



Document No: 0074

SpecTRON 10 Connector Operations Manual

Protection, Storage, Shipment, Unpacking, Deployment
& Maintenance Instructions

SIEMENS	SpecTRON 10 MK II CONNECTORS - PROTECTION, STORAGE, SHIPMENT, UNPACKING, DEPLOYMENT & MAINTENANCE INSTRUCTIONS	Doc No:	DOC0074
		Rev No:	8
		Category:	Technical
		Created By:	C. Plant

General

Thank you for purchasing a Siemens Subsea Connectors SpecTRON 10 Mk II product. The information that follows is an overview of the protection, storage, shipment, unpacking, deployment and maintenance instructions for SpecTRON 10 Mk II products.

Siemens Subsea Connectors recommend the termination and installation of all equipment only be undertaken by suitably trained and qualified personnel.

Revision Details:

Revision	Comments	Date	Originator	Approver
0	First Issue	13/08/12	C. Plant	W. Barrett
1	Bundle jumper bend radius changed to 500 mm, updated notes on clamping to clarify penetrator requirements	20/09/12	C. Plant	W. Barrett
2	Section 6.1 - Add maximum clamping distance (2 meters) Section 8.1 - Clarify that receptacle should only be exposed when changing from plug to dummy plug and that total exposure time is 28 days in total+ Section 8.1 - Clarify that plug can be left unmated as long as required Section 8.2.2 - Clarify that SpecTRON 10 connectors are not isolated from CP by design Section 8.4.1 - Clarify cleaning and maintenance instructions	12/11/12	C. Plant	W. Barrett
3	Front Cover – Updated. Section 1 – Add 'In Line' to PCE-B62 and PCE-A74 connector descriptions. Section 1 – Add Right Angle connectors, PCE-A74, PCE-B64 and PCE-B76. Section 4 – Add image of Right Angle connector lifting positions. Whole document – Change all 'Tronic' references to 'Siemens Subsea Connectors'.	04/09/13	N. Knight	K. Higgs
4	1. – add product safety information to introduction 2. – add the HSE section 11. – add the punch list to document	07-03-14	M. Gretton	B. Leach
5	New Front cover design added	28.4.14	K. Mutton	W. Barrett
6	Section 2. – HSE section comment about receptacle connectors added	04/06/14	M. Gretton	B. Leach
7	Section 9.2 amended, reference to CP strap being 30mm ² is incorrect. CP strap corrected to be 16mm ² .	26/06/14	S. Roberts	D. Church
8	Major update to document. Technical specification update to include more data on cable and hose. Information added for the packing, lifting and handling of Bundled harnesses. Section 11 added for cleaning of protective caps and receptacles post SIT and deployment. Connector storage conditions updated. Umbilical section created that outlines testing, handling and umbilical receptacle orientation. Installation section updates for mount orientations and hose routing. SIT section updated for hose routing in SIT and when connector cleaning is required. Added tolerance to OD of Hose in section 3.3.1. Added cable clamp strength rate to section 6. Updated document to latest Siemens template.	13/09/17	J. Keith	M. Earnshaw

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1. INTRODUCTION

The document describes correct handling, packaging, shipping, operation and maintenance practice and includes limited technical information which applies to the entire SpecTRON 10 Mk II connector range. For technical information on a specific SpecTRON 10 Mk II connector, please refer to the applicable Siemens Subsea Connectors datasheet which is available from Siemens Subsea Connectors upon request.

The SpecTRON 10 Mk II connector range is a family of wet mateable subsea electrical connectors and penetrators with a nominal IEC voltage classification of 6/10(12) kV. Please refer to connector datasheets for specific electrical and mechanical ratings.

Any information, records or Health and Safety feedback that needs to be detailed, can be recorded in the punch list at the rear of the document.

2. HEALTH AND SAFETY

Manual Handling, Lifting and Carrying are known to be the largest contributors to occupational ill-health.

Ensure that mechanical handling aids are used whenever possible to avoid manual handling. Where manual handling is considered appropriate for the task safe lifting guidelines must be followed, e.g. adopt correct posture, consider team lifting, employ safe lifting technique, etc. Only competent persons are permitted to perform tasks without supervision, if in doubt ask. Good Housekeeping avoids Slips Trips and Falls, keep your area clean and tidy.

It is the operator's responsibility to comply with current Company & regional health and safety legislation.

Caution shall be exercised during assembly to ensure that fittings and hydraulic / pneumatic equipment are properly installed.

In the event of a safety incident or any safety improvement suggestions, please contact the Health & Safety Department at prodsafe.gb@siemens.com and/or complete and return the punch list at the end of this procedure.

Note – All receptacle's (male pins) must be mated to its correct mating half before it is energised (this includes the correct Test, Dummy and Wet Mate Pair).

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3. TECHNICAL SPECIFICATION

This section of the report is intended as a guide to the general specification of the SpecTRON 10 Mk II connector range. For full details please see the appropriate connector datasheet, available from Siemens Subsea Connectors.

3.1 ELECTRICAL

Rated Voltage	6/10(12) kV
Rated Frequency	5 – 200 Hz
Rated Current	Refer to project and connector specifications

3.2 ENVIRONMENTAL

Design Life	30 years
Storage Temperature	Hose dependant (see relevant section below)
Subsea Operating Temperature Range	-5 °C to + 30 °C
Operating Water Depth	3000 m (1.5 FoS – TD0153) 4090 m (1.1 FoS – TR2313, SEPS SP-1001)

3.3 HOSE

3.3.1 AquaTRON 200

Outside Diameter	66 mm ±0.5mm (Measured Typical) 64.6 Nom +4/-2.8mm
Minimum Bend Radius	375 mm
Storage Temperature Range	-40 °C to +70 °C
Minimum Manipulation Temperature	-25 °C

Approximate weight for fully terminated hose with FF70

Weight in Air	4.5 kg/m
Weight in Water	1.1 kg/m

Approximate Weight for fully terminated hose with FF150

Weight in Air	5.2 kg/m
Weight in Water	1.8 kg/m

3.3.2 AquaTRON 200 (Three Phase Bundle including Spiral Guard and 4mm² Strain Relief wire)

Outside Diameter	147.5 mm
Minimum Bend Radius on inner edge	500 mm
Storage Temperature Range	-40 °C to +70 °C
Minimum Manipulation Temperature	-25 °C

Approximate weight for fully terminated hose with FF70

Weight in Air	15.7 kg/m
Weight in Water	4.9 kg/m

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Approximate weight for fully terminated hose with FF150

Weight in Air	18.6 kg/m
Weight in Water	7.8 kg/m

3.3.3 Gorilla

Outside Diameter	51.8 mm
Minimum Bend Radius	250 mm
Storage Temperature Range	-25 °C to +70 °C
Minimum Manipulation Temperature	-25 °C

Approximate weight for fully terminated hose with FF70

Weight in Air	3.2 kg/m
Weight in Water	1.0 kg/m

Approximate weight for fully terminated hose with FF150

Weight in Air	3.8 kg/m
Weight in Water	1.7 kg/m

3.3.4 Gorilla (Three Phase Bundle including Spiral Guard and 4mm² Strain Relief wire)

Outside Diameter	117 mm
Minimum Bend Radius	500 mm
Storage Temperature Range	-40 °C to +70 °C
Minimum Manipulation Temperature	-25 °C

Approximate Weight for fully terminated hose with FF70

Weight in Air	10.8 kg/m
Weight in Water	3.7 kg/m

Approximate Weight for fully terminated hose with FF150

Weight in Air	12.6 kg/m
Weight in Water	5.5 kg/m

3.4 **STANDARD CABLE**

3.4.1 Felflex 70

Outside Diameter	28.5 mm
Minimum Bend Radius	140 mm
Weight in Air	1.53 kg/m
Resistance @ 20°C Maximum	0.277 mΩ/m
Capacitance (core to ground)	0.42 nF/m
Storage Temperature Range	-40 °C to +80 °C (Cable only)
Minimum Manipulation Temperature	-25 °C

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3.4.2 Feltoflex 150

Outside Diameter	35 mm
Minimum Bend Radius	170 mm
Weight in Air	2.55 kg/m
Resistance @ 20°C Maximum	0.277 mΩ/m
Capacitance (core to ground)	0.56 nF/m
Storage Temperature Range	-40 °C to +80 °C (Cable only)
Minimum Manipulation Temperature	-25 °C

4. MARKING

The SpecTRON 10 Mk II products are marked in a number of locations. The connector Front End body is marked with the Siemens Subsea Front End serial number and the Front End part number. Tagging is available on the hose or cable for harnesses and is project and customer specific. Typical markings are shown below in Figure 1. Gland bodies are marked using a laser etching process, whilst harnesses are marked using a yellow label fixed to the hose using durable clear heatshrink or clear adhesive tape.



Figure 1 - Marking Details

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5. TRANSPORT

The SpecTRON 10 Mk II connector insert and exposed parts are susceptible to mechanical damage if not adequately protected. Protective caps (nominally IP66) are fitted to all connectors before transport. It is recommended that protective caps remain in place until the connectors are in use or immediately before the connectors are deployed subsea.

Connectors are designed to withstand vibration that occurs during transportation and to withstand being dropped from a height of 1m whilst in packaging.

5.1 PACKAGING

The connectors can be shipped singularly or in multiples. Care should be taken to protect the connector with bubble wrap or similar wrapping materials to avoid surface damage during transit. If large numbers are shipped in one consignment a suitably reinforced packing crate will be necessary to withstand the weight. Protective caps must be fitted at all times during transport.

Bulkhead type connectors with exposed tailing wires should be packed and shipped in a suitably sized packing crate to allow adequate space for the tailing wires without bending or kinking.

If the connectors are assembled onto hoses these must be suitably coiled and secured with tape to prevent uncoiling during transit. The minimum bend radii specified in section 3.3 must be maintained during the storage and transportation of jumpers.



