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DigiTRON EFL's, Jumpers and Harness Assemblies - Installation, Operations and Maintenance Manual

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

www.siemens.com/energy/connector-operations-manual

This page records the revision status of the entire document and its authorisation for issue. When a page or pages of the document are revised, the number of the page affected will be entered in the Page Affected/Remarks Column and a vertical margin line will appear against the latest amended text.

DigiTRON Electrical Flying Leads, Jumpers and Harness Assemblies - Installation, Operation and Maintenance Manual

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1. INTRODUCTION

This manual details procedures for the following:
Installation Operation and Maintenance of DigiTRON electrical flying leads, Jumper and Sensor Harnesses.

2. SCOPE

This manual includes details of installing the DigiTRON family of connectors when fitted on oil filled hose or cable assemblies. Electrical and mechanical specification of connectors and hose is also detailed in this document.

The back page includes a sign off point which must be completed by the user of this manual.

Any information, records or Health and Safety feedback that need to be detailed can be recorded in the punch list at the rear of the document. Sensor installation shall be covered by manufacturer specific procedures.

3. ABBREVIATIONS

A	Ampere
AC	Alternating Current
Assy	Assembly
API	American Petroleum Institute
AWG	American Wire Gauge
BOM	Bill of Material
°C	Degree Celsius
CE	Controlled Environment
Comms	Communication Signal
CP	Cathodic Protection
DC	Direct Current
DWG	Drawing
EFL	Electrical Flying Lead
EMF	Electrical Magnetic Field
FAT	Factory Acceptance Test
GA	General Arrangement
IR	Insulation Resistance
ISO	International Organization for Standardization
ITP	Inspection Test Plan
K	Kelvin
LTC	Long Term Cover
M	Metres
Max.	Maximum
MFG	Manufacturing
Min.	Minimum
No.	Number
ROV	Remotely Operated Vehicle
SI	Standard International
SRT	Site Received Test
SST	Stainless Steel
TBD	To Be Defined
TSP	Twisted Screened Pair
UNS	Unified Numbering System for Metals and Alloys
V	Volt

4. 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 if manual handling is inappropriate. 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 and Safety Department at prodsafe.gb@siemens.com and/or complete and return the punch list in section 18.

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).

5. PROTECTION, HANDLING AND SHIPMENT

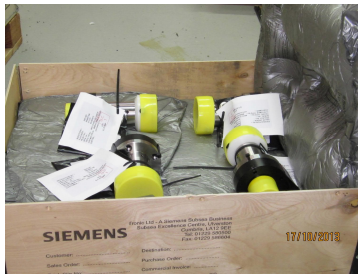
Siemens Subsea electrical connectors are manufactured primarily from materials such as 316L stainless steel (UNS S31603), and Super Duplex stainless steel (UNS S32550), and as such are designed to withstand harsh saliferous environments. However, the connector insert and exposed parts are susceptible to mechanical damage if not adequately protected. Dust caps or Acetal protective caps are fitted to all Siemens Subsea connectors before transport. Caps are recommended to remain in place until connectors are deployed subsea.

The connectors are generally relatively small items of equipment, and therefore, can be shipped singularly or in multiples. Care should be taken to protect the connector with either Instapak (or similar), 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. Dust caps or Acetal protective caps must be fitted at all times during transport.

See next page for images.

WARNING: Please refer to product packaging for accurate lifting weight and ensure the appropriate lifting equipment and PPE are used during handling operations.

ACCEPTABLE PACKAGING FOR SHIPMENT



Instapak (or similar)



bubble wrap (or similar)

UNACCEPTABLE PACKAGING



If storage is carried out in saline conditions, e.g. on a ship's deck or hold, then full dummy connectors should be used to protect a receptacle connector and a protective cap to protect a plug connector. 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 following bend radii are recommended for storage/transport of hoses.

Siemens Pressure Balanced Oil Filled Hose 50, TC6A-700 – Minimum inside bend radii
- 125mm

Siemens Pressure Balanced Oil Filled Hose 75, TC6A-712 – Minimum inside bend radii
- 180mm

Connectors are designed & qualified to withstand vibration that occurs during transportation and to withstand being dropped from a height of 1m whilst in packaging. Any connector-specific handling and transport advice is contained within the appropriate section further on in this document. Ensure that mechanical handling aids are used whenever possible to avoid manual handling.

6. 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 protective caps until connectors are ready for installation. On removal do not allow the hoses to drag over the edges of the packing crate. Connectors supplied in boxes must be stored in the box.

7. STORAGE

7.1 SHORT TERM CONNECTOR STORAGE

(Non-controlled warehouse / exposed storage and transportation)

Prior to installation /deployment 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 their protective wrapping material or similar. Protective caps must be fitted if supplied (also refer to section 5). No carbon steel must be present in the storage of the products.

Please note; Maximum storage temperature takes into account solar gain. Skin / Surface temperature must not exceed 70°C. Suitable protection must be used to ensure maximum storage temperature is not exceeded.

7.2 LONG TERM CONNECTOR STORAGE

The 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 -40°C and 70°C. 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.

No carbon steel must be present in the storage of the products

Please note; maximum storage temperature takes into account solar gain. Skin temperature must not exceed 70°C. Suitable protection must be used to ensure maximum storage temperature is not exceeded.

7.3 SIEMENS PRESSURE BALANCED OIL FILLED HOSE STORAGE

Storage temperature range: -40°C to 70°C

Storage humidity: 0% to 85% R.H.

Maximum initial storage period: 2 years stored in accordance with ISO 2230 (pressurised). If storage is outside the above guidelines, then protective covering is available on request. Where Junction Boxes are used ensure protection from strong sunlight and strong artificial light.

Extended storage period: After the initial storage period expires all pressurised hose assemblies must be visibly inspected for:

- Permanent distortions, such as creases or flats
- Mechanical damage, such as cuts, tears, abraded areas or delaminated plies
- Surface cracking
- Changes in surface condition, such as hardening, softness or tackiness.

After the inspection is completed and data recorded the assembly can be stored for a further 2 years.

7.4 CABLE STORAGE

Storage temperature range: -40°C to 70°C

All our cables are designed for long life in hazardous environments but for extended storage periods we recommend dry storage, under cover and out of direct sunlight.

7.5 LONG TERM STORAGE OF ELASTOMERS

For the recommended storage of elastomeric components e.g. termination sleeves and cable boots, please refer to Siemens document MH006 - Procedure for Storage and Handling of Elastomeric Materials.

8. ELECTRICAL FLYING LEADS, JUMPERS & SENSOR HARNESSES

An EFL is completely independent and is fitted with ROV or Diver installable connectors at each end. All EFL's are oil filled pressure compensated hose or suitable subsea cable assemblies and are supplied complete. They are used to connect various subsea equipment. All EFL's should be retrievable and when installed should not cross-over each other.

Also included in this document is the installation of other electrical harnesses. These may involve the installation of a flange mounted fixed connector or sensor. The DigiTRON range of connectors have been developed for long term reliable signal and low power control system applications associated with offshore installations. The underwater mateable capacity of these connectors is achieved using pressure compensated electrical inserts employing the CE principle.

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

If the connectors are to be left unmated, in seawater, for any length of time 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. Plug connectors do not require full dummy connectors for protection. Siemens Subsea advise the fitting of acetal caps to protect plugs against marine growth. It is good practice to always fit the protective cap when a connector is unmated topside prior to deployment to provide mechanical protection.

