CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	EQUIPMENT MANUFACTURERS RECORD BOOK	Sheet 1 of 217 Date: 26/01/2026 Rev: 00

Base Load Power Hub (BLPH)

EQUIPMENT MANUFACTURERS RECORD BOOK
Document Number: 1724002000-QC-DB-00012

Document Class: Class 2

00	26/01/2026	Issue for Review (IFR)	T. Papadimitriou	P. Maniatis	G. Keser
Rev.	Date	Description	Prepared	Reviewed	Approved

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1724002000-MD-LIS-00001
SUPPLIER MASTER INDEX REGISTER (SMIR)

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	SUPPLIER MASTER INFORMATION REGISTER	Sh. 1 of 5 Date: 19/11/2024 Rev. 01

Base Load Power Hub (BLPH)

HV CABLE AND ACCESSORIES

SUPPLIER MASTER INFORMATION REGISTER

Document Number: 1724002000-MD-LIS-00001

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Andrea Padovani	19/11/2024

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	Ordine n°/*order nr.*	1724002000		Fornitore/*Supplier*:	REYNARD	
	data / *dated:*			Codice F./ *S. Code:*		
	Commessa / *Job:*	123A90		Indirizzo/ *address* :		
	Descrizione / *Description*	HV CABLE AND ACCESSORIES		Persona di riferim./ *contact person:*	gerard.keser@reynard.nl	
	Macrofase / *Phase*					

Pos.	Document nr. Client (1)	Doc Client Rev. (1)	Document nr. Internal	Document nr. Internal Rev. (2)	Document nr. Supplier (3)	Doc Supplier Rev. (3)	Titolo Documento / *Document title* (4)	Disciplina / *Discipline* (5)	Blocco Classe / *Class Block (6)*	Docum. Format (7)	first issue date (8)	Third Party Approval (I/A)	Design KEY Document	Document subject to liquidated damages	Document Approval (I/A)
							CONTROL DOCUMENTS								
1	1724002000-MD-LIS-00001	00	1724002000-MD-LIS-00001	00	TBD	00	SUPPLIER MASTER INDEX REGISTER (SMIR)- HV CABLE AND ACCESSORIES	ELE		A4	04/11/2024		NO		I
							QUALITY DOCUMENTS								
2	1724002000-QC-ITP-00002	00	1724002000-QC-ITP-00002	00	TBD	00	INSPECTION AND TEST PLAN -HV CABLE AND ACCESSORIES	QUA		A4	15/11/2024		NO		A
							ENGINEERING DOCUMENTS								
3	1724002000-EL-DS-00003	00	1724002000-EL-DS-00003	00	TBD	00	DATA SHEETS - HV CABLE	ELE		A4	04/11/2024		YES		I
4	1724002000-EL-DS-00004	00	1724002000-EL-DS-00004	00	TBD	00	DATA SHEETS - T-CONNECTORS	ELE		A4	04/11/2024		YES		I
5	1724002000-EL-DS-00005	00	1724002000-EL-DS-00005	00	TBD	00	DATA SHEETS - CABLE CLEATS AND ACCESSORIES	ELE		A4	04/11/2024		NO		I
6	1724002000-EL-DA-00006	00	1724002000-EL-DA-00006	00	TBD	00	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	ELE		A4	04/11/2024		NO		A
7	1724002000-EL-MAN-00007	00	1724002000-EL-MAN-00007	00	TBD	00	INSTALLATION AND OPERATIONAL MANUAL PULLING	ELE		A4	04/12/2024		NO		I
8	1724002000-EL-MAN-00008	00	1724002000-EL-MAN-00008	00	TBD	00	INSTALLATION AND OPERATION MANUAL, TERMINATION AND TESTING	ELE		A4	04/12/2024		NO		I
9	1724002000-QC-PRO-00009	00	1724002000-QC-PRO-00009	00	TBD	00	FAT PROCEDURE - Factory Acceptance test Procedure and Reports - HV CABLE AND ACCESSORIES	QUA		A4	08/11/2024		NO		A
10	1724002000-QC-PRO-00010	00	1724002000-QC-PRO-00010	00	TBD	00	SAT - Site Acceptannce Test Procedure and reports - Pre commissioning -Commissioning procedure - HV CABLE AND ACCESSORIES	QUA		A4	13/12/2024		NO		A
11	1724002000-QC-LIS-00011	00	1724002000-QC-LIS-00011	00	TBD	00	EQUIPMENT MANUFACTURERS RECORD BOOK (FINAL DOSSIER) - INDEX - ELECTRICAL CABLES, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	QUA		A4	15/11/2024		NO		A
							CERTIFICATES (ref. to notes in the RDDS)								
12	1724002000-QC-DB-00012	00	1724002000-QC-DB-00012	00	BOOK01	00	EQUIPMENT MANUFACTURERS RECORD BOOK – COMPLETE - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	CERT		A4	28/02/2025		NO		A
							HANDLING, SHIPPING & SITE INSTALLATION								
13	1724002000-QC-PRO-00013	00	1724002000-QC-PRO-00013	00	PACKING01	00	PACKING SHIPPING HANDLING AND STORAGE PROCEDURES - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES (including CABLE DRUMS SPECIFICATION (DIMENSION, WEIGHT, EXACT CABLE LENGTH)	EXP		A4	04/11/2024		NO		I

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1724002000-EL-DS-00003
DATA SHEETS – HV CABLES

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	DATA SHEETS - HV CABLE	Sheet 1 of 13 Date: 17/12/2024 Rev: 02

Base Load Power Hub (BLPH)

DATA SHEETS - HV CABLE

Document Number: 1724002000-EL-DS-00003

Document Class: Class 3

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Sign	Date
Andrea Fadoschi	17/12/2024

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Revision / Change Log

Rev.	Description
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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

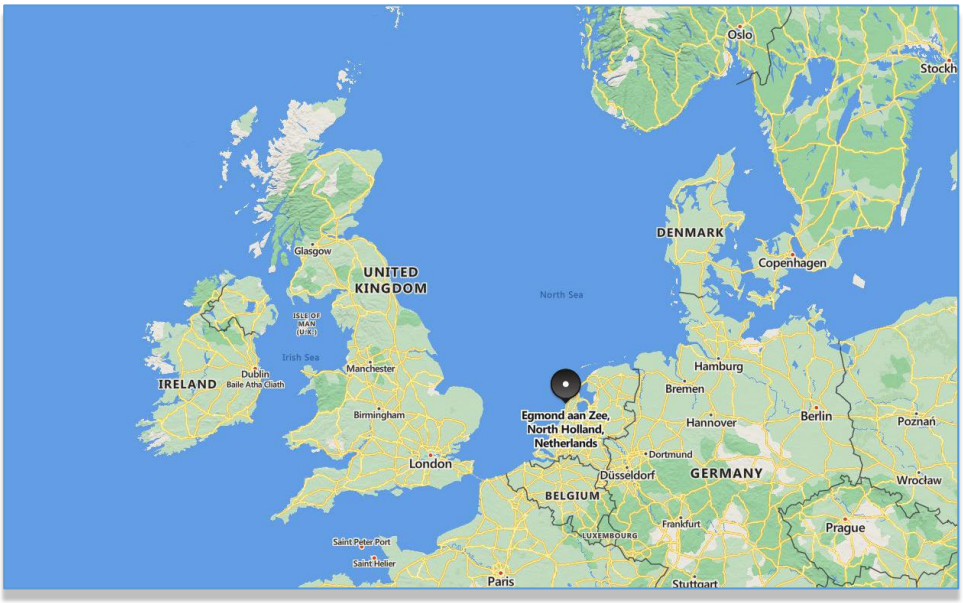


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

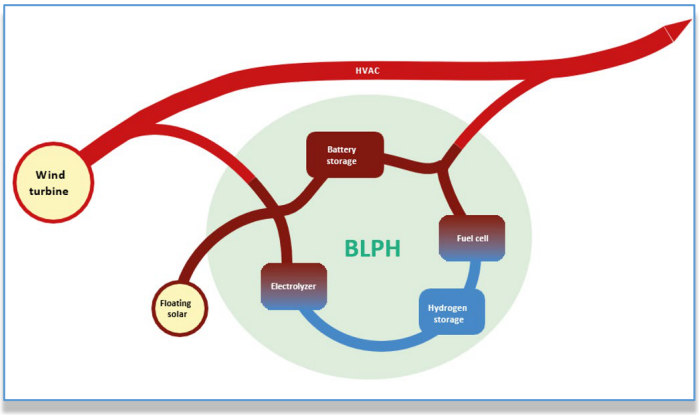


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

Providing the technical specifications of the cables to determine the dimensions and properties so the cable accessories and interface components can be adapted to this and compatibility be verified. The document also references to applied standards and (Employer) requirements.

2.1 REFERENCES

Doc. No.	Description
IEC 60840	Power Cables with Extruded Insulation and their Accessories for Rated Voltages above 30 kV (Um= 36 kV) up to 150 kV (Um = 170 kV) – Test Methods and requirements
IEC 60228	Conductors of Insulated Cables

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

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3 HV CABLE DATA SHEET

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Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Description

1 x 240 / 50



* This image may differ from the actual product.

Trading information

Product group	Power cable >= 1 kV, for permanent installation
Type	Cu/XLPE/CWS/LAT/LSZH 36/66 kV
Net. Weight	4.11 kg/m
Sheath marking	{Length} TKF - Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240/50 IEC 60840 - {Year} {Batch}

Trade lengths

	Minimal order
(58239 / 8713182481131)	1 MTR

Construction characteristics

Standardization	IEC 60840
Number of cores	1
Nominal cross section conductor	240 mm²
Conductor material	Copper
Conductor surface	Bare

Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Construction characteristics

Standardization conductor material	IEC 60228
Shape of conductor	Round
Conductor category	Class 2c = stranded & compacted
Conductor shield	Semiconductive Compound
Material core insulation	XLPE++
Insulation shield	Semiconductive compound with semiconductive swellable tape
Earthscreen construction	Copper round wire + copper tape counter spiral
Nominal earthscreen cross section	50 mm²
Material outer sheath	LSZH
Colour outer sheath	Black
Diameter conductor	18.6 mm
Insulation thickness	9.5 mm
Diameter over insulation	39.2 mm
Aluminium sheath thickness	0.2 mm
Diameter shield wires	1.15 mm
Diameter over shield	41.7 mm
Outer sheath thickness	2.5 mm
Outer diameter approx.	48.1 mm

Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Properties

Flame retardant	IEC 60332-3-24 Cat. C
Halogen free	IEC 60754-1 / IEC 60754-2
Low smoke	IEC 61034-1 & IEC 61034-2
Longitudinal water blocking	Yes
Radial water blocking	Yes
Radial watertight construction	Al/PE
UV resistant	Yes
UV protection	NEN EN 50289-4-17A

Technical characteristics

Min. bending radius during installation	870 mm
Min. bending radius after installation	755 mm
Tensile force with pullinghead	12,000 N
Tensile force with pullingsleeve	4,620 N
Max. conductor temperature	90 °C
Max. operating temperature	70 °C
Minimum installation temperature	-10 °C

Electrical characteristics

Nominal voltage U0	36 kV
Nominal voltage U	60 kV
Nominal voltage Umax	72.5 kV
Conductor DC resistance @ 20°C	0.0754 Ohm/km
Conductor AC resistance @ max. cont. Conductor temp.	0.0973 Ohm/km
Shield DC resistance	0.387 Ohm/km

Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Electrical characteristics

Mutual capacitance (Nominal)	0.21 µF/km
Max. thermal short-circuit current conductor 0,5 sec	48.5 kA
Max. thermal short-circuit current conductor 1 sec	34.3 kA
Max. short-circuit temperature conductor	250 °C
Max. thermal short-circuit current shield 0,5 sec	10.51 kA
Max. thermal short-circuit current shield 1 sec	7.43 kA
Max. short-circuit temperature shield	250 °C
E-Max fieldstrength	5.38 kV/mm
E-Min fieldstrength	2.77 kV/mm
Charging current per core	2.373 A/km
Frequency	50 Hz
Operating reactance trefoil arrangement	0.12 Ohm/km
Operating reactance flat arrangement	0.18 Ohm/km
*) Theoretical calculated values	Depends on application
Maximum current buried trefoil arrangement	455 A
Maximum current buried flat arrangement	455 A
Maximum current in air trefoil arrangement	630 A
Maximum current in air flat arrangement	730 A
Homopolar resistance Ro (trefoil) *)	2.1899 Ohm/km
Homopolar resistance Ro (flat) *)	2.1894 Ohm/km
Homopolar reactance Xo (trefoil) *)	0.3877 Ohm/km
Homopolar reactance Xo (flat) *)	0.6233 Ohm/km
Homopolar impedance Zo (trefoil) *)	2.2239 Ohm/km
Homopolar impedance Zo (flat) *)	2.2764 Ohm/km

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1724002000-EL-DS-00004
DATA SHEETS - T-CONNECTORS

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Document Title:	DATA SHEETS - T-CONNECTORS	Sheet 1 of 16 Date: 20/11/2024 Rev: 02

Base Load Power Hub (BLPH)

DATA SHEETS - T-CONNECTORS

Document Number: 1724002000-EL-DS-00004

Document Class: Class 3

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Sign	Date
Andrea Padoschi	15/01/2024

Rev.	Date	Description	Prepared	Reviewed	Approved
02	20/11/2024	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
01	19/11/2024	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
00	07/11/2024	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	DATA SHEETS - T-CONNECTORS	Sheet 2 of 16 Date: 20/11/2024 Rev: 02

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1 INTRODUCTION

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1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

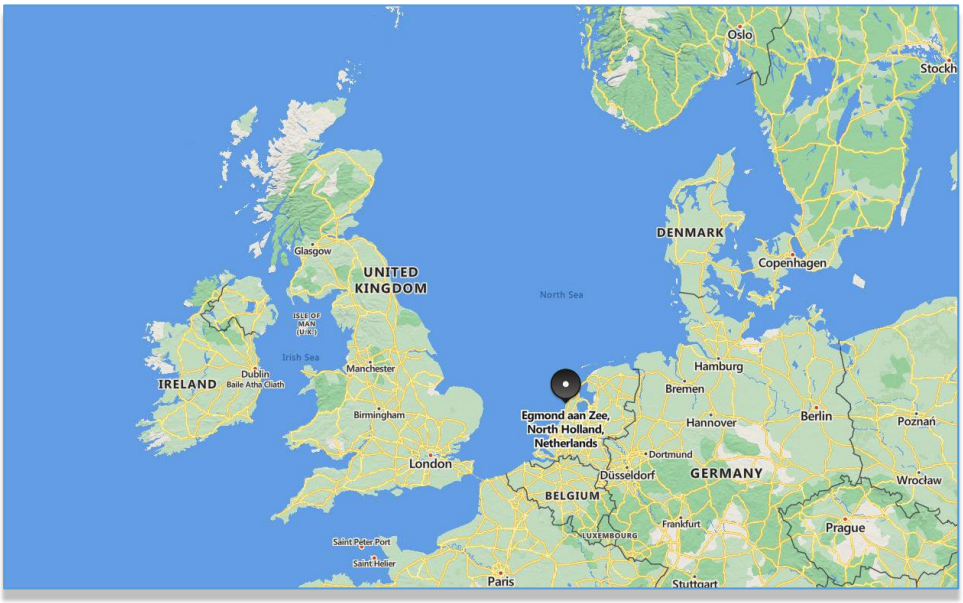


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

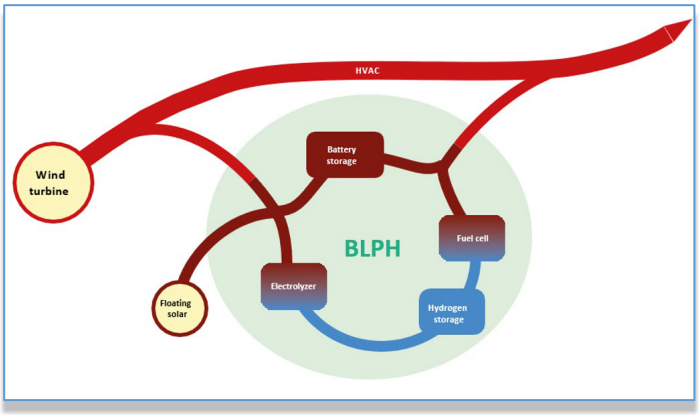


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

Providing the technical specifications of the T-Connectors that are going to be installed for the HOLLANDSE KUST NOORD WIND PARK Project. The document also references to applied standards and (Employer) requirements.

2.1 REFERENCES

Doc. No.	Description
1724002000-EL-DS-00003	DATA SHEETS - HV CABLE
1724002000-EL-DA-00006	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES
1724002000-EL-DS-00005	DATA SHEETS - CABLE CLEATS AND ACCESSORIES

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

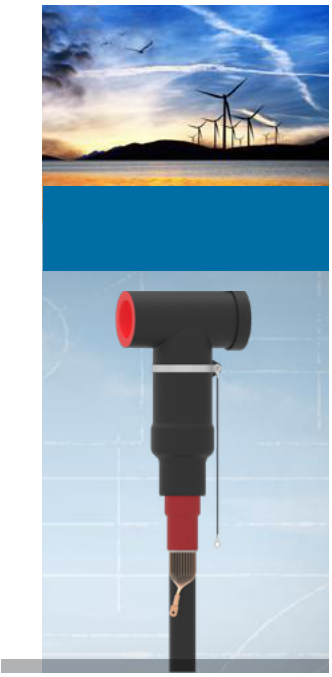
COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

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3 DATA SHEET OF TE'S RAYCHEM SCREENED T-CONNECTORS AND COUPLING CONNECTORS FOR INTERFACE F RSTF

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TE's Raychem SCREENED T-CONNECTORS AND COUPLING CONNECTORS FOR INTERFACE F RSTF

1250A up to 72.5 kV

TE Connectivity (TE) combines over 60 years experience and engineering excellence to offer reliable and innovative switchgear connection systems. As part of this commitment, we have developed the RSTF: an outer cone Screened separable T-connector for 72.5 kV type F bushings.

TE's Raychem RSTF are engineered to meet the technical and business challenges of today´s large offshore wind applications through a comprehensive product range:

- Base connectors and coupling connectors for single- and parallel cable connections
- Screened surge arresters for base and coupling connectors

Furthermore, TE provides an end-to-end customer support including on-site training, installer certification and customized products in order to ensure made-to-last installation quality.

RSTF PRODUCT FAMILY OVERVIEW

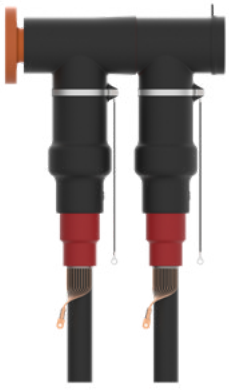
TE's Raychem Screened T-connectors for interface F RSTF up to 72.5 kV



- Suitable for flexible tower cable and subsea array cables
- Compact design for cables with cross sections from 95 mm^2 to 1200 mm^2
- Reduced installation time as no special tools are required
- High performance and longevity in harsh environments
- Meet EN 50673 standard
- Tested according to IEC 60840
- 100% routine tested
- End-to-end components traceability

TECHNICAL DATA FOR RSTF	
Conductor cross-section range	95 mm^2 - 1200 mm^2
Maximum system voltage	72.5 kV
Continuous current rating	1250A
Lightning impulse withstand level	325 kV
Partial discharge at 1.5 U_o	< 5 pC
Heating cycle voltage test (2 U_o)	72 kV
AC voltage test (2.5 U_o)	90 kV
Ø over cable insulation	28 mm – 70 mm

TE's Raychem Screened Coupling Connectors RSTF-CC up to 72.5 kV



- Designed to mate with the RSTF T-connector enabling inline- and parallel- connections
- Offering an effortless installation onto the t-connector due to patented design and installation procedure
- Featuring up to 1800A as combined continuous current rating for T-connector and coupling connector in parallel or inline connection

AN OPTIMIZED DESIGN FOR HIGH RELIABILITY

1. Screened Body
A thin-walled conductive outer screen that is permanently bonded to the insulating silicone rubber material of the T-body.

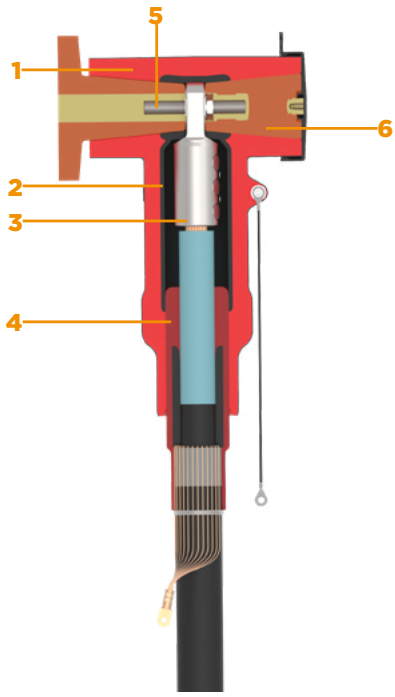
2. Inner screen
A conductive inner layer around the mechanical cable lug that works as a Faraday cage to prevent corona at rated voltage.

3. Mechanical lug
Mechanical lugs with shear bolts for connecting Class 2 and Class 5 aluminium and copper conductor cables.

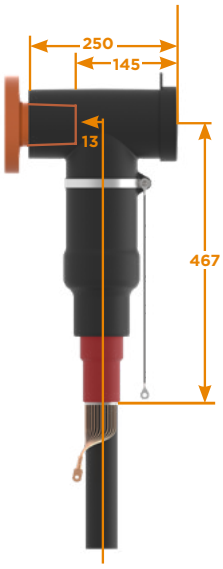
4. Stress cone adapter
Relieves electrical stress around the cable's screen cut. The insulated section is extending beyond the cable's oversheath to provide sealing against water ingress.

5. Threaded pin
A threaded pin together with a special lock-washer ensure a sound electrical for providing low contact resistance and a reliable mechanical contact that is fit to handle the vibrations in offshore wind turbines.

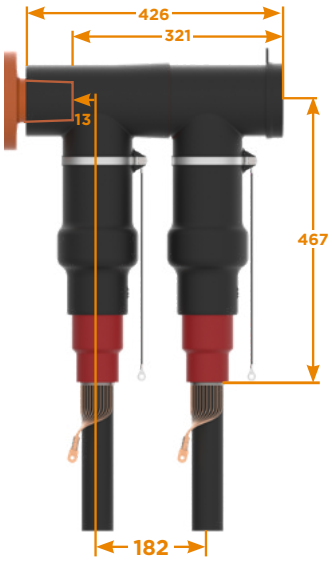
6. Rear plug with test point
Removable rear plug with capacitive test point that enables to check for presence of voltage.



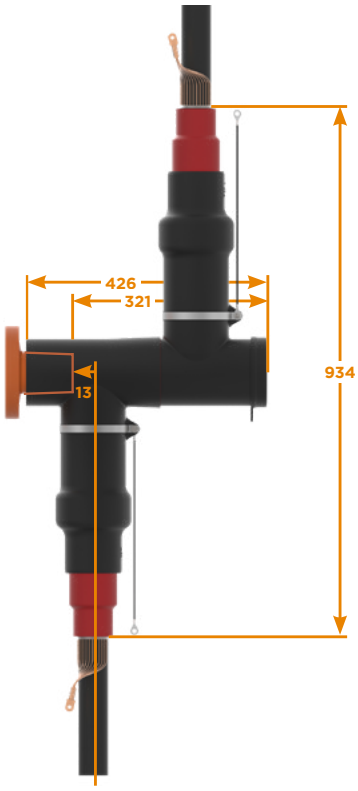
OFFERING A VARIETY OF APPLICATIONS



Single connection



Parallel connection



Inline connection

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Germany/Switzerland:	+49 (0) 89-608-9903
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4 DATA SHEET OF NEXANS EUROMOLD K480TB/G-21-95.240CU-FLEX+MWS+KIT MT/RS)-MT-AS044

APPLICATION

Separable tee shape connector designed to connect polymeric insulated cable to equipment (transformers, switchgear, motors, ...).
Also connects cable to cable when using the appropriate mating parts.

TECHNICAL CHARACTERISTICS

- A thick conductive EPDM jacket provides a total safe to touch screen.
- Each separable connector is tested for AC withstand and partial discharge prior to leaving the factory.

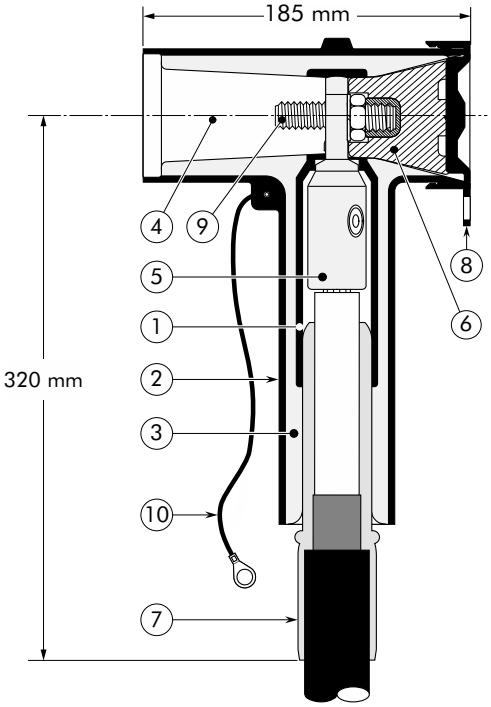


DESIGN

Separable connector comprising:

1. Conductive EPDM insert.
2. Conductive EPDM jacket.
3. Insulating EPDM layer moulded between the insert and the jacket.
4. Type C interface as described by CENELEC EN 50180 and 50181.
5. Conductor contact.
6. Basic insulating plug.
7. Cable reducer.
8. Conductive rubber cap.
9. Clamping screw.
10. Earthing lead.

The screen break design enables cable outer sheath testing without removing or dismantling the connector.



6/10 (12) kV
6.35/11 (12) kV
8.7/15 (17.5) kV
12/20 (24) kV
12.7/22 (24) kV
18/30 (36) kV
19/33 (36) kV

Up to 36 kV
630 A -1250 A

EUROMOLD®

SPECIFICATIONS AND STANDARDS

The 480TB separable connector meets the requirements of CENELEC HD 629.1.

Separable connector type	Voltage Um (kV)	Current Ir (A)	Conductor sizes (mm^2)	
			min	max
480TB/G	12	1250	16	300
K480TB/G	24	1250	16	300
M480TB/G	36	1250	50	300

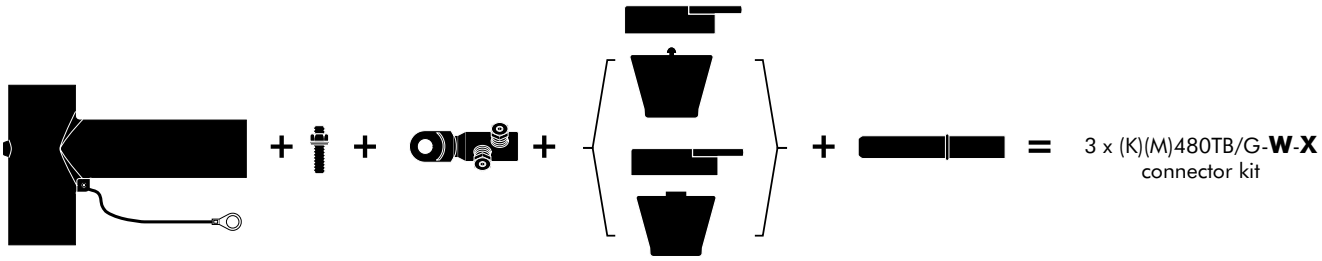
08/2020

Nexans

KIT CONTENTS

The complete (K)(M)480TB/G tee connector kit comprises 3x the following components:

The kit also comprises silicone grease, installation cone, gloves, wipers, roll adhesive tape and installation instructions.



Connector housing (K)(M)480BT/G

Clamping screw 430TCS

Conductor contact TMBC-**X**

Basic insulating plug 800BIPR (24 kV) or 800BIPA (36 kV) + rubber cap

Cable reducer CA0-**W**

ORDERING INSTRUCTIONS

To order the tee connector, select the ordering part number which gives you the best centring of your core insulation diameter and substitute **X** using table X, according to your conductor size and type. Add a 'K' for use up to 24 kV, add an 'M' for use up to 36 kV.

EXAMPLE:

The cable is 24 kV, 185 mm^2 compact stranded copper with a diameter over core insulation of 27.5 mm.

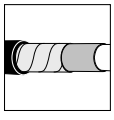
Order 3 x K480TB/G-018-95.300UN5 tee connector kit.

TABLE W

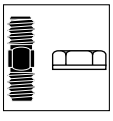
Ordering part number	Dia. over core insulation (mm)	
	min	max
3 x 480TB/G-011-**X**	12.0	19.0
3 x 480TB/G-015-**X**	16.0	26.5
3 x 480TB/G-018-**X**	19.0	32.6
3 x 480TB/G-021-**X**	22.0	34.6
3 x 480TB/G-027-**X**	28.5	37.5

TABLE X

Conductor sizes (mm^2)	Aluminium and copper conductor
	Bolted
16 25 35 50 70 95 120 150 185 240 300	16.95UN5 95.300UN5



For use with copper tape screened cables. Order: Kit MT.



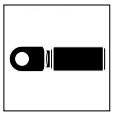
This product can also be installed using a stud & flange nut. Please contact our representative.



For use in potentially explosive atmospheres (for 12 kV max). Order: ATEX-IECEx



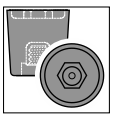
For applications outdoors and in humid climate. Order: +MWS.



This product can also be installed using crimped conductor contacts. Please contact our representative.



For use on vessels classed by DNV GL. Add -/DNV GL to part number



K480TB (24kV version) can also be installed using a 800BIPA (with VD point) Order: /VD

CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	EQUIPMENT MANUFACTURERS RECORD BOOK	Sheet 1 of 217 Date: 26/01/2026 Rev: 00

1724002000-EL-DS-00005
DATA SHEETS – CABLE CLEATS AND ACCESSORIES

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	DATA SHEETS - CABLE CLEATS AND ACCESSORIES	Sheet 1 of 16 Date: 09/10/2025 Rev: 02

Base Load Power Hub (BLPH)

DATA SHEETS - CABLE CLEATS AND ACCESSORIES

Document Number: 1724002000-EL-DS-00005

Document Class: Class 3

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
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Sign	Date
	10/10/2025

02	09/10/2025	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
01	19/11/2024	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
00	04/11/2024	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
Rev.	Date	Description	Prepared	Reviewed	Approved

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	DATA SHEETS - CABLE CLEATS AND ACCESSORIES	Sheet 2 of 16 Date: 09/10/2025 Rev: 02

Revision / Change Log

Rev.	Description
00	Issue for Information (IFI)
01	Issue for Information (IFI)
02	Issue for Information (IFI)

HOLDS LIST

No.	Description
1	
2	
3	
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List of Attachments

None

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

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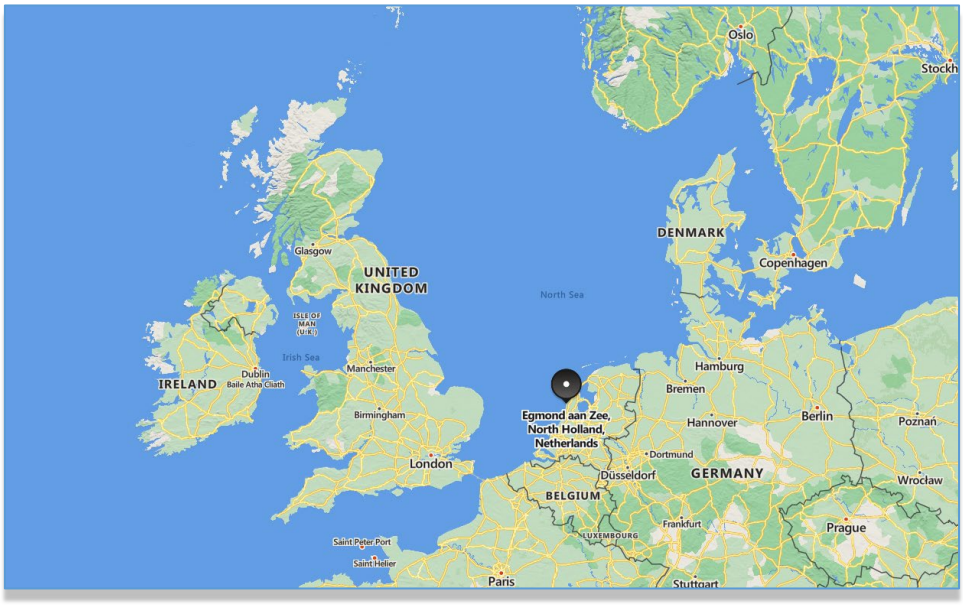


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Document Title:	DATA SHEETS - CABLE CLEATS AND ACCESSORIES	Sheet 6 of 16 Date: 09/10/2025 Rev: 02

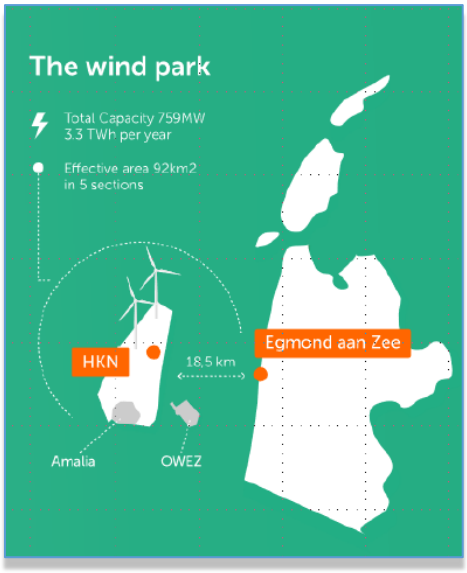


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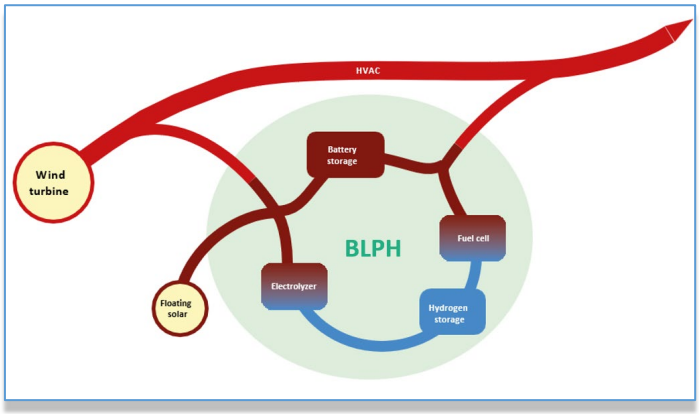


Figure 3 – BLPH Concept

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2 DOCUMENT SCOPE

Providing the technical specifications of the cable cleats that are going to be installed for the HOLLANDSE KUST NOORD WIND PARK Project. The document also references to applied standards and (Employer) requirements.

2.1 REFERENCES

Doc. No.	Description
1724002000-EL-DA-00006	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

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3 KOZ CABLE CLAMP STC 36-52 DATA SHEET (SINGLE)

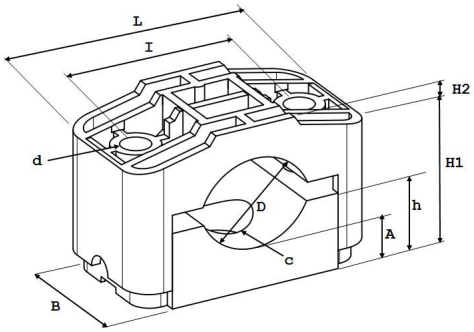
TEL: +31 (0) 113 21 87 62 / INFO@KOZPRODUCTS.COM / WWW.KOZPRODUCTS.COM

SPECIFICATION KOZ CABLE CLAMP STC 36-52

Application:	Suitable for mounting single- and multiple-conductor low- medium- and high voltage cables.
Range:	For cables with a nominal outer diameter of 36 up to 52 mm.
Material:	Black polyamide (PA66), fibreglass-reinforced, virgin material.
Fire resistance:	UL94 V-0 and classification standard EN 45545-2: 2020 – Railway applications. Requirement set R22,R23 / Hazard level HL1,HL2.
Standards:	Certified in accordance with the international standard NEN-EN-IEC 61914:2021.
Temperature:	Permanent application from -80˚C to +120˚C. Short-term heating of up to +220˚C.
Advantages:	Resistant to oils, greases, frost, heat, UV, ozone, salt water, salts, acids and aggressive chemicals. Non-oxidizing, non-corrosive, non-magnetic and non-conductive. Halogen-free and no sharp edges. Lifetime warranty, easy assembly and available worldwide.
Extra possibilities:	The central fastening hole in the bottom part of this STC clamp enables more installation possibilities for e.g. masts, poles, concrete or fitting rails.







Initial torque for fastening fixing material : 5 – 8 Nm.
(depends on cable manufacturer's prescription).

Tests have been performed by KEMA, SGS, KU Leuven, UL and Schneider.

The product listed in this datasheet is produced in conformity with the latest EU Directive 2011/65 / EU (RoHS), and complies with all legal obligations in accordance with REACH.

DIMENSIONS IN MILIMETERS

Type	DØ	L	B	I	dØ	H1	H2	h	A	C	Kracht (N)
KOZ STC 36-52	36-52	107	60	75	12,5	57-72	12	33	18	12,5	45.300

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4 KOZ CABLE CLAMP TRI ECT 47-66 DATA SHEET (TREFOIL)

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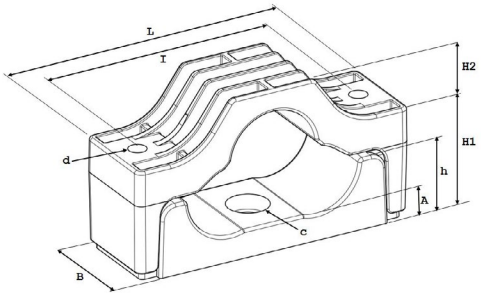
TEL: +31 (0) 113 21 87 62 / INFO@KOZPRODUCTS.COM / WWW.KOZPRODUCTS.COM

SPECIFICATION KOZ CABLE CLAMP TRI ECO 47-66

Application:	Suitable for mounting 3 single- and multiple-conductor low- medium- and high voltage cables.
Range:	For cables with a nominal outer diameter of 47 up to 66 mm.
Material:	Black polyamide (PA66), fibreglass-reinforced, virgin material.
Fire resistance:	UL94 V-0 and classification standard EN 45545-2: 2020 – Railway applications. Requirement set R22,R23 / Hazard level HL1,HL2.
Standards:	Certified in accordance with the international standard NEN-EN-IEC 61914:2021.
Temperature:	Permanent application from -80˚C to +120˚C. Short-term heating of up to +220˚C.
Advantages:	Resistant to oils, greases, frost, heat, UV, ozone, salt water, salts, acids and aggressive chemicals. Non-oxidizing, non-corrosive, non-magnetic and non-conductive. Halogen-free and no sharp edges. Lifetime warranty, easy assembly and available worldwide.
Extra possibilities:	The central fastening hole in the bottom part of this TRI eco clamp enables more installation possibilities for e.g. masts, poles, concrete or fitting rails.







Initial torque for fastening fixing material : 5 – 8 Nm.
(depends on cable manufacturer's prescription).

Tests have been performed by KEMA, SGS, KU Leuven, UL and Schneider.

The product listed in this datasheet is produced in conformity with the latest EU Directive 2011/65 / EU (RoHS), and complies with all legal obligations in accordance with REACH.

DIMENSIONS IN MILIMETERS

Type	DØ	L	B	I	dØ	H1	H2	h	A	C	Strength (N)
KOZ TRI eco 47-66	3x47-66	205	70	170	13	80-120	38	51	19	13	22.300

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5 RSTF FIXING FRAME DRAWING

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RSTF FIXING FRAME (RSTF-F)

STRUCTURE FOR FIXING RSTF CONNECTIONS

KEY FEATURES

- Compatible with RSTF 72,5 kV
- Allows safe fixing of inline connections
- Stepless adjustable fixation
- 13 mm holes available for fixing to rail or structure
- Made in stainless steel, for Offshore application
- Wide range of cable clamps
- Allows quick and easy installation

TE Connectivity's (TE) Raychem RSTF Fixing Frame is designed for fixing a single phase assembly of RSTF (Raychem Screened T-Connectors 72,5kV for Interface F) Base Connector and Coupling connector in multiple angles, providing mechanical stability.

The materials are specially selected for offshore applications. Whether it´s in a straight position, 90° or intermediate angles, the frame can be repositioned according to the application with a stepless adjustable fixation. Embedded wide range cable clamps allows different cable diameters to be connected. Several fixing holes, 13 mm diameter are available for fixing the frame to a rail or structure and be used for grounding.

Designed in order to be used with all common cable constructions: copper wires and metallic laminate, smooth welded aluminium sheath, and others.

The structure is composed by 2 arms articulated in the center, cable clamps in both ends and dead plug bushing. It can be used for emergency and failure fixing. This frame provides grounding points for the whole arrangement.

Customers can count on consistent, high quality products, driven by TE's proven innovation and backed by our extraordinary customer support.

RSTF Fixing Frame (RSTF-F)





MECHANICAL DATA	
Frame weight	Approx. 17 kg
Material	EN 1.4404 / AISI 316L
Total length	1800 mm
Length lower leg	950 mm
Length upper leg	850 mm
Distance between center of bushing and cable clamp	760 mm
Fixing holes	13 mm
Width	142 mm
Thickness of plates	3 mm
Connection angle	90° up to 180°



CABLE OUTER DIAMETER RANGE	REFERENCE FOR ORDERING	PART NUMBER
26 - 38 mm	RSTF-F-Size1	ER2203-000
38 - 50 mm	RSTF-F-Size2	ER2204-000
50 - 75 mm	RSTF-F-Size3	ER2205-000

Kit contains: Metal parts, cable clamps and Dead Plug.
T connectors are not included.

