Omterra - Subsea

ElecTRON Rev05 English IOM

Product Manual - Document 10204852 IOM Rev05

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Foreword

Thank you for purchasing an Omterra subsea product. The information contained in this document is an overview including the protection, storage, shipment, unpacking, deployment and maintenance for subsea ElecTRON connector product range.

IMPORTANT

READ CAREFULLY BEFORE USE

KEEP FOR FUTURE REFERENCE

Revision Summary

This page records the revision status of the entire document and its authorisation for issue.

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Rev	Compiled by	Date	Approved by	Issue Date	Page(s) Affected/Remarks
Rev 05	D. McDougle	17/02/2026	J. Rogers	17/02/2026	Section 3.2 – intended use clarified Section 5.1 & 5.2 – Storage temp. range clarified Section 5.6.3 – Dry mate system use clarified Section 6.1 – Transport information and examples added Section 6.2.1 – Protective cap information expanded and examples added Section 6.5.1 & 6.5.2 – Storage timings and limitations clarified Section 8.1.1 – Timings for unmated exposure clarified Section 8.1.4 – Stab connection information updated
Rev 04	D. McDougle	25/01/2024	J. Rogers	26/01/2024	Section 3.3.5.1 added to highlight the potential of trapped pressure.
Rev 03	E. Chaize	04.04.2022	J. Rogers	21.04.2022	Overall update of document in line with new Omterra branding and change of email addresses with siemens-energy.com. Section 2.4 – Replace with new and current Product Advice Label. Section 2.6 – Additional Section to cover CE & UKCA assessment. Section 9.3.2 – Update of Section with Test connector verification routine test.
Rev 02	E.Chaize	13.11.2020	J. Rogers	16.11.2020	Section 2.6 – Removed from document (not a requirement).
Rev 01	E.Chaize	24.08.2020	R. Wyatt	25.09.2020	Creation of IOM for ElecTRON only Updated onto new IOM template with product safety advice clearly identified.

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1 PRODUCT SCOPE

This manual includes information on the following ElecTRON range of instrumentation feedthrough subsea connector types:

- Vertical single pin systems
- Horizontal single and multi-pin systems
- Landing strings
- Test caps
- Dummy hangers

2 BASIC INFORMATION & QUICK REFERENCE

2.1 Product overview

ElecTRON connectors intended use is to provide live signal from the downhole well environment to bring greater efficiency and improve performance. The ElecTRON range of products serves Vertical Xmas Trees with its ElecTRONv and Horizontal Xmas Trees through ElecTRONh products

The underwater mateable capacity of these connectors is achieved using pressure compensated electrical inserts employing the CE principle.

2.2 Product specification and certification

Standard	Description
API6A-PR2	Specification for Wellheads and Christmas Tree Equipment, Product Specification Level PSL 3 and PSL 3G
API-17D	Design and Operation of Subsea Production Systems-Subsea Wellhead and Tree Equipment
NACE MR0175	Petroleum and Natural Gas Industries – Materials for use in H2S – containing environments in oil and gas production
IWIS-RP-A2	2011 Intelligent Well Interface Standardisation Recommended Practice

Table 1 ElecTRON product specification

Note: Self-certified via in-house testing.
Note: Standards and Product Certification vary between product variant, Product Data Sheet shall be reference for specific product certification.

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2.3 Contact details

For additional information or questions regards the products visit the Omterra website www.omterra.com or contact the following:

Department	E-mail address
Product Safety Officer	subsea.connectors.productsafety.gb@siemens-energy.com
Technical Support	connectortechnicalsupport.gb@siemens-energy.com
Service (Site Team)	susultlcmsupport.gb@siemens-energy.com
Sales	connectorsales.gb@siemens-energy.com

Table 2 ElecTRON product contact details

2.4 Product advice label

The following product advice label is supplied with all Omterra subsea products.



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Figure 1 Product advice label

2.5 Product marking

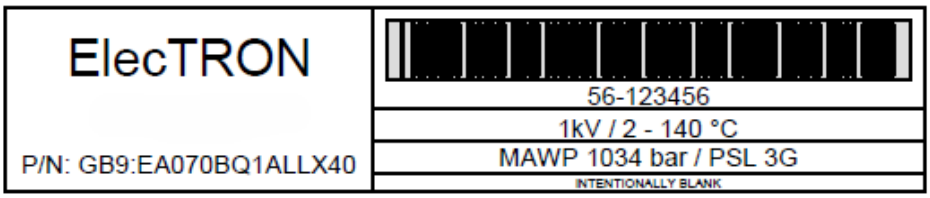


Figure 2 ElecTRON typical product marking

Omterra Subsea ElecTRON products are typically marked as shown in Figure 2 above, the marking is generally etched onto the product.

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2.6 CE & UKCA Conformity Assessment

2.6.1 CE label/marking

The CE label/marking where applicable shows that the products comply with the requirements of the applicable directives as follows:

- 2014/35/EU – Low Voltage Directive

Declaration of Conformity will be supplied with the goods.

2.6.2 UKCA label/marking

The UKCA label/marking where applicable shows that the products comply with the requirements of the applicable directives as follows:

- Regulation 16 – Electrical Equipment (Safety)

Declaration of Conformity will be supplied with the goods.

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3 PRODUCT SAFETY

Omterra Subsea recommends termination of all equipment, shall be undertaken by trained, suitably qualified and experienced personnel (SQEP) i.e. competent person.

3.1 Action-related warnings

Classification of action-related warnings

The action related warnings are classified in accordance with the severity of the possible danger using the following warning signs and signal words:

Warning symbols and signal words

	**Danger!** Imminent danger to life or risk of severe personal injury
	**Danger!** Risk of death from electric shock
	**Warning.** Risk of minor personal injury
	**Caution.** Risk of material or environmental damage

3.2 Intended use

Following installation, commissioning and deployment of product, please complete and return the Customer Comments/Feedback form (Section 9). Please e-mail completed form to the Product Safety Officer at subsea.connectors.productsafety.gb@siemens-energy.com.

There is a risk of injury or death to the user or others, or of damage to the product and other property in the event of improper use or use for which the product is not intended.

The product is intended as a subsea connector designed to convey Low Voltage electrical signals from pressure and temperature sensors down hole through the tubing hangers and Xmas tree.

Intended use includes the following:

- Observance of the installation and operating instructions included for the product and any other system components.
- Compliance with all inspection and maintenance conditions listed in the instructions.
- Use of all recommended tooling appropriate for specific tasks.
- All activities to be undertaken by a competent person (see 2.3.1 for definition).

