

Unity & seaMux

Topside Control System & Subsea Multiplexer



Installation Manual

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1.0 Introduction

Unity is a 1U high, 19" rack mountable computer with multiple Ethernet and Serial communication interfaces. seaView is run on Unity and facilitates operation of Impact Subsea sensors together with a transparent path for third-party serial data from subsea to surface.

Unity has four communications ports which can operate on RS232, RS485 or Ethernet. The ports are available for connection to sensors or to third party systems. Each of the four ports are also equipped with a software controllable power output to locally power sensors.



UNITY Control System

seaMux provides a highly compact underwater multiplexer for use with Impact Subsea Sonars, Profilers, Altimeters, Depth and AHRS sensors.

In addition to Impact Subsea sensors, seaMux also facilitates the connection of third-party serial or Ethernet based devices. This allows the throughput of any third-party Serial or Ethernet data from subsea to surface.

Although both devices can be used in stand-alone operation, UNITY and seaMux have been designed from the outset to seamlessly work together.

Data is transmitted from the seaMux to UNITY via an Ethernet channel or over a single screened twisted pair using VDSL communications.



seaMux Subsea Multiplexer

This manual provides a guide to the physical installation of Unity and seaMux. For operation of the system, this is explained in full via a software overview film. This is provided on the USB drive with the system and is also available on the Unity and seaMux pages of the Impact Subsea website.

2.0 Unity Specifications

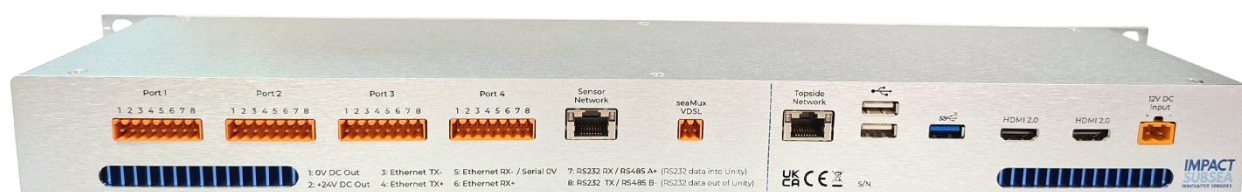
2.1 Overview



Above: UNITY Control System Front & Top

Provided in a 1U high, 19" rack mountable case with a clean front design. Features from left to right are:

- **Power:** The power button is in the form of the Impact Subsea icon. This can illuminate a number of different colours to provide a system status indication.
- **USB:** To the right of the power button are two USB-A ports. One is USB2.0 (black) and one is USB3.1 (blue). These are for connection of USB drives or other devices.
- **Cooling:** Running close to the base of the front panel are two cuts into the case with the blue anodised aluminium heatsink on display. This removes heat from the electronics and has a fine mesh behind it to prevent the ingress of dust into Unity.



Above: UNITY Control System Back

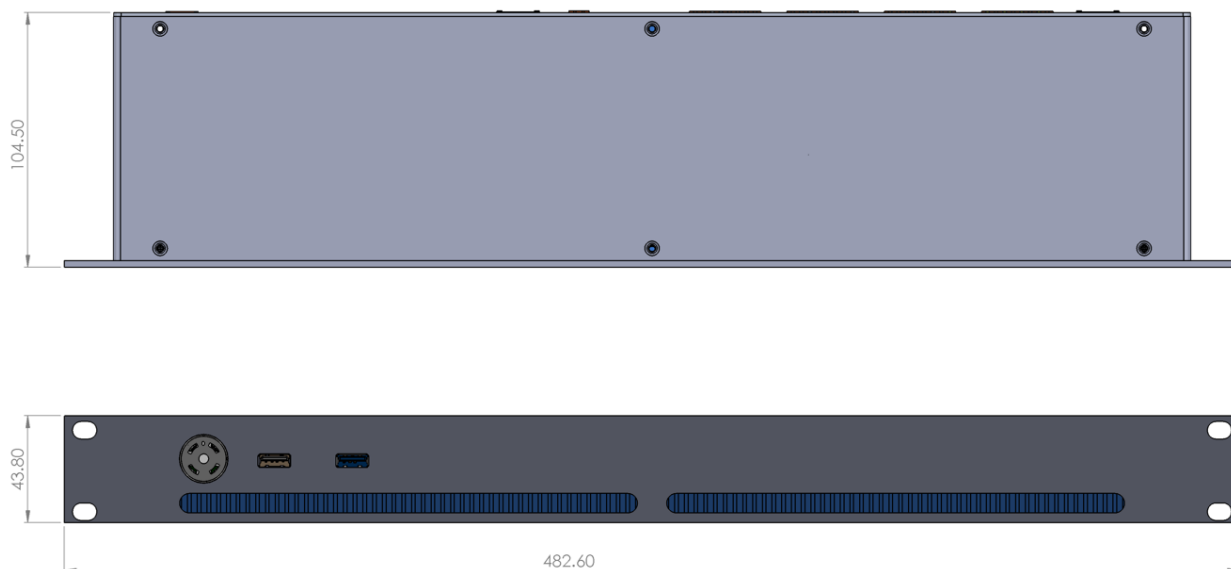
The rear of Unity is split into two parts: to the left are all the connections related to the seaMux, Impact Subsea sensors and any other survey data. To the right are all of the computer connections.

