine**
Range	1m to 150m
Angular Resolution	0.95° x 30°
Pulse Type	CW and LFM
Description	This Sonar App is intended for site clearance applications where the ROV operator is planning on remaining on station for a few seconds in order to capture the highest quality images possible. The "Fine Enhanced Image Quality" mode increases the angular resolution 1.5 times more than the "Enhanced Image Quality" mode, but 1.5 times slower update rate.

ROV Navigation

Sonar App Names	**ROV Navigation**
Range	1m to 150m
Angular Resolution	1.6° x 30°
Pulse Type	CW and LFM
Description	ROV Navigation mode automatically switches between "EIQ - Fine", "EIQ", and "Imaging 30° modes. EIQ -Fine is used to provide highest resolution images with a good image update rate at short range. EIQ mode is used for medium ranges and Imaging for long.

Profiling

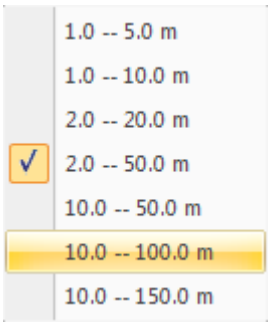
Sonar App Names	**Profiling**
Range	1m to 150m
Angular Resolution	1.6° x 3°
Pulse Type	CW and LFM
Description	Profiling mode is used with the automated point extraction of the seabottom or structures. The points are used to create a real-time 3D point cloud in a separate window. The profile point PMB data can later be used by other programs to extract depth, distance and volume measurements.

9.8.2 Changing the Operation Range

For each Sonar App mode, the M3 sonar head can operate at different pre-defined Near Range and Far Ranges.

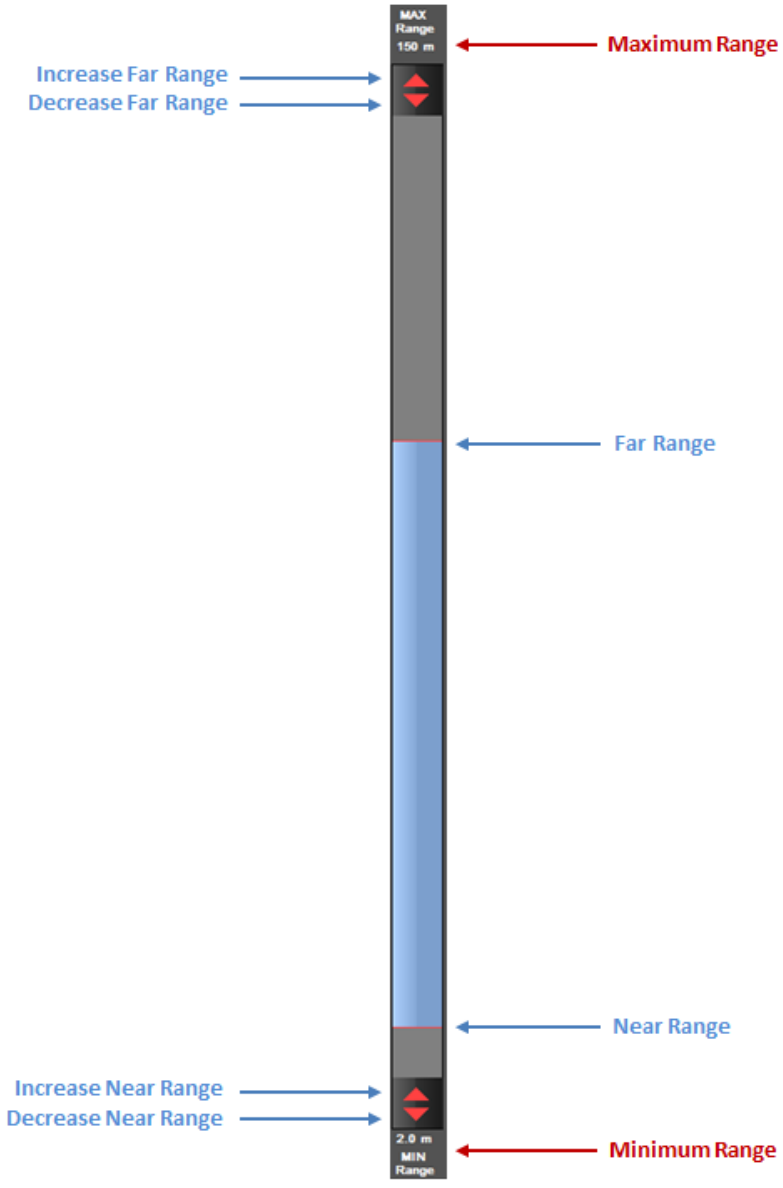
To change the operation range from the Context menu:

1. Right click on the sonar image screen
2. Select desired near and far range from the Context menu



To change the operation range from the Range Slider Bar:

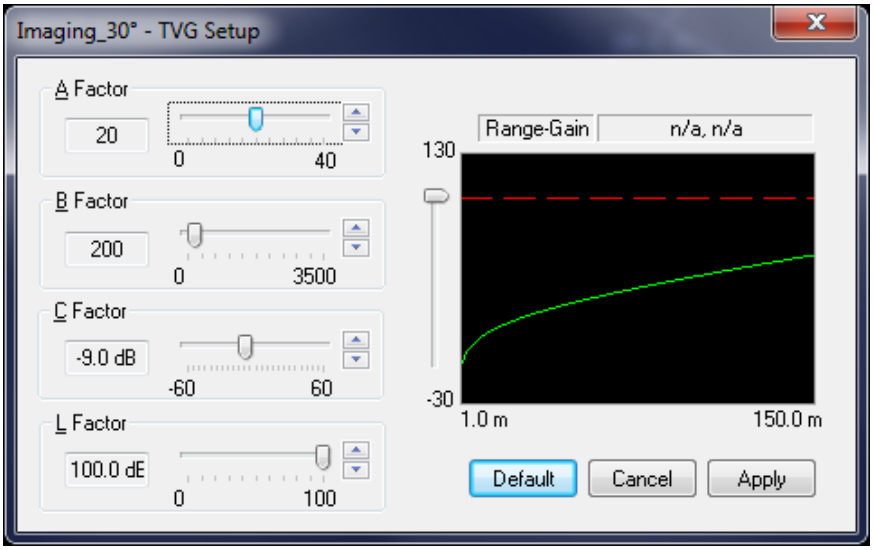
- Click “Increase Far Range” arrow to increase the Far Range up to the Maximum Range.
- Click “ Decrease Far Range” arrow to decrease the Far Range
- Click “Increase Near Range” arrow to increase the Near Range
- Click “Decrease Near Range” arrow to decrease the Near Range down to the Minimum Range.



9.8.3 Changing the TVG

The TVG dialog is used to control the Time Varying Gain characteristics for the sonar.

1. The controls allow a custom TVG curve to be defined. Four adjustable factors are used to set the gain curve:
   - A Factor: represents spreading loss
   - B Factor: represents one way absorption loss
   - C factor represents a base or starting gain level
   - L factor limits the maximum gain to reasonable levels



2. To the left of the TVG curve display is a slider with a range from -30 to 130. This represents the system gain. Moving that slider down until the dashed red line intersects the green TVG curve will cause a Range-Gain pair of values to be displayed in the "Range-Gain" box. In this manner the gain at a particular range can be determined.

9.8.4 Recording and Playback

With M3 software application, user can record the raw sonar data to ".mmb" data file or beamformed sonar data to ".imb" data file. The recorded data are time-stamped and displayed in GMT format during playback. The recording file name will be generated automatically using the current system time. The recording files are stored in ..\bin\Record under the installation folder.

- To select a recording format, open File (menu) | Recording Format. The default format is Raw (.mmb).
- To start recording, click "Record Data" in the "On Screen Menu Widget" or press F4.

- Use Preferences menu to set recording folder and file name. See section 9.5.5 File saving properties on page 72.
- To stop recording, click "Stop Recording" in the "On screen Menu Widget" or press F4.

- Recording file name is displayed to the left of the recording icon

Note *Data can be recorded again during playback.*

9.9 Interpreting the Sonar Display

The Color Palette

The sonar image is a map of the echo returns over the scanned area. A sequence of colors is used to show the relative strengths of the returns. Several color schemes or image palettes are available. Most of them use darker colors to indicate weak returns and brighter colors to indicate the stronger returns.

Bright Spots

Bright spots in the image indicate strong sonar targets. Generally, this indicates a hard, highly reflective surface.

Dark Spots

Dark spots in the image indicate either areas of low reflectivity (soft areas) or possibly an acoustic shadow zone behind a target.

Shadows

Most targets will block the transmission of sound either by reflecting it or absorbing it. This will leave a shadowed area behind the target that is not insonified and therefore will not generate any echoes. This is very similar to the shadow formed when an object is illuminated with a single light source. The shadow behind a target can often yield more information about the target than the reflections from the target itself. The shadow will often reveal the shape of the target, but you must remember that the shape will usually be distorted according to the position of the sonar head relative to the target and the bottom, and according to the slope of the bottom. It is often possible to estimate the height of a bottom target based on the length of the shadow and the known height of the sonar head.

Noise and Interference

It is usually easy to recognize interference from other acoustic sources such as echo sounders, pingers, and other sonars. These sources all produce pulses at regularly timed intervals and will therefore tend to create a regular or symmetrical pattern of blips on the screen. Mechanical noise sources such as propellers, hydraulic pumps, and thrusters, are usually more directional and tend to show up only when the sonar is pointed directly at them.

Masking Effects

Sonar signals are easily blocked by air or gas bubbles in the water or on the transducer face. As an example, the aeration present in the wake of a vessel will often last for ten to twenty minutes and effectively mask out most sonar returns on the far side. The aeration partially blocks the outgoing pulses as well as any returns. Another source of gas bubbles can be found when a sea bottom containing decomposing organic matter is disturbed by dredging or ploughing.

9.10 Sonar Head Discovery and Connection

Follow the steps in this section to discover the IP address of the M3 Sonar Head and connect to the Sonar.

Check Network Setup

1. Ensure that the Head Ethernet cable is connected to a dedicated network adapter on the Host PC
2. Ensure that other network cards on the Host PC are disabled for this test
3. Ensure that the dedicated network adapter has the following IP settings:
    a. Static IP Address: **192.168.1.233**
    b. Subnet mask: **255.255.255.0**

Power on and Bring up the TCP/IP Setup Tab

4. Power on the Head
5. Bring up the System Configuration Dialog (**Setup → System Configuration**)
6. Select the Heads page in the dialog
7. Select the TCP/IP Setup tab

Discover the Sonar Head

8. Press **Discover Sonar Heads** button in the TCP/IP Setup tab
9. Record the discovered Head details (IP Address, TCP Port, UDP Port, Head ID, Status)

Choose the Discovered Sonar Head

10. Highlight the Head entry in the Sonar Heads list
11. Press Use Discovered Head

12. Press OK to close the dialog

Connect to the Sonar Head

13. Connect to the Head (Setup → Connect Head)

9.11 Changing the Sonar Head Static IP Address

1. Connect the M3 Sonar Head directly to the computer network card (i.e., no network switches, routers, etc.)
2. Power on the M3 Sonar Head
3. Start the M3 Software
4. Connect to the Head (**Setup → Connect Head**)
5. **Pause** the sonar (press Pause in the upper right widget)
6. Open the System Configuration dialog (**Setup → System Configuration**)
7. Press **Read Config** to refresh the contents of the **Head Network Setup** table
8. Enter the new **Static IP Address** in the table
9. Press **Write Config**, then press **Yes** to confirm
10. Wait for Write Config operation to be completed
11. Press **OK** to close the System Configuration dialog
12. Disconnect the Head (Setup → Disconnect)
13. Power off the Sonar Head for 3 seconds then back on to apply the updated IP address
14. If necessary, change the computer's network adapter address to place it on the same network as the Sonar Head
15. Open the System Configuration dialog in the M3 Software (Setup → System Configuration)
16. Press **Discover Sonar Heads** – the Head with its updated IP address should appear in the **Sonar Heads** table
17. Select the Sonar Head in the **Sonar Heads** table and press **Use Discovered Head**
18. Press **OK** to close the System Configuration dialog
19. Connect to the Sonar Head (Setup → Connect Head)

9.12 Beamformed data Ethernet output

M3 software is able to output the beamformed data through TCP/IP socket at default port 20001. Any third party TCP/IP client can issue a TCP/IP connection to the M3 computer IP address, port 20001, to receive beamformed data.

This function does not require any configuration and available when running a M3 sonar head or replaying a recorded file.

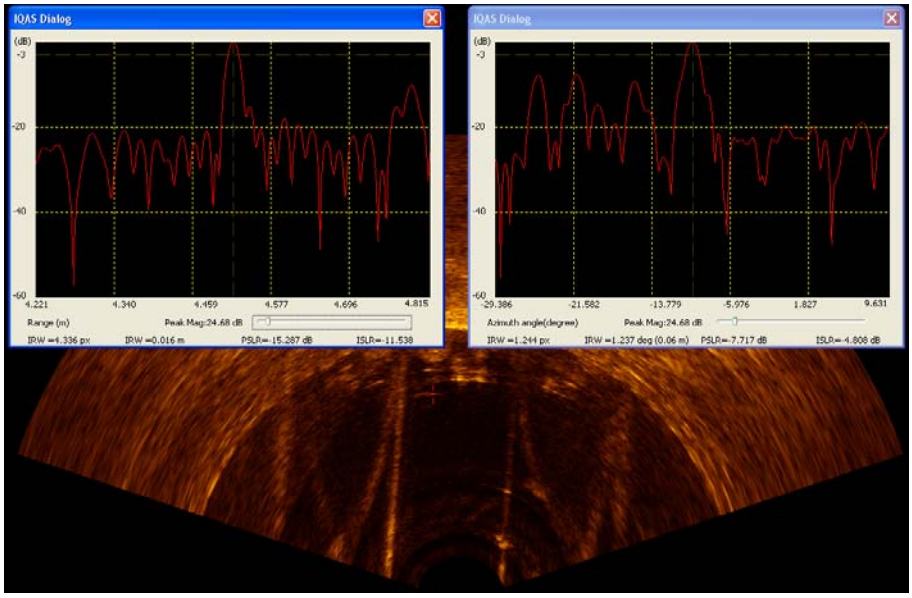
Refer to Kongsberg Mesotech Ltd. document 922-20007002 for Beamformed data format.

9.13 Image Quality Analysis System (IQAS)

IQAS is a build-in tool in the M3 software to analyze the image quality of a point target or can be used to measure a known point target against a specification, such as resolution, Peak Side Lobe Ratio (PSLR), Integrated Side Lobe Ratio (ISLR).

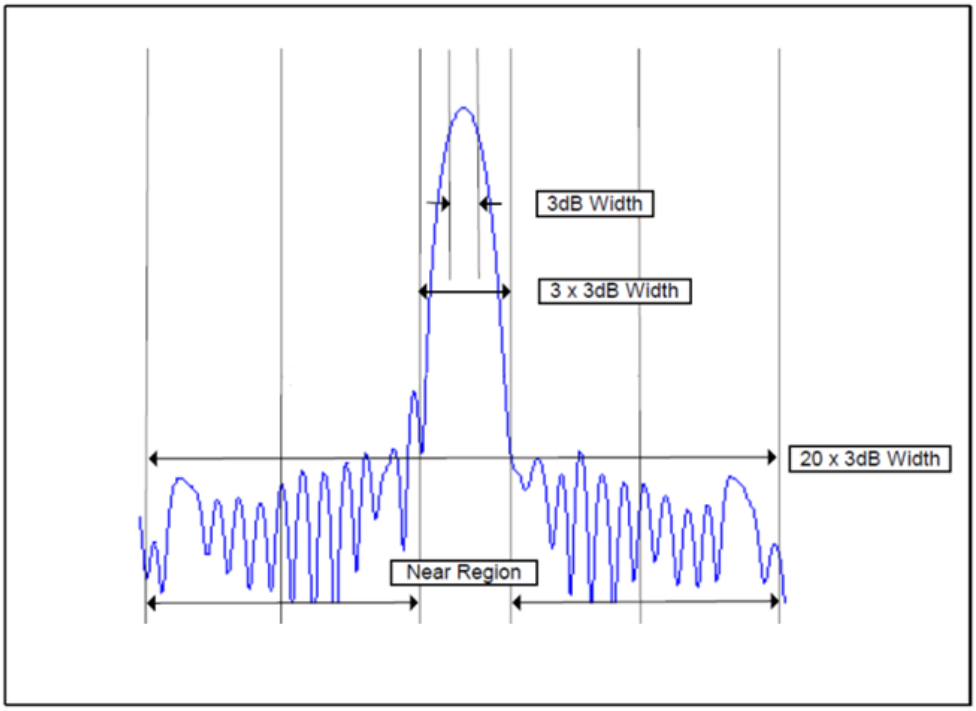
To enable IQAS:

1. Select the IQAS cursor from the Tool Bar, see page 62, IQAS cursor.
2. Move the IQAS cursor to the point of interest on the sonar image.



The following information will be displayed in the 2 IQAS dialogs:

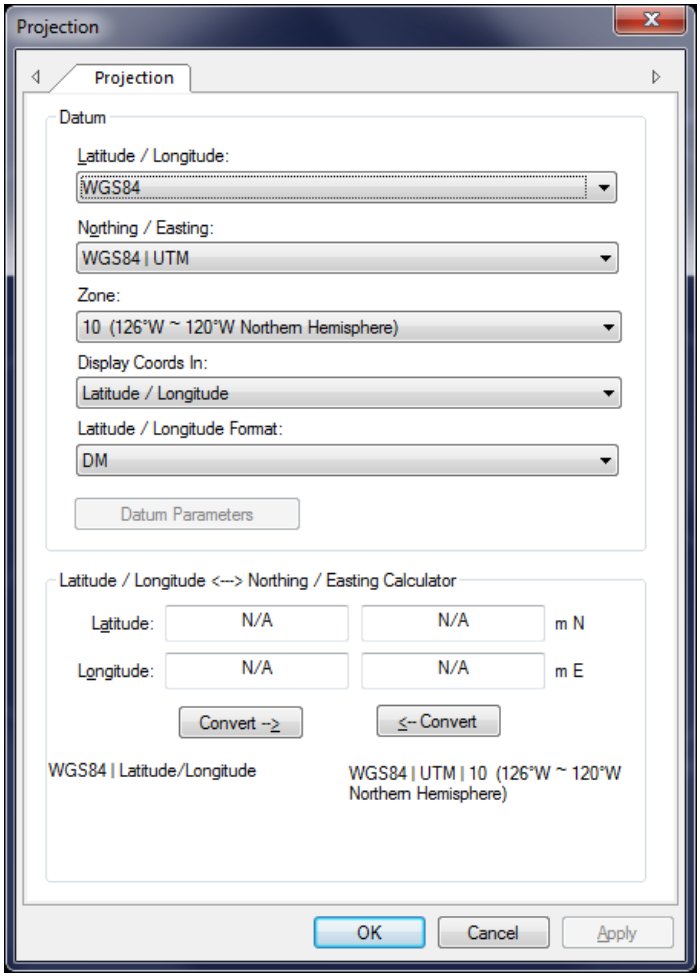
- **Resolution, Impulse Response Width (IRW):** is measured 3dB down from the top of the Main Lobe of the impulse response
  - IRW in Range: in meters and in pixels
  - IRW in Azimuth: in degrees and in pixels
- **PSLR:** is the Peak Side Lobe level in the Near Region relative to the level of the Main Lobe. The unit of measurement is dB
- **ISLR:** the Integrated Side Lobe Ratio (ISLR) is the ratio of the energy in the Near Region to the energy within the Main Lobe Region. The unit of measurement is dB



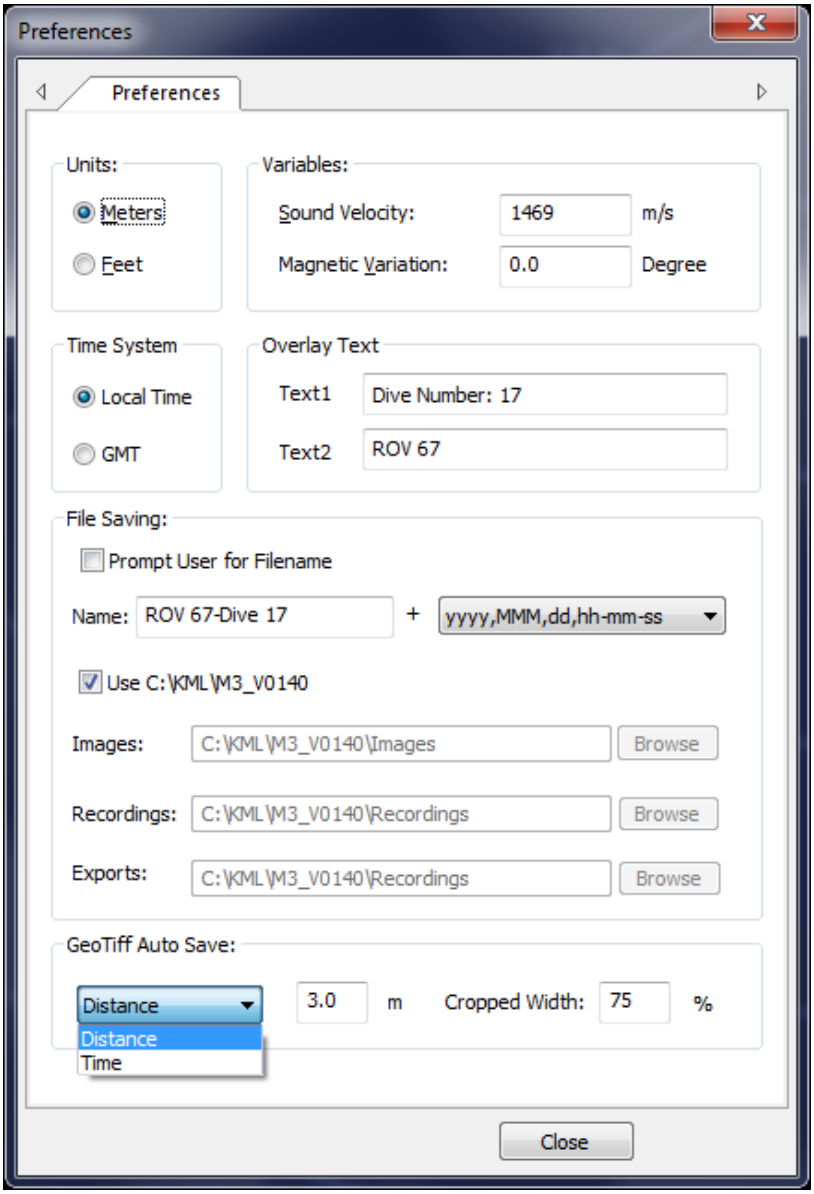
9.14 Saving GeoTiff files

To save a sonar image to a GeoTiff file:

1. Connect the system with a GPS sensor (See page 77 how to setup a sensor), or set the system in a fixed location by entering Latitude and Longitude in the Master Reference Page (see section 9.7.4 Master Reference on page 83)
2. Select "Geo Projection" from the "Setup", choose desired coordinate system.