NOTE: 28 DAYS IS THE MAXIMUM CUMMULATIVE ALLOWABLE EXPOSURE OF UNPROTECTED CONTACT PINS TO SEAWATER OVER THE LIFE OF THE CONNECTOR. THIS ONLY APPLIES WITH POWER OFF.

Some illustrations are shown on the following 3 pages to help identify an EFL and harness.

Page 12,

Figure 1 - Shows a simple overview GA drawing of a typical EFL with a DigiTRON+ ROV receptacle and plug installed.

Page 13,

Figure 2 - Shows a simple overview GA drawing of a typical Jumper with a DigiTRON+ ROV receptacle and a DigiTRON+ stab plate receptacle connector.

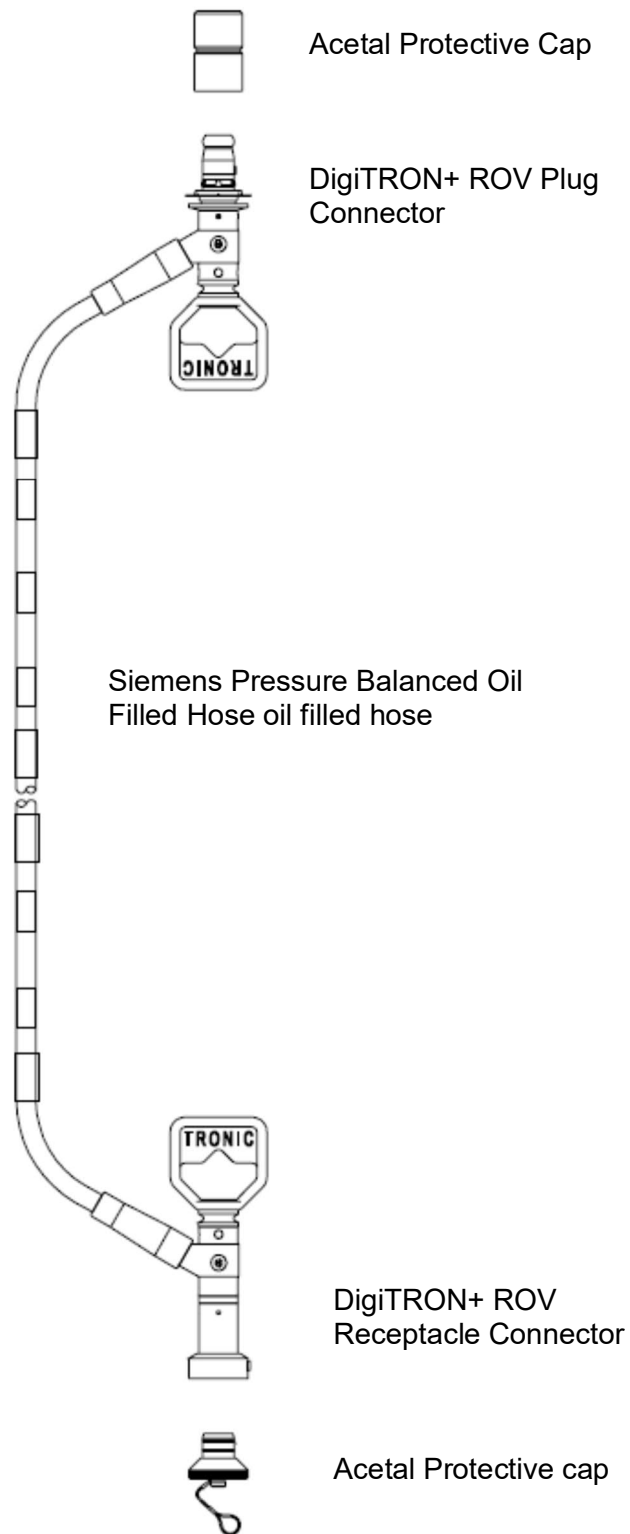
Page 14,

Figure 3 - Examples of DigiTRON+ oil hose connectors

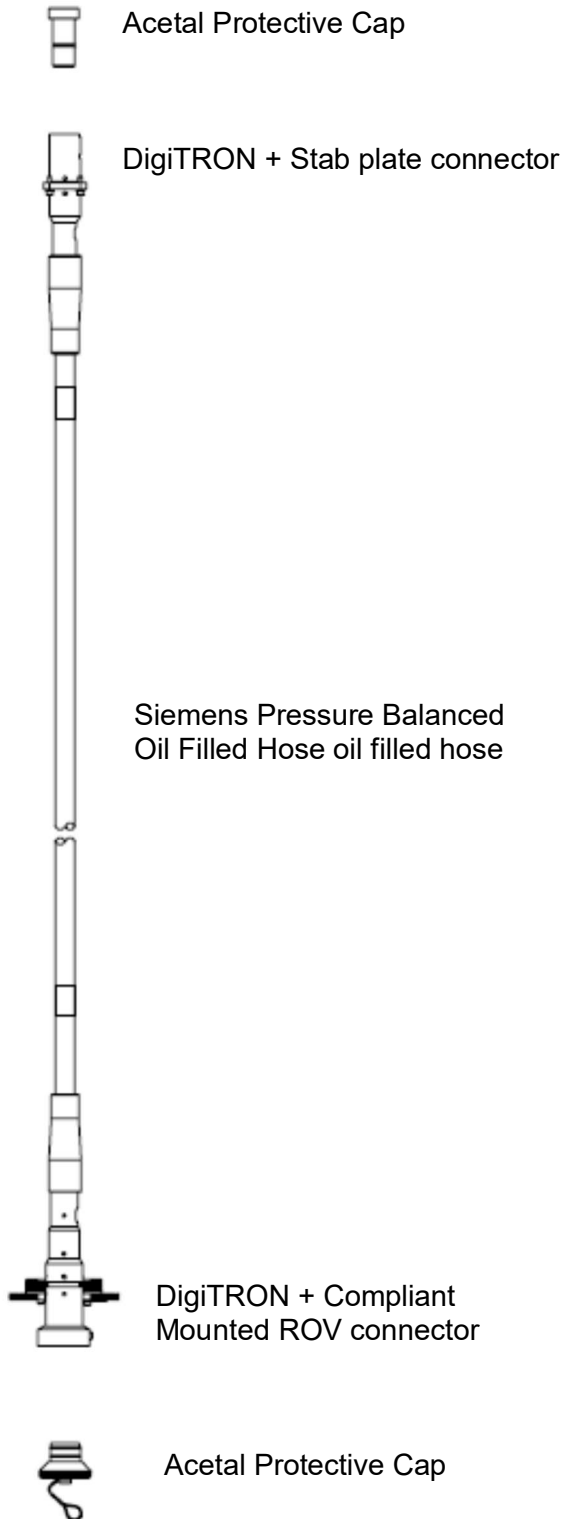
Figure 4 - Assembled EFL with a DigiTRON+ ROV plug and receptacle.

Figure 5 - Sensor harness assembly with a stab plug connector fitted.