Figure 2 - SpecTRON 10 harness in packaging

Figure 2 shows how a SpecTRON 10 Mk II harness is packaged. The connectors on either end of the harness have a transportation cap fitted and are surrounded in bubble wrap. The base of the shipping crate is lined with protective packaging and the harness is positioned so that the hose can be coiled without kinking. Any loose items are placed in a box inside the crate. Protective packaging is then placed on top of the harness and secured in place with a wooden baton, before the lid of the crate is screwed down.

Bundled harnesses require a large reinforced packing crate to transport them due to their size and weight see figure 3. The reinforced packing crate comes with specific lifting points and lifting should only be performed by suitable equipment that is rated to the require weight to lift the bundled harness and the packing crate.

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Figure 4 shows the packing of a bundled harness, End A and End B are placed in the middle of the crate with all protective caps fitted and the transportation plate for both ends. The hose assembly of the harness is coiled around the outer edge of the box maintaining the bundled MBR of 500mm on the inner edge.



Figure 3-Reinforced Bundled Harness Box



**Figure 4 – Specific Packing for Bundled Harness
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5.2 UNPACKING

Remove wrapping material taking care to inspect for any surface damage or items that may have become separated from the connector, such as 'O' seals. Do not use a knife to cut the wrapping material, as this may cause damage to any elastomeric parts of the connector. Do not remove protection caps until connectors are ready for installation. Upon removal of harness from crate do not allow the hoses to drag over the edges of the packing crate.

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6. LIFTING AND HANDLING

The SpecTRON 10 Mk II connectors with glands typically weigh in excess of 30 kg and hence should not be manually handled. The connector can be safely slung around the gland body (see Figure 5 and Figure 6) at a position where the connector is evenly balanced using a noose lifting arrangement.

For particularly heavy connectors (e.g. SPO flange penetrator), lifting eyes positions are provided on the connector flange. These are shown on the connector outline drawing, which is part of the connector datasheet. The datasheet is available separately upon request and is included as part of the connector documentation.

Dummy, or parking connectors weigh less than 15 kg and can be lifted by hand, however correct lifting practice should be observed at all times.

Connectors should never be lifted by the hose or cable, as this places unnecessary strain on the cable clamp and connector internals.

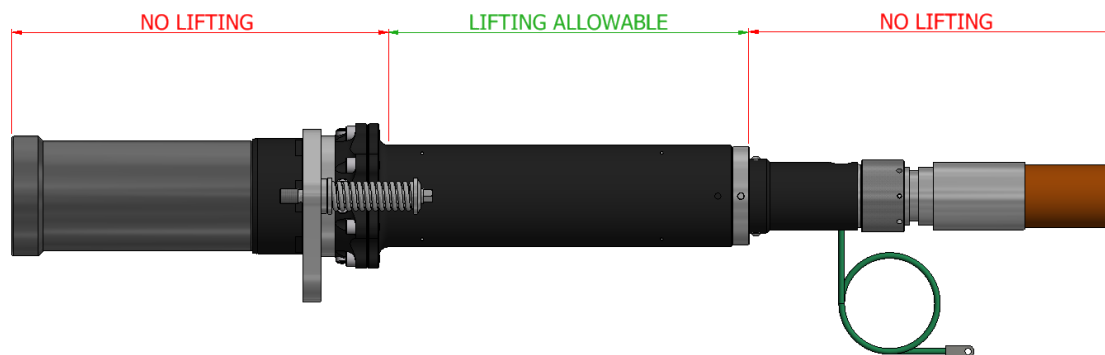


Figure 5 - Allowable lift positions (In Line Connectors)

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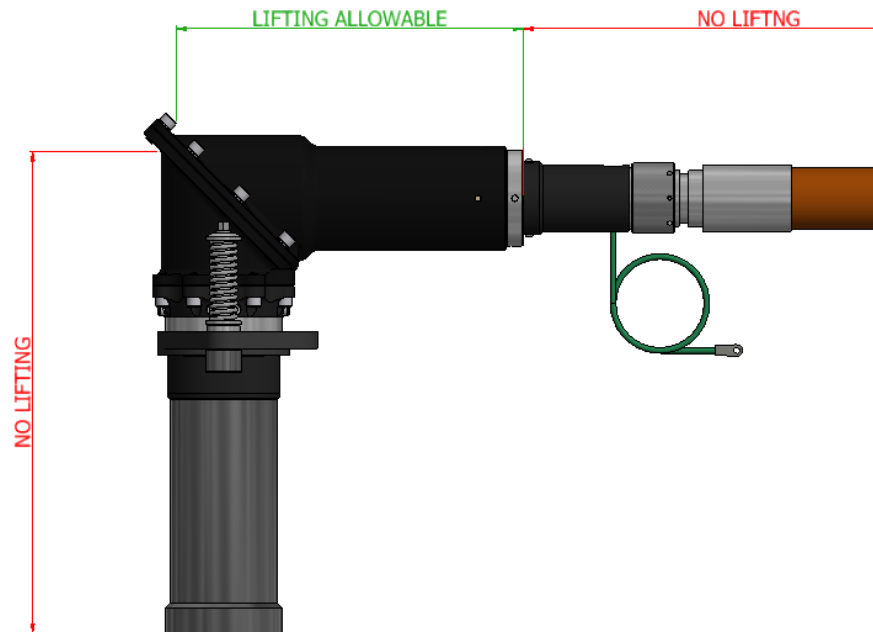


Figure 6 – Allowable lift positions (Right Angle Connectors)

Protective caps should remain on wherever possible during lifting operations to minimise the risk of damage to connector sealing or electrical components. This particularly applies to penetrators.

For harnesses, the cable or hose should be supported during lifts to minimise strain on the connector, as the cable clamp and hose are rated to 3.5kN. The maximum length of harness (bundled or single) which can be unsupported during a lifting operation is 5 meters.

A bundled harness weighs more than a single harness therefore extra care should be taken when manoeuvring them. Bundled harnesses are typically supplied with a 4mm² strain relief wire **this is not for lifting the harness** but rated to 5kN to protect against snag loads while mating the harness. A bundled harness MBR is 500mm on the inside edge of the bend.

Cable only connectors or hose brake out connectors with cable should be handled with care as these connectors do not have the hose to protect the cable jacket from mechanical damage. These types of connectors are usually used for testing purposes. During unpacking and use, these should not be dragged along surfaces, protected when routed over edges and kept away from abrasive materials to keep the outer jacket in the best possible condition.

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7. INSTALLATION

When any equipment is removed from storage for installation or SIT testing a thorough inspection should be made of the harness as a whole.

The SpectRON 10 Mk II connectors (not penetrators) can be installed onto client subsea structures by the end user provided the guidance in this document is followed. It is important to ensure that the handling guidelines are following during all parts of the installation process. This is particularly important for hoses and cables, which must be adequately supported during any lifting operations to prevent damage to the hose/cable and the termination inside the connector.

It is recommend that installation and internal termination of penetrators onto customer modules is carried out by Siemens Subsea Connectors.

During lifting and manoeuvring of the connector the transportation/protective caps should be left on the connectors for as long as possible to protect the mechanical interfaces. Care must be taken to ensure that the hose does not bend beyond its stated MBR as this may cause kinking which could damage the hose and the cable within. All manoeuvring of any SpectRON equipment must be done in accordance with Section 6.

During or after the installation of SpectRON equipment if any structural work is performed around the connectors such as welding or grinding, where contaminants may affect the connectors they must go through the cleaning process outline in section 11.

7.1 CONNECTOR MOUNTS

The mount orientation for SpectRON 10 connectors are driven by the mount type of the connector. The fixed mount Inline and Right Angled connectors, Dummy Plugs and Parking Receptacles can be installed in any orientation.

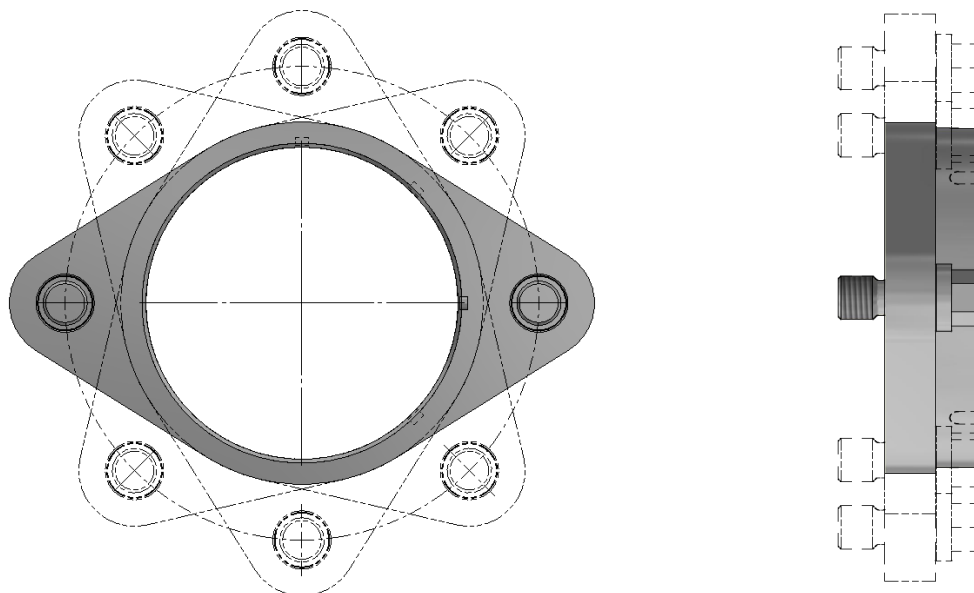


Figure 7 – Fixed I/L mount orientation

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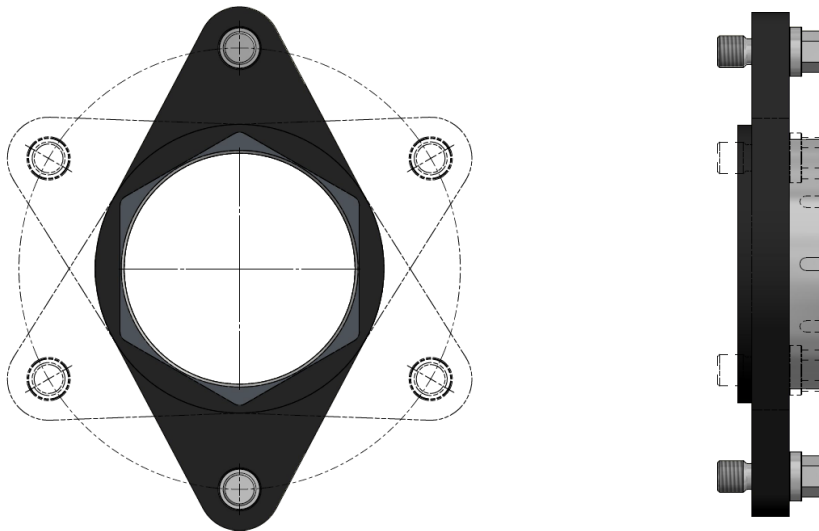