Learn more: TE.com/energy

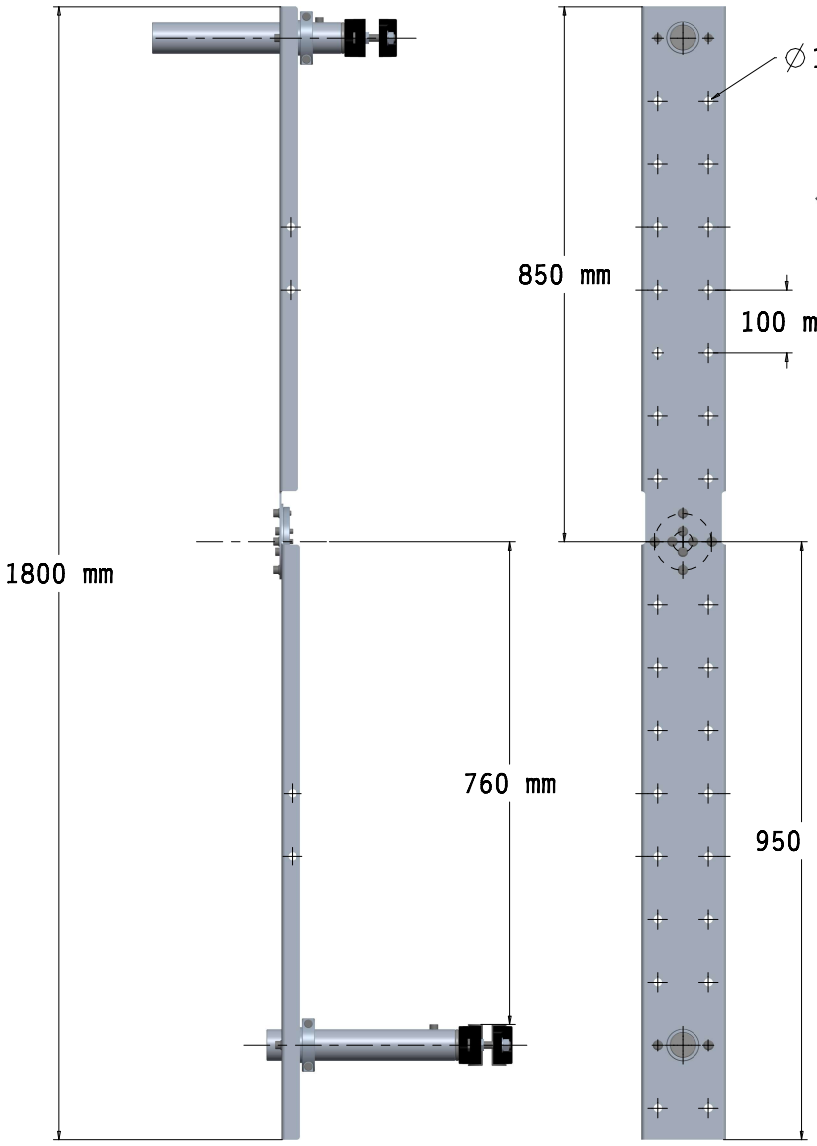
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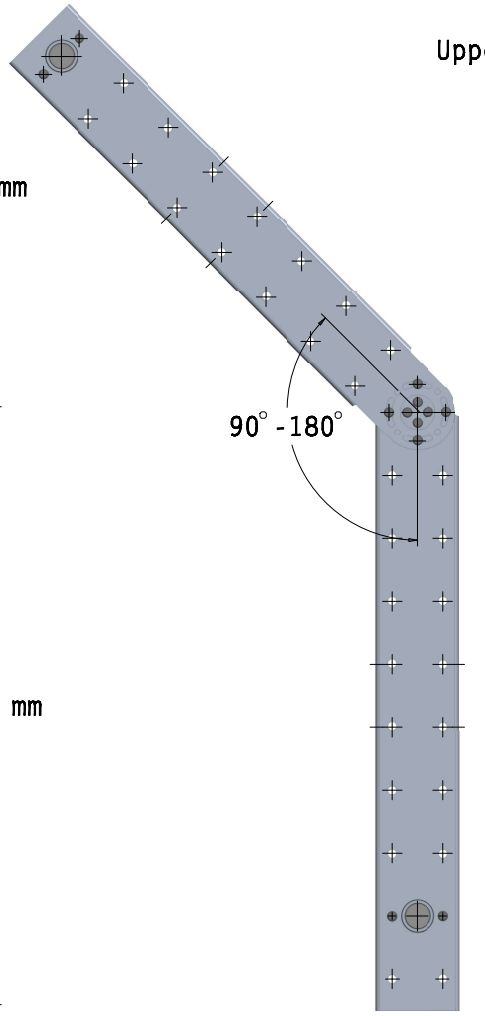
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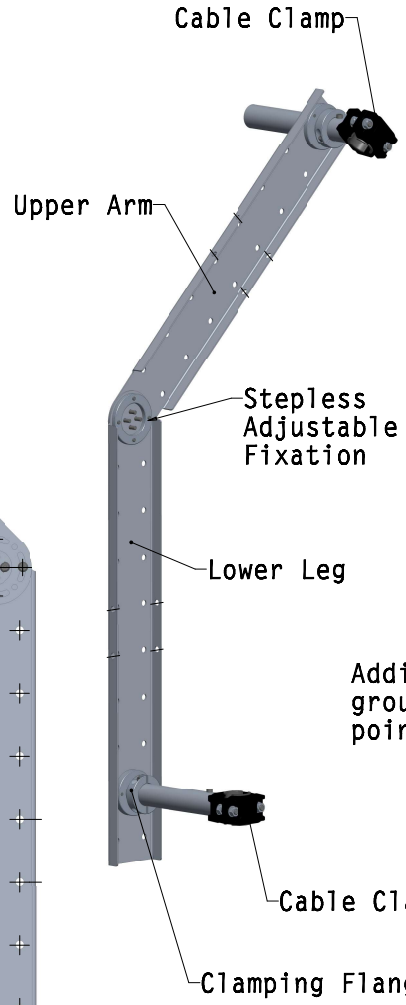
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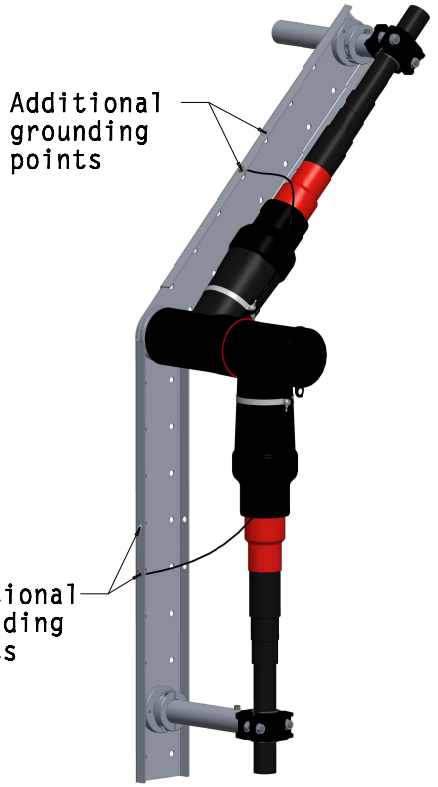
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CABLE OUTER DIAMETER RANGE	REFERENCE FOR ORDERING
26-38 mm	RSTF-F-Size1
38-50 mm	RSTF-F-Size2
50-75 mm	RSTF-F-Size3

RSTF FIXING FRAME STRUCTURE FOR FIXING RSTF CONNECTIONS

RSTF-F
OFFER DRAWING

TE connectivity

Raychem High Voltage Cable Accessories

TE Connectivity drawing no: EPD-204-2338-00

REV. 1

CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	EQUIPMENT MANUFACTURERS RECORD BOOK	Sheet 1 of 217 Date: 26/01/2026 Rev: 00

1724002000-EL-DA-00006
GENERAL ARRANGEMENT AND DIMESIONAL DRAWINGS

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 1 of 31 Date: 17/12/2024 Rev: 01

Base Load Power Hub (BLPH)

GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES

Document Number: 1724002000-EL-DA-00006

ROSETTI MARINO

1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
3	MAJOR COMMENTS – REJECTED – DO NOT PROCEED
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Sign	Date
	17/12/2024

Document Class: Class 2

Rev.	Date	Description	Prepared	Reviewed	Approved
01	17/12/2024	Accepted for Construction (AFC)	T. Papadimitriou	P. Maniatis	G. Keser
00	07/11/2024	Issue for Review (IFR)	T. Papadimitriou	P. Maniatis	G. Keser

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Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 2 of 31 Date: 17/12/2024 Rev: 01

Revision / Change Log

Rev.	Description
01	Accepted for Construction (AFC)
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No.	Description
1	
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Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 3 of 31 Date: 17/12/2024 Rev: 01

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3.7 KOZ CABLE CLAMP TRI ECT 47-66 DATA SHEET (TREFOIL) Drawing 26
3.8 Cable Connectors BLMT-16/95-RS-13 & BLMT-16/95-RS-17 dRAWING (RSTF-72 SC surge arrestor) 28
3.9 Cable Connectors BLMC-150/400-16-1800A dRAWING (RSTF-72b & RSTF 72C) 30

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Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 5 of 31 Date: 17/12/2024 Rev: 01

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

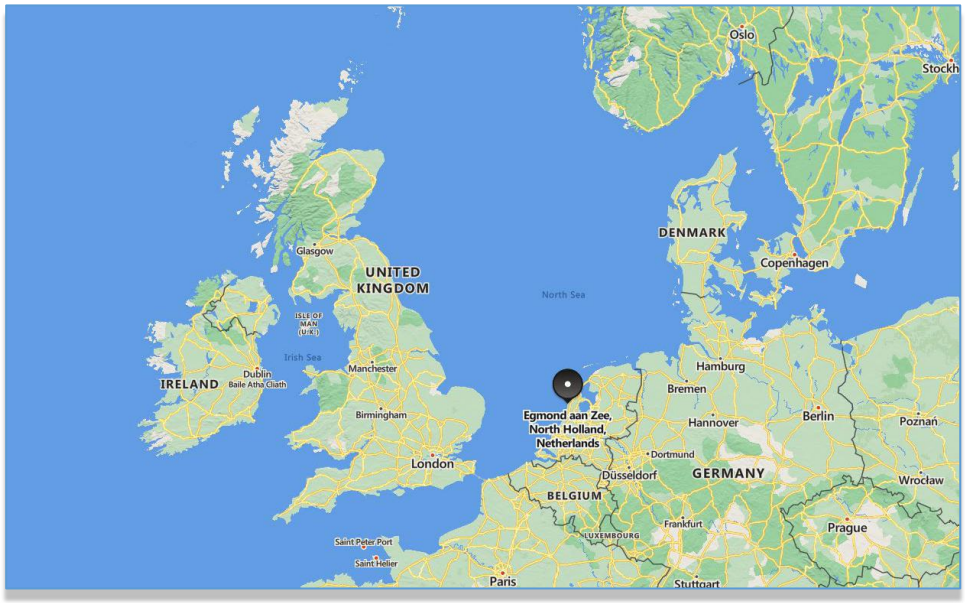


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

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Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 6 of 31 Date: 17/12/2024 Rev: 01



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

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Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 7 of 31 Date: 17/12/2024 Rev: 01

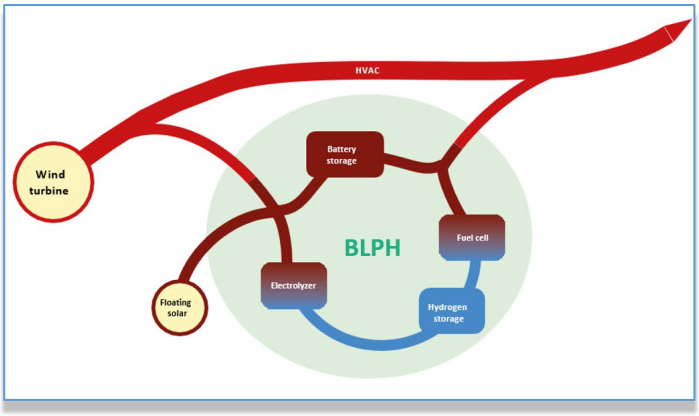


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

Providing the general arrangement and dimensional drawings for the items as shown in table below and are going to be installed for the HOLLANDSE KUST NOORD WIND PARK Project. The document also references to applied standards and (Employer) requirements.

Item	Description
1.	RSTF-72B 95-1200SQMM
2.	RSTF-72C_95-1200SQMM
3.	RSTF-72SC - Surge Arrester – Coupling
4.	RSTF Fixing Frame
5.	HV Cable
6.	KOZ CABLE CLAMP STC 36-52 DATA SHEET (SINGLE)
7.	KOZ CABLE CLAMP TRI ECT 47-66 DATA SHEET (TREFOIL)
8.	Cable Connectors BLMT-16/95-RS-13 & BLMT-16/95-RS-17
9.	Cable Connectors BLMC-150/400-16-1800A

-Table 2-1: HV Cables, T-Connectors, Cleats and Accessories

2.1 REFERENCES

Doc. No.	Description
1724002000-EL-DS-00003	DATA SHEETS - HV CABLE
1724002000-EL-DS-00004	DATA SHEETS - T-CONNECTORS
1724002000-EL-DS-00005	DATA SHEETS - CABLE CLEATS AND ACCESSORIES

Table 2-2 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2-3 - Definitions and Abbreviations

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3 GENERAL ARRANGEMENT

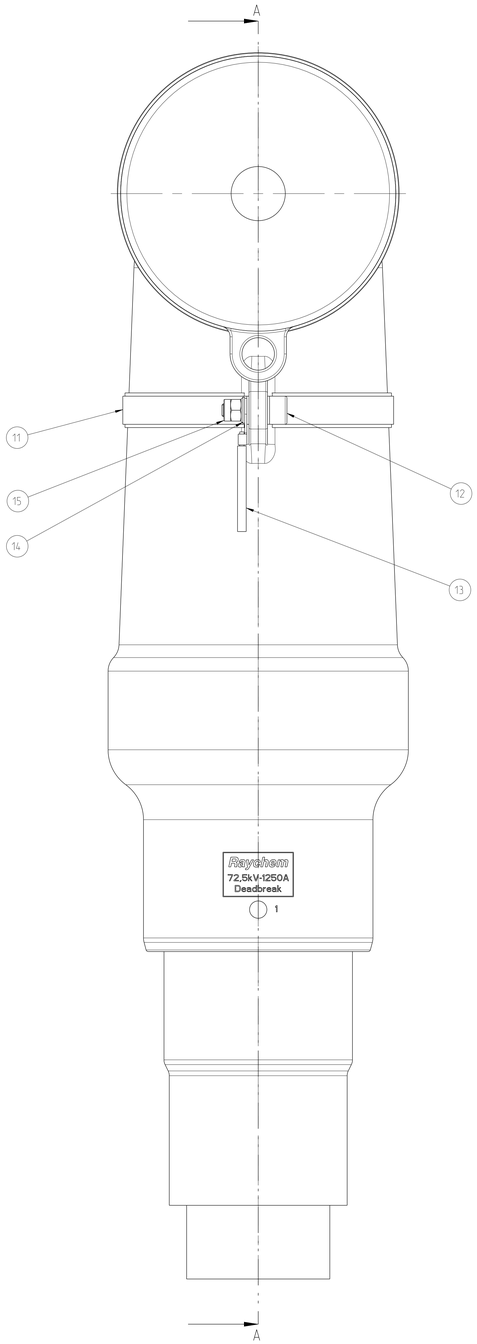
3.1 RSTF-72B 95-1200SQMM DRAWING

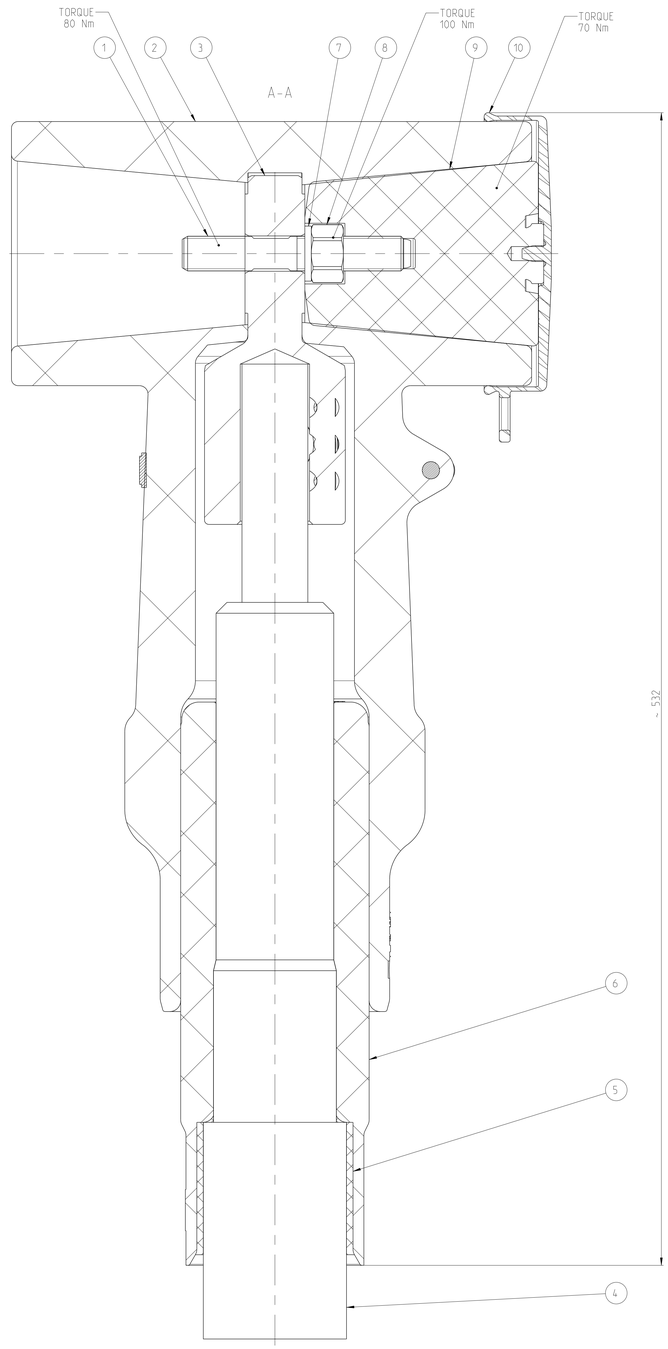
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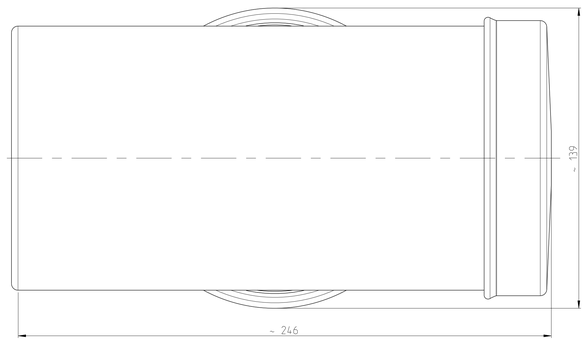
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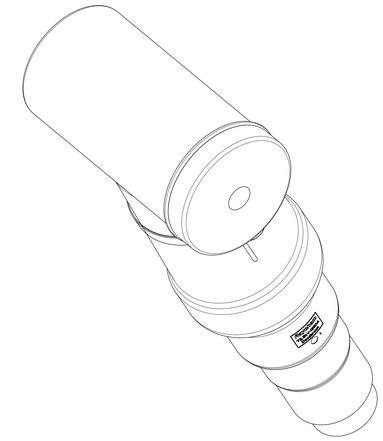
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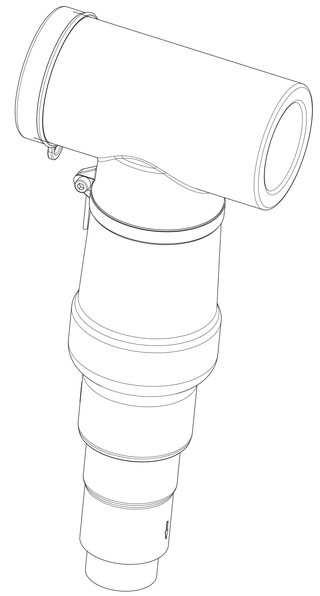


TABLE 01	
CABLE LUG	LUG TYPE CODE
BLMC-95/240-16-1800A	A
BLMC-70-150 FLEX-16-1800A	B
BLMC-150/400-16-1800A	C
BLMC-500/360-16-1800A	D
BLMC-800/1000-16-1800A	E
BLMC-1200-16-1800A	F
SPECIAL CASE	G

TABLE 02	
Ø CORE INSULATION	STRESS CONE Ø CODE
28.6-35.0MM (HVSCA 26)	26
33.0-39.5MM (HVSCA 30)	30
37.4-45.0MM (HVSCA 34)	34
42.9-51.5MM (HVSCA 39)	39
49.5-58.5MM (HVSCA 45)	45
56.1-70.0MM (HVSCA 51)	51

ITEM	QTY	DESCRIPTION
1	1	THREADED PIN M16
2	1	ASSEMBLY MAIN BODY
3	1	CABLE LUG (TABLE 01)
4	1	CABLE 95-1200SQMM
5	1	MASTIC
6	1	STRESS CONE (TABLE 02)
7	1	WEDGE LOCK WASHER M16
8	1	HEXAGON NUT ISO 4032 M16 A4-70
9	1	BACK PLUG 72KV
10	1	CONDUCTIVE CAP
11	1	EARTHING CLAMP
12	1	CLAMPING SCREW 8 / M6
13	1	GROUND LEAD TINNED
14	1	Washer ISO 7090 - 6 - A4
15	1	SELF-LOCKING HEXAGON-HEAD NUT ISO 7040 - M6 - A4

THIS DRAWING IS A CONTROLLED DOCUMENT.

DIMENSIONS: mm

TOLERANCES UNLESS OTHERWISE SPECIFIED
0 PLC ±
1 PLC ±
2 PLC ±.
3 PLC ±.
4 PLC ±.
ANGLES ±

MATERIAL – – –
FINISH – – –

DWN INDRAJITH 25JUN2024
CHK SABER 25JUN2024
APVD ANDREAS 25JUN2024
PRODUCT SPEC –
APPLICATION SPEC –
WEIGHT –

TE Connectivity

NAME RSTF-72B 95-1200SQMM
–

SIZE A0 | CAGE CODE 00779 | DRAWING NO C-EPD-204-2639-00 | RESTRICTED TO –
CUSTOMER DRAWING | SCALE 1:1 | SHEET 1 OF 1 | REV 1

4806 (3/13)

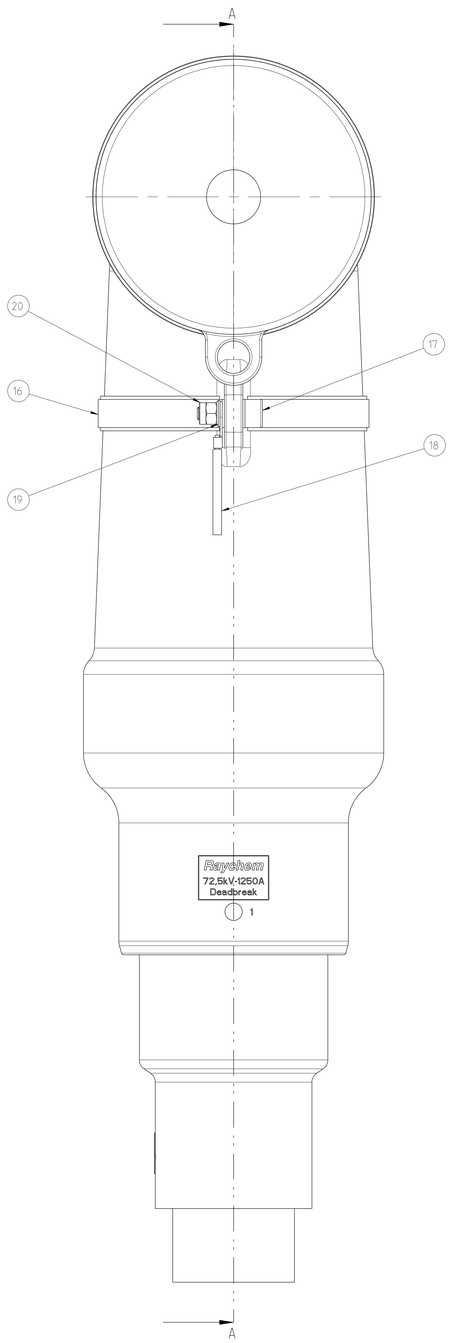
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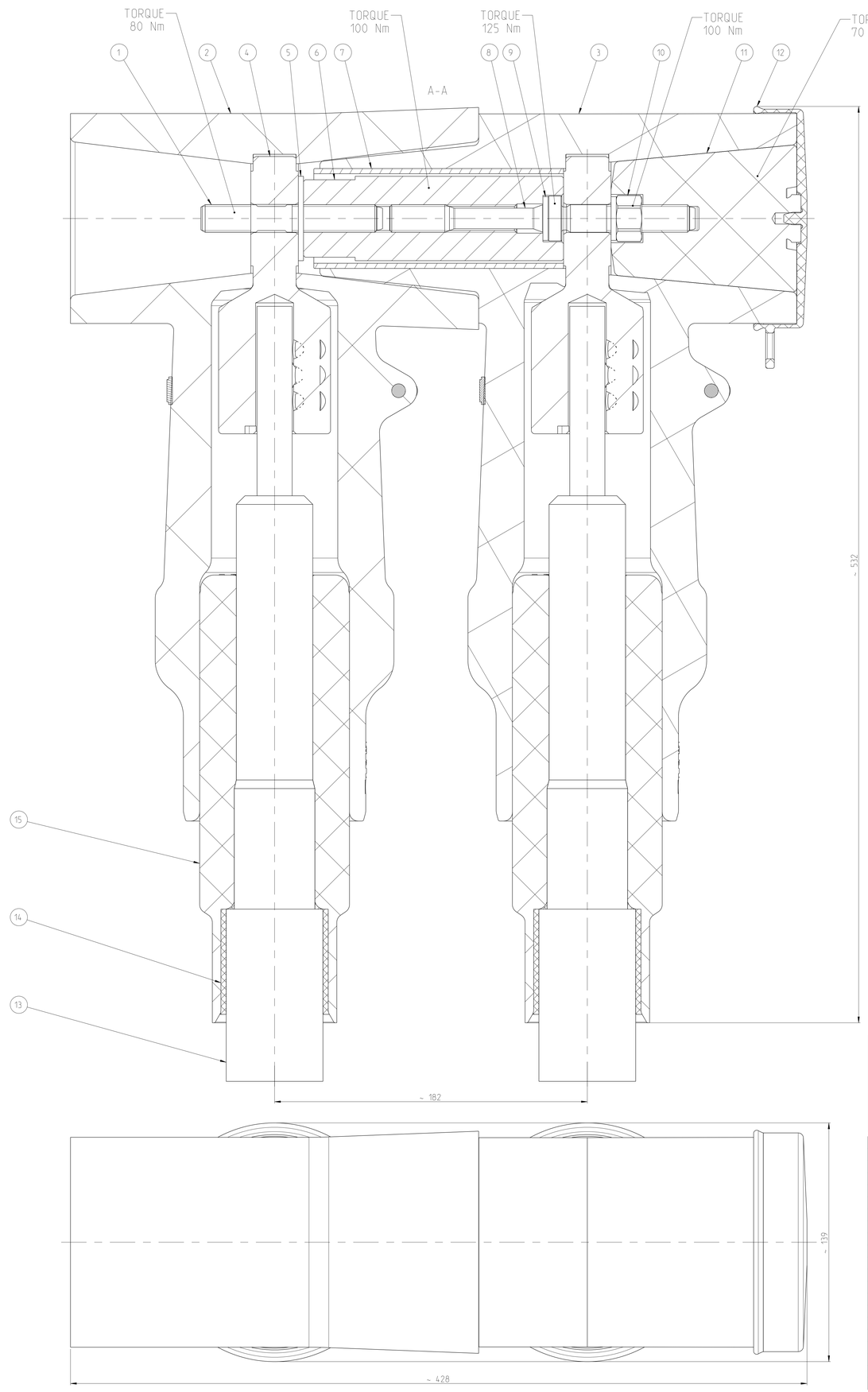
3.2 RSTF-72C_95-1200SQMM DRAWING

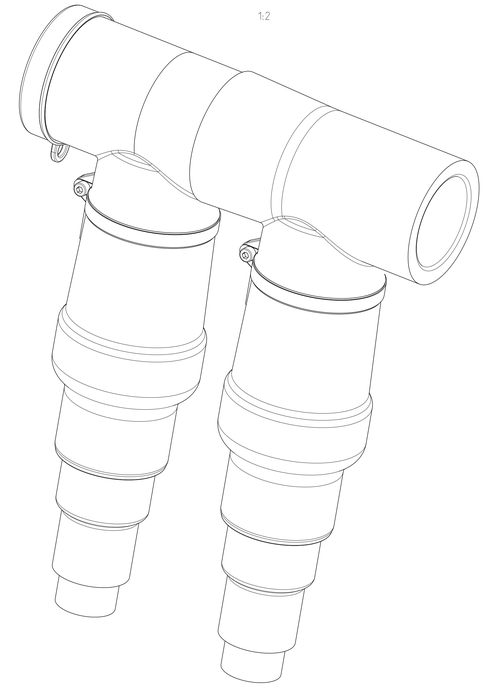
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REVISIONS

P	LTR	DESCRIPTION	DATE	DWN	APVD
	1	INTIAL RELEASE	25JUN2024	MI	SA







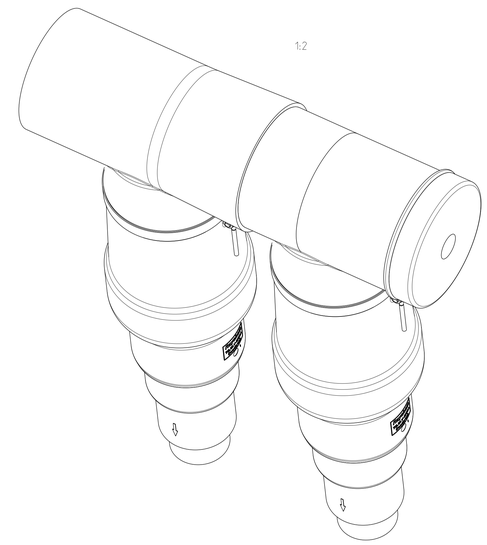


TABLE 01	
CABLE LUG	LUG TYPE CODE
BLMC-95/240-16-1800A	A
BLMC-70-150 FLEX-16-1800A	B
BLMC-150/400-16-1800A	C
BLMC-500/360-16-1800A	D
BLMC-800/1000-16-1800A	E
BLMC-1200-16-1800A	F
SPECIAL CASE	G

TABLE 02	
Ø CORE INSULATION	STRESS CONE Ø CODE
28.6-35.0MM (HVSCA 26)	26
33.0-39.5MM (HVSCA 30)	30
37.4-45.0MM (HVSCA 34)	34
42.9-51.5MM (HVSCA 39)	39
49.5-58.5MM (HVSCA 45)	45
56.1-70.0MM (HVSCA 51)	51

ITEM	QTY	DESCRIPTION
1	1	THREADED PIN M16
2	1	ASSEMBLY MAIN BODY
3	1	ASSEMBLY COUPLING CONNECTOR
4	2	CABLE LUG (TABLE 01)
5	1	COUPLING WASHER
6	1	COUPLING ROD
7	1	METAL TUBE
8	1	CLAMPING BOLT M16
9	2	WEDGE LOCK WASHER M16
10	1	HEXAGON NUT ISO 4032 M16 A4-70
11	1	BACK PLUG 72KV
12	1	CONDUCTIVE CAP
13	2	CABLE 95-1200SQMM
14	2	MASTIC
15	2	STRESS CONE (TABLE 02)
16	2	EARTHING CLAMP
17	2	CLAMPING SCREW 8 / M6
18	2	GROUND LEAD TINNED
19	2	Washer ISO 7090 - 6 - A4
20	2	SELF-LOCKING HEXAGON-HEAD NUT ISO 7040 - M6 - A4

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DIMENSIONS: mm
TOLERANCES UNLESS OTHERWISE SPECIFIED:
0 PLC ±
1 PLC ±.
2 PLC ±.0
3 PLC ±.00
4 PLC ±.000
ANGLES ±
FINISH –
MATERIAL – –

DWN: VINDRAJITH 25JUN2024
CHK: SABER 25JUN2024
APVD: ANDREAS 25JUN2024
PRODUCT SPEC –
APPLICATION SPEC –
WEIGHT –

TE Connectivity

NAME: RSTF-72C 95-1200SQMM –

SIZE A0 | CAGE CODE 00779 | DRAWING NO C-EPD-204-2640-00 | RESTRICTED TO –

CUSTOMER DRAWING | SCALE 1:1 | SHEET 1 OF 1 | REV 1

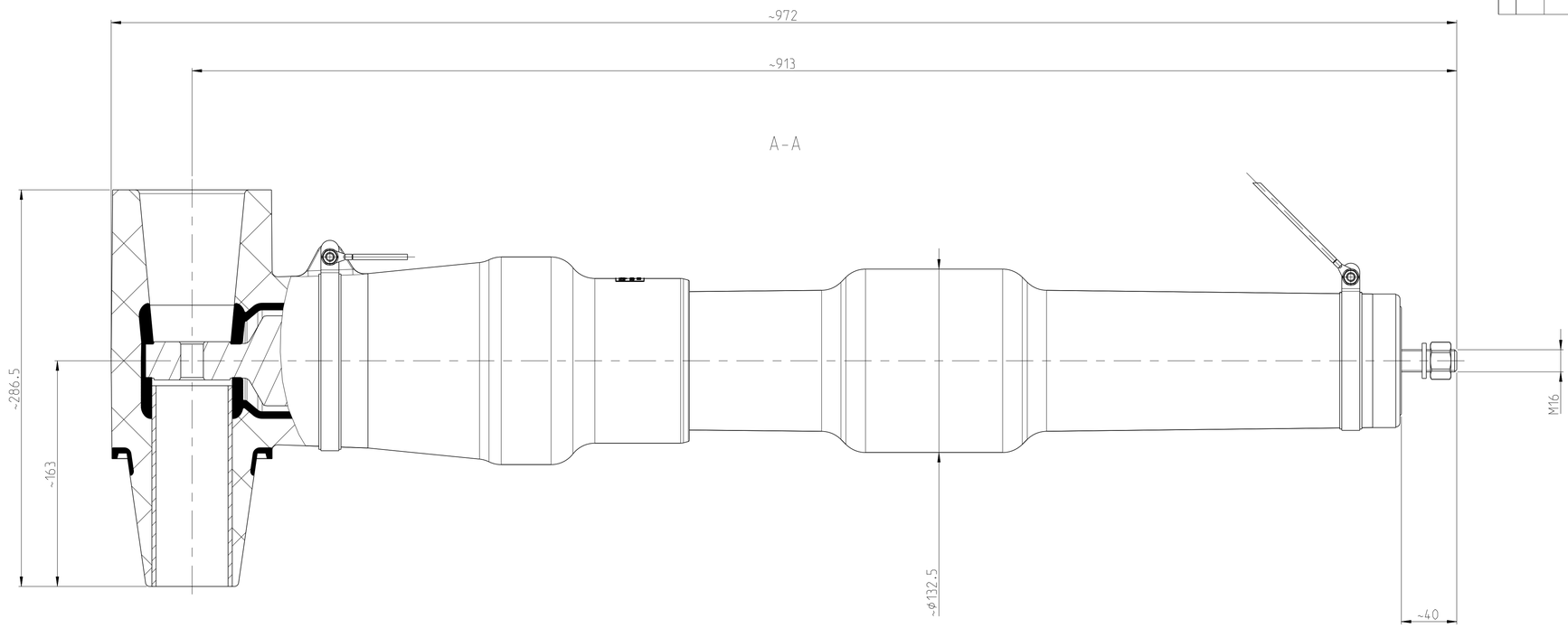
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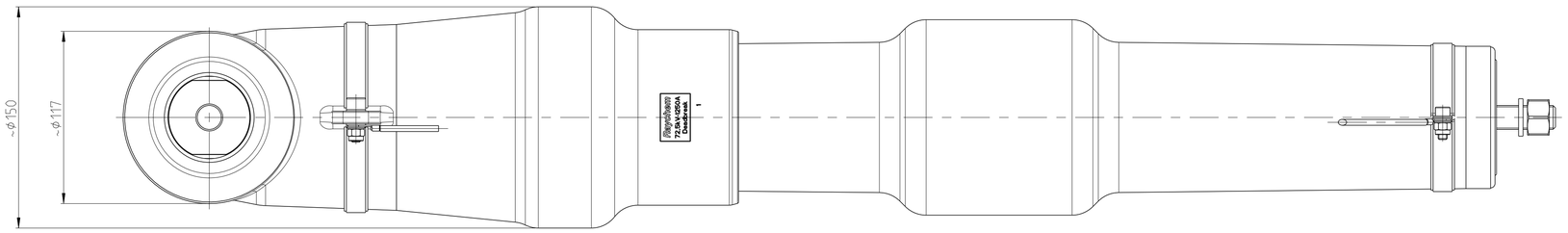
4806 (3/13)

3.3 RSTF-72SC - SURGE ARRESTER – COUPLING DRAWING

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REVISIONS					
P	LTR	DESCRIPTION	DATE	DWN	APVD
	A	INITIAL RELEASE	22JUL2021	BJ	ALE





THIS DRAWING IS A CONTROLLED DOCUMENT.		DWN B. Joel 22JUL2021	TE Connectivity
		CHK T. Friedrich 23JUL2021	
DIMENSIONS: mm	TOLERANCES UNLESS OTHERWISE SPECIFIED: 0 PLC ± 1 PLC ± 2 PLC ± 3 PLC ± 4 PLC ± ANGLES ±	APVD A. Figner 23JUL2021	NAME RSTF-72CC-SA-EL RSTF
		PRODUCT SPEC –	
		APPLICATION SPEC –	SIZE A1 | CAGE CODE 00779 | DRAWING NO C-2333764 | RESTRICTED TO –
MATERIAL – –	FINISH – –	WEIGHT –	SCALE 1:2 | SHEET 1 OF 1 | REV A
		CUSTOMER DRAWING	

3.4 RSTF FIXING FRAME DRAWING

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RSTF FIXING FRAME (RSTF-F)

STRUCTURE FOR FIXING RSTF CONNECTIONS

KEY FEATURES

- Compatible with RSTF 72,5 kV
- Allows safe fixing of inline connections
- Stepless adjustable fixation
- 13 mm holes available for fixing to rail or structure
- Made in stainless steel, for Offshore application
- Wide range of cable clamps
- Allows quick and easy installation

TE Connectivity's (TE) Raychem RSTF Fixing Frame is designed for fixing a single phase assembly of RSTF (Raychem Screened T-Connectors 72,5kV for Interface F) Base Connector and Coupling connector in multiple angles, providing mechanical stability.

The materials are specially selected for offshore applications. Whether it´s in a straight position, 90° or intermediate angles, the frame can be repositioned according to the application with a stepless adjustable fixation. Embedded wide range cable clamps allows different cable diameters to be connected. Several fixing holes, 13 mm diameter are available for fixing the frame to a rail or structure and be used for grounding.

Designed in order to be used with all common cable constructions: copper wires and metallic laminate, smooth welded aluminium sheath, and others.

The structure is composed by 2 arms articulated in the center, cable clamps in both ends and dead plug bushing. It can be used for emergency and failure fixing. This frame provides grounding points for the whole arrangement.

Customers can count on consistent, high quality products, driven by TE's proven innovation and backed by our extraordinary customer support.

RSTF Fixing Frame (RSTF-F)





MECHANICAL DATA	
Frame weight	Approx. 17 kg
Material	EN 1.4404 / AISI 316L
Total length	1800 mm
Length lower leg	950 mm
Length upper leg	850 mm
Distance between center of bushing and cable clamp	760 mm
Fixing holes	13 mm
Width	142 mm
Thickness of plates	3 mm
Connection angle	90° up to 180°



CABLE OUTER DIAMETER RANGE	REFERENCE FOR ORDERING	PART NUMBER
26 - 38 mm	RSTF-F-Size1	ER2203-000
38 - 50 mm	RSTF-F-Size2	ER2204-000
50 - 75 mm	RSTF-F-Size3	ER2205-000

Kit contains: Metal parts, cable clamps and Dead Plug.
T connectors are not included.

Learn more: TE.com/energy

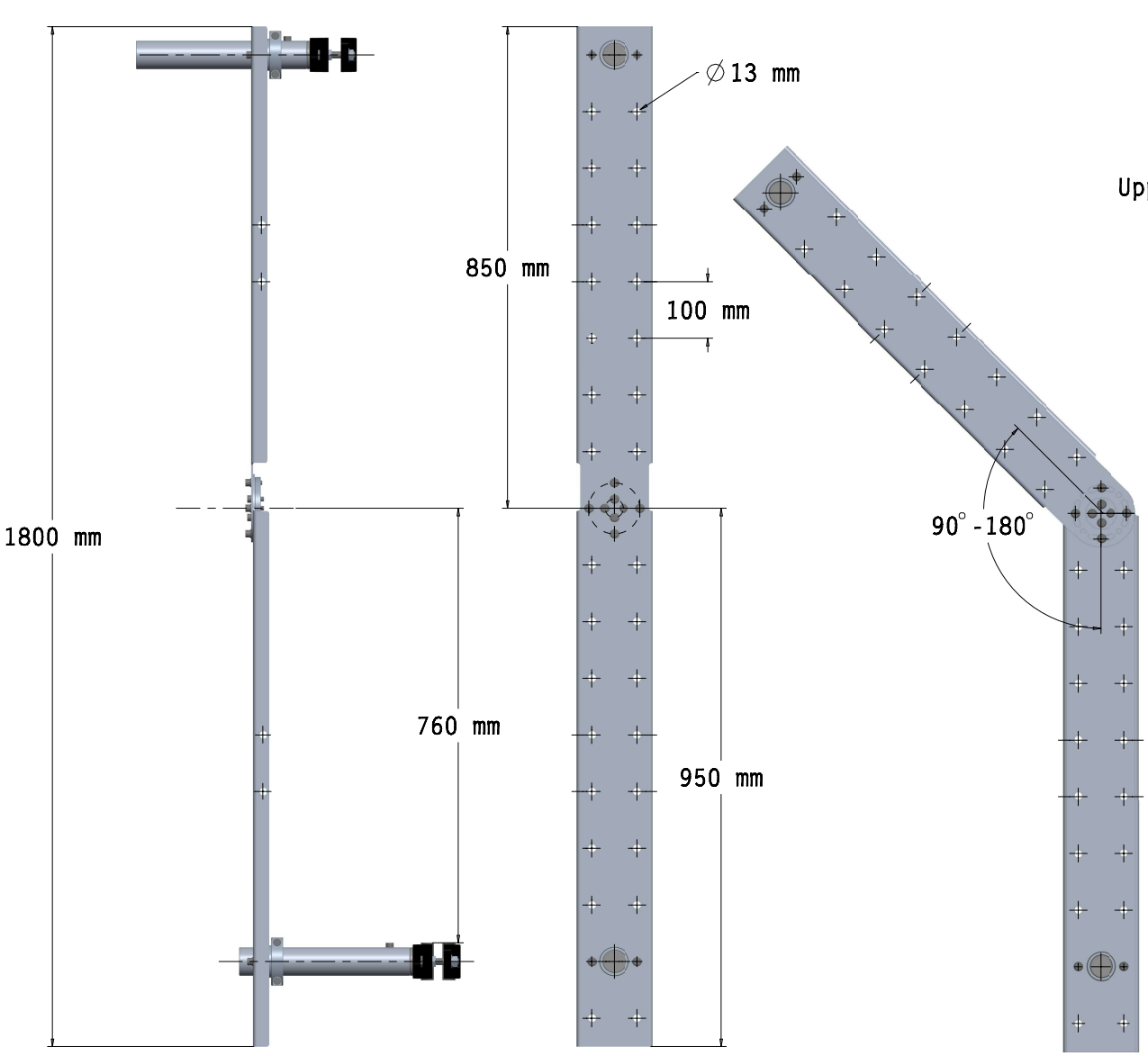
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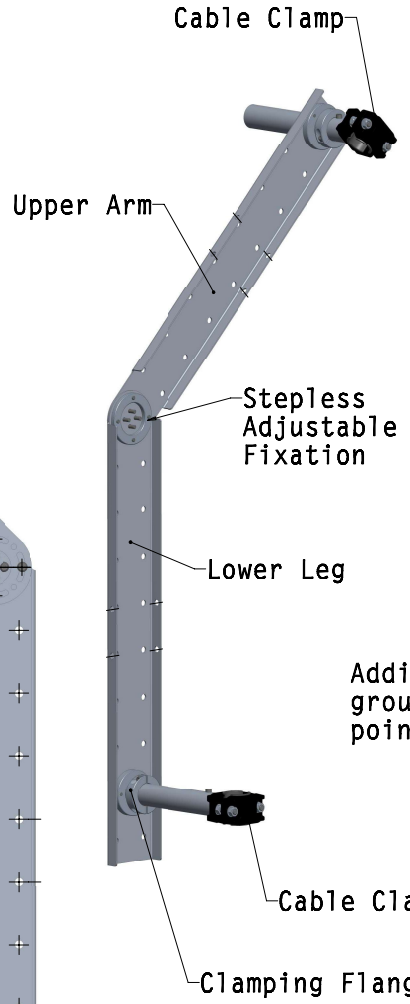
TE.com/energy-contact

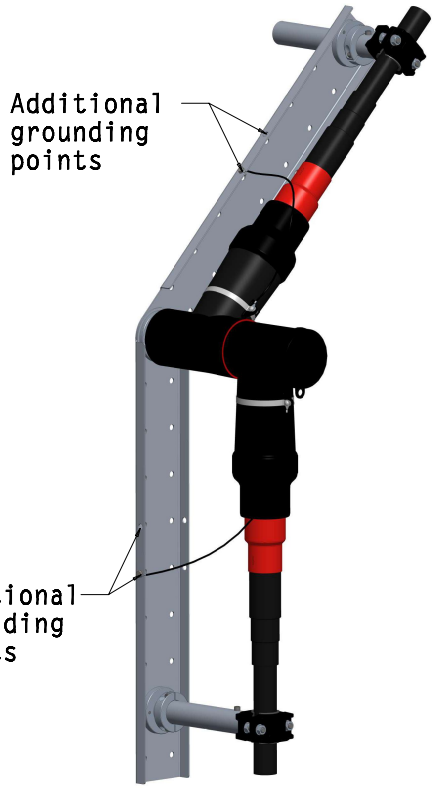
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CABLE OUTER DIAMETER RANGE	REFERENCE FOR ORDERING
26-38 mm	RSTF-F-Size1
38-50 mm	RSTF-F-Size2
50-75 mm	RSTF-F-Size3

RSTF FIXING FRAME STRUCTURE FOR FIXING RSTF CONNECTIONS

RSTF-F
OFFER DRAWING

TE connectivity

Raychem High Voltage Cable Accessories

TE Connectivity drawing no: EPD-204-2338-00

REV. 1

3.5 HV CABLE DRAWING

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Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Description

1 x 240 / 50



* This image may differ from the actual product.