GA drawing of an EFL (Electrical Flying Lead)
Figure 1



**GA Drawing of a Jumper Assembly
Figure 2**



Examples of DigiTRON+ oil hose connectors Figure 3

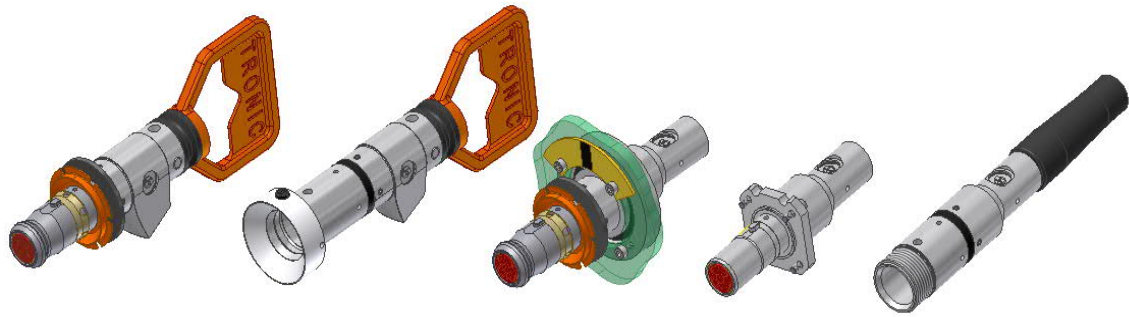


Figure 4
Image to show Electrical Flying Lead.



Figure 5
Image to show a sensor harness Assembly

9. CATHODIC PROTECTION

ROV Connectors are designed to operate isolated from the CP (Cathodic Protection) system. (Super Duplex stainless steel (UNS S32550) connectors should be isolated from the CP system to reduce the possibility of hydrogen embrittlement).

Stainless steel 316L (UNS S31603) diver/stab mate connectors must be connected to the CP (Cathodic Protection) system at all times. However ROV connectors will not suffer damage by being connected to the CP system.

10. INSTALLATION & DEPLOYMENT

Note: A flying EFL only requires an ROV for Installation.

Tools required for installation of jumper and sensor harness

1. ¼ inch drive torque wrench 0-25 Nm – with 3mm and 5mm Allan key drive
2. Flat blade screwdriver
3. Loctite 243
4. Working class ROV with correct manipulator interface for Siemens Subsea paddle handle.

10.1 PRE-INSTALLATION CHECKS FOR EFL'S

The following section details installation & deployment of Electrical Flying Leads:

- Check hose tagging information is correct according to drawing/tag schedule.
- Ensure Flying Lead has passed Site Received Test (SRT-001).
- Make sure prior to installation a final visual inspection of the Flying Lead is completed.
- No part of the connectors should be dismantled prior to or during deployment, apart from the removal of protective caps and installation of split flanges, since there are no user serviceable parts inside.
- Any defects need to be recorded on the punch list at the rear of this document and where possible take photos of any issues that need to be recorded and inform Technical Dept.
- 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. Use a water jet if subsea (see section 18.3).
- Before mate / demate all power is to be switched off – The DigiTRON range is designed to be mated with POWER OFF. In exceptional circumstances it is possible to mate the connectors with power on but the following is to be considered:

Note: It is important to isolate and earth prior to disconnect in order to remove any stray charges in the system. If left, this can induce corrosion on the exposed pins once the plug is removed.

10.2 LIVE MATE / DE-MATE

Resistive loads

Mating the connectors should not lead to any damage to the sealing mechanisms within the plugs.

The speed of de-mating should be between 40mm/s to 60mm/s. Following this de-mating procedure, testing should be carried out on the connector to establish if any damage has occurred. Under no circumstances shall connectors be partially mated with power on.

Capacitive loads

Mating with power on will lead to an in-rush current. The magnitude of this in-rush current will depend on the capacitance of the circuit. It is very important that the in-rush current is no more than 100A for 5 seconds.

Inductive loads

Mating the connectors should not lead to any damage to the sealing mechanisms within the inserts. De-mating **must not be attempted** as there is a risk of high back EMF's which will cause damage to the seals and insulation within the inserts.

Note:

The maximum number of live mate / de-mate operations under the above conditions is ONE only.

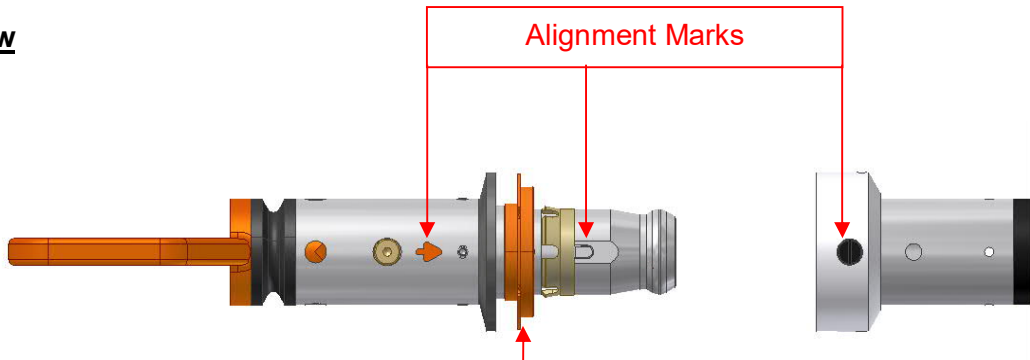
10.3 ALIGNMENT AND MATING

- DigiTRON connectors have been designed to self align during mating.
- The connectors must be roughly aligned using the alignment marks on the plug body, flange and receptacle cone.
- The mounting of the ROV handle has sufficient compliance to accommodate fine adjustments during the final approach prior to connector engagement.
- Ensure correct orientation of the alignment disc
- It is important that the ROV compliant flange is orientated correctly.
- Observe the text on the flange, and orientate accordingly.

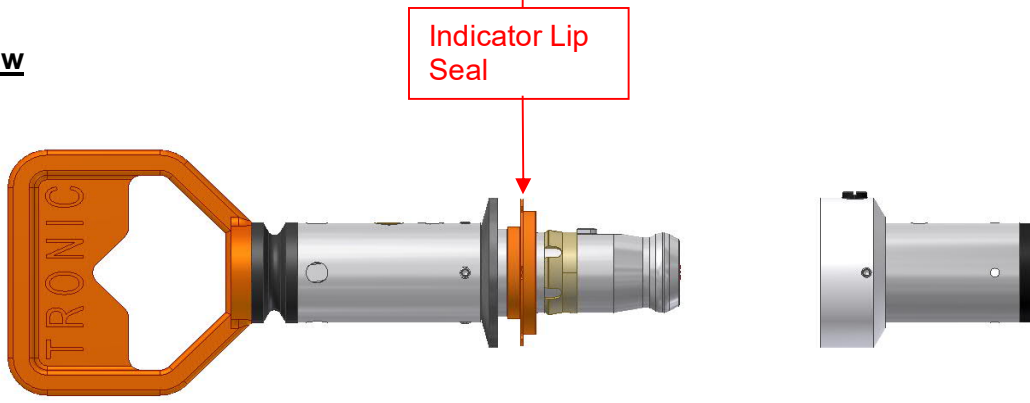
Please see Figure 6 on following page for images of alignment marks and mating

Figure 6
Images of alignment marks and lip seal mating indicator.