Any other use that is not specified in this document or covered in installation and operating instructions, shall be considered improper use, which will invalidate the warranty of the product.

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	**Danger!** Risk of Imminent danger to life or risk of severe personal injury, through unforeseeable misuse of an ElecTRON connector, if tested as a pressure barrier or pressure retaining item on a pressure vessel application, when not deployed subsea. - All pressure testing of ElecTRON product must be undertaken by a competent person.
	**Caution.** Risk of material or environmental damage, improper use of any kind is prohibited.

3.3 General safety information and risk

3.3.1 Installation by competent persons only

The installation, inspection, maintenance and repair of the product shall be undertaken by trained, suitably qualified and experienced personnel (SQEP) i.e. competent person, to carry out a specified activity. Installation, inspection, maintenance and repair of products by untrained and deemed non-competent persons could invalidate the product warranty.

For further information contact Service (Site Team) susultlcmsupport.gb@siemens-energy.com.

3.3.2 Personal protective equipment (PPE)

Personal Protective Equipment (PPE) is legally defined as 'all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects the user against one or more risks to their health or safety'.

In the hierarchy of risk control, PPE is considered to rank lowest and represent the option of last resort. PPE is only appropriate where the hazard in question cannot be totally removed or controlled in such a way that harm is unlikely (for example by isolating the hazard or reducing the risk at source to an acceptable level).

All company personnel and operators should wear appropriate Personal Protective Equipment (PPE) defined as a result of relevant risk assessments in accordance with the Personal Protective Equipment (PPE) Regulations.

Wear appropriate PPE according to the product safety advice given in this document

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3.3.3 Danger caused by improper operation and foreseeable misuse

Improper operation and foreseeable misuse may present a danger to you and others and cause material damage. Carefully read the enclosed instructions and all other applicable documents, particularly the “Safety” section and the warnings.

	**Danger!** Risk of death from electric shock if user dismantles/incorrectly re-assembles/incorrectly re-terminates product (foreseeable misuse). - Maintenance, disassembly, re-assembly and termination activities must only be carried out by a competent person.
	**Danger!** Risk of death from electric shock if shuttle pins are depressed e.g. with a screwdriver when plug is live (foreseeable misuse). - Maintenance and testing activities must only be carried out by a competent person. - Correct tools must always be used.
	**Danger!** Risk of imminent danger to life, risk of severe personal injury caused by a shuttle pin projectile due to damage caused to shuttle pins e.g. with a screwdriver (foreseeable misuse). - Maintenance and testing activities must only be carried out by a competent person. - Correct tools must always be used.

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3.3.4 Risk of death due to electrocution

	**Danger!** Risk of death from electric shock due to exposed live pins, e.g. factory or top-side system test and unmated receptacle is energised, e.g. by diver subsea. - Ensure all test procedures are followed. - Communication channels and protocols are observed.
	**Danger!** Risk of death from electric shock due to unscreened LV cables in Jumpers. - Ensure all test procedures are followed.
	**Danger!** Risk of death from electric shock from any exposed conductors due to stored electrical energy, e.g. capacitance of cable or elsewhere in the system. - Ensure all procedures are followed.
	**Danger!** Risk of death from electric shock from test connectors. Live parts accessible with standard finger test, also live parts can be exposed by disassembly without a tool (e.g. termination sleeves are accessible and can be removed). Also exposed cable conductors at free end and cables unscreened. - Ensure all connectors are assembled correctly with termination sleeves in position prior to conducting standard finger test.
	**Danger!** Risk of death from electric shock if product is terminated incorrectly by 3rd party e.g. loose conductor touching metal body, or live wire terminated to metal body in error. - Installation/termination activities must be carried out by a competent person.
	**Danger!** Risk of death from electric shock due to metal body of connector not being earthed during test and connector having earth fault (e.g. conductor touching metalwork) during electrical testing. - Ensure all testing of products both factory and deployed in-field have been completed by competent persons.
	**Danger!** Risk of death from electric shock or severe personal injury through burning from de-mating live conductors by hand. - Ensure all procedures are followed for mating/de-mating connectors.

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3.3.5 Risk of injury and material damage due to maintenance and repairs carried out incorrectly or not performed

Never attempt to carry out maintenance work or repairs on your product yourself. Faults and damage should be immediately rectified by a competent person. Adhere to the maintenance intervals specified.

	**Danger!** Risk of imminent danger to life, risk of severe personal injury from burning and material damage from ohmic heating in short-circuit condition or high over-currents. - Ensure all testing of products both factory and deployed in-field have been completed by competent persons.
	**Danger!** Risk of imminent danger to life, risk of severe personal injury caused by released pressure and or projectile due to incorrectly installed pressure retaining product, e.g. during system pressure test (e.g. ElecTRON fitted with wrong/insufficient screws or seals). - Ensure all product assembly and testing activities are completed by competent persons.
	**Danger!** Risk of imminent danger to life, risk of severe personal injury to persons with pacemakers or implantable cardioverter-defibrillators (ICDS) from electromagnetic interference (EMI) e.g. high frequency testing with large load currents. - Ensure all testing of products both factory and topside are not conducted by or in the presence of persons with pacemakers or ICDS.
	**Danger!** Risk of severe personal eye injury due to pressurised oil squirting out of damaged hose or removal of fill/vent screw. - Ensure all testing of products both factory and deployed in-field have been completed by competent persons.
	**Warning.** Risk of eye/bodily injury caused by released pressure during product disassembly, in the event of retrieval from subsea with a fault that causes depth pressure to be trapped inside the product. - Ensure all product disassembly activities are completed by competent persons in accordance with relevant procedures and the use of relevant personal protective equipment (PPE) – refer to section 3.3.5.1 for additional precautions.
	**Warning.** Risk of bodily injury caused by pressure retaining parts becoming projectile due to user over-pressurising the system, e.g. during Site Installation Test (SIT). - Ensure all product SIT activities are completed by competent persons in accordance with relevant procedures – refer to section 3.3.5.1 for additional precautions.

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3.3.5.1 Risk of injury from pressure retaining parts becoming a projectile

Always assume that all connectors that have witnessed pressure during SIT or deployment will have stored pressure behind them. Additional safety precautions must be employed when removing the connectors from their various structures which includes as a minimum:

- Ensure structure containing the connectors is in a blast room or equivalent.
- Move the structure so that the connector is pointing downwards and towards the blast wall.
- Cover connector/structure with a pressure damping (blast) blanket or equivalent.
- Wear PPE including gloves and protective face shield as a minimum.
- Stand away from the projectile line and remove the connector slowly, preparing yourself for a bang.