3. Press F10 to save a GeoTiff to a pre-configured folder. The default folder is C:\KML\M3_VXXXX\Images. You may change the pre-configured folder from the "Setup" menu -> Preferences.
4. Press F11 to automatically save GeoTiff continuously based on the sonar travel distance or time. The settings can be configured on the "Preferences" page. Under "GeoTiff Auto Save", select "Distance" or "Time" to specify either automatically save the GeoTiff file every N meters or seconds. Specify the "Cropped Width" to save cropped sonar image for mosaicking purpose.



5. The GeoTiff files can be loaded to the third party software such as Google Earth Pro with registered coordinates.

Figure 26. Individual GeoTiff Files loaded to Google Earth Pro.

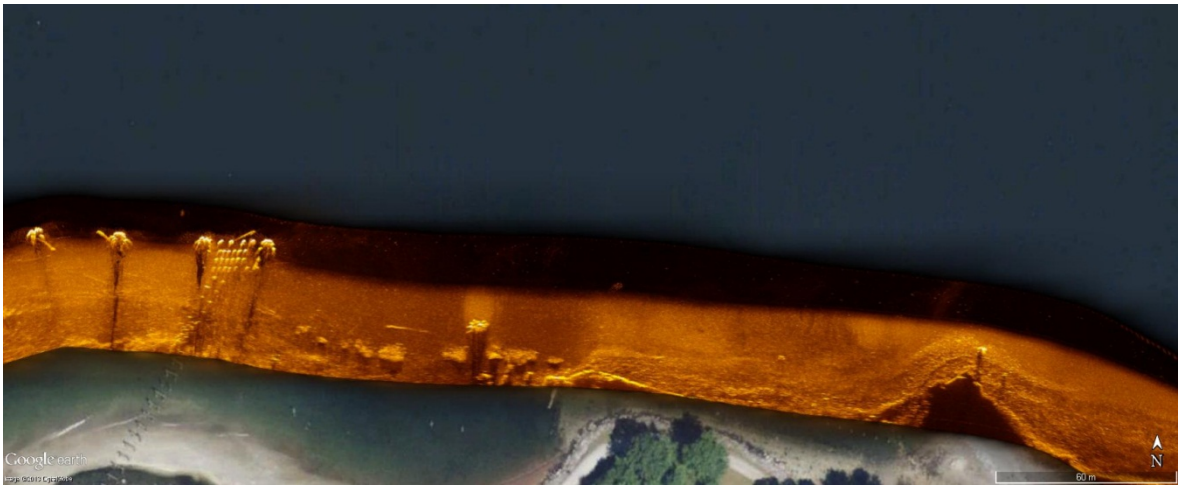


Figure 27. A Mosaic of GeoTiff files loaded to Google Earth Pro.

9.15 Using Target Marker

Target Marker can be used to put a time and location stamped marker on the interested target on the sonar image. The time and location information can be exported to a serial port or UDP port 20004.

To use Target Marker, select "Enable Target Marker" from the "Display" menu. In the following "Target Marker Export" dialog box, select a serial port and click OK to enable serial export or click Cancel to use the Target Marker without exporting to serial port. The UDP export is available in both cases. The default serial settings for the target marker export is 9600, N, 8, 1.

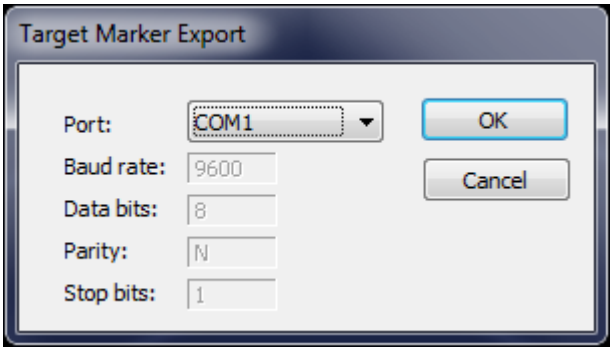


Figure 28. Target Marker Export dialog box

After Target Marker function is enabled, the target marker is generated and exported upon pressing a short-cut keys, the key 0 to 9 on both the main key pad and the small key pad of the standard US keyboard. These keys are used to generate Target Marker with target ID from 0 to 9.

The Target Marker format description:

```
$MSTRK,xx,hhmmss.ss,nnnnnnnn.nn,c,eeeeeeee.ee,c
,U<CR><LF>
```

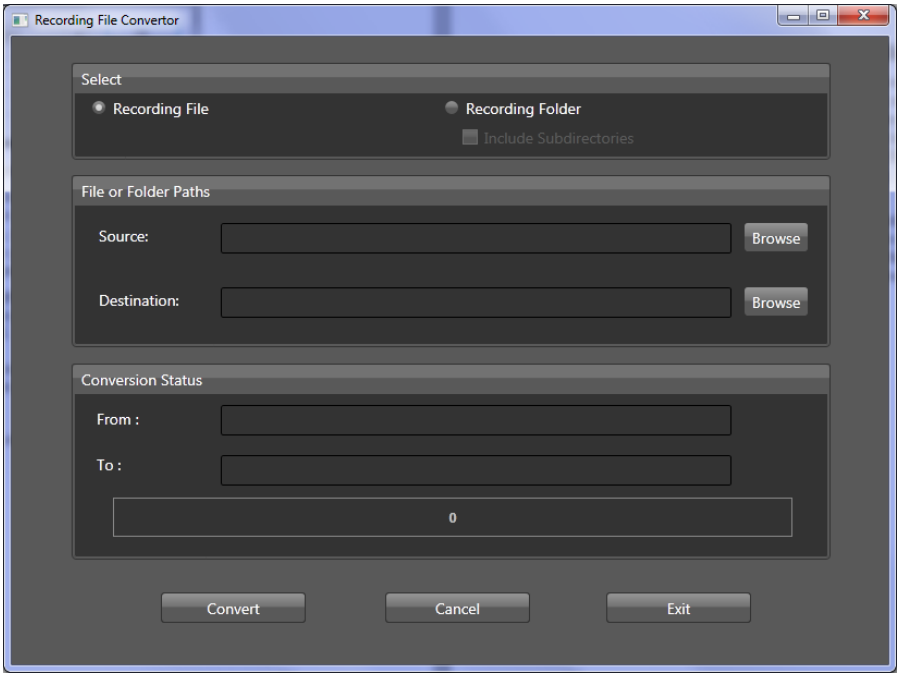
$MSTRK	Start character and prefix.
xx	target number, range from 00 to 99
hhmmss.ss	UTC time, hours, minutes, seconds
nnnnnnnn.nn	Northing or Latitude depends on the "U" definition
c	N: North, S: South
eeeeeeee.ee	Easting or Longitude depends on the "U" definition
c	E: East, W: West

U	‘f’: Northing/Easting in feet. Variable number of digits for Northing/Easting and variable number of digits for decimal-fraction of Northing/Easting. ‘m’: Northing/Easting in meters. Variable number of digits for Northing, Easting and variable number of digits for decimal-fraction of Northing and Easting. ‘l’: Lat/Lon in degrees, For Latitude: 2 fixed digits of Latitude degrees, 2 fixed digits of minutes and a variable number of digits for decimal-fraction of minutes. For Longitude: 3 fixed digits of Longitude degrees, 2 fixed digits of minutes and a variable number of digits for decimal-fraction of minutes.
CRLF	Termination

9.16 Converting recording files

M3 software records sonar data in two formats, raw element data (.mmb) or beamformed data (.imb). If the M3 software records the sonar data in .mmb format, the recorded files can be beamformed or converted to .imb during replay. If the M3 software records the sonar data in .imb format, it will not be able to converted back to .mmb.

A conversion utility, M3Converter.exe, is provided with M3 software to convert or batch-convert the .mmb to .imb file for those who wants to keep recordings in .mmb format but process data in .imb format.



Procedure

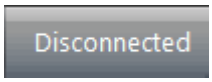
1. Select “Recording file” to convert a single .mmb recording to .imb recording.
2. Select “Recording folder” to convert all the .mmb files under the folder to .imb files. Check “Include subdirectories” to include all the .mmb files in the subdirectories under that folder.
3. Select source .mmb file or folder.
4. Select destination .mmb file or folder.
5. Click “Convert” button to start the conversion.

Note

The M3 recordings are recorded in 1GB volumes, the start of the volume is .mmb for element raw data or .imb for beamformed data, the following volumes are sequential numbers .001, .002, .003, etc. for both type of recordings. It's recommended to select different folder for source and destination to avoid file name duplications.

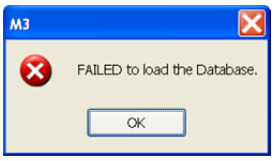
10 TROUBLESHOOTING

10.1 Problems connecting to the Sonar Head

Symptom	*Probable Cause*	*Corrective Action*
1. Cannot connect to the Sonar Head and cannot ping the sonar IP address 192.168.1.234 Status remains shown as: 	a. The IP Address on the computer is not set correctly.	a. Confirm the Ethernet adapter has the IP address set to **192.168.1.233** with Subnet Mask **255.255.255.0**.
	b. There is no physical connection to the sonar telemetry.	b. Confirm the wiring from the M3 computer and the Sonar Head are correct and that any switches, routers or fiber optic converters are powered on. *Refer to Figure 11 and Figure 12.*
	c. The power supplied to the sonar head is not within the specified input voltage or current range.	c. Confirm that the Voltage at the sonar head connector is between 12 to 36VDC and capable of supplying up to 50 Watts.
	d. Poor quality communication link or improperly terminated cable(s).	d. Check the Ethernet link between the M3 computer and sonar head. Test the cables with a suitable Ethernet tester.
	e. Connect Head was pressed too soon after powering on the Sonar Head.	e. Turn off power to the sonar head. Turn the power back on and wait 20 seconds before clicking on **Connect Head**.
	f. On some computers the M3 Software may incorrectly try to use the WiFi adapters or other Ethernet adapters to connect to the Sonar Head.	f. Disable all other Ethernet adapters including WiFi, then try connecting to the Sonar Head.
	g. The Ethernet Adapter may be damaged or the settings are configured in a way that does not support operation with the sonar.	g. Try another Ethernet port on the computer or try another computer.
	h. The Sonar Head and Computer are connected to a shared network with an IP address conflict.	h. Remove the Sonar Head and Computer from the shared network and try to establish a connection with the two connected directly together.

Symptom	***Probable Cause***	***Corrective Action***
		Change the IP address of the Sonar Head, Computer or other device with the IP address conflict.
	i. The Ethernet cable length is too long.	i. Try running the system on a shorter cable. Use of appropriate Ethernet extenders or switches may be required to extend the link distance between the Sonar Head and Computer.
	j. The IP address configuration used by the M3 Software is not correct. The IP address shown in the message log is not on the same network as the M3 computer.	j. Refer to section 9.10 on page 94 for information on how to discover and connect to the Sonar Head IP address.
2. The system is able to connect with a 1000Base-T link using all four Ethernet pairs. 100Base-TX connection cannot be made using Green and Orange pairs when wired: **RJ-45 - M3 Sonar whip (SEA CON)** **Pin 1 - Pin 2 (ORN/WHT)** **Pin 2 - Pin 4 (ORN)** **Pin 3 - Pin 5 (GRN/WHT)** **Pin 6 - Pin 8 (GRN)**	a. The Ethernet adapter speed setting is set in the adapter properties to 1000 Mb only.	a. Set the Ethernet adapter **Speed and Duplex** settings on the computer to **Auto**. Open the Network Controller Properties window: ***Action:*** ***Local Area Connection Status*** *window > Click* ***Properties****, then* ***Advanced*** *tab > select* ***Speed & Duplex*** *property > then set the* ***Value = Auto***
3. A message box appears when connecting to the M3 sonar head: "Configuration was updated in the sonar head. Please reset power to the sonar head and reconnect."	b. This is an automated sonar head reconfiguration to correct a head internal configuration error for the sonar heads built before May 2013.	b. Cycle the power of the sonar head and reconnect.

10.2 Software Problems

Symptom	*Probable Cause*	*Corrective Action*
1. An error message appears when the M3 Software is launched: **"Failed to load the database"** 	a. The M3 shortcut created on the desktop was not created properly. The **Start in** field is missing the correct directory information.	a. Delete the shortcut and create a new one from **C:\KML\M3 v1.xx\bin\M3.exe**. Or add **"C:\KML\M3 v1.xx\bin\"** to the **Start in** field in the M3 shortcut properties.

10.3 BIST Errors

Symptom	*Probable Cause*	*Corrective Action*
1. Errors are shown in the Head Status window.	a. The Head Status window was opened too soon after the Sonar Head was connected to the system.	a. Close the Head Status window and wait at least one minute after the Sonar Head is connected before checking the Head Status window.

10.4 Sonar Image

Symptom	*Probable Cause*	*Corrective Action*
1. Noise shown in the sonar image.	a. The sonar head is picking up noise from the DC switching power supply used to power the sonar head.	a. Install a filter to the output of the DC switching supply. See the spare parts section for suggested filters under Sonar Heads.
2. The Sonar Head connects but fails to update the sonar image. The status switches between Active and Inactive and the message log shows the Sonar Head looses connection then reconnects.	a. The power supply voltage to the Sonar Head is intermittent.	a. Confirm the power supply is set for the correct line voltage (i.e. The manually switch on the power supply may be set to 220VAC when the line voltage is 110VAC). Confirm the cable loop resistance and supply voltage are within the range listed in the technical specification section of this manual.

11 SPARE PARTS

11.1 Sonar Head

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
1.	922-20010000	KML	922-2001DEMO	M3 Sonar Head, 500m, SEA CON	A	D
2.	922-20020000	KML	922-2002DEMO	M3 Sonar Head, 4000m, SEA CON	A	D
3.	922-20040000	KML	922-2004DEMO	M3 Sonar Head, 4000m, SEANET	A	D
4.	922-20050000	KML	922-2005DEMO	M3 Sonar Head with Sync, 4000m, SEA CON	A	D
5.	922-20060000	KML	922-2006DEMO	M3 Sonar Head with Sync, 4000m, SEA CON	A	D
6.	172-01010201	Parker	#2-016/N1470	O-ring (2-016)	B	-
7.	144-07650005	SEA CON	MINK-PSPL	Plastic Splashproof Plug MINK-PSPL, mates to MINK-FCRL	A	-
8.	422-44040000	KML	422-44040000	M3 Sonar Head Accessory Kit	A	-
9.	359-01320000	KML	359-01320000	M3 Sonar Head Guard Ring	A	-
10.	159-05000002	CFP Industries	VC-7500-32	M3 Sonar Head Protective Cover	A	-

11.2 Cables

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
1.	436-02380000-0015	KML	436-02380000-0015	M3 Cable Whip – 15-ft	A	C
2.	436-02380000-0050	KML	436-02380000-0015	M3 Cable Whip – 50-ft	A	C
3.	436-02380000-0279	KML	436-02380000-0015	M3 Cable Whip – 279-ft (85m)	A	C
4.	436-02390000-0250	KML	436-02390000-0050	M3 Test Cable Whip – 50-ft (15m)	A	C
5.	172-01011201	Parker	#2-017/N1470	O-ring (2-017)	B	-
6.	144-07650004	SEA CON	MINK-PSRL	Plastic Splashproof Receptacle	A	-
7.	144-07650054	HARTING	09454521560	Connector jack, RJ45 CAT6 (See drawing 436-02391000 drawing v1.3 or later)	B	-
8.	144-07650055	HARTING	09455020000	Connector cap for RJ45 jack (See drawing 436-02391000 drawing v 1.3 or later)	B	-
9.	140-0751	BOMAR	300668EZ	Connector plug RJ45 CAT5E&6 Crimp (Requires crimp tool listed under Tools and Consumables section 11.4, page 109)	B	-

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
10.	140-08000014	ASSMAN	DN-93601-U/BL	CAT6 Unshielded Jack, Tool-free, Black – (See drawing 436-02391000 v1.2 or earlier)	B	-
11.	N/A	Panduit	CJ5E88TG	Connector Socket Category 5e (Refer to Panduit Installation Instructions PN403K) – for p/n 436-02380000	A	-
12.	N/A	Panduit	EGJT	Tool to assemble Panduit CJ5E88TG (Refer to Panduit Installation Instructions PN403K) – for p/n 436-02380000	A	-
13.	140-08000015	SwitchCraft	L722AS	Power Jack, ID = 2.1mm, OD ==5.5mm	B	-
14.	140-08000016	SwitchCraft	TCAP	Protective cover for Power Jack L722AS	B	-
15.	422-00770000	KML	422-00770000	M3 Cable Accessory Kit – North America	B	-
16.	422-00780000	KML	422-00780000	M3 Cable Accessory Kit – Europe	B	-
17.	422-00790000	KML	422-00790000	M3 Cable Accessory Kit – UK	B	-
18.	159-00510004	PANDUIT	HLSP5S-X12	Velcro strap ¾" x 18"	A	-

11.3 Power Supply

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
1.	436-02430000	KML	436-02430000	M3 Test Power Supply 24VDC @ 2.7A works with test cable p/n 436-02390000	A	-
2.	154-02900012	PHIHONG USA QUALTEK	AC15WNA 223020-01	Cable AC Power, North America, NEMA1-15 plug to IEC60320 C7 connector 6-ft 125V/10A	A	-
3.	154-02900013	PHIHONG USA	AC15WEU	Cable AC Power, Europe, CEE 7/16 plug to IEC60320 C7 connector 6-ft 250V/2.5A	A	-
4.	154-02900014	PHIHONG USA	AC15WUK	Cable AC Power, Europe, BS1363A plug to IEC60320 C7 connector 6-ft 250V/2.5A	A	-
5.	144-07650009	Switchcraft	767KS15	Connector DC Power Plug, 2.1mm, 5.5mm circular	B	-
6.	N/A	CORCOM	3EZ1	Filter for Sonar Head input power	B	-

11.4 Tools and Consumables

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
1.	159-04000608	PARKER	Plastic o-ring pick	O-ring extraction tool, plastic	B	-
2.	159-04000613	SEA CON	MINK-DOITHANDLE	Dove-tail O-ring Installation Tool (DOIT) for oring installation in the CCP/CCPL (Cable Connector Plug)	B	-
3.	159-0002B	Dow Corning	DOW55-150GM	O-ring grease – Silicon	B	-

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
4.	159-0072	McMaster-Carr	10295K29	Nickel Anti-seize Lubricant – 1/4 oz Tube	B	-
5.	159-0074	Parker	OL400	O-ring grease – Silicon 4 fl-oz	B	-
6.	159-0079	D.A. Stuart	Aqua Shield	Water Resistant Grease – 8oz Tube	B	-
7.	159-04000602	Loctite	LCT51605	Nickel Anti-seize Lubricant – 9 oz can	B	-
8.	N/A	Fluke	Fluke 87V/AEK	Digital Multi-Meter (DMM)	A	-
9.	N/A	Fluke	CIQ-100	Ethernet Cable Qualification Tester – Fluke CableIQ™	A	-
10.	N/A	Fluke	DTX-1800	Ethernet Cable Certification Tester – DTX CableAnalyzer™	B	-
11.	N/A	Eagle Plastic Devices	382-2094C	Crimp Tool for RJ45 plug	B	-

11.5 Mounting Brackets

Item	KML Part No.	Manufacturer	Mfg. Part No.	Description	Maintenance Level	
					Replace	Repair
1.	422-44050000	KML	422-44050000	Bracket Kit, M3 Sonar Head to Rotator (OE10-102 / OE10-103), Stainless Steel	A	-
2.	422-44060000	KML	422-44060000	Bracket Kit, Pole Mount to Rotator (OE10-103), Stainless Steel	A	-
3.	422-44070000	KML	422-44070000	Adapter Plate Kit, Pole Mount to Rotator (OE10-102), Stainless Steel	A	-
4.	422-44120000	KML	422-44120000	Bracket Kit, Sonar Head to Pole Mount Tilt 15°, SS	A	-
5.	422-44130000	KML	422-44130000	Bracket Kit, Sonar Head to Pole Mount Downlooking, SS	A	-
6.	422-44140000	KML	422-44140000	Bracket Kit, Sonar Head to Pole Mount Tilt 10°, SS	A	-
7.	422-44150000	KML	422-44150000	Bracket Kit, Sonar Head to Pole Mount Tilt 0°, SS	A	-
8.	422-44170000	KML	422-44170000	Bracket Kit, Pole Mount to M3 Sonar Head and Rotator (OE10-102), SS	A	-

12 ATTACHMENTS

The following attachments include drawings to assist with the installation, troubleshooting, repair and maintenance of the M3 Sonar. These documents were the most current at the time this manual was printed. Drawings should be replaced with the most recent revisions as they become available. Contact your local Kongsberg Mesotech Ltd. representative to ensure your drawings are up to date.