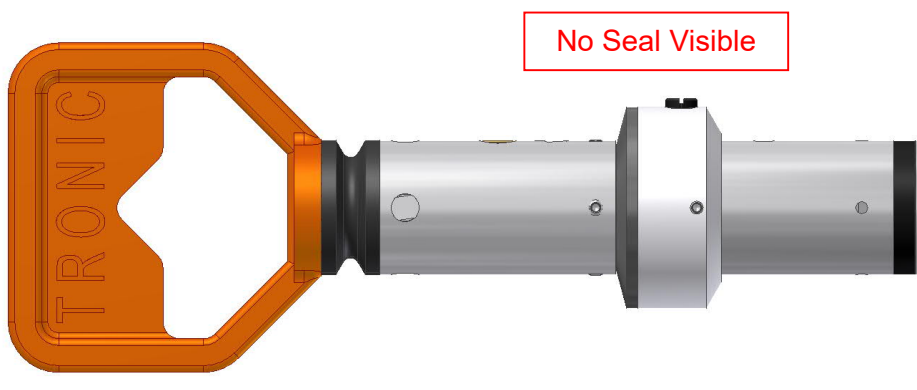
Top View



Side View



Fully Mated – Lip seal not visible



Mate/De-Mate Speed

The connectors have been designed to operate across a wide range of mate / de-mate speeds with POWER OFF. There is no practical limit to the speed at which the connectors may be mated or de-mated, however as a guide:

á

- Mate and de-mate speed should not exceed 1 m/s.
- When fully mated lip seal will not be visible and connection should look like as shown in Figure 6.
- If lip seal can still be seen remove and retry making connection by following the procedure again.
- If connectors can't be mated both the plug and receptacle need to be inspected for any mis-alignment damage or debris that is preventing connection.
- If any damage has occurred please record on punch list at the rear of this document and inform Technical Department.

10.4 MAXIMUM MISALIGNMENT VALUES

The values for maximum misalignment that the DigiTRON connectors can tolerate with mating still possible are as follows.

Misalignment Type	4/7-way	12-way
Rotational (0°)	±15°	±15°
Radial	±20mm	±20mm
Angular	±20°	±20°

10.5 POST MATING CHECKS (DIGITRON ROV ONLY):

During mating the orange indicator lip seal located on the plug connector will fold back and disappear into the alignment cone on the receptacle connector. After a successful mating of the connectors no part of the indicator lip seal should protrude through the joint between the plug and receptacle connector.

10.6 ROV MATING / DE-MATING FORCES (DIGITRON)

4 & 7 way	Mating	<30 Kgf
	De-mating	24 – 36 Kgf
12 way	Mating	<50 Kgf
	De-mating	48 – 80 Kgf

Mechanical Forces During Mating / De-Mating:

The connectors have been designed to accommodate over stroking and bending forces to the following limits:

Over-stroking force < 2,205 lbf [9810N]

Bending < 370 ft-lbs. [500Nm]

Torsion < 370 ft-lbs. [500Nm]

Mechanical Over-Loading From The ROV

The maximum bending moment that can be applied to the connectors when mated is 2000Nm before the risk of mechanical damage to the electrical connection becomes significant.

10.7 DE-MATING

- De-mating is achieved by a straight pull on the ROV handle sufficient to release the latching mechanism.
- Force required is detailed under the mechanical forces section see section 10.6
- When EFL is de-mated and returned to the surface please inspect, store and protect as detailed in section 7.
- Ensure protective caps are fitted when not mated and while in storage
- If the connectors are to be left unmated, in seawater, for any length of time 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. Plug connectors do not require full dummy connectors for protection. Siemens advise the fitting of acetal caps to protect plugs.

NOTE: 28 DAYS IS THE MAXIMUM CUMMULATIVE ALLOWABLE EXPOSURE OF UNPROTECTED CONTACT PINS TO SEAWATER OVER THE LIFE OF THE CONNECTOR. THIS ONLY APPLIES WITH POWER OFF.

11. INSTALLATION OF EFL / HARNESS WITH FIXED CONNECTORS

Tools Required for installation

1. ¼ inch drive torque wrench 0-25 Nm – with 3mm and 5mm Allen key drive
2. Loctite 243

11.1 STAB PLATE CONNECTORS



Figure 7
Image to show stab plate connector.

- **Flange Mount**

For stab plate connectors, there are 4 types of flange – Fixed, Floating, Split-Fixed and Split-Floating flange types. Split flanges allow the connector to be passed through an interface and the flange fitted at the front. In both cases, an M6 grub screw is supplied for tightening the flange to the connector body. Apply Loctite 243, screw into the M6 tapped hole on the bottom face of the flange and tighten to 3.5 Nm. In the case of the split flange, this can only be carried out after the flange has been fitted to the interface on-site. For stab plate connectors (metal to metal flange contact) mounting screws shall be torqued to 10-12Nm

See following page for Flange styles:

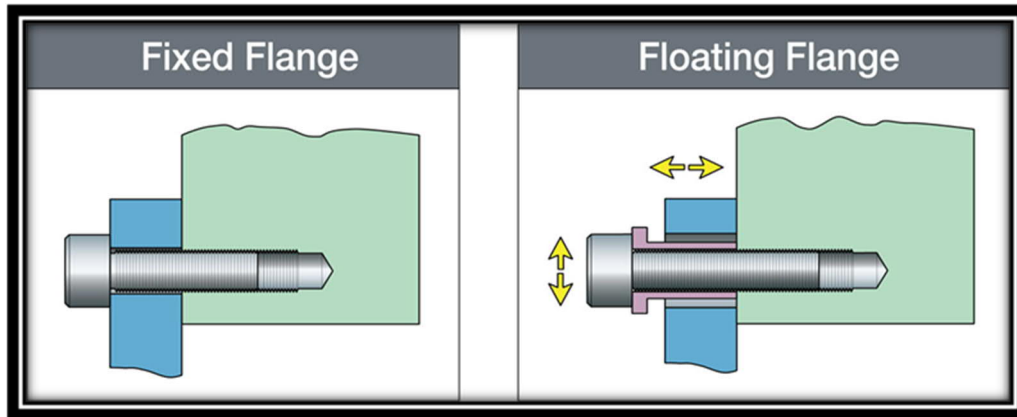


Figure 8

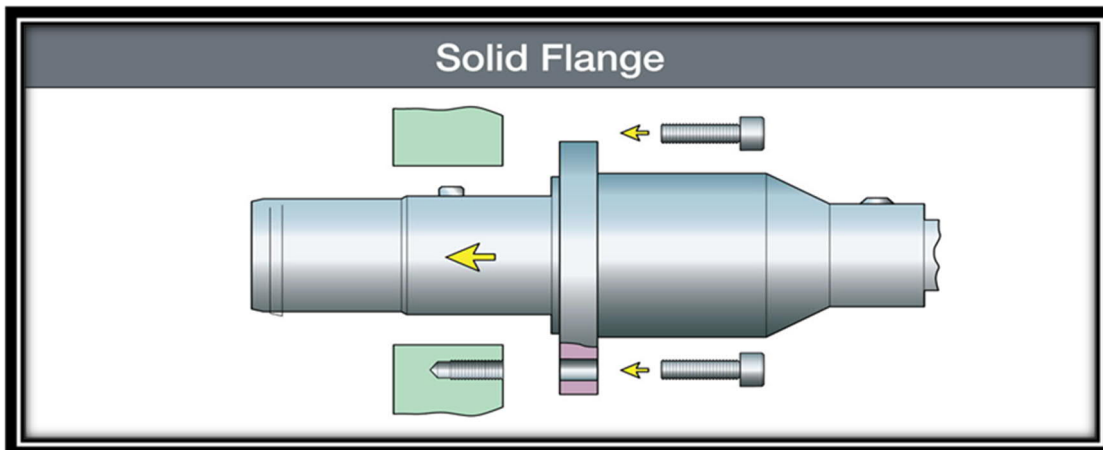


Figure 9

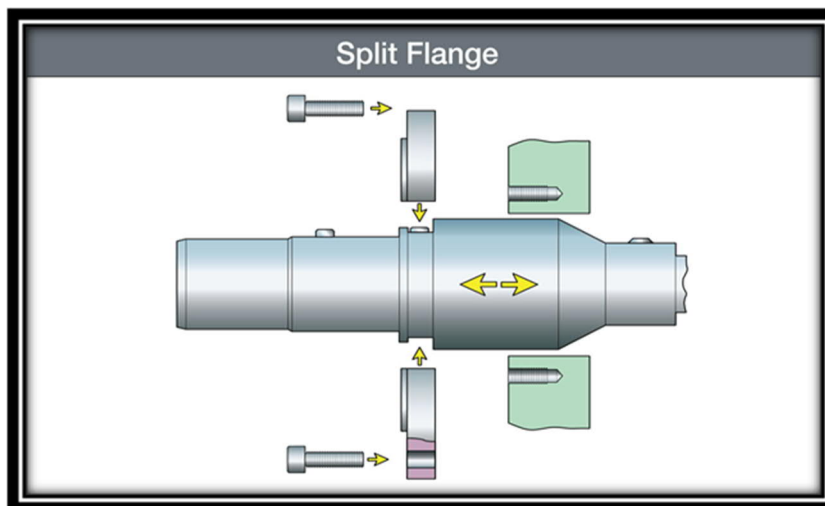


Figure 10

- Floating flanges have larger fixing holes in the flange, and a steel top hat washer under the screw head. The larger hole means that if an attempt were made to fit the connector without the top hats, the screw head would pass straight through the hole, indicating that something was missing. Standard M6 cap screws are used for both fixed and floating mounted flanges.

Apply a spot of Loctite 243 to the threads of the cap head screws. For Diver mate / stab plate connectors (metal to metal flange contact) mounting screws shall be torqued to 10-12Nm.

- **Split Floating Flanges**– Assembly and installation.
To mount the flange on the connector, first, pass the connector through the interface hole, the two halves of the flange should be brought together around the connector front end. Make sure that the lip around the through hole is facing forwards toward the connector front end and the key is in-line with the keyway in the flange.
To secure the two halves together, Insert the 2-off location dowels into the holes in the flange and press fit until flush with the face of the flange.
A M6 grub screw is supplied for tightening the flange to the connector body. Apply Loctite 243, screw into the M6 tapped hole on the bottom face of the flange and tighten to 3.5 Nm.
Place the top hat spacers on the M6 fasteners, apply a spot of Loctite 243 to the threads of the cap head screws and position through the flange into the interface. Stab plate connectors (metal to metal flange contact) mounting screws shall be torqued to 10-12Nm
- **Compliance**
One half of a stab mate connector pair must be allowed to float so that misalignment tolerances can be accommodated.
Misalignment tolerances:-
Radial (mm) +/- 1,0mm
Angular (°) +/- 0.7°
Rotational (°) +/- 1.6°
- **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. Use a water jet if subsea (see section 18.3).
- **Partial Disconnection**
Partial disconnection with the contact pin remaining between the primary and secondary diaphragms is not recommended, as there is a risk of damaging the insulation. If it is necessary to operate the connectors partially mated, the connectors should be separated by 0.340-0.360" [8,6-9,2mm] from the nominal, mated, stab distance. 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 voltages above 500V.
- **Interrupted Connection**
Interrupted connection (i.e. Partial mate to full de-mate) can be carried out without any adverse affect to connectors, as long as the power is off.

- **Cathodic Protection:**

Stainless steel 316L (UNS S31603) stab plate connectors must be connected to the CP (Cathodic Protection) system at all times. Super Duplex stainless steel (UNS S32550) connectors should be isolated from the CP system to reduce the slight possibility of hydrogen embrittlement

11.2 ROV CONNECTORS

- Installation of flange mounted connectors:
 Remove M6 mounting screws and orientation disc, pass the front of the connector through the interface, install 4 off M6 mounting screws and orientation disc, secure screws with a spot of loctite 243 on the threads and torque to 10-12 Nm. See figure 11 below:

NOTE:

The alignment cone on the receptacle may require removal and re-fitting once installed. Ensure correct orientation to the internal key-way. For topside use eg SIT, there is a hand operated ROV de-mate tool available. Part number BQ-30090-00.

View to show installation of compliant mount flange ROV plug connector

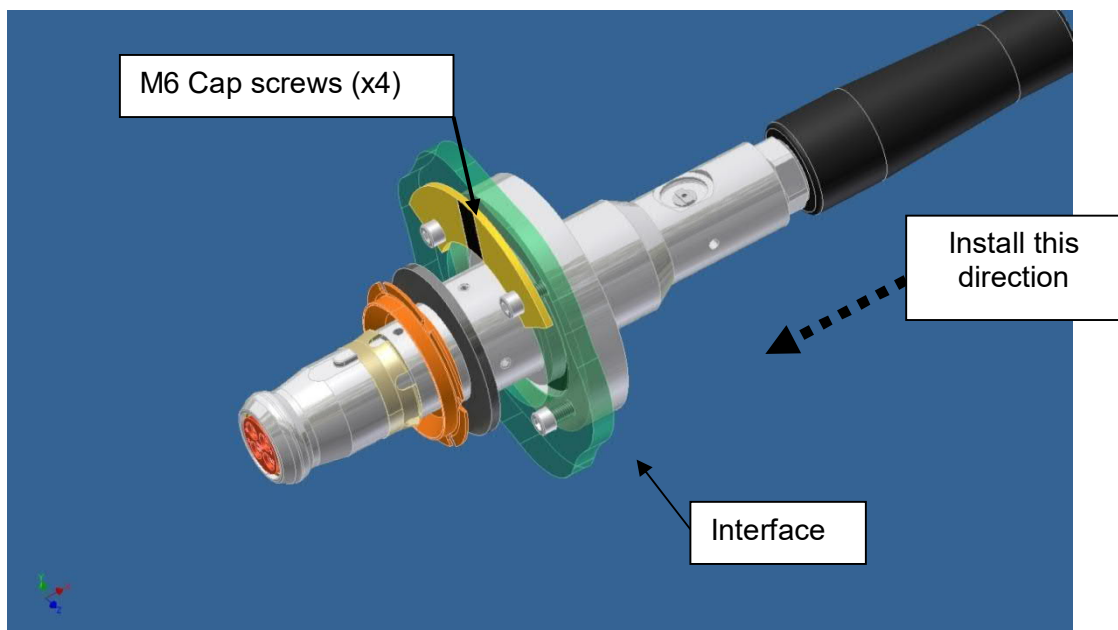


Figure 11

- For ROV receptacles an extra ring is required, to keep the connector captive in the event that the rubber mount is lost. This should be fitted to the connector, along with the alignment disc, in the orientation shown in figures 12 & 13 below.