3.3.6 Risk of injury and material damage due to manual handling

Manual handling, lifting and carrying are known to be one of the largest contributors to occupational ill-health. Ensure mechanical handling aids are used wherever 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.

	**Warning.** Risk of musculoskeletal injury from hand-mating connectors with high mate/de-mate force and/or connector rapidly fires out during de-mate due to high shuttle spring force, e.g. factory/topside testing. - Ensure all product testing activities are completed by competent persons in accordance with relevant procedures. - Ensure mechanical handling aids are used wherever 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.
	**Warning.** Risk of musculoskeletal injury from manual handling of heavy products. - Ensure mechanical handling aids are used wherever 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.
	**Warning.** Risk of bodily injury from heavy product falling during lift with machinery. - Ensure machinery/slings used have been tested and are within their expiry date. - Safe lifting guidelines must be followed, e.g. lifting plan, banksman, etc. - Correct lifting points must be identified and used. - Only competent persons are permitted to perform tasks without supervision, if in doubt ask.
	**Warning.** Risk of minor personal injury due to cut waste of optical fibre glass shards can result in skin injury and if ingested could cause damage to major organs. - Ensure correct handling by competent persons.

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	- Personal protective equipment (PPE) is used e.g. safety glasses with tight-fitting side shields, suitable hand protection gloves. - Follow approved waste disposal procedures to ensure safety for further waste handlers.
	**Warning.** Risk of minor personal injury to persons with sensitivities to mineral based oils. - Wear appropriate hand protection when handling products or mineral or synthetic based oils.
	**Warning.** Risk of minor personal injury and material damage due to slips, trips and falls. - Good housekeeping avoids slips, trips and falls, keep all work areas clean and tidy.
	**Warning.** Risk of minor personal injury and/or material or environmental damage during assembly. - Caution shall be exercised during assembly to ensure that fittings and hydraulic/pneumatic equipment are correctly installed.

3.4 Related documents

Installers shall carryout a full site risk assessment and put into place all necessary steps and procedures to comply with applicable area, regional, national or international health and safety legislation, e.g. The Health and Safety at Work Act (HASAWA) in the United Kingdom (UK) and ensure safety of themselves and others regarding manual handling and working at height requirements.

During the product installation (and any subsequent work) it will be necessary to employ caution. All installers and operatives involved from unloading the product until it is deployed in its final installed location must exercise a full duty of care for themselves and others regarding safety. When lifting and handling this product, operatives should employ assistance if required. In certain situations, it may be necessary to use mechanical handling aids. Take care to avoid trip hazards, slippery or wet surfaces.

Employers and installers should refer to the Health and Safety Executive (HSE) web site in the UK for full advice and manual handling assessment charts (MAC) tool.

In addition, where no specific instructions are given then reference shall be made, but not restricted to, where applicable, British Standards and codes of practice such as the following:

- The Health and Safety at Work Act.
- COSHH Control of substances hazardous to health.
- BS 7671 Requirements for electrical installations. IEE Wiring Regulations.
- The Electricity at Work Regulations.

It is the operator's and installers responsibility to comply with current Company, area, regional, national or international health and safety legislation.

Following installation, commissioning and deployment of product, please complete and return the Customer Comments/Feedback form (Section 9). Please e-mail completed form to the Product Safety Officer at subsea.connectors.productsafety.gb@siemens-energy.com.

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4 ABBREVIATIONS

A	Ampere
ac	Alternating Current
Assy	Assembly
API	American Petroleum Institute
AWG	American Wire Gauge
BOM	Bill of Material
°C	Degree Celsius
CE	Community European
Comms	Communication Signal
COSHH	Control of substances hazardous to health
CP	Cathodic Protection
dc	Direct Current
DWG	Drawing
EFL	Electrical Flying Leads
EMF	Electrical Magnetic Field
EMI	Electromagnetic Interference
FAT	Factory Acceptance Test
IR	Insulation Resistance
ICDS	Implantable Cardioverter-Defibrillators
ISO	International Organization for Standardization
ITP	Inspection Test Plan
IWIS	Intelligent Well Interface Standardisation
K	Kelvin
LTC	Long Term Cover
LV	Low Voltage (<1000 VAC / 1500 VDC)
M	Metres
Max.	Maximum
MFG	Manufacturer
Min.	Minimum
NACE	National Association of Corrosion Engineers
No.	Number
PPE	Personal Protective Equipment
ROV	Remotely Operated Vehicle

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SI	Standard International
SIT	Site Installation Test
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

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5 SPECIFICATION AND RESIDUAL HAZARDS

The following is a basic specification for ElecTRON connectors. Actual product may vary. Please refer to product/project specific data sheet(s), website www.omterra.com or contact Technical Support connectortechnicalsupport.gb@siemens-energy.com for more detailed information.

5.1 Wet mate connector general specification

	VERTICAL SYSTEMS		HORIZONTAL SYSTEMS				
	Standard	Improved Compliance	Single Pin		Multi Pin		
Maximum number of electrical conductors	1	1	1	1	2 (Splitter)	2	3
Maximum Working Pressure PSI (Bar)	15,000 (1034)	10,000 (689)	10,000 (689)	15,000 (1034)	10,000 (689)	10,000 (689)	10,000 (689)
Maximum Test Pressure PSI (Bar)	22,500 (1551)	15,000 (1034)	15,000 (1034)	22,500 (1551)	15,000 (1034)	15,000 (1034)	15,000 (1034)
Maximum Water Depth (metres)	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Operating Temperature °C	0 to 135	-18 to 121	-18 to 121	0 to 135	-18 to 121	-18 to 121	-18 to 121
Test Medium	Gas	Gas	Gas	Gas	Gas	Hydro	Hydro
Number of Matings (Wet Mate Pair)	100	100	100	100	100	100	100
Minimum Storage Temperature °C	-18 to +70	-18 to +70	-18 to +70	-18 to +70	-18 to +70	-18 to +70	-18 to +70