Figure 8 – Fixed R/A mount orientation

Design of compliant mounts has restriction to ensure they work effectively. The Inline type 1 Complaint mount is restricted to a vertical orientation plus/minus 45° (see Figure 9).

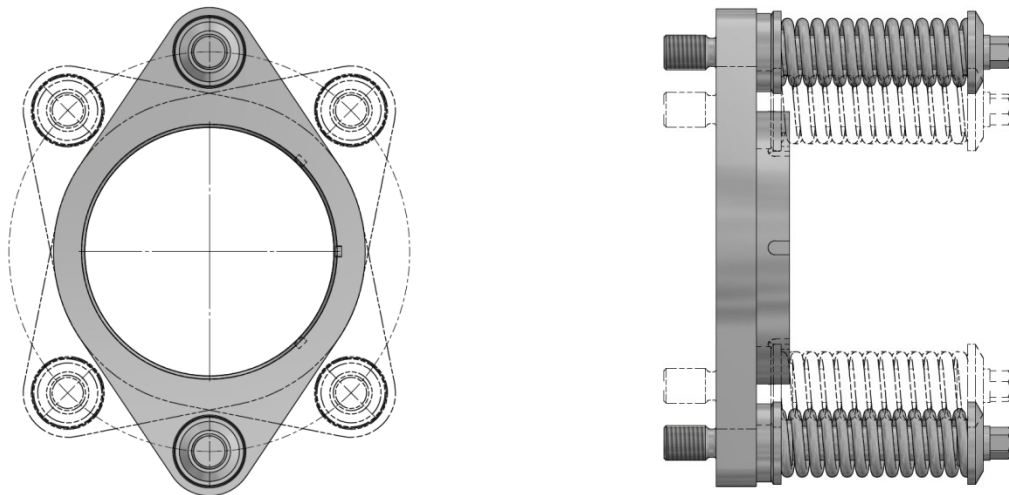


Figure 9- Compliant I/L Mount Type 1 Orientation

The Inline Type 2 Compliant mount and the Right Angled Compliant mount orientation is designed for horizontal mounting with the chin located at the bottom, to handle the force created by the weight of the connector (see figures below).

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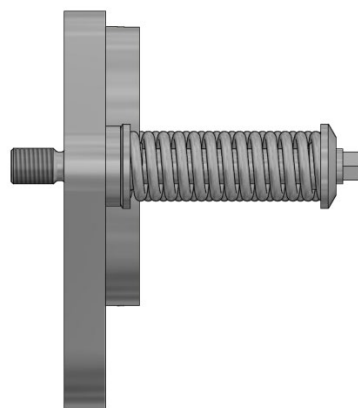
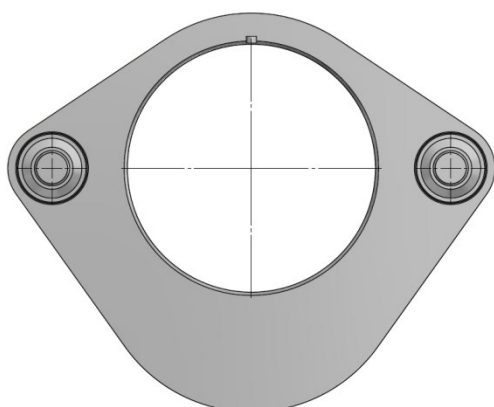


Figure 10- Compliant I/L Mount Type 2 Orientation

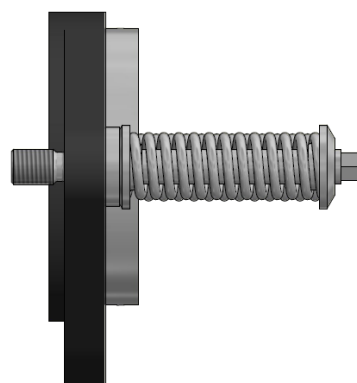
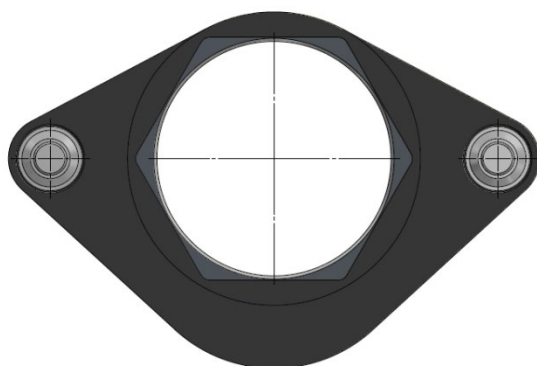


Figure 11- Compliant R/A Mount Orientation

Orientation of Receptacle connectors can be altered on site at the customer's request so the mount is able to rotate free to accommodate routing etc this is done by removing the location key. However with plug type connectors this is not possible and must be specified before the connectors leaves Siemens Subsea so the key is not fitted and then torque to an agree value with Siemens once installed on site.

Before installing connectors into their interface, the locking ring that holds the mount interface in place must be checked for loctite. If it is not present Siemens Subsea Connectors recommend that the locking ring is secured with a thread-locking compound, e.g. Loctite 243.

The mounting screws (compliant and fixed mount) should be tightened to the following torques:-

- | | | |
|--------------|---------------------------------|--------|
| • M16 Screws | SpecTRON 10 Mk. II (All) | 100 Nm |
| | SpecTRON 10 Mk. I (Right Angle) | 100 Nm |
| • M12 Screws | SpecTRON 10 Mk. I (In-line) | 40 Nm |

Siemens Subsea Connectors recommend that the mounting screws are secured with a thread-locking compound, e.g. Loctite 243.

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7.2 HOSE MANAGEMENT, ROUTING AND SUPPORT

Hose should be routed in a manner to avoid bending beyond the MBR under any circumstances. Particular care should be taken when designing mounting arrangements for hose and compliant mount connectors to ensure that the compliance does not bend the hose beyond its MBR.

Hose routing is application dependant. However, for straight horizontal runs, Siemens Subsea Connectors suggest that the maximum unsupported hose length is 2 meters. At bends the cable must be supported at tangents to maintain the MBR around the bend.

The weight of hose in air will vary from that in water (refer to section 3.3 for weights in air and water). Topside the weights can be significantly different to the weight in water and efforts should be made to avoid application of excessive weight to avoid exceeding the MBR or causing kinking.



Figure 12-MBR being maintained (AquaTRON 200 Hose)

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Figure 13- MBR being maintained (Gorilla 1.5" Hose)

The hose will have some natural resistance to bending/ kinking however application of snag force due to unsuitable routing (ignoring hose MBR) or application of force due to unsupported hose weight may cause damage to the conductors or terminations and efforts should be made to avoid this during all applications topside or in water.



Figure 14-Incorrect routing (hose deformed over "sharp" edge- AquaTRON 200 Hose)

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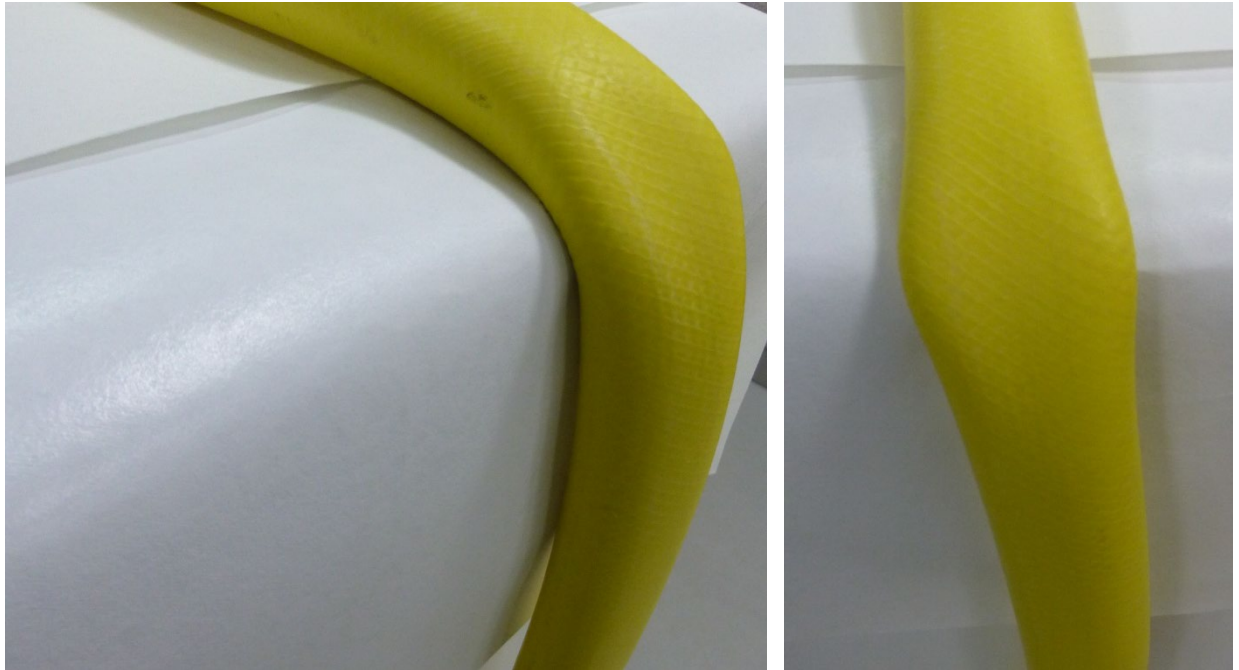


Figure 15-Incorrect routing (hose deformed over “sharp” edge- Gorilla 1.5” Hose)

Particular efforts should be made to support the hose where it exits the rear of the connector, particularly if the hose is to be routed immediately in an orientation contradictory to the connector (e.g. immediate fall in routing – see Figures below).