Document List

Drawing Number	Description
421-21821000	M3 Sonar Head, Power & Telemetry Connector SEA CON- Drawing
421-21981000	M3 Sonar Head, Power & Telemetry Connector SEANET - Drawing
436-02381000	M3 Cable Whip, Power & Telemetry – Drawing
436-02391000	M3 Cable, Power & Telemetry – Drawing
436-02811000	M3 Cable, Synchronization, SEA CON MIND-4-CCP – Drawing
436-02831000	M3 Cable Whip, Synchronization, SEA CON MIND-4-CCP – Drawing
922-20011001	M3 Sonar Head 500m, SEA CON – Outline Drawing
922-20021001	M3 Sonar Head 4000m, SEA CON – Outline Drawing
922-20041001	M3 Sonar Head 4000m, SEANET – Outline Drawing
922-20051001	M3 Sonar Head 4000m, with Synchronization, SEA CON – Outline Drawing
922-20061001	M3 Sonar Head 4000m, with Synchronization, SEA CON – Outline Drawing
422-44051000	Bracket, M3 Sonar Head to Rotator (OE10-102 / OE10-013) – Assembly Drawing
422-44061000	Bracket, Pole Mount to Rotator (OE10-103) – Assembly Drawing
422-44061001	M3 Sonar Head 500m, SEA CON, with Rotator (OE10-103) – Outline Drawing
422-44071000	Adapter Plate, Pole Mount to Rotator (OE10-102) – Assembly Drawing
422-44121000	Bracket, M3 Sonar Head to Pole Mount – Assembly Drawing
422-44121001	Bracket, M3 Sonar Head to Pole Mount – Outline Drawing
422-44131000	Bracket, M3 Sonar Head to Pole Mount, Downlooking – Assembly Drawing
422-44131001	Bracket, M3 Sonar Head to Pole Mount, Downlooking – Outline Drawing
422-44171000	M3 Sonar Head 4000m, SEA CON, with Rotator (OE10-102) – Assembly Drawing
422-44171001	M3 Sonar Head 4000m, SEA CON, with Rotator (OE10-102) – Outline Drawing

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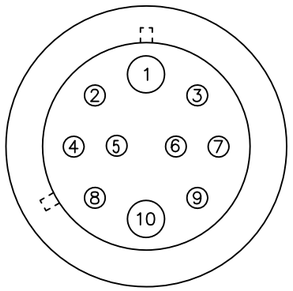
DWG NO. 421-21821000 | SHT 1 | ISS 1.1



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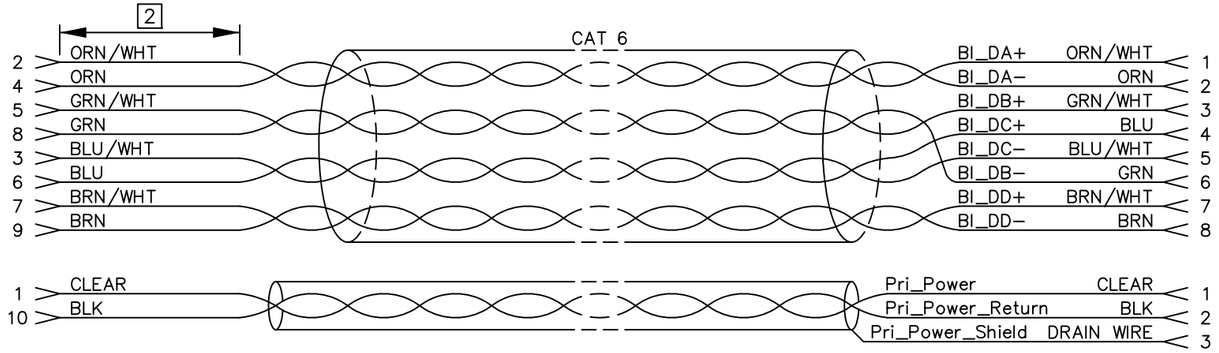

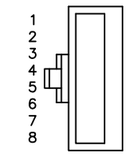

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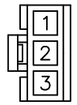

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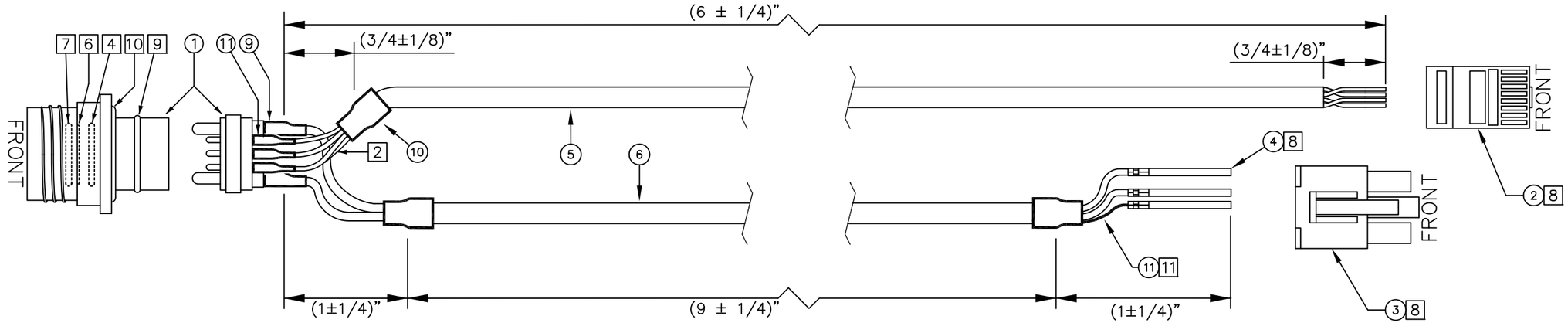

NOTES:

1 ALL PARTS AND PROCESSES USED IN THIS ASSEMBLY MUST COMPLY WITH THE RoHS DIRECTIVE.
2 MAXIMUM 1/2" UNTWISTED.
3 SOLDER AND HEATSHRINK WIRES.
4 INSTALL 1st O-RING.
5 INSERT CONNECTOR INTO HOUSING FROM FRONT.
6 INSTALL SPRING CLIP.
7 INSTALL 2nd O-RING.
8 ADD RJ45 CONNECTOR, CRIMPS, AND MOLEX HOUSING.
9 INSTALL 3rd O-RING.
10 PUT 4th O-RING IN A PLASTIC BAG AND KEEP WITH ASSEMBLY.
11 HEATSHRINK DRAIN WIRE.

ISS	DESCRIPTION	DATE
1.1	SEE ECO 4934	2012 MAR 02
	REVISIONS	

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APPROVALS		DATE
DRAWN	BH	2011/06/29
REVISED	BH	2012/03/02
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ISSUED		

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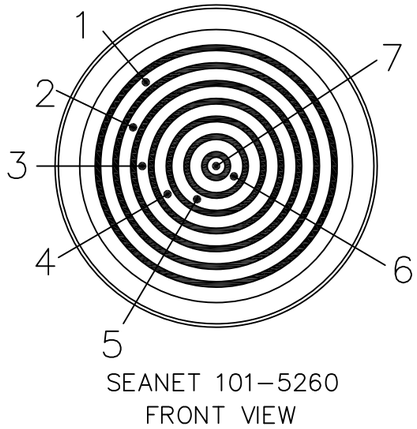
M3
POWER/TELEMETRY HEAD CONNECTOR
WIRING ASSEMBLY

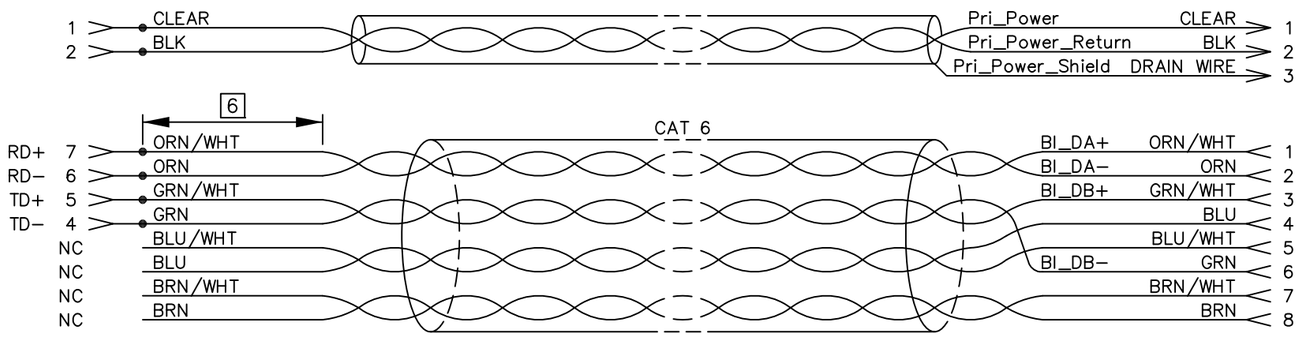
SIZE	NSCM NO	TYPE	DWG NO.	ISS
B	1C965	MD	421-21821000	1.1

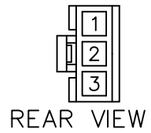
SCALE: – | W.O. NO. | SHEET 1 OF 1

DWG NO. 421-21981000 | SHT 1 | ISS 1.1



SEANET 101-5260
FRONT VIEW





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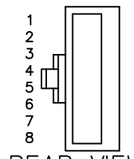

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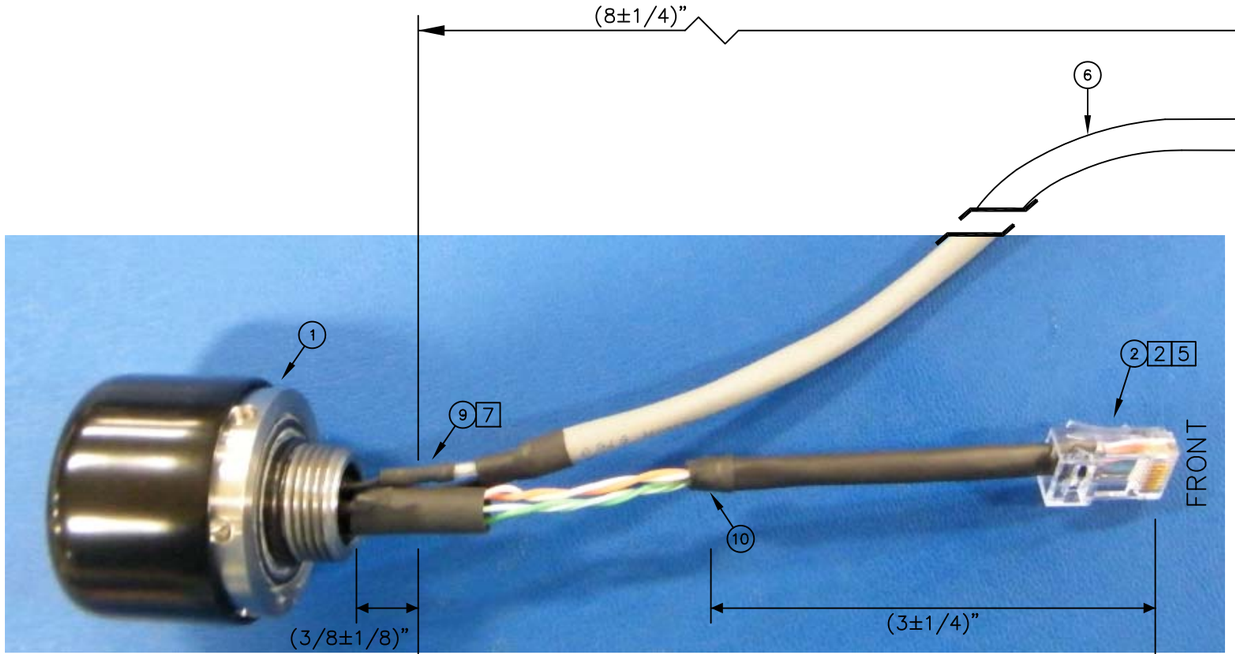

NOTES:

1 ALL PARTS AND PROCESSES USED IN THIS ASSEMBLY MUST COMPLY WITH THE RoHS DIRECTIVE.
2 ADD RJ45 AND MOLEX CONNECTORS BEFORE SOLDERING.
3 MAKE WIRE TO THE CENTER (PIN 2) 1/8" LONGER THAN THE OTHER ONES.
4 HEATSHRINK DRAIN WIRE.
5 ADD RJ45 CONNECTOR, CRIMPS, AND MOLEX HOUSING.
6 MAXIMUM 1/2" UNTWISTED.
7 SOLDER AND HEATSHRINK WIRES.

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ISS	DESCRIPTION	DATE
1.1	ECO 5071	2012/12/10

REVISIONS

Kongsberg Mesotech Ltd.

M3
POWER/TELEMETRY HEAD CONNECTOR
WIRING ASSEMBLY

SIZE	NSCM NO	TYPE	DWG NO.	ISS
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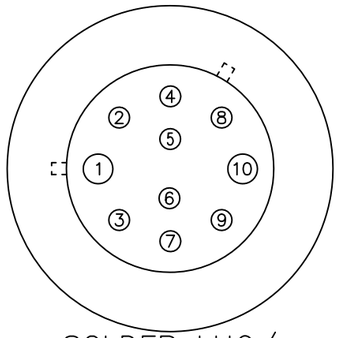
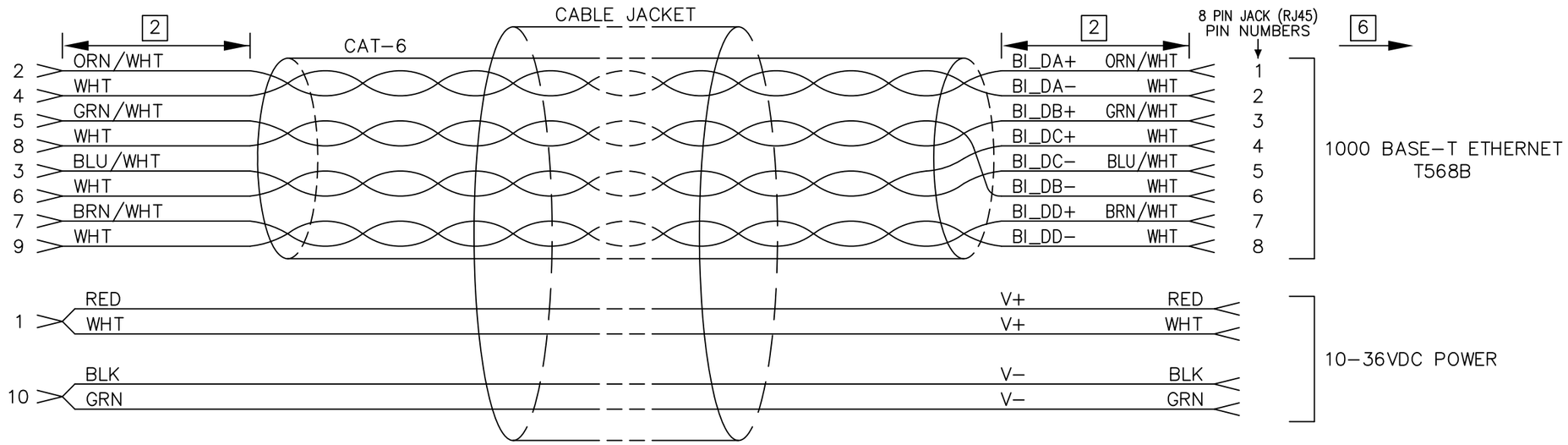
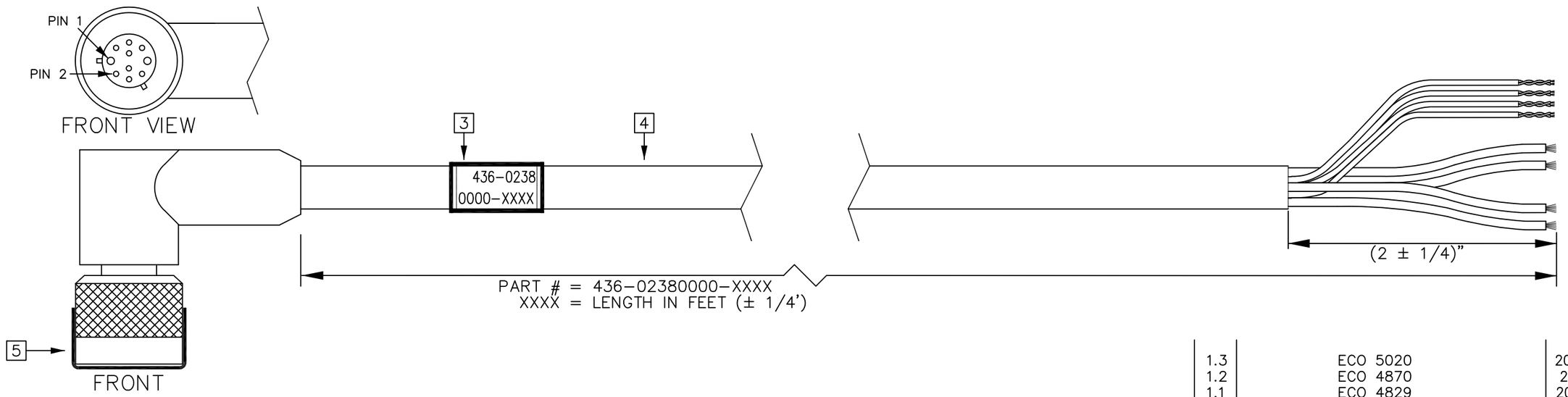
DWG NO. 436-02381000 | SHT 1 | ISS 1.3







NOTES:

1 ALL PARTS AND PROCESSES USED IN THIS ASSEMBLY MUST COMPLY WITH THE RoHS DIRECTIVE.
2 MAXIMUM 1/2" UNTWISTED.
3 PRINT PART NUMBER USING 1/8" BLACK TEXT ON WHITE, THEN INSTALL CLEAR HEATSHRINK OVER.
4 CABLE MINIMUM BEND RADIUS = 5".
5 INSTALL PUSH-ON PROTECTIVE CAP (SUPPLIED WITH CONNECTOR).
6 USE ONLY CAT-5E OR CAT-6 RATED UNDERWATER CONNECTOR.

ISS	DESCRIPTION	DATE
1.3	ECO 5020	2012 AUG 14
1.2	ECO 4870	2011 OCT 4
1.1	ECO 4829	2011 AUG 10
1.0	ECO 4796	2011 MAY 31

REVISIONS

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ISSUED		

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Kongsberg Mesotech Ltd.

M3 SONAR
CABLE POWER/TELEMETRY WHIP
SEACON MINK-10-CCPL

SIZE	NSCM NO	TYPE	DWG NO.	ISS
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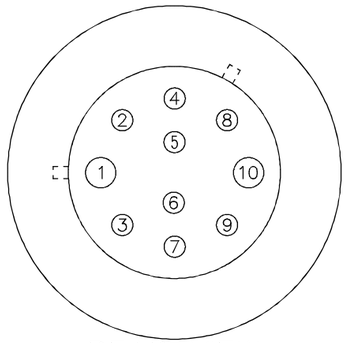
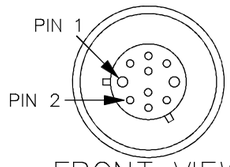
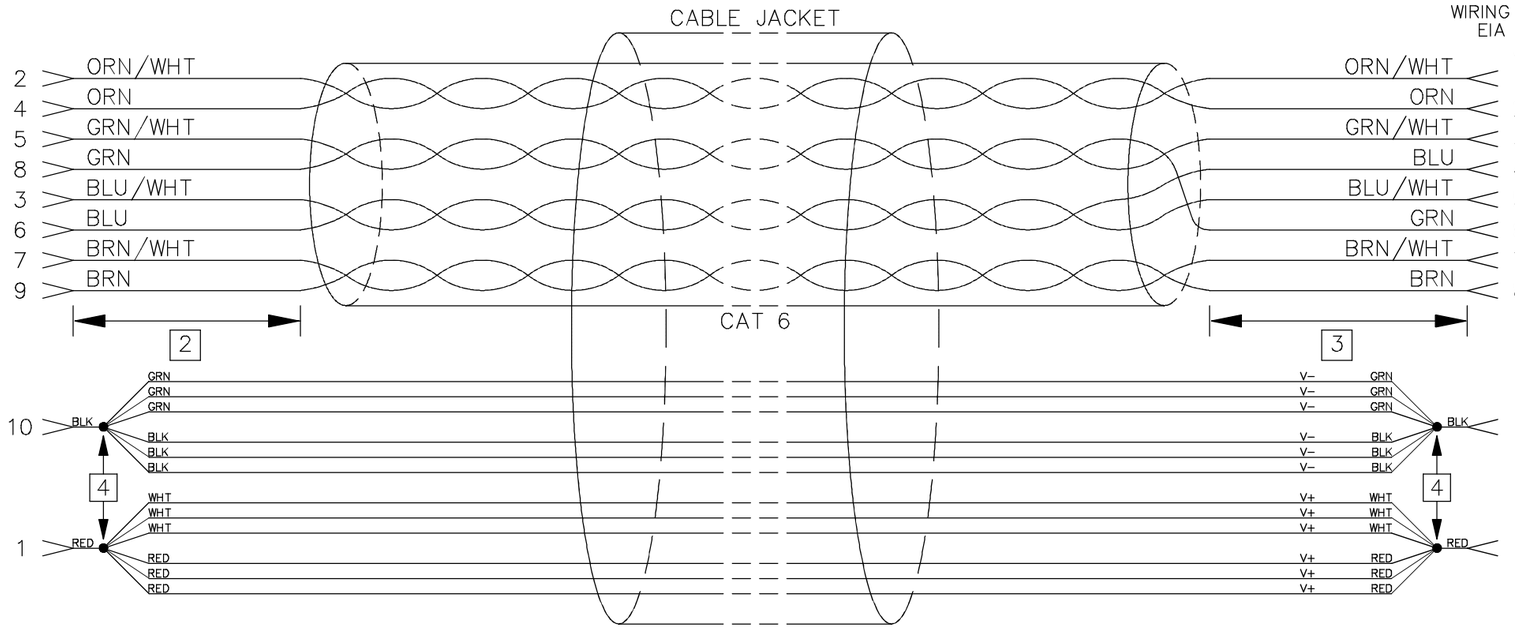
DWG NO. 436-02391000 | SHT 1 | ISS 1.4

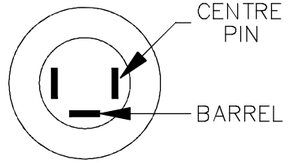


REAR VIEW
(ZOOMED)