From left to right:

- **Ports 1 - 4:** These ports can be configured for Ethernet, RS232 or RS485. These can be input or output ports used to connect to sensors or third-party systems.
- **Sensor Network:** This port is for connecting to the seaMux via an Ethernet connection.
- **seaMux VDSL:** This port is for connecting to the seaMux via an VDSL connection.
- **Topside Network:** This is for connection to the topside vessel network.
- **USB-A:** Two USB-A connections. Both are USB2.0.
- **USB-A:** One SuperSpeed USB-A connection (USB 3.1 Gen 2).
- **HDMI 2.0:** Two HDMI 2.0 monitor connections.
- **12V DC Input:** For connection to the external Unity power supply.

2.2 Dimensions

The dimensions of the UNITY Control system are shown below:



All dimensions are in mm.

2.3 Communication, Power & Physical

Communications & Power		Physical	
Input Voltage	12VDC (PSU supplied with Unity)	Temperature	Operating: -10°C to 40°C Storage: -20°C to 60°C
		Form Factor	1U High 19" Rack Mountable 100mm deep
Port to seaMux	Ethernet or VDSL		
Ports:	4 x Data Channels		
Port Communication	Ethernet, RS232 or RS485		
Port Power	24V @ 0.5A (12W per port)		

3.0 seaMux Specifications

3.1 Overview



Above Left: seaMux side view, **Above Right:** seaMux Top view

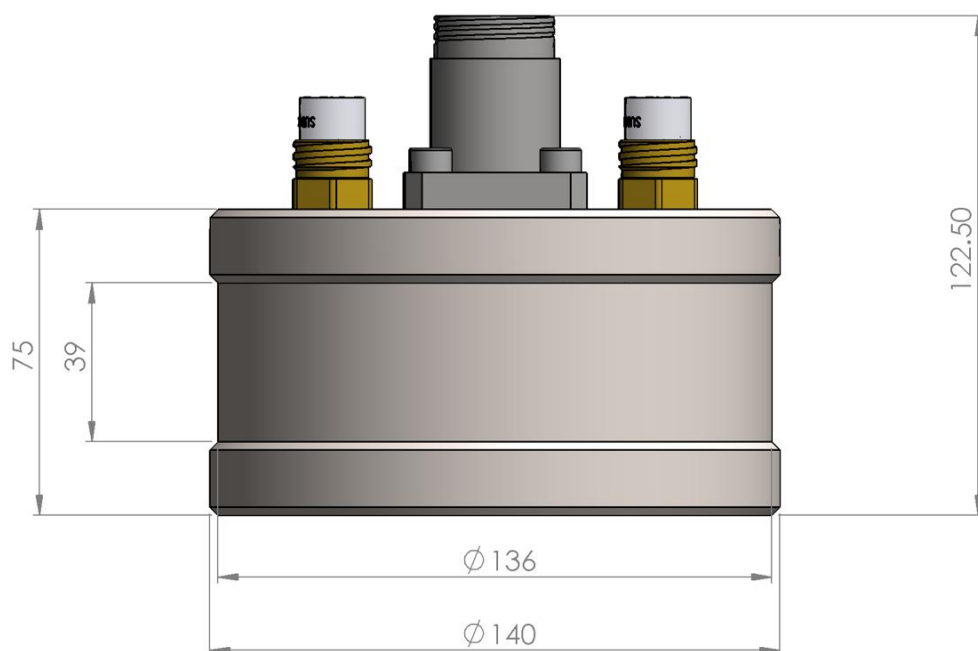
Provided in a highly compact titanium housing the seaMux employs a clean external design. A recess is provided around the body of the seaMux to facilitate clamping in place. The base also has four M5 screw holes as an alternative securing arrangement.