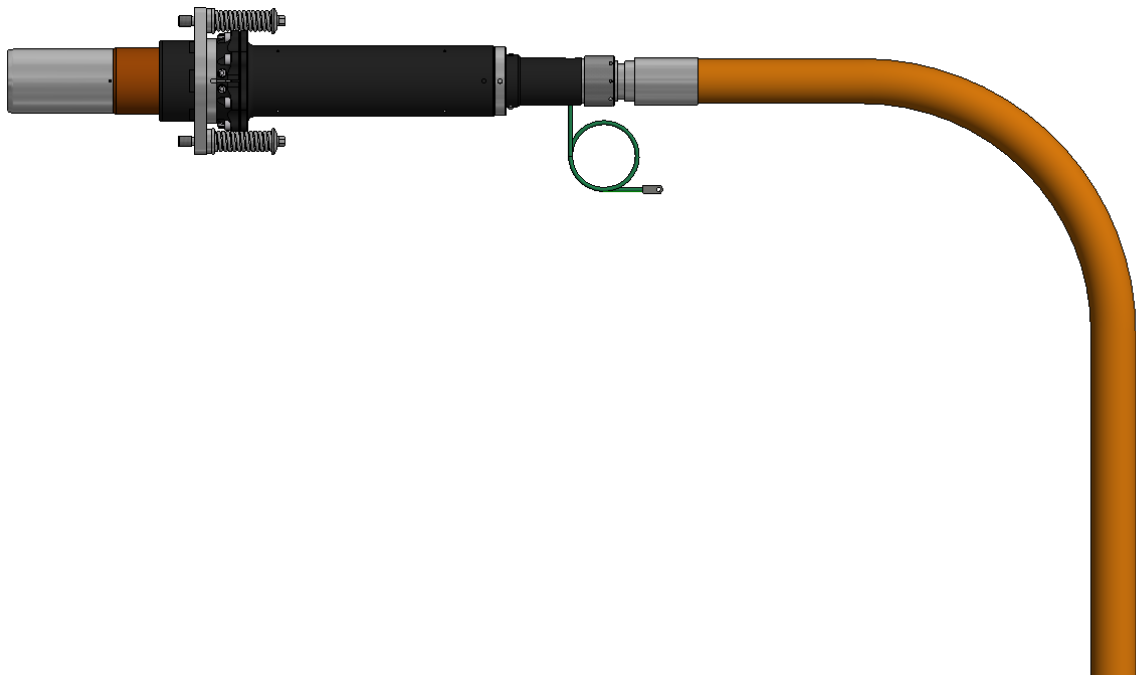


Figure 16-Immediate fall in routing

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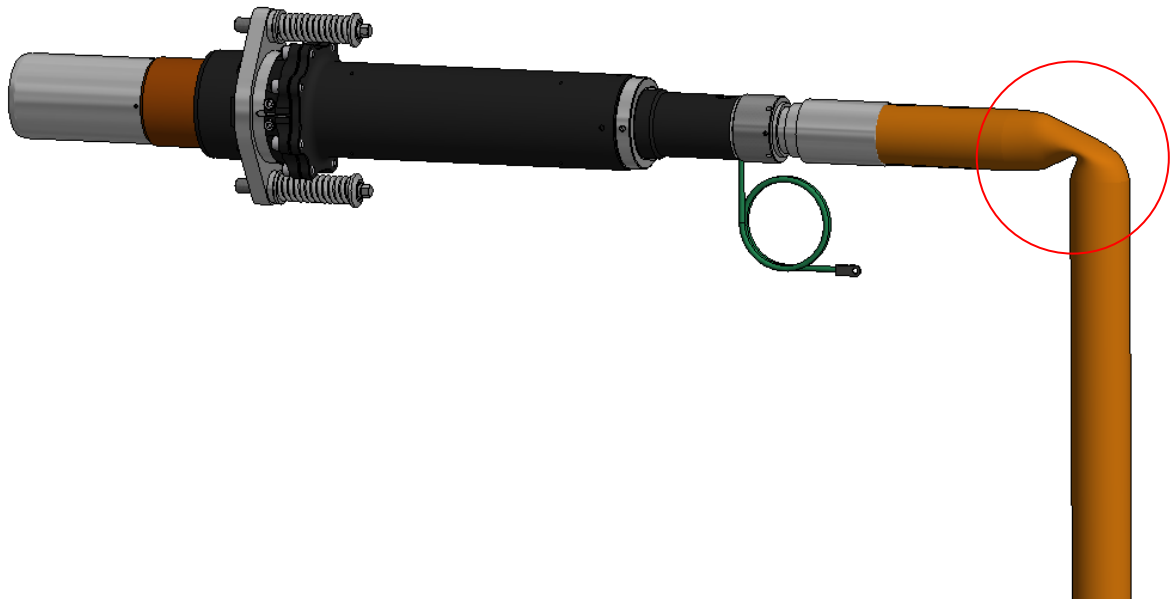


Figure 17-Hose kink due to immediate fall in routing and weight application

Siemens recommends the use of “formers” to avoid exceeding the MBR of the hose when exiting the connector or passing over acute angled surfaces (through or around structures).

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7.2.1 FORMERS

Detailed below are some recommended shapes of former that may be utilised to aid routing of hose during SIT or structure routing (deployment).