Trading information

Product group	Power cable >= 1 kV, for permanent installation
Type	Cu/XLPE/CWS/LAT/LSZH 36/66 kV
Net. Weight	4.11 kg/m
Sheath marking	{Length} TKF - Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240/50 IEC 60840 - {Year} {Batch}

Trade lengths

		Minimal order
	(58239 / 8713182481131)	1 MTR

Construction characteristics

Standardization	IEC 60840
Number of cores	1
Nominal cross section conductor	240 mm²
Conductor material	Copper
Conductor surface	Bare

Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Construction characteristics

Standardization conductor material	IEC 60228
Shape of conductor	Round
Conductor category	Class 2c = stranded & compacted
Conductor shield	Semiconductive Compound
Material core insulation	XLPE++
Insulation shield	Semiconductive compound with semiconductive swellable tape
Earthscreen construction	Copper round wire + copper tape counter spiral
Nominal earthscreen cross section	50 mm²
Material outer sheath	LSZH
Colour outer sheath	Black
Diameter conductor	18.6 mm
Insulation thickness	9.5 mm
Diameter over insulation	39.2 mm
Aluminium sheath thickness	0.2 mm
Diameter shield wires	1.15 mm
Diameter over shield	41.7 mm
Outer sheath thickness	2.5 mm
Outer diameter approx.	48.1 mm

Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Properties

Flame retardant	IEC 60332-3-24 Cat. C
Halogen free	IEC 60754-1 / IEC 60754-2
Low smoke	IEC 61034-1 & IEC 61034-2
Longitudinal water blocking	Yes
Radial water blocking	Yes
Radial watertight construction	Al/PE
UV resistant	Yes
UV protection	NEN EN 50289-4-17A

Technical characteristics

Min. bending radius during installation	870 mm
Min. bending radius after installation	755 mm
Tensile force with pullinghead	12,000 N
Tensile force with pullingsleeve	4,620 N
Max. conductor temperature	90 °C
Max. operating temperature	70 °C
Minimum installation temperature	-10 °C

Electrical characteristics

Nominal voltage U0	36 kV
Nominal voltage U	60 kV
Nominal voltage Umax	72.5 kV
Conductor DC resistance @ 20°C	0.0754 Ohm/km
Conductor AC resistance @ max. cont. Conductor temp.	0.0973 Ohm/km
Shield DC resistance	0.387 Ohm/km

Power cable >= 1 kV, for permanent installation

Cu/XLPE/CWS/LAT/LSZH 36/66 kV

Article number: 58239 03-07-2024

Electrical characteristics

Mutual capacitance (Nominal)	0.21 µF/km
Max. thermal short-circuit current conductor 0,5 sec	48.5 kA
Max. thermal short-circuit current conductor 1 sec	34.3 kA
Max. short-circuit temperature conductor	250 °C
Max. thermal short-circuit current shield 0,5 sec	10.51 kA
Max. thermal short-circuit current shield 1 sec	7.43 kA
Max. short-circuit temperature shield	250 °C
E-Max fieldstrength	5.38 kV/mm
E-Min fieldstrength	2.77 kV/mm
Charging current per core	2.373 A/km
Frequency	50 Hz
Operating reactance trefoil arrangement	0.12 Ohm/km
Operating reactance flat arrangement	0.18 Ohm/km
*) Theoretical calculated values	Depends on application
Maximum current buried trefoil arrangement	455 A
Maximum current buried flat arrangement	455 A
Maximum current in air trefoil arrangement	630 A
Maximum current in air flat arrangement	730 A
Homopolar resistance Ro (trefoil) *)	2.1899 Ohm/km
Homopolar resistance Ro (flat) *)	2.1894 Ohm/km
Homopolar reactance Xo (trefoil) *)	0.3877 Ohm/km
Homopolar reactance Xo (flat) *)	0.6233 Ohm/km
Homopolar impedance Zo (trefoil) *)	2.2239 Ohm/km
Homopolar impedance Zo (flat) *)	2.2764 Ohm/km

3.6 KOZ CABLE CLAMP STC 36-52 DATA SHEET (SINGLE) DRAWING

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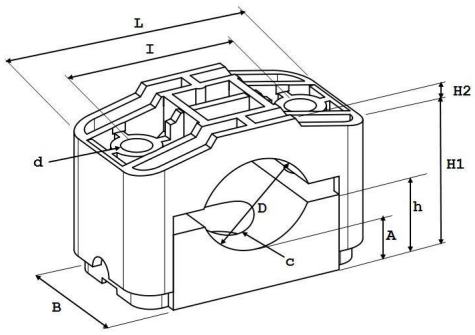
TEL: +31 (0) 113 21 87 62 / INFO@KOZPRODUCTS.COM / WWW.KOZPRODUCTS.COM

SPECIFICATION KOZ CABLE CLAMP STC 36-52

Application:	Suitable for mounting single- and multiple-conductor low- medium- and high voltage cables.
Range:	For cables with a nominal outer diameter of 36 up to 52 mm.
Material:	Black polyamide (PA66), fibreglass-reinforced, virgin material.
Fire resistance:	UL94 V-0 and classification standard EN 45545-2: 2020 – Railway applications. Requirement set R22,R23 / Hazard level HL1,HL2.
Standards:	Certified in accordance with the international standard NEN-EN-IEC 61914:2021.
Temperature:	Permanent application from -80˚C to +120˚C. Short-term heating of up to +220˚C.
Advantages:	Resistant to oils, greases, frost, heat, UV, ozone, salt water, salts, acids and aggressive chemicals. Non-oxidizing, non-corrosive, non-magnetic and non-conductive. Halogen-free and no sharp edges. Lifetime warranty, easy assembly and available worldwide.
Extra possibilities:	The central fastening hole in the bottom part of this STC clamp enables more installation possibilities for e.g. masts, poles, concrete or fitting rails.







Initial torque for fastening fixing material : 5 – 8 Nm.
(depends on cable manufacturer's prescription).

Tests have been performed by KEMA, SGS, KU Leuven, UL and Schneider.

The product listed in this datasheet is produced in conformity with the latest EU Directive 2011/65 / EU (RoHS), and complies with all legal obligations in accordance with REACH.

DIMENSIONS IN MILIMETERS

Type	DØ	L	B	I	dØ	H1	H2	h	A	C	Kracht (N)
KOZ STC 36-52	36-52	107	60	75	12,5	57-72	12	33	18	12,5	45.300

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3.7 KOZ CABLE CLAMP TRI ECT 47-66 DATA SHEET (TREFOIL) DRAWING

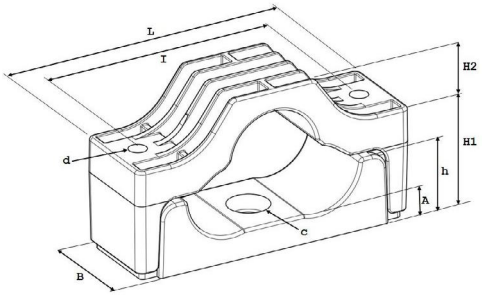
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SPECIFICATION KOZ CABLE CLAMP TRI ECO 47-66

Application:	Suitable for mounting 3 single- and multiple-conductor low- medium- and high voltage cables.
Range:	For cables with a nominal outer diameter of 47 up to 66 mm.
Material:	Black polyamide (PA66), fibreglass-reinforced, virgin material.
Fire resistance:	UL94 V-0 and classification standard EN 45545-2: 2020 – Railway applications. Requirement set R22,R23 / Hazard level HL1,HL2.
Standards:	Certified in accordance with the international standard NEN-EN-IEC 61914:2021.
Temperature:	Permanent application from -80˚C to +120˚C. Short-term heating of up to +220˚C.
Advantages:	Resistant to oils, greases, frost, heat, UV, ozone, salt water, salts, acids and aggressive chemicals. Non-oxidizing, non-corrosive, non-magnetic and non-conductive. Halogen-free and no sharp edges. Lifetime warranty, easy assembly and available worldwide.
Extra possibilities:	The central fastening hole in the bottom part of this TRI eco clamp enables more installation possibilities for e.g. masts, poles, concrete or fitting rails.







Initial torque for fastening fixing material : 5 – 8 Nm.
(depends on cable manufacturer's prescription).

Tests have been performed by KEMA, SGS, KU Leuven, UL and Schneider.

The product listed in this datasheet is produced in conformity with the latest EU Directive 2011/65 / EU (RoHS), and complies with all legal obligations in accordance with REACH.

DIMENSIONS IN MILIMETERS

Type	DØ	L	B	I	dØ	H1	H2	h	A	C	Strength (N)
KOZ TRI eco 47-66	3x47-66	205	70	170	13	80-120	38	51	19	13	22.300

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Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 28 of 31 Date: 17/12/2024 Rev: 01

3.8 CABLE CONNECTORS BLMT-16/95-RS-13 & BLMT-16/95-RS-17 DRAWING (RSTF-72 SC SURGE ARRESTOR)

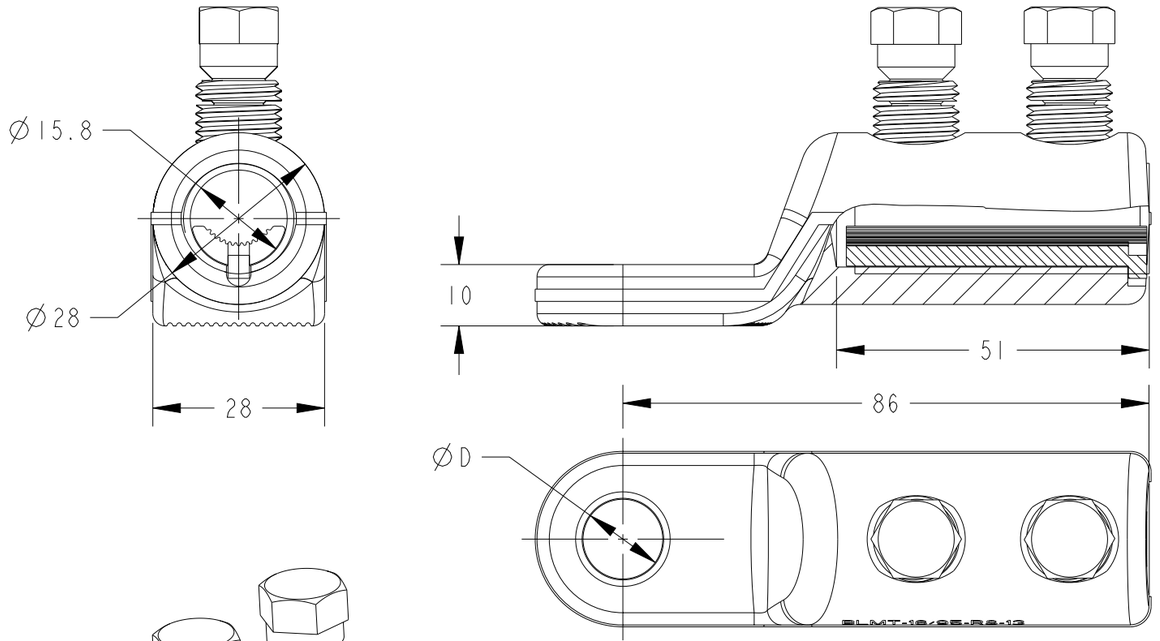
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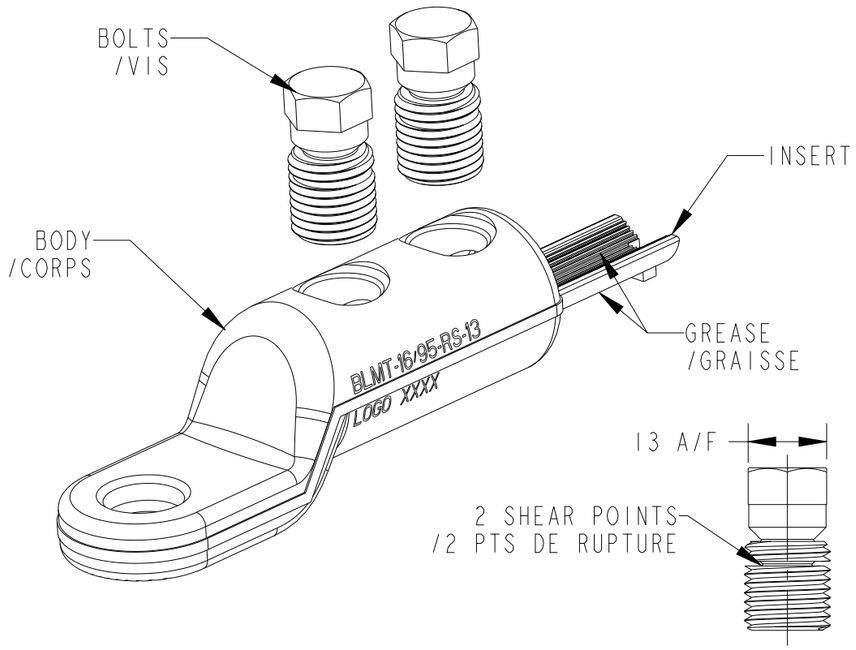
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BLMT-16/95-RS-17	2002443-2	17
BLMT-16/95-RS-13	2002443-1	13
DESCRIPTION	PART NUMBER	ØD

REVISIONS

P	LTR REV	DESCRIPTION MODIFICATIONS	DATE	DWN DESS.	APVD APP.
	A	CREATION	02MAR2007	RB	NA
	B	UPDATE NUMBER OF BOLTS	26NOV2007	BM	NA
	D	ECR-18-009281	15JUN2018	JB	NA
	E	REDUCE HEX HEAD DOWN TO 13	28JUN2024	BM	NA





	AL				CU	
	ROUND STRANDED /Rond câblé /RM	ROUND SOLID /Rond solide /RE	SECTOR STRANDED /Sectoral câblé /SM	SECTOR SOLID /Sectoral câblé /SE	ROUND STRANDED /Rond câblé /RM	SECTOR STRANDED /Sectoral câblé /SM
CONDUCTOR CROSS-SECTION /Section conducteur /Querschnittsbereich mm^2	25-95	-	25-95	-	16-95	16-95
CONDUCTOR DIAMETER /Diamètre conducteur /Leiterdurchmesser mm	Ø5.6-Ø12.9	-	-	-	Ø4.6-Ø12.9	-

TOLERANCES UNLESS OTHERWISE SPECIFIED -
TOLERANCES NON SPECIFIEES: -

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DIMENSIONS: mm

TOLERANCES UNLESS OTHERWISE SPECIFIED: TOLERANCES NON SPECIFIEES (SUIV NB DE DECIMALES):
0 PLC/DEC: ±0
1 PLC/DEC: ±0
2 PLC/DEC: ±0
3 PLC/DEC: ±0
4 PLC/DEC: ±0
ANGLES ±-

MATERIAL / MATIERE: AL ALLOY -

FINISH / FINITION: TINNED -

DWN/DESSINE: 02MAR2007 R.BUTHIOT
CHK/VERIFIE: - B.MILLOT
APVD/APPROUVE: - N.ALMEIDA
PRODUCT SPEC / SPEC. PRODUIT: -
APPLICATION SPEC / SPEC. APPLICATION: IEC 61238-1
WEIGHT / MASSE APPROX.: 121g

TE Connectivity

NAME / TITRE: BLMT-16/95-RS-13 BLMT-16/95-RS-17 -

SIZE FORMAT	CAGE CODE	DRAWING NO / No PLAN	RESTRICTED TO RESERVE A
A3	-	C-2002443	

CUSTOMER DRAWING /PLAN CLIENT UNIQUEMENT POUR REFERENCE | SCALE / ECHELLE 1:1 | SHEET / FEUILLE 1 OF / DE 1 | REV E

CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES	Sheet 30 of 31 Date: 17/12/2024 Rev: 01

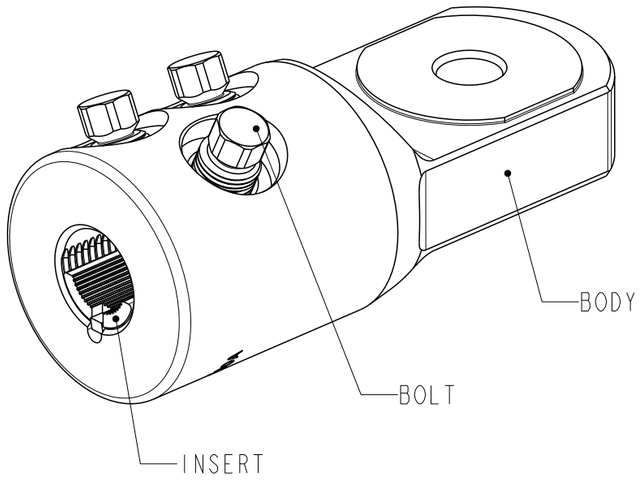
3.9 CABLE CONNECTORS BLMC-150/400-16-1800A DRAWING (RSTF-72B & RSTF 72C)

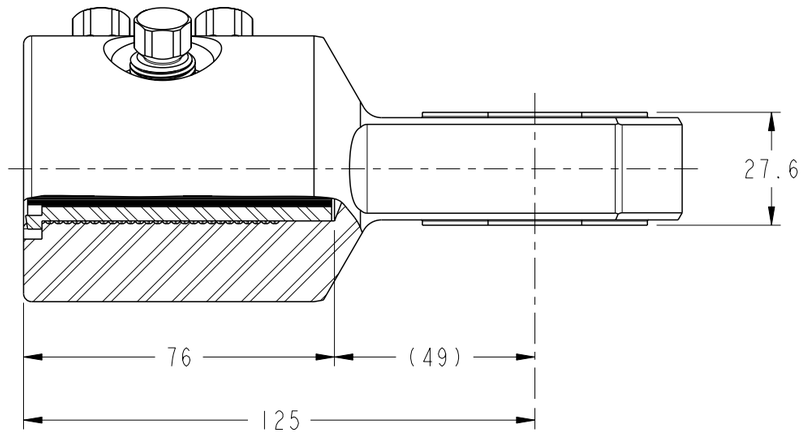
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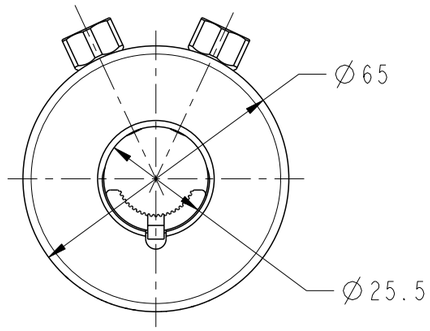
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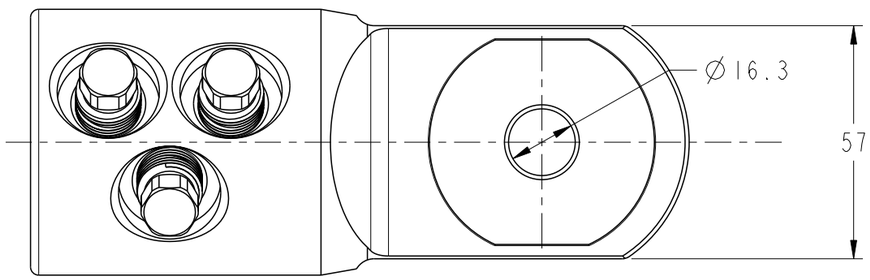
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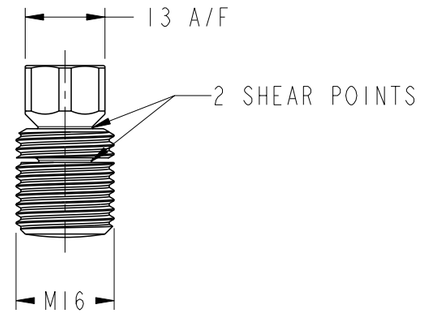






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	ROUND STRANDED /Circ. cablé /RM	ROUND STRANDED /Circ. cablé /RM	ROUND FLEXIBLE /Circ. flex /RF
CONDUCTOR CROSS-SECTION /Section conducteur /Querschnittsbereich mm^2	150 - 400	150 - 400	240 - 300
CONDUCTOR DIAMETER /Diamètre conducteur /Leiterdurchmesser mm	Ø13.7 - Ø24.6	Ø13.7 - Ø24.6	Ø21-Ø24

BLMC-150/400-16-1800A	2832328
DESCRIPTION	PART NUMBER

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1724002000-EL-MAN-00007
INSTALLATION AND OPERATIONAL MANUAL PULLING

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Document Title:	INSTALLATION AND OPERATIONAL MANUAL PULLING	Sheet 1 of 106 Date: 09/10/2025 Rev: 01

Base Load Power Hub (BLPH)

HV CABLE AND ACCESSORIES
INSTALLATION AND OPERATIONAL MANUAL PULLING
Document Number: 1724002000-EL-MAN-00007
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1	NO COMMENTS - APPROVED - WORK MAY PROCEED
2	MINOR COMMENTS - REVISE AND RESUBMIT - WORK MAY PROCEED
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Sign	Date
Andrea Papadimitriou	10/10/2025

01	09/10/2025	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
00	22/01/2025	Issue for Information (IFI)	T. Papadimitriou	P. Maniatis	G. Keser
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Revision / Change Log

Rev.	Description
00	Issue for Information (IFI)
01	Issue for Information (IFI)

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

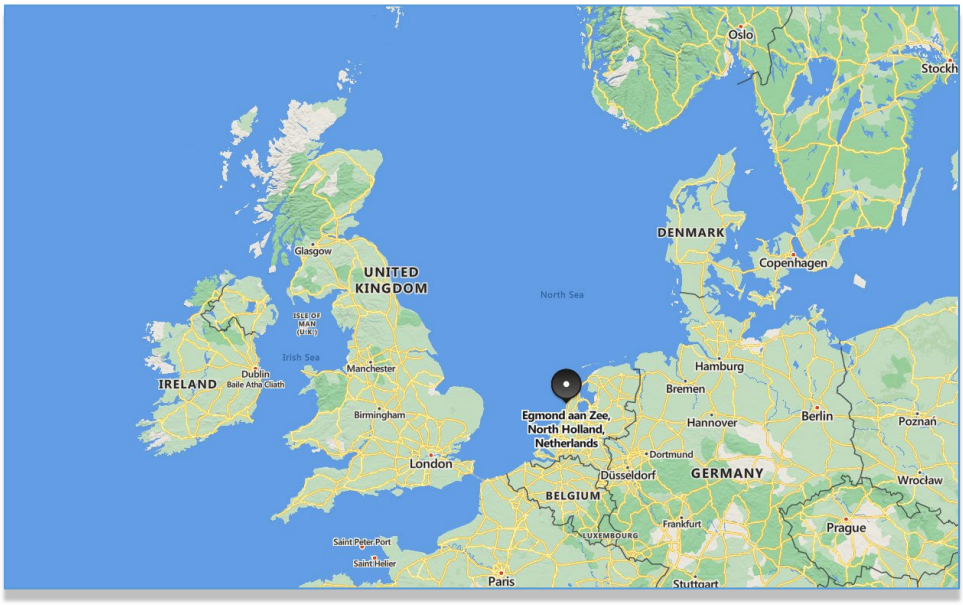


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

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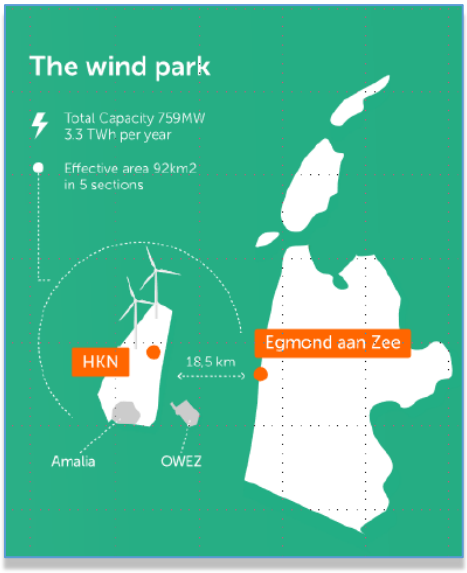


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

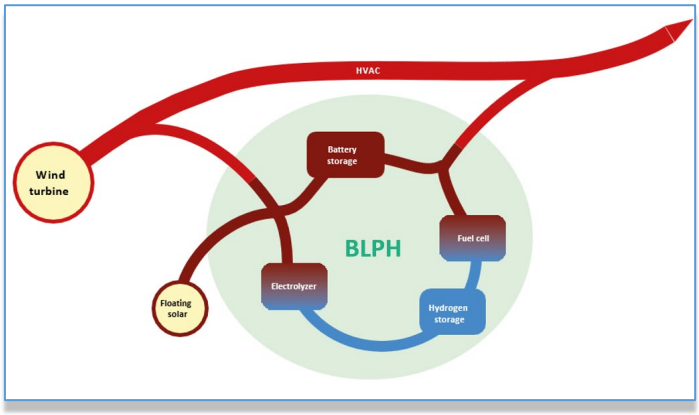


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

The purpose of this document is to outline the methodologies that will be employed during the pulling, termination and testing activities for internal platform cables on the Offshore Substation (OSS) platforms at the Rosetti fabrication yard, Ravena.

The specified methodologies pertain to the installation of 1x240mm2 at OSS. These cables will be routed from the Transformer to the Gas Insulated Switchgear (GIS).

The purpose of detailing these procedures is to systematically identify and document the necessary steps, work sequence, required resources, timeframes, equipment, tools, and consumables essential for the safe and successful completion of the specified scope of work. Additionally, the documentation aims to explicitly identify any potential issues that need to be taken into consideration during the execution of the work

2.1 REFERENCES

Doc. No.	Description
1724002000-EL-DA-00006	GENERAL ARRANGEMENT AND DIMENSIONAL DRAWINGS - HV CABLE, T-CONNECTORS, CABLE CLEATS AND ACCESSORIES
1724002000-EL-DS-00003	DATA SHEETS - HV CABLE
1724002000-EL-DS-00004	DATA SHEETS - T-CONNECTORS
1724002000-EL-DS-00005	DATA SHEETS - CABLE CLEATS AND ACCESSORIES
1724002000-QC-ITP-00002	INSPECTION AND TEST PLAN -HV CABLE AND ACCESSORIES

Table 2-1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

2.2.1 Definitions

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
SUBCONTRACTOR (SCTR):	Reynard High Voltage Solutions
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2-2 - Definitions and Abbreviations

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2.2.2 Abbreviations

IPC	Inter Platform Cable
W.A.H.	Working at heights
DPR	Daily Progress Report
TE	TE Connectivity
Cu	Copper
SWG	Switch Gear
HV	High Voltage
GIS	Gas Insulated Switchgear
REY	Reynard High Voltage Solutions
MOC	Management of Change
PPE	Personal Protection Equipment
QHSE	Quality, Health Safety & Environment
TBT	Toolbox Talk
RAMS	Risk Assessed Method Statement
MBR	Minimum Bending Radius
THO	Temporary Hang-off
PHO	Permanent Hang-off
T&T	Termination and Testing
TDR	Time-domain Reflectometry
SIMOPS	Simultaneous Operations
SDS	Safety Data sheet
PTW	Permit To Work
SWL	Safe working load
CTR	Contractor
HV	High Voltage
ToTC	Tests on Termination Completion
Mm	Millimetres
N	Newton
ITP	Inspection and Test Plan

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3 RESOURCES

This chapter describes the required resources scheduled to realize the scope of works covered under this procedure.

3.1 PLANT AND EQUIPMENT

Plant and Equipment will be Certified by Local PE (Professional Engineer) according to Local Regulations. The following equipment (or similar) is scheduled to be used during the realization of the works.

Name	Description	Responsible
Scaffolding	To grant safe access to termination works.	CTR
Lifting Gear (shackles, belts, etc.)	Lifting of accessories, and tools and securing the Platform cable.	REY
Safety signs / chains / barriers / PTW	To indicate hazards at the working area designated for REY activities.	REY
Tools	For cable installation, the complete set of our equipment should normally be a 20ft container	REY
Crane/ Lever hoist	To assist in the lifting operations	CTR
Termination parts	T-connectors, cable cleats, etc.	REY
Earthing	Earthing components	CTR
Testing Equipment	TDR tester, Insulation Resistance unit	REY
Consumables	Consumables that are required for the termination works (PVC tapes, earthing lugs, tie-raps, hexane, cleaning paper, washers, bolts, lugs, etc.) For contingency, a spare 10% will be ordered for the consumables	REY
Office Facilities	Office, desk, welfare facilities	CTR
Cable transportation	Transport of cables and tools close to the OSS top-side	CTR
Pulling equipment (drum/capstan winch, pulling sock, sheaves, etc.)	Pulling equipment that will be used for the pulling of the cables	REY

Table 3-1: Plant and Equipment

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3.2 PERSONNEL

In order to ensure timely project completion and adherence to appropriate procedures for concluding the onshore activities, Reynard HV Solutions will allocate the following teams and personnel to facilitate the prompt fulfilment of the project objectives.

Personnel per Onshore Installation Activity

- Pulling/ Routing & Cleating Activities
  - 1x Supervisor
  - 1x Certified Lead HV Jointers
  - 1x HV Jointers as an assistance
  - 2x Cable workers
- Testing & Termination Activities
  - 1x Supervisor
  - 1x Certified Lead HV Jointers
  - 1x HV Jointers as an assistance

3.3 CABLE PULLING WORKS

A total of one team will be engaged in the pulling, routing, and installation activities of circuits, in 12/7 Operations to be conducted during the entire period of the onshore activities at Rosetti Fabrication Yard and the team assigned to work only dayshift.

The drum location inside Rosetti Marino SPA fabrication yard is shown in the sketch below.

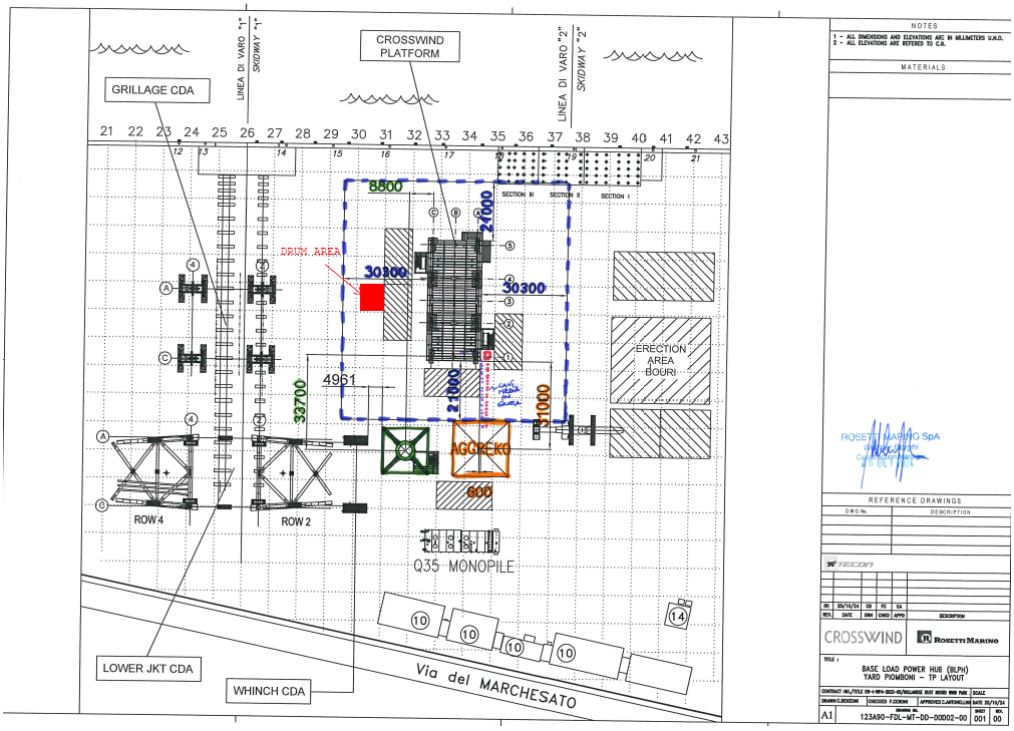


Table 3-2: Drum location inside RM SPA fabrication yard

3.4 CABLE TERMINATION WORKS

A total of one teams will be engaged in the testing and termination activities of the circuits, in 12/7 Operations to be conducted during the entire period of the onshore activities at Rosetti Fabrication Yard and the team assigned to work only dayshift.

3.5 CABLE TESTING WORKS

Testing activities must be conducted before and during onshore termination processes.

3.6 TEST PRIOR & DURING ONSHORE TERMINATION WORKS

All tests conducted by Reynard HV Solutions are designated as Tests on Termination Completion (ToTC), as outlined in "our contract " The specific tests to be performed for the different parts of the Works are further specified below.

Before the commencement of the termination works, the tests described in the Table below shall be carried out by Reynard. The tests shall be performed before commencing the termination work (i.e. before / after cable pulling). The CTR/CTR shall be allowed to witness the test.

Test	Works Phase	Responsible
Insulation Resistance Test between conductor and screen	Prior to Pulling	REY (Lead Jointer)
Insulation Resistance Test between conductor and screen	Prior to Termination	REY (Lead Jointer)
Sheath Test	Prior to Termination	REY (Lead Jointer)
Phasing order check	Prior to & During Termination	REY (Lead Jointer)

Table 3-3: Test Prior and during Onshore Termination Works

3.7 TESTING AFTER ONSHORE TERMINATION WORKS

All tests conducted by Reynard HV Solutions are designated as Tests on Termination Completion (ToTC), as outlined in "our contract " The specific tests to be performed for the different parts of the Works are further specified below.

After the completion of the termination works, the tests described in the Table below shall be carried out by Reynard. The tests shall be performed before after the termination work. The CTR/CTR shall be allowed to witness the test.

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Test	Termination Works Phase	Responsible
Insulation Resistance Test between conductor and screen	After	REY (Lead Jointer)
Sheath Test	After	REY (Lead Jointer)
TDR TEST	After	REY (Lead Jointer)

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4 REALIZATION

This section outlines the methodology for the implementation of onshore Offshore Substation (OSS) pulling, testing, and termination activities at the shipyard. It describes the preparatory tasks, execution methods, and scheduling.

4.1 CABLE DESIGN

The characteristics of the HV cables are presented below, while the offered cross section for OSS is 240mm2.

4.2 MECHANICAL DATA

Mechanical Data		
Designation	1x240mm² Cu/XLPE/CWS/LAT/LSZH 38/66 kV	
Min. bending radius during installation	870	mm
Min. bending radius after installation	755	mm
Tensile force with pulling sleeve	4,620	N
Tensile load	12,000	N

4.3 PREPARATION

REY will install IPCs on trays, while is also responsible for terminating the platform cables at the GIS switchgear and the Transformer, as well as terminating IPC cables at "Testing" accessories. To facilitate the connection of platform cables to/from the GIS switchgear/Transformer, RSTF T-connectors from TE Connectivity, a reputable manufacturer in the electricity transmission and distribution sector, will be utilized.

Prior to commencing work, the following prerequisites must be met:

- A brief site walkthrough with the site supervisor, CTR representative, and platform owner. The site supervisor will document the as-found conditions in a report, subject to agreement and signature by the CTR representative and platform owner.
- Availability and adherence to an approved Task Plan for each operation.
- Presence in the Daily morning meeting inside Rosetti Fabrication Yard.
- Presence of a Risk Assessment on the Work Floor.
- Identification and assessment of any required changes through the Management of Change process.
- Completion of a Toolbox Talk specific to the task.
- Emergency procedures for the worksite must be provided and comprehended by operatives.
- No work is allowed without a valid Permit to Work
- Access to work areas or installations in service must be managed in accordance with established protocols.

A toolbox talk is a presentation delivered by supervisors or team leaders, making reference to pre-recorded Risk Assessment records. This talk is directed to individuals directly supervised by them and

involved in the work activities. Its primary objective is to ensure a comprehensive understanding among the involved individuals regarding the nature of the work, implemented control measures, potential recovery or contingency actions, and their respective responsibilities in executing these measures.

This process will be reiterated on a daily basis, encompassing the pertinent work scope for each shift, as well as addressing concurrent scopes of work to guarantee awareness among all involved parties regarding other ongoing operations. The prescribed actions during the preparation and execution phases of the onshore Offshore Substation (OSS) pulling, testing, and termination activities are outlined below.

4.3.1 Preparation for OSS onshore pulling of the IPC cables

Task	Responsible
Provision of Pulling tools and consumables	REY
Scaffold for Cable Pulling works to grant safe access	CTR
Provision of all pulling accessories and mobilization to the site	REY
All project inductions	CTR
All site inductions (to be provided by CTR)	CTR
Provision of required PPE	REY
Provision of Lifting Gear (Lifting of accessories, tools, and securing the platform cable)	REY
Removal of sections of the cable containment system to enable the pulling	REY
Cable drum handling by the delivery of the cable drums (Lifting on the OSS platform)	CTR

4.3.2 Preparation for Onshore OSS Cable Termination Works

Task	Responsible
Provision of Termination tools and consumables	REY
Provision of cable fastening equipment (cleats)	REY
Scaffold for Cable Termination works to grant safe access to termination works	CTR
Habitat (scaffolding and tarpaulin) for jointing and termination works (if needed)	CTR
Provision of suitable earthing points on platforms (to be provided by CTR)	CTR

Task	Responsible
Provision of all accessories and mobilization to the site	REY
Garbage segregation (for the termination works)	REY
Garbage disposal	CTR
All project inductions	CTR
All site inductions (to be provided by CTR)	CTR
Provision of required PPE	REY
Provision of Lifting Gear (Lifting of accessories, tools, and securing the platform cable)	REY
Phasing order check of platform cables will be performed post-pull-in and prior to commencing termination works	REY
Erection of scaffolding structure and/ or habitat appropriate for the termination works	CTR
Platform Cable/ IPC routing up to the final termination / back-to-back position on the platform	REY
Cut and expose the cable to the measured termination length	REY
Reinstatement of the containment system	REY
Cleating cable to the containment system	REY

4.3.3 Execution

The sequence of the works during the execution phase of the OSS onshore Cable Termination works is presented in the tables below:

Task	Responsible
Scaffolding erection	CTR
Removal of the necessary number of cleats close to terminations	REY
Installation of T-Connectors	REY
Removal of sections of the cable containment system to enable the plug-in of the connectors	REY
Installation of the connectors as per Pfisterer requirements using properly experienced (Pfisterer certified) jointers	REY

Task	Responsible
Plug-in of the T-Connectors in the GIS termination sockets	REY
Plug-in of the T-Connectors in the Transformer termination sockets.	REY
Re-Instatement of removed containment system section and final cleating of cables cores	REY
Installation of MCT/Roxtec sealing parts at the MCT area	CTR
Routing of single-core earthing cables to the earthing bars and/or earthing bosses	REY
Earthing system (e.g. bosses, copper plates) close to termination area is pre-installed by others	CTR
Insulation Resistance Test between conductor and screen after termination works	REY
Phasing order check of platform cables will be performed after termination works	REY
Verification of the screen earthing after termination works	REY

Notes:

- The cable length will be cut in order to leave an extra length, according to the position of the interface point inside transition piece, for offshore cable pulling step from lower deck to the interface point.
- The extra length will not be installed in yard and will be coiled near to the MCT between lower deck and transition piece.
- All the works that are planned to be installed during the offshore activities, like EUROMOLD K480TB/G T-CONNECTOR, cable pulling, connection, termination, testing and RTSF Fixing Frame installation as it is optional and REY is not going to perform them.

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5 ORGANIZATION

This section delineates the individuals engaged in the execution of the tasks outlined within this procedure and furnishes details concerning the organizational structure, roles, and responsibilities.

Task Description	Responsible
The Project Manager has overall responsibility for project success. The project manager is responsible for the approval and implementation of Project related procedures and method statements, including QHSE plans. As the official REY representative, the project manager will be the sole interface for formal external communications.	Project Manager
The works Manager shall be responsible for appointing site supervisory personnel to organize, coordinate, and oversee the execution/implementation of the work detailed in this document	Works Manager
The Project Engineer is responsible for the execution of the works detailed in this document. The Project Engineer will be responsible for instructing the Foremen / Supervisor about the requirements of the contract, including all restrictions, scope of work, and time schedule. In addition, he will be responsible for related logistic matters and all matters related to the implementation of HSE regulations and the quality of the works.	Project Engineer (not present at the site at all times)
The Superintendent and the Supervisor are responsible for the day-to-day operations on site. Both of them will ensure that Project-related work activities are carried out in a safe, efficient, and controlled manner in accordance with the applicable Risk Assessments and Method Statements and QHSE procedures and instructions.	Superintendent/Supervisor (present at the site)
The quality Manager will be responsible for assisting/advising the workforce to ensure all works comply with specified requirements and	Quality Manager

Task Description	Responsible
to monitor the implementation of the controls as required.	
The HSE Manager provides the Project team with advice and guidance on legislation and best practices in the prevention of accidents, incidents, and damage to plant and equipment and the environment. The HSE Manager will co-ordinate a team of HSE Co-Ordinators in assisting with these duties. The HSE function will further take responsibility for assisting with the preparation and planning of detailed risk assessments, safety inductions, general site security, and safety and environmental training for the involved workforce.	Health Safety & Environment Manager

5.1 PERMIT TO WORK SYSTEM

The Permit to Work system constitutes a set of management protocols employed to ensure the safe and efficient execution of tasks. It forms an integral component of the overall control of work, encompassing the comprehensive management of critical maintenance processes essential to business operations. The control of work comprises the Permit-to-work system, hazard identification and risk assessment, and isolation management.