Looking top-down onto seaMux:

- **Input Port:** Labelled 'IN' is the port for the connection to the UNITY control system.
- **Output Port:** Labelled 'OUT' is the port for the connection of further seaMuxs. This facilitates an expansion of the subsea system should further physical ports be required.
- **Ports 1 – 4:** These are for connection to Impact Subsea sensors or third-party devices.

3.2 Dimensions

The dimensions of seaMux are shown below:



All dimensions are in mm.

3.3 Communication, Power & Physical

Communications & Power		Physical	
Input Voltage	12 to 54VDC	Temperature	Operating: -10°C to 40°C Storage: -20°C to 60°C
		Depth Rating	6,000 meters / 19,685 feet
Port to UNITY	Subconn D/FCR2013M Ethernet or VDSL	Weight (Air/Fresh Water)	4.0/2.9kg
Port to Further seaMux	Subconn D/FCR2013F Ethernet	Material	Titanium Body, Stainless Steel 316 Connectors
Port to Sensors	4 x Subconn MCBH8F-SS Ethernet, RS232 or RS485 Ethernet speed is up to 100Mbps on each port.		
Port Power	Port 1 : 24VDC @ 1.25A (30W) Port 2 : 24VDC @ 0.835A (20W) Port 3 : 24VDC @ 0.835A (20W) Port 4 : 24VDC @ 0.835A (20W) All ports are isolated.		

4.0 Unity Installation

4.1 Electrical Installation

Unity is intended to be installed in a standard 19" rack. It has four rack mount holes on the front face to enable securing to the rack via standard rack screws.

4.1.1 Ports 1 to 4:

The four communication & power ports on the back of Unity are Weidmuller 8 pin socket connectors which will mate to a **Weidmuller 8 pin terminal block plug (Weidmuller part number 1597420000)**. Each port has the same pin-out, detailed below and also printed on the back of Unity. The number of each pin is denoted on the back of Unity for clarity.

Pin	Function
1	0V DC Out
2	+24V DC Out
3	Ethernet TX-
4	Ethernet TX+
5	Ethernet RX- / Serial 0V
6	Ethernet RX+
7	RS232 RX & RS485 A+ (Data into Unity)
8	RS232 TX & RS485 B- (Data out of Unity)

4.1.2 Sensor Network:

This port is for use when there is an Ethernet link from the topside (Unity) to the subsea side (seaMux). If using a VDSL connection, this port is not required.

Standard Ethernet RJ45 and Ethernet wiring is used for this port.

The Ethernet link between the seaMux and Unity can support rates up to 1,000 Mbps. The actual rate achievable will depend on the quality of the Ethernet connection/physical infrastructure between Unity and seaMux.

4.1.3 seaMux VDSL:

This port is for use when creating a VDSL link from the topside (Unity) to the subsea side (seaMux). If using an Ethernet connection, this port is not required.

The VDSL link is exceptionally useful as it enables a high bandwidth communications link using only a screened twisted pair within the vehicle umbilical. This negates the requirement for a fibre or Ethernet communications link from surface to subsea.

The port itself is a Weidmuller 2 pin socket which mates to a **Weidmuller 2 pin terminal block plug (Weidmuller part number BL 3.5/2)**.

The VDSL connection does not have a polarity, so the twisted pair can be terminated in either of the two possible orientations (the two VDSL wires can be connected to either VDSL pin on Unity).