Section view to show installation and parts of compliantly flange mounted connector

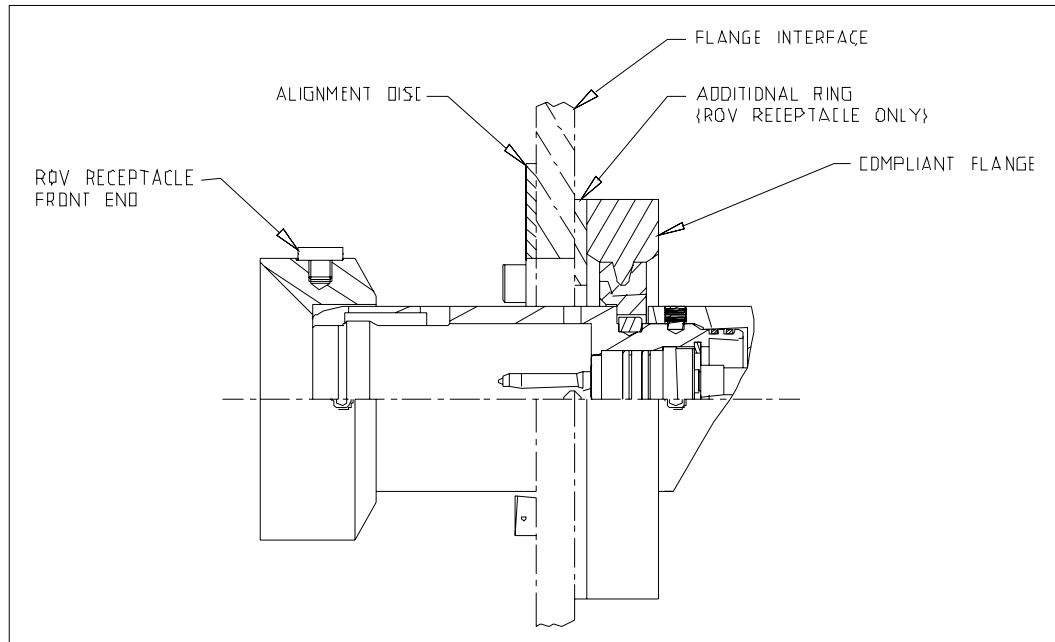


Figure 12

View to show ROV compliant mount flange text (orientation of flange is different plug to receptacle)

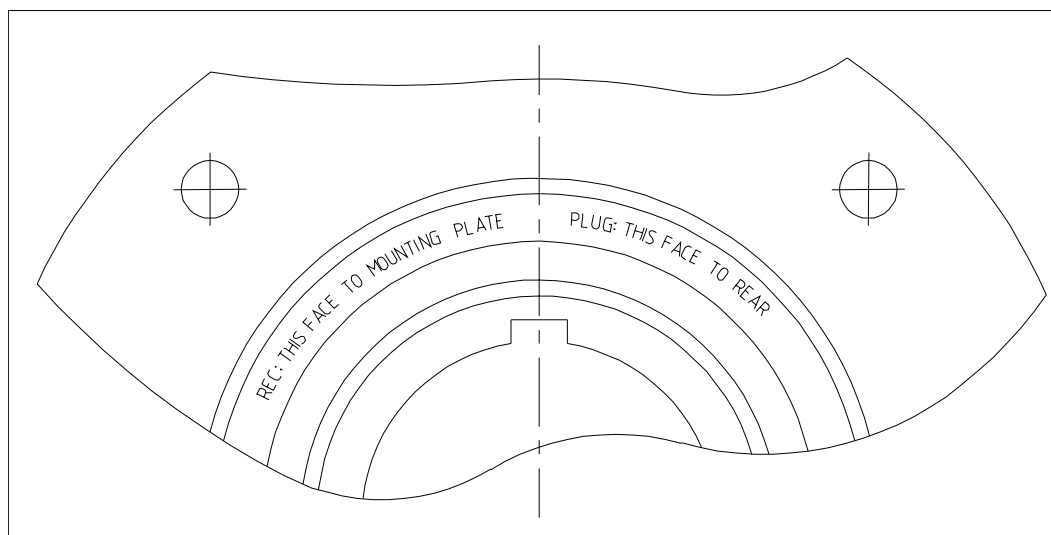


Figure 13

11.3 DIVER CONNECTORS

- **Installation Flange mounted**

For Diver mate connectors (metal to metal flange contact) mounting screws shall be torqued to 10-12Nm

- **Alignment**

These connectors have been designed to self-align during mating. All that is required is to ensure that the alignment pin on the plug connector is engaged in the alignment groove within the receptacle connector before screwing the clamp ring up.

- **Pre Mating Check**

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 (see section 18.3).

- **Mating**

The clamp ring should be rotated clockwise by hand until tight. The connectors are designed to remain clamped together with only firm hand tightness on the clamp ring. If a clamping torque is required this **MUST NOT** exceed 15 ft-lbs. [20Nm]. A 2-3" C-spanner or purpose made Siemens Subsea tool (T11367 – For size 10 connectors only) may be used to apply this torque.

- **Post Mating Checks**

Full engagement of the connectors can be checked through the viewing hole in the clamp ring. If the connectors are fully mated then no gap should be visible between the plug and receptacle.

- **Cathodic Protection**

Stainless steel 316L (UNS S31603) diver mate connectors must be connected to the CP (Cathodic Protection) system at all times. Super Duplex stainless steel (UNS S32550) connectors should be isolated from the CP system to reduce the possibility of hydrogen embrittlement.

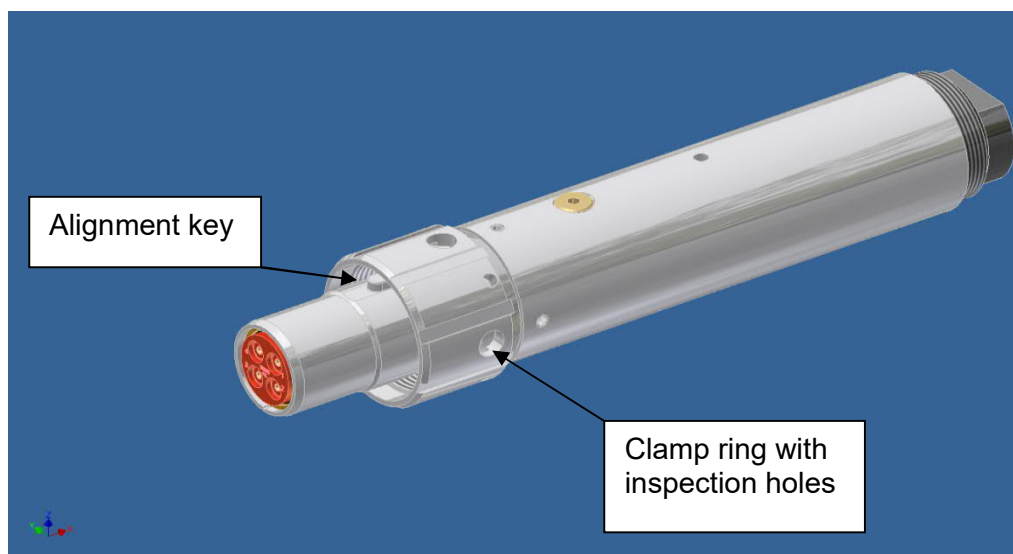


Figure 14

Image shows clamp ring, inspection holes and key on diver plug connector.