While instructions or procedures suffice for many work activities, certain tasks necessitate heightened attention. The Permit to Work system establishes a formal framework specifying the nature, location, and timing of the work. A designated authority must evaluate the work and verify safety considerations at each stage. The individuals performing the task endorse the permit, indicating their comprehension of associated risks and required precautions.

Prior to initiating any pulling, testing and termination works, stringent safety measures must be observed, and the pertinent Permit to Work must be applied for and obtained. The Platform Contractor's Permit To Work system will be employed for this purpose, as agreed with the CTR.

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6 QHSE

This section delineates all quality aspects directly associated with the scope of work specified in this procedure.

6.1 QUALITY

This section outlines the quality aspects directly pertinent to the scope of work outlined in this procedure. For a comprehensive understanding of the project's overall quality aspects, please refer to the Inspection and Test Plan (ITP, section 9).

6.1.1 MOC Procedure

In case of deviation from the procedure, it is mandatory to follow the MOC procedure.

6.1.2 Non-Conformance Report

In case of test failure, incident or deviation from the specification, requirement under the Contract, a non-conformity report will be conducted.

6.1.3 Health and Safety

This chapter describes all health and safety aspects including hazard identification, risk assessment, and applicable Personal Protective Equipment related to the specific scope of work covered under this procedure.

6.1.4 Risk Assessment

Prior to the start of an activity covered under this procedure, a Risk Assessment (RA) will be carried out in order to identify risks and if necessary mitigate risks to an acceptable level.

Prior to commencing work, comprehensive discussions and communication of the Risk Assessment(s) will be conducted with the involved individuals, and these discussions will be thoroughly documented. Attendees will be required to sign the Risk Assessment to affirm their attendance and comprehension of the briefing. It is imperative that all mitigation measures outlined in the enclosed Risk Assessment(s) are implemented before the commencement of the work, please refer to 8.1.

A Last Minute Risk Analysis (LMRA) shall be performed before the start of work to identify and exclude all potential safety, health and environmental hazards at the workplace.

6.1.5 Personal Protective Equipment

Mandatory Personal Protective Equipment (PPE) within REY as a minimum are:

Mandatory PPE

					
Fixed Safety Footwear (EN ISO 20345)	Safety Helmet (EN397 or EN 12495 for climbing)	High visibility clothing (jacket or coverall) with long sleeves	Life jacket (when working near or over the water and during boat transfer)	Safety glasses (EN 166)	Safety harness when working above 3m height.

Table 6-1 Mandatory PPE

Certain designated tasks and activities outlined in this procedure may necessitate personnel to don job-specific Personal Protective Equipment (PPE). The specific type of job-specific PPE to be utilized will be stipulated in the Risk Assessment and Work Instruction found in the appendices and/or the Job Safety Analysis (JSA) prepared in advance of the commencement of the work.

6.1.6 Training

All personnel engaged in the project are expected to demonstrate competency and expertise, meeting at least the CTR's specified criteria for their respective fields of work, and possessing all pertinent certifications.

6.1.7 Daily Progress Report

Throughout the Termination works, a Daily and a Monthly Progress Report will be conducted by either the REY site engineer or the REY Supervisor. In addition, a weekly and monthly progress report will be implemented. The reports will subsequently be disseminated to Rosetti.

6.1.8 As-Built

After the completion of the termination, a final check as listed below shall be performed:

- Visual inspection
- Earthing connections
- Items Identification

Separate as-built reports, one for each cable phase, shall be provided. After finishing the termination works a legal inspection of the works shall take place.

6.1.9 Handover

Upon the successful completion of all Reynards' works on the onshore Offshore Substation (OSS), a verification process shall be undertaken during the handover between Reynard, and the CTR. This

verification will ensure the proper installation of joints and correct termination of cables according to the Termination procedure and relevant fitting instructions.

Furthermore, the workspace utilized for the execution of the works will undergo a thorough cleaning process to remove any generated waste and leftovers. Subsequently, all equipment and tools essential for the works under the REY scope will be demobilized, appropriately packed, and retrieved from the work environment by Reynard.

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7 TASK PLAN

This section delineates the necessary work teams, their respective roles, and the associated responsibilities essential for the implementation of the scopes of work detailed in this procedure.

The task plans within this procedure incorporate 'Safety Highlights' to draw specific attention to hazardous tasks, as outlined below:

Sign	Convention
	Safety Critical Include this Icon to flag up that this task is to be considered “Safety Critical” and will required to be marked as such in the work procedures. Changes to this task would invoke the Management of Change measures identified for “Safety Critical” tasks in the Management of Change Procedure.
	Tool Box Talks This Icon is included if one of the control measures or additional actions specifies a Tool Box Talk as a means of reducing the risk. This Tool Box Talk would be considered as an important risk reducing measure and should be recorded on the Tool Box Talk Form and filed in the Risk Management System.
	Safety Flash This Icon to be utilized when wishing to highlight safety issues within a procedure.
WITNESS POINT	This means there is a requirement for CTR or independent witnessing or sign off before proceeding.
INFO	Information statements are given to avoid doubt in certain instances and for clarity
	Critical Picture This icon to be used to highlight the critical pictures to be taken during the method statement

7.1 TASK PLAN OF INTERNAL PLATFORM CABLE CONNECTIONS

7.1.1 Task Plan of IPCs - Pulling Works

The following task plan will delineate the processes for pulling IPCs, encompassing methodologies, necessary documentation, and required equipment.

7.1.2 Drum Handling

Item	Task Description	Resp.	Check
WITNESS POINT	1. As-found of the cable drum on arrival to the site, the as-found shall be compared to the as-found done when the drum was originally delivered. Any differences must be highlighted and reported.	REY/CTR	
INFO	2. Set up Jacks and cable drum stand in the designated position	REY	
INFO	3. Check calibration certificates and data sheets to see if the equipment is suitable for the handling of the drum	REY	
INFO	4. Simultaneous operations must be informed that lifting operations are to be performed.	REY/CTR	
SAFETY CRITICAL	5. Toolbox Talk to be performed with the working party 6. LMRA to be performed before the commencement of the work	REY/CTR	
INFO	7. The crane operator will then lift the drum into the required position.	CTR	
INFO	8. Perform functionality checks with the cable drum in position	REY	

7.1.3 Cable Route Preparation

Item	Task Description	Resp.	Check
INFO	1. Task Plan generated and assigned to the circuit being worked	REY	

Item	Task Description	Resp.	Check
	2. Toolbox Talks will be undertaken at the commencement of each shift and additionally when deemed necessary by the Site Manager or his/her representative. All parties will be informed of the command and control hierarchy with a review of safety and operational requirements	REY	
	3. Last minute risk assessment carried out.	REY	
INFO	4. Confirm required tools, equipment and consumables are present, within calibration date from last inspection and in good working condition.	REY	
INFO	5. Confirm verification of all equipment required for the works are fit for purpose.	REY	
WITNESS POINT	6. Carry out cable route walkdown checklist	REY/CTR	
WITNESS POINT	7. Check of free issued materials required to route, secure, and seal the power cores have been checked against accessory Quantities.	REY	
INFO	8. The phasing of the route shall be planned in accordance with the Phasing Order Diagram. No cable to be pulled until each cable route has been properly planned and checked against the GA of the cable routes.	REY	
INFO	9. Where required affix the small capacity portable winch (400kg) to the identified strong points along the route. 10. *Note – For Installation of any pull-in equipment to the scaffolding the design drawings supplied by the scaffolding subcontractor must be followed.	REY	
INFO	11. Position the Lead Rollers between the cable drum and the end of the cable route. 12. *Note – For Installation of any pull-in equipment to the scaffolding the design drawings supplied by the scaffolding subcontractor must be followed.	REY	

Item	Task Description	Resp.	Check
INFO	13. Where applicable set up the Box Rollers on the vertical sections and on each bend of the route 14. *Note – For Installation of any pull-in equipment to the scaffolding the design drawings supplied by the scaffolding subcontractor must be followed.	REY/ SCAFF	
INFO	15. Where applicable secure the Box Rollers to the scaffold 16. *Note – For Installation of any pull-in equipment to the scaffolding the design drawings supplied by the scaffolding subcontractor must be followed.	REY/ SCAFF	
INFO	17. In-line rollers and/or further Box Rollers are to be positioned where required. 18. *Note – For Installation of any pull-in equipment to the scaffolding the design drawings supplied by the scaffolding subcontractor must be followed.	REY/ SCAFF	
INFO	19. Release the tie and spin the drum by hand to position the nose of the cable to allow fitment of the stocking (Chinese finger).	REY	
INFO	20. Secure the stocking to the nose of the cable.	REY	
WITNESS POINT	21. Carry out the Pulling Preparation Checklist	REY/ CTR	

7.1.4 Cable Route Walkdown Checklist

Item	Task Description	Resp.	Check
WITNESS POINT	1. Complete a Clash Check a. Location, Width and Clearance from Other Structures b. There shall be no clashes for access/egress c. Verify that that the cable ladders are free from damage or defects d. Check for clashes in the rooms and penetrations e. Check suitability of flexible supports	REY	

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Item	Task Description	Resp.	Check
WITNESS POINT	2. Termination/joint check Check joint/termination area for clashes / damage and issues that could hamper installation / termination work	REY	
WITNESS POINT	3. Cable Route Check cable route for any sharp edges, clashes / damage and issues that could hamper cable installation	REY	
WITNESS POINT	4. Minimum Bending Radius a. 1x240mm2 i. During Installation : 830 mm ii. After Installation : 700 mm Verify the MBR is not compromised by support positions/orientation	REY	
WITNESS POINT	5. Earthing arrangement Verify the earthing point are installed as required (OSS earthing arrangement at cable trays, equipment, etc.) by CTR.	REY/CTR	
WITNESS POINT	6. Drum position a. Verify correct drum position b. Verify there is no operation clashes	REY	
WITNESS POINT	7. Scaffolding Check the scaffolding supports are adequate to facilitate access and pulling operation *Note – For Installation of any pull-in equipment to the scaffolding the design drawings supplied by the scaffolding subcontractor must be followed	REY	
WITNESS POINT	8. Winch locations a. Check the location of the winches are suitable b. Check the strong points are suitable c. Check the line of the winch wire to ensure no clashes	REY	
WITNESS POINT	9. Overlength and hold back a. An overlength of at least 2m past the termination point will be required, as an additional measure take a further measurement to confirm requirements.	REY	

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Item	Task Description	Resp.	Check
	b. Ensure suitable hold back support is available for stopper installation		
WITNESS POINT	10. Phasing Check the phasing order in order to ensure correct phase order pull	REY	
WITNESS POINT	11. Handover Complete Handover of cable route	REY	

7.1.5 Pulling Preparation Checklist

Item	Task Description	Resp.	Check
WITNESS POINT	1. Cable Drum a. Test drum rotation operation b. Check cable pulling head / sock installation c. Check area	REY	
WITNESS POINT	2. Rollers a. Check distance between rollers b. Check roller alignment c. Check rollers at bends d. Check the roller fixing and supports are secure e. Check roller has no damage or defects f. Check free spinning of rollers bearings	REY	
WITNESS POINT	3. Check support structure bracing Check that sufficient bracing of the cable support structure has been installed to facilitate pull in operation	REY	
WITNESS POINT	4. Winches & Rigging a. Test winch operation b. Check winch is securely installed c. Check winch and rigging is not damaged or defective and in date	REY	
WITNESS POINT	5. Hold Back Position Check the preparation of hold back positions	REY	

Item	Task Description	Resp.	Check
WITNESS POINT	6. Communication Check the radios' operational status Ensure each person understands the radio signals (all stop etc.)	REY	
WITNESS POINT	7. TBT and RAMS Carry out TBT and Procedure according to RAMS	REY	

7.1.6 Cable Pull-in

Item	Task Description	Resp.	Check
SAFETY CRITICAL	1. The following steps can only be performed when all the described previous steps in this task plan are completely finished.	REY	
SAFETY CRITICAL	2. Ensure all equipment has been function tested and checked accordingly.	REY	
SAFETY FLASH	3. Check verbal / radio communication between all members of the pulling team 4. LMRA to be performed before the commencement of the work	REY	
INFO	5. Attach the end of the pulling grip to the pull line	REY	
INFO	6. Apply colored PVC Tape to the power core(s) Power Core (L1) - Red; Power Core (L2) - Yellow; Power Core (L3) - Blue	REY	

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Item	Task Description	Resp.	Check
INFO	7. Core L1 - Detail the Cable Drum, the meterage marking start, finish, and the total installed length.	REY	
INFO	8. Core L2 - Detail the Cable Drum, the meterage marking start, finish, and the total installed length.	REY	
INFO	9. Core L3 - Detail the Cable Drum, the meterage marking start, finish, and the total installed length.	REY	
	10. Prior to pulling of the cables please ensure the area is cleared of non-essential personnel and the area of your operations is secure from others	REY	
INFO	11. Pull the power core from the drum, measure in advance the cable length that is needed for each route.	REY	
	12. [HOLD POINT] - As the cable is rolled from the drum ensure there are no damages or defects in the cable.	REY	
	13. Safety Note: At any time, any personnel can call an "ALL STOP" to the installation operations but ONLY the REY can give authorization to restart operations (unless the operations have been stopped due to a QHSE risk). Each pull-in should be monitored along the route by personnel with a radio.	REY	
INFO	14. The power core will be pushed/pulled along the cable route.	REY	
WITNESS POINT	15. QUALITY CHECK: A photograph shall be taken showing the power core positioned and secured at End A.	REY	

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Item	Task Description	Resp.	Check
WITNESS POINT	16. QUALITY CHECK: A photograph shall be taken showing the power core positioned and secured at End B	REY	
INFO	17. Repeat Steps until all three power cores have been pulled- in	REY	

7.2 TASK PLAN OF IPC'S/ – CABLE INSTALLATION WORKS

This task plan will outline the routing, positioning, and securing of cables, as well as the installation of T-Connectors. This includes the removal and re-assembly of the containment system where applicable.

7.2.1 Cutting and Capping the Power Cores

Item	Task Description	Resp.	Check
INFO	1. Cables will be cut at the desired location using a reciprocating saw.	REY	
INFO	2. An accurate measure will be taken from the terminal point and cables cut at the required position on the cable racking.	REy	
INFO	3. **NOTE:** On some cable routes it will be required to pull well past the point of final termination (GIS / Transformer room) in order to take a measurement of the cable for cutting, the over length will then be pulled back towards the termination location. • Measurement from the cable racking to the termination location will need to be taken, at least 2m of additional cable will be needed to be included past the point of termination • Additional overpull at the far end termination location including the extra cable required also at that end will be needed • Once the cable measurements have been taken the cable can be cut and routed back down the length and past the point of termination	REY	

Item	Task Description	Resp.	Check
	• The cable cores should be secured, and heat shrink cap applied and shrunk onto the cable • Detailed cable routes and lengths will be issues at the start of each shift		
SAFETY FLASH	4. Hot works permit to be obtained for the fitment of the heat shrink caps. Fire Extinguisher will always be present at capping location or during any other hot works. 5. LMRA to be performed before the commencement of the work	REY/ CTR	
INFO	6. Cables will be capped using a hot shrink end caps.	REY	

7.2.2 Cleating the Power Cores

Item	Task Description	Resp.	Check
INFO	1. Cables will be cleated on to the Cable Ladder. The minimum distance of the cleats is 0.6m and the General Arrangement of cables routing Cables 1x240mm^2 for Trefoil and Flat Formation: TBC ≤ 600mm ≤ TBC	REY	
INFO	2. Ensure that the cables transition from trefoil to single formation as soon as possible. We want to minimize the distance that the cables run in single formation. Ensure cleats don't clash with fire sealing below GIS	REY	
INFO	3. Mount the KOZ Trefoil Cleats onto the cable management system and torque tighten to the specified torque value of **5-8N/m.**	REY	
INFO	4. Mount the KOZ Single Cleats onto the cable management system and torque tighten to the specified torque value of **5-8N/m.**	REY	
INFO	5. Verify MBR is not exceeded at any point using templates.	REY	

Item	Task Description	Resp.	Check
WITNESS POINT	6. **QUALITY CHECK:** Photographs shall be taken along the cable route showing the power cores secured by the KOZ Cleats.	REY	

7.3 TASK PLAN OF IPC'S – TESTING WORKS

7.3.1 Task Plan of IPC's – Testing Prior Termination Works

This task will delineate the procedures for conducting testing before commencing the Termination works on IPC cables at the shipyard. The tests to be performed include the Phase Identification Test and the Insulation Resistance Test.

7.3.2 Tests before Termination Preparation

Item	Task Description	Resp.	Check
INFO	1. Task Plan generated and assigned to the circuit being worked on.	REY	
INFO	2. **INFORMATION -** For test purposes the ends of the core(s) under test are defined as follows: Test End A - test end (Location where the test equipment is applied). Test End B – non-test end (Remote end of the cable under test).	REY	
SAFETY FLASH	3. PTW procedures to be followed, all parties involved in the scope of work to sign work permit. 4. LMRA to be performed before the commencement of the work	REY	
WITNESS POINT	5. **Test End A&B:** check all test equipment and certification is present and correct. Ensure all equipment has been function tested and checked accordingly.	REY/ CTR	

Item	Task Description	Resp.	Check
SAFETY CRITICAL	6. **Test End A&B:** check cable ends are secured and safe and that if any personnel are present, they are authorised to be so and that safety warning notices are fixed to warn that the cable is under test.	REY	
INFO	7. **Test End A&B**: release the power cores, remove any end seals and prepare the HV power cores for attachment to test equipment. Ensure that the prepared and exposed cable end is protected from damage.	REY	
INFO	8. **Test End A:** connect all conductors, metallic screens and the semi-conductive layer securely to the safety earth connection point.	REY	

7.3.3 Phase Identification Test Task Plan

Item	Task Description	Resp.	Check
WITNESS POINT	1. Ensure all equipment has been function tested and checked accordingly.	REY/ CTR	
WITNESS POINT	2. QUALITY CHECK: Confirm calibration dates of test equipment used for the Phase Identification Testing.	REY	
INFO	3. Turn on DLRO device	REY	
INFO	4. Remove all earthing aspects from Test End A&B	REY	
INFO	5. Test End B Link Core L1 – Red to L1 Screen	REY	
INFO	6. Test End A connect one end of the test leads to L1 Screen and Connect the other to L1 Core	REY	

Item	Task Description	Resp.	Check
WITNESS POINT	7. Test End B Take picture of test setup	REY/ CTR	
WITNESS POINT	8. Test End A Take picture of test setup	REY/ CTR	
INFO	9. If a Milliohms reading is shown on the DLRO device this means that there is continuity	REY	
WITNESS POINT	10. Take picture of Milliohms reading	REY/ CTR	
INFO	11. After confirmation of continuity between each phases apply Red (L1), Yellow (L2) or Blue phase tape (L3).	REY	
INFO	12. Repeat the above steps until a continuity measurement has been achieved for all phases.	REY	
SAFETY FLASH	13. On completion of the phase identification measurement, reapply earthing at both ends.	REY	

7.3.4 Insulation Resistance Test Task Plan

Item	Task Description	Resp.	Check
SAFETY FLASH	**1. ELECTROCUTION HAZARD** Insulation Resistance Testing presents an electric shock hazard to personnel and additional precautions must be taken due to the applied test voltage of 5kV. LMRA to be performed before the commencement of the work	REY	

Item	Task Description	Resp.	Check
WITNESS POINT	2. Test End A&B: Ensure all equipment has been function tested and checked accordingly.	REY/ CTR	
INFO	3. **Test** End A&B: Safety regulations for work with electrical equipment: a. Disconnect completely b. Secure against re-connection c. Ground and short-circuit d. Cover or close off nearby live parts	REY	
INFO	4. Test End A&B: Protection of the test set-up against direct contact with live parts is required, by using e.g. appropriate e. insulation, f. covers, g. housings, enclosures, guards h. barriers, i. safe distances, j. Personnel Protective Equipment (PPE), k. Demarcation of Work Area	REY	
INFO	5. Test End A&B: Confirm both ends of the power cores have been prepared for the Insulation Resistance Test. The remote end of the cable needs to be prepared in such a way that no spark-over can occur and leakage currents are avoided, this can be achieved by thorough stripping, cleaning and the application of suitable end caps.	REY	
INFO	6. Test End A&B: Removing the likelihood of a spark-over ensure the outer sheath and the semi-conductive layer have been removed from both ends of the cable approximately 10cm wide. A copper band / roll spring or similar will be wrapped around the conductive section of the outer sheath and connected to earth.	REY	
INFO	7. Test End A&B: The metallic screen wires, the outer sheath and the power core conductors will be connected to a suitable earth point.	REY	

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Item	Task Description	Resp.	Check
	Prior to testing the test engineer will verify that all of the required safety earthing is present, that communication paths are present between all parties that could potentially be at risk and that personnel are clear at the test site.		
INFO	8. Test End A&B: Ensure that suitable barriers, screens and warning signs are in place as required and that a controlled and secure means of access to both the cable end under test and the Cable Remote End is in place and effective.	REY	
INFO	9. Test End A&B: Re-check two-way radio communications between test personnel at the cable end under test and any test personnel that shall be present at the Cable Remote End. Where provided, re-test the secondary 'back up' communication. **Note:** At all stages of testing a two way 'command and confirm' communication procedure MUST be strictly adhered to between personnel at the cable end under test and personnel at the Cable Remote End. If at any stage during the testing procedure radio communication is lost or an instruction, communication or transmission is not confirmed by the other party the test must be stopped immediately and the cable returned to a safe condition as quickly as possible i.e. test voltage removed, cable discharged, proved dead and earthed.	REY	
INFO	**Test End A&B:** Complete the following checklist before proceeding: a. Both ends of the power cores have been prepared b. The metallic screen wires, the outer sheath, and the power core conductors are connected to a dedicated earth point.	REY	

Item	Task Description	Resp.	Check
	c. A secure means of access is in place at both the Test End and the Remote End. d. The two-way radio communication has been checked		
INFO	10. **Test End A:** Instruct personnel at the Cable Remote End that Insulation Resistance Testing will commence.	REY	
INFO	11. **Test End B:** Confirm instruction received and understood.	REY	
INFO	12. **Test End A:** Select and identify HV core to test and instruct personnel at the Cable Remote End to disconnect safety earth connection from the “Metallic Screen”.	REY	
INFO	13. **Test End B:** Confirm earth disconnected.	REY	
	14. **Test End A:** Instruct personnel at the Cable Remote End to stand clear of the cable end until further instruction and that testing will now commence.	REY	
	15. **Test End B:** confirm personnel standing clear.	REY	
	16. **Test End A:** Connect insulation resistance tester red lead to the core and the black to the screen	REY	
WITNESS POINT	17. **Test End A:** Carry out the Insulation Resistance test and document the outcomes on the designated test sheet. Ensure that the results are accurately logged in accordance with the respective phase under examination. The acceptance standard is no “breakdown shall occur".	REY/ CTR	

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Item	Task Description	Resp.	Check
	However, considering the new cable installation, the Insulation Resistance (IR) value should align reasonably with the Factory Acceptance Test (FAT) results, specifically when tested at 5kV within a time range of 1:00 to 5:00 minutes. It is imperative that the test voltage is applied for a duration sufficient to achieve a stable measurement, not exceeding 5 minutes but not less than 1 minute. The test voltage shall be applied for sufficient time to reach reasonably stable measurement, but for not less than 1 minute and not more than 5 minutes.		
WITNESS POINT	18. **QUALITY CHECK:** Photograph(s) shall be taken showing the digital readout on the test equipment.	REY/ CTR	
SAFETY FLASH	19. **Test End A:** On completion of the test allow enough time for the insulation resistance tester to discharge the cable. The voltage reading on the IR tester should read 0 volts.	REY	
SAFETY FLASH	20. **Test End A:** re-apply safety earth connection to the cable under test.	REY	
SAFETY FLASH	21. **Test End A:** Advise personnel at the Cable Remote End that the test is complete, the cable/conductor is proved dead, the conductor safety earth connection is applied at the test end and that the cable is safe to approach.	REY	
SAFETY FLASH	22. **Test End B:** confirm.	REY	
SAFETY FLASH	23. **Test End A:** Request personnel at the Cable Remote End to reconnect “Metallic Screen” to the safety earth.	REY	

Item	Task Description	Resp.	Check
SAFETY FLASH	24. **Test End B:** confirm.	REY	
SAFETY FLASH	25. **Test End A&B:** repeat previous steps for each HV core until the insulation testing has been completed on all three cores.	REY	
SAFETY FLASH	26. **Test End A&B**: Once the third and final core has been tested, the safety earths shall remain fitted for a period of no shorter than 1 minute before proceeding.	REY	
INFO	27. **Test End A&B:** Disconnect the safety earth from the metallic screen wires and the power core conductors.	REY	
INFO	28. **Test End A&B:** If termination of the power cores is to be carried out immediately after completion of the prior to termination testing by the same team, the cable ends may be left exposed. If termination is to be carried out at a later time by different personnel seal the power cores with end caps, proceed to the below steps.	REY	
INFO	29. Test End A&B: Remove the 10cm of the power core that was prepared for the prior to termination tests. 30. Degrease and dry the outer sheath surfaces of the power core thoroughly to provide a surface suitable for good adhesion of the end sealing cap.	REY	
INFO	31. Test End A&B: Install suitable adhesive lined end seal caps onto power cores with either hot or cold cure adhesive according to the manufacturer's installation procedure.	REY	

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Item	Task Description	Resp.	Check
WITNESS POINT 	32. QUALITY CHECK: Photograph(s) shall be taken showing the end caps fitted to the power cores (if applicable).	REY/ CTR	
INFO	33. Test End A&B: tidy test area and remove equipment as required.	REY	

7.4 TASK PLAN OF IPC'S - ACCESSORIES INSTALLATION WORKS

7.4.1 Task plan of IPC's – T-Connector RSTF Installation Works

The installation of the TE T-Connector will adhere to the TE fitting instruction, as referenced below. In addition to the TE instructions, the completion of the TE accessory installation necessitates the execution of the following steps.

Item	Task Description	Resp.	Check
SAFETY CRITICAL	1. Read the Procedure, TE's Installation Instruction and Test Plan, Work Instruction, and Risk Assessment.	REY	
SAFETY CRITICAL	2. Complete any required CTR/Site training to Access the Asset	REY/CTR	
SAFETY CRITICAL	3. Consult with the OIM/Supervisor to confirm work can be conducted and completed.	REY	
SAFETY CRITICAL	4. Accept Permit to Work Documents. DO NOT sign until all Parties understand the works to be carried out.	REY/CTR	

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Item	Task Description	Resp.	Check
TOOL BOX TALK	5. Complete and Sign REY's TBT form.	REY	
SAFETY CRITICAL	6. Adhere to REY's/CTR's/Site Rules.	REY/CTR	
SAFETY CRITICAL	7. Coordinate with OIM/Supervisor/CTR to Gain access to the Asset. Team Leaders to carry a form of communication at all times.	REY/CTR	
SAFETY CRITICAL	8. **Team Leaders, OIM/Supervisors Check Comms. Clearly state Team leaders' Location and what termination works are to be carried out.**	REY	
INFO	9. Team leaders at Assets to coordinate all Termination works including all equipment and materials.	REY	
INFO	10. With the use of hand tools remove termination covers and panels for HV cable termination.	REY	
INFO	11. Apply straightening bars & heating blankets provided to the power cores. Apply straightening bars & heating blankets provided to the power cores. ***Cores are to be heated between 4-5 hours at 80°C.** ****On completion of the heating the cables must be allowed to cool for 2 hours.**	REY	
INFO 	12. Complete HV termination works as per TE instruction. ***Complete Termination Checklist provided.** ****Remember to take pictures throughout the Termination works (Core cut to length, semi-conductive layer & insulation removed,**	REY	

Item	Task Description	Resp.	Check
	stress cone & T-Connector body fitted correctly, completion of all 3 terminations & all earthing aspects) *****In-between each cable installation reinstate the switchgear components and take pictures of the gland plates, cleat bar, cleats & Arc Flash Plates**		
INFO 	13. Take as left pictures following the picture index template.	REY	

8 APPENDICES

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8.1 RISK ASSESSMENT

Risk Assessment Table

Low Risk	1 - 5	May proceed without additional controls
Medium Risk	6 – 14	Additional considerations and risk reduction measures required – where personal injury is very unlikely to happen task may proceed after higher management consultation / approval.
High Risk	15 - 25	May not proceed, alternative method may be required – consult higher management

RA of IPC's – Cable Pulling & Installation Works

Ref No:	Activity	Hazard	Harms / Concerns	Without Controls			Control Measure	Action By:	With Controls		
				S	P	R			S	P	R
01.	Driving around Site	➢ Loss of Control	➢ Personnel Injury ➢ Crushing	4	3	12	➢ All personnel accessing the work area will do so by the designated pedestrian access routes, which will be made known during the induction to site	➢ Site Manager ➢ Team Leader	3	1	3
02.	Cable Routing	➢ Manual Handling	➢ Personnel Injury ➢ Crushing ➢ Equipment Damage	3	4	12	➢ Certified Rigging Equipment ➢ Competent Personnel ➢ Manual Handling Training ➢ Chain Blocks to be used where practicable	➢ Site Manager ➢ Team Leader	3	1	3

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Ref No:	Activity	Hazard	Harms / Concerns	Without Controls			Control Measure	Action By:	With Controls		
				S	P	R			S	P	R
03.	Cable Routing	➢ Slips, Trips & Falls	➢ Personnel Injury ➢ Equipment Damage	3	3	9	➢ Good Housekeeping and Awareness of the Working Area to be maintained ➢ Good Levels of Light	➢ Site Manager ➢ Team Leader	3	1	3
04.	Cable Routing	➢ Exceeding MBR	➢ Equipment Damage	3	3	9	➢ Assembly procedure documents to be strictly adhered to at all times ➢ MBR Template to be used	➢ Site Manager ➢ Team Leader	3	1	3
05.	Cable Routing	➢ Sharp Edges	➢ Personnel Injury ➢ Equipment Damage	4	3	12	➢ Cable route to be checked for sharp edges ➢ All sharp edges along the cable route to be covered ➢ Gloves to be worn	➢ Site Manager ➢ Team Leader	4	1	4
06.	Cable Routing	➢ Over / Under Tightening	➢ Equipment Damage	4	2	8	➢ Trained and Competent Personnel Only ➢ Torqued bolts independently checked and verified; ➢ Tell-tale identification mark upon completion of torque verification ➢ An in-date certificate of calibration for all torque wrenches being used.	➢ Site Manager ➢ Team Leader	4	1	4
07.	Cable Routing	➢ Battery Operated Tools	➢ Personnel Injury ➢ Equipment Damage	3	3	9	➢ Tools to be maintained at regular intervals and inspected before use ➢ Eye protection to be worn ➢ No loose-fitting clothes to be worn when operating rotating tools	➢ Site Manager ➢ Team Leader	3	1	3
08.	Cable Routing	➢ Hand Tools	➢ Personnel Injury ➢ Equipment Damage	4	2	8	➢ Trained and Competent Personnel Only ➢ Hand Tools shall be fit for purpose ➢ Light Assembly Gloves to be worn for general tasks ➢ Cut resistant gloves to be worn when using cutting or profiling tools	➢ Site Manager ➢ Team Leader	4	1	4
09.	Cable Routing	➢ Slips and Falls from height	➢ Personnel Injury	4	4	16	➢ All operatives working on scaffolding will use designated access and egress; ➢ Only access scaffolding once structure has been assembled and visually inspected. ➢ No unauthorized alterations to scaffolding ➢ Good housekeeping at all times when working on scaffolding platform. ➢ Edge protection present at all times.	➢ Site Manager ➢ Team Leader	4	1	4
10.	Cable Routing	➢ Dropped objects	➢ Injury to Personnel ➢ Damage to equipment / material	4	4	16	➢ Securely store / fasten fastening materials and equipment at height; ➢ Tools / Lanyards to be pre-inspected before use; ➢ Good Housekeeping;	➢ Site Manager ➢ Team Leader	4	1	4

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Ref No:	Activity	Hazard	Harms / Concerns	Without Controls			Control Measure	Action By:	With Controls		
				S	P	R			S	P	R
							➢ When working above an opening, install a temporary cover. ➢ Find an alternatives and arrange works to avoid working above others				
11.	End Seals	➢ Pfisterer shrinks	➢ Injury to Personnel	4	3	12	➢ Cable heat shrink shall be held in place during the heat shrink process. ➢ Cap fitted with Pfisterer fitting instruction. ➢ Once process is complete the cable shall be allowed to cool before handling ➢ Ensure all correct PPE is always used. ➢ Note when working on the OSS the suppression system must be isolated before any hot works can commence.	➢ Site Manager ➢ Team Leader	4	2	8
12.	HOT WORKS	➢ Automatic fire suppression system activation	➢ Injury to Personnel	5	3	15	➢ The suppression system must be isolated before any hot works can commence. This will be isolated and controlled by the Park Wind manager ➢ Issue of PTW Hot Works via Yard's Management System	➢ Site Manager ➢ Team Leader	5	1	5

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RA of IPC's - Drum Handling

Ref No:	Activity	Hazard	Harms / Concerns	Without Contro			Control Measure	Action By:	With Controls		
				S	P	R			S	P	R
13.	Driving around Site	➢ Loss of Control	➢ Personnel Injury ➢ Crushing	4	3	12	➢ All personnel accessing the work area will do so by the designated pedestrian access routes, which will be made known during the induction to site	➢ Site Manager ➢ Team Leader	3	1	
14.	Lifting Operations	➢ Loss of Control ➢ Dropped Objects	➢ Personnel Injury ➢ Crushing	4	4	12	➢ All personnel accessing the work area will do so by the designated pedestrian access routes, which will be made known during the induction to site ➢ Toolbox Talks with Simops ➢ Competent and trained personnel ➢ No personnel to enter lifting zones ➢ Please consider adding pre and post use visual inspection of rigging equipment. ➢ If loads are suspended barriers must be erected around the life zone. ➢ No personnel to stand under a suspended load. ➢ Any damaged equipment to be taken out of service/quarantined.	➢ Site Manager ➢ Team Leader	3	1	3
15.	Drum Positioning	➢ Loss of Control ➢ Equipment Failure	➢ Personnel Injury ➢ Crushing ➢ Nipped fingers	4	3	12	➢ Equipment calibration and fit for use ➢ PPE ➢ Competent and trained personnel	➢ Site Manager ➢ Team Leader	3	1	3

RA of IPC's - Accessories Installation Works

RA of IPC's – T-Connectors

Ref No:	Activity	Hazard	Harms / Concerns	Without Controls			Control Measure	Action By:	With Controls		
				S	P	R			S	P	R
16.	Terminations & Earthing	➢ Manual Handling	➢ Personnel Injury ➢ Crushing ➢ Equipment Damage	3	4	12	➢ Certified Rigging Equipment ➢ Competent Personnel ➢ Manual Handling Training ➢ Chain Blocks to be used where practicable ➢ Identification of pinch points o T; Task o I; Individual o L; load o E; Environment	Team Leader	3	1	3
17.	Terminations & Earthing	➢ Exceeding MBR	➢ Equipment Damage	3	3	9	➢ Assembly procedure documents to be strictly adhered to at all times ➢ MBR Template to be used	Team Leader	3	1	3
18.	Terminations & Earthing	➢ Slips and Falls from height	➢ Personnel Injury	4	4	16	➢ All operatives working on scaffolding will use designated access and egress; ➢ Only access scaffolding once structure has been assembled and visually inspected. ➢ Good housekeeping at all times when working on scaffolding platform. ➢ Edge protection present at all times.	Team Leader	4	1	4
19.	Terminations & Earthing	➢ Cutting Cable	➢ Equipment Damage ➢ Hand and Arm Vibration	4	3	12	➢ Cable route to be checked for sharp edges ➢ All sharp edges along the cable route to be covered with Rubber or pipe lagging ➢ Limited use to 20-minute intervals	Team Leader	4	1	4
20.	Terminations & Earthing	➢ Hand Tools	➢ Personnel Injury ➢ Equipment Damage	4	2	8	➢ Trained and Competent Personnel Only ➢ Hand Tools shall be fit for purpose ➢ Light Assembly Gloves to be worn for general tasks ➢ Cut resistant gloves to be worn when using cutting or profiling tools	Team Leader	4	1	4
21.	Terminations & Earthing	➢ Over / Under Tightening	➢ Equipment Damage	4	2	8	➢ Trained and Competent Personnel Only ➢ Torqued bolts independently checked and verified; ➢ Tell-tale identification mark upon completion of torque verification ➢ An in-date certificate of calibration for all torque wrenches being used.	Team Leader	4	1	4
22.	Terminations & Earthing	➢ Battery Operated Tools	➢ Personnel Injury ➢ Equipment Damage	3	3	9	➢ Tools to be maintained at regular intervals and inspected before use ➢ Eye protection to be worn ➢ No loose-fitting clothes to be worn when operating rotating tools	Team Leader	3	1	3

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23.	Terminations & Earthing	➢ Cleaning Materials	➢ Personnel Injury	4	3	12	➢ Safety Data Sheets to be provided with Jointing Instruction ➢ Wear disposable nitrile gloves and general eye protection as specified in the safety data sheet ➢ Ensure there is no ignition sources (naked flames, sparks and hot surfaces) in the vicinity when using flammable materials ➢ Do not eat, drink, smoke or vape while using these materials and always wash hands after use.	Team Leader	4	1	4
24.	Terminations & Earthing	➢ Fire ➢ Burns ➢ Explosion	➢ Personnel Injury	5	3	15	➢ Hot work permit to be in place. ➢ Gas bottle to be kept clear of blow torch. ➢ Personnel to wear fire retardant overalls. ➢ All hose connections shall be visually inspected before use. ➢ Fire fighting equipment to be available. ➢ Note when working on the OSS the suppression system must be isolated before any hot works can commence.	Team Leader	5	1	5
25.	Terminations & Earthing	➢ Heating of the power cores	➢ Cable Damage	4	3	12	➢ Pfisterer Jointing instruction to be followed for heating of the power cores ➢ Temperature probe with monitor to be used ➢ 15 minute intervals to check heating probe monitor	Team Leader	4	2	8
26.	Terminations & Earthing	➢ Pfisterer shrinks	➢ Injury to Personnel	4	3	12	➢ Cable heat shrink shall be held in place during the heat shrink process. ➢ Cap fitted with Raychem fitting instruction. ➢ Once process is complete the cable shall be allowed to cool before handling ➢ Ensure all correct PPE is always used. ➢ Note when working on the OSS the suppression system must be isolated before any hot works can commence.	Team Leader	4	2	8
27.	Terminations & Earthing	➢ Ingestion/inhalation & Absorption	➢ Injury to Personnel	4	2	8	➢ When using hazardous substances, wear the correct PPE. ➢ Know where washing and first aid facilities are on site. ➢ Ensure that hazardous substances are put back into a secure location after use. ➢ Always keep good ventilation in the work area ➢ Ensure all flammable materials are always away from ignition source. ➢ COSHH assessment to be carried out ➢ Note when working on the OSS the suppression system must be isolated before any hot works can commence. ➢ MSDS available at point of work for firefighting and first aid requirements.	Team Leader	4	1	4

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28.	Terminations & Earthing	➢ Use of sharp glass ➢ Open bladed hook knifes ➢ HAVS – electric sanders	➢ Injury to Personnel	4	3	12	➢ Jointers to use appropriate PPE whilst carrying out screen removal i.e. Kevlar gloves. ➢ Whilst using knives the jointer must always cut away from self never towards. ➢ Whilst glassing cable insulation jointers need to be able to feel the cable to ensure that there are no irregularities present, for this task only gloves will be removed. Electrical tape or similar will be placed on the edge of the glass holding point to ensure that there is no possibility of cuts to the fingers occurring. ➢ If electric sanders are used when preparing the insulation, vibration exposure limits will be monitored and will not be exceeded. ➢ Note when working on the OSS the suppression system must be isolated before any hot works can commence.	Team Leader	4	1	4
29.	Terminations & Earthing	➢ Automatic fire suppression system activation	➢ Injury to Personnel	5	3	15	➢ The suppression system must be isolated before any hot works can commence. This will be isolated and controlled by the Park Wind manager	OSS Manager	5	1	5

8.2 INSPECTION AND TEST PLAN (ITP)

8.2.1 Inspection Authority

ITP ID. :		**ITP Title :**			**Revision Date ITP :**		
Types:	LT = Laboratory Testing VI	VI = Visual Inspection	FT = Field Testing	SA = Sampling	CA = Calibration	DO = Documentation	CS = Check Sheet
Authorities:	E = Executing Party	W = Witness Point	H = Hold Point	M = Monitor Point	R = Review Point		
	Subc = Subcontractor	Contr = Rosetti	CTR = Crosswind	TPI = Third Party Inspector	TBC= To be confirmed		

8.2.2 ITP – IPC DRUM HANDLING WORKS

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No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.2.2.1	Drum Handling	Visual inspection of the cable drum before the start of lifting operations	Each cable drum, prior to lifting	No damages to cable drum and wooden battens or other anomalies to the IPC cable(s)	Checklist As-Found	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	M	--
8.2.2.2	Drum Handling	Visual inspection of the cable drum after lifting operations	Each cable drum, prior to work at OSS	No damages to cable drum and wooden battens or other anomalies to the HV cable(s)	Checklist As-Found	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	M	--
8.2.2.3	Drum Handling	Check of calibration and suitability of equipment	Each cable drum & equipment prior to work	Proper calibrated and suitable running equipment	Checklist As-Found	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	M	--

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8.2.2.4	Drum Handling	Functionality checks Cable Drum	Each cable run, prior to work	Properly running cable drum	Checklist cable drum	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	M	--
8.2.2.5	Drum Handling	Visual inspection of the cable drum	Each cable drum, after all works has been completed	Properly re-spooled cables on cable drum and re-fitted wooden battens	Checklist cable drum or Checklist As-left	Signed checklist (As-left) and picture evidence	Supervisor	Yes	E	W	W	--

8.2.3 ITP – PULLING WORKS

No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.2.3.1	Pulling	Visual inspection of Platform prior to start of work	Each cable run, prior to work	No damages of obstructions that could uphold pulling works. (Representatives have walked the whole route cable drum to cable trays)	Checklist As-Found	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	W	--

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No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.2.3.2	Pulling	Functionality checks of Winch	Each cable run, prior to work	Proper calibrated and suitable running equipment	Checklist Winch	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	W	--
8.2.3.3	Pulling	Visual inspection of small equipment and tools	Each cable run, prior to work	Certified and suitable small equipment and tools	Checklist Tools	Signed checklist tools	Supervisor	Yes	E	M	M	--
8.2.3.4	Pulling	Functionality checks Cable Drum	Each cable run, prior to work	Properly running cable drum, equipment to support drum handling	Checklist cable drum	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	W	--

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No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.2.4	Pulling	Visual inspection of Platform after completion of work	After mechanical completion	No damages to Platform. (Representatives have walked together after completion of work)	Checklist As-Found	Signed checklist (As-found) and picture evidence	Supervisor	Yes	E	H	W	-

8.3 ITP – IPC INSTALLATION WORKS

8.3.1 ITP – Cable Installation Works

No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.3.1.1	Mechanical Completion	Visual Inspection	Each Core before Termination	Works have been installed as per the procedure and manuals	IPC Installation RAMS	Signed mechanical completion	HV Technician	Yes	E	H	W	-
8.3.1.2	Mechanical Completion	Insulation resistance	Each Core before Termination	@ 5kV no breakdown within 1 min >= 100MΩ	ANSI NETA ATS-2009	Test report	HV Technician	Yes	E	H	W	-

8.4 ITP – IPC CABLE ACCESSORIES INSTALLATION WORKS

8.4.1 ITP – IPC Termination and Earthing of T-CONNECTORS AT TRANSFORMER/GIS

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No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.4.1.1	Termination and earthing	HV Cable routing and cleating	Each Core	Works have been installed as per Ellis Cleat Installation Manual, including Drawing(s).	Installation RAMS	Signed Mechanical Completion checklist	Supervisor	Yes	E	R	W	--
8.4.1.2	Termination and earthing	HV Termination GIS	Each Core	Works have been installed as per Pfisterer Assembly Instruction and Part List	Installation RAMS Pfisterer Assembly instruction and Part List	Signed Mechanical Completion	HV Jointer	Yes	E	R	W	--
8.4.1.3	Termination and earthing	HV Termination Pfisterer Joints	Each Core	Works have been installed as per Assembly Instruction and Part List	IPC Installation RAMS Assembly instruction and Part List	Signed Mechanical Completion checklist	HV Jointer	Yes	E	R	W	--

8.4.1.4	Termination and earthing	HV Termination Transformer	Each Core	Works have been installed as per Assembly Instruction and Part List	IPC Installation RAMS Assembly instruction and Part List	Signed Mechanical Completion checklist	HV Jointer	Yes	E	R	W	--
8.4.1.5	Termination and earthing	Mechanical Completion	Each Cable Route	All Cable Accessories have been installed as per agreed documentation(s)	Contract/ Installation RAMS	Signed Mechanical Completion Checklist	Supervisor	Yes	E	H	W	--

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8.5 ITP – TESTING WORKS

8.5.1 ITP – TESTING WORKS PRIOR TERMINATION WORKS

No	Process step	Description	Frequency	Acceptance Criteria	Standard/Internal reference	Verifying Records	Responsible Person	As-Built Doc.	Subc.	Contr.	CTR	TPI
8.5.1.1	Testing	Phase order check	Each core before Termination	Identification of phase per cable	L1(red), L2(yellow), L3(blue)	Signed Pre-Termination Test Sheet	HV Technician	Yes	E	H	W	-
8.5.1.2	Testing	Insulation resistance	Each core before Termination	@5kV no breakdown within 1 min ≥ 100MΩ.	ANSI NETA ATS-2009	Signed Pre-Termination Test Sheet	HV Technician	Yes	E	H	W	-
8.5.1.3	Testing	TDR	Each core before Termination	Core continuity	IEC 60840	Signed Pre-Termination Test Sheet	HV Technician	Yes	E	H	W	-

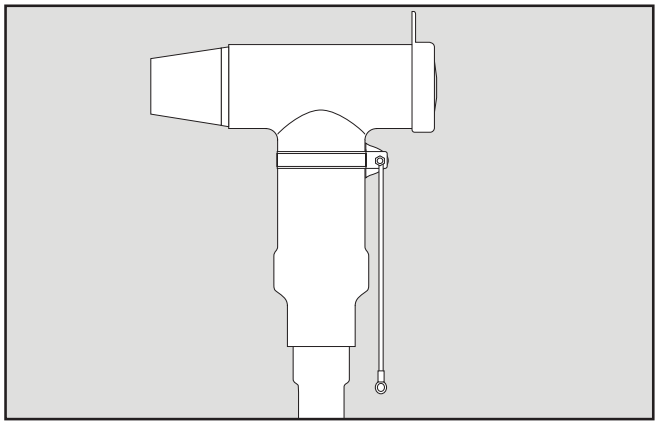
8.6 INSTALLATION INSTRUCTIONS RSTF-72C

INSTALLATION INSTRUCTIONS

EPP-3755-3/24

RSTF

Screened Separable Coupling Connector 1250 A for RSTF Base connectors in Accordance to EN 50673, and Single Core Polymeric Insulated Cable with Cu-Wire Shield and Laminated Copper or Aluminum Foil up to 72.5 kV



TE's Raychem Cable Accessories

SAFETY WARNING

It is essential to observe the applicable safety regulations for working with high voltage equipment.