To establish a VDSL link from ROV to surface, it is essential that the following is observed:

1. **Cable Type:**
Ensure the cable is screened twisted pair from the Unity to seaMux.
2. **Remove:**
 - a. Any untwisted sections of cable must be removed from the path. An untwisted cable as short as 10cm can prevent a VDSL connection in some circumstances. **The presence of untwisted cable, within the physical link between Unity and seaMux, is the most common cause for a lack of VDSL communications.**
 - b. Any chock block used to connect wires together in the link should also be removed as chock block causes an impedance mismatch which will degrade the link. Solder wires together while maintaining cable twist.
3. **Cables:**
Minimise the use of different types of twisted pairs. Each different type of twisted pair used in the link will reduce the quality of the link due to impedance mismatch.
4. **Wire Length:**
Ensure each of the wires in the twisted pair are length matched. Make sure both wires in the twisted pair are trimmed to be the same overall length as each other.
5. **Cable Cores:**
Ensure you use a communications screened twisted pair with cores as small as possible to minimise capacitance of the cable.

Once a physical connection is present and of good quality; **'Negotiating'** will be shown within the seaView Comms window. The negotiation period for VDSL can take up to a minute to complete when the connection is first made or when the system is powered up.

Once the VDSL connection is established **'Connected'** will be shown.

4.1.4 Computer Ports

The various computer ports (Topside Network, USB ports, HDMI 2.0 ports) all follow standard convention.

4.1.5 12V DC Input

For connection of the Unity power supply which is external to Unity and will require to be connected to a 120VAC to 240VAC power supply. The power supply will then step this down to 12VDC for powering Unity.

The power supply connection must be connected in the correct orientation as indicated by the polarity markings on the back of Unity. When using the provided power supply, this is pre-terminated and can only be connected in the correct orientation.

The port itself is a Weidmuller 2 pin socket which mates to a **Weidmuller 2 pin terminal block plug (Weidmuller part number 1943580000)**.

4.2 Unity Accessories

As standard, Unity will be supplied with the following accessories:

Accessory	Purpose	Part Number
4 x Weidmuller 8 pin terminal block plug (Weidmuller part number 1597420000)	To allow cable termination and connection to Ports 1 to 4.	0000-0322
1 x Weidmuller 2 pin terminal block plug (Weidmuller part number BL 3.5/2)	To allow cable termination and connection to VDSL port.	0000-0317
1 x Power Supply	For powering Unity from a 100 to 240VAC supply.	0000-3136
1 x Flight Case	For transportation of Unity and accessories.	0000-3134

5.0 seaMux Installation

5.1 Electrical Installation

seaMux has been designed for installation on an underwater vehicle or any other underwater item which requires a number of sensors to be utilised with it.

5.1.1 IN Port

The 'IN' input port to seaMux is the main connector to power the seaMux and for connection to Unity at the surface. This port will always be used.

The bulkhead connector is a Subconn D/FCR2013M which will mate to a **Subconn DIL13F** and a **LS2000 female locking sleeve complete with DLSA snap ring**.



The pin assignment of the IN port is provided below:

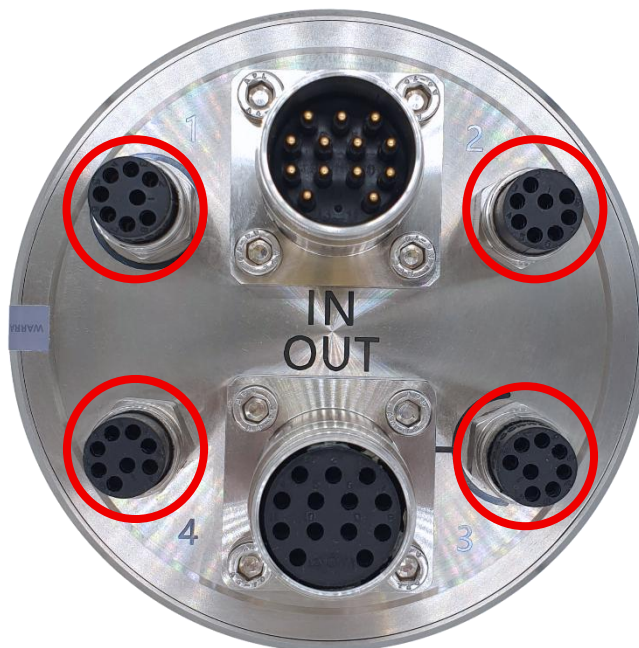
Pin	Function	Mating Wire Colour
1	0VDC (Power In)	Black
2	Ethernet Shield	Orange
3	12-54V DC (Power In)	White
4	Bi-C- (1000 Mbps)	Blue
5	Bi-C+ (1000 Mbps)	Blue/White
6	Bi-D- (1000 Mbps)	Brown
7	Bi-D+ (1000 Mbps)	Brown/White
8	Ethernet RX- (10/100 Mbps) / Bi-B- (1000 Mbps)	Orange
9	Ethernet RX+ (10/100 Mbps) / Bi-B+ (1000 Mbps)	Orange/White
10	Ethernet TX- (10/100 Mbps) / Bi-A- (1000 Mbps)	Green
11	Ethernet TX+ (10/100 Mbps) / Bi-A+ (1000 Mbps)	Green/White
12	VDSL A	Green
13	VDSL B	Red

