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	Originator STEWART BARLOW	Checked By J. Bess	Page 1 of 8	Reference ODN-004-23	Class 23	

SUBJECT: **INSTALLATION & OPERATION MANUAL FOR NAUTILUS CONNECTORS**

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1.0 **INTRODUCTION:**

This Installation and Operation Manual covers Nautilus plug, receptacle, and penetrator connectors. The connector's outline and interface details are provided on the assembly drawing.

Note: This is a generic manual covering all Nautilus connectors. Any project specific instructions, such as field-installable terminations, will be dealt with in a separate document.

Note: For Nautilus High Power Connectors, please refer to D/N 63860 (ODN-342-23).

2.0 **INSTALLATION:**

In general, Nautilus connectors are simple and straightforward to install, usually without the need for special tools. However, the following sections should be read to prevent damage to connectors.

Note: Where cable termination work and mounting are carried out by those other than Ocean Design, then the responsibility for that work lies with the customer or his subcontractor, and the following information is provided for guidance only.

2.1 **Solder Buckets**

Both plug and socket are provided with gold plated solder buckets for cable connection. Standard solder buckets can accommodate wire sizes up to 14 AWG (2.5 mm²) and up to 10 AWG (6 mm²) using solder pot adaptors. Termination should be performed per a commercially recognized soldering standard such as IPC/E1A J-STD-001C.

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2.2 Boot Seals

If rubber "mechanical" boot seals are employed, then both wire jacket and boot seal nipple should be cleaned with a warm, 50% distilled water/alcohol solution (verify wire jacket is compatible with alcohol), dried, and then lightly lubricated with dielectric silicone lubricant (e.g., Dow Corning, DC-4). Take care to ensure the wire is cut cleanly and that no sharp edges or stray wires are sticking out that may damage the boot seals during installation.

It is recommended that the integrity of seals be verified using standard installation resistance practices.

Note: If other cleaning agents or solvents are to be used, contact Ocean Design for confirmation of their compatibility with the plastic and rubber parts of the connector.

2.3 O-Rings

Both the plug and receptacle are supplied with all o-rings required for sealing the connector onto its mounting. Normally, these are Nitrile o-rings and their compatibility with the contained fluid (if any) should be confirmed. The o-rings are supplied in a separate bag. Prior to fitment, ensure that the o-ring grooves in the connector are clean. Lightly lubricate the o-rings with silicone lubricant and install in grooves.

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2.4 General Notes of Caution

Do **not** under any circumstances insert anything into the Nautilus receptacle except the Nautilus plug. Insertion of foreign objects such as electrical test probes will most likely damage the seals or break the stoppers. Similarly, probing the pins in the Nautilus plug could result in cracking of the pin insulation.

These Nautilus connectors are designed to withstand differential pressure across them only when the pressure is applied from the connector face normally exposed to the sea. Applying differential pressure from the solder-pot side of these connectors will likely result in damage to the connector. For purposes of designing pressure balanced oil-filled systems (PBOF), pressure on the solder-pot side of these connectors should not exceed the ambient exterior pressure applied to the connector's open face by more than 150 psi.

Great care should be taken not to drop these connectors. Their solder-pots are vulnerable to mechanical damage prior to termination.

Connectors should not be handled by their pigtails. This may cause damage to the solder joints resulting in electrical failure.

Live Connection and Disconnection - These connectors are **NOT** designed to be connected or disconnected while power is applied to the electrical circuits. **Severe** damage (including connector failure) can occur if this is done. In the event that live connection may occur or has occurred, please contact Ocean Design for further guidance.

Subsea Storage of Unmated Connector - The connectors should not be left unmated subsea for a cumulative period of greater than two weeks due to corrosion and marine growth. After 2 weeks, the connector should be cleaned and inspected. Upon re-deployment it may remain for another 2-week period. Plug connectors should never be left unmated subsea if there is a possibility that the circuits may become energized, this will most certainly result in damage. In the event unmated connectors are to be stored subsea, contact Ocean Design, Inc. for the appropriate protective covers.

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3.0 **OPERATION:**

Nautilus connectors require no special instructions regarding their operation. The following lists the capabilities of the Nautilus connector. These should not be exceeded.