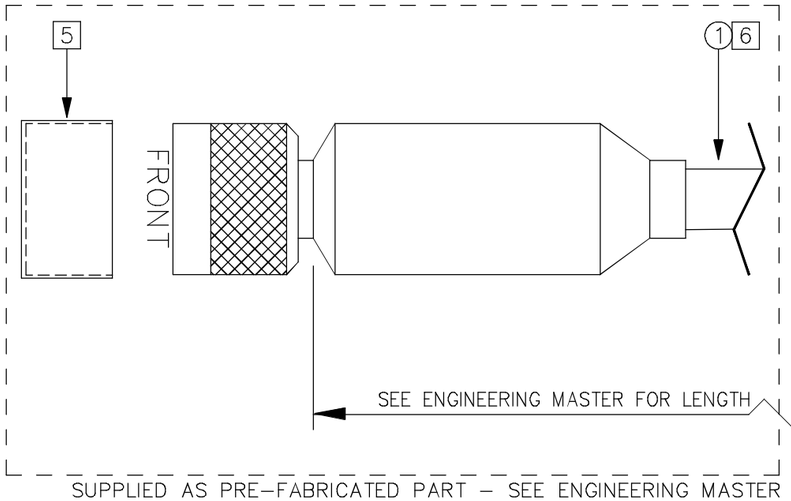


FRONT VIEW

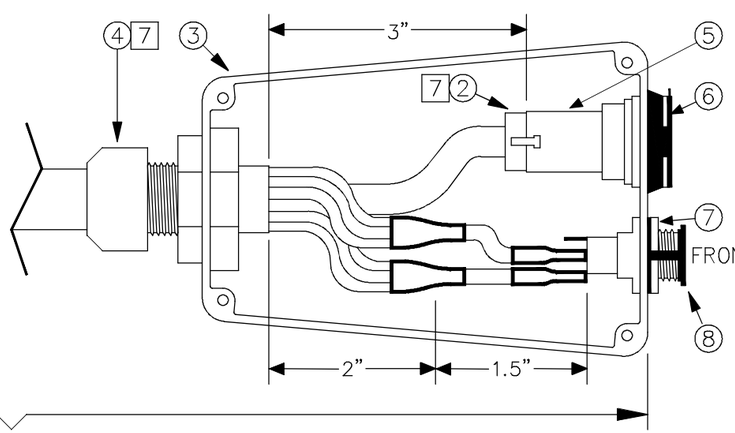


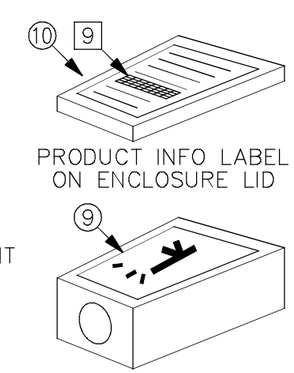


REAR VIEW
(ZOOMED)



SUPPLIED AS PRE–FABRICATED PART – SEE ENGINEERING MASTER





NOTES:

1 ALL PARTS AND PROCESSES USED IN THIS ASSEMBLY MUST COMPLY WITH THE RoHS DIRECTIVE.

2 STRIP CABLE BY 1.5" +/– 0.10". MAXIMUM 0.5" UNTWISTED.

3 STRIP CABLE BY 3.5" +/– 0.25". MAXIMUM 0.5" UNTWISTED.

4 SPLICE 6x24AWG WIRES TO 1x18AWG WIRE, COVER SPLICE WITH HEATSHRINK.

5 INSTALL CAP (SUPPLIED WITH CONNECTOR).

6 CABLE MINIMUM BEND RADIUS = 5".

7 INSTALL CABLE GLAND (PAGE 2, PHOTO 1).
INSTALL RJ45 JACK:
a – REMOVE JACK PLUG FROM RJ45 JACK ⑤, THEN INSTALL OUTER PIECE AND HAND–TIGHTEN WITH 24MM SOCKET (COVER BEND ON TOP).
b – INSTALL WIRES AS PER WIRING DIAGRAM (PAGE 2, PHOTO 2).
c – TEST WITH 1 Gbps ETHERNET TESTER (FLUKE CABLE IQ TESTER OR EQUIVALENT).

8 INSTALL POWER JACK CONNECTOR (PAGE 2, PHOTO 3):
a – INSTALL O–RING, THEN INSTALL CONNECTOR THRU THE HOLE IN THE BOX.
b – INSTALL COVER (WITH THE BEND ON TOP), WASHER, THEN THE NUT.
c – INSTALL WIRES AS PER WIRING DIAGRAM.

9 INSTALL A STICKER WITH CABLE P/N ON ENCLOSURE LID.

ISS	DESCRIPTION	DATE
1.4	SEE ECO 5127	2013/05/15
1.3	SEE ECO 5057	2012/11/30

REVISIONS

DO NOT SCALE DRAWING

APPROVALS		DATE
DRAWN	BH	2011/09/26
REVISED	BH	2013/05/15
CHECKED		
ENGR		
ISSUED		

CONFIDENTIAL DO NOT COPY

Kongsberg Mesotech Ltd.

M3 SONAR
POWER/TELEMETRY CABLE SEA CON

SIZE	NSCM NO	TYPE	DWG NO.	ISS
B	1C965	MD	436-02391000	1.4

SCALE: – | W.O. NO. | SHEET 1 OF 2

PHOTO 1

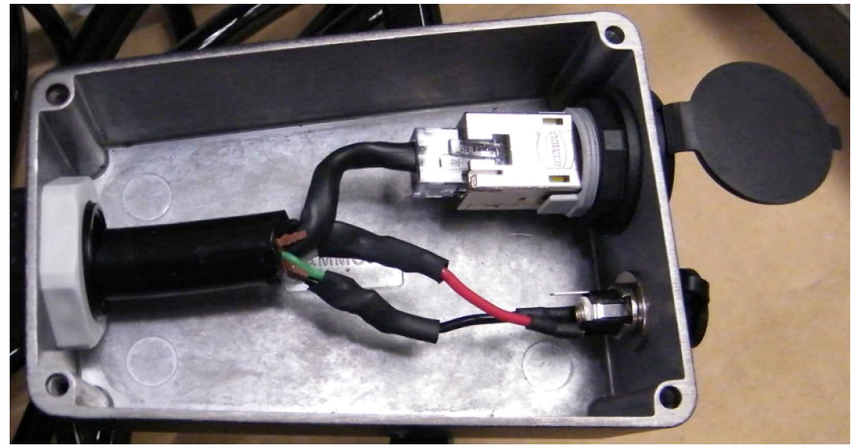


PHOTO 3

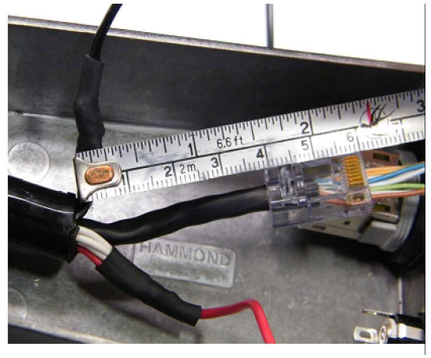


PHOTO 2

APPROVALS		DATE
DRAWN	BH	2011/09/26
REVISED	BH	2013/05/15
CHECKED		
ENGR		
ISSUED		

CONFIDENTIAL DO NOT COPY

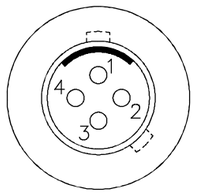
Kongsberg Mesotech Ltd.

M3 SONAR
POWER/TELEMETRY CABLE SEA CON

SIZE	NSCM NO	TYPE	DWG NO.	ISS
B	1C965	MD	436-02391000	1.4

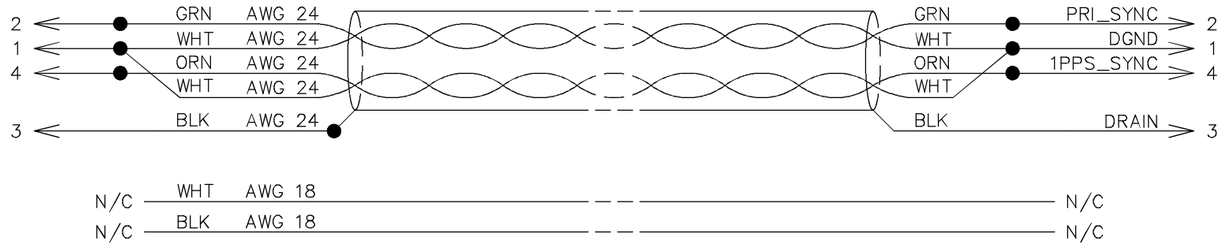
SCALE: – | W.O. NO. | SHEET 2 OF 2

DWG NO. 436-02811000	SHT 1	ISS 1.1

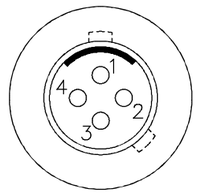


SEACON
MIND-CCP
4#22

REAR VIEW

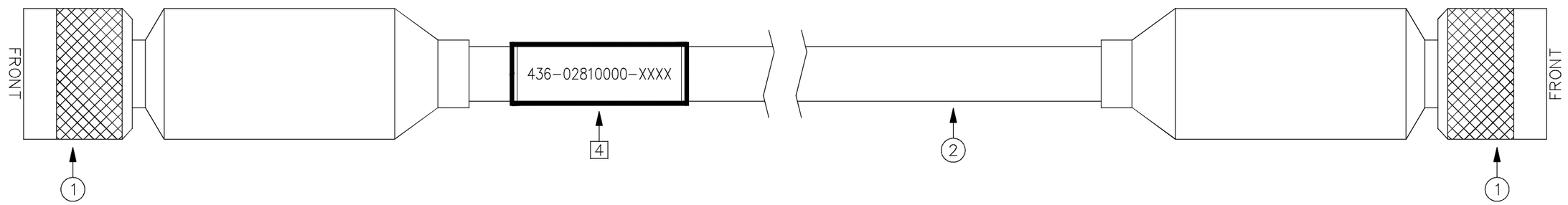


FALMAT FM022208-03



SEACON
MIND-CCP
4#22

REAR VIEW



NOTES:

1. ALL PARTS AND PROCESSES USED IN THIS ASSEMBLY MUST COMPLY WITH THE RoHS DIRECTIVE.
2. SOLDER AND HEATSHRINK WIRES.
3. LENGTH (IN FT, ± 0.1 FT.) = XXXX IN PART# nnn-nnnn0000-XXXX.
4. PRINT PART# USING 1/8" BLACK TEXT ON WHITE, THEN COVER WITH CLEAR HEATSHRINK.

DO NOT SCALE DRAWING

APPROVALS		DATE
DRAWN	BH	2013/07/20
REVISED	IB	2013/08/15
CHECKED		
ENGR		
ISSUED		
CONFIDENTIAL DO NOT COPY		

ISS	DESCRIPTION	DATE
1.1	ECO# 5174	2013/08/15

REVISIONS

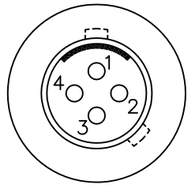
Kongsberg Mesotech Ltd.

M3
DUAL HEAD SYNC
CABLE ASSEMBLY

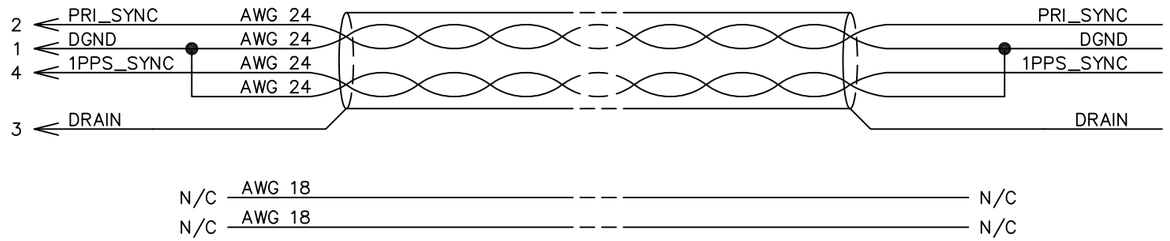
SIZE	NSCM NO	TYPE	DWG NO.	ISS
B	1C965	MD	436-02811000	1.1

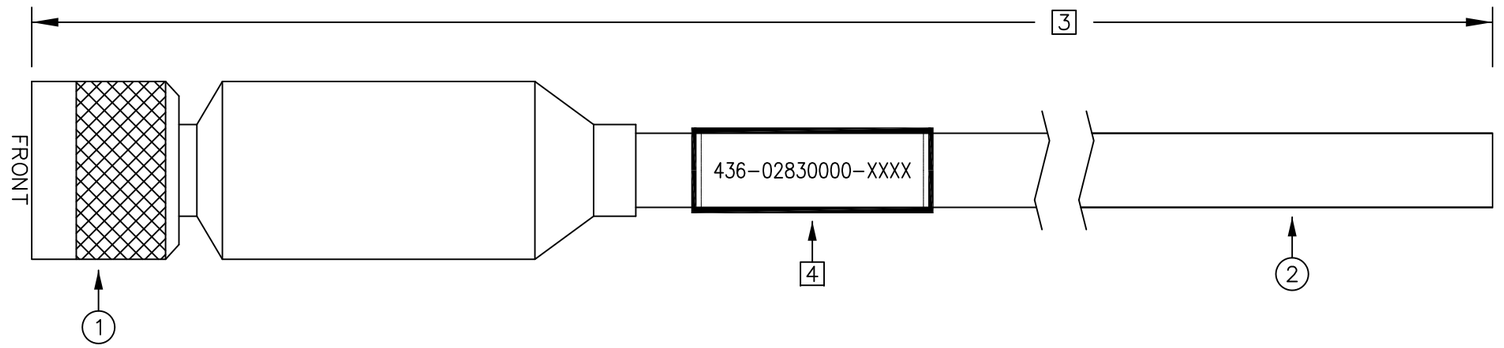
SCALE: – | W.O. NO. | SHEET 1 OF 1

DWG NO. 436-02831000	SHT 1	ISS 1.0



4#22
REAR VIEW





NOTES:

1 ALL PARTS AND PROCESSES USED IN THIS ASSEMBLY MUST COMPLY WITH THE RoHS DIRECTIVE.
2 SOLDER AND HEATSHRINK WIRES.
3 LENGTH (IN FT, ± 0.1 FT.) = XXXX IN PART# nnn-nnnn0000-XXXX.
4 PRINT PART# USING 1/8" BLACK TEXT ON WHITE, THEN COVER WITH CLEAR HEATSHRINK.

DO NOT SCALE DRAWING

APPROVALS	DATE
DRAWN BH	2013/07/20
REVISED	
CHECKED	
ENGR	
ISSUED	
CONFIDENTIAL DO NOT COPY	

ISS	DESCRIPTION	DATE
	REVISIONS	

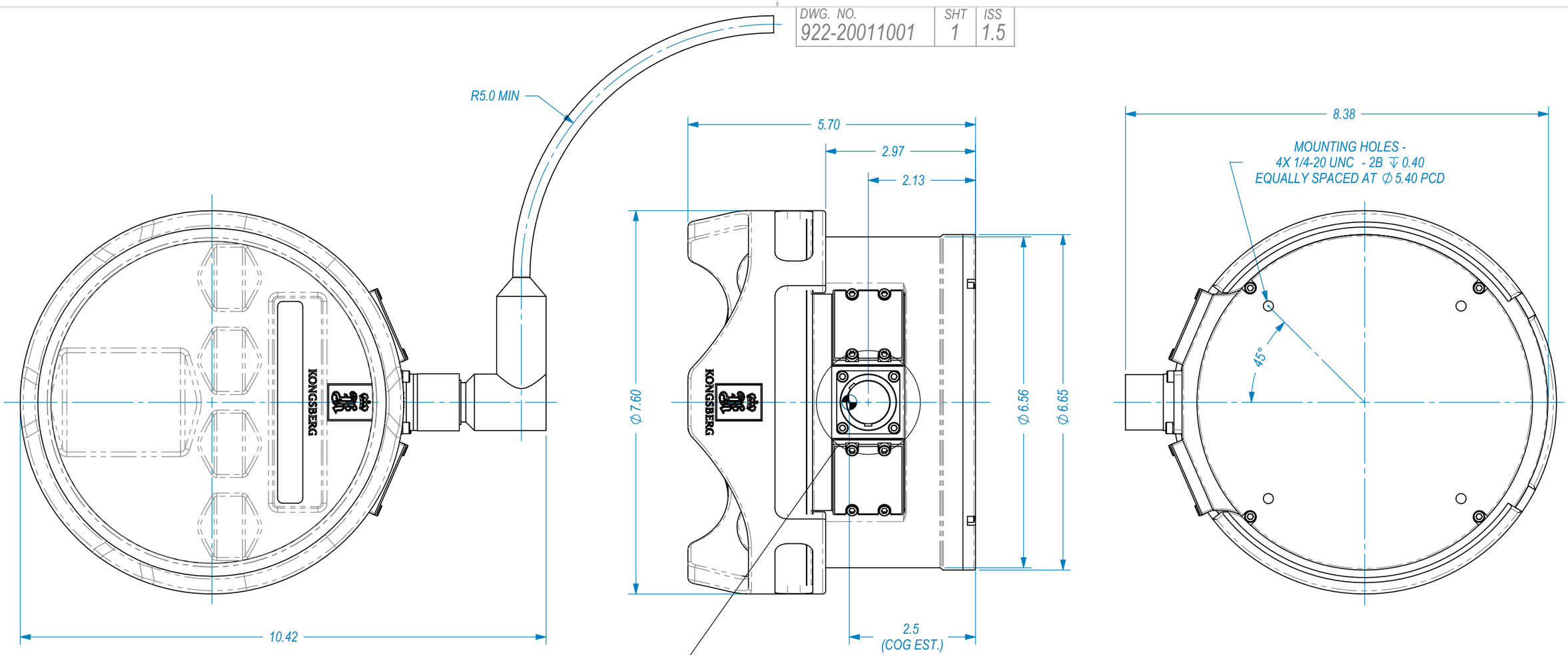
Kongsberg Mesotech Ltd.

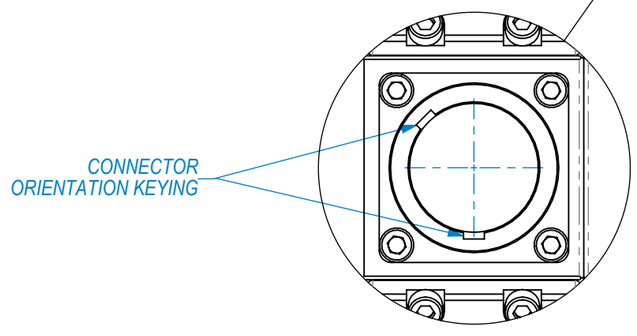
DWG CABLE WHIP
M3 HEAD SYNC

SIZE	NSCM NO	TYPE	DWG NO.	ISS
B	1C965	MD	436-02831000	1.0

SCALE: – | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
922-20011001	1	1.5





DETAIL A
SCALE 1 : 1

NOTES:

1. MAXIMUM OPERATING DEPTH: 500msw / 1640fsw.
2. WEIGHT IN AIR: 4.6kg [10.1lbs] ESTIMATED
3. WEIGHT IN SEA WATER: 1.7kg [3.7lbs] ESTIMATED
4. STANDARD CONNECTOR: SEACON MINK-10-FCRL (2 #14, 8 #20).
5. WETTED MATERIALS: 6061-T6 ALUMINIUM, 300 SERIES STAINLESS STEEL, ELASTOMERIC POLYURETHANE.
6. DIMENSIONS ARE NOMINAL, IN INCHES. DO NOT SCALE.

ISS	DESCRIPTION	DATE
1.5	ECO 5047, ECO 5048	12/10/04
1.4	ECO 4974	12/05/02
1.3	ECO 4858	11/10/04
1.2	ECO 4788	11/05/12
1.1	ECO 4715	11/04/05

REVISIONS

APPROVALS	NAME	DATE
DRAWN	DL	11/02/16
REVISED	BMS	12/10/04
CHECKED		
ENGR		
ISSUED		

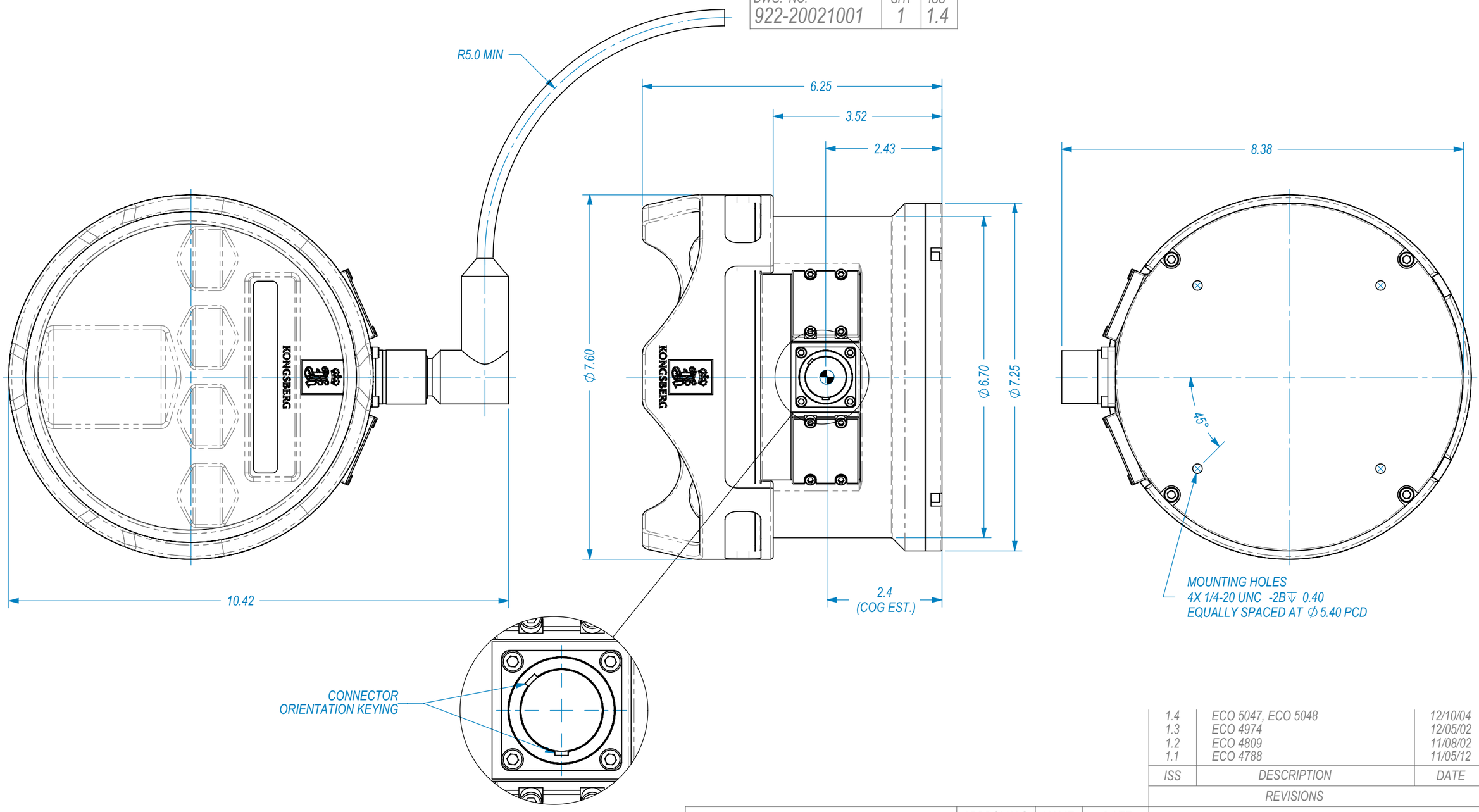
Kongsberg Mesotech Ltd.