Power will always require a connection then either Ethernet or VDSL connection to Unity at the surface.

5.1.2 Ports 1 to 4 (Subconn MCBH8F):

The four communication and power ports on seaMux are Subconn MCBH8F-SS connectors which each mate to a **Subconn MCIL8M** tail which is secured in place with a **Subconn MCDLS-F** locking sleeve.

If any of Ports 1 to 4 are not in use, they must be blanked with a pressure blank (**Subconn MCDL8M**) and locked in place with a **Subconn MCDLS-F** locking sleeve.



The pin assignment of Ports 1 to 4 is provided below:

Pin	Function	Mating Wire Colour
1	0VDC (Power Out)	Black
2	24V DC (Power Out)	White
3	Ethernet TX-	Red
4	Ethernet TX+	Green
5	Ethernet RX- / Serial 0V	Orange
6	Ethernet RX+	Blue
7	RS232 RX & RS485 A+	White/Black
8	RS232 TX & RS485 B-	Red/Black

Note:

Port 1 has a higher power rating (30W) than ports 2, 3 and 4 (20W each). This is to facilitate connection of a higher power rating third-part sensor should this be required.

5.1.3 OUT Port

The 'OUT' output port from seaMux is to enable further seaMux multiplexers to be added. This enables expansion of the system by facilitating further physical ports to be available for connection to Impact Subsea sensors or third-party devices.

The bulkhead connector is a Subconn D/FCR2013F which will mate to a **Subconn DIL13M** and a **LS2000 female locking sleeve complete with DLSA snap ring**.

When the OUT port is not in use it must be blanked with a pressure blank (**Subconn DDC13M**) and locked in place with a **LS2000 Locking Collar and snap ring**.



The pin assignment of the OUT port is provided below:

Pin	Function	Mating Wire Colour
1	0VDC (Power Out)	Black
2	Comms Ground	Orange
3	24V DC (Power Out)	White
4	Bi-C- (1000 Mbps)	Blue
5	Bi-C+ (1000 Mbps)	Blue/White
6	Bi-D- (1000 Mbps)	Brown
7	Bi-D+ (1000 Mbps)	Brown/White
8	Ethernet RX- (10/100 Mbps) / Bi-B- (1000 Mbps)	Orange
9	Ethernet RX+ (10/100 Mbps) / Bi-B+ (1000 Mbps)	Orange/White
10	Ethernet TX- (10/100 Mbps) / Bi-A- (1000 Mbps)	Green
11	Ethernet TX+ (10/100 Mbps) / Bi-A+ (1000 Mbps)	Green/White
12	RS232 RX & RS485 A+	Red
13	RS232 TX & RS485 B-	Green

Note:

The serial line on the OUT port is the same serial line as that of Port 4.

5.1.4 seaMux Cables & Accessories

Several standard cables assemblies are available for seaMux to enable quick connection and setup of a complete suite of Impact Subsea sensors:

Cable	Purpose	Part Number
Subconn Mxxx8 Extender, 2 meters	To connect a single Impact Subsea sensor to one of the four ports on seaMux. This cable supports Ethernet, RS232 or RS485 comms. 2 meters overall length.	0000-3066
Subconn Mxxx8 Extender, 4 meters	To connect a single Impact Subsea sensor to one of the four ports on seaMux. This cable supports Ethernet, RS232 or RS485 comms. 4 meters overall length.	0000-3068
Subconn Mxxx8 RS485 Multidrop	To connect up to three Impact Subsea sensors to a single port on seaMux. This works when all sensors are set to operate over RS485 communications. 3 meters overall length.	0000-3067
seaMux to seaMux	To connect additional seaMux multiplexers. 1 meter in overall length.	0000-3135

Other cable configurations are available from Impact Subsea upon request.