For precise safety information please contact the responsible authority.

Please dispose of all waste according to environmental regulations.

For more information: te.com/energy

Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
Finsinger Feld 1
85521 Ottobrunn/Munich, Germany
Tel: +49-89-6089-0
Fax: +49-89-6096-345

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, TE Connectivity has no control over the field conditions which influence product installation.
It is the user's responsibility to determine the suitability of the installation method in the user's field conditions.
TE Connectivity's only obligations are those in TE Connectivity's standard Conditions of Sale for this product and in no case will TE Connectivity be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products.
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General Instructions

Before Starting

- Check the kit label and the title of the installation instructions to prove that the cable accessory you are going to use matches the cable.
- Make sure the cable is properly sealed.
- Make sure the cable is in the final installation position.
- Make sure the cable is straight at the jointing position.
- Check the position of the cables to be in alignment to the final position of the accessories.
- Make sure the joint bay/installation area provides adequate space for the cable components to be parked on either cable for later use during the installation.
- The joint bay/Installation area must be kept clean and dry during installation. For outdoor installation use tent or other appropriate shelter.
- Carefully read and follow the steps in the installation instructions. Components or working steps may have been changed/improved since you last installed this product.
- All tools, PPE and apparatus used must be kept clean during the installation.
- Obey relevant and local security and safety rules during the installation.

Shrinking Heat-Shrink Tubing

- Use a propane (preferred) or butane gas torch.
- Ensure the torch is always used in a well-ventilated environment.
- Adjust the torch to obtain a soft blue flame with a yellow tip. Pencil-like blue flames should be avoided.
- Keep the torch aimed in the shrink direction to preheat the material.
- Keep the flame moving continuously to avoid scorching the material.
- Clean and degrease all parts that will come into contact with adhesives.
- If a solvent is used follow the manufacturer’s handling instructions.
- Start shrinking the tubing at the position recommended in the instructions.
- Ensure that the tubing is shrunk smoothly all around before continuing along the cable.
- Tubing should be smooth and wrinkle free with inner components clearly defined.

Stripping the Cable

Use appropriate stripping tools for smooth and even insulation diameter.
Adjust the stripping tool to the thickness of the semi-conductive layer. Avoid removing too much of the insulation. Polish the stripped surface by hand using the supplied abrasive paper beginning with the lowest grid size, or by an appropriate sanding machine and abrasive paper and grades. The surface of the insulation must be even and free of all traces of conductive material.

Cables with Segmented Conductors

All cut back dimensions and information given in this instructions document refer to cables with non-segmented conductors only. In case of cables with segmented conductors, all insulation or conductive materials have to be removed from the conductor. If the removal of these materials require a longer cut back of the cable insulation, this length needs to be added to the cable cut back dimensions mentioned in the instructions.

NOTE

Special instructions for segmented conductors are available on request.

Table 1

Cross Section	Voltage Class	Ø Core Insulation	
mm²	(U_m)/kV	min	max
See cable lug marking	72.5	See stress cone adapter marking	

RSTF Tool Checklist

In order to install RSTF base and coupling connectors, the following tools are required:

- Heating device and slide rails (for cable straightening)
- Heat gun or torch (for cables with Aluminum laminated sheath only)
- Ligarex pliers (for cables with Aluminum laminated sheath only / TE Connectivity ordering reference IT-1000-004)
- Suitable cable screen removal tool that can remove screen down to a distance of 65 mm from the oversheath
- Suitable cable Insulation removal tool
- Torque wrench
- 8 mm socket (for cables with metal tape/foil shield only)
- 10 mm socket (for cables with Cu-wire shield only)
- 13 mm socket
- 24 mm socket
- 24 mm deep socket (for coupling connector installations only)
- 8 mm Allen bit (for base connector installations only)
- 17 mm Allen bit (for coupling connector installations only)
- 0.4 mm fixed blade scoring tool

A. Straightening and Heating of the Cable

Before starting the cable preparation, train the cable end in the straight installation position and fix it.

The cable needs to be heated and straightened for the length of complete Installation.

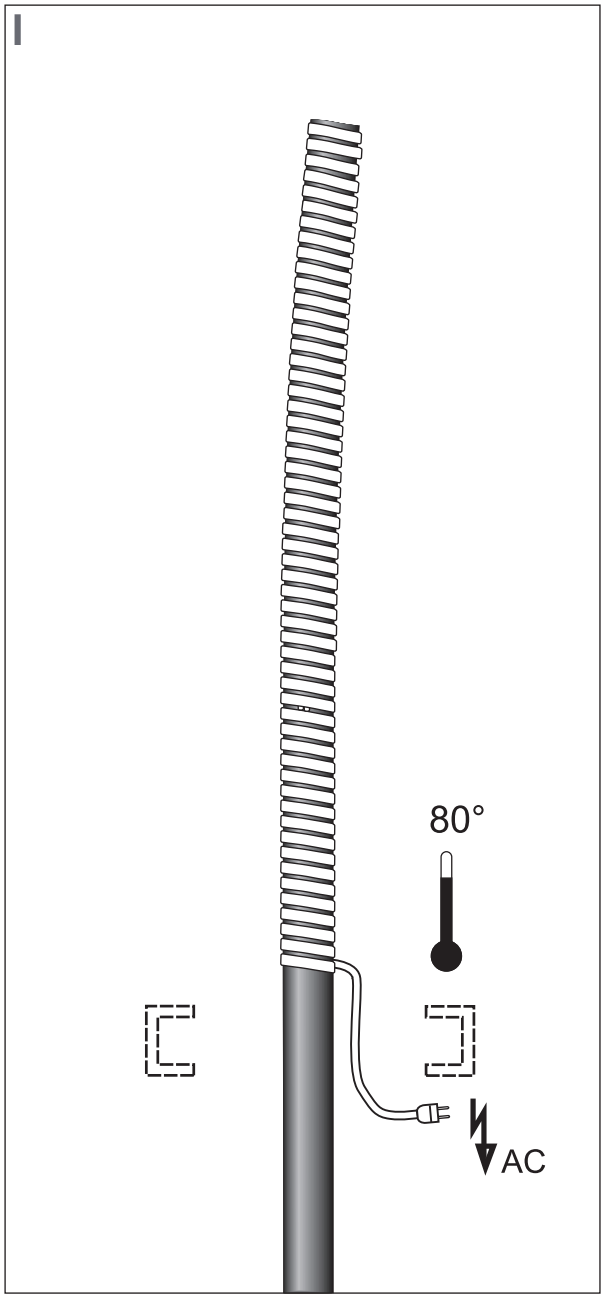
In case of graphite coating cover the cable with one layer of crepe paper.

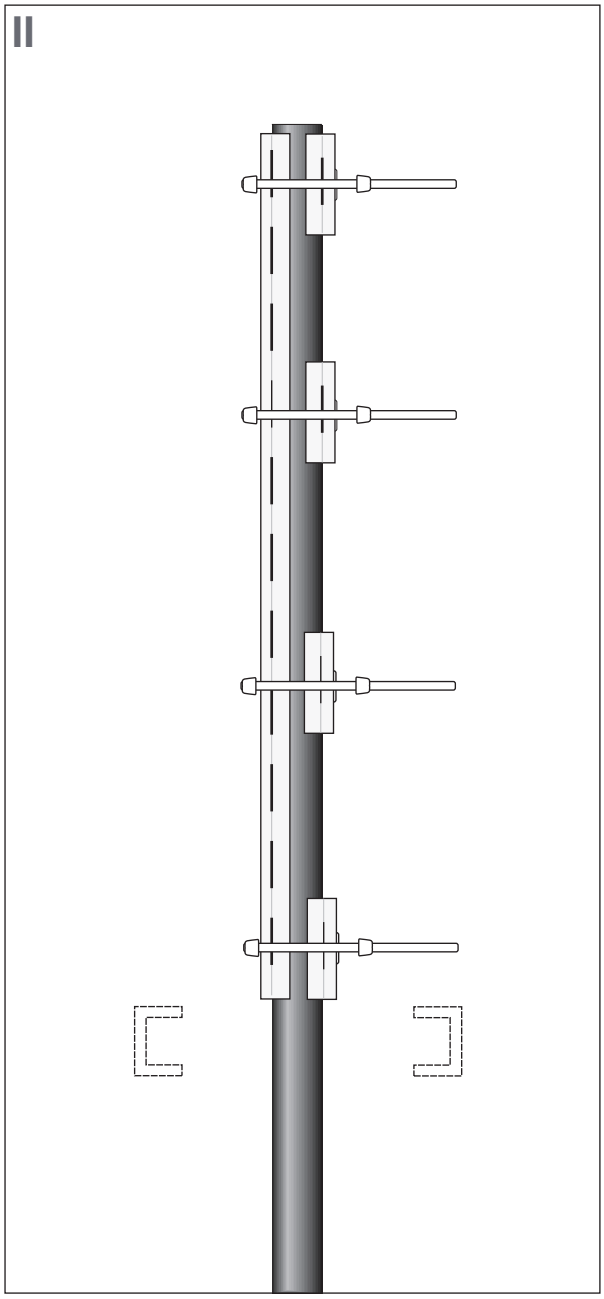
Degrease and clean the oversheath.

Heat the cable by applying a heating device to the oversheath as shown in the TABLE BELOW.

Before stripping to the required dimensions, the cable needs to be cooled down to ambient temperature using slide rails.

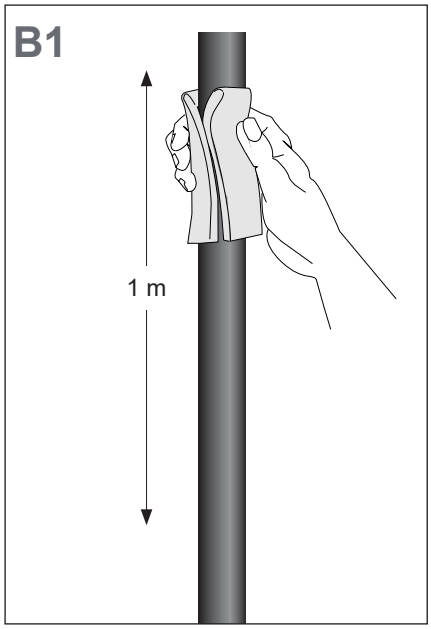
Cable Cross Section	Heating Time/ Temperature
up to 400 mm^2	4 h / 80 °C
up to 1200 mm^2	5 h / 80 °C





B. Marking Reference Lines

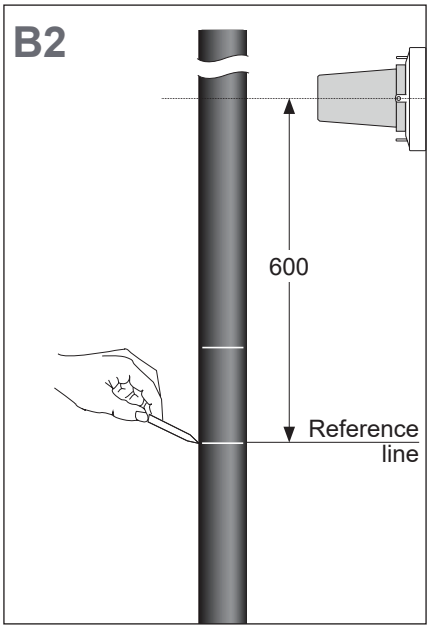
For switchgear connectors: Before starting, place cable cabinet grommets.



Remove the graphite coating or semiconductive layer (if any) over a length of 1m from the center of the bushing.

Clean and degrease the oversheath with solvent wipe.

Do a resistance test to confirm all semi-con traces have been removed.



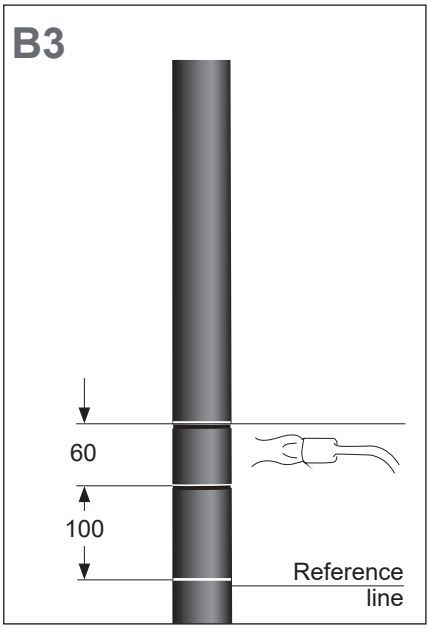
Position the cable with sufficient overlap to the bushing centre.

Mark the cable core at distance 600 mm below the bushing centre **Reference line**.

In case of waterblocked conductor the cutting length should be 150 mm longer than the length given in the picture.

ATTENTION

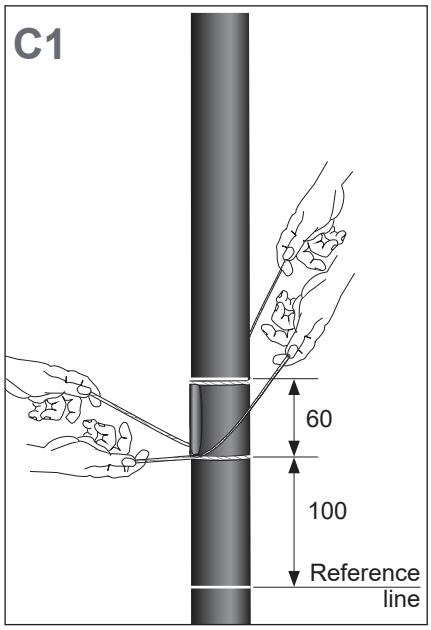
For the Switchgear terminations, the cable must be pulled at least 250mm more than the bushing centre position, so the wires screen have sufficient length for connecting to the switchgear earthing bar.



Mark a 60 mm segment at a distance of 100 mm above the reference line.

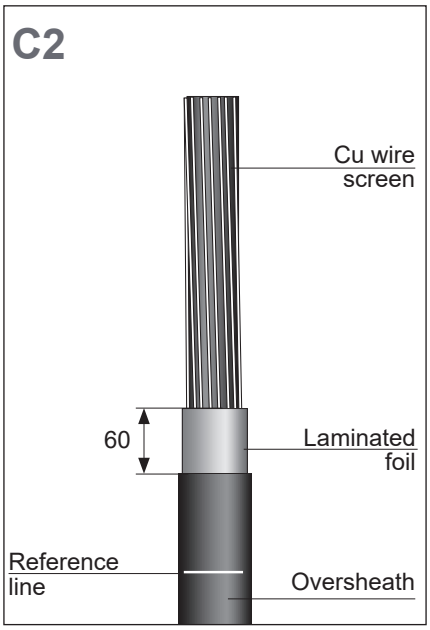
Heat the 60 mm wide segment with a propane flame or heat gun until it is soft.

C. Preparation of the Cable Screen/Sheath



With the yellow aramid string, cut through the oversheath.

Remove the marked oversheath segment from the laminated foil by slicing it away bit by bit with the string as shown in the drawing.



Place 3 layers of copper binding wire on the top edge of the laminated foil.

Remove the oversheath above the 60 mm laminated foil window down to the copper wire screen against the binding wire.

Remove the binding wire from the laminated foil.



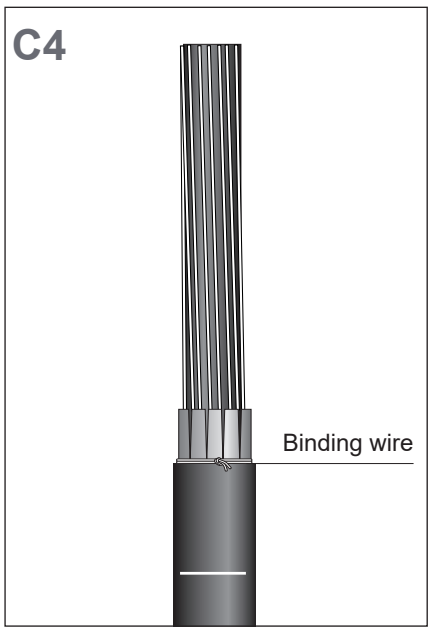
Carefully slice the laminated foil parallel to the cable's axis, creating 15 mm to 20 mm wide strips.

NOTE

Use a fixed blade scoring tool to create the incisions for slicing the strips. Do not cut/damage the insulation screen.

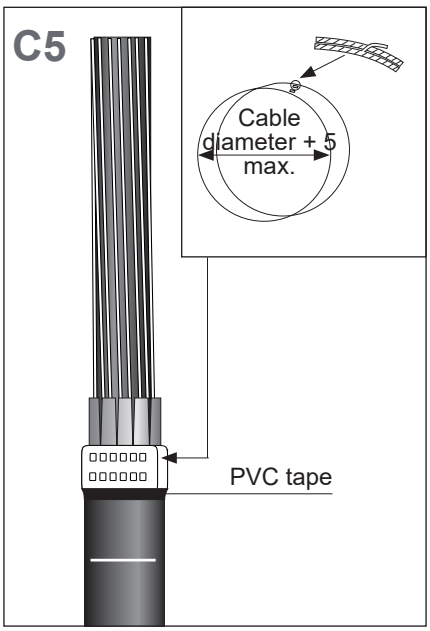
Place 2 windings of binding wire on the laminated foil close to the edge of the oversheath.

Clean and abrade the outer sheath.



Adjust the support ring to a diameter **no greater than 5 mm** wider than the diameter of the cable's oversheath and lock it as shown.

Slide it over the cable and align its top edge with the edge of the oversheath. Fix it to the oversheath with PVC tape as shown.

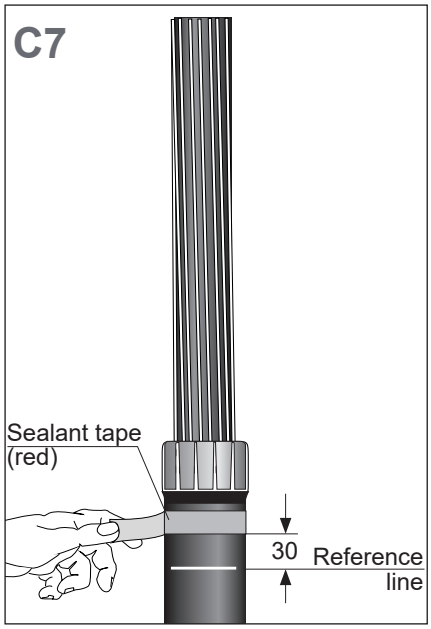


Carefully fold the laminated foil strips over the support ring.

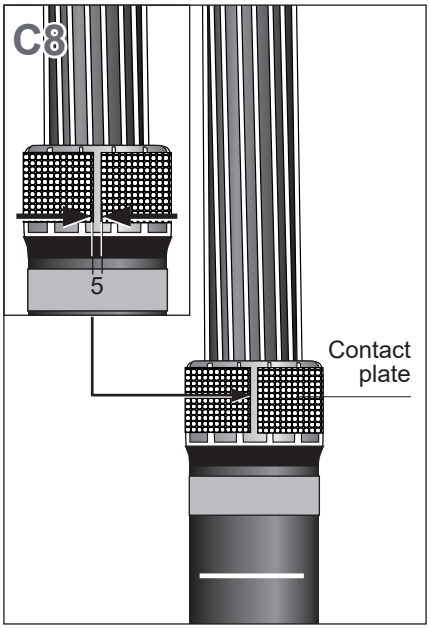
NOTE

Do not rip/tear the strips. In case one strip is ripped/teared, remove additional 50 mm oversheath, and restart from step B2.



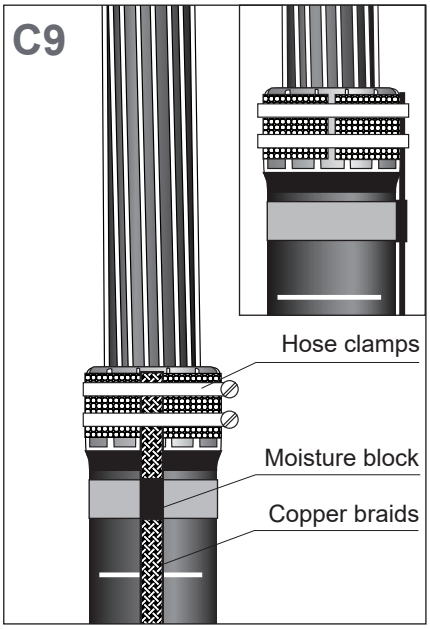


Wrap two turns of sealant tape (red) at a distance of 30 mm above **Reference line** around the cable's oversheath.



Measure the circumference around the support ring and cut the contact plate 5 mm shorter than the measured length.

Carefully bend the contact plate into a round shape until it sits tightly around the support ring. Position it 5 mm below the top edge of the support ring so that it is fully positioned on top of the laminated foil strips.



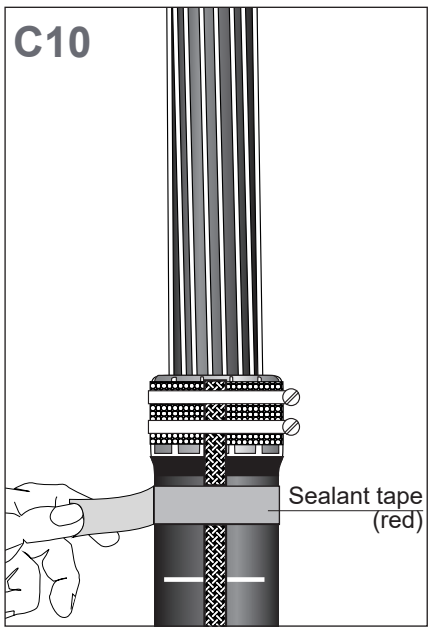
Place the copper braid on top of the contact plate. The moisture block of the braid is positioned on top of the sealant tape. Make sure that the braid is not positioned on the gap of the contact plate.

Fix the braid to the contact plate with 2 hose clamps as shown (one on the top half and one of the bottom half of the contact plate). Use a torque of 7 Nm to tighten up both hose clamps.

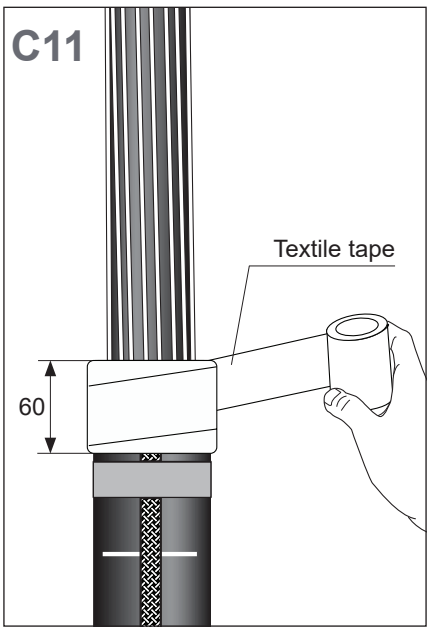
Verify the torque on both hose clamps after tightening.

Fold the excess length of the braid protruding upwards beyond the support ring (if any) over the hose clamps.

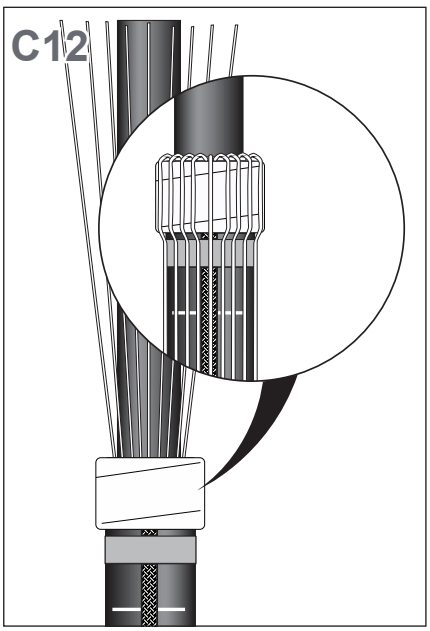
Wrap 2 additional turns of red sealant tape around the cable on top of the copper braid and the other sealant tape layer. Press the layers together to avoid air gaps around the moisture block.

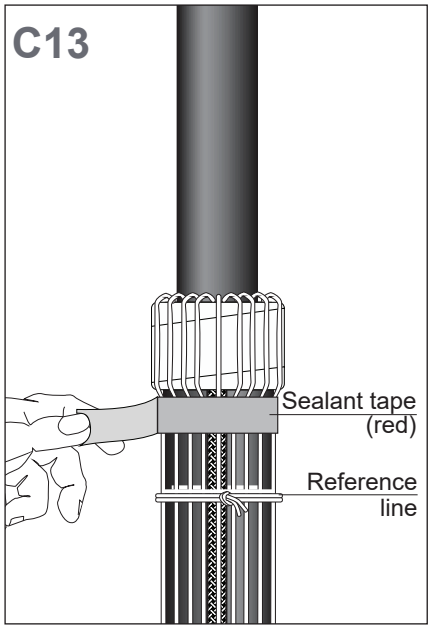


Apply 5 layers of textile tape to cover the support ring and all of the laminated foil over a length of 60 mm as shown. Make sure that all sharp edges are covered.



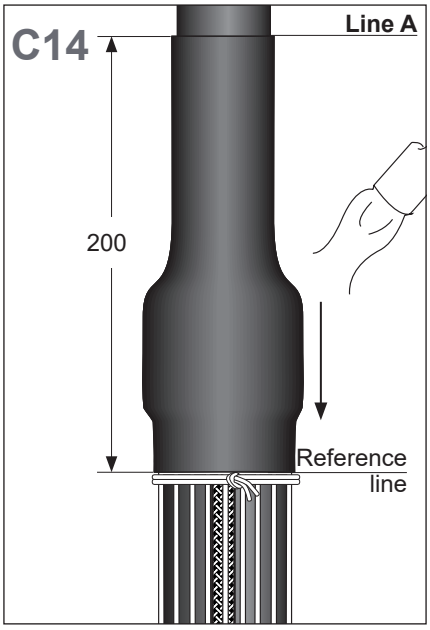
Bend the screen wires back over the textile tape and onto the oversheath. Push them into the sealant tape.





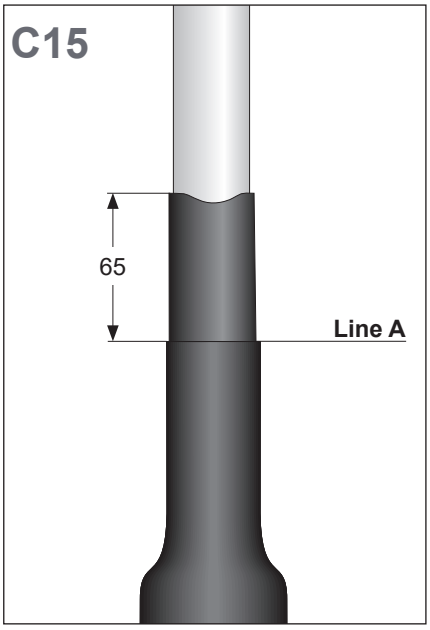
Wrap another 2 turns of red sealant tape around the cable on top of the copper wires and the other sealant tape layers.

Fix the earth lead and copper wires onto the oversheath with a wire binder just below the **Reference line**.



Mark Line A 200 mm up from **Reference line** and start shrinking the tube from the top (**Line A**)

Start shrinking from the **Line A** as shown in the drawing.



Remove the core screen with appropriate screen removal tool according to the drawing.

The surface of the insulation should be free from all traces of conductive material.

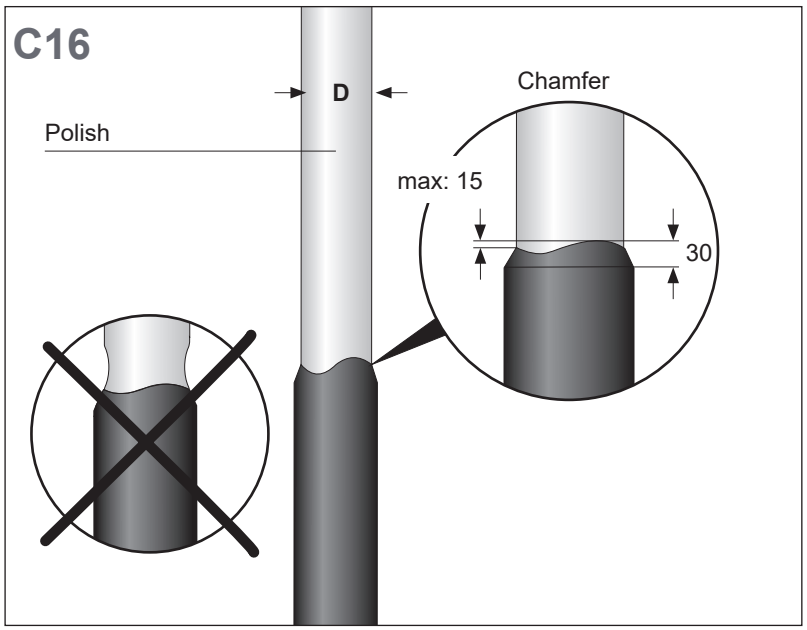
Chamfer the insulation screen

Abrade and smooth the insulation from the screen cut towards the end.

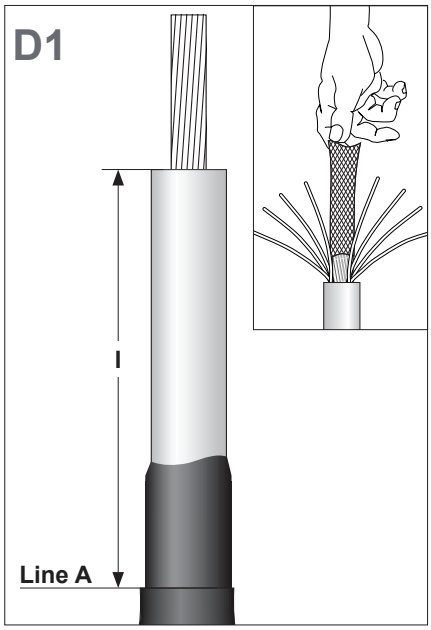
NOTE

Do not nick the insulation.

Make sure the semicon transition wave shape is in accordance with the values shown in the drawing.
Clean and degrease the insulation with the supplied cleanser in direction of the semicon to prevent contamination. Take care to ensure that the diameter of the insulation is not reduced close to the transition to the semiconducting layer.
Check dimension **D**. The finally prepared diameter over insulation shall be within the application range of the stress cone, marked at the rubber body.



D. Insulation Cut-back and Pre-installation

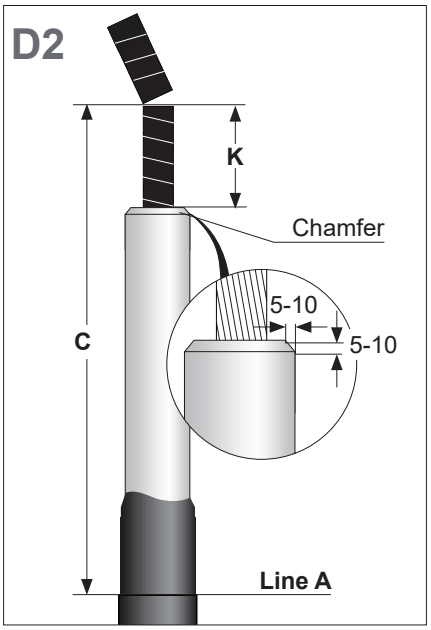


Cut back the insulation according to the dimension **I** (see Table 2). Protect the cable insulation.

Remove longitudinal water blocking material from the conductor (if any) as per instructions given by the cable manufacturer.

Thoroughly relay the conductor strands layer by layer. Take care that the original conductor shape is fully restored.

Protect the conductor with several layers of PVC tape.



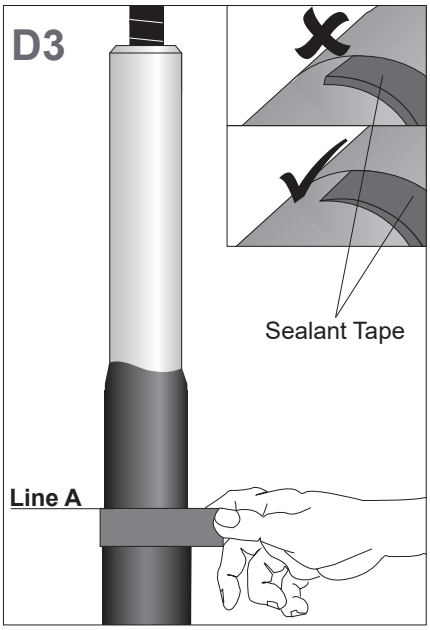
Chamfer the edge of the core insulation with appropriate tool to facilitate pushing on the stress cone adapter.

Protect and cut the conductor on the length **K** (see Table 2)**,** verifier the length **C** (see Table 2)**.**

Remove any sharp edges and thoroughly clean the insulation and core screen.

NOTE

Make sure all dimensions are according to the Table 2.

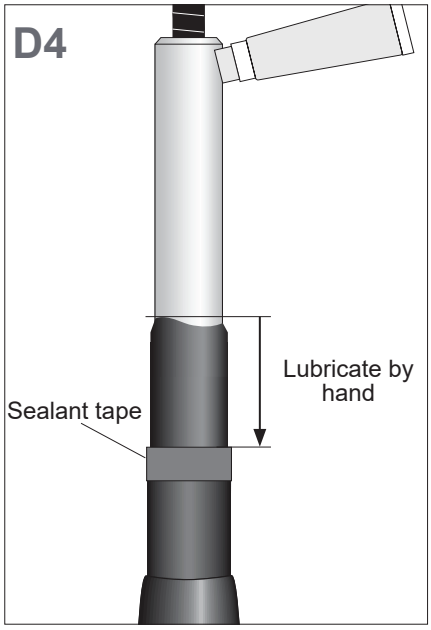


Apply one sealant tape (grey) with slight tension and its top edge aligned with **Line A** on the end of the outer sheath.

Flatten the ends of the sealant tape and push them together to avoid air gaps.

Table 2

Cable Lug	C (mm)	K (mm)	I (mm)
BLMC-1200	345	110	235
BLMC-800/1000	340	90	250
BLMC-500/630 **BLMC-150/400**	345	70	275
BLMC-95/240	350	60	290



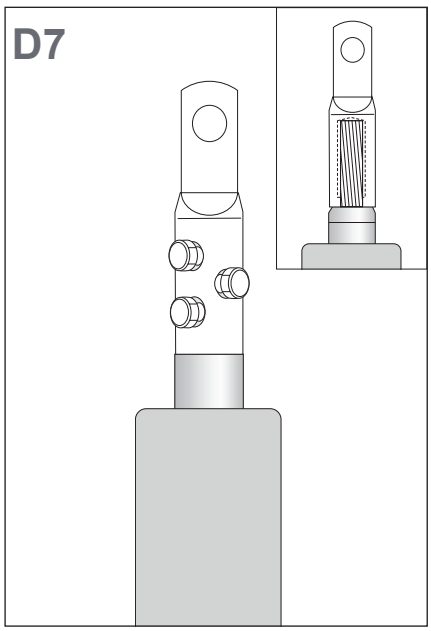
Gently lubricate the outer surface of the core insulation, semiconductive insulation screen and sealing tape with a thin layer of assembly lubricant.

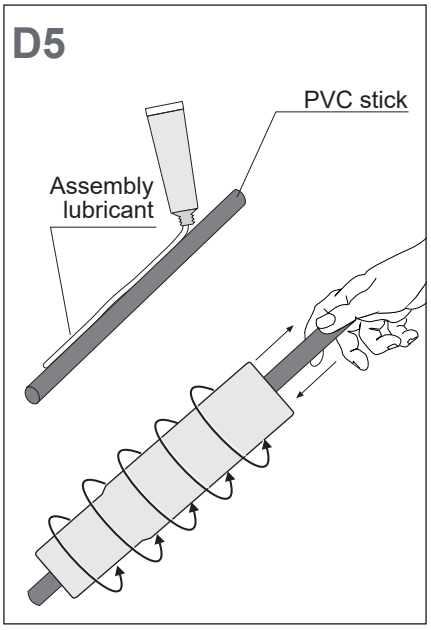
Apply the lubricant layer on cable insulation, semiconductive screen and sealing tape by hand as shown.

Clean and brush the conductor.
Position the cable lug on the conductor so that the end of the conductor touches the end of the lug's barrel.
Align the palm hole with the bushing face prior to sharing the bolts.
Install the cable lug.
Tighten the set of bolts gradually in several equal steps starting at the bolts closest to the insulation cut. Continue until the heads shear off.
Remove any sharp edges with sandpaper provided in the kit.

NOTE

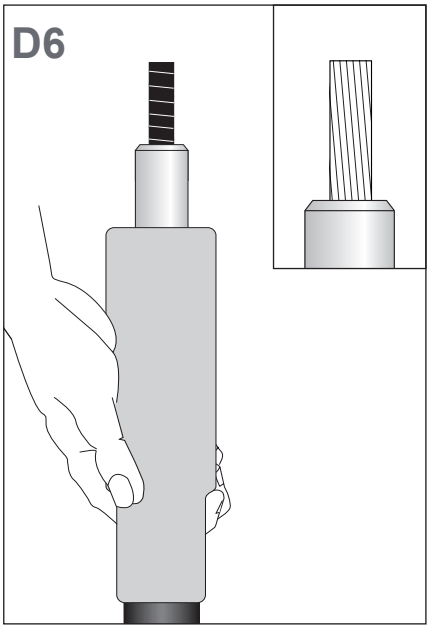
Pre-Installation completed.





Clean the PVC stick and apply assembly lubricant as shown.

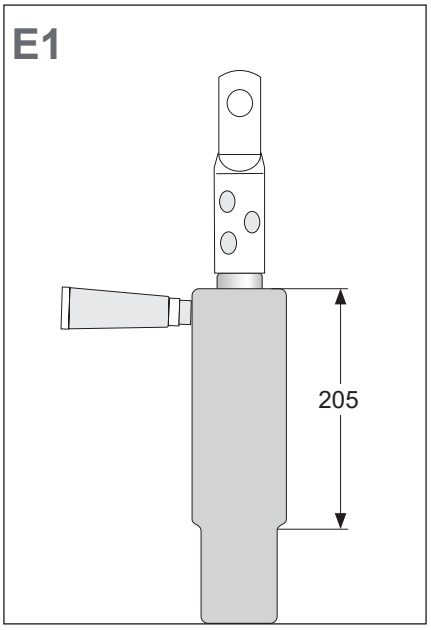
Slide the PVC stick into the stress cone and turn the stress cone adapter to fully cover the inner surface of the stress cone adapter with lubricant.



Push the stress cone in one sequence with a twisting movement onto the insulation until the inner collar of the stress cone stops at the oversheath.

Afterwards, remove the PVC protection wrap from the conductor.