OUTLINE AND INSTALLATION DRAWING M3 SONAR 500m VERSION

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	922-20011001	1.5

SCALE: 1:2 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
922-20021001	1	1.4



NOTES:

1. MAXIMUM OPERATING DEPTH: 4000msw / 13123fsw.
2. WEIGHT IN AIR: 8.4kg [18.5 lbs]
3. WEIGHT IN SEA WATER: 5.2kg [11.4 lbs]
4. STANDARD CONNECTOR: SEACON MINK-10-FCRL (2 #14, 8 #20)
5. WETTED MATERIALS: TITANIUM (CP AND ALLOY), 300 SERIES STAINLESS STEEL, ELASTOMERIC POLYURETHANE.
6. DIMENSIONS ARE NOMINAL, IN INCHES. DO NOT SCALE.

ISS	DESCRIPTION	DATE
1.4	ECO 5047, ECO 5048	12/10/04
1.3	ECO 4974	12/05/02
1.2	ECO 4809	11/08/02
1.1	ECO 4788	11/05/12

REVISIONS

APPROVALS	NAME	DATE
DRAWN	DL	11/02/16
REVISED	BMS	12/10/04
CHECKED		
ENGR		
ISSUED		

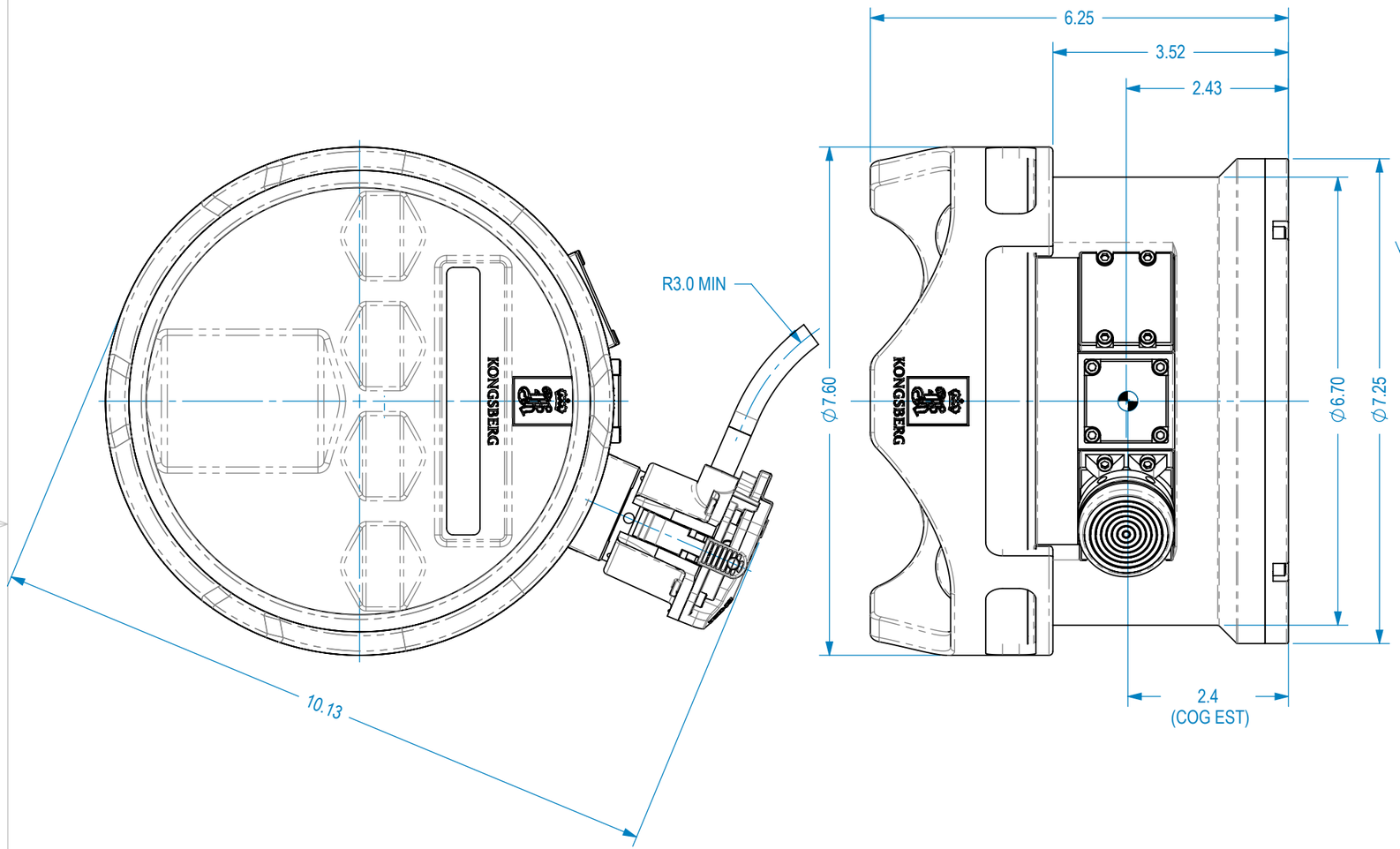
Kongsberg Mesotech Ltd.

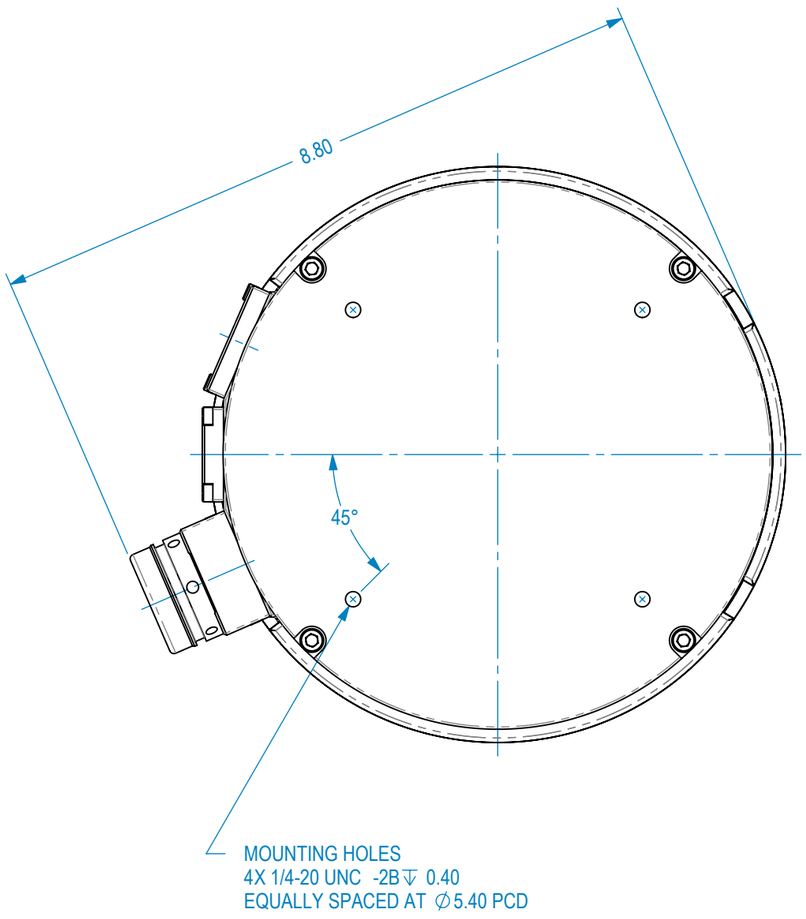
OUTLINE AND INSTALLATION DRAWING M3 SONAR 4000m VERSION

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	922-20021001	1.4

SCALE: 1:2 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
922-20041001	1	1.0





NOTES:
1. MAXIMUM OPERATING DEPTH: 4000msw / 13123fsw.
2. WEIGHT IN AIR: 8.5kg [18.8 lbs]
3. WEIGHT IN SEA WATER: 5.3kg [11.7 lbs]
4. UNDERWATER CONNECTOR: SCHILLING SEANET 101-5260
5. WETTED MATERIALS: TITANIUM (CP AND ALLOY), 300 SERIES STAINLESS STEEL, ELASTOMERIC POLYURETHANE.
6. DIMENSIONS ARE NOMINAL, IN INCHES. DO NOT SCALE.

APPROVALS	NAME	DATE
DRAWN	BMS	12/10/23
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
	REVISIONS	

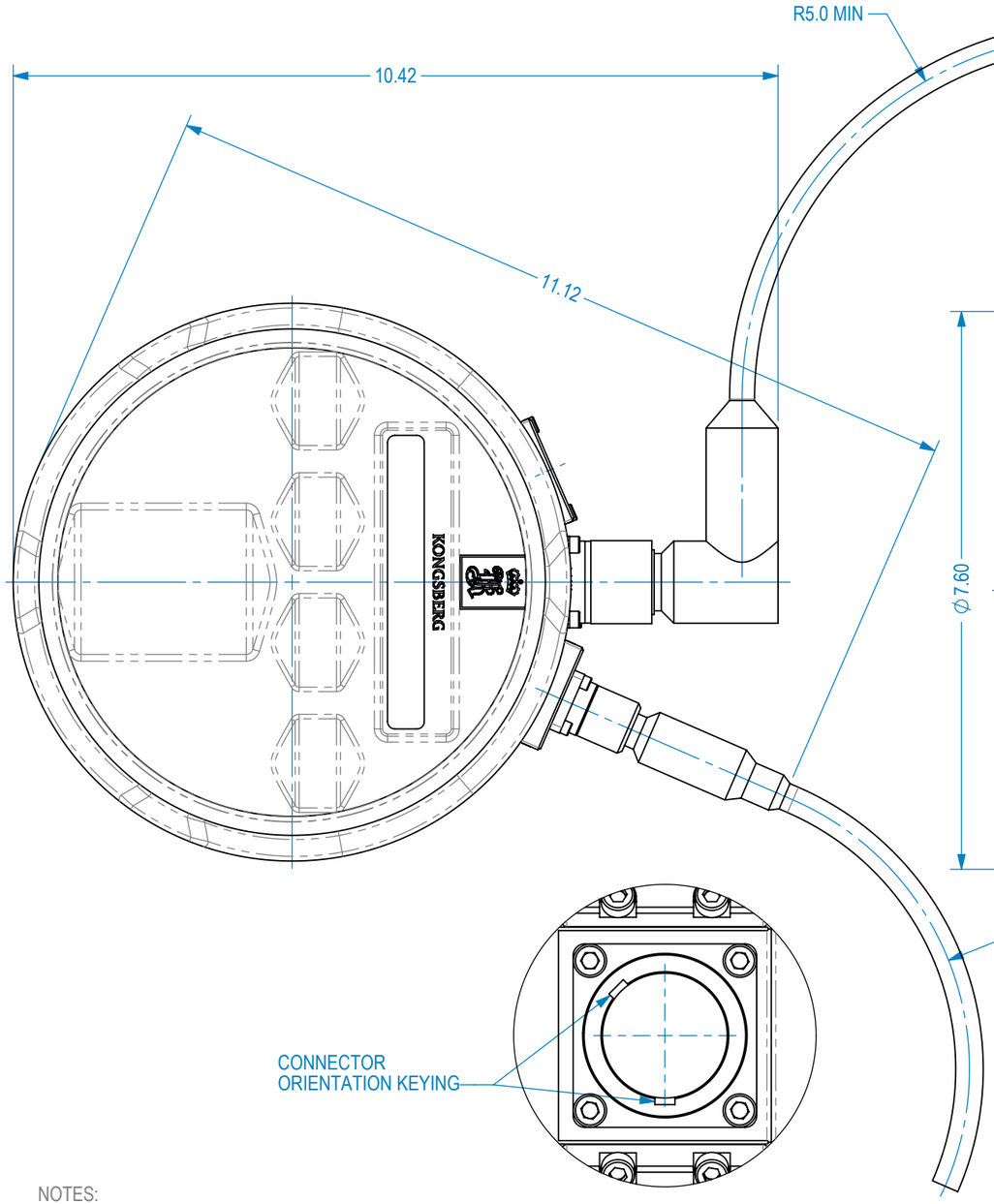
Kongsberg Mesotech Ltd.

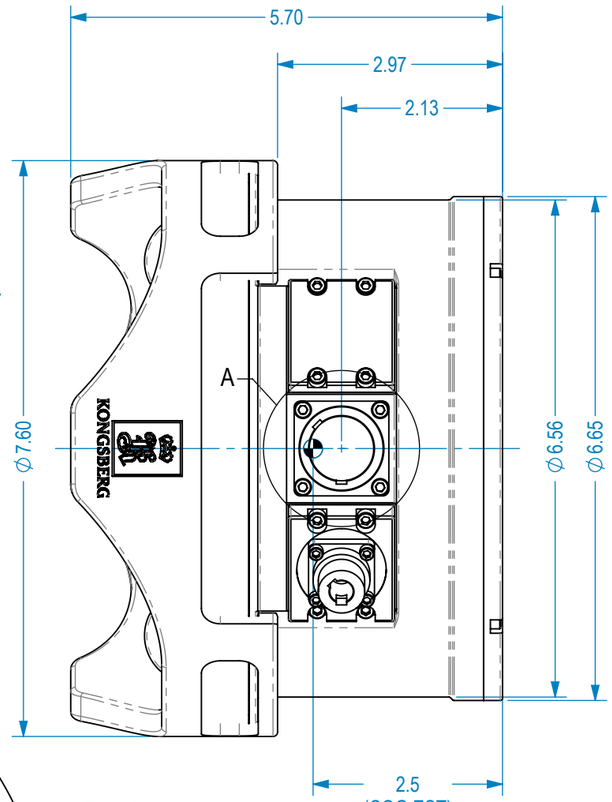
OUTLINE AND INSTALLATION DRAWING- M3 SONAR C/W SEANET CONNECTOR 4000m VERSION

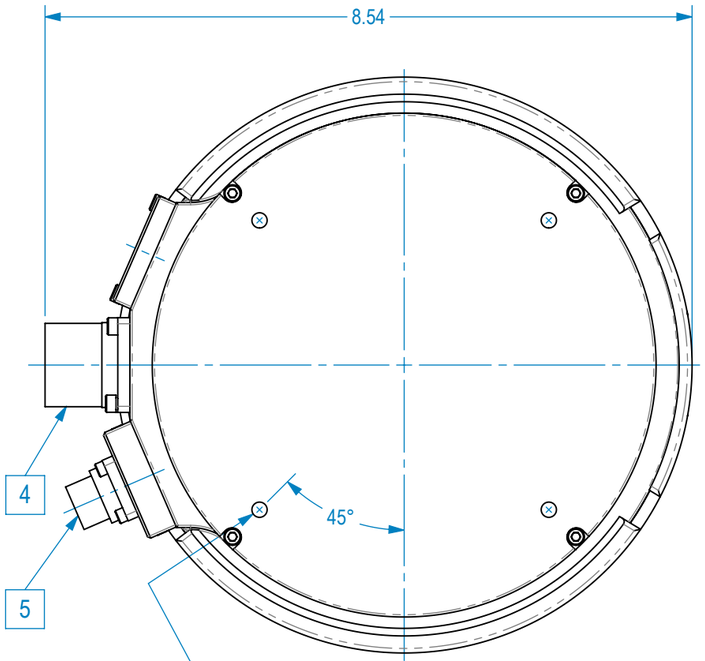
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	922-20041001	1.0

SCALE: 1:2 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
922-20051001	1	1.0







DETAIL A
POWER/TEL CONNECTOR

NOTES:
1. MAXIMUM OPERATING DEPTH: 500msw / 1640fsw.
2. WEIGHT IN AIR: 4.7kg [10.4lbs] ESTIMATED
3. WEIGHT IN SEA WATER: 1.8kg [4.0lbs] ESTIMATED
4. POWER/TEL CONNECTOR: SEACON MINK-10-FCRL (2 #14, 8 #20)
5. SYNC CONNECTOR: SEACON MIND-4-FCR (4 #22)
6. WETTED MATERIALS: 6061-T6 ALUMINUM, 300 SERIES STAINLESS STEEL, ELASTOMERIC POLYURETHANE.
7. DIMENSIONS ARE NOMINAL, IN INCHES. DO NOT SCALE.

APPROVALS	NAME	DATE
DRAWN	BMS	13/08/30
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

DO NOT SCALE DRAWING
CONFIDENTIAL DO NOT COPY.

ISS	DESCRIPTION	DATE

REVISIONS

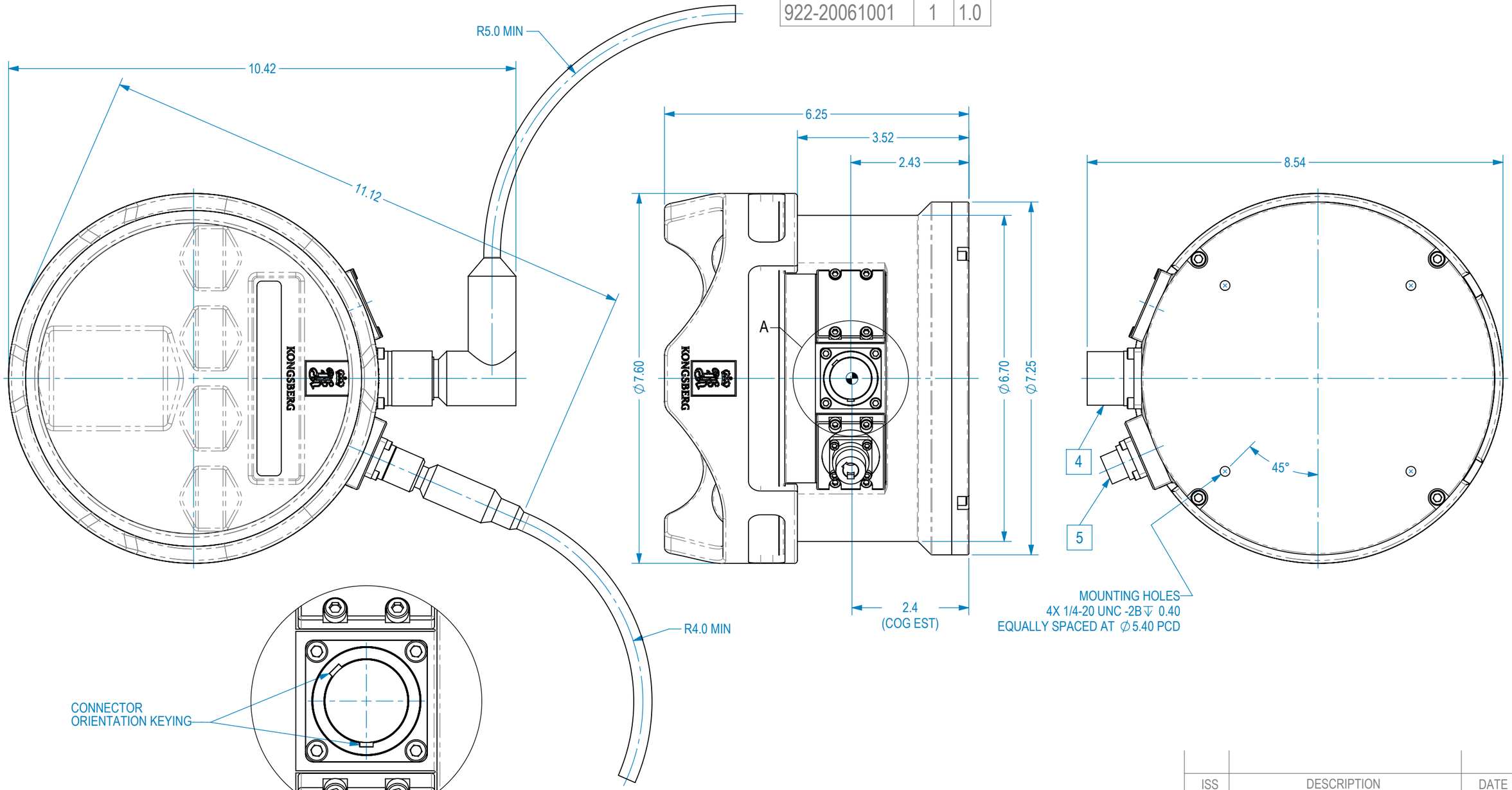
Kongsberg Mesotech Ltd.

OUTLINE AND INSTALLATION DRAWING- M3 SONAR C/W SYNC OPTION 500m VERSION

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	922-20051001	1.0

SCALE: 1:2	W.O. NO.	SHEET 1 OF 1

DWG. NO.	SHT	ISS
922-20061001	1	1.0



NOTES:
1. MAXIMUM OPERATING DEPTH: 4000msw / 13123fsw.
2. WEIGHT IN AIR: 8.5kg [18.8lbs] ESTIMATED
3. WEIGHT IN SEA WATER: 5.3kg [11.7lbs] ESTIMATED
4. POWER/TEL CONNECTOR: SEACON MINK-10-FCRL (2 #14, 8 #20)
5. SYNC CONNECTOR: SEACON MIND-4-FCR (4 #22)
6. WETTED MATERIALS: TITANIUM (CP AND ALLOY), 300 SERIES STAINLESS STEEL, ELASTOMERIC POLYURETHANE.
7. DIMENSIONS ARE NOMINAL, IN INCHES. DO NOT SCALE.