As standard, seaMux will be supplied with the following accessories:

Accessory	Purpose	Part Number
1 x Subconn DIL13F C/W Subconn LS2000 Locking Collar and snap ring.	For connection to the IN port and for integration into your system. Supplied open ended ready to terminate and mould.	0000-2878 & 0000-2880 & 0000-2881
4 x Subconn MCD8M C/W Subconn MCDLS-F locking sleeve.	Pressure blanks for Ports 1 – 4 for sealing ports when not in use.	0000-2445 & 0000-1436
1 x Subconn DDC13M with a LS2000 Locking Collar and snap ring.	Pressure blank for OUT port. For sealing port when not in use.	0000-3047 & 0000-2880 & 0000-2881
1 x USB Drive	To provide seaView software, manuals and demonstration videos.	0000-1449
1 x Flight Case	For transportation of seaMux and accessories.	0000-3133
1 x Quick Start Guide	Providing connector pin outs.	0000-3176

5.1.5 Connector Mating

When mating any of the cables to the applicable SubConn connector, to maximise the life of the connector, it is important to observe the following:

- Always apply grease before mating, Molykote 44 Medium grease must be used.
- Disconnect by pulling straight, not at an angle.
- Do not pull on the cable and avoid sharp bends at cable entry.
- Do not over-tighten the bulkhead locking sleeve.
- Ensure correct alignment of cable connector pins with bulkhead.

Do not expose the connector to extended periods of heat or direct sunlight. If a connector becomes very dry, it should be soaked in fresh water before use.



Above: Example of grease correctly applied to connectors

Note: the Subconn connectors are not keyed – take care to ensure that the pins are orientated correctly for mating prior to pushing the connector together.

5.1.6 Connector Cleaning

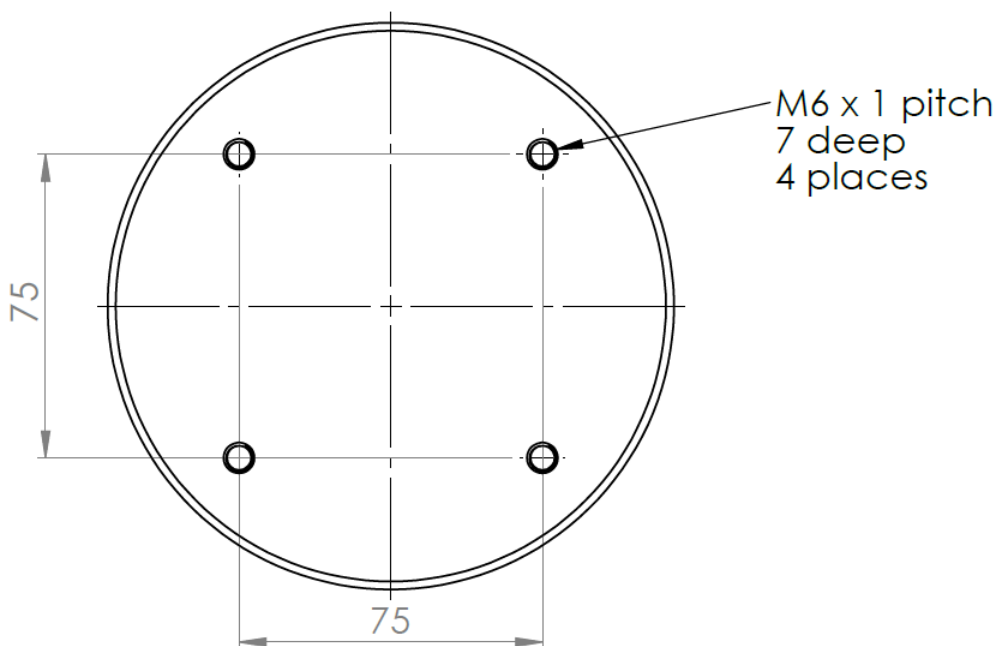
General cleaning and removal of any accumulated sand or mud on a connector should be performed using spray-based cleaner (for example Isopropyl Alcohol). Avoid using strong cleaners such as contact cleaner.

New grease must be applied again prior to mating.