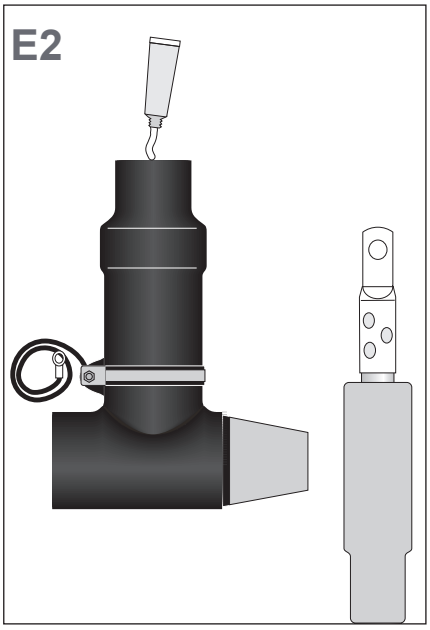
E. Installation of Coupling Connector Body



NOTE

Continue here for completion of pre-installed RSTF coupling connector.

Clean the surface of stress cone and apply a thin layer of lubricant onto the outer surface over a length of 205 mm with the sponge top as shown in the drawing.



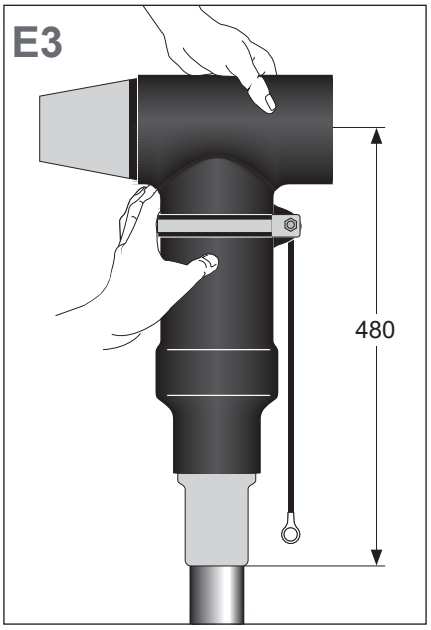
Clean and degrease the bottom end of the screened connector body and apply a thin layer of lubricant onto the inner surface without the sponge top as shown.

NOTE

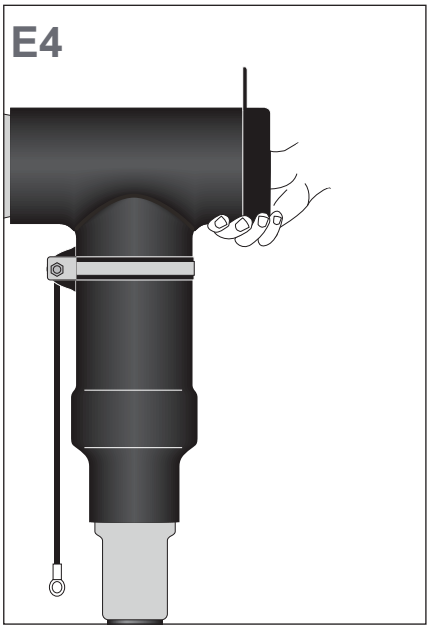
Use one way glove and PVC stick to evenly lubricate the entire inner surface.

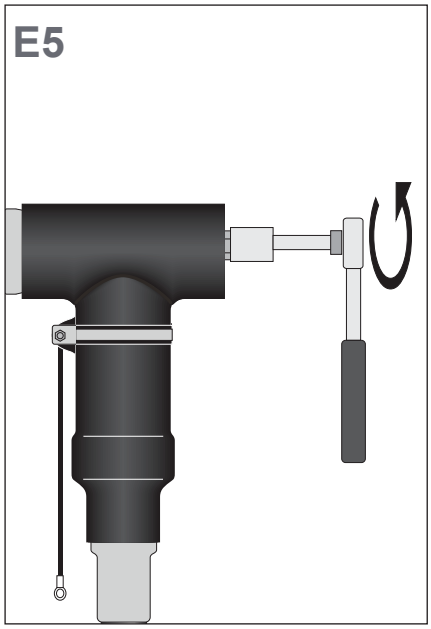
Push screened connector body with no interruption onto the stress cone.

Make sure the measurement from center of the bushing and end of stress cone is approximately 480 mm.

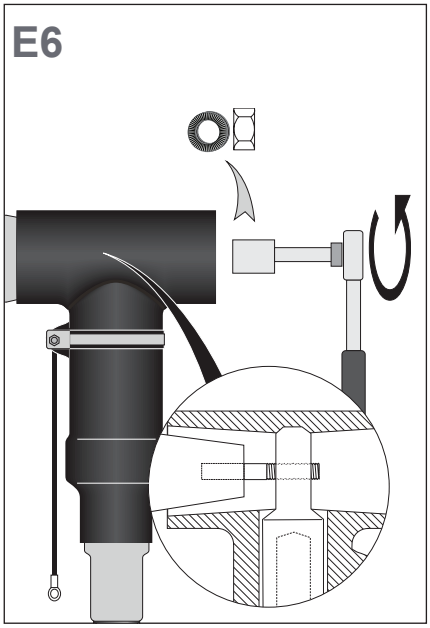


Remove the conductive endcap from the installed connector and save it in a clean container.



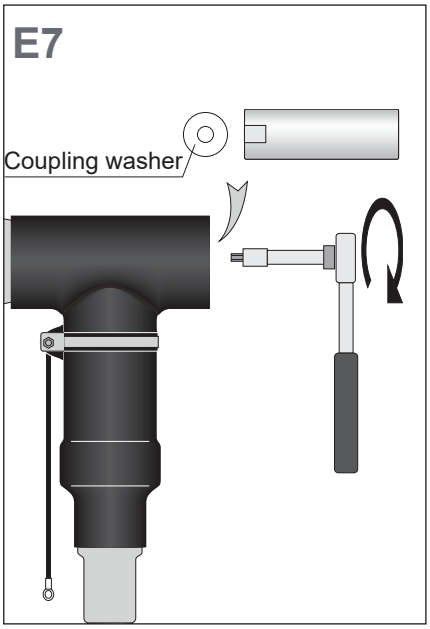


Remove the back plug from the installed connector and save it in a clean container.



Unscrew the M16 hexagon nut and M16 washer. Take nut and washer out of the connector and save it in a clean container.

Clean the inner surface of the base connector's rear end and lubricate it again with assembly grease.

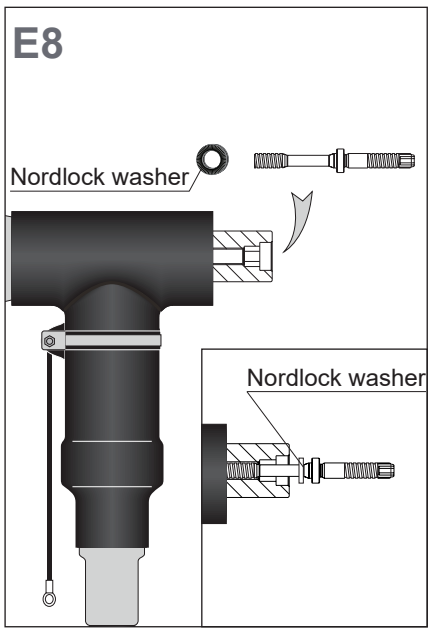


Insert the coupling washer and coupling rod.

Tighten the coupling rod onto the stud with an allen key (17) at a torque of **100 Nm**.

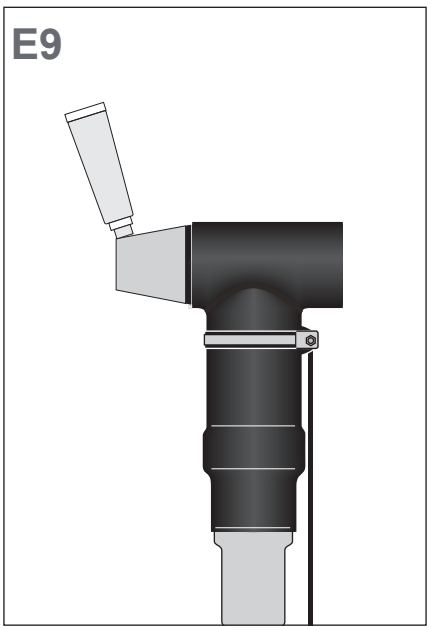
Slide the nordlock washer over the short thread of the coupling pin.

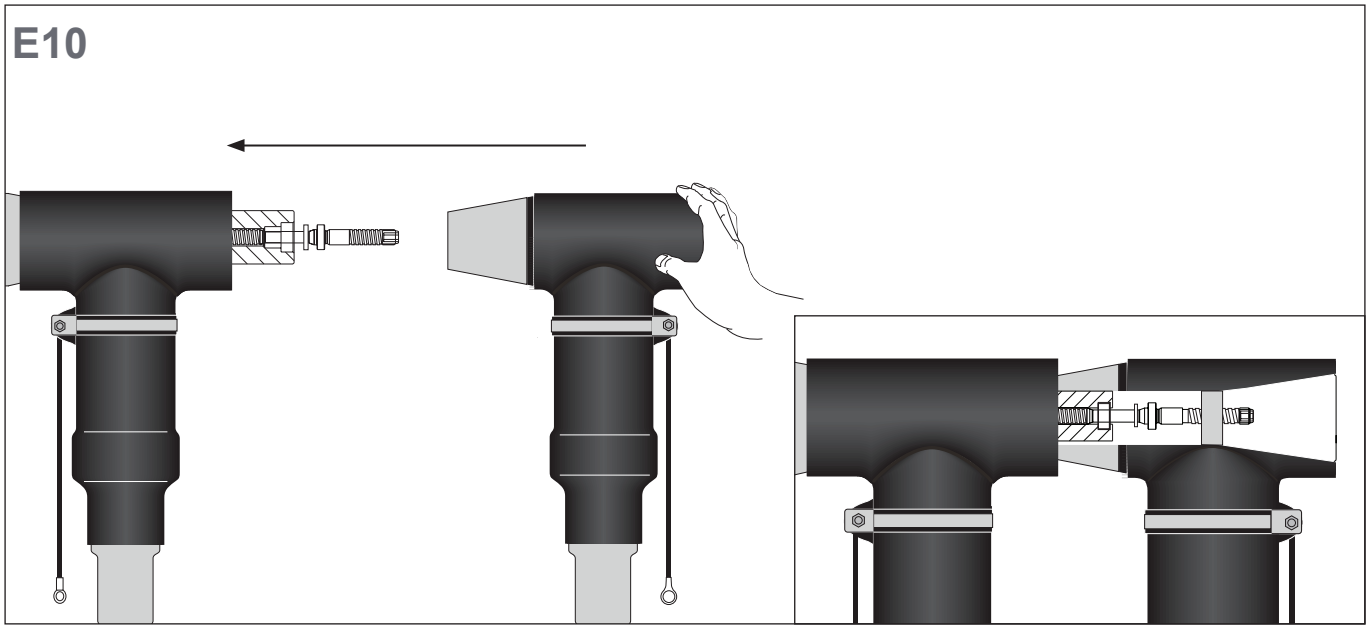
Then screw the coupling pin into the coupling rod by hand until the short thread **completely** entered the coupling rod.



Clean the conical front end of the coupling connector and apply a thin layer of lubricant onto the outer surface of the cone with the sponge top.

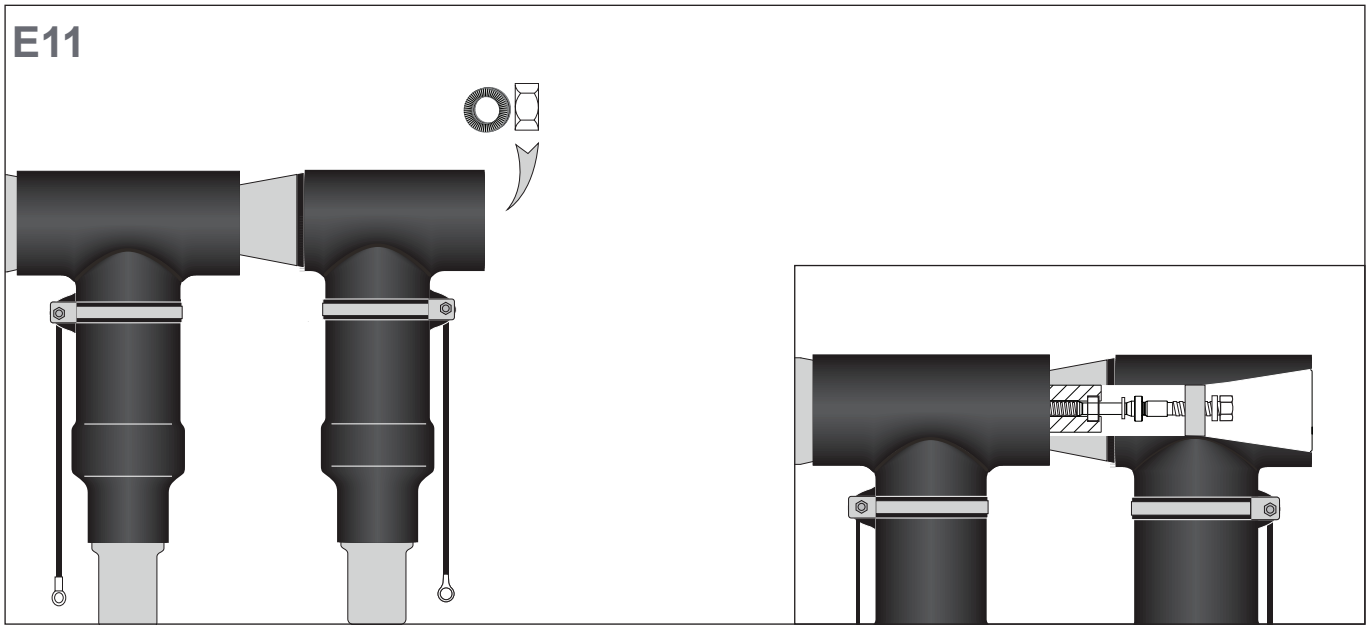
Continue **immediately** with the next step.

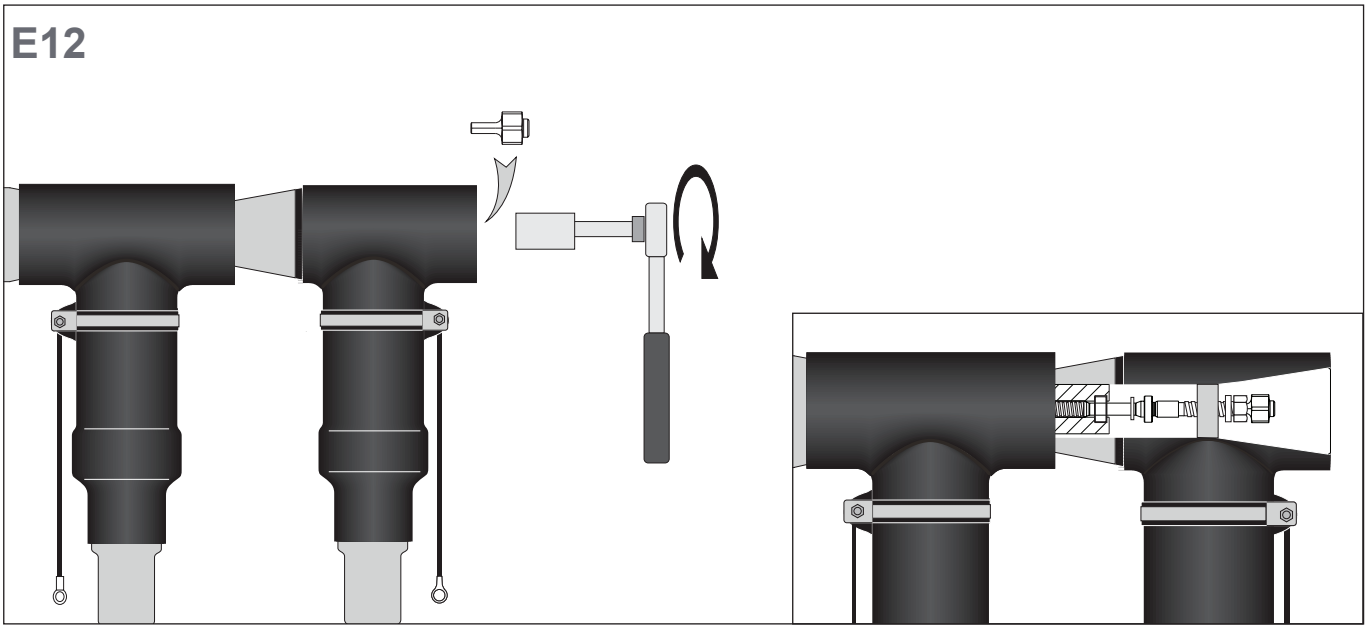




Align the conical front end of the coupling connector with the rear end of the already installed base connector and push the coupling connector over the coupling pin and coupling rod into the base connector until the long thread of the coupling pin protrudes from the lug inside the coupling connector.

Screw the saved nordlock washer and hex nut (unscrewed in step **27**) on the coupling pin by hand until the nut sits entirely on the thread.





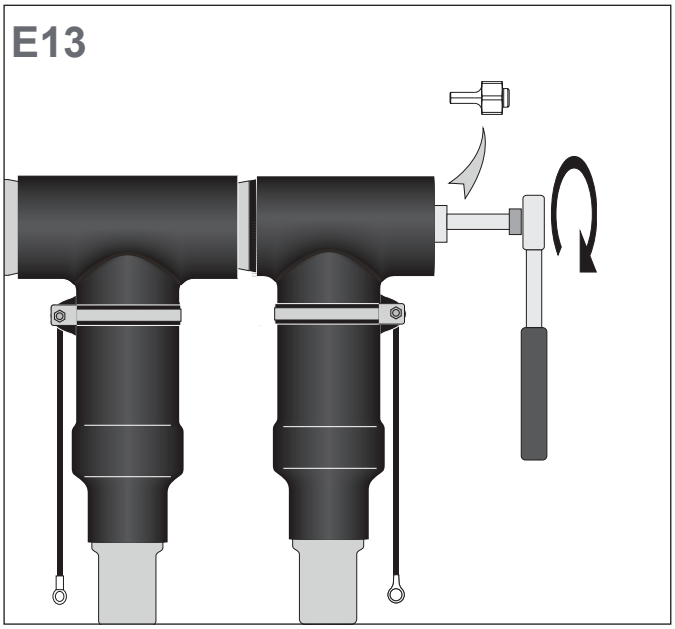
Insert the hex adapter into the coupling pin and align the flats of the hex nut with the hex adapter.

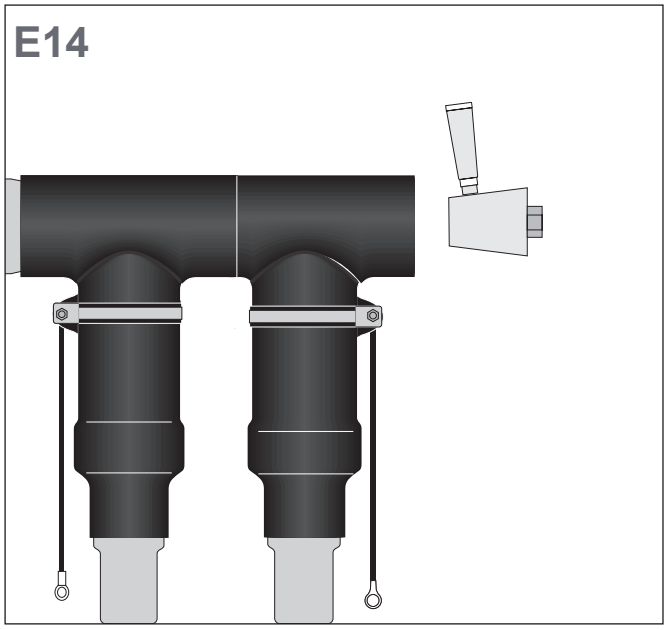
Use a torque wrench with a 24 mm deep socket and put it on the hex adapter and the hex nut.

Then tighten the coupling pin at a torque of **125 Nm**.

Remove the hex adapter from the coupling pin.

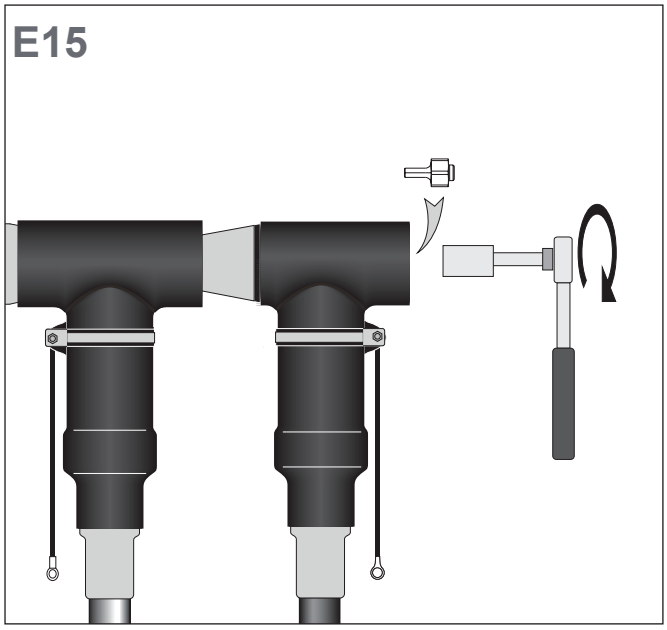
Then use the torque wrench to tighten the hex nut itself at a torque of **100 Nm**.





Clean the inner surface of the coupling connector's rear end and apply a thin layer of assembly lubricant.

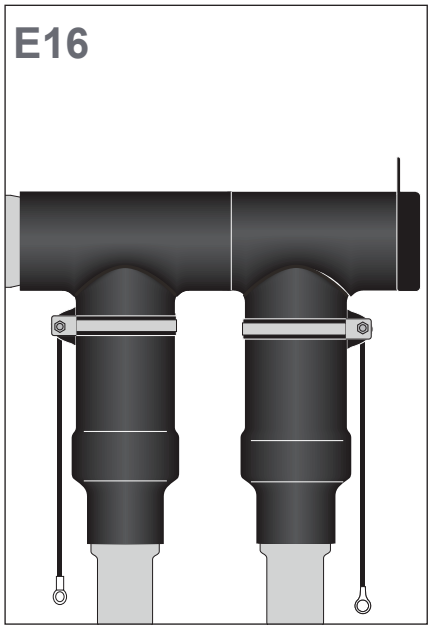
Do the same with the conical interface of the back plug as shown.



Push the back plug into the connector body until it reaches the thread of the coupling pin. Then screw it in using a spanner (24 mm). Tighten it at a torque of **70 Nm**.

Turn the covering cap inside out and push its pin into the socket in the backplug´s electrode.

Then flip the sidewall of the cap onto the connector.

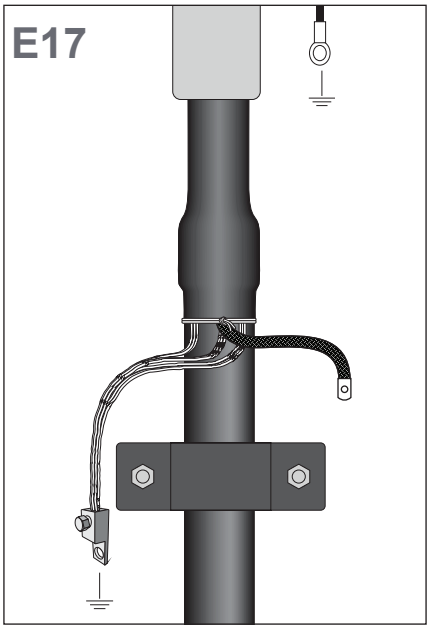


Ensure that the grounding lead of the RSTF body is fastened tightly.

Connect each of the grounding adapters with an insulated grounding cable.

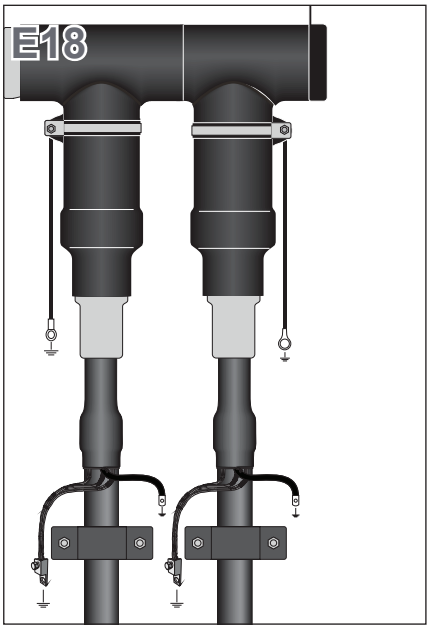
Perform connections to ground (RSTF body, Cu-wires and laminated foil). For switchgear connectors: Use 70 Nm for M12 connections.

For good mechanical strength fasten protected core as close as possible to the connector.



Screened separable connector installation completed.

Complete and sign the enclosed Installation Protocol.



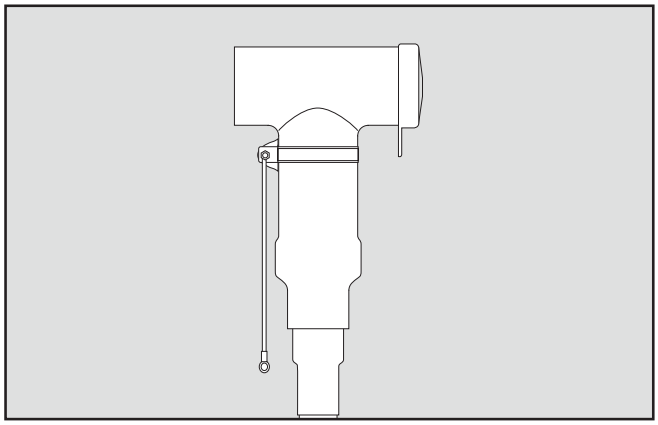
8.7 INSTALLATION INSTRUCTION RSTF-72B

INSTALLATION INSTRUCTIONS

EPP-3754-3/24

RSTF

Screened Separable Connector 1250 A for Bushing Profile “F” in Accordance to EN 50673, and Single Core Polymeric Insulated Cable with Cu-Wire Shield and Laminated Copper or Aluminum Foil up to 72.5 kV



TE’s Raychem Cable Accessories

SAFETY WARNING

It is essential to observe the applicable safety regulations for working with high voltage equipment.

For precise safety information please contact the responsible authority.

Please dispose of all waste according to environmental regulations.

For more information: te.com/energy

Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
Finsinger Feld 1
85521 Ottobrunn/Munich, Germany
Tel: +49-89-6089-0
Fax: +49-89-6096-345

The Information contained in these installation instructions is for use only by installers trained to make electrical power installations and is intended to describe the correct method of installation for this product. However, TE Connectivity has no control over the field conditions which influence product installation.
It is the user’s responsibility to determine the suitability of the installation method in the user’s field conditions.
TE Connectivity’s only obligations are those in TE Connectivity’s standard Conditions of Sale for this product and in no case will TE Connectivity be liable for any other incidental, indirect or consequential damages arising from the use or misuse of the products.
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General Instructions

Before Starting

- Check the kit label and the title of the installation instructions to prove that the cable accessory you are going to use matches the cable.
- Make sure the cable is properly sealed.
- Make sure the cable is in the final installation position.
- Make sure the cable is straight at the jointing position.
- Check the position of the cables to be in alignment to the final position of the accessories.
- Make sure the joint bay/installation area provides adequate space for the cable components to be parked on either cable for later use during the installation.
- The joint bay/Installation area must be kept clean and dry during installation. For outdoor installation use tent or other appropriate shelter.
- Carefully read and follow the steps in the installation instructions. Components or working steps may have been changed/improved since you last installed this product.
- All tools, PPE and apparatus used must be kept clean during the installation.
- Obey relevant and local security and safety rules during the installation.

Shrinking Heat-Shrink Tubing

- Use a propane (preferred) or butane gas torch.
- Ensure the torch is always used in a well-ventilated environment.
- Adjust the torch to obtain a soft blue flame with a yellow tip. Pencil-like blue flames should be avoided.
- Keep the torch aimed in the shrink direction to preheat the material.
- Keep the flame moving continuously to avoid scorching the material.
- Clean and degrease all parts that will come into contact with adhesives.
- If a solvent is used follow the manufacturer’s handling instructions.
- Start shrinking the tubing at the position recommended in the instructions.
- Ensure that the tubing is shrunk smoothly all around before continuing along the cable.
- Tubing should be smooth and wrinkle free with inner components clearly defined.

Stripping the Cable

Use appropriate stripping tools for smooth and even insulation diameter.
Adjust the stripping tool to the thickness of the semi-conductive layer. Avoid removing too much of the insulation. Polish the stripped surface by hand using the supplied abrasive paper beginning with the lowest grid size, or by an appropriate sanding machine and abrasive paper and grades. The surface of the insulation must be even and free of all traces of conductive material.

Cables with Segmented Conductors

All cut back dimensions and information given in this instructions document refer to cables with non-segmented conductors only. In case of cables with segmented conductors, all insulation or conductive materials have to be removed from the conductor. If the removal of these materials require a longer cut back of the cable insulation, this length needs to be added to the cable cut back dimensions mentioned in the instructions.

NOTE

Special instructions for segmented conductors are available on request.

Table 1

Cross Section	Voltage Class	Ø Core Insulation	
mm²	(U_m)/kV	min	max
see cable lug marking	72.5	See stress cone adapter marking	

RSTF Tool Checklist

In order to install RSTF base and coupling connectors, the following tools are required:

- Heating device and slide rails (for cable straightening)
- Heat gun or torch (for cables with Aluminum laminated sheath only)
- Ligarex pliers (for cables with Aluminum laminated sheath only / TE Connectivity ordering reference IT-1000-004)
- Suitable cable screen removal tool that can remove screen down to a distance of 65 mm from the oversheath
- Suitable cable insulation removal tool
- Torque wrench
- 8 mm socket (for cables with metal tape/foil shield only)
- 10 mm socket (for cables with Cu-wire shield only)
- 13 mm socket
- 24 mm socket
- 24 mm deep socket (for coupling connector installations only)
- 8 mm Allen bit (for base connector installations only)
- 17 mm Allen bit (for coupling connector installations only)
- 0.4 mm fixed blade scoring tool

A. Straightening and Heating of the Cable

Before starting the cable preparation, train the cable end in the straight installation position and fix it.

The cable needs to be heated and straightened for the length of complete Installation.

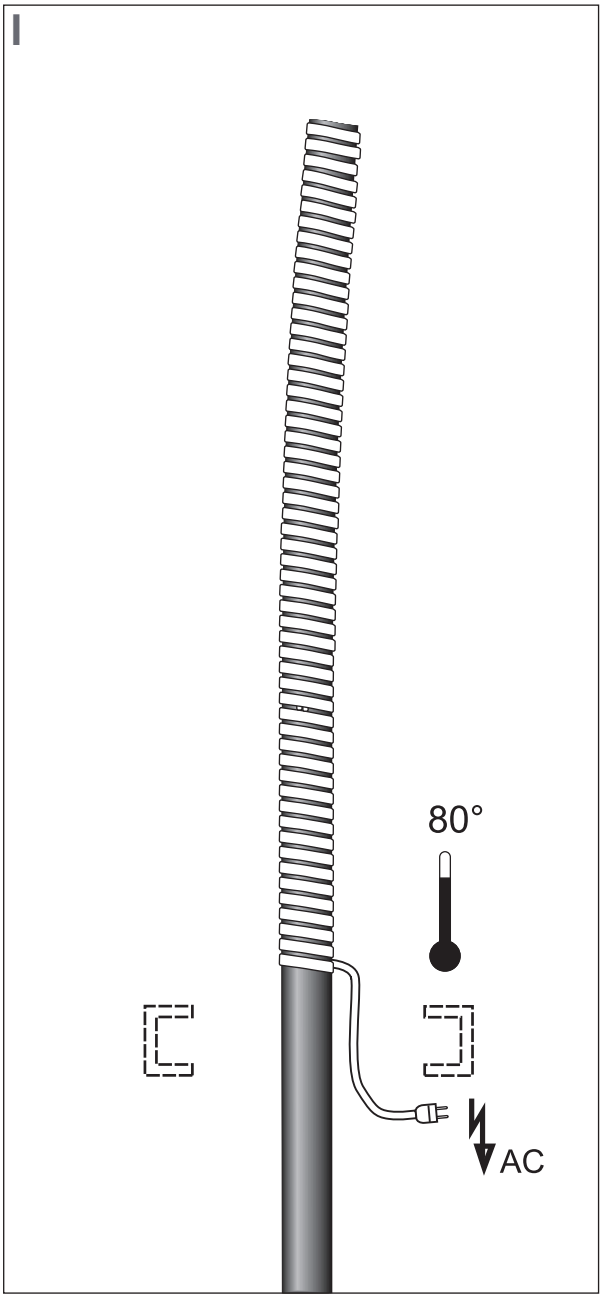
In case of graphite coating cover the cable with one layer of crepe paper.

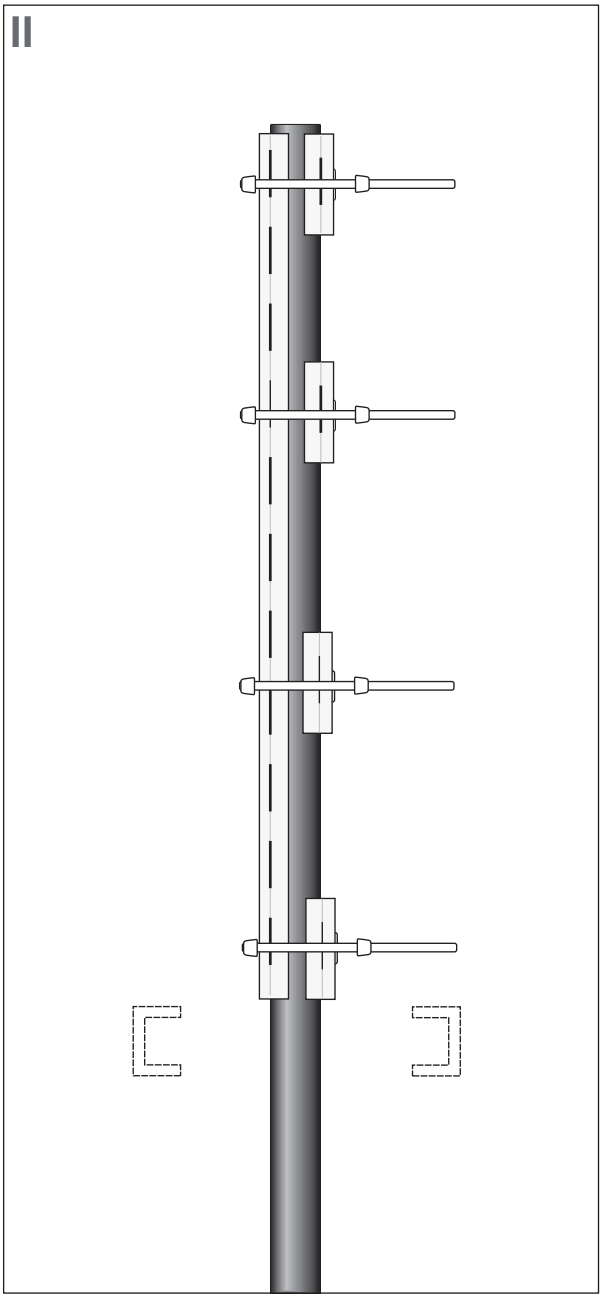
Degrease and clean the oversheath.

Heat the cable by applying a heating device to the oversheath as shown in the TABLE BELOW.

Before stripping to the required dimensions, the cable needs to be cooled down to ambient temperature using slide rails.

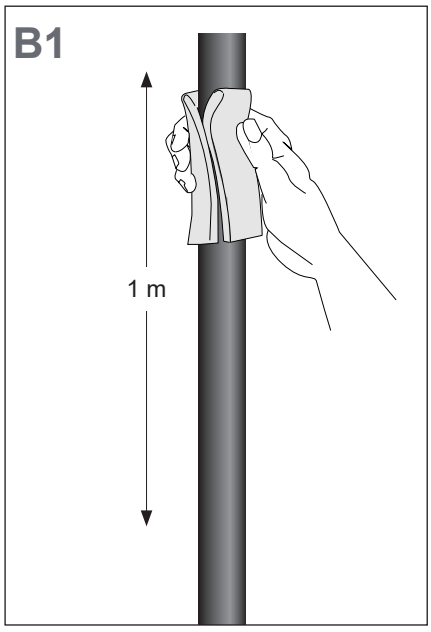
Cable Cross Section	Heating Time/ Temperature
up to 400 mm^2	4 h / 80 °C
up to 1200 mm^2	5 h / 80 °C





B. Marking Reference Lines

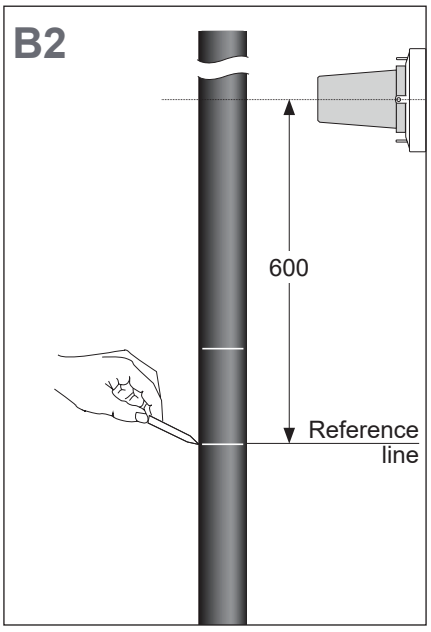
For switchgear connectors: Before starting, place cable cabinet grommets.



Remove the graphite coating or semiconductive layer (if any) over a length of 1m from the center of the bushing.

Clean and degrease the oversheath with solvent wipe.

Do a resistance test to confirm all semi-con traces have been removed.



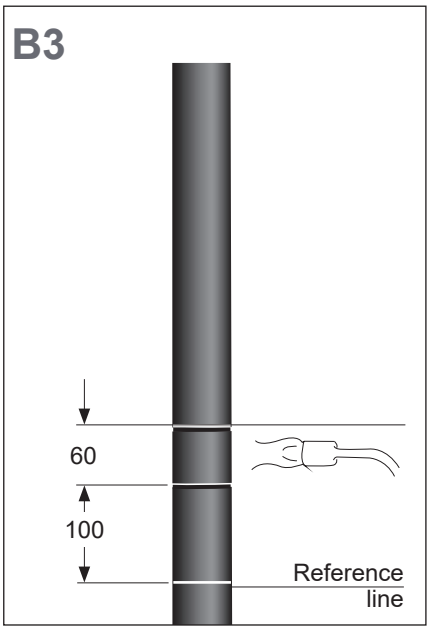
Position the cable with sufficient overlap to the bushing centre.

Mark the cable core at distance 600 mm below the bushing centre **Reference line**.

In case of waterblocked conductor the cutting length should be 150 mm longer than the length given in the picture.

ATTENTION

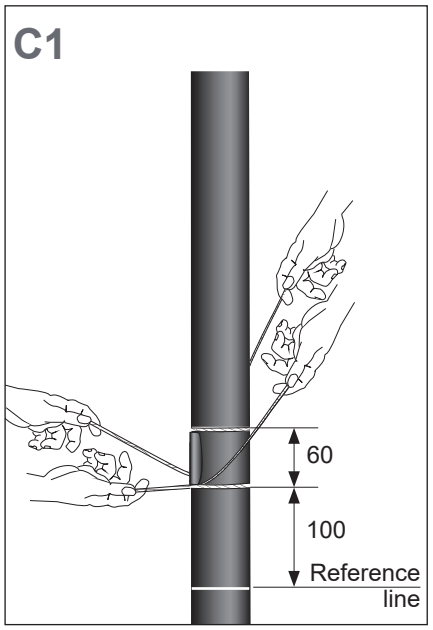
For the Switchgear terminations, the cable must be pulled at least 250mm more than the bushing centre position, so the wires screen have sufficient length for connecting to the switchgear earthing bar.



Mark a 60 mm segment at a distance of 100 mm above the reference line.

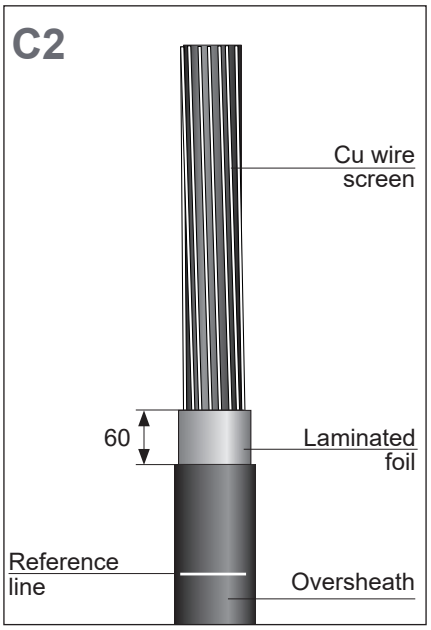
Heat the 60 mm wide segment with a propane flame or heat gun until it is soft.

C. Preparation of the Cable Screen/Sheath



With the yellow aramid string, cut through the oversheath.

Remove the marked oversheath segment from the laminated foil by slicing it away bit by bit with the string as shown in the drawing.



Place 3 layers of copper binding wire on the top edge of the laminated foil.

Remove the oversheath above the 60 mm laminated foil window down to the copper wire screen against the binding wire.

Remove the binding wire from the laminated foil.



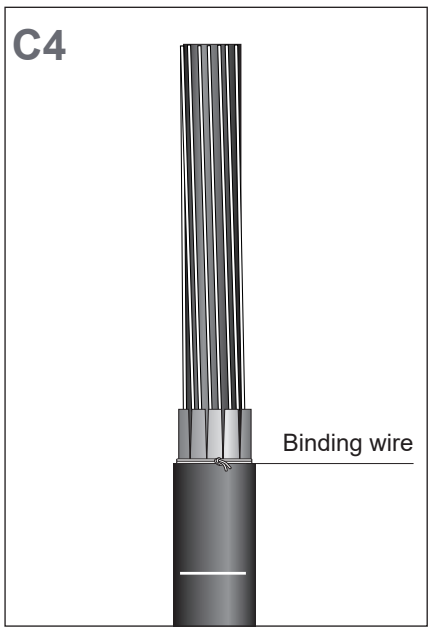
Carefully slice the laminated foil parallel to the cable's axis, creating 15 mm to 20 mm wide strips.

NOTE

Use a fixed blade scoring tool to create the incisions for slicing the strips. Do not cut/damage the insulation screen.

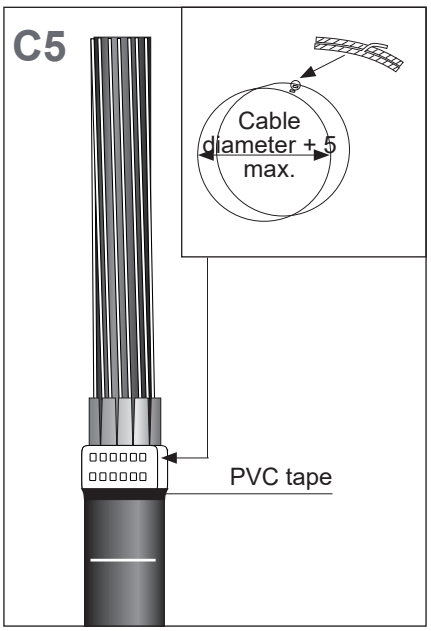
Place 2 windings of binding wire on the laminated foil close to the edge of the oversheath.