3.1 **Standard Nautilus Specification**

Characteristics:	These connectors are intended for general subsea use. They are wet-mateable at the surface and at any ocean depth.
Pressure Rating:	Pressure balanced - 10 kPSI Differential Pressure - Contact Ocean Design for rating of connector in question.
Current Rating:	30 amps/circuit
Breakdown Voltage:	> 15,000 volts AC or DC
Electrical Insulation Resistance:	≥ 10 gigohms between circuits and to seawater @1,000 VDC
Electrical Contact Resistance:	≤0.2 ohms/circuit
Temperature Rating:	-2 to +50° C
Operating Storage Temperature:	-20 to +60° C
Mating Cycle Lifetime:	>1,000 mate cycles
Design Life	25 years

Note: The above refer to the Nautilus connectors' qualified capabilities and not to the Factory Acceptance Tests actually carried out on the delivered connectors. Refer to test procedure for details of the delivered connectors tested parameters.

3.2 ROV Mate Nautilus Connectors

ROV connectors should be mated and de-mated using only the attached handle. The mate is a simple push to connect and the de-mate is a simple pull to disconnect, both via the handle. Any attempt to disconnect by pulling on other parts of the connector (including the hose or cable termination) will likely result in permanent damage to the connector. The following lists the capabilities of the ROV Mate Nautilus Connector. These should not be exceeded.

3.3 ROV Mate Nautilus Specification

Connector Mating Force ($\pm 10\%$):

4-WAY	6-WAY 7-WAY	8-WAY 9-WAY	12-WAY
35 lbs 16 kgf	55 lbs 25 kgf	62 lbs 28 kgf	84 lbs 38 kgf

ROV Handle De-mating Force: 35 - 55 lbs (16 - 25 kgf)

Connector Mated Breakaway Force:

>300 lbs (136 kgf) applied via hose or termination shell

ROV Mating Indication:

Visual Latch Finger Engagement (See Photos 1 & 2)

Maximum Allowable Axial Force During Mating:

Approximately 450 lbs (204 kgf), depending on connector configuration



Photo 1: ROV Connectors showing ROV Latch Fingers in the closed position



Photo 2: ROV Connectors showing ROV Latch Fingers in the open

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3.4 Maintenance

Nautilus connectors require no periodic maintenance and are maintenance-free for their intended life. If damage occurs to the connector, then the entire connector must be returned to Ocean Design for repair or replacement.

General Connector Cleaning

If it becomes necessary, Nautilus connectors can be cleaned following the instructions below:

Note: Do not disassemble connectors. General cleaning instructions are intended for light to moderately soiled connectors. If connectors exhibit reduced performance and extreme soiling is suspected, return the connector to Ocean Design for repair or replacement.

3.4.1 Nautilus Plugs: Plugs can be cleaned with a warm 50% distilled water/alcohol solution. This includes the pins, shell, and most boot seals. Some rubber compounds display reduced electrical performance after exposure to alcohol. Rinse the connector thoroughly with the solution followed by a clean water rinse. If performance does not improve, clean a second time using a soft, natural bristle brush.

Note: Use caution when cleaning pins, side-loading will result in cracked pins.

3.4.2 Nautilus Receptacles: Receptacles can be cleaned by rinsing with clean water. Do not clean receptacles with alcohol.

Note: Never insert anything into the receptacle since this may introduce contamination into the connector or cause internal damage.

Never inject connectors with any type of fluid or attempt to clean connectors with any fluid not stated above. For specific questions, contact Ocean Design, Inc.

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Removal of Marine Growth and Calcareous Deposits

3.4.3 To remove calcite growth from the Nautilus connectors, a solution of 50% by volume of Citric Acid and water is recommended. All Seawater exposed elastomeric materials in the connectors have been fully tested against Citric Acid and are compatible for duration of 1 hour. After soaking, rinse thoroughly with fresh water to remove traces of the Citric Acid solution. Use of a water jet is acceptable, but the jet should not be directed onto the shuttle pins at the front of the receptacle or into the radial vent holes as this could result in a risk of water being forced through the primary seals.