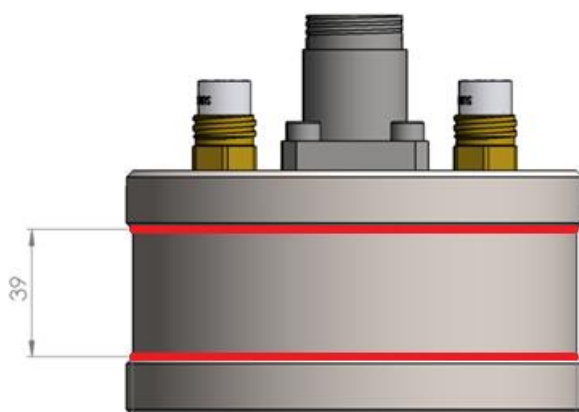
5.2 Mounting

The base of seaMux has four M6 screw holes which can be used to secure seaMux to a mounting plate or other item.

Each of the M6 holes is 7mm deep – do not attempt to use screws which are longer than this. The layout of the base is shown below:



If the above is not a suitable method to secure the seaMux in place, the central part of the titanium housing has a 39mm recess which can be used to clamp around:

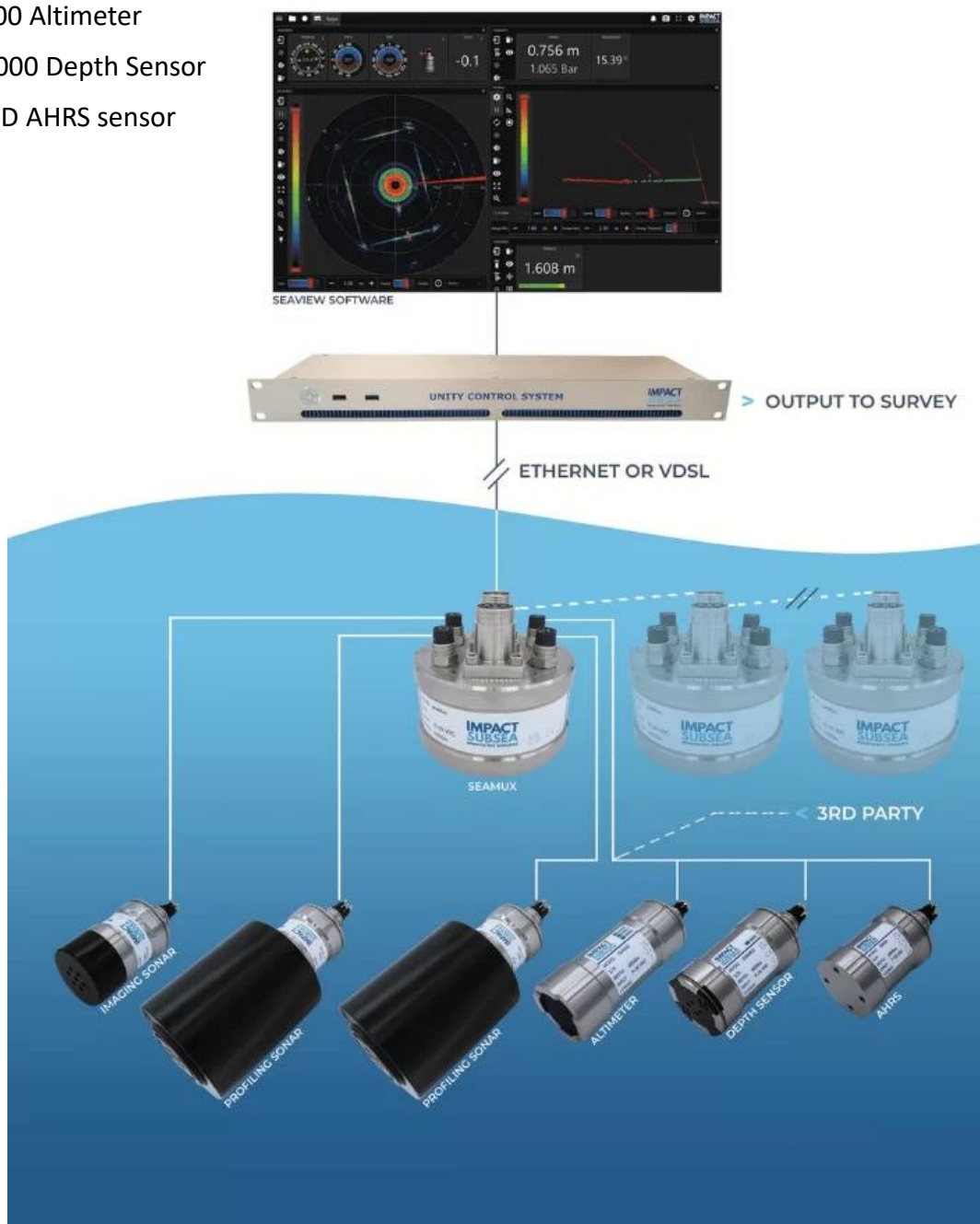


5.3 Example System Setup

The nature of Unity and seaMux allows many different combinations of Impact Subsea sensors and third-party devices to be added to the system.

An example of a potential setup is shown below which includes the following sensors:

- 1 x ISS360 Imaging Sonar
- 2 x ISP360 Profiling Sonars
- 1 x ISA500 Altimeter
- 1 x ISD4000 Depth Sensor
- 1 x ISM3D AHRS sensor



6.0 Operation

Once seaMux and Unity have been physically installed and all cabling completed, the system can be setup for operation.

All system setup and operation is conducted using the Impact Subsea seaView software. There are no parts to configure internally in either Unity or seaMux.

For setup and operation of the system, a full explanation is available via a software overview film. This is provided on the USB drive with the system and is also available on the [Unity](#) and [seaMux](#) pages of the Impact Subsea website.



Video available on USB drive and at www.impactsubsea.com

7.0 Maintenance & Servicing

Unity and seaMux are highly robust Topside Control and Subsea Multiplexer systems designed to require minimal maintenance. Due to this there are no user serviceable components.

Following use, the seaMux should be rinsed in fresh water to remove particles and salt deposits. If required a light detergent (such as that used to clean household dishes) can be used.

DO NOT USE SOLVENTS TO CLEAN THE UNIT

Following rinsing, the seaMux should be dried with a cloth.

The connectors should be cleaned and a light coating of Molykote 44 Medium grease should be applied.

The seaMux should be stored in its original case, in a cool, dry place.

It is recommended that Unity and seaMux be returned to Impact Subsea Ltd, on an annual basis to have a health check and service conducted. When returning, seaMux and Unity should be returned to Impact Subsea in their original flight cases in order to provide adequate protection during transport.