Clean and abrade the outer sheath.



Adjust the support ring to a diameter **no greater than 5 mm** wider than the diameter of the cable's oversheath and lock it as shown.

Slide it over the cable and align its top edge with the edge of the oversheath. Fix it to the oversheath with PVC tape as shown.

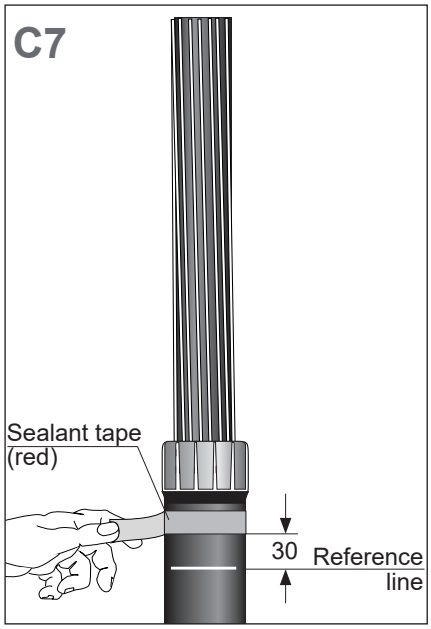


Carefully fold the laminated foil strips over the support ring.

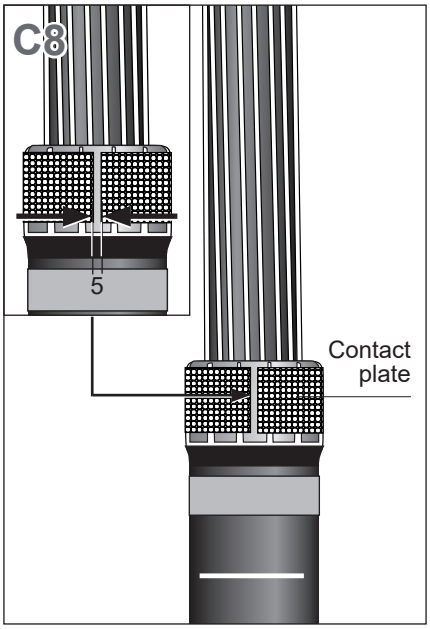
NOTE

Do not rip/tear the strips. In case one strip is ripped/teared, remove additional 50 mm oversheath, and restart from step B2.

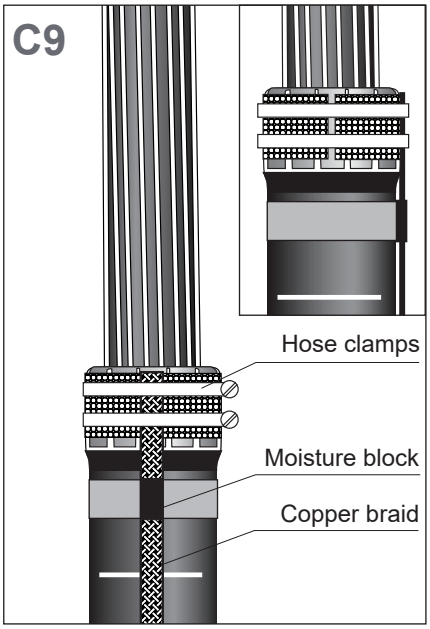




Wrap two turns of sealant tape (red) at a distance of 30 mm above **reference line** around the cable's oversheath.



Measure the circumference around the support ring and cut the contact plate 5 mm shorter than the measured length. Carefully bend the contact plate into a round shape until it sits tightly around the support ring. Position it 5 mm below the top edge of the support ring so that it is fully positioned on top of the laminated foil strips.



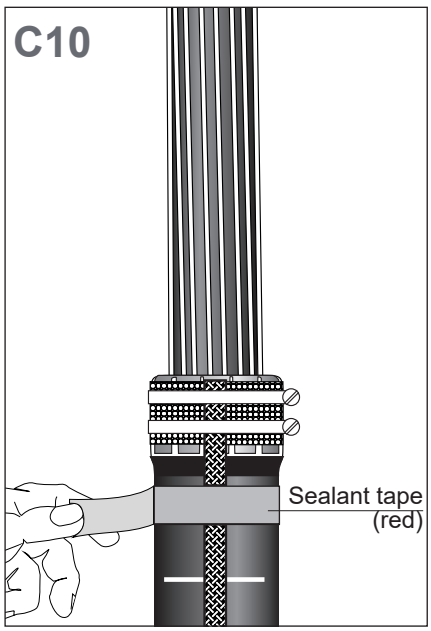
Place the copper braid on top of the contact plate. The moisture block of the braid is positioned on top of the sealant tape. Make sure that the braid is not positioned on the gap of the contact plate.

Fix the braid to the contact plate with 2 hose clamps as shown (one on the top half and one of the bottom half of the contact plate). Use a torque of 7 Nm to tighten up both hose clamps.

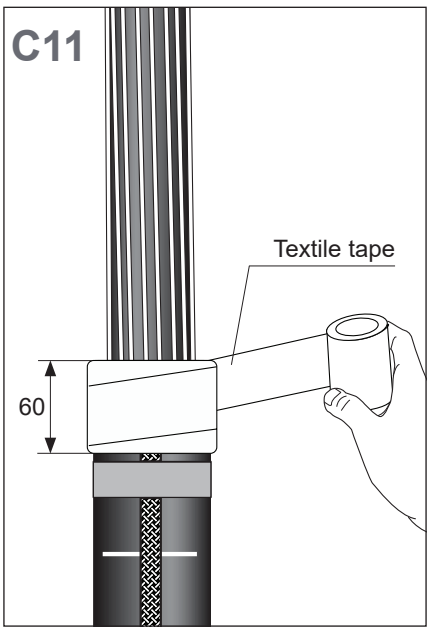
Verify the torque on both hose clamps after tightening.

Fold the excess length of the braid protruding upwards beyond the support ring (if any) over the hose clamps.

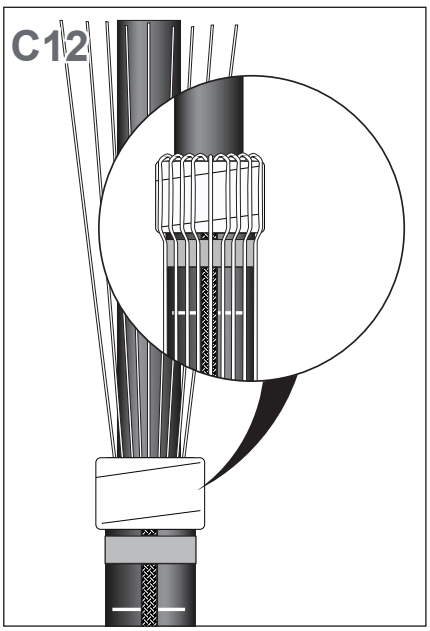
Wrap 2 additional turns of red sealant tape around the cable on top of the copper braid and the other sealant tape layer. Press the layers together to avoid air gaps around the moisture block.

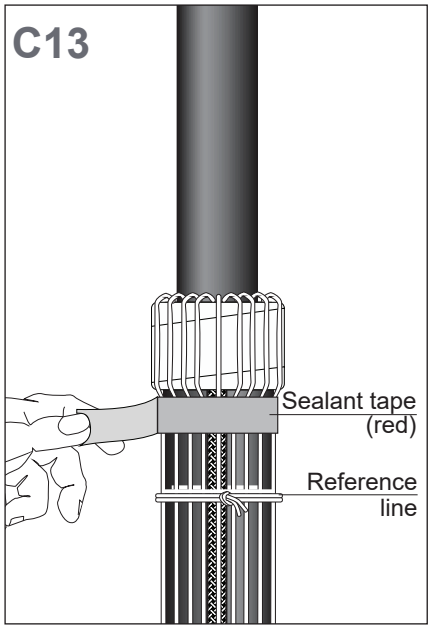


Apply 5 layers of textile tape to cover the support ring and all of the laminated foil over a length of 60 mm as shown. Make sure that all sharp edges are covered.



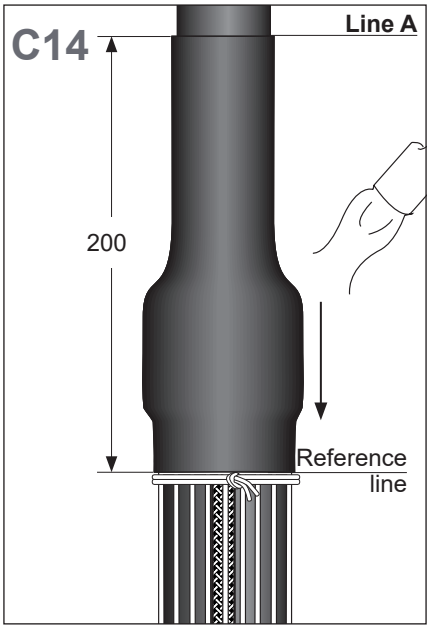
Bend the screen wires back over the textile tape and onto the oversheath. Push them into the sealant tape.





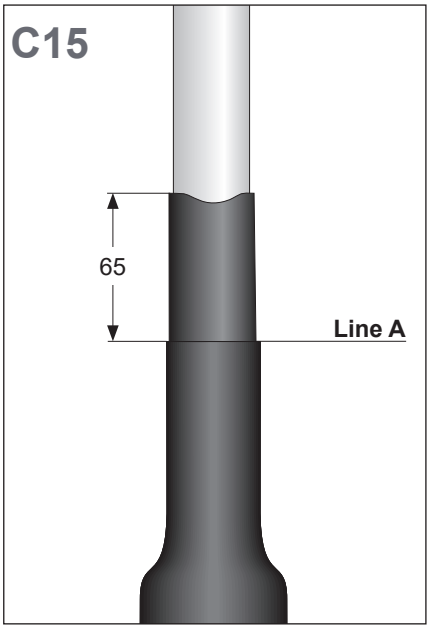
Wrap another 2 turns of red sealant tape around the cable on top of the copper wires and the other sealant tape layers.

Fix the earth lead and copper wires onto the oversheath with a wire binder just below the **Reference line**.



Mark Line A 200 mm up from **Reference line** and start shrinking the tube from the top (**Line A**)

Start shrinking from the **Line A** as shown in the drawing.



Remove the core screen with appropriate screen removal tool according to the drawing.

The surface of the insulation should be free from all traces of conductive material.

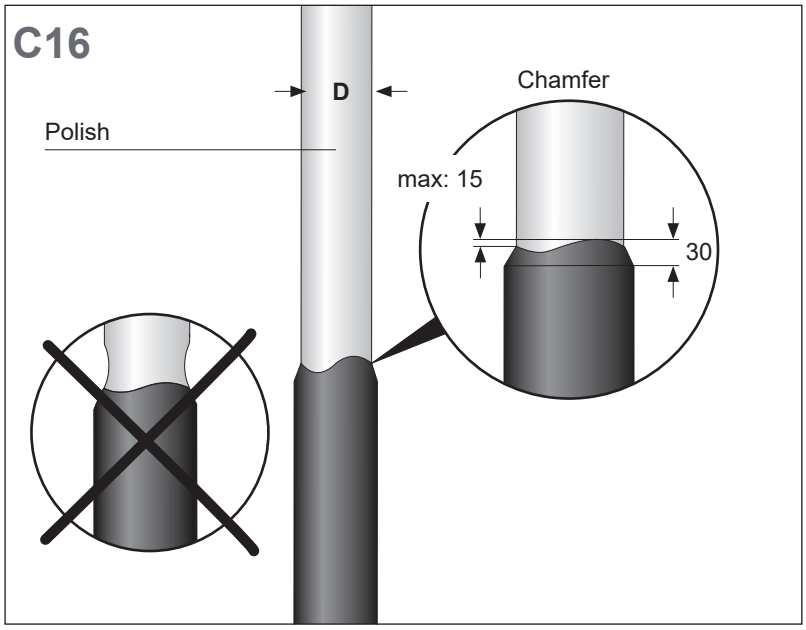
Chamfer the insulation screen

Abrade and smooth the insulation from the screen cut towards the end.

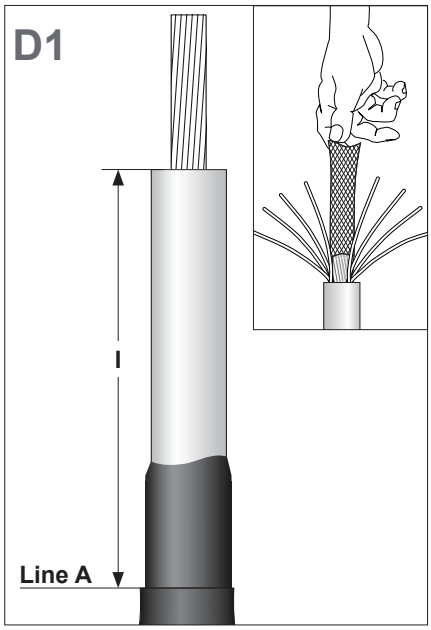
NOTE

Do not nick the insulation.

Make sure the semicon transition wave shape is in accordance with the values shown in the drawing.
Clean and degrease the insulation with the supplied cleanser in direction of the semicon to prevent contamination. Take care to ensure that the diameter of the insulation is not reduced close to the transition to the semiconducting layer.
Check dimension **D**. The finally prepared diameter over insulation shall be within the application range of the stress cone, marked at the rubber body.



D. Insulation Cut-back and Pre-installation

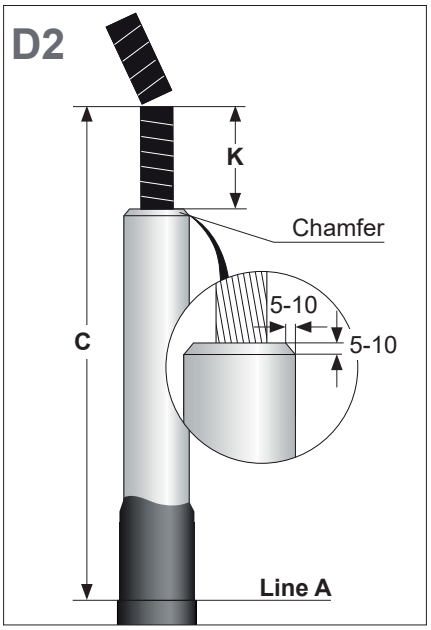


Cut back the insulation according to the dimension **I** (see Table 2). Protect the cable insulation.

Remove longitudinal water blocking material from the conductor (if any) as per instructions given by the cable manufacturer.

Thoroughly relay the conductor strands layer by layer. Take care that the original conductor shape is fully restored.

Protect the conductor with several layers of PVC tape.



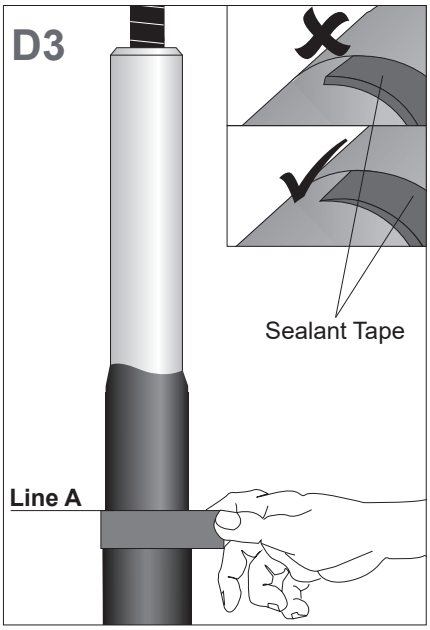
Chamfer the edge of the core insulation with appropriate tool to facilitate pushing on the stress cone adapter.

Protect and cut the conductor on the length **K** (see Table 2)**,** verify the length **C** (see Table 2)**.**

Remove any sharp edges and thoroughly clean the insulation and core screen.

NOTE

Make sure all dimensions are according to the Table 2.

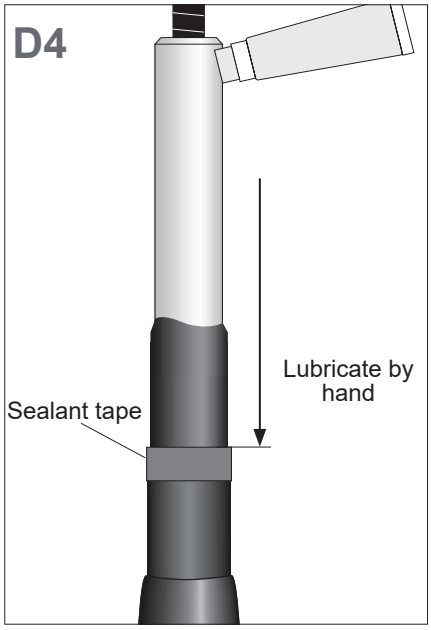


Apply one sealant tape (grey) with slight tension and its top edge aligned with **Line A** on the end of the outer sheath.

Flatten the ends of the sealant tape and push them together to avoid air gaps.

Table 2

Cable Lug	C (mm)	K (mm)	I (mm)
BLMC-1200	345	110	235
BLMC-800/1000	340	90	250
BLMC-500/630 **BLMC-150/400**	345	70	275
BLMC-95/240	350	60	290



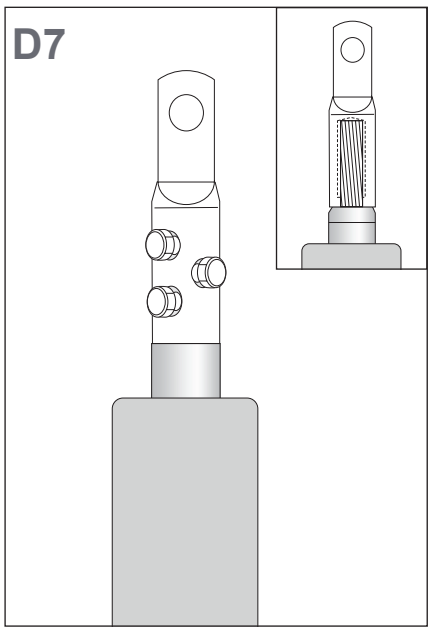
Gently lubricate the outer surface of the core insulation, semiconductive insulation screen and sealing tape with a thin layer of assembly lubricant.

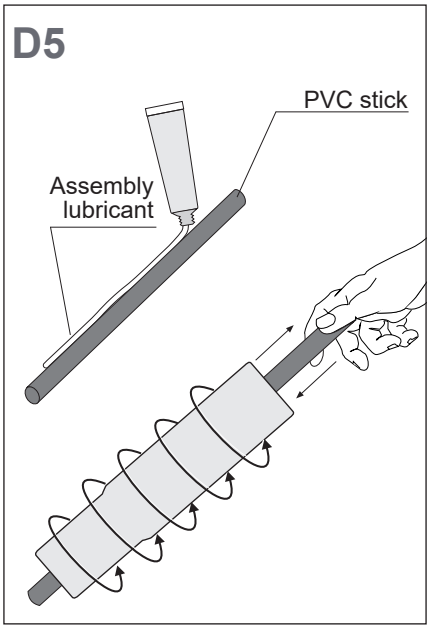
Apply the lubricant layer on cable insulation, semiconductive screen and sealing tape by hand as shown.

Clean and brush the conductor.
Position the cable lug on the conductor so that the end of the core insulation touches the lug. Align the palm hole with the bushing face prior to shearing the bolts.
Install the cable lug. Tighten the set of bolts gradually in several equal steps starting at the bolts closest to the insulation cut. Continue until the heads shear off.
Remove any sharp edges with sandpaper provided in the kit.

NOTE

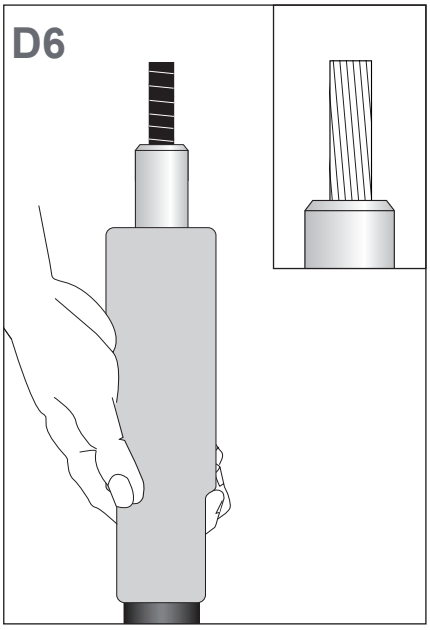
Pre-Installation completed.





Clean the PVC stick and apply assembly lubricant as shown.

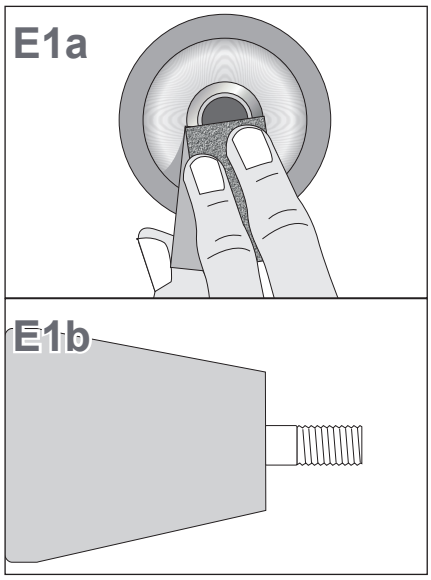
Slide the PVC stick into the stress cone and turn the stress cone adapter to fully cover the inner surface of the stress cone adapter with lubricant.



Push the stress cone in one sequence with a twisting movement onto the insulation until the inner collar of the stress cone stops at the oversheath.

Afterwards, remove the PVC protection wrap from the conductor.

E. Installation of Base Connector (Use the box Final assembly)



NOTE

Continue here for completion of pre-installed RSTF connector.

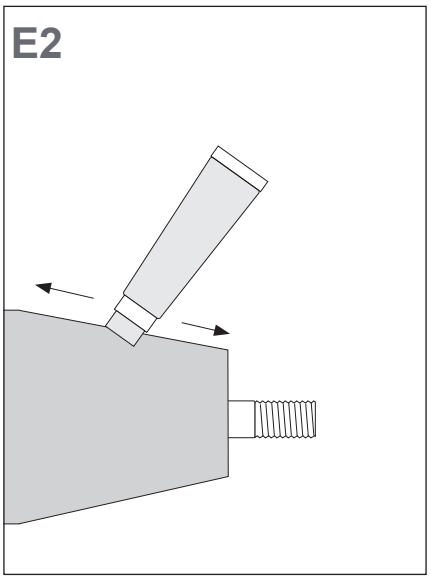
a. Abrade and clean the contact ring of the bushing thread from residuals such as resin or varnish if any.

b. Insert the threaded pin into the bushing and tighten it up with an Allen key (8 mm). **Maximum torque must be defined by the Switchgear Manufacturer. If not specified, Maximum Torque is 80 Nm.**

Clean and degrease the bottom and front end of the screened connector body and apply a thin layer of lubricant onto the inner surface without the sponge top as shown.

NOTE

Use one way glove and PVC stick to evenly lubricate the entire inner surface.



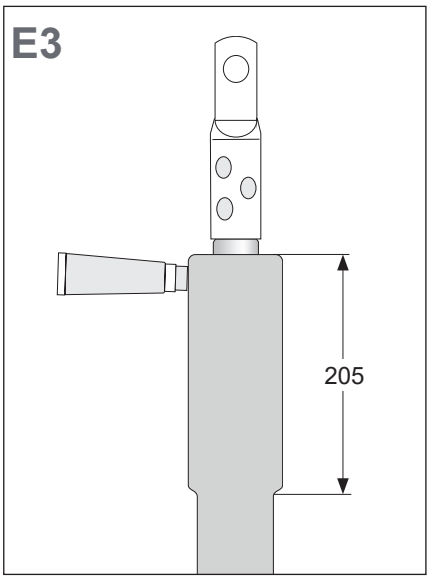
Clean the conical surface of the bushing and lubricate it with the assembly lubricant as shown.

Align the back of the screened connector body with the bushing and push it onto the stress cone adapter.

NOTE

The drain wire must be positioned towards the bushing.

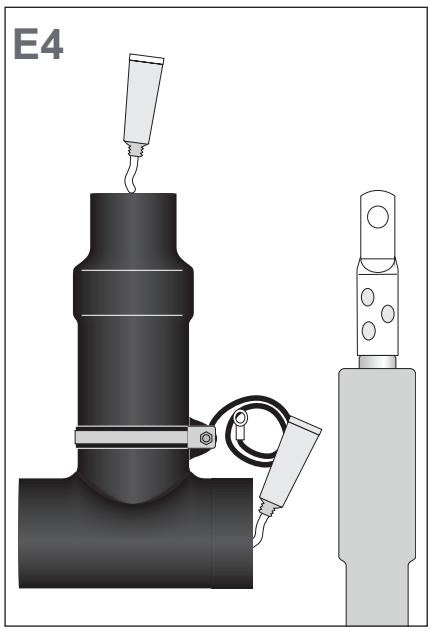
Make sure the measurement from center of the bushing and end of stress cone is approximately 480 mm.

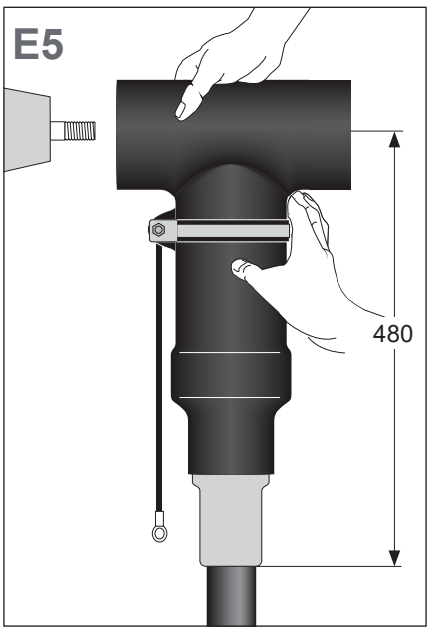


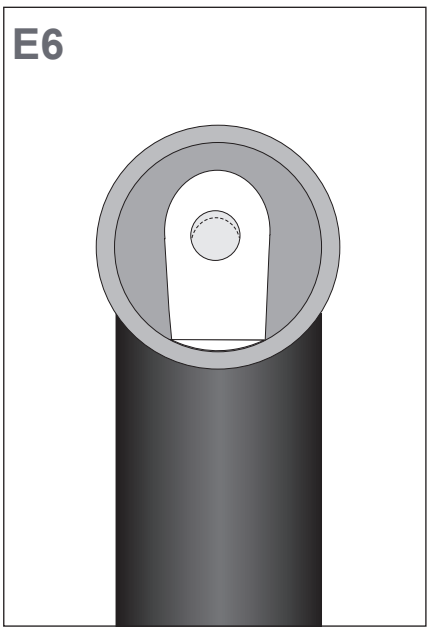
Clean the surface of stress cone and apply a thin layer of lubricant onto the outer surface over a length of 205 mm with the sponge top as shown in the drawing.

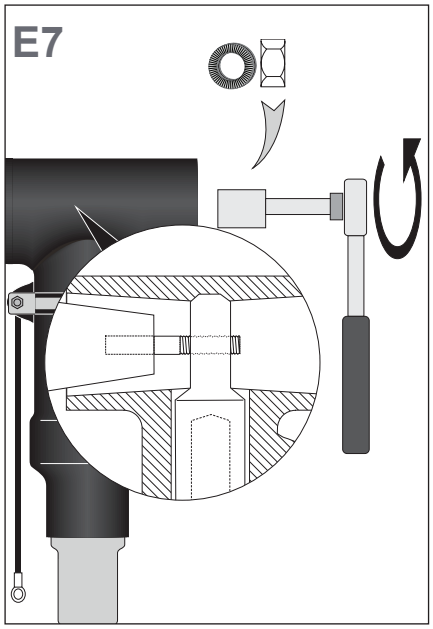
Align the eye of the cable lug with the threaded pin and push the screened connector onto the bushing.

There is no need to push it completely onto the bushing. It is sufficient when the threaded pin protrudes the lug.

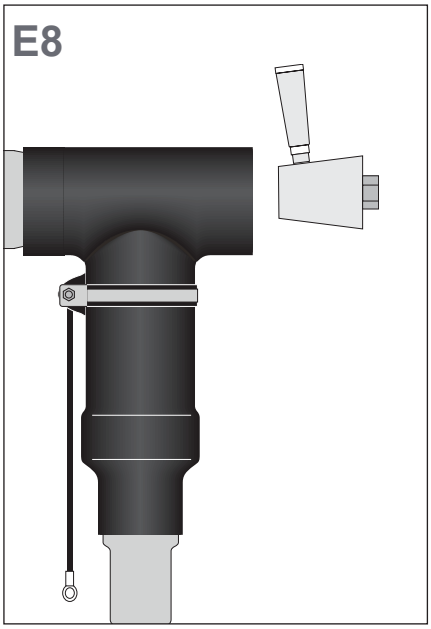






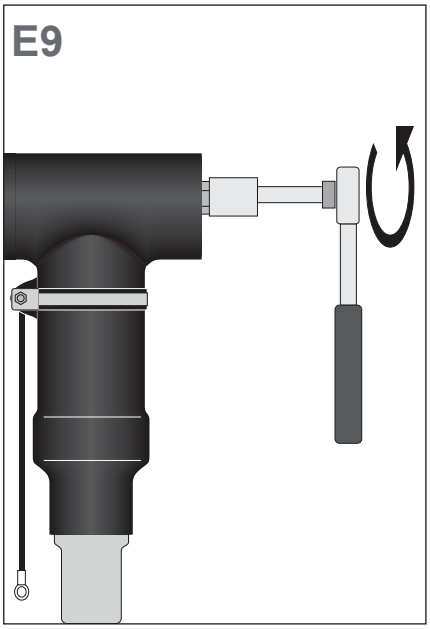


Insert the Nordlock washer and hex nut. Tighten the hex nut onto the threaded pin with a spanner (24 mm) at a torque of **100 Nm**.



Clean the inner surface of connector back end and apply a thin layer of assembly lubricant. Do the same with the conical interface of the back plug as shown.

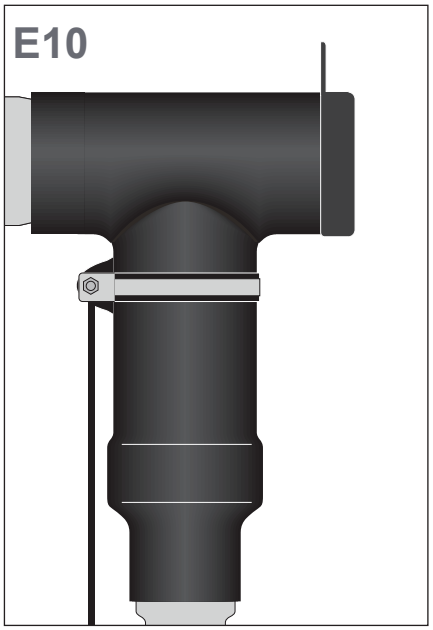
Ensure there is no dirt either on the back plug or inside the T connector.



Insert the back plug and screw it into place using a spanner (24 mm) at a torque of **70 Nm**.

Turn the covering cap inside out and push its pin into the socket in the backplug's electrode.

Flip the sidewall of the cap onto the connector as shown.

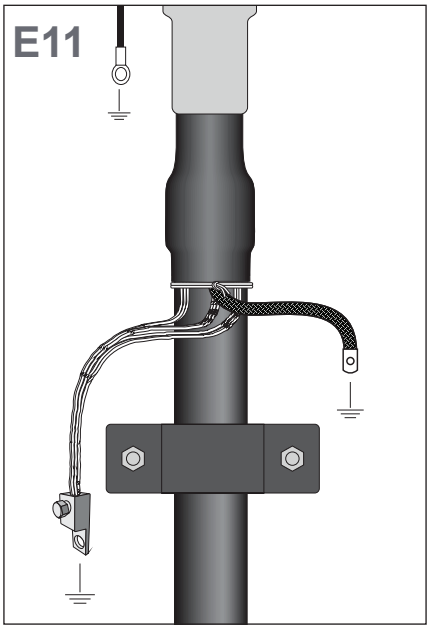


Ensure that the grounding lead of the RSTF body is fastened tightly.

Gather the screen wires, cut them to length and install the screen lug.

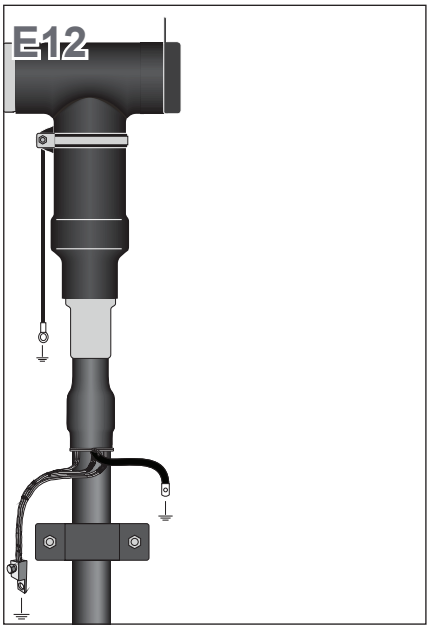
Perform connections to ground (RSTF body, Cu-wires and laminated foil). For switchgear connectors: Use 70 Nm for M12 connections.

For good mechanical strength fasten protected core as close as possible to the connector.



Screened separable connector installation completed.

Complete and sign the enclosed Installation Protocol.



8.8 INSTALLATION INSTRUCTION OF RSTF-SC

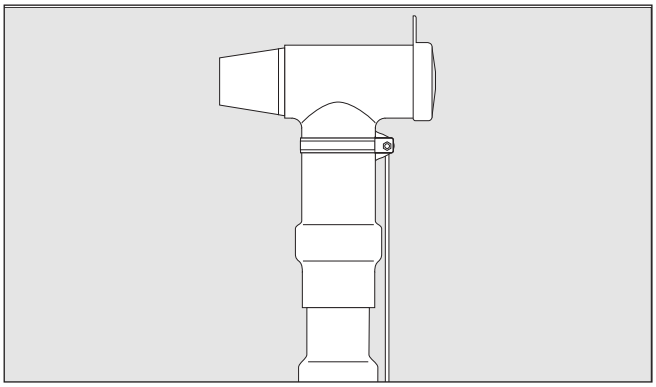
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INSTALLATION INSTRUCTIONS

EPP-3145-10/24

RSTF-72SC

Screened Separable Coupling Connector Surge Arrester for use with RSTF Base Connector



TE's Raychem Cable Accessories

SAFETY WARNING

It is essential to observe the applicable safety regulations for working with high voltage equipment.

For precise safety information please contact the responsible authority.

Please dispose of all waste according to environmental regulations.

For more information: te.com/energy

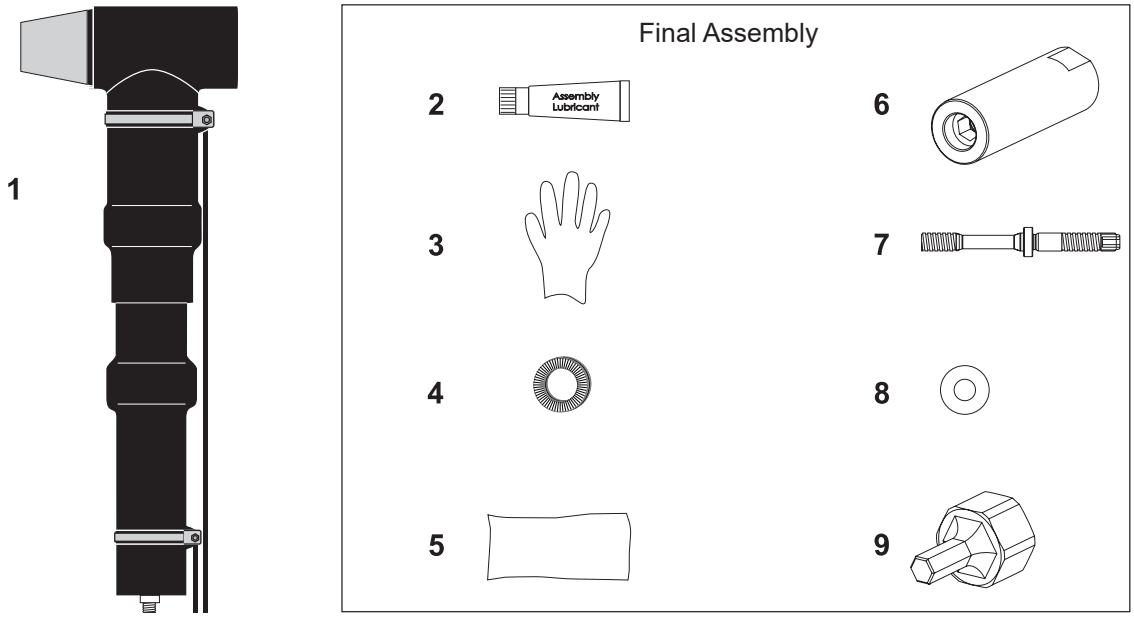
Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
Finsinger Feld 1
85521 Ottobrunn/Munich, Germany
Tel: +49-89-6089-0
Fax: +49-89-6096-345

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Before Starting

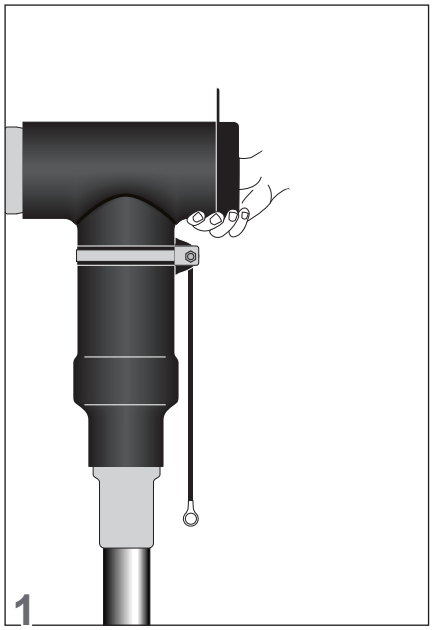
- Check to ensure that the kit you are going to use fits the cable.
- Refer to the kit label and the title of the installation instructions.
- Components or working steps may have been modified since you last installed this product.
- Carefully read and follow the steps in the installation instructions.

Kit Content

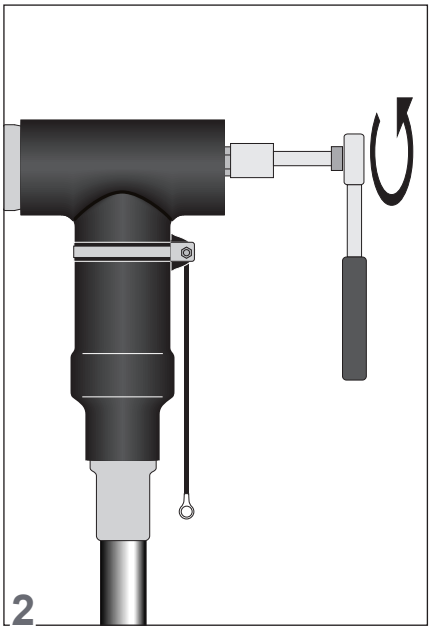


1	1 x Surge Arrester Coupling Connector	**2**	1 x Assembly Lubricant	**6**	1 x Coupling Rod
		3	10 x Gloves	**7**	1 x Coupling Pin
		4	1 x Nordlock Washer	**8**	1 x Coupling Washer
		5	8 x Cleaning Tissue	**9**	1 x Hex Adapter

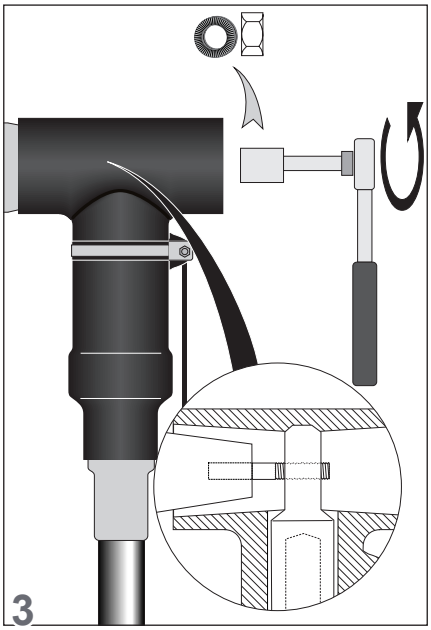
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Remove the conductive endcap from the installed connector and save it in a clean container.

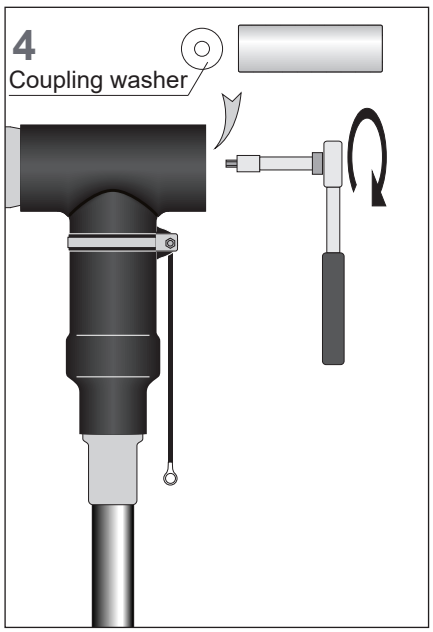


Remove the back plug from the installed connector and save it in a clean container.

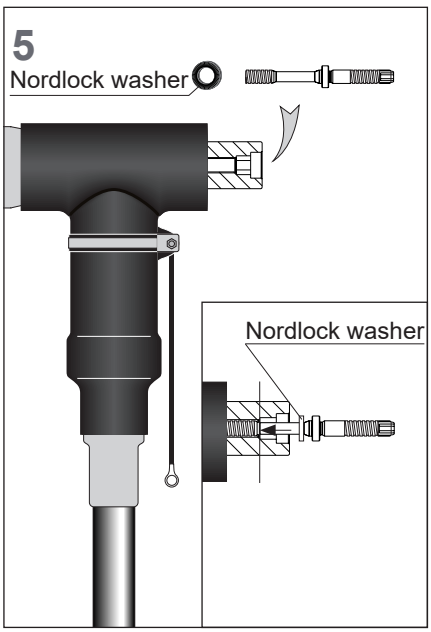


Unscrew the M16 hexagon nut and M16 washer. Take nut and washer out of the connector and save it in a clean container.
Clean the interface and lubricate it again with assembly grease.

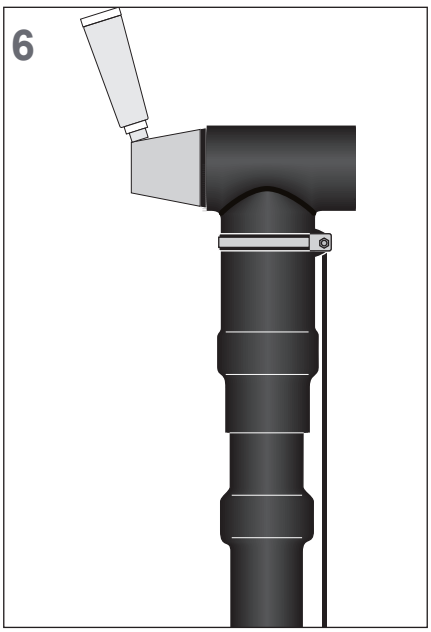
Insert the coupling washer and coupling rod.
Tighten the coupling rod onto the stud with an allen key at a torque of **100 Nm**.