RECOMENDED FORMER DESIGNS

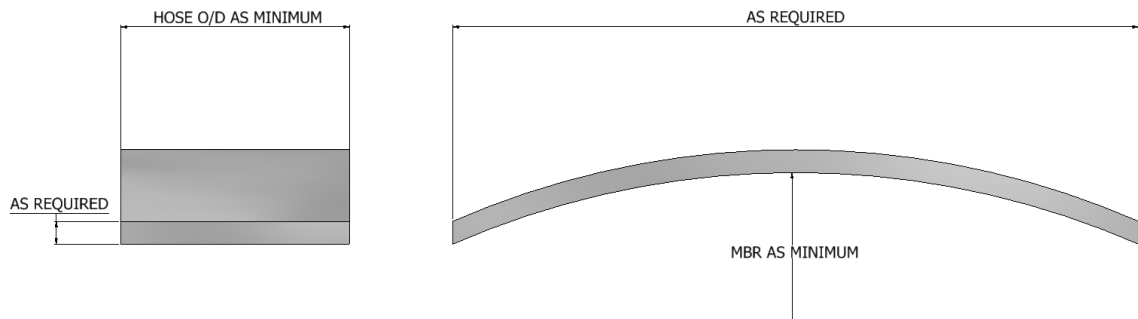


Figure 18- Plate Former

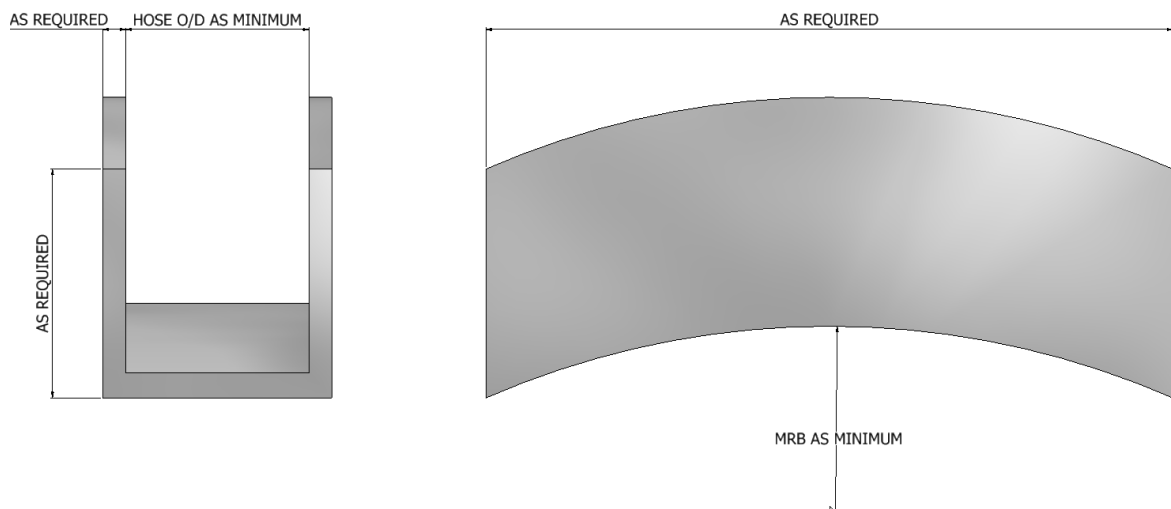


Figure 19- 'U' Former

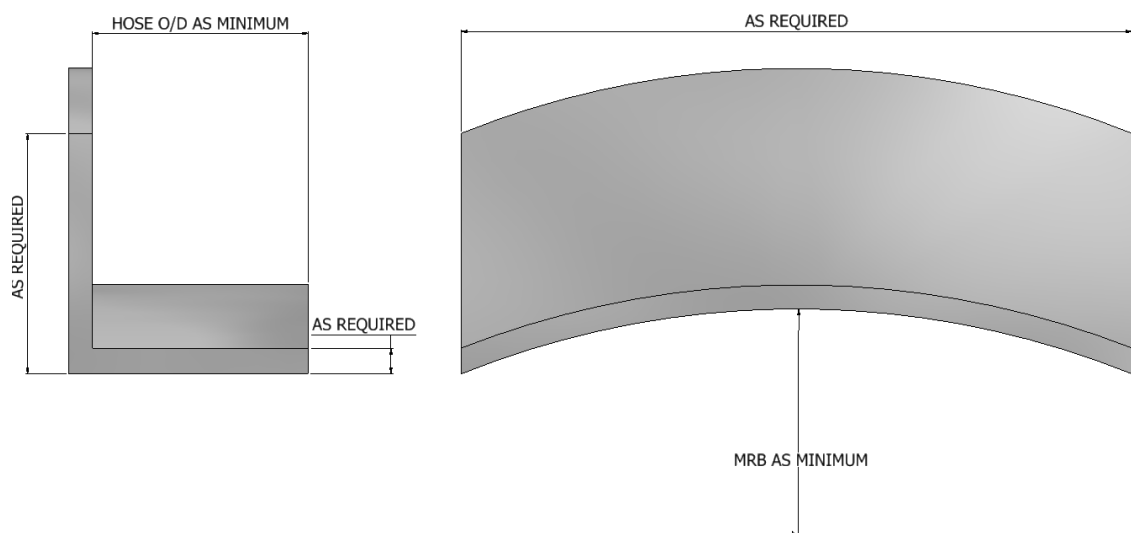


Figure 20- 'L' Former

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7.2.2 FIXED INSTALLATIONS

Hose management should be considered in fixed installations, where more permanent solutions are acceptable.

ROUTING

To aid routing of hose within MBR and support free hanging hose greater than 5m, formers can be produced to Siemens recommended design (See section 7.2.1) or to client specific design, and permanently fixed to the client's structure via welding or bolt pattern.

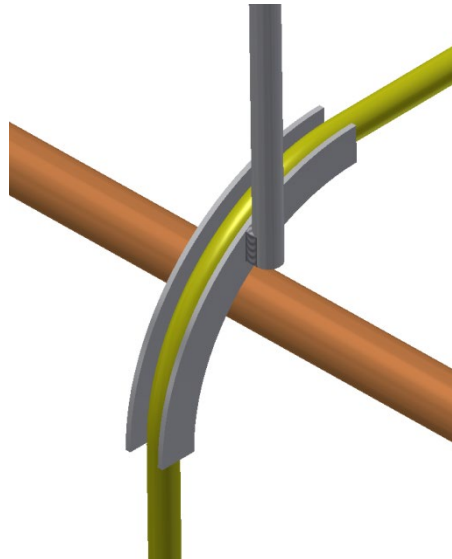


Figure 21-Permanent fixed 'U' former

CLAMPING

Siemens Subsea recommends that plastic clamps with elastomer insert are used to secure the hose (such as a Stauff pipe clamps with the correct inside diameter, refer to section 3.3 for hose diameters).

Careful consideration should be given to the placement of the first clamp on a compliant mount connector so as not to restrict the compliancy of the connector or impart stresses into the hose and cable. Where clamping is required on compliantly mounted connectors, it is recommended that an 'S' type arrangement or similar as shown in Figure 23 is utilised to take up the potential movement of the connector the hose should not be clamped any closer than 750 mm to the start of the hose adaptor on a compliant mount connector and 350 mm for a fixed mount connector or penetrator as shown below.



Figure 22 - Minimum clamp spacing from connector

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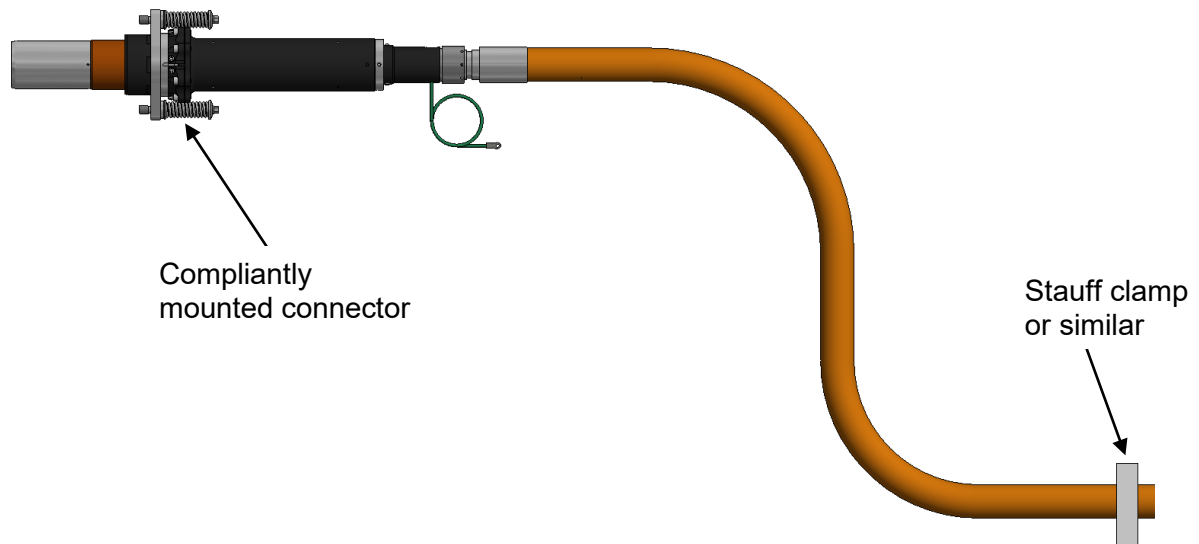


Figure 23 – Potential clamping of hose on compliant connector

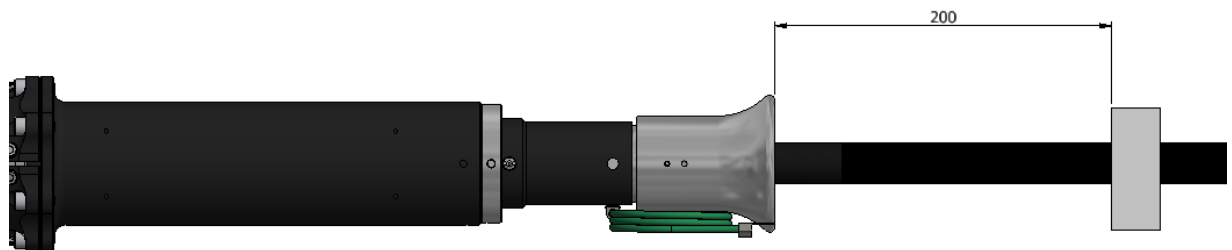


Figure 24- Umbilical clamping position

Umbilical cable can be clamped at a minimum of 200mm in line with the axis of the connector to add with routing and support.

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7.2.3 DYNAMIC INSTALLATION (SIT LAYOUT)

To aid the support of hose during SIT, formers can be produced to Siemens recommended design (See section 7.2.1) or to client specific design, and temporarily fixed to the client's structures via the use of tie wraps or clamps.

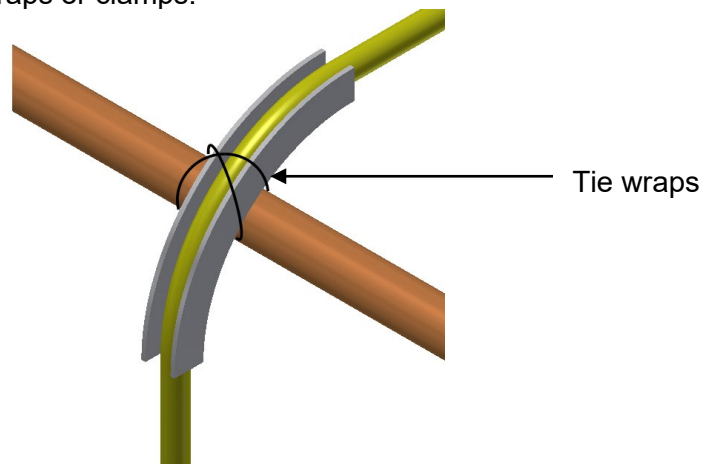


Figure 25

The maximum recommended length of hose which can be unsupported is 5 meters, however the MBR of the hose must still be observed at the hose exit of a connector before allowing 5m of hose to hang freely.