12. INSTALLATION OF AQUATRON JUNCTION BOX AND MOUNTING BRACKETS

- The junction box bracket is designed to be mounted and deployed in a horizontal position. If the junction box is to be mounted vertically, the hose will need to be supported on either side of the junction box.
- It is critical the brackets for the junction box are installed as identified on DRG T33073
- Drill interface holes as required for installation as per drawing T33073.
 4-off M8X1,25-6H TAPPED HOLES MIN THREAD LENGTH 35mm
 Or
 4-off M8 THRO' HOLES – (Client to provide nuts for thro hole fitting option – material 316L stainless steel).
- In the event that the brackets are not installed to the junction box body these will need to be assembled and installed. If applicable: Assemble brackets to the body taking into account the anti-rotation peg, which is to be situated on the underside of the unit and locates into a recess in the body. Fit 1-off black nitrile strip to each bracket on the opposite side to the anti-rotation peg. Tighten the M6 fasteners to 3.5Nm to complete the bracket installation. See fig 15.

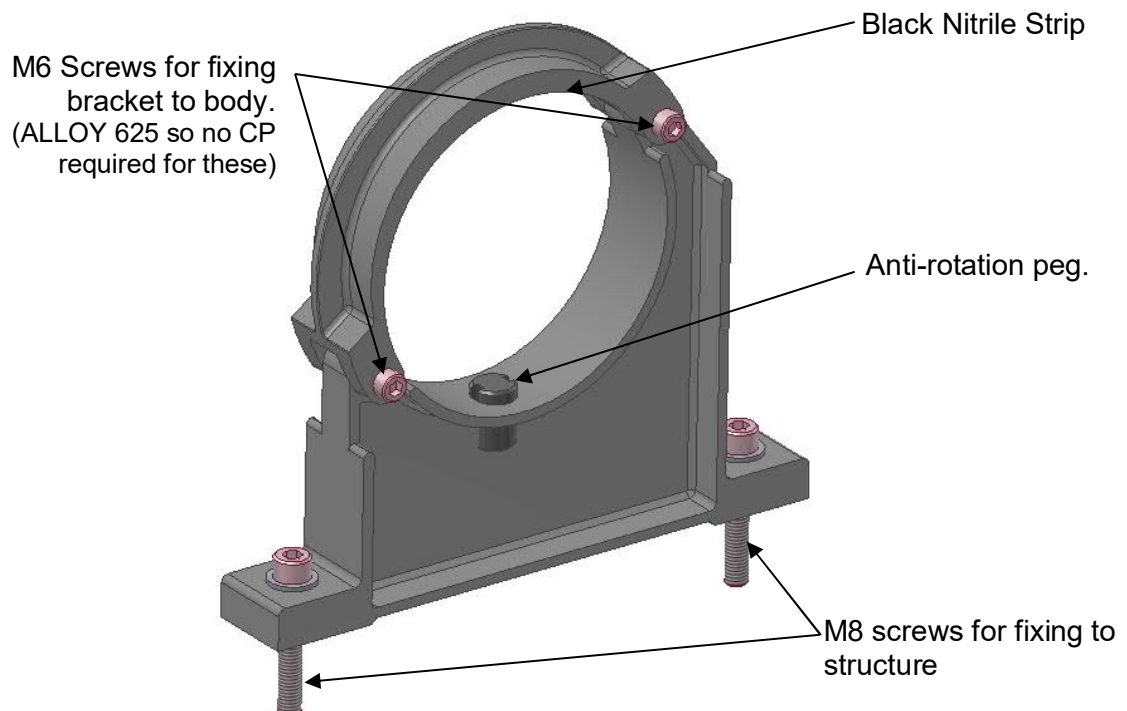


Figure 15. Mounting bracket assembly

- Ensure mounting brackets are secure and the junction box is orientated correctly. This completes the installation of the junction box.

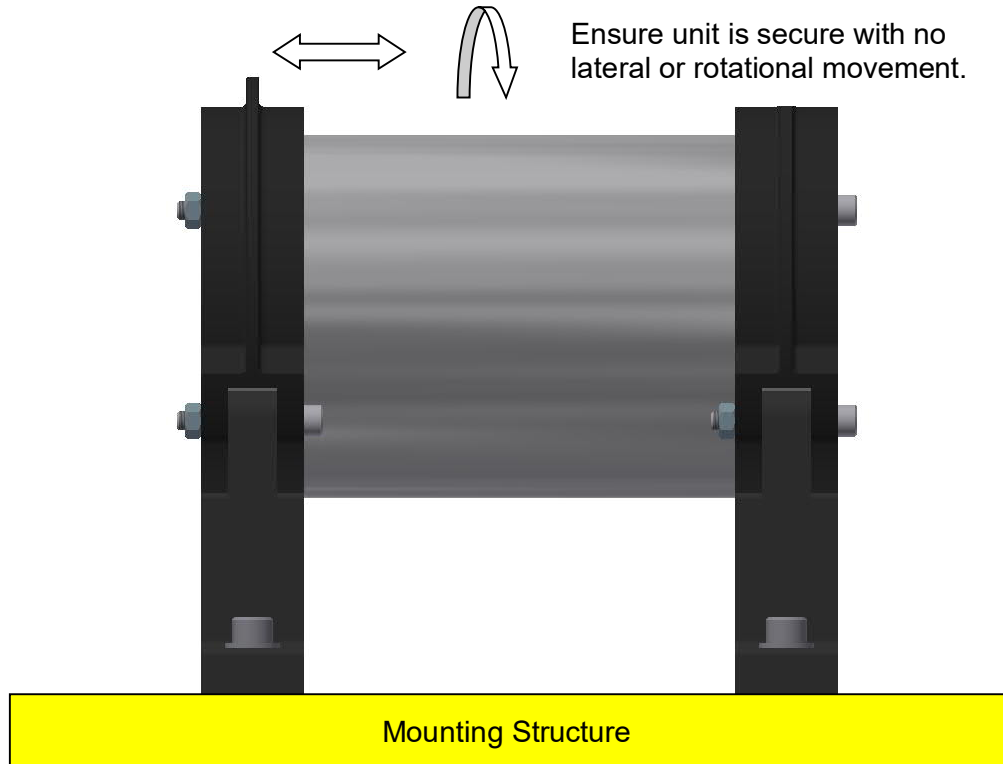


Figure 16. Shows junction box installed on structure

13. SENSOR ASSEMBLY

Sensor installation is specific to each sensor and assembly instructions are to be provided by the manufacturer.

14. TESTING OF EFL'S

- 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.
- Guide pins must never be removed from test connectors as this can lead to damage and will invalidate the connector warranty.
- Below are some images of standard Siemens Subsea test connectors.