Table 3 ElecTRON wet mate connector general specification

5.2 Dry mate connector general specification

	VERTICAL SYSTEMS		HORIZONTAL SYSTEMS				
	Standard	Improved Compliance	Single Pin		Multi Pin		
Maximum number of electrical conductors	1	1	1	1	2 (Splitter)	2	3
Maximum Working Pressure PSI (Bar)	15,000 (1034)	10,000 (689)	10,000 (689)	15,000 (1034)	10,000 (689)	10,000 (689)	10,000 (689)
Maximum Test Pressure PSI (Bar)	22,500 (1551)	15,000 (1034)	15,000 (1034)	22,500 (1551)	15,000 (1034)	15,000 (1034)	15,000 (1034)
Maximum Water Depth (metres)	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Operating Temperature °C	0 to 135	-18 to 121	-18 to 121	0 to 135	-18 to 121	-18 to 121	-18 to 121
Test Medium	Gas	Gas	Gas	Gas	Gas	Hydro	Hydro
Number of Matings (Dry Mate Pair)	20	20	20	20	20	20	20
Minimum Storage Temperature °C	-18 to +70	-18 to +70	-18 to +70	-18 to +70	-18 to +70	-18 to +70	-18 to +70

Table 4 ElecTRON dry mate connector general specification

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5.3 Electrical specification of connectors

	VERTICAL SYSTEMS		HORIZONTAL SYSTEMS				
	Standard	Improved Compliance	Single Pin		Multi Pin		
Maximum Working Voltage	1,000V DC	1,000V DC	1,000V DC	1,000V DC	1,000V DC	1,000V DC	1,000V DC
Maximum Working Current	5 Amps	5 Amps	5 Amps	5 Amps	5 Amps	5 Amps	5 Amps
Insulation Resistance (System @ Ambient)	>1 GΩ	>1 GΩ	>1 GΩ	>1 GΩ	>1 GΩ	>1 GΩ	>1 GΩ
Insulation Resistance (Connector @ Ambient)	>10 GΩ	>10 GΩ	>10 GΩ	>10 GΩ	>10 GΩ	>10 GΩ	>10 GΩ
Insulation Resistance (Connector @ Max Temp)	>100 MΩ	>100 MΩ	>100 MΩ	>100 MΩ	>100 MΩ	>100 MΩ	>100 MΩ
Contact Resistance (per connector pair – excludes cables)	<4 mΩ	<4 mΩ	<4 mΩ	<4 mΩ	<4 mΩ	<4 mΩ	<4 mΩ
Line resistance (permanently installed equipment – excluding leads)	<100 mΩ	<100 mΩ	<100 mΩ	<100 mΩ	<100 mΩ	<100 mΩ	<100 mΩ

Table 5 ElecTRON connectors electrical specification

5.4 Misalignment capability of wet mate connector

	VERTICAL SYSTEMS		HORIZONTAL SYSTEMS				
	Standard	Improved Compliance	Single Pin		Multi Pin		
Radial mm (inch)	Up to ± 2.5 (± 0.1)	Up to ± 2.5 (± 0.1)	± 3 (± 0.12)	± 3 (± 0.12)	± 3 (± 0.12)	± 3 (± 0.12)	± 3 (± 0.12)
Axial mm (inch)	Up to ± 5 (± 0.2)	Up to ± 12.7 (± 0.5)	± 2.3 (± 0.09)	± 2.3 (± 0.09)	± 2.3 (± 0.09)	± 2.3 (± 0.09)	± 2.3 (± 0.09)
Maximum Tubing Hanger Rotation	-	-	± 1°	± 1°	± 1°	± 1°	± 1°
Angular Misalignment	1°	1°	-	-	-	-	-

Table 6 ElecTRON wet mate connector misalignment capability

5.5 Other specifications

For all other specifications not included in the above tables, refer to product/project specific data sheet(s), alternatively contact Technical Support connectortechnicalsupport.gb@siemens-energy.com.

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5.6 ElecTRON connector part diagrams

Refer to Product data sheets for all dimensions not shown.