APPROVALS	NAME	DATE
DRAWN	BMS	13/08/30
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE

REVISIONS

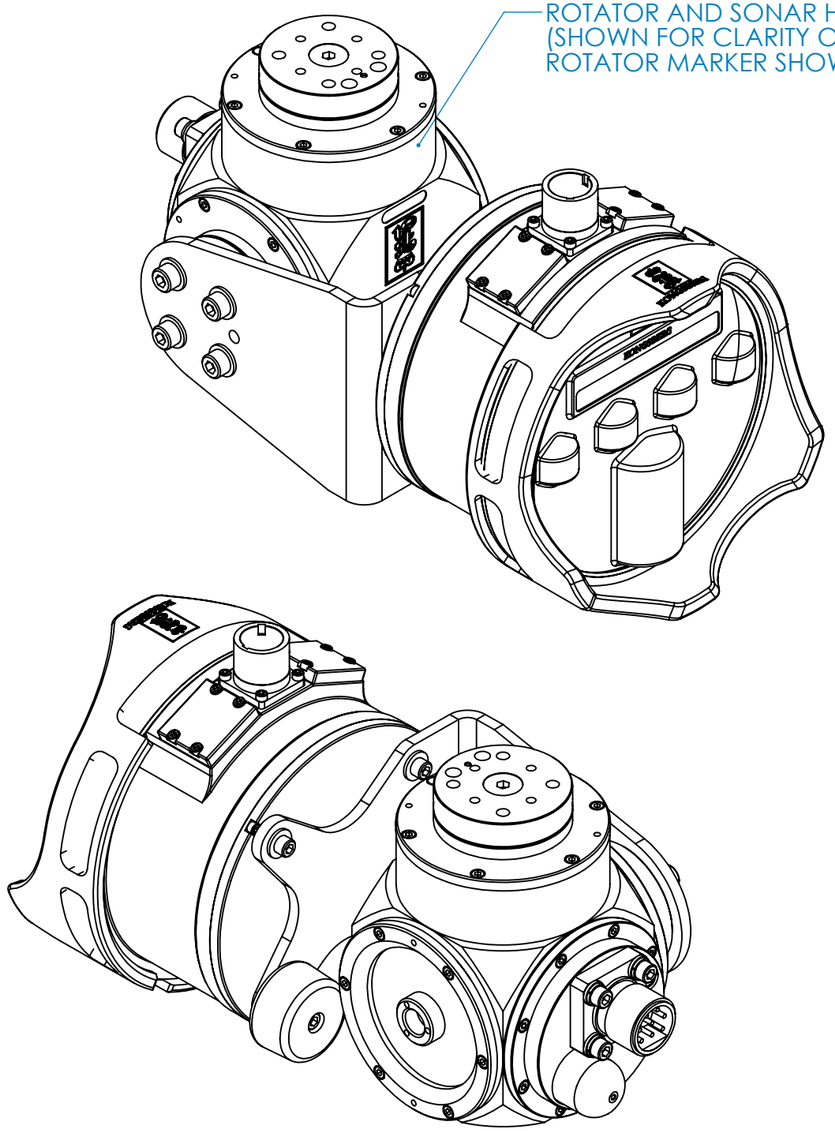
Kongsberg Mesotech Ltd.

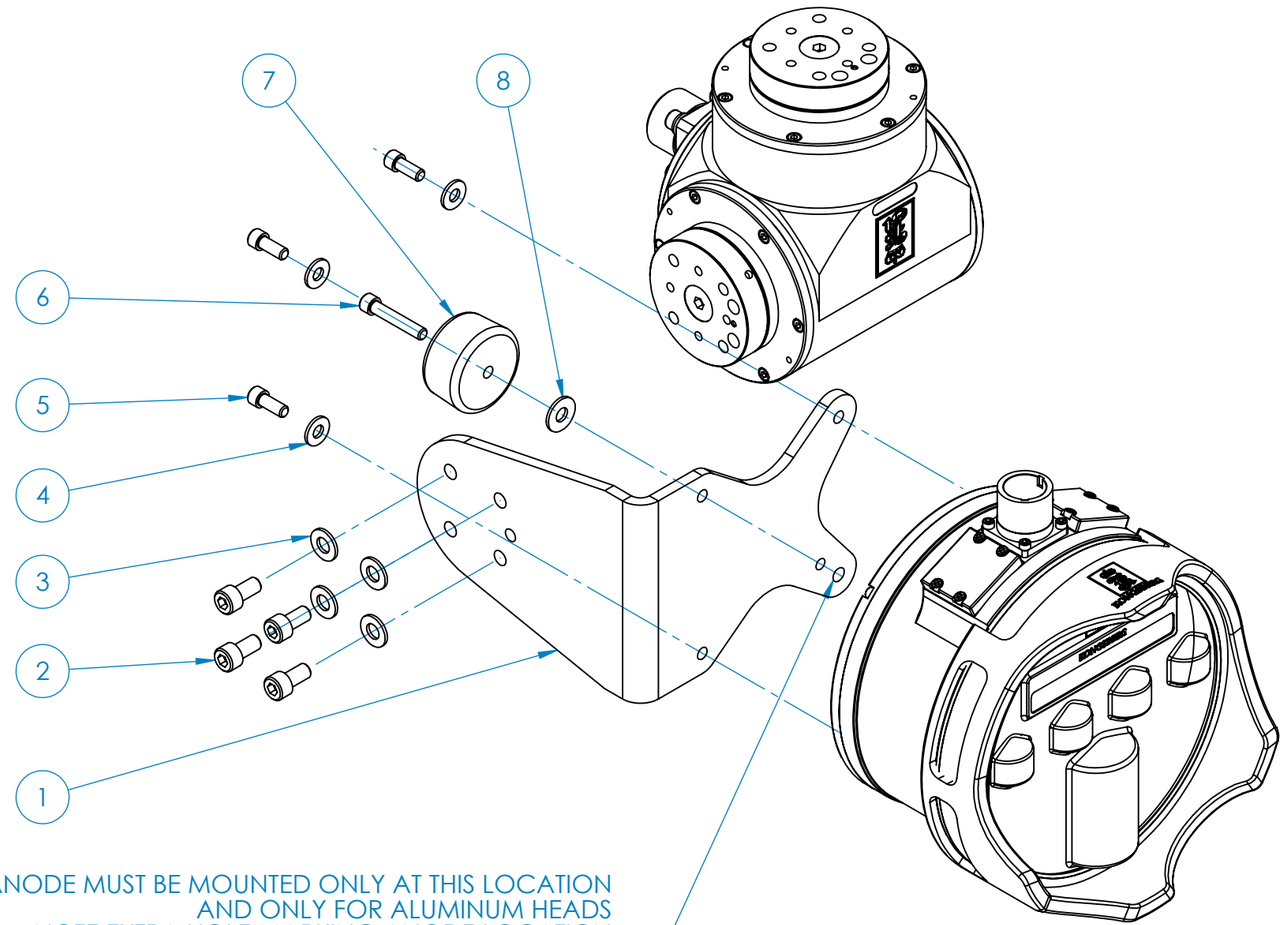
OUTLINE AND INSTALLATION DRAWING- M3 SONAR C/W SYNC OPTION 4000m VERSION

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	922-20061001	1.0

SCALE: 1:2 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
422-44051000	1	1.0





NOTE:
- LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT
- LUBRICATE BASE OF ANODE WITH WATER RESISTANT GREASE

ISS	DESCRIPTION	DATE
	REVISIONS	

APPROVALS	NAME	DATE
DRAWN	DV	2012-05-30
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

DO NOT SCALE DRAWING.
CONFIDENTIAL. DO NOT COPY.

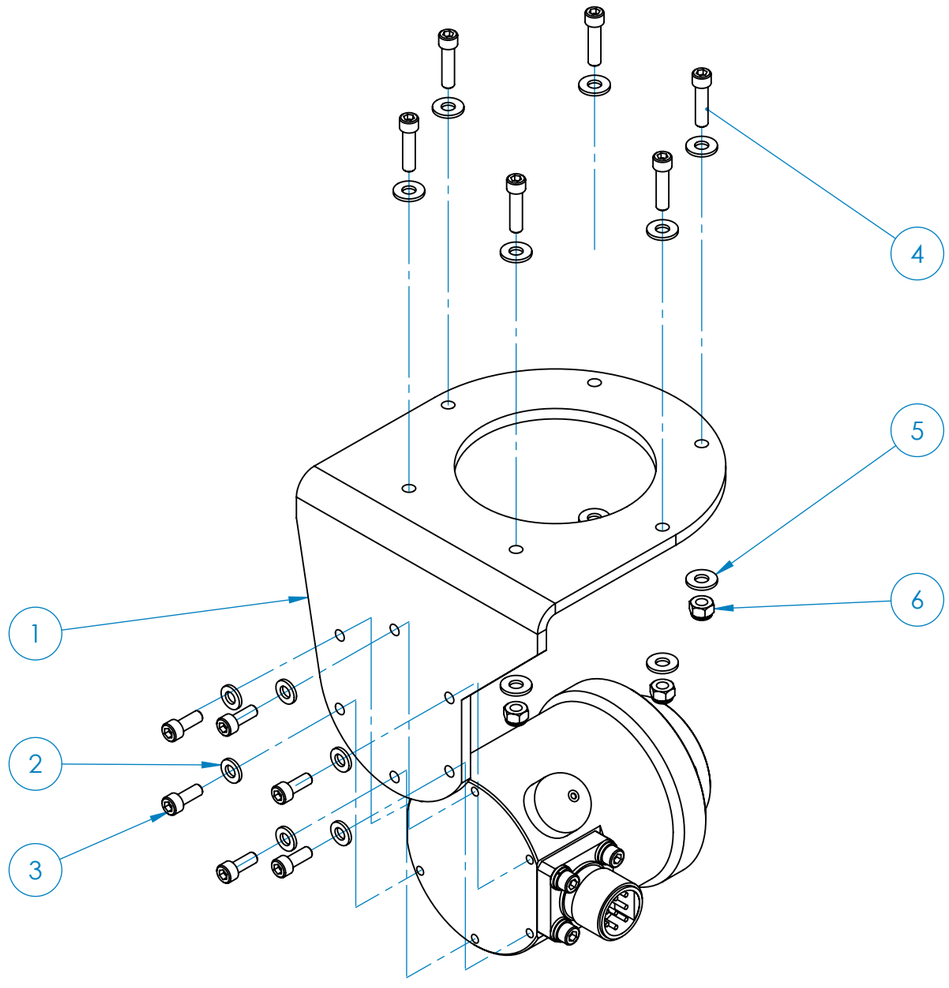
Kongsberg Mesotech Ltd.

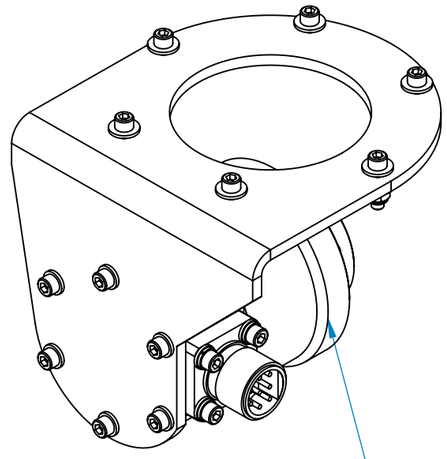
ASSEMBLY DRAWING BRACKET - M3 SONAR TO ROTATOR (OE10-102 / OE10-103)

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44051000	1.0

SCALE: 1:3 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
422-44061000	1	1.1





ROTATOR NOT INCLUDED
SHOWN FOR CLARITY ONLY

NOTE:
- LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT

APPROVALS	NAME	DATE
DRAWN	DV	2012-05-30
REVISED	BMS	2013-07-03
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
1.1	ECO 5148	2013-07-03

REVISIONS

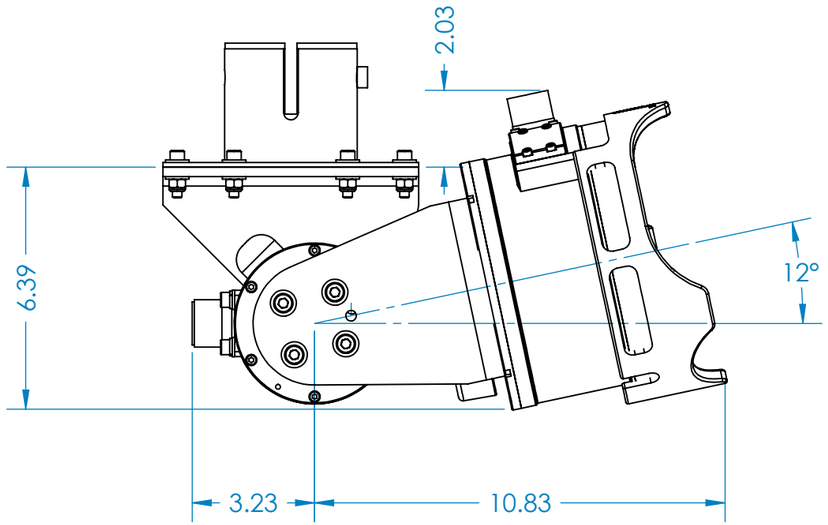
Kongsberg Mesotech Ltd.

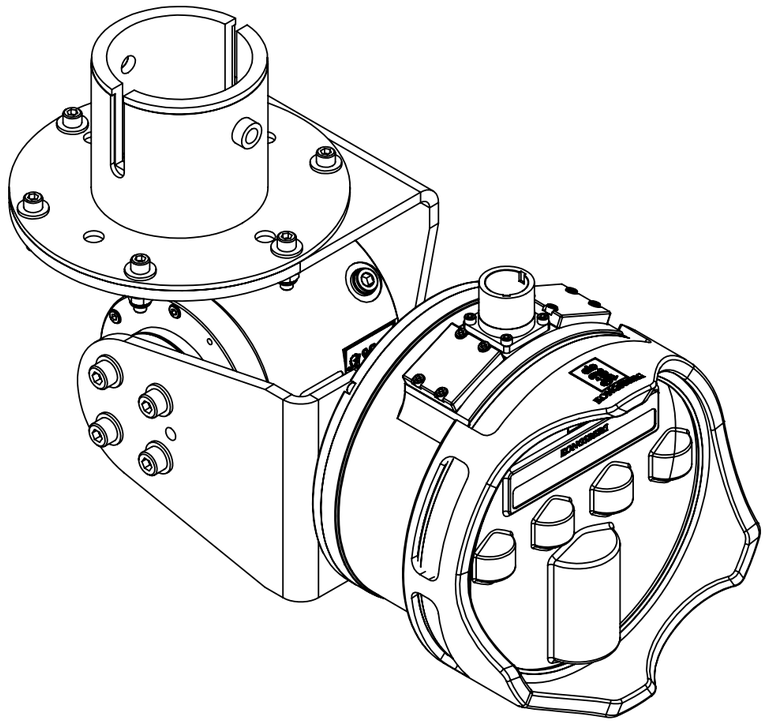
ASSEMBLY DRAWING
BRACKET - POLE MOUNT TO ROTATOR (OE10-103)

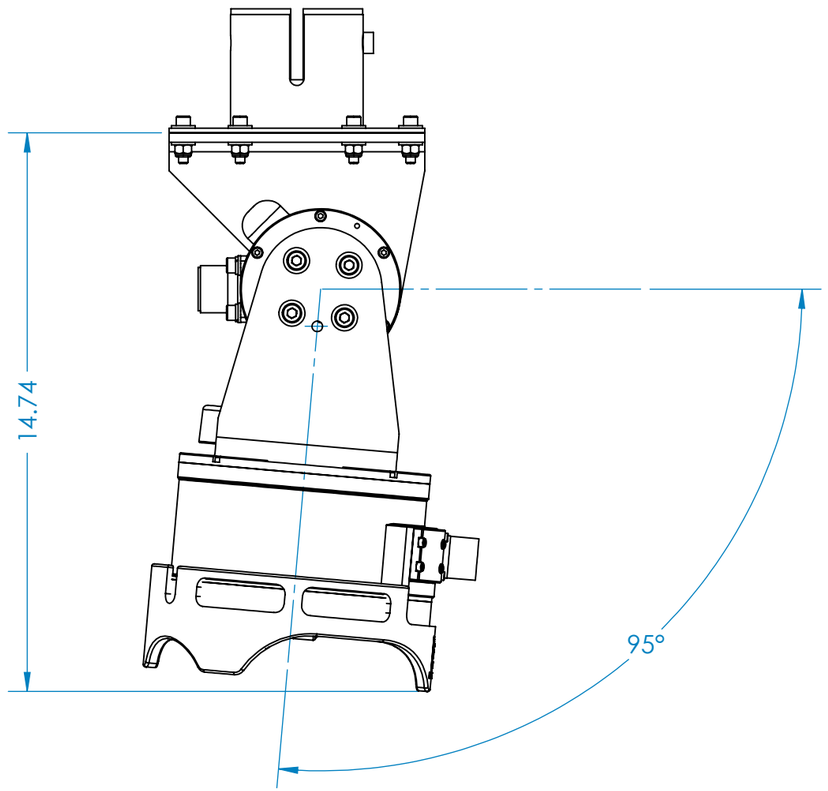
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44061000	1.1

SCALE: 1:3 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
422-44061001	1	1.0







NOTE: DIMENSIONS IN INCHES

ISS	DESCRIPTION	DATE
	REVISIONS	

APPROVALS	NAME	DATE
DRAWN	DV	2012-07-24
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

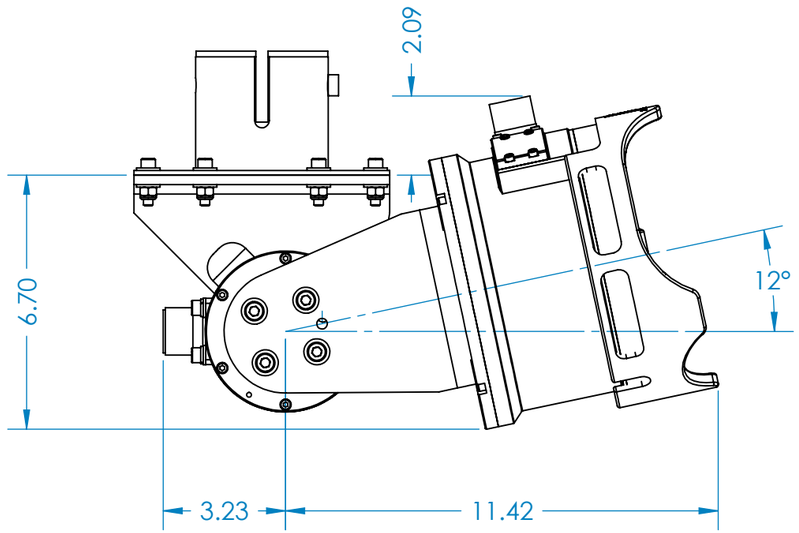
Kongsberg Mesotech Ltd.

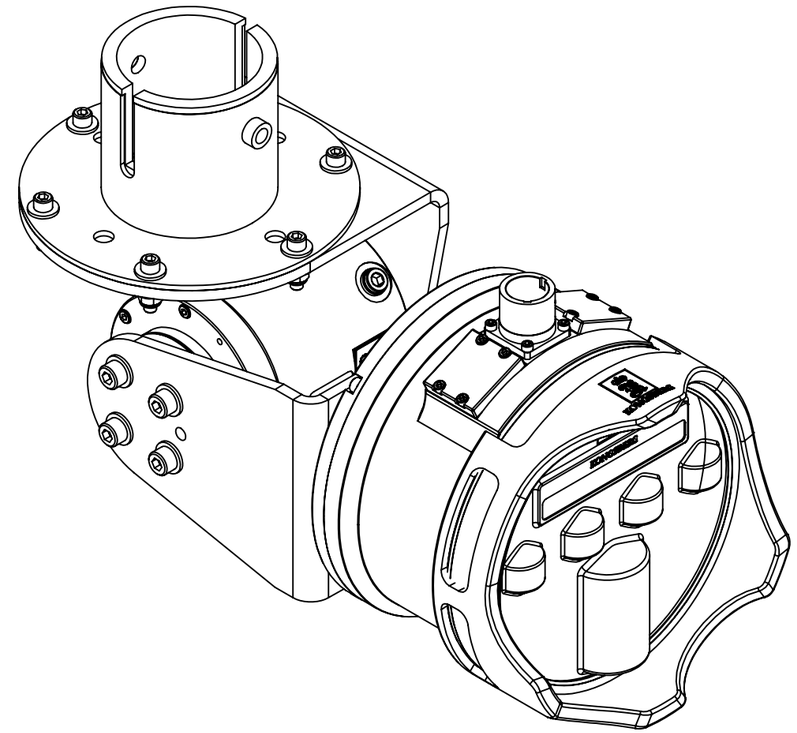
OUTLINE AND INSTALLATION DRAWING M3 SONAR 500M WITH ROTATOR (OE10-103)

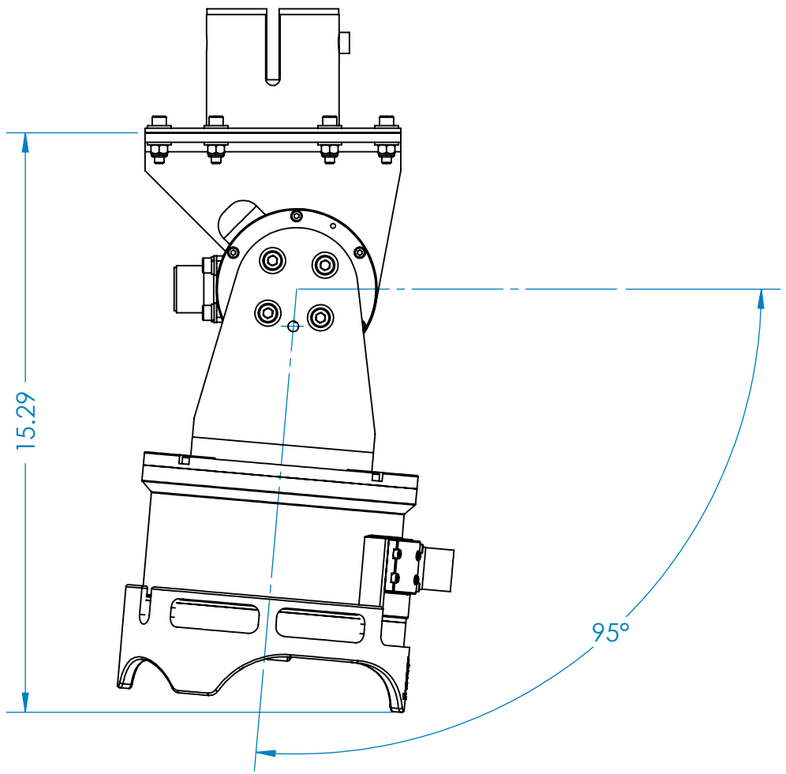
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44061001	1.0

SCALE: 1:3	W.O. NO.	SHEET 1 OF 2

DWG. NO.	SHT	ISS
422-44061001	2	1.0







NOTE: DIMENSIONS IN INCHES

ISS	DESCRIPTION	DATE
	REVISIONS	

APPROVALS	NAME	DATE
DRAWN	DV	2012-07-24
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

DO NOT SCALE DRAWING.
CONFIDENTIAL. DO NOT COPY.