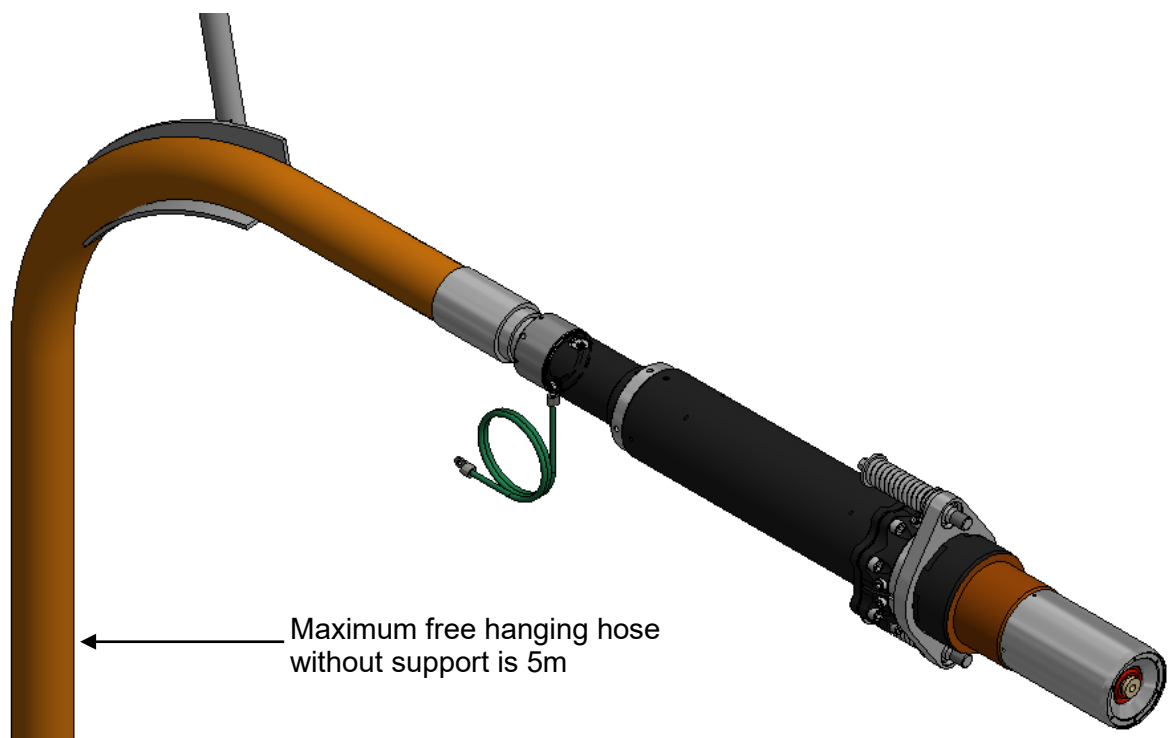


Figure 26

Figure 26 shows an example of a immediate fall in routing from an inline plug. The image shows how the hose may be supported by the use of formers mounted to the customer's structure. If a system similar to Figure 26 is to be employed then Siemens Technical must be consulted to assess the impact on the connectors and their terminations.

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During SIT the hose termination has significant weight (refer to section 3.3 for hose weights) and efforts should be made to avoid hanging of this weight from the connector termination itself. This could also be combated by providing a temporary elevated floor for SIT via the use equipment such as scaffolding, scissor lifts and ladders etc or alternatively a fabricated stand with a former attached. See Figure 27.

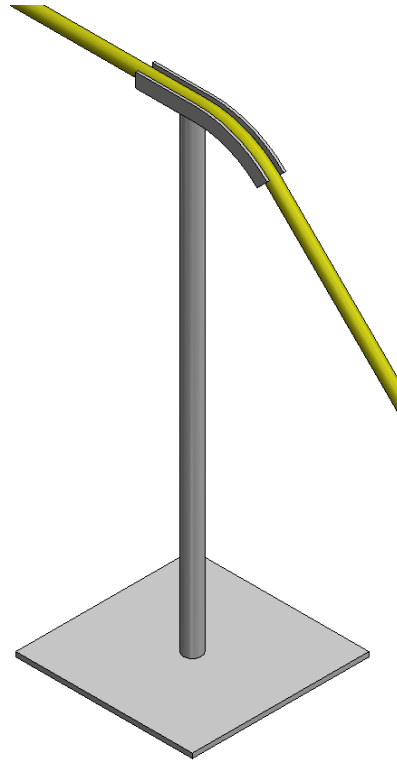


Figure 27- fabricated stand with former used for hose support

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8. SYSTEMS INTEGRATION TESTING

8.1 SIT LEVELS

The SpecTRON 10 Mk II connectors and penetrators are subjected to a complete FAT program as part of the manufacturing process. Penetrators will also be subjected to SIT testing after installation by Siemens Subsea Connectors onto customer equipment (e.g. transformers, motors).

It is also possible for customers to perform additional testing, subject to the restrictions outlined below.

8.2 ELECTRICAL TESTS

- Insulation resistance tests
 - Connectors may be subjected to IR tests at voltages of up to 5 kV. It is not possible to give a generic acceptance criteria as this will vary depending on the test setup, cable lengths, etc.
- Line resistance tests
 - Connectors and penetrators can be subjected to line resistance tests either at low current or rated current. Please consult connector or project specification before commencing a test at rated current.
- High Voltage Testing
 - Although it is possible to carry out high voltage AC or DC tests of connectors, jumpers and penetrators, Siemens Subsea Connectors technical department should be consulted before starting any testing.
- Partial Discharge Test
 - Please consult Siemens Subsea Connectors technical department before carrying out partial discharge (PD) testing of harnesses, connectors and penetrators.

8.3 PRESSURE/HYDROSTATIC TESTS

- Hydrostatic Tests
 - Connectors can be subjected to hydrostatic test pressures as defined by the connector and harness datasheets.
- Differential Pressure Testing (Penetrators)
 - Penetrators can be subjected to differential pressure testing as defined in the project requirements or connector datasheet.
- Gas Testing (Penetrators)
 - Penetrators can be subjected to low pressure helium leak testing of environmental seals, but must not be tested using high pressure gas. It is not possible for the end user to perform leak testing on connectors or harnesses.

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8.4 POST SIT

After any SIT, a full inspection of all SpecTRON equipment should be complete. Critical inspections are of the Receptacle pin contacts and Receptacle multilam and multilam groove which should be free from any mechanical damage such as scratches or pitting.

If the SIT requires the SpecTRON equipment to be partially or fully submerged in water or seawater they must undergo a full cleaning process outline in section 11 whether they are to be placed in storage or to remain on the structure for deployment.

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9. DEPLOYMENT AND MAINTAINANCE

The SpecTRON 10 Mk II connectors and penetrators have been developed for long term reliable high power control system applications associated with offshore installations. The underwater mateable capacity of the connectors is achieved using pressure compensated electrical inserts employing the CE principle.

All mild steel sealing interfaces shall be inlaid with Inconel 625, or similar, where no additional protection (e.g. CP, Paint etc.) can be provided. This is to prevent localised pitting of the interface.

The appropriate test connector must always be used to make electrical contact during testing. Under no circumstances should a foreign object (such as a screwdriver, test probe, or crocodile clip) be used as a test connection as this could damage the seals and insulation. Such actions will invalidate the warranty of the connector.

9.1 DEPLOYMENT

The connectors are usually supplied with protective caps. It is good practice to always fit the protective cap when a connector is unmated topside prior to deployment to provide mechanical protection. The protective caps must be removed prior to mating the connectors and ideally immediately before deployment to provide maximum protection.

If the connectors are to be left unmated in seawater dummy connectors must be used to protect the pin contacts in the receptacle connectors. Over exposure will increase the risk of corrosion damage or marine growth on the contact surfaces of the receptacle contact pins. This could lead to damage to the seals and insulation within the socket contacts.

28 days is the maximum cumulative allowable exposure (i.e. time between mate/demate operations) of unprotected (receptacle) contact pins to seawater over the life of the connector.

Plug connectors can be left unmated in sea-water, but parking receptacles are available to provide mechanical protection of mating interfaces on unmated plugs.

The maximum deployment rate for SpecTRON 10 Mk II connectors is 20 bar/minute. Refer to project specific data sheets and scope of supply drawings for performance specifications and detailed deployment instructions.

9.1.1 Protection of Receptacle Contact Pins

Under no circumstances must the contact pins in the receptacle connector be exposed to seawater with power on. If this situation does occur the contact surfaces of the pins will very rapidly degrade by electrolytic action. If these damaged pins are subsequently mated into a socket insert there is a **very high risk** of damage to the insulation and seals within the plug connector.

9.1.2 Over current capacity

Over current capacity varies for each product. Please refer to the product datasheet.

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9.2 CATHODIC PROTECTION

The SpecTRON 10 Mk II Connectors are offered with two material options, 316L stainless steel (UNS S31603), or Super Duplex stainless steel (UNS S32550/UNS S32760).

9.2.1 Stainless Steel 316L (UNS S31603, Siemens Subsea Connectors Material "AA")

Stainless steel 316L (UNS S31603) connectors and penetrators must be connected to a CP (Cathodic Protection) system at all times in order to withstand harsh saliferous environments.

Siemens Subsea Connectors provide a CP strap with connectors manufactured to the length specified by the end-user. The CP strap is manufactured in 316 stainless steel, has a cross section of 16 mm², and has an M6 spade terminal for connection to the CP system.

9.2.2 Super Duplex (UNS S32550/UNS S32760, Siemens Subsea Connectors Material "BQ")

Siemens Subsea Connectors advise that Super Duplex stainless steel connectors and penetrators should be isolated from the CP system to minimise the possibility of hydrogen embrittlement and withstand harsh saliferous environments.

SpecTRON 10 connectors manufactured from super duplex are not designed with isolation from the equipment to which they are mounted. Care must be taken to provide isolation from the CP system for the connectors if it is required by the system design.

Siemens Subsea Connectors do not typically supply CP straps with Super Duplex connectors, however, if required, Siemens Subsea Connectors can supply CP strap with Super Duplex connectors, to the same specification as the strap used on 316L connectors, as above.

9.3 MATING GUIDELINES

The connector is primarily offered as a stab plate connector, however a diver mate option is available, for In Line connectors only, when requested. The details below refer to a stab plate mated connector.

Connectors must be de-energised, isolated and earthed prior to disconnection, even if the connectors are only partially demated. If mated or demated whilst live, serious damage can occur to the connector contacts which will lead to seal damage on both connector halves.

The connector pair must be free of any stray charges before demating, as these can induce corrosion in the exposed receptacle pin after the plug is removed.

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9.3.1 Compliance

One half of a stab mate connector pair must always be fitted with a compliant mount option ("COM" in the part number). This mount allows movement to accommodate misalignment between the two connector halves.