5.6.1 Wet mate vertical

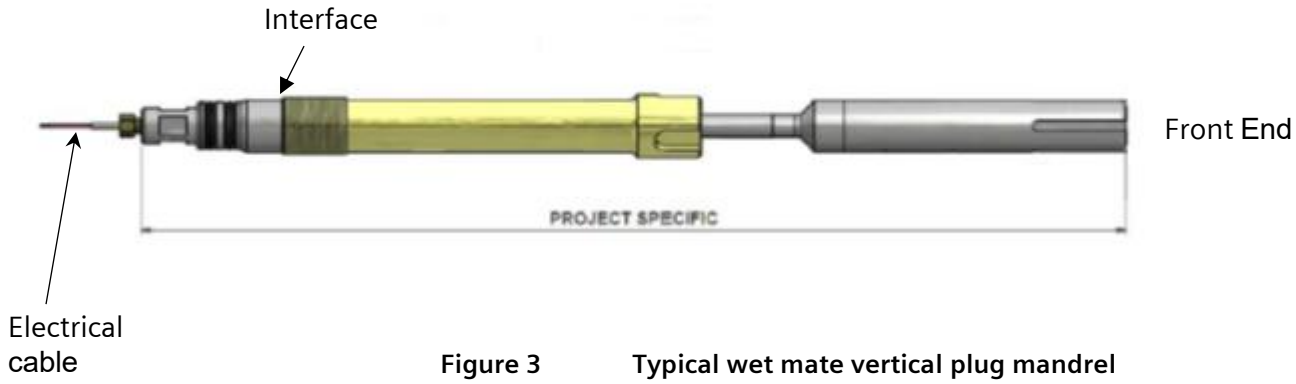


Figure 3 Typical wet mate vertical plug mandrel

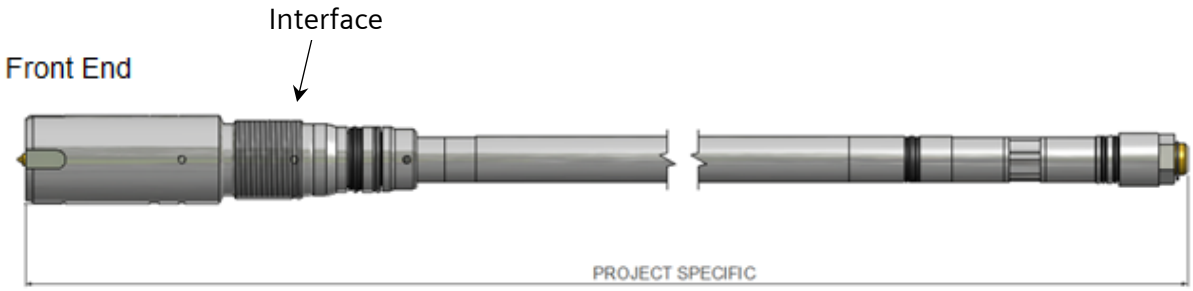


Figure 4 Typical wet mate vertical receptacle mandrel

5.6.2 Wet mate horizontal

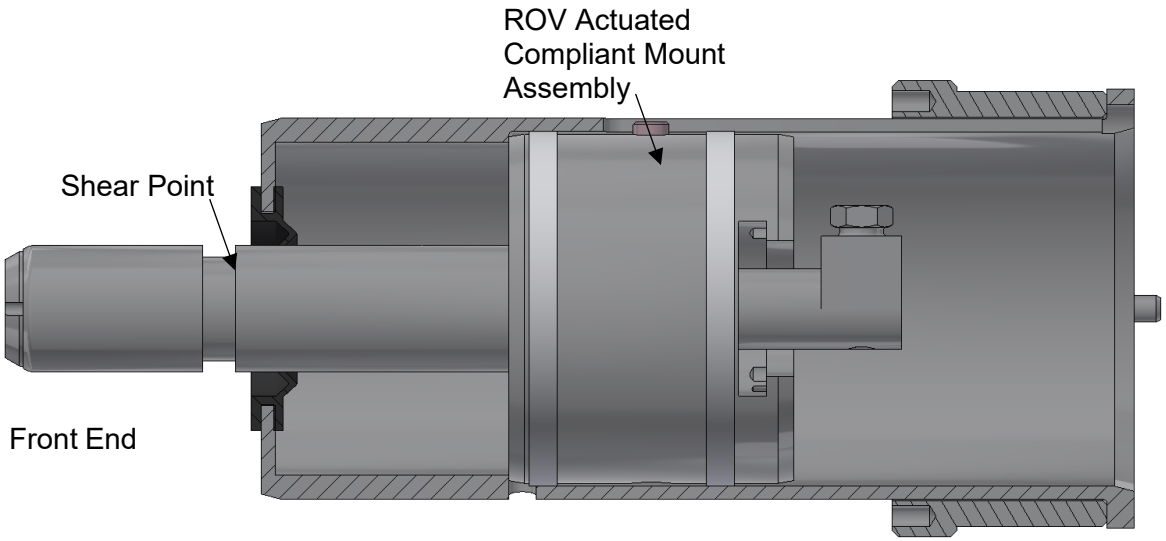


Figure 5 Typical wet mate horizontal plug assembly

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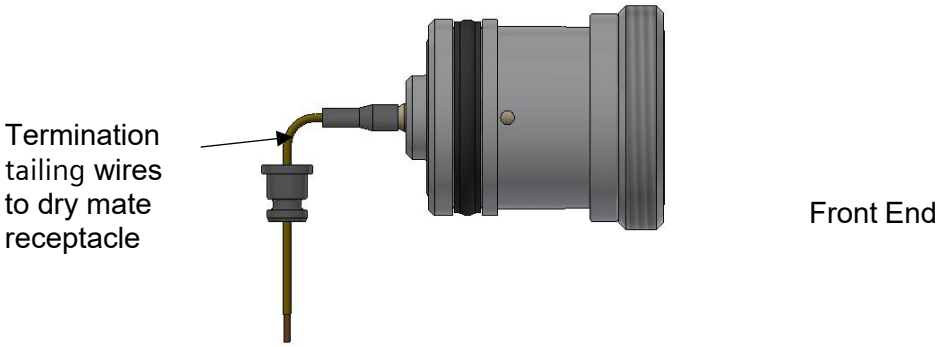


Figure 6 Typical wet mate horizontal receptacle

5.6.3 Dry mate horizontal / vertical

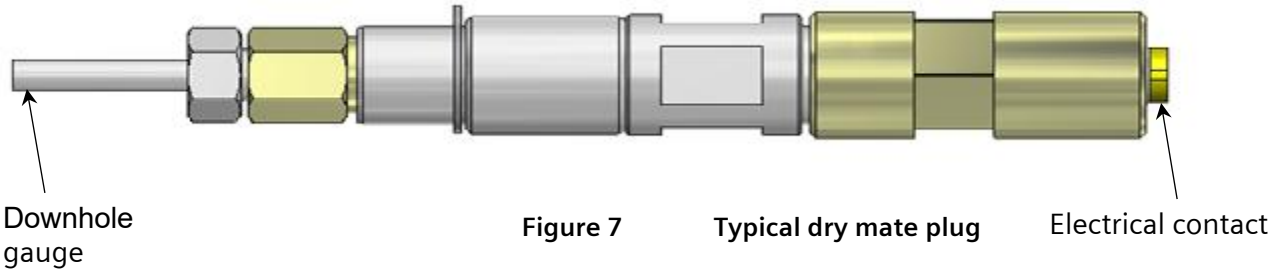


Figure 7 Typical dry mate plug



Figure 8 Typical dry mate receptacle

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5.7 Health and environmental information

5.7.1 Environmental, disposal and recycling

Safe disposal or recycling of waste packaging and/or end of life product is recommended by correctly, observing and complying with area, regional, national, or international environmental legislation where applicable.

To return waste packaging and/or end of life product to the manufacturer, contact the Product Safety Officer at subsea.connectors.productsafety.gb@siemens-energy.com.

Hazardous substances, Control of Substances Hazardous to Health (COSHH) Assessments regards to materials such as elastomers and oils, etc. used in ElecTRON products are available on request from the Product Safety Officer at subsea.connectors.productsafety.gb@siemens-energy.com.

5.8 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is legally defined as 'all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects the user against one or more risks to their health or safety'.

In the hierarchy of risk control, PPE is considered to rank lowest and represent the option of last resort. PPE is only appropriate where the hazard in question cannot be totally removed or controlled in such a way that harm is unlikely (for example by isolating the hazard or reducing the risk at source to an acceptable level).

All company personnel and operators should wear appropriate PPE defined as a result of relevant risk assessments in accordance with the PPE Regulations.



Warning. Risk of minor personal injury to persons with sensitivities to mineral based oils.

- Wear appropriate hand protection when handling products, mineral or synthetic based oils.

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6 PREPARING PRODUCT FOR USE

6.1 Transportation precautions before installation

Omterra Subsea electrical connectors are manufactured primarily from materials such as 316L stainless steel, Super Duplex stainless steel and Inconel 625, and as such are designed to withstand harsh saliferous environments. However, the connector inserts and exposed parts are susceptible to mechanical damage if not protected. Disposable dust caps or Acetal protective caps must be fitted to all Omterra Subsea connectors before transport. For information regarding what caps are supplied as standard, refer to product/project specific data sheet(s), alternatively contact Technical Support connectortechnicalsupport.gb@siemens-energy.com.

	**Caution.** Risk of material damage. Dust/protective caps must always be fitted during transport are recommended to remain in place until connectors are deployed Subsea.