8.0 Warranty

Unity and seaMux are supplied with a Limited Warranty. This warranty applies solely to the Unity and seaMux and only if purchased directly from Impact Subsea Ltd.

What does the limited warranty cover?

This Limited Warranty covers any defects in material or workmanship under normal use during the Warranty Period.

During the Warranty Period, Impact Subsea Ltd will repair or replace products, or part of a product (under normal use and maintenance), that prove defective due to improper material or workmanship.

What will we do to correct the problems?

Impact Subsea Ltd will either replace or repair the Product at no charge: using new or refurbished replacement parts. Replacement or repair is at the discretion of Impact Subsea Ltd.

How long does the coverage last?

The Warranty Period for Unity and seaMux, purchased from Impact Subsea Ltd, is 1 year from the date of dispatch from Impact Subsea Ltd.

A replacement Unity, seaMux, or part, assumes the remaining warranty of the original item or 60 days from the replacement/repair, whichever is longer.

What does this limited warranty not cover?

This limited warranty does not cover any problem that is caused by operating conditions, malfunctions or damage resulting from defects in material or workmanship.

What do you have to do?

To obtain a warranty repair of your Unity or seaMux, you must first contact Impact Subsea Support to determine the problem and the most appropriate solution for you.

9.0 Technical Support

Should you require technical support for your Unity or seaMux, our Support team can be contacted as follows:

T. +44 (0) 1224 460 850

E. support@impactsubsea.co.uk

W. www.impactsubsea.com

An out of hours emergency number is available via the Impact Subsea website.

Utilising the above email address will ensure that a number of support engineers are copied into your support request, and will ensure a prompt response.

When contacting our Support team, please provide the following details of the Unity or seaMux:

- Serial Number
- Firmware version
- Software version
- Fault Description
- Remedial action undertaken thus far

Every effort is made to ensure that information within this document is up to date. However, information within this document is subject to change without notice, in-line with our commitment to continuous product development and improvement.