Two types of compliant mount are offered, Type 1 and 2. Type 1 is used for all connector orientations except when the mounting holes are horizontal (relative to gravity) of the connector, when Type 2 should be used. See section 7.1 for further details.

9.3.2 Mate/De-Mate Speed

The connectors have been designed to operate across a wide range of mate / de-mate speeds. Siemens Subsea Connectors recommend that:

- Mating speed should not exceed 1 m/s.
- De-mating speed should not exceed 5 m/s

9.3.3 Pre-Mating Checks

Before mating, the receptacle connector should be checked for debris. The connectors have been designed to accommodate sand and silt contamination, however large pieces of debris should be removed using a water jet.

9.3.4 Partial Disconnection

Partial disconnection with the contact pin remaining between the primary and secondary diaphragms is not recommended. In this condition the level of insulation between the contact pin and socket contact is reduced and the connector is relying on the primary seals within the plug. There is also an increased risk of insulation break down at increased voltages.

9.3.5 Interrupted Connection

Interrupted connection (i.e. Partial mate to full de-mate) can be carried out without any adverse affect to connectors, provided the connectors are not energised.

9.4 MAINTAINANCE AND CLEANING

No part of the connectors should be dismantled prior to or during deployment, other than the removal of protective caps, since there are no user serviceable parts inside the connectors.

9.4.1 Removal of Marine Growth and Calcareous Deposits

To remove calcite growth from SpecTRON 10 Mk II connectors, a solution of 50% Citric Acid is recommended. All Seawater exposed elastomeric and polymeric materials in connectors have been fully tested against 50% Citric Acid and are suitable for intermittent cleaning of connectors throughout the connector's life. Other acid cleaners, such as 50% Acetic Acid, should not be used as they may cause deterioration of the elastomeric materials.

Chiselling and abrasive methods are not recommended. Use of water jetting for the removal of sand/silt and deposits is recommended subsea given the critical areas identified in Figure 28 are avoided and the following restrictions are followed:

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- The jet should not be directed at the face of the plug shuttle pin as this could result in a risk of water being forced through the primary seals and/or front seal. However jetting across the face of the plug is acceptable.
- The water jet should not be directed into the mouth of the Receptacle shroud as the earth contact could be displaced.

All forms of water jet cleaning of connectors in air must be avoided. The likelihood of damage to connectors is great, given the high localised impact velocities of the water jet.

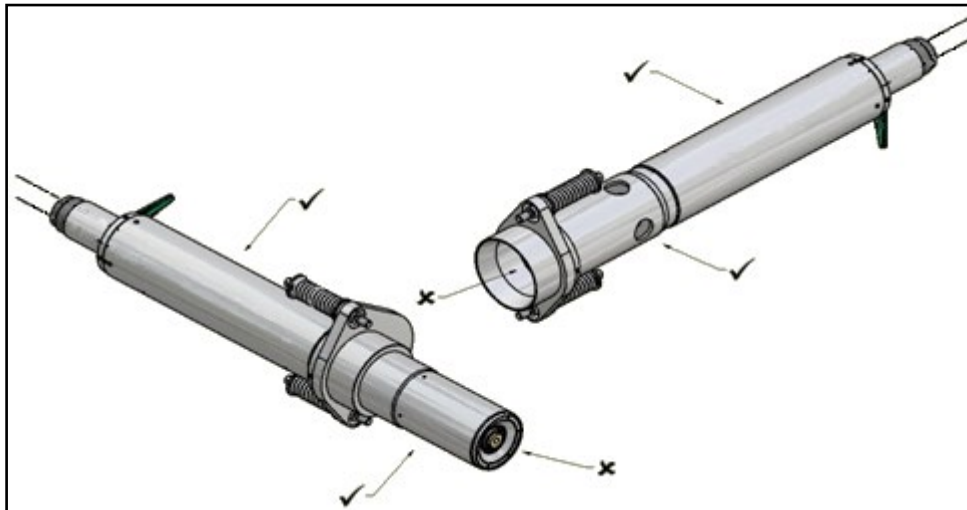


Figure 28 – SpecTRON 10 power washing precautions

9.5 RETRIVAL

If SpecTRON equipment is retrieved from deployment as well as the removal of Marine growth and Calcareous deposits they cleaning process outlined in section 11 for should be followed.

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10. UMBILICAL HANDLING AND TERMINATION

Termination of the umbilical cable to a SpecTRON umbilical connector must be done by a trained Siemens employee.

10.1 ROUTING

Service loops can be planned into the UTA to give enough length for re-termination purposes. If service loops are not possible then enough length should be available in the three dimensional routing as a minimum to incorporate re-termination of the umbilical connector of 0.5m and to facilitate the termination of the umbilical receptacle outside of the UTA.

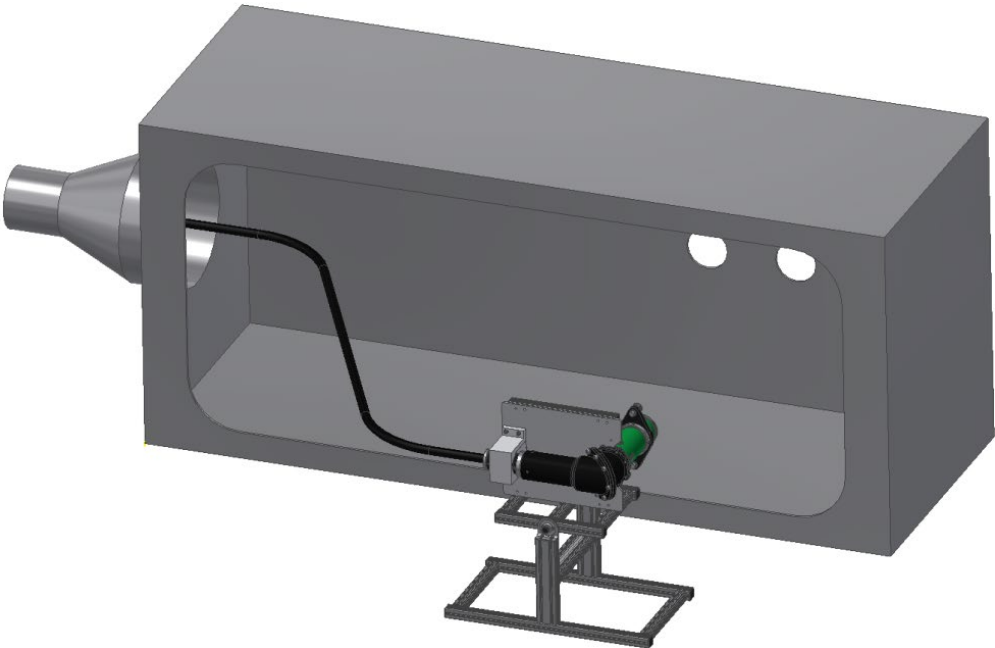


Figure 29 - Umbilical Receptacle Side on Termination (outside UTA)

Siemens Subsea offers multiple options for umbilical connector orientation within the UTA. The connector can be side on with the shroud facing left or right and the connector in the vertical position with the connector shroud facing down see figure 30. Due to the termination process a vertical position with the connector shroud facing up is not available therefore the orientation of the UTA during termination must be considered if this position is required. The position of the mount holes will depend on the mount type see section 7.1 and this will drive the angle selected for the cable and cable gland.



Figure 30 - Umbilical Receptacle orientations

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10.2 TESTING

IR testing can be performed on the terminated umbilical connector through the un-terminated power core of the umbilical cable with just a protective cap fitted to the umbilical receptacle. The protective cap and receptacle contact pin must be clean and dry in accordance with the cleaning process outlined in section 11.

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11. POST SIT / DEPLOYMENT CLEANING

The specified cleaning process must be followed when connectors have been retrieved from deployment or after they have completed SIT where the receptacles have been in contact with water. Correct PPE must be worn at all times when performing the cleaning process.

Protective Caps;

- Disassemble the Protective Cap by unscrewing (AC-27597-00) with appropriate pin spanner, then removing all 'O' rings and internal parts. (See figure 31)
- Clean each part thoroughly with fresh water
- Rinse with Isopropyl Alcohol (IPA absolute alcohol 100%)
- Allow to dry (can be placed in an oven at 50°C for 1 hour if required)
- Check all parts to ensure they are free from dried salts
- Reassemble cap using a small amount of silicone grease on the O rings. (See figure 31).

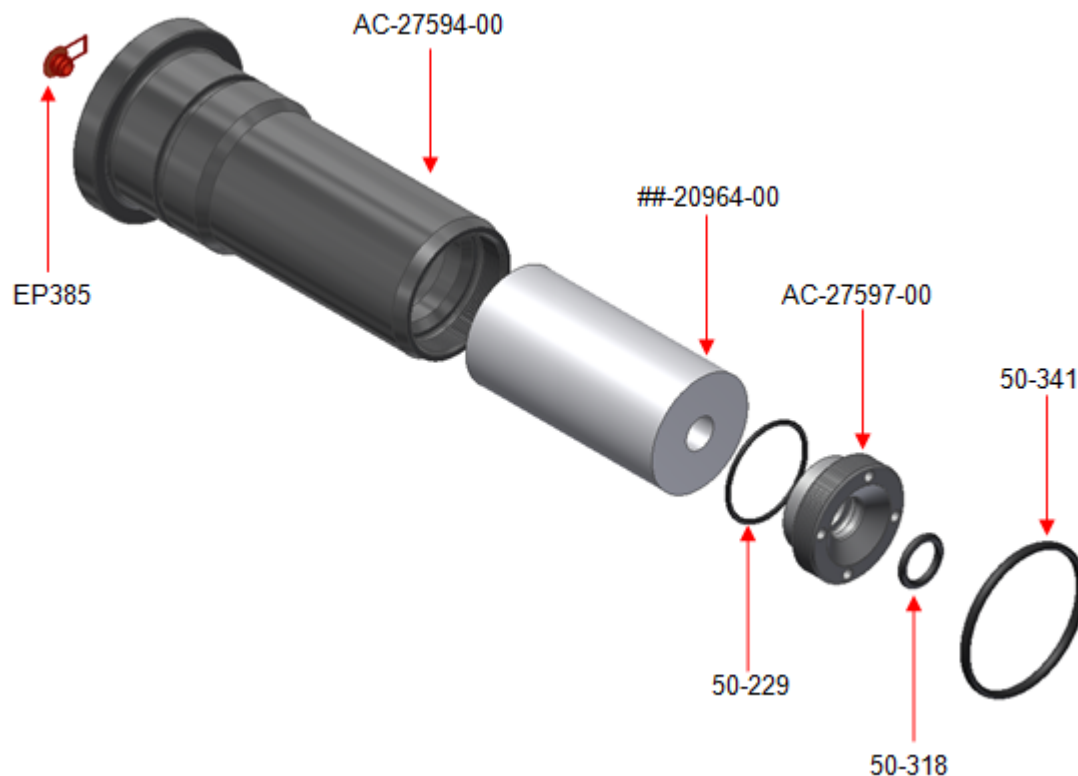


Figure 31 - Disassembled receptacle protective cap

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Receptacle Pins / Multilam Groove and Multilam