Connectors can be shipped singularly or in multiples. Care should be taken to protect the connector(s) with bubble wrap or similar wrapping materials to avoid surface damage during transit. If large numbers are shipped in one consignment suitably reinforced transport box will be necessary to withstand the weight. See Figure(s) for examples of transport box(es).



Figure 9 Typical transport box- Inner packaging



Figure 10 Typical transport pallet box

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Figure 11 Bespoke transport pallet

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.

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

6.2 Unpacking

Remove wrapping material taking care to inspect for any surface damage or items that may have become separated from a connector, such as 'O' seals.

	**Caution.** Risk of material damage. - 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 dust/protection caps until connectors are ready for installation. - On removal do not allow the hoses or tailing wires to drag over the edges of a transport box. - For specific handling precautions for ElecTRON oil filled hose harnesses, please refer to IOM-001.

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6.2.1 Protective caps

All connectors come supplied with a protective cap, or combinations of protective caps, e.g. pressure rated cap on the front end and dust cap covering the unterminated pin. These can either be disposable dust caps, protective caps, or pressure rated caps. Dust caps (typically yellow in colour) can be simply removed by twisting or pulling them off, they may have additional yellow tape securing them to the product. Protective caps (typically black in colour) can be removed by unscrewing from the connector by hand.



Figure 12 Figure 1 - Example yellow dust cover

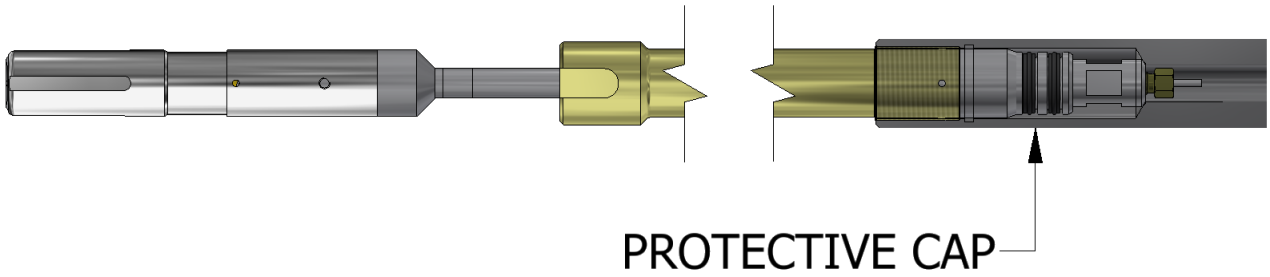


Figure 13 Example Acetal transport cap (shown in section for clarity)

Dry mate receptacles may be supplied with a pressure rated protective cap as shown in the Figure below. These may be torqued on to the connector and will require an appropriately sized spanner for removal.

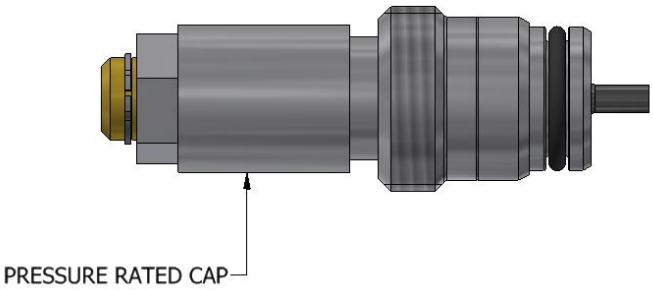


Figure 14 Example pressure rated cap

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6.3 Safe disposal of packaging

Dispose of the packaging correctly, observing and complying with area, regional, national or international environmental legislation. Where possible recycle responsibly.

To return waste packaging to the manufacturer, contact the Product Safety Officer at subsea.connectors.productsafety.gb@siemens-energy.com

6.4 Installation and assembly

Refer to Product Data Sheet for specific projects. If in doubt contact Technical Support connectortechnicalsupport.gb@siemens-energy.com for more detailed information.

6.5 Storage and protection during intervals of normal use

	**Caution.** Risk of material damage. If storage is carried out in saline conditions, e.g. on a ship's deck or hold, then full dummy connectors should be used.

6.5.1 Short term connector storage

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, duration where temperature and humidity are not controlled should be limited to 4 weeks. Dust/protective caps must be fitted, and the storage temperature should be between -18 °C and 70 °C (Project specific connectors storage temperature may vary). Humidity of the storage room should be below 75%.

	**Caution.** Risk of material damage. Maximum storage temperature accounts for solar gain. Skin temperature must not exceed 70°C. Suitable protection must be used to ensure maximum storage temperature is not exceeded.

6.5.2 Long term connector storage

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 -18 °C and 70 °C (Project specific connectors storage temperature may vary). Humidity of the storage room should be below 75%. Very moist or very dry conditions should be avoided. The equipment should be protected from strong sunlight and strong artificial light with a high ultraviolet content.

	**Caution.** Risk of material damage. Maximum storage temperature accounts for solar gain. Skin temperature must not exceed 70°C. Suitable protection must be used to ensure maximum storage temperature is not exceeded.
	**Caution.** Risk of material damage. Connectors should not be allowed to encounter solvents, oil, grease or other semi-solid materials.

If glanded connectors are to be stored bolted into their interfaces prior to cable termination, ensure the cable entry point into the gland is covered to prevent water ingress.

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6.5.3 Long term storage of elastomers

For the recommended storage of elastomeric components e.g. termination sleeves and cable boots, please refer to Omterra Subsea Document MH006 – Procedure for Storage and Handling of Elastomeric Materials.

6.6 Repackaging to prevent damage in transport

In the event of a requirement to return any product back to the manufacturer (Omterra Subsea Connectors), it is recommended that a dust/protective cap is fitted to the connector(s) and care should be taken to protect the connector(s) with bubble wrap or similar wrapping materials to avoid any surface damage. Singular connectors can be returned using a padded envelope (e.g. Jiffy Bag) or similar. However, if there are multiple connectors to be returned, it is recommended that a suitably reinforced box be used to withstand the weight and allow shipping in one consignment. Contact Technical Support connectortechnicalsupport.gb@siemens-energy.com to discuss details of typical boxes.

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7 OPERATION OF PRODUCT

7.1 Basic functions

The ElecTRON wet-mateable connectors are based around the unique and patented Controlled Environment (CE) principle. This arrangement ensures the highest level of integrity for long life and repeated subsea mating capability.