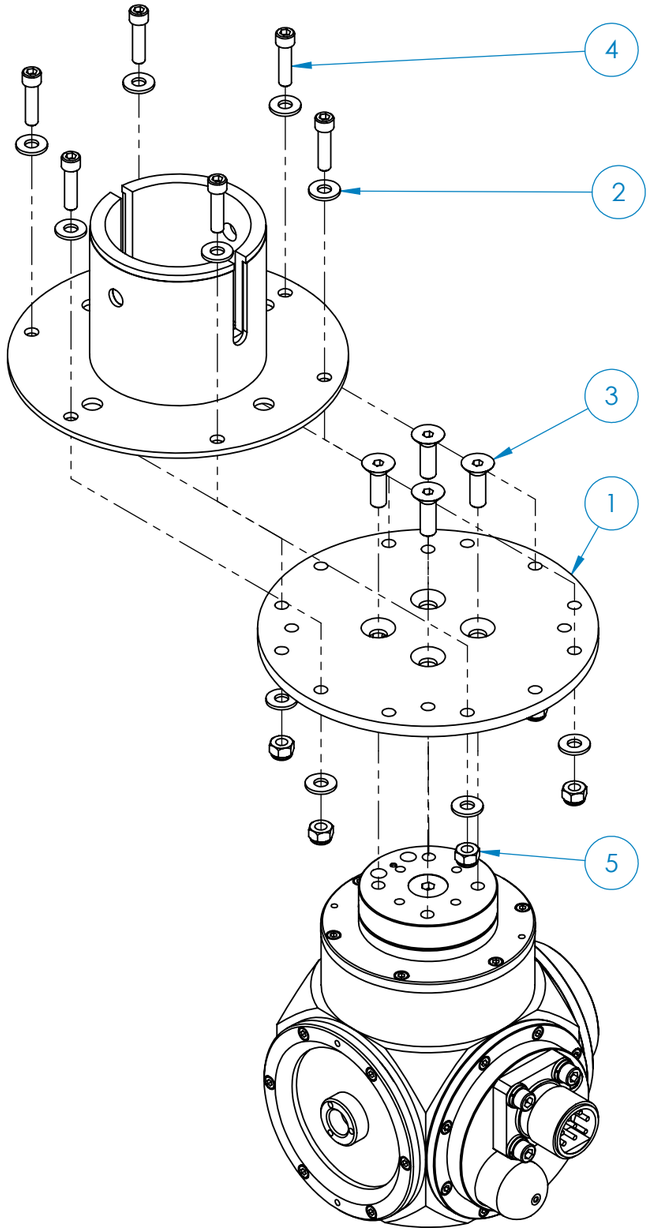
Kongsberg Mesotech Ltd.

OUTLINE AND INSTALLATION DRAWING M3 SONAR 4000M WITH ROTATOR (OE10-103)

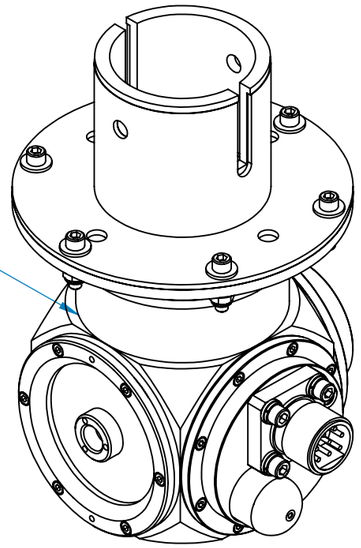
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44061001	1.0

SCALE: 1:3 | W.O. NO. | SHEET 2 OF 2

DWG. NO.	SHT	ISS
422-44071000	1	1.1



ROTATOR AND POLE MOUNT FLANGE
NOT INCLUDED
SHOWN FOR CLARITY ONLY



NOTES:
1. LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DV	2012-07-24
REVISED	DRC	2013-08-21
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
1.1	ECO 5170-1	2013-08-21

REVISIONS

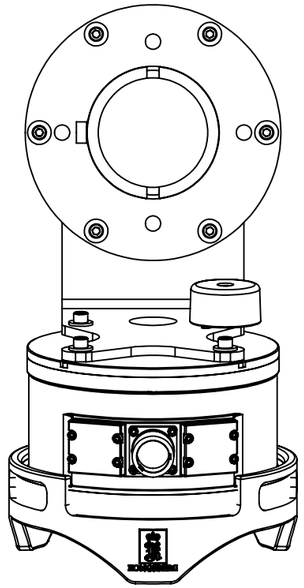
Kongsberg Mesotech Ltd.

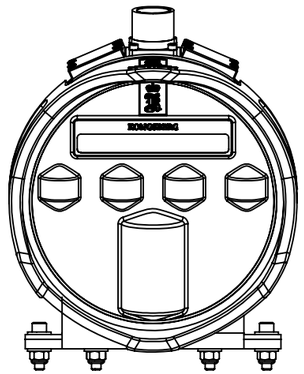
ASSEMBLY DRAWING
ADAPTER PLATE - POLE MOUNT TO ROTATOR (OE10-102)

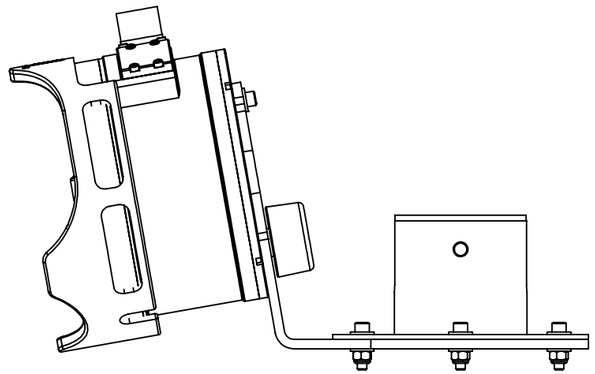
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44071000	1.1

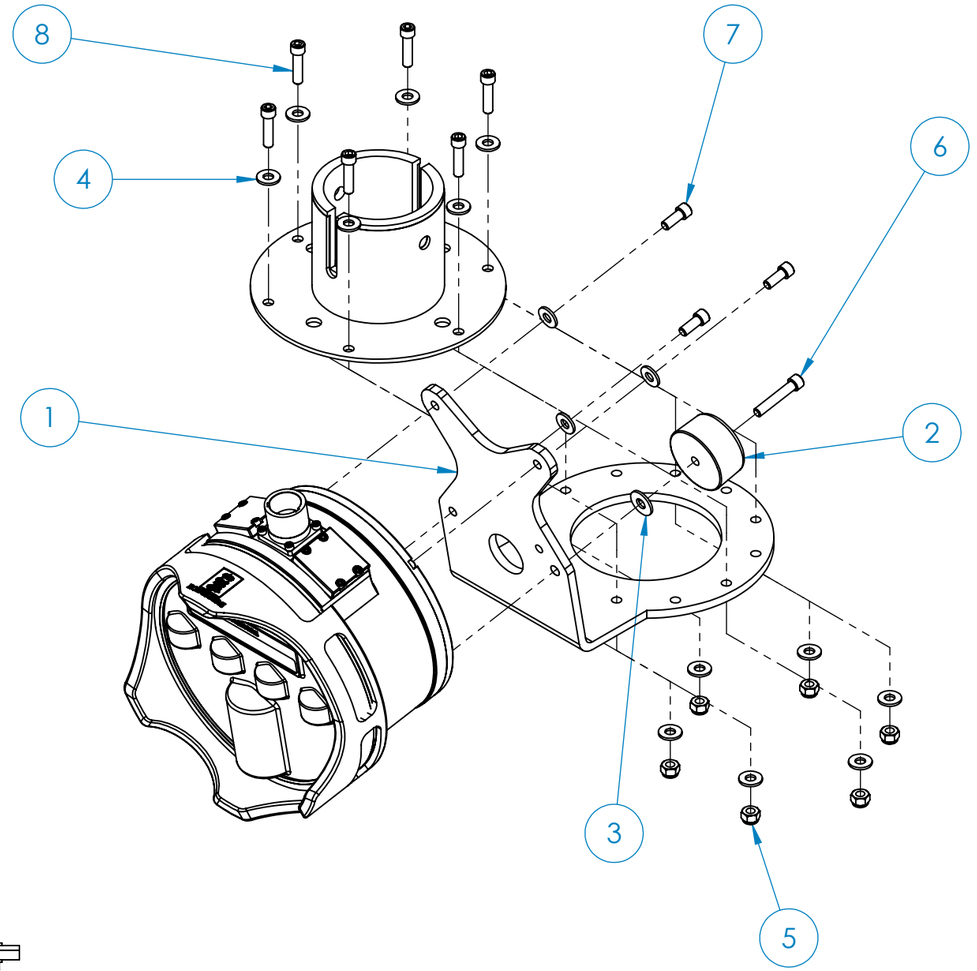
SCALE: 1:3 | W.O. NO. | SHEET 1 OF 1

DWG. NO.	SHT	ISS
422-44121000	1	1.0









NOTES:
1. ANODE ONLY TO BE USED ON ALUMINUM HEAD; LOCATION MARKED WITH EXTRA HOLE
2. FOR TITANIUM HEAD, ITEMS 2, 3, AND 6 UNNECESSARY; USE INSTEAD ONE MORE EACH OF ITEMS 4 AND 7
3. HEAD AND FLANGE NOT INCLUDED; SHOWN ONLY FOR CLARITY
4. LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT
5. LUBRICATE BASE OF ANODE WITH WATER RESISTANT GREASE

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/07
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
1.0		2013-08-07

REVISIONS

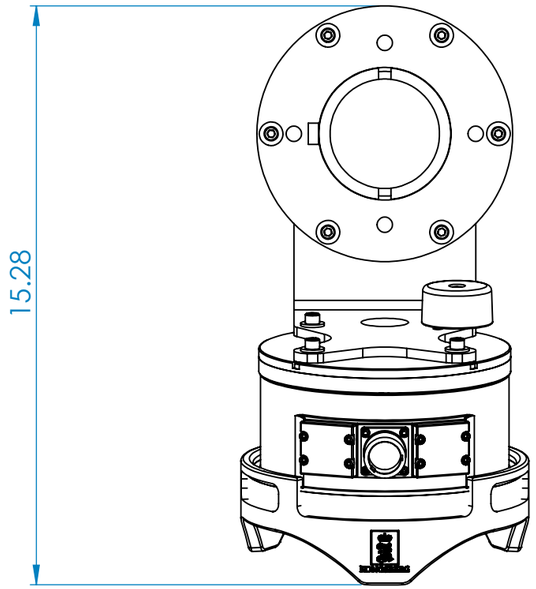
Kongsberg Mesotech Ltd.

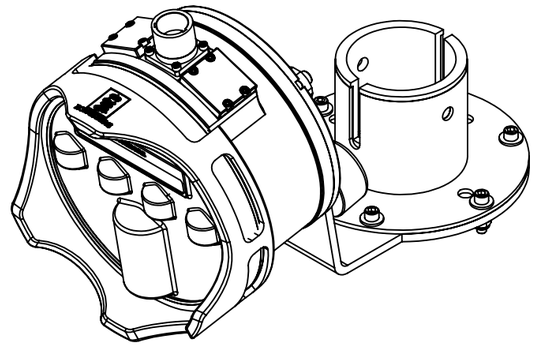
ASSEMBLY DRAWING
TILT BRACKET
POLE MOUNT TO M3 SONAR

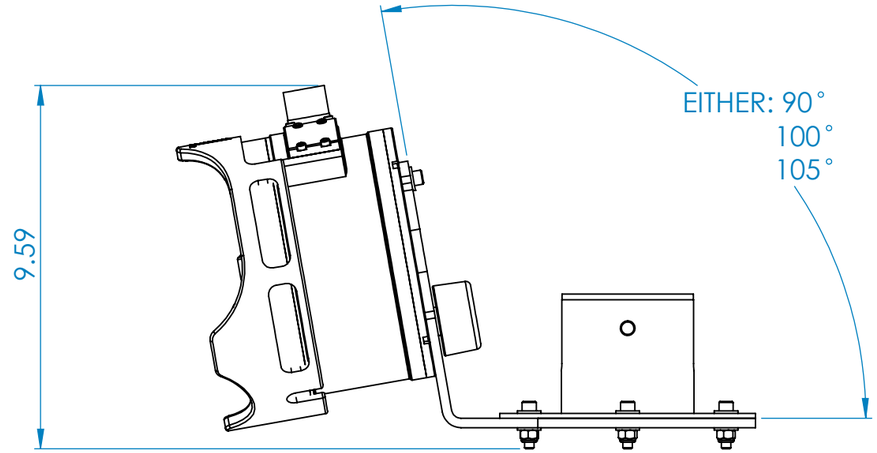
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44121000	1.0

SCALE: 1:4	W.O. NO. 277-0852	SHEET 1 OF 1

DWG. NO.	SHT	ISS
422-44121001	1	1.0







NOTES:
1. HEAD AND FLANGE NOT INCLUDED; SHOWN ONLY FOR CLARITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/07
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
1.0		2013-08-07

REVISIONS

Kongsberg Mesotech Ltd.

OUTLINE AND INSTALLATION DRAWING M3 SONAR 500M WITH TILT BRACKET

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44121001	1.0

SCALE: 1:4	W.O. NO. 277-0852	SHEET 1 OF 1

DWG. NO.	SHT	ISS
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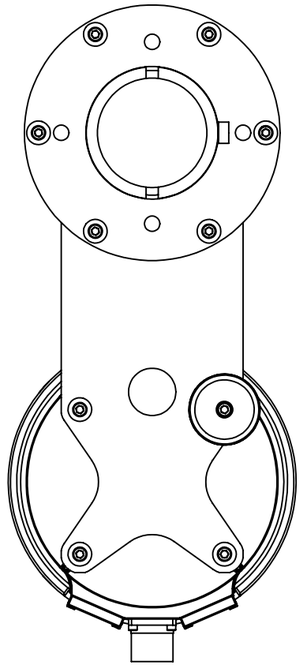
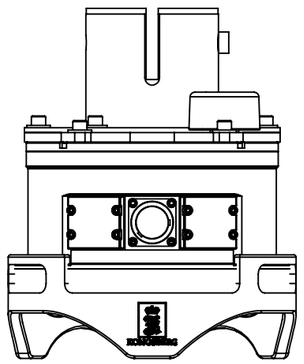
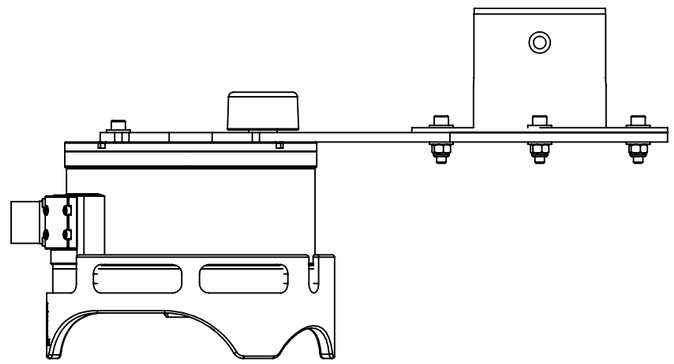
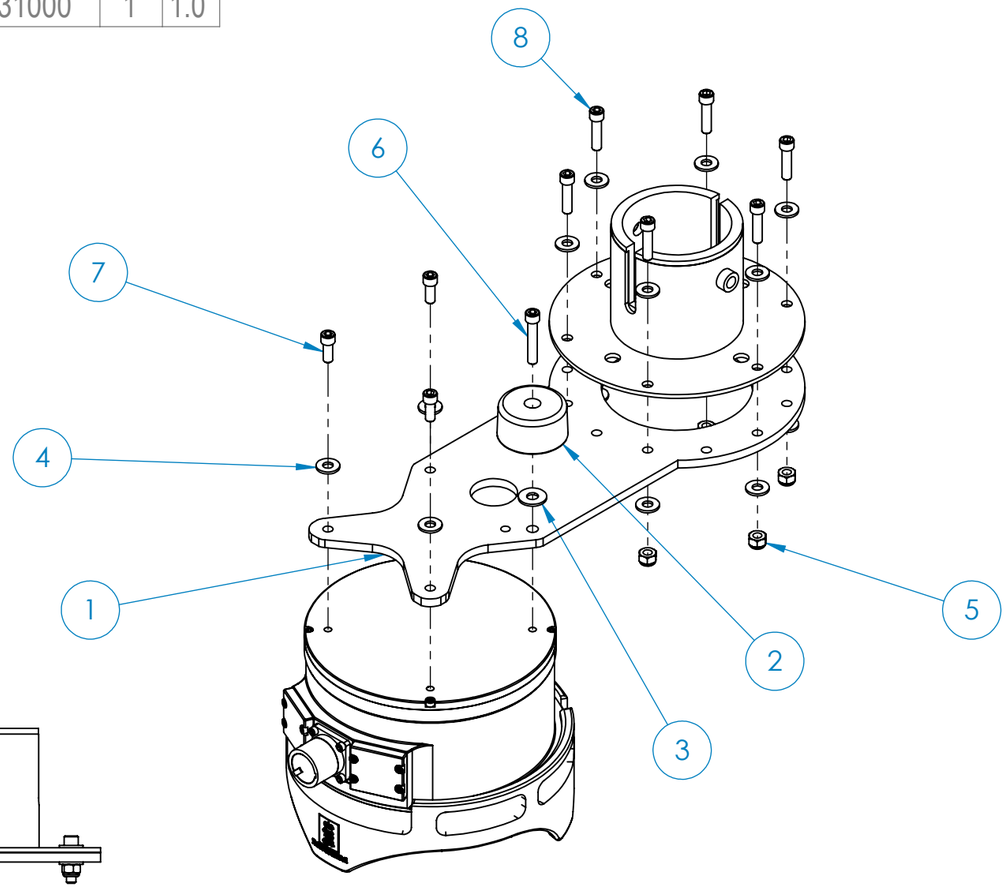








NOTES:
1. ANODE ONLY TO BE USED ON ALUMINUM HEAD; LOCATION MARKED WITH EXTRA HOLE
2. FOR TITANIUM HEAD, ITEMS 2, 3, AND 6 UNNECESSARY; USE INSTEAD ONE MORE EACH OF ITEM 4 AND 7
3. HEAD AND FLANGE NOT INCLUDED; SHOWN ONLY FOR CLARITY
4. LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT
5. LUBRICATE BASE OF ANODE WITH WATER RESISTANT GREASE

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/07
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
1.0		2013-08-07

REVISIONS

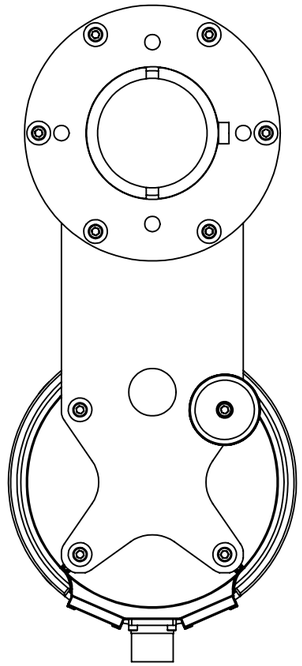
Kongsberg Mesotech Ltd.