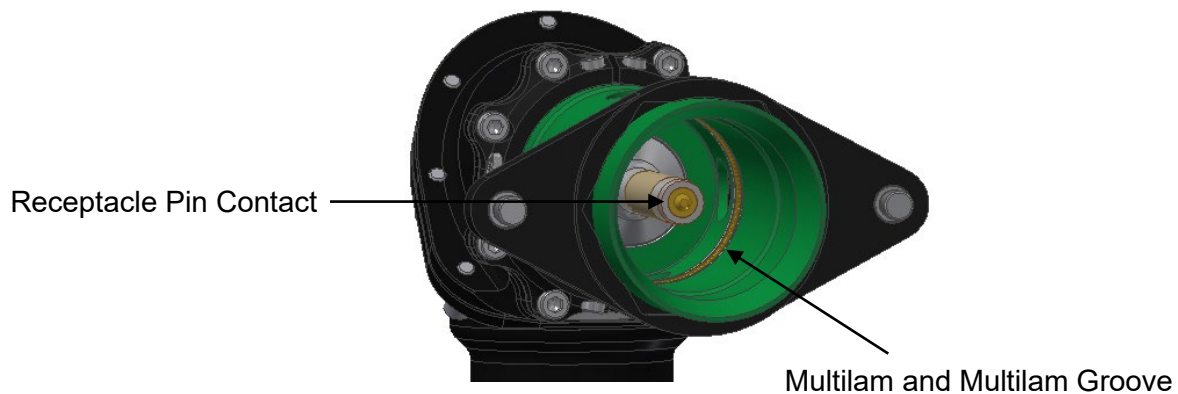


Figure 32

- Rinse the whole pin and the earth multilam well with fresh water, for the pin tip recess a squeeze bottle can be use to spray in the recess to dislodge any contaminants.

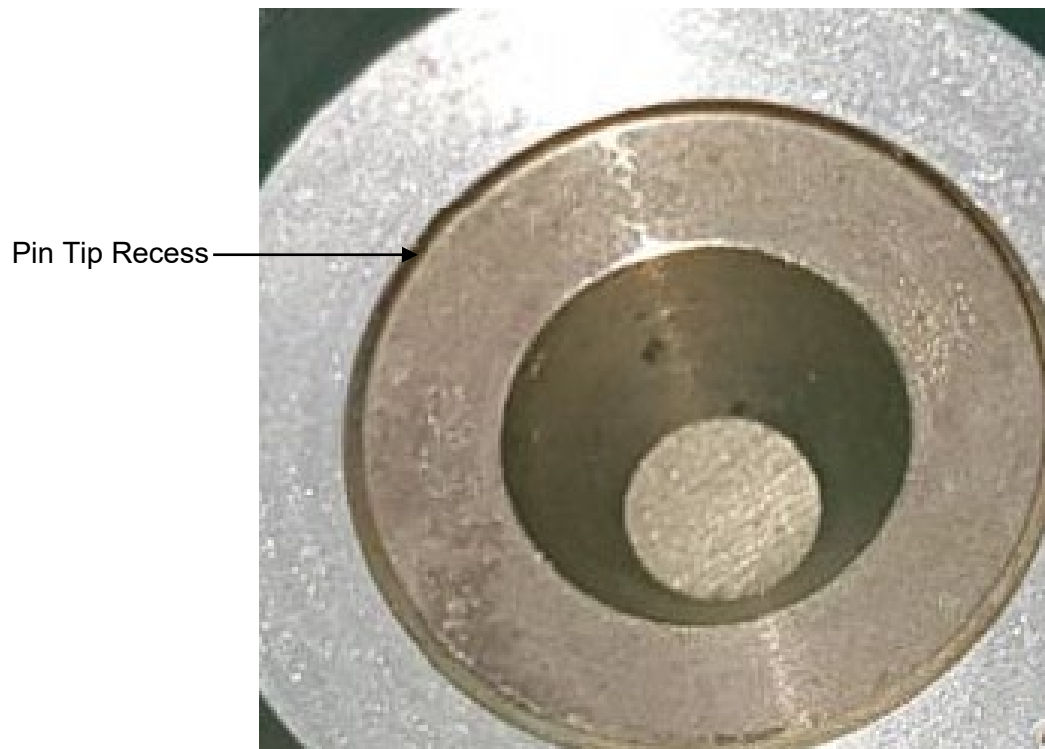


Figure 33 - Receptacle Pin tip recess

- Wipe using lint free tissue if required
- Rinse with Isopropyl Alcohol (IPA absolute alcohol 100%)
- No pooling of IPA or water should be found within the Multilam groove on the Receptacle Shroud. Compressed air can be used to disperse any pooled fluid but the Receptacle pin must be rechecked for contamination.
- Allow Receptacle pin, Multilam and Multilam groove to completely dry
- There should be no damage present on the receptacle contact area and receptacle shroud Multilam. (See figure 34)

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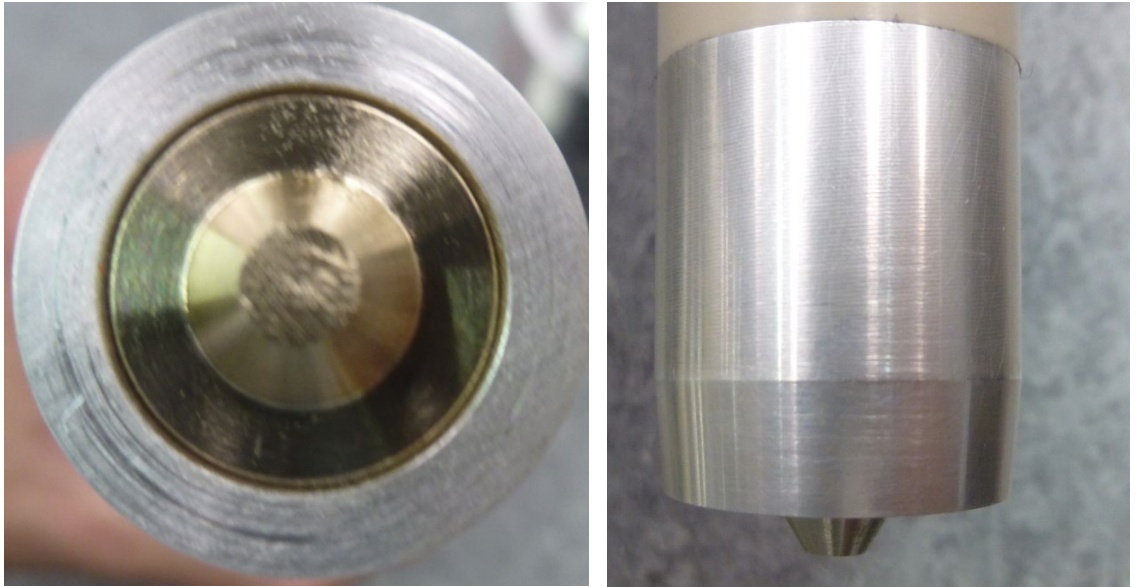


Figure 34 - Receptacle pin contact area with no damage

- Apply dielectric oil to the pin. Dielectric oil must be TD01 to avoid compatibility issue with elastomeric components. Siemens Subsea advises that one mate should be performed with a Plug connector to provide sufficient coverage. (If no plugs are available contact Siemens Subsea for TD01 oil)
- Protective cap must be refitted at this stage. It is critical that both the protective cap and receptacle Shroud/Pin are clean and dry before fitting, this is so moisture is not trapped around the pin contact area, which could result in corrosion over the long term.

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12. CONNECTOR STORAGE

The SpecTRON 10 Mk II connectors must be stored in a clean dry area and be protected by bubble wrap or similar. Clean & dry protection caps supplied by Siemens must be fitted at all times, and the storage temperature is product dependant, see section 3 for info.

No modification to the internal profile of the protection cap or any foreign materials such as Silica gel should be introduced into the protection cap, as these will lead to damage of the critical seals and electrical contact areas.

Prior to installation the connectors are sensitive to environments where grit and dirt are present. To prevent ingress of the above, they should be stored in a clean dry area and be protected by bubble wrap or similar wrapping material. Protective caps must be fitted until immediately before deployment.

Humidity of the store room should be below 75%. Very moist or very dry conditions should be avoided. The Plug connector should be protected from strong sunlight and strong artificial light with a high ultra violet content.


The connectors should not be allowed to come into contact with solvents, oil, greases or any other semi-solid materials. If glanded connectors are to be stored bolted into their interfaces ensure the cable entry point into the gland is covered to prevent water ingress.

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