- The CE plug features an oil-filled primary diaphragm to prevent water ingress. Each electrical socket is further protected within an individual secondary oil-filled diaphragm.
- Both diaphragms have individual seals, failure of either seal would not compromise the connector's integrity.
- Shuttle pins prevent water ingress or loss of oil when the connector is not mated.
- Insulated pins on the receptacle connector displace the shuttle pins during the mating process. The conductive tips of the pins are wiped twice before making contact with the electrical socket.
- The whole assembly is pressure balanced to minimise stress within the sealing areas.

7.2 Secondary functions

A secondary function of the ElecTRON connectors is that they can be used as a pressure barrier, only when deployed subsea, see section 3.2.

Refer to product datasheet for specific pressure rating(s).

7.3 Quick references

For quick reference of the product, see 2.4 Product advice label, which provides basic warning, caution and contact details among other information.

In addition to the above, some details are also listed on the product label such as, system type designated by a h/v postfix to Electron indicating horizontal or vertical system, part number (P/N), serial number (S/N), electrical, pressure and temperature rating.

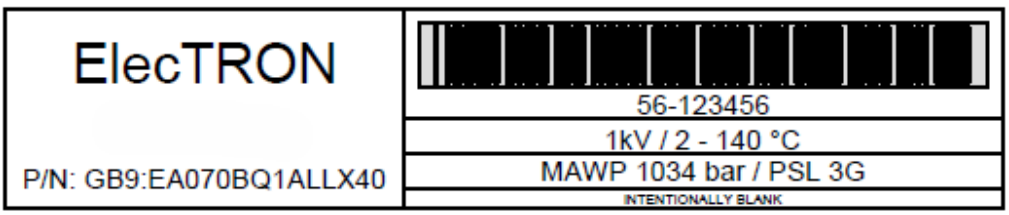


Figure 15 Product label example

7.4 Disposal of waste products

Safe disposal or recycling of waste/end of life product is recommended by correctly, observing and complying with area, regional, national or international environmental legislation where applicable.

To return waste packaging and/or end of life product to the manufacturer, contact the Product Safety Officer at subsea.connectors.productsafety.gb@siemens-energy.com

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8 USER INFORMATION

8.1 Normal and faulty/dangerous operation

8.1.1 General

The ElecTRON range of instrumentation connectors has been developed for long term reliable signal and low voltage control systems for down-hole applications in high pressure, high temperature environments.

The ElecTRON range of instrumentation connectors consists of two unique types of connectors, wet mate and dry mate.

All connectors are usually supplied with protective caps. The protective caps must be removed prior to mating the connectors.

All mild steel sealing surfaces 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.

If the wet mate 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, see table overleaf for restriction information. 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. It is good practice to always fit the protective cap when a connector is unmated topside prior to deployment to provide mechanical protection.

For any situation where a dry mate plug or receptacle are to be left unmated, then protective caps must be fitted prior to deployment to protect the pin contacts in the receptacle connectors and the socket contact in the plug connectors. Ensure that all sealing elements of the dry mate connectors are clean and free of contamination prior to mating.

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	**Caution.** Risk of material damage, 28 days is the maximum cumulative allowable exposure of unprotected contact pins to seawater over the life of the connector. This only applies with the power off.
	**Caution.** Risk of material damage. 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 would invalidate the warranty of the product.
	**Danger!** Risk of death from electric shock or severe personal injury through burning, under no circumstances must connectors be de-mated whilst live. Neither should they be partially mated and power applied. - Refer to project specific data sheets and scope of supply drawings for performance specifications and detailed deployment instructions.
	**Danger!** Risk of death from electric shock if user dismantles/incorrectly re-assembles/incorrectly re-terminates product (foreseeable misuse). 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. - Maintenance, disassembly, re-assembly and termination activities must only be carried out by a competent person. - Instrumentation connectors must be terminated by Omterra Subsea trained personnel.

8.1.2 Protection of receptacle contact pins

	**Caution.** Risk of material damage. 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.

8.1.3 Removal of marine growth and calcareous deposits

	**Warning.** Risk of minor personal injury to persons with sensitivities to a solution of 50% Citric Acid, should wear appropriate hand and eye protection when handling. - To remove calcite growth from Omterra Subsea connectors, a solution of 50% Citric Acid is recommended. All seawater exposed elastomeric materials in Omterra Subsea connectors have been fully tested against 50% Citric Acid and are compatible for a duration of 1 hour. In addition, the thermoplastic materials have a 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 into the shuttle pins at the front of the plug as this could result in a risk of water being forced through the primary seals.

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8.1.4 Stab mating connectors

- Compliance – ElecTRON wet mate connectors are generally fixed to the structure, depending on the connector type they may have limited compliance engineered into the connector design. Refer to product/project specific data sheet(s), alternatively contact Technical Support connectortechnicalsupport.gb@siemens-energy.com
  a) 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.
  b) 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:
     i. Mating speed should not exceed 1 m/s;
     ii. De-mating speed should not exceed 5 m/s.
  c) 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.
  d) Interrupted connection – i.e. Partial mate to full de-mate can be carried out without any adverse effect to connectors, if the power is off.
  e) Cathodic protection – Stainless steel 316L instrumentation connectors must always be connected to the cathodic protection (CP) system. Super Duplex stainless steel connectors and nickel-chromium-molybdenum alloys should be isolated from the CP system to reduce possibility of hydrogen embrittlement.

8.2 Troubleshooting (FAQ's)

A Technical Bulletin is available on request, alternatively contact any of the following:

Department	E-mail address
Product Safety Officer	subsea.connectors.productsafety.gb@siemens-energy.com
Technical Support	connectortechnicalsupport.gb@siemens-energy.com
Service (Site Team)	susultlcmsupport.gb@siemens-energy.com
Sales	connectorsales.gb@siemens-energy.com

Table 7 Troubleshooting product contact details

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9 PRODUCT MAINTENANCE

9.1 Safety precautions

	**Danger!** Risk of death from electric shock, under no circumstances must connectors be de-mated whilst live. Neither should connectors be partially mated and power applied.

9.2 Product maintenance (skilled persons)

9.2.1 Removal of marine growth and calcareous deposits

	**Warning.** Risk of minor personal injury to persons with sensitivities to a solution of 50% Citric Acid, should wear appropriate hand and eye protection when handling. - To remove calcite growth from Omterra Subsea connectors, a solution of 50% Citric Acid is recommended. All seawater exposed elastomeric materials in Omterra Subsea connectors have been fully tested against 50% Citric Acid and are compatible for a duration of 1 hour. In addition, the thermoplastic materials have a good resistance to citric acid.
	**Warning.** Risk of minor personal injury to persons with sensitivities to mineral or synthetic based oils, should wear appropriate hand protection when handling the ElecTRON range of products.
	**Caution.** Risk of material damage. Other acid cleaners, such as 50% Acetic Acid, should not be used as they may cause deterioration of the elastomeric materials.
	**Caution.** Risk of material damage. Chiselling and abrasive methods are not recommended. Use of a water jet is acceptable, but the jet should not be directed into the shuttle pins at the front of the plug as this could result in a risk of water being forced through the primary seals.

