SpecTRON 10
Connector Operations Manual
Protection, Storage, Shipment, Unpacking, Deployment & Maintenance Instructions
SpecTRON 10 MK II CONNECTORS - PROTECTION, STORAGE, SHIPMENT, UNPACKING, DEPLOYMENT & MAINTENANCE INSTRUCTIONS

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:

<table>
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<th>Comments</th>
<th>Date</th>
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<td>0</td>
<td>First Issue</td>
<td>13/08/12</td>
<td>C. Plant</td>
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<td>1</td>
<td>Bundle jumper bend radius changed to 500 mm, updated notes on clamping to clarify penetrator requirements</td>
<td>20/09/12</td>
<td>C. Plant</td>
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<td></td>
<td>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</td>
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<td>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</td>
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<td>3</td>
<td>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’.</td>
<td>04/09/13</td>
<td>N. Knight</td>
<td>K. Higgs</td>
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<td>Rev 4</td>
<td>1. – add product safety information to introduction 2. – add the HSE section 11. – add the punch list to document</td>
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<td>M. Gretton</td>
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<td>New Front cover design added</td>
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<td>S. Roberts</td>
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1. INTRODUCTION

This document applies to the SpecTRON 10 Mk II connector range, including (but not limited to) the following product types:

- PCE-B62-01P-##-###-##  Wet Mate In Line Receptacle Connector
- PCE-B64-01P-##-###-##  Wet Mate Right Angle Receptacle Connector
- PCE-B76-01P-##-###-##  Wet Mate Right Angle Umbilical Receptacle
- PCE-A73-01S-##-###-##  Wet Mate In Line Plug Connector
- PCE-A74-01S-##-###-##  Wet Mate Right Angle Plug Connector
- TC1A-270-####-####  SPO Flange Penetrator
- TC1A-263-####-####  Square Flange Penetrator
- PCE-M18  Parking Receptacle
- PCE-L10-01S-####-####  Wet Mate Dummy Plug
- TC6A-1104  Dual Barrier Inline Termination Kit
- TC6A-1071  Single Barrier Inline Termination Kit
- TC6A-1072  Single Barrier Right Angle Termination Kit
- TC6A-1075  Third Party Bushing Termination Kit

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 & 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 in section 11.

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).
3. MARKING

The SpecTRON 10 Mk II products are marked in a number of locations. The connector gland body is marked with the Siemens Subsea Connectors serial number and the customer identification number. This marking is repeated on the hose or cable for harnesses. 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.

![Figure 1 - Marking Details]
4. 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 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.

4.1 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 box 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 box 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 10.3 must be maintained during the storage and transportation of jumpers.

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.

4.2 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. On removal do not allow the hoses to drag over the edges of the packing crate.
5. **LIFTING & 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 at the centre of gravity using a noose lifting arrangement, as shown in the image below. The centre of gravity is marked on the connector outline drawing (supplied in documentation pack) but must be verified at low level before commencing any lift.

![Figure 3 - Allowable lift positions (In Line Connectors)](image)

![Figure 4 – Allowable lift positions (Right Angle Connectors)](image)
For particularly heavy connectors (e.g. SPO flange penetrator), lifting eyes are provided on the connector. 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.**

For harnesses, the cable or hose should be supported during lifts to minimise strain on the connector. The maximum length of hose which can be unsupported during a lifting operation is 5 meters.

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.
6. CONNECTOR STORAGE

The SpecTRON 10 Mk II connectors must be stored in a clean dry area and be protected by bubble wrap or similar. Suitable protection caps must be fitted, and the storage temperature should be between -25°C and 60°C.

6.1 Short Term

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.

6.2 Long Term

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.
7. INSTALLATION

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.

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)
- 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.

7.1 Hose 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.

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.

Siemens Subsea Connectors recommend that a rubber inlayed plastic clamp is used to secure the hose, such as a Stauff pipe clamp with the correct inside diameter (refer to hose datasheets).

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.
8. SYSTEMS INTEGRATION TESTING

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.

8.1 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 an 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.

8.2 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.
9. DEPLOYMENT AND MAINTAINENCE

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 inlayed 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.
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 mm$^2$, 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.

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.
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 breakdown 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 **Maintenance & 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 6 are avoided and the following restrictions are followed:

- 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 6 – SpecTRON 10 power washing precautions
10. 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.

10.1 Electrical

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<td>Rated Current</td>
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10.2 Environmental

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10.3 Hose

10.3.1 AquaTRON 200

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10.3.3 Gorilla

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