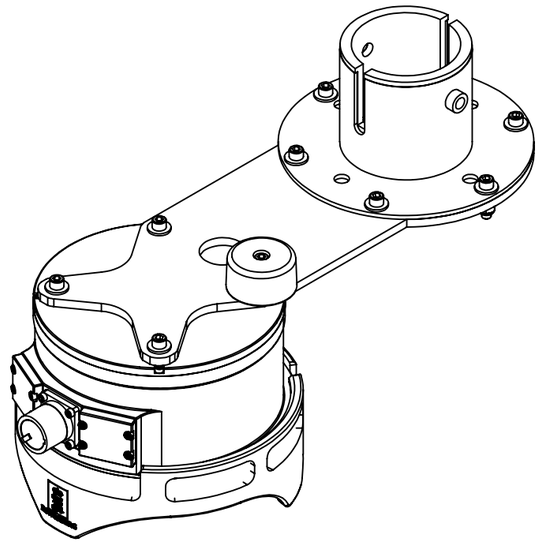
ASSEMBLY DRAWING DOWNLOOKING BRACKET POLE MOUNT TO M3 SONAR

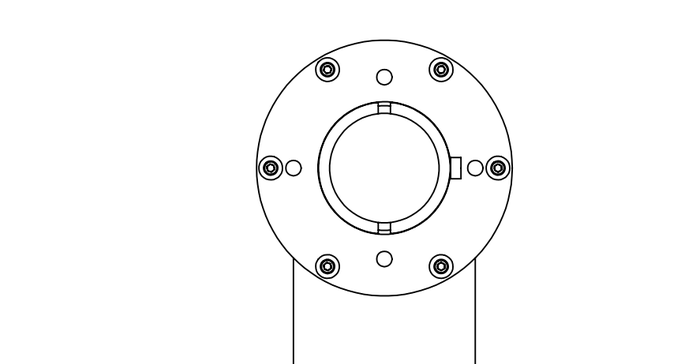
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44131000	1.0

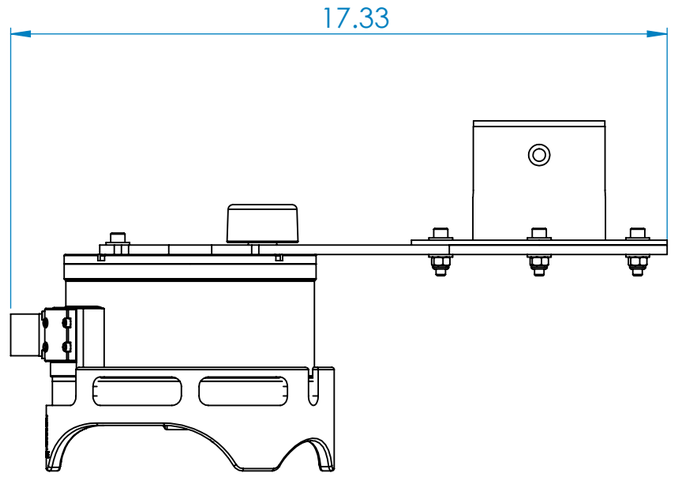
SCALE: 1:4 | W.O. NO. 277-0852 | SHEET 1 OF 1

DWG. NO.	SHT	ISS
422-44131001	1	1.0









NOTES:
1. HEAD AND FLANGE NOT INCLUDED; SHOWN ONLY FOR CLARITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/07
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
1.0		2013-08-07

REVISIONS

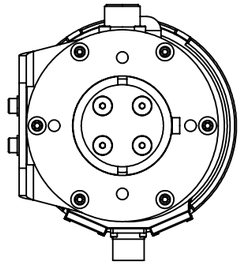
Kongsberg Mesotech Ltd.

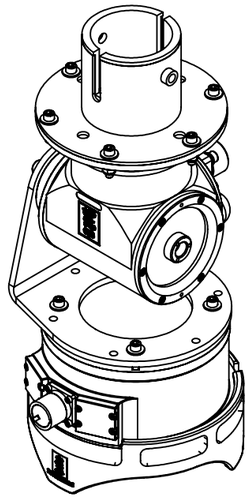
OUTLINE AND INSTALLATION DRAWING M3 SONAR 500M WITH DOWNLOOKING BRACKET

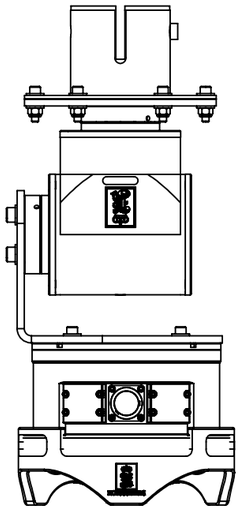
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44131001	1.0

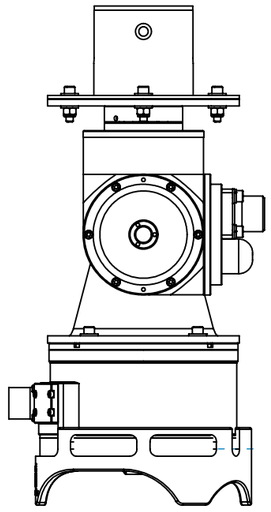
SCALE: 1:4	W.O. NO. 277-0852	SHEET 1 OF 1

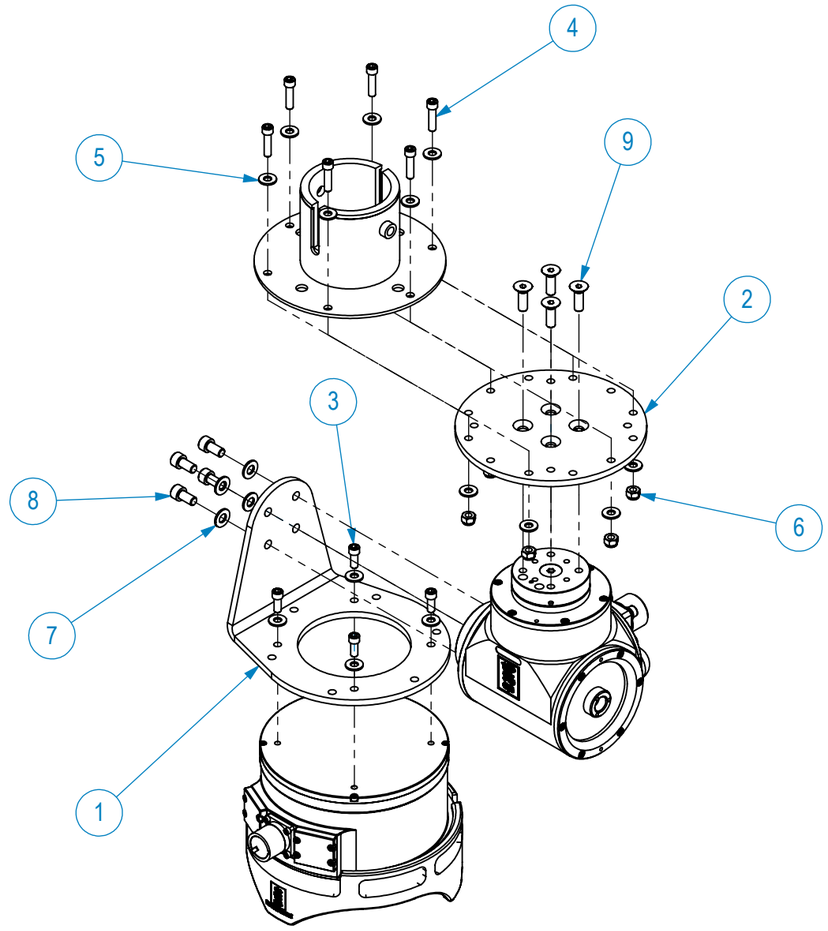
DWG. NO.	SHT	ISS
422-44171000	1	1.0











NOTES:
1. FLANGE, ROTATOR, AND SONAR HEAD NOT INCLUDED; SHOWN ONLY FOR CLARITY
2. LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT
3. BRACKET AND ADAPTOR CAN BE ASSEMBLED AS SHOWN ON EITHER PAGE

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/15
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE

REVISIONS

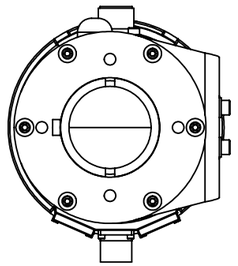
Kongsberg Mesotech Ltd.

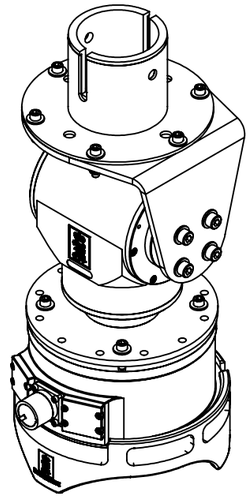
ASSEMBLY DRAWING
ADAPTOR PLATE AND BRACKET - M3 SONAR AND ROTATOR (OE10-102) TO POLE MOUNT

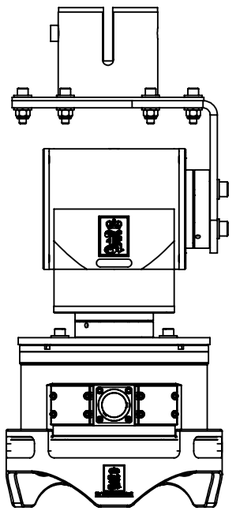
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44171000	1.0

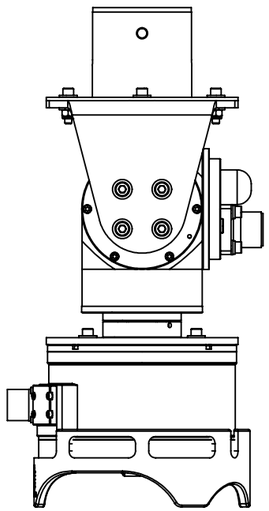
SCALE: 3:16 | W.O. NO. 150-1366 | SHEET 1 OF 2

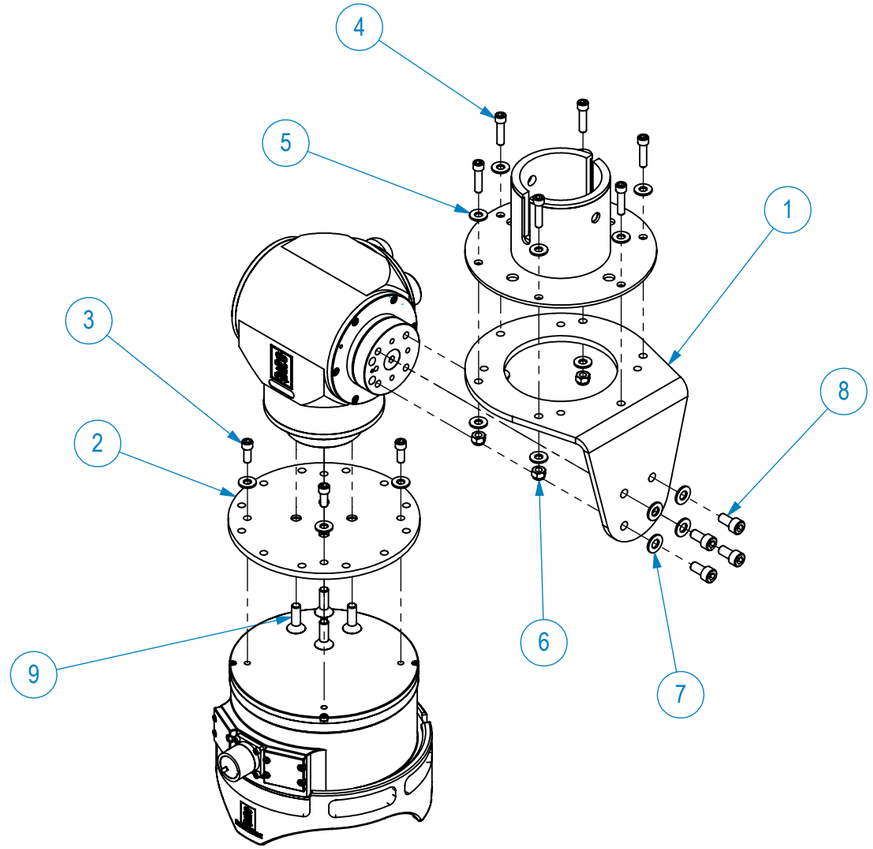
DWG. NO.	SHT	ISS
422-44171000	2	1.0











NOTES:
1. FLANGE, ROTATOR, AND SONAR HEAD NOT INCLUDED; SHOWN ONLY FOR CLARITY
2. LUBRICATE FASTENERS WITH ANTI-SEIZE LUBRICANT
3. BRACKET AND ADAPTOR CAN BE ASSEMBLED AS SHOWN ON EITHER PAGE

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/15
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
	REVISIONS	

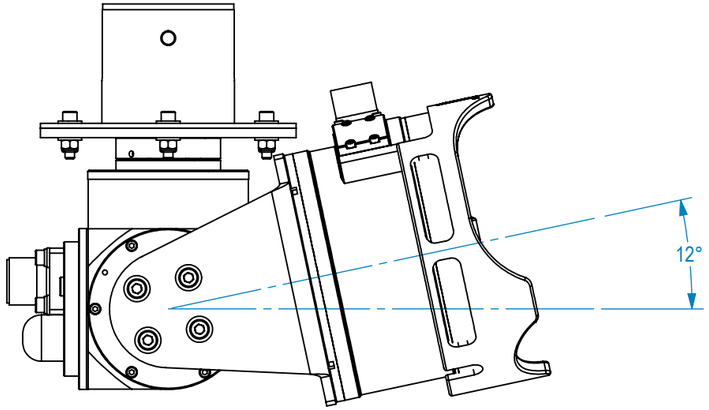
Kongsberg Mesotech Ltd.

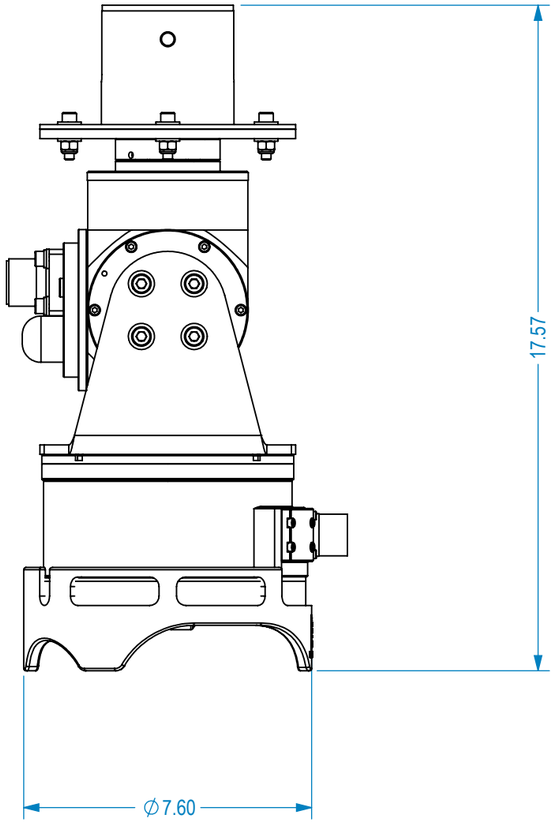
ASSEMBLY DRAWING
ADAPTOR PLATE AND BRACKET - M3 SONAR AND ROTATOR (OE10-102) TO POLE MOUNT

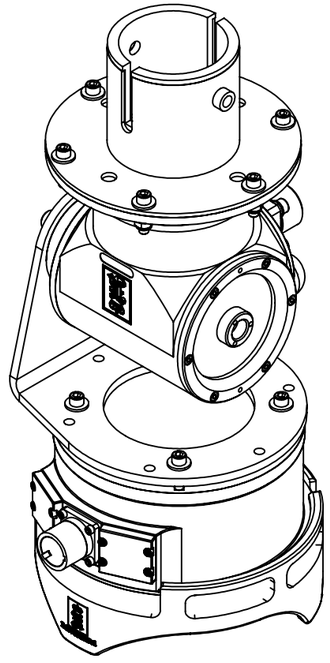
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44171000	1.0

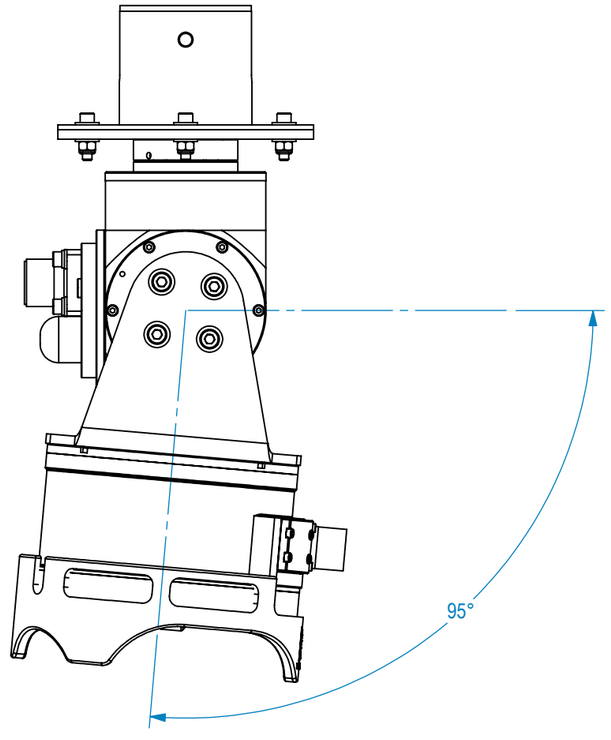
SCALE: 3:16 | W.O. NO. 150-1366 | SHEET 2 OF 2

DWG. NO.	SHT	ISS
422-44171001	1	1.0









NOTES:
1. FLANGE, ROTATOR, AND SONAR HEAD NOT INCLUDED; SHOWN ONLY FOR CLARITY

ISS	DESCRIPTION	DATE
REVISIONS		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/15
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

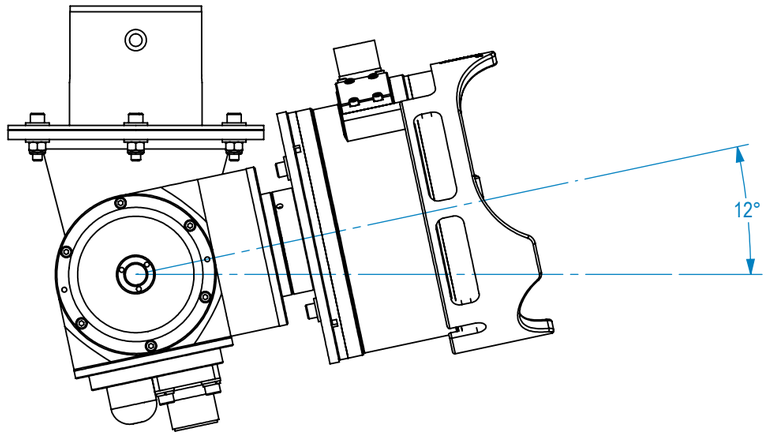
Kongsberg Mesotech Ltd.

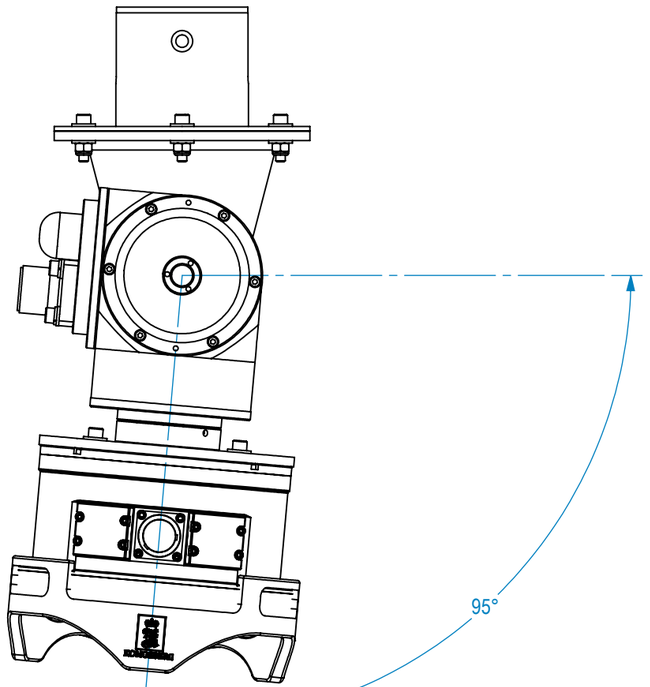
OUTLINE AND INSTALLATION DRAWING ADAPTOR PLATE AND BRACKET - M3 SONAR AND ROTATOR (OE10-102) TO POLE MOUNT

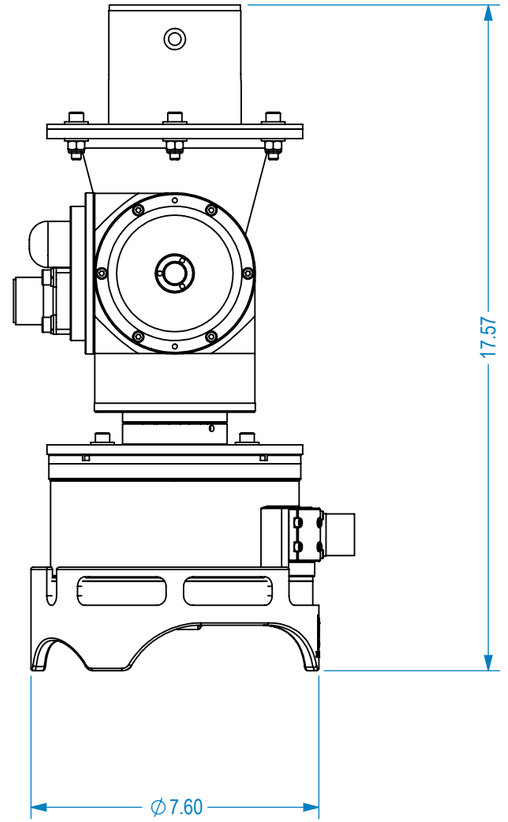
SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44171001	1.0

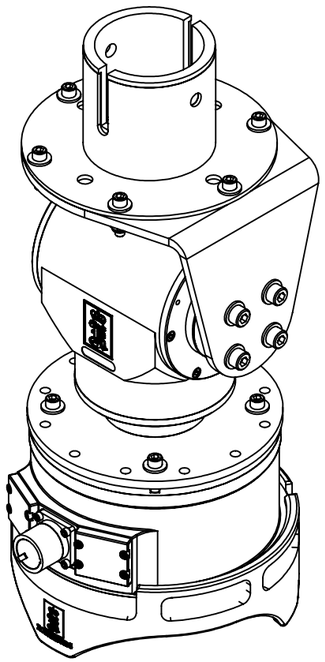
SCALE: 1:4 | W.O. NO. 150-1366 | SHEET 1 OF 2

DWG. NO.	SHT	ISS
422-44171001	2	1.0









NOTES:
1. FLANGE, ROTATOR, AND SONAR HEAD NOT INCLUDED; SHOWN ONLY FOR CLARITY

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:

DECIMALS	FRACTIONAL	ANGULAR
X.XX ±0.006	±1/32	MACH ±30'
X.XXX ±0.003		BEND ±1°

SURFACE FINISH 125 Ra, DE-BURR HOLES
BREAK SHARP EDGES 0.010

DO NOT SCALE DRAWING

APPROVALS	NAME	DATE
DRAWN	DRC	13/08/15
REVISED	--	--
CHECKED		
ENGR		
ISSUED		

ISS	DESCRIPTION	DATE
	REVISIONS	

Kongsberg Mesotech Ltd.

OUTLINE AND INSTALLATION DRAWING ADAPTOR PLATE AND BRACKET - M3 SONAR AND ROTATOR (OE10-102) TO POLE MOUNT

SIZE	NSCM NO	TYPE	DWG. NO.	ISS
B	1C965	MD	422-44171001	1.0

SCALE: 1:4 | W.O. NO. 150-1366 | SHEET 2 OF 2

KONGSBERG