9.2.2 Lubrication of contact pin seals

To achieve the highest performance of the ElecTRON Dry Mate connectors a tube of TRONILUBE LUBRICATION GREASE is supplied to aid contact sealing during service. Please ensure that the Pin contact green rubber cone seals of the receptacle connector receive a smear of Tronilube (available from Omterra Subsea in 1ml syringes) prior to deployment as shown below in Figure 13.

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Caution. Risk of material damage. Do not use solvents to degrease.

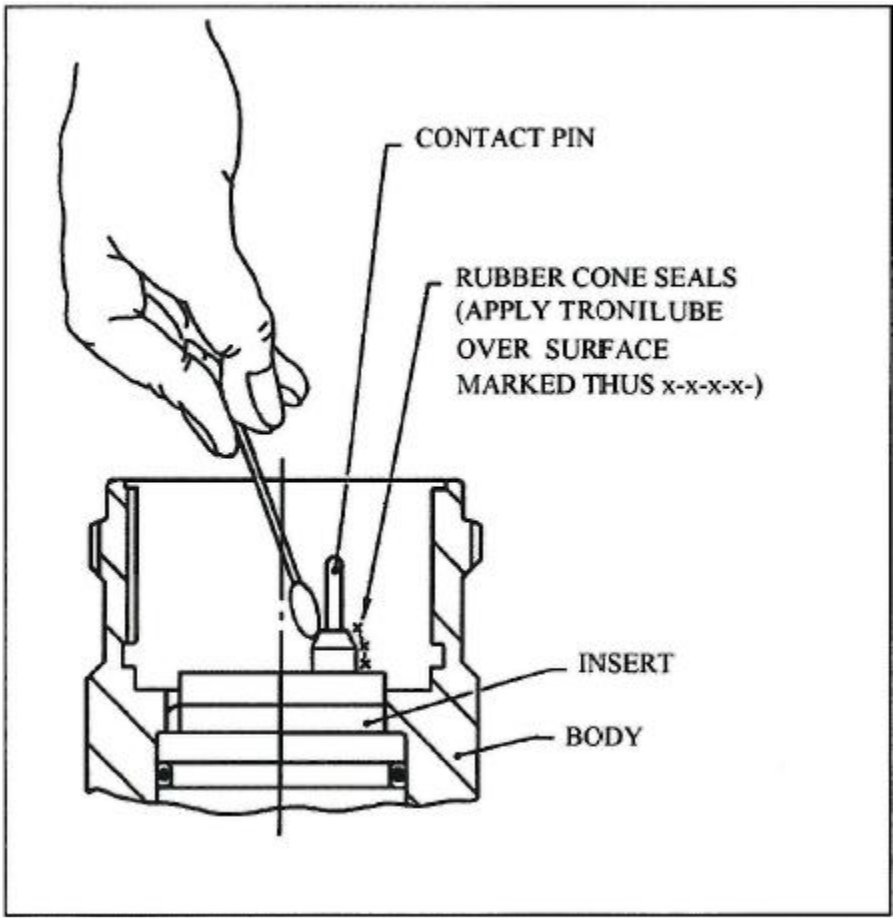


Figure 16 Lubrication of contact pin seals

9.3 Safety/deterioration maintenance checks

9.3.1 Protection of receptacle contact pins

	Caution. Risk of material damage. 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.

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9.3.2 Test connectors

	**Caution.** Risk of material damage. 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 product warranty.

Guide pins where applicable must never be removed from test connectors as this can lead to damage and will invalidate the product warranty.

9.3.2.1 Verification Routine Tests

Under Product safety recommendations complying with CE and UKCA regulations, test connectors shall undergo routine test to ascertain their good functionality and expected safety.

Omterra recommends that every 50 mating cycles, test connectors shall follow this sequence:

Routine Test for ElecTRON test Connectors			
Part Number		**Serial Number:**	
Date:		**Operator:**	**Location:**
Test	**Acceptance Criteria**	**Result**	**Pass / Fail**
Visual Examination	No damage or degradation		Pass / Fail
Contact Resistance[1] (CR)	<4 mΩ @10 mA/100 mA		Pass / Fail
Insulation Resistance (IR)	>10 GΩ @1000 Vdc		Pass / Fail
High Voltage (Proof Test)	No breakdown or flashover @2000 Vdc Current leakage: <200 nA		Pass / Fail

Table 8 Troubleshooting product contact details

Table 8 record shall be kept by the customer/owner of the product.

Any failure of any routine tests shall be removed from usage and under no circumstance a test connector can be used until repaired, refurbished or replaced by Omterra.

[1] Excluding all wire leads & extension leads – for guidelines 50Ohm/m can be used for extension leads length.

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Refer to Section 3.3 to review all risks and danger prior performing any testing.



Caution.

- It is the responsibility of the client/owner to ensure that all safety measures are in place and adhere to facilities rules and local compliance requirements.
- It is the responsibility of the client/owner to ensure that all risk assessments are conducted under local safety responsible.



Danger! Risk of death from electric shock if user dismantles/incorrectly re-assembles/incorrectly re-terminates product (foreseeable misuse). 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.



Danger! Risk of imminent danger to life, risk of severe personal injury to persons with pacemakers or implantable cardioverter-defibrillators (ICDS) from electromagnetic interference (EMI) e.g. high frequency testing with large load currents.

Ensure all testing of products both factory and topside are not conducted by or in the presence of persons with pacemakers or ICDS.

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10 CUSTOMER COMMENTS/FEEDBACK

Please complete the Sign Off section at the bottom of form to confirm each page of this document has been read and complied with in full.

Originator Name and Initials (BLOCK CAPITALS)		Date
✉ Contact Details		☎ Contact Details
Project Reference	Customer	Region
Product Type	Part Number (P/N)	Serial Number (S/N)
Please enter details below e.g. comments; complaints; evidence of good practice; incident reports; observations and recommendations, including any associated with health, safety or the environment, etc., also include any names/contact details of other relevant personnel.		

Sign Off Section

Name (BLOCK CAPITALS)	Signature	Date

Please e-mail completed form to the Product Safety Officer at the following address:
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Freyeslebenstraße 1
91058 Erlangen
Germany

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