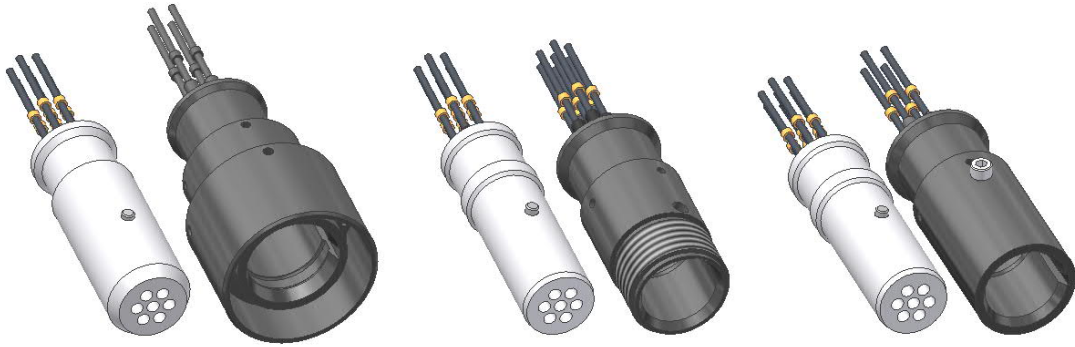


Figure 17

- To perform any testing refer to specific project documentation for details of procedures.

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

15. DIGITRON + CONNECTOR SPECIFICATION

Electrical and Mechanical

- Maximum current (dry topside)
 - 4-way = 18A
 - 7-way = 14A
 - 12-way = 11A
- Maximum current (submerged)
 - 4-way = 35-40A
 - 7-way = 22-32A
 - 12-way = 20-28A
- Maximum working voltage: 1000V rms phase to earth, 2000V rms phase to phase
- Rated number of operations: 1000 (750dry/250wet) mate/de-mate cycles (Power off)
- Working pressure: 5800 psi (13,123 ft / 4000 metres water depth)
- Working temperature range: -5°C to +60°C
- Onshore testing temperature range: -20°C to +50°C
- Storage temperature range: -40°C to +70°C

Please note; maximum storage temperature takes into account solar gain. Skin temperature must not exceed 70°C. Suitable protection must be used to ensure maximum storage temperature is not exceeded.

**View to show DigiTRON Front end assembly
(Fully factory acceptance tested)**

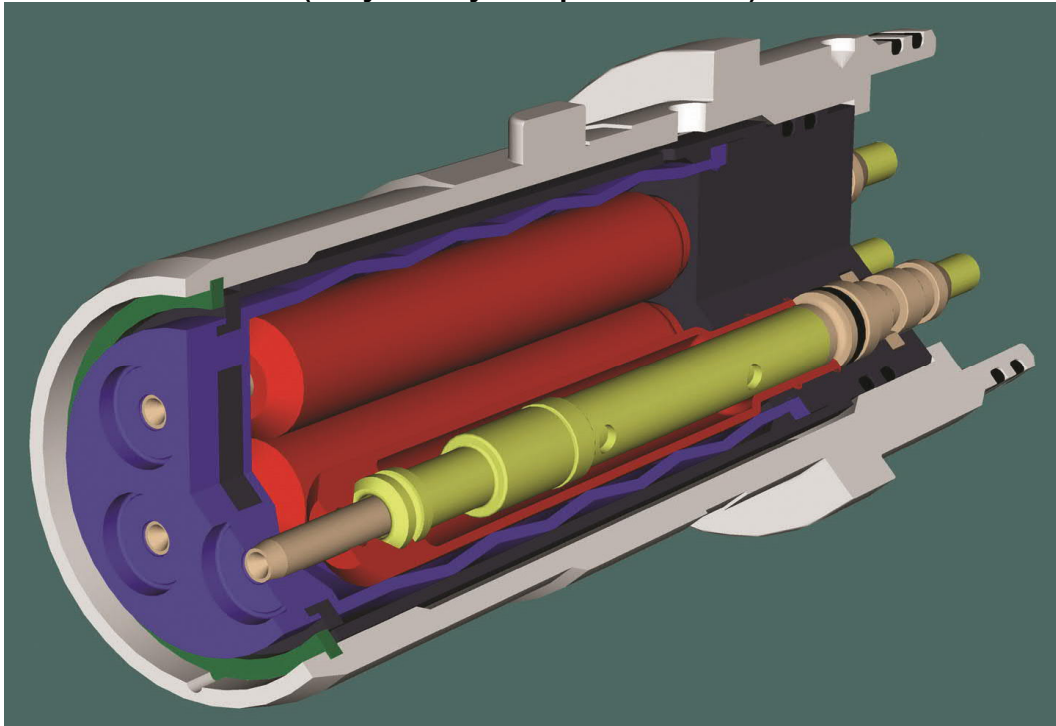


Figure 18

16. SIEMENS PRESSURE BALANCED OIL FILLED HOSE SPECIFICATION



Figure 19

- Design life: 25 years
- External pressure: 0 to 400 bar (depth pressure)
- Recommended fill pressure: 15 bar
- Deployment rate: 10 metres / minute
- Operational temperature range: -5°C to +60°C
- Hose Burst Strength: 90 Bar Siemens Pressure Balanced Oil Filled Hose 50, 45 Bar Siemens Pressure Balanced Oil Filled Hose 75.
- Max twisting of Siemens Pressure Balanced Oil Filled Hose: 180° per 5m length
- Recommend hose be protected with tarpaulin sheet or equivalent if in direct sunlight.
- Axial loads for Siemens Pressure Balanced Oil Filled Hose oil tube
Siemens Pressure Balanced Oil Filled Hose can withstand an axial load of 5000N. It has been tested to failure at 11000N.
*If cable ties are used leave loose on the hose. Do not compress.
- Chemical Compatibility for Siemens Pressure Balanced Oil Filled Hose oil tube
- For chemical compatibility use with Siemens Pressure Balanced Oil Filled Hose see qualification report TR-422 section 3.11 and ERP-001-06.

17. CABLE HARNESSSES / GLANDED CONNECTORS

- Axial loads for cable as follows:
Siemens Subsea 4 core, 75-004-TR =100KG Axial load / MBR = 182MM
Siemens Subsea 7 core, 75-007-TR =100KG Axial load / MBR = 200MM
Siemens Subsea 12 core, 75-012-TR =100KG Axial load / MBR = 300MM
- Axial loads on Glanded Connectors should be kept to a minimum unless the connector has been specifically designed to take such a load.
(Contact Siemens Subsea Technical Department for advice).
- The maximum applied loads a Glanded connector can take will depend on the cable type and the gland internals.

18. MAINTENANCE

All EFL's and harnesses are designed for Subsea immersion and require no maintenance while installed.

18.1 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.

18.2 OVER CURRENT CAPACITY

Over current capacity for all DigiTRON connectors is 100A for 5 seconds at no more than 2 per hour.

18.3 MARINE GROWTH AND CALCAREOUS DEPOSITS

To remove calcite growth from Siemens Subsea connectors, a solution of 50% Citric Acid is recommended. All Seawater exposed elastomeric materials in Siemens Subsea connectors have been fully tested against 50% Citric Acid and are compatible for duration of 1 hour. In addition, the thermoplastic materials have good resistance to Citric Acid.

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 a water jet is acceptable, but the jet should not be directed onto the shuttle pins at the front of the plug, or the pin contacts at the front of the receptacle, as this could result in a risk of water being forced through the primary seals.

Any damage found should be recorded and reported to the Technical Department.