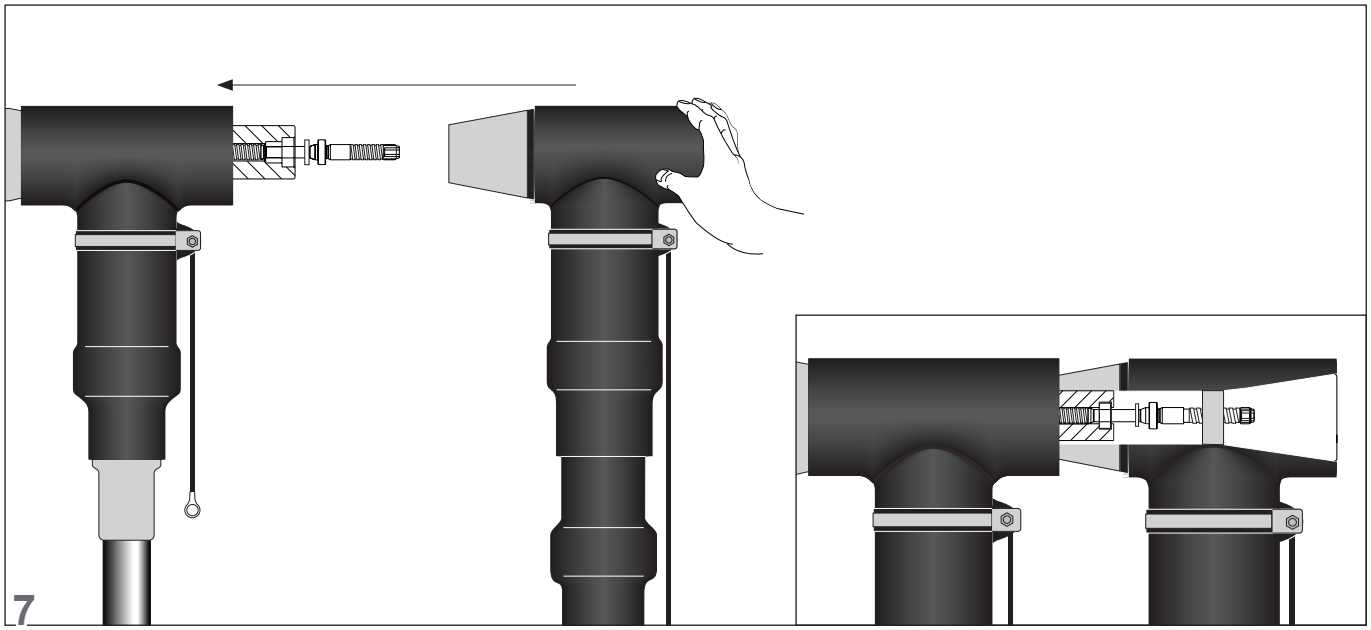


Slide the nordlock washer over the short thread of the coupling pin.
Then screw the coupling pin into the coupling rod by hand until the short thread **completely** entered the coupling rod.



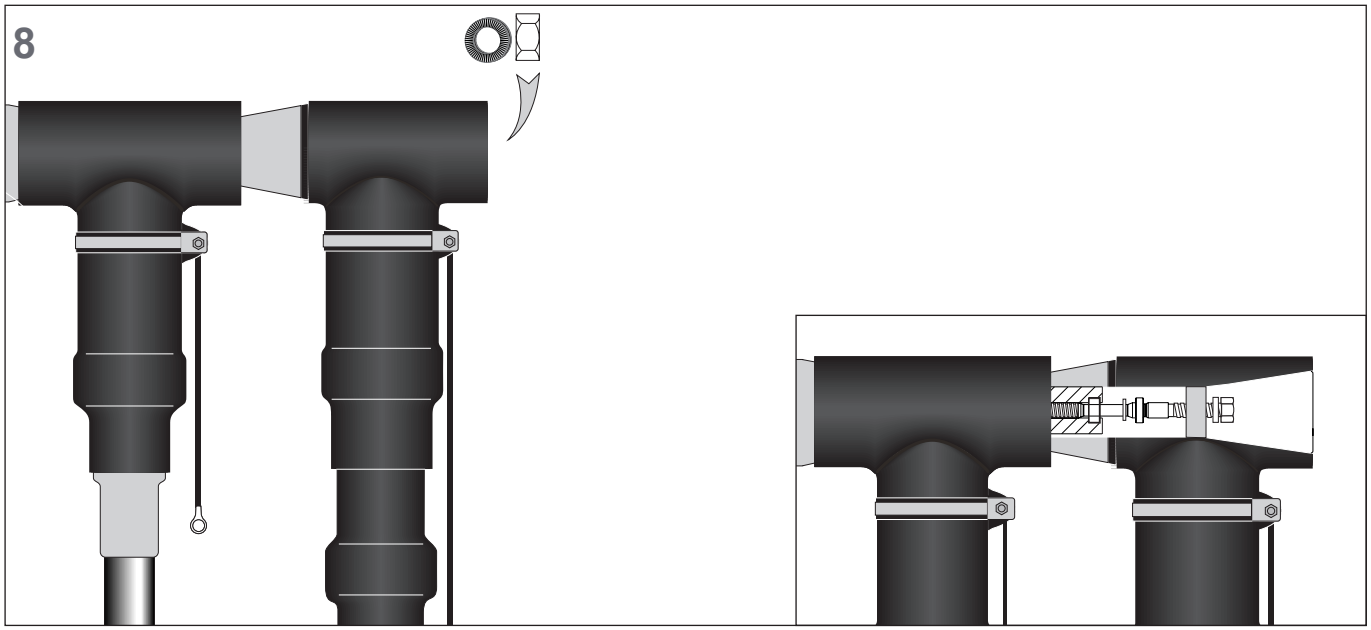
Clean the conical front end of the coupling connector and apply a thin layer of lubricant onto the outer surface of the cone with the sponge top.
Continue **immediately** with the next step.

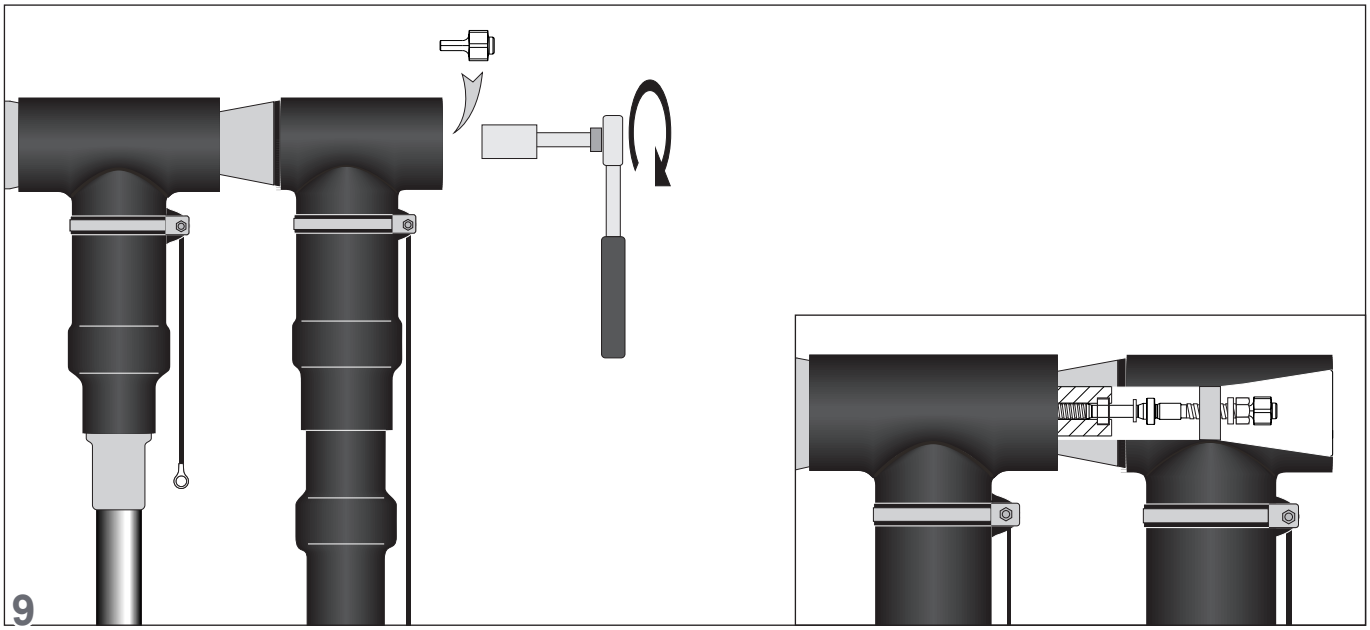




Align the conical front end of the coupling connector surge arrester with the rear end of the already installed base connector and push the coupling connector over the coupling pin and coupling rod into the base connector until the long thread of the coupling pin protrudes from the lug inside the coupling connector surge arrester.

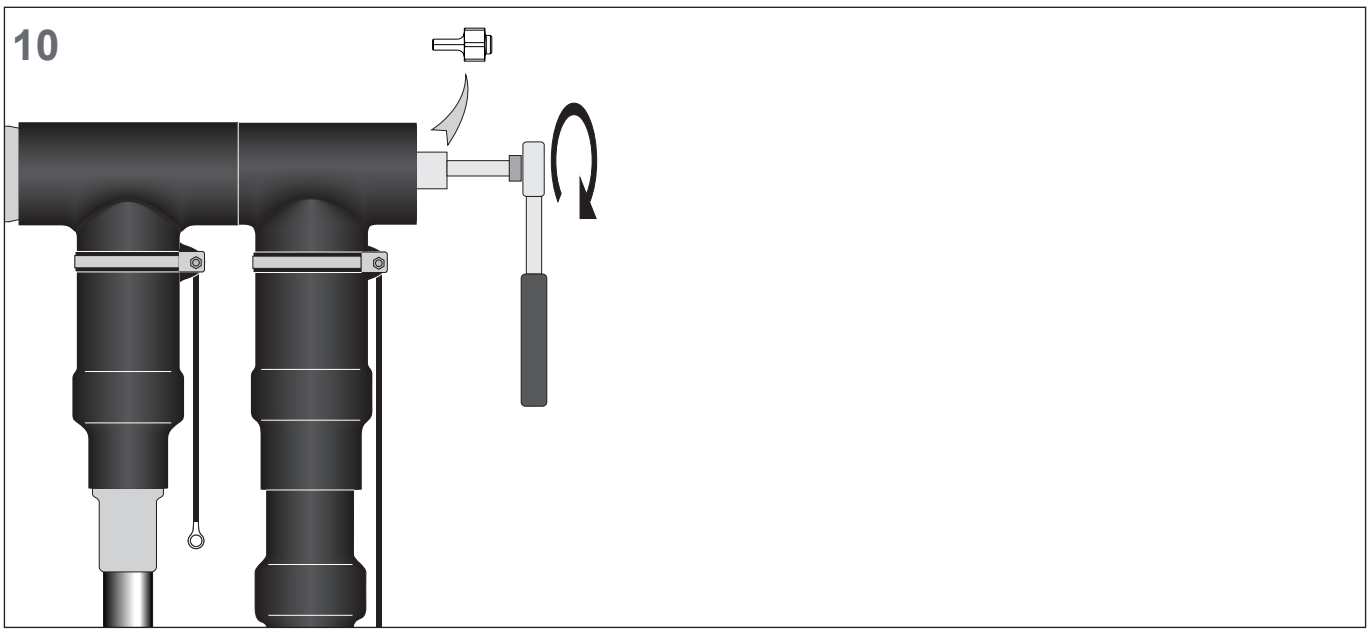
Screw the saved nordlock washer and hex nut (unscrewed in step 3) on the coupling pin by hand until the nut sits entirely on the thread.

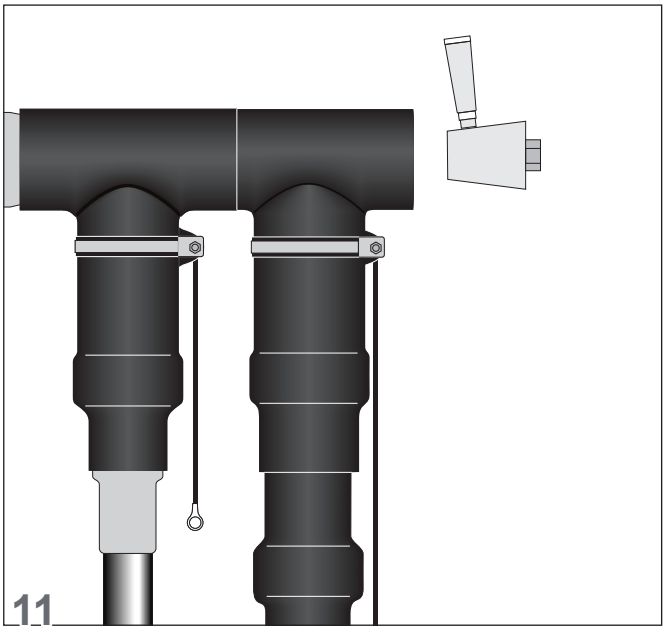




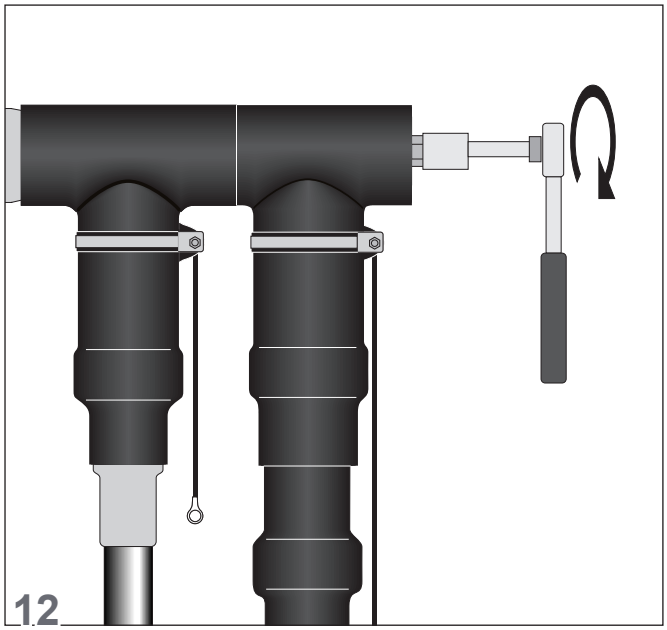
Insert the hex adapter into the coupling pin and align the hex nut with the hex adapter.
Use a torque wrench with a 24 mm deep socket and put it on the hex adapter and the hex nut.
Then tighten the coupling pin at a torque of **125 Nm**.

Remove the hex adapter from the coupling pin.
Then use the torque wrench to tighten the hex nut itself at a torque of **100 Nm**.



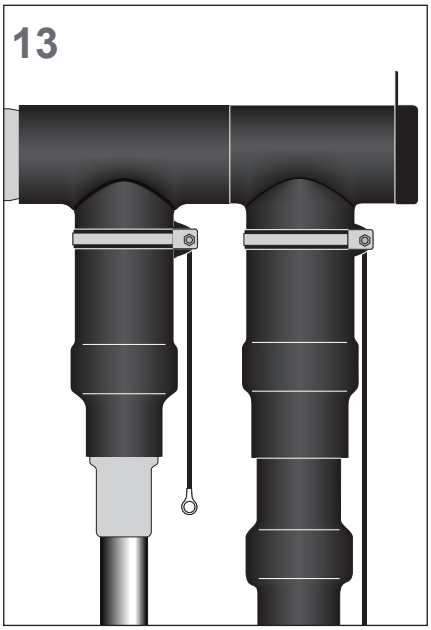


Clean the inner surface of the coupling connector connector rear end and apply a thin layer of assembly lubricant.
Do the same with the conical interface of the back plug as shown.

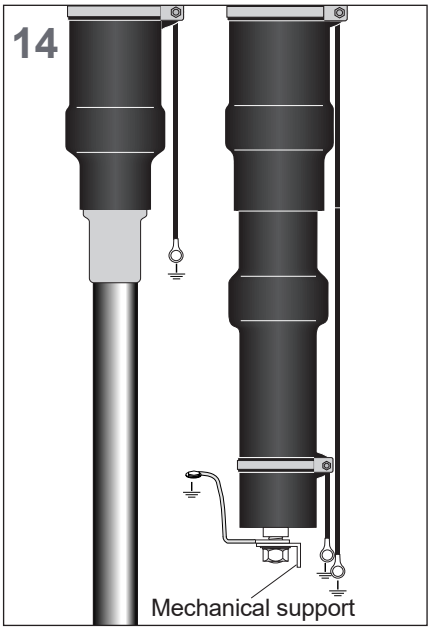


Push the back plug into the connector body until it reaches the thread of the coupling pin. Then screw it in using a spanner (24 mm). Thighten it at a torque of **70 Nm**.

Turn the covering cap inside out and push its pin into the socket in the backplug´s electrode.
Then flip the sidewall of the cap onto the connector.

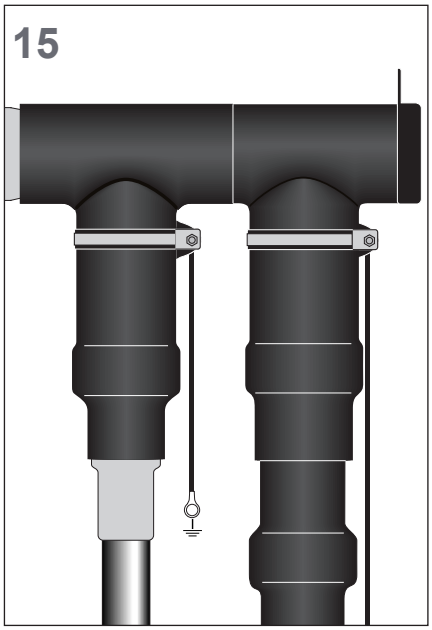


Adjust and install the mechanical support bar below the surge arrester.
Ensure that the ground leads of the coupling connector body and surge arrester module are fastened tightly and connect them to ground.
Connect the arrester's ground terminal to earth using the enclosed earth lead.



Screened separable coupling connector surge arrester installation completed.

Please dispose of all waste according to environmental regulations.



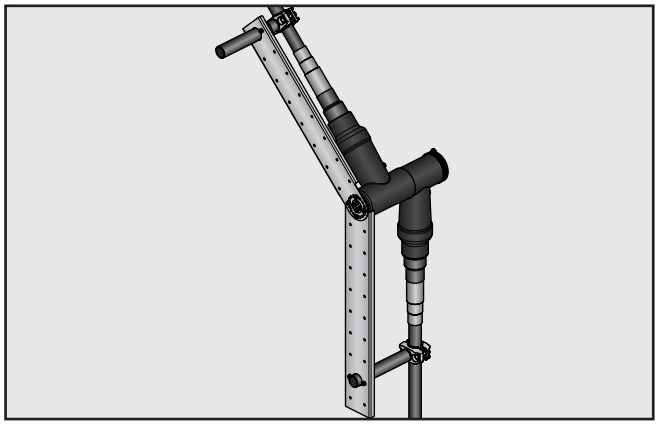
8.9 INSTALLATION INSTRUCTION OF RSTF-F

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INSTALLATION INSTRUCTIONS

EPP-3737-2/21

RSTF Fixing Structure



TE's Raychem Cable Accessories

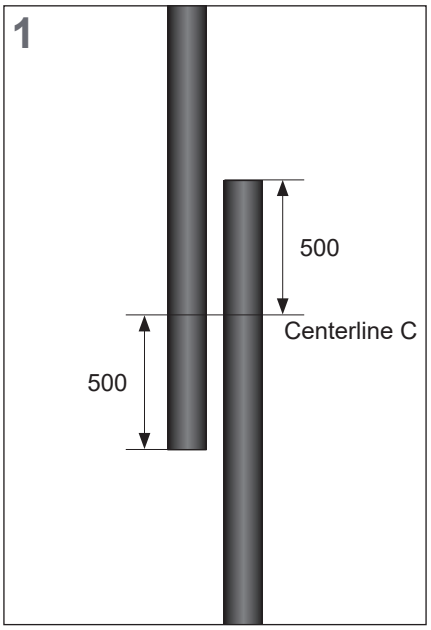
Please dispose of all waste according to environmental regulations.

For more information: te.com/energy

Tyco Electronics Raychem GmbH
a TE Connectivity Ltd. Company
Finsinger Feld 1
85521 Ottobrunn/Munich, Germany
Tel: +49-89-6089-0
Fax: +49-89-6096-345

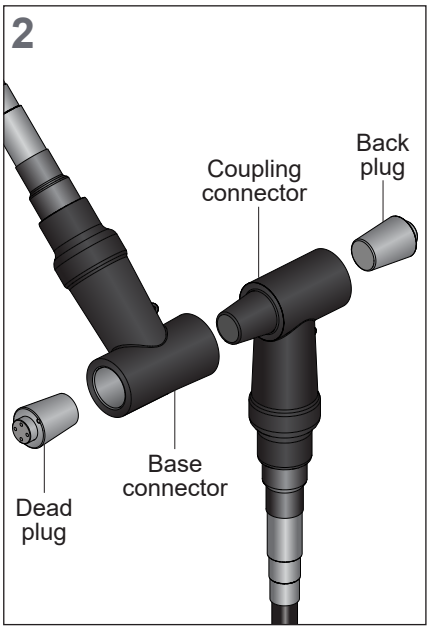
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RSTF Fixing Structure Installation Instructions



Overlap both the cables and mark one center line "C". This line will be the reference of the bushing center.

Prepare both cable ends according to the supplied installation instruction until the step "Pre-Installation Completed".

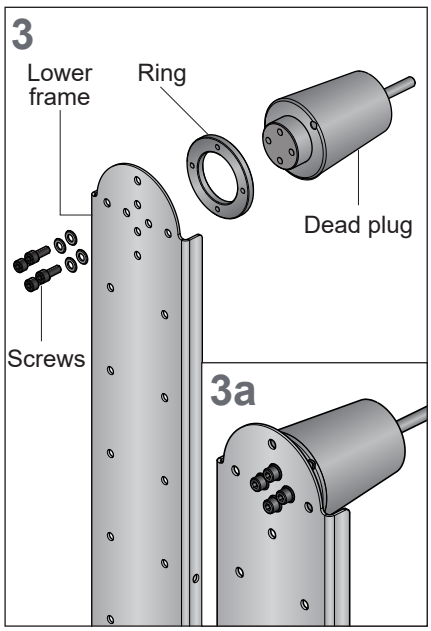


The final assembly of the components needs to be done as shown in the drawing.

Fix the dead plug onto the lower frame part using the four M8 screws.
Place the ring over the metallic part of the dead plug.
Tighten the screws to a torque of **29 Nm**.
The ring should be hanging loosely on the dead plug metal part.

NOTE

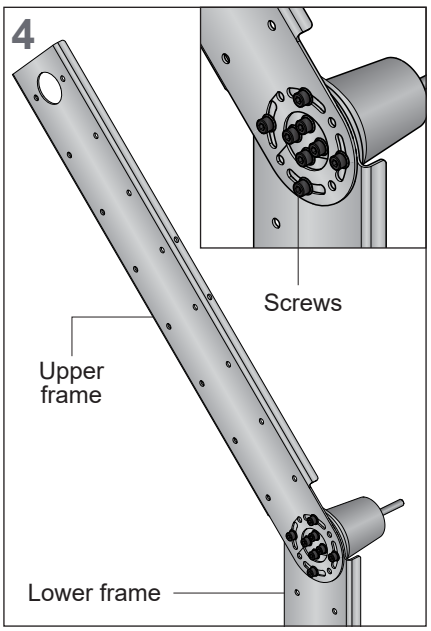
There is no installation direction whether to fix the frame with the straps looking to or away from the cable. This can be adjusted to the local conditions.



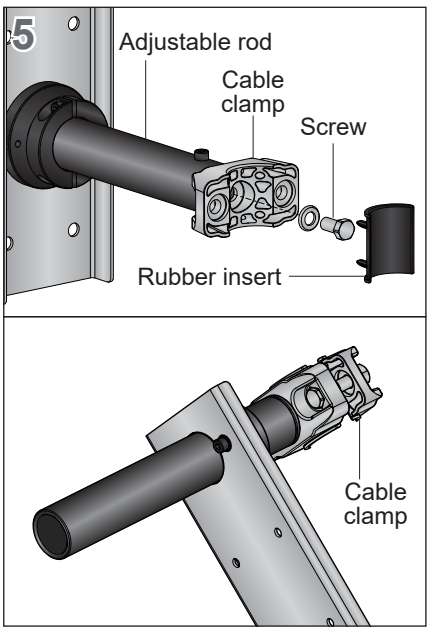
Adjust the angle of the upper frame parallel to the upper cable.
Fix the upper frame to the lower frame by using the ring.
Tighten the M8 screws by hand, so that the upper frame does not move from its position.

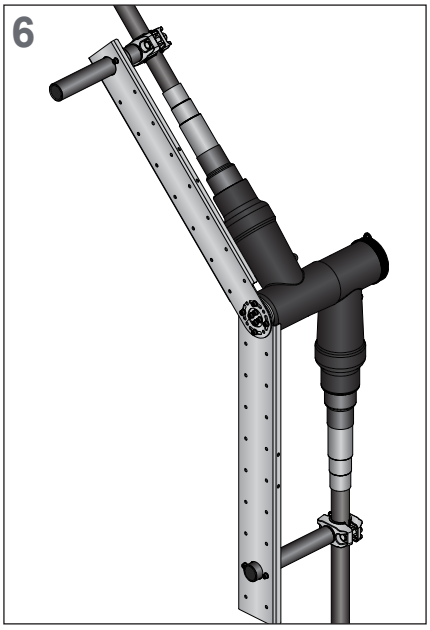
NOTE

There is no installation direction whether to fix the frame with the straps looking to or away from the cable. This can be adjusted to the local conditions.

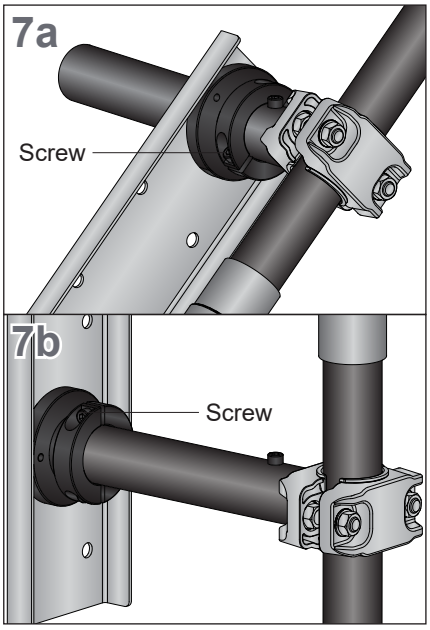


Install the adjustable rods onto both ends of the frame.
Temporarily remove the rubber insert from the cable clamps.
Install the cable clamp onto the rod by using the M12 screws.
Tighten the screws with a torque of 40 Nm.
Put the rubber insert back into the cable clamps.





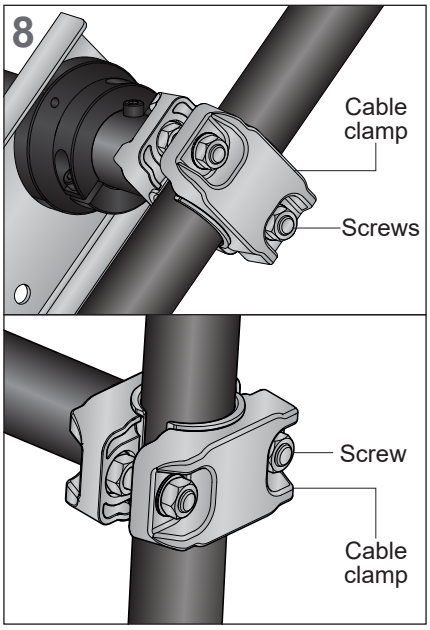
Install the base connector and the coupling connector using the appropriate installation instructions.



Adjust the rods of the cable clamp fixture in the way that the cable is absolutely in parallel with the frame parts. Fix the position by using the supplied scews.

Tighten the screws of both cable clamps to a torque of 10 Nm.

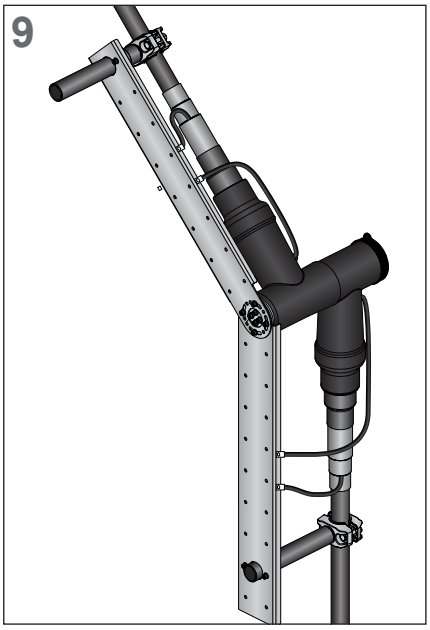
The fixing structure should be fixed firmly to a rack by using the fixing holes in the frame.



Connect the grounding wire of the T-Connector onto the frame by using one of the grounding holes.

Connect the shield wires of the cabel onto the frame by using one of the grounding holes.

Use one of the fixing holes to connect the fixing structure to the local ground.



CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	EQUIPMENT MANUFACTURERS RECORD BOOK	Sheet 1 of 217 Date: 26/01/2026 Rev: 00

1724002000-QC-PRO-00009
FAT PROCEDURE

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	FAT PROCEDURE - Factory Acceptance test Procedure and Reports - HV CABLE AND ACCESSORIES	Sheet 1 of 20 Date: 24/01/2025 Rev: 01

Base Load Power Hub (BLPH)

FAT PROCEDURE - Factory Acceptance test Procedure and Reports - HV CABLE AND ACCESSORIES

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reynard HIGH VOLTAGE SOLUTIONS

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CROSSWIND	HOLLANDSE KUST NOORD WIND PARK Project Contract No. CW-I-WP4-2023-05	ROSETTI MARINO
Document Title:	FAT PROCEDURE - Factory Acceptance test Procedure and Reports - HV CABLE AND ACCESSORIES	Sheet 2 of 12 Date: 24/01/2025 Rev: 01

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

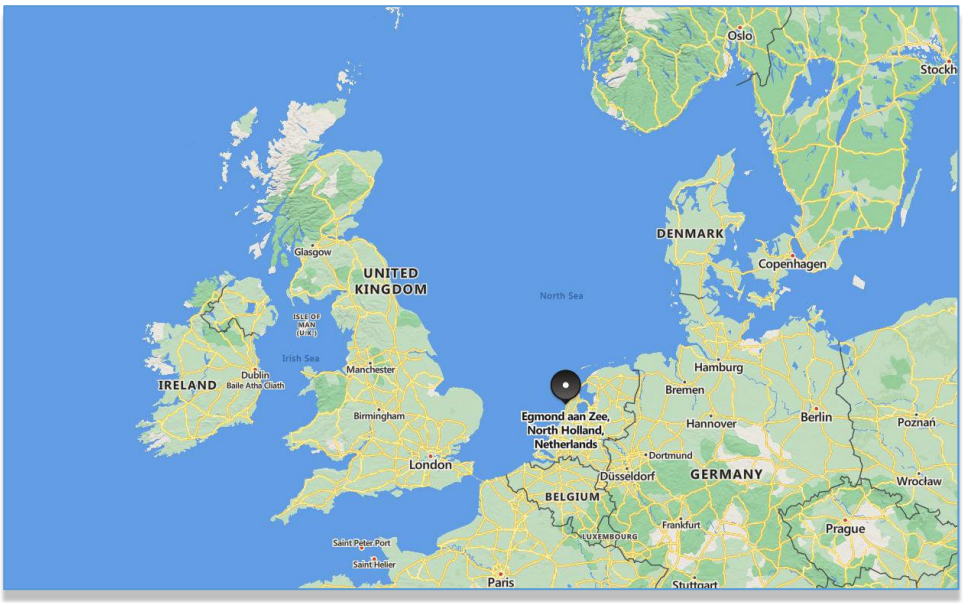


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

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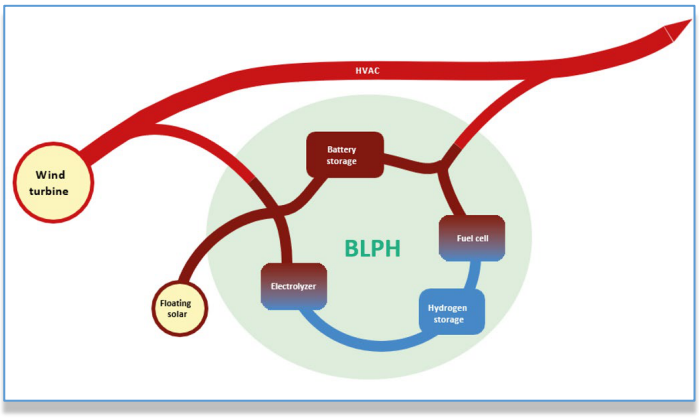


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

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2 DOCUMENT SCOPE

The Factory Acceptance Test (FAT) document establishes a framework for assessing the performance, quality, and compliance of equipment or systems before delivery. It delineates the test plan, procedures, and acceptance criteria while ensuring alignment with technical specifications and regulatory standards. This document serves as an assurance tool to verify the readiness of the product for installation and commissioning in the field.

2.1 REFERENCES

Doc. No.	Description
1724002000-EL-DS-00003	DATA SHEETS - HV CABLE
1724002000-EL-DS-00004	DATA SHEETS - T-CONNECTORS
1724002000-QC-ITP-00002	INSPECTION AND TEST PLAN -HV CABLE AND ACCESSORIES

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

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3 HV CABLE FACTORY ACCEPTANCE TEST

Cable Type: Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240 / 50
Standards: IEC 60228:2023, IEC 60840:2020

3.1 PREPARATION AND VISUAL INSPECTION

3.1.1 Verification of Documentation

- Confirm that the cable under test matches the specification (type, dimensions, markings, etc.).
- Verify test equipment calibration certificates and compliance with standards.

3.1.2 Visual Inspection

- Examine the cable for any visible defects, such as surface irregularities, damage, or inconsistencies in the layers (sheath, insulation, etc.).
- Document any observations before proceeding to electrical tests.

3.2 CONDUCTOR RESISTANCE TEST

Standard: IEC 60228:2023, Table 4 & IEC60840:2020 §10.5

Objective: Verify that the DC resistance of the copper conductor complies with specified values.

Procedure:

1. Connect the conductor ends to a resistance measurement device.
2. Apply a stable DC current as per standard requirements.
3. Measure and record the conductor resistance at 20°C.
4. Verify compliance with IEC 60228:2023, Table 4 & IEC60840:2020 §10.5 values.

3.3 VOLTAGE TEST (WITHSTAND TEST)

Standard: IEC 60840:2020, §9.3

Objective: Verify the cable's insulation withstands the specified AC voltage without breakdown.

Procedure:

1. Mount the cable on insulated supports to avoid external interference.

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2. Apply an AC voltage of 2.5 x U0 (where U0 is the nominal voltage) for a duration of 30 minutes.
3. Gradually increase the voltage to avoid transients.
4. Monitor the cable for any signs of insulation failure or breakdown.
5. Document the test result as "Pass" or "Fail."

3.4 PARTIAL DISCHARGE TEST

Standard: IEC 60840:2020, §9.2

Objective: Assess the quality of the cable insulation by measuring partial discharge (PD) levels.

Procedure:

1. Set up the test system, including coupling capacitors and a PD measurement device.
2. Apply a voltage of 1.75 x U0 for 10sec and then decrease to 1.5 x U0.
3. Measure the PD levels during the test duration.
4. Ensure the PD values are within acceptable limits as specified in IEC 60840:2020, §9.2.

3.5 SCREEN RESISTANCE TEST

Standard: IEC 60840 §10.5 & IEC 60228:2023, Table 4

Objective: Confirm that the resistance of the cable's screen complies with the standard.

Procedure:

1. Connect the ends of the screen to a resistance measurement device.
2. Apply a stable DC current as specified.
3. Measure and record the resistance at 20°C.
4. Compare the measured resistance against the limits in IEC 60840 §10.5 & IEC 60228:2023, Table 4

3.6 CAPACITANCE TEST

Standard: IEC 60840:2020, §10.10

Objective: Measure the capacitance of the cable to verify the consistency of the insulation system.

Procedure:

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1. Connect the test equipment to the conductor and the screen.
2. Apply an AC voltage within the specified range.
3. Measure the capacitance value per unit length.
4. Record the results and ensure they comply with the design specifications and IEC 60840:2020, §10.10.

3.7 FINAL REVIEW AND REPORTING

1. Compile all test results, including measured values, observations, and pass/fail status.
2. Ensure all tests meet the specified standards and contract requirements.
3. Prepare a detailed test report with supporting evidence (photos, measurements, and observations).
4. Submit the report for client approval and retain a copy for documentation.

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4 HV CABLE TEST REPORTS

Inspection & Test Plan

IEC 60840

Art. 58239

Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240 / 50

FAT scheduled 23-01-2025

Document:	#58239
Version:	0.1
Date:	20/01/2025
Page:	1 of 1

Item	Test	Requirement	Standard	Test	CU	TPI	Results FAT	Signature
1	Partial discharge	Sensitivity ≤ 10pC 10 sec. 1.75Uo then decrease to 1.5Uo No detectable discharge exceeding the declared sensitivity	IEC60840: 2020 §9.2	RT	W	W	Pass / Fail	
2	Voltage test	30 min: 2,5 x 36 = 90 kV No breakdown	IEC60840: 2020 §9.3	RT	W	W	Pass / Fail	
3	Electrical test on oversheath of the cable, Spark test	15 kV	IEC60840: 2020 §9.4	RT	W	W	Pass / Fail	
4	Conductor resistance	Shall not exceed the maximum value: Max. 0,0754 Ohm/km	IEC 60840 §10.5 IEC 60228:2023, Table 4	RT	W	W	Pass / Fail	
5	Screen resistance	Shall not exceed the maximum value: Max. 0,387 Ohm/km	IEC 60840 §10.5 IEC 60228:2023, Table 4	RT	W	W	Pass / Fail	
6	Capacitance	Nom. 0,21 µF/km Max. 0,2268 µF/km	IEC60840: 2020 §10.10	ST	W	W	Pass / Fail	
7	Nameplate marking, tagging, color coding & labeling			P	W	W	Pass / Fail	
8	Check of drums			P	W	W	Pass / Fail	
9	Inspection (Release) report				H	H	Pass / Fail	

Frequencies of Routine and Sample tests

Routine tests According to IEC 60840

Sample tests According to IEC 60840

Note:

TPI: Third Party Inspector

CU: Customer

FAT: Factory Acceptance Test

H: Hold Point

P: Perform

RT: Routine test

ST: Sample test

TKF: BV Twentsche Kabelfabriek (Manufacturer)

WSR: Witness a Special Request -Hotset (seperate visit or document control as preferred by client)

W: Witness Point

Inspection & Test Plan

IEC 60840

Art. 58239

Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240 / 50

FAT scheduled 23-01-2025

Document:	#58239
Version:	0.1
Date:	07-11-2024
Page:	1 of 1

Item	Test	Requirement	Standard	Test	CU	TPI	Results FAT	Signature
1	Conductor resistance 0,07438	Shall not exceed the maximum value: Max. 0,0754 Ohm/km	IEC 60228:2004 Table 2	RT	W	W	Pass / ~~Fail~~	
2	Voltage test	30 min: 2,5 x 36 = 90 kV No breakdown	IEC60840: 2020 §9.3	RT	W	W	Pass / ~~Fail~~	
3	Partial discharge	Sensitivity ≤ 10pC 10 sec. 1.75Uo then decrease to 1.5Uo No detectable discharge exceeding the declared sensitivity	IEC60840: 2020 §9.2 0,7 PC	RT	W	W	Pass / ~~Fail~~	
4	Screen resistance 92607	Shall not exceed the maximum value: Max. 0,387 Ohm/km	IEC 60228:2004 Table 2	RT	W	W	Pass / ~~Fail~~	
5	Capacitance 198 nF	Nom. 0,21 µF/km Max. 0,2268 µF/km	IEC60840: 2020 §10.10	RT	W	W	Pass / ~~Fail~~	
6	Nameplate marking, tagging, color coding & labeling	Drum: 25228484 Production order: 5126600005		P	W	W	Pass / ~~Fail~~	

7	Check of drums			P	W	W	Pass / ~~Fail~~	
8	Inspection (Release) report				H	H	Pass / ~~Fail~~	

Frequencies of Routine and Sample tests

Routine tests	According to IEC 60840
Sample tests	According to IEC 60840

Note:

TPI:	Third Party Inspector
CU:	Customer
FAT:	Factory Acceptance Test
H:	Hold Point
P:	Perform
RT:	Routine test
ST:	Sample test
TKF:	BV Twentsche Kabelfabriek (Manufacturer)
WSR:	Witness a Special Request -Hotset (seperate visit or document control as preferred by client)
W:	Witness Point

BV TWENTSCHE KABELFABRIEK

Quality Certificate

Results of Final Inspection according to specification : IEC 60840

Cable Identification

Construction	: 58239 Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240 / 50
Cable number	: 9999999997
Drum number	: 25228484
Length [m]	: 1006
Inspection date	: 23-01-2025

These results concern the total tested length of cablenumber :9999999997
The total length was dispatched.

Routine Test

Outer diameter of the cable	[mm]	: 49.10	
Test voltage	90 kV 30 minutes	: Passed	
Spark test oversheath acc. MIK		: Passed	
Partial discharge test 1.5 U0	[pC]	: 1.0	Limit Max: 10.0
DC-resistance: conductor	[Ohm/km]	: 0.0739	Limit Max.: 0.0754
Screen resistance	[Ohm/km]	: 0.259	Limit Max.: 0.387
Sheathmarking		: Approved	

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BV TWENTSCHE KABELFABRIEK

Quality Certificate

Results of Final Inspection according to specification : IEC 60840

Cable Identification

Construction	: 58239 Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240 / 50
Cable number	: 5126600005
Drum number	: 25228484
Length [m]	: 1006
Inspection date	: 15-01-2025

These results concern the total tested length of cablenumber :5126600005
The total length was dispatched.

Routine Test

Test voltage	90 kV 30 minutes	: Passed	
Spark test oversheath acc. MIK		: Passed	
Partial discharge test 1.5 U0	[pC]	: 1.0	Limit Max: 10.0
DC-resistance: conductor	[Ohm/km]	: 0.0741	Limit Max.: 0.0754
Screen resistance	[Ohm/km]	: 0.259	Limit Max.: 0.387

Sample Test

		Results	Spec	
Sheathmarking according spec		: Yes		
Lengthmarking present		: Present		
Outer diameter of the cable	[mm]	: 49.4	Min:	45.7
Thickness of outer sheath	[mm]	: 2.59	Avg:	2.50
		: 2.36	Min:	2.03
Alu-foil thickness	[mm]	: 0.21	Max:	0.22
		: 0.20	Min:	0.18
Thickness counterspiral	[mm]	: 0.09		
Width counterspiral	[mm]	: 20.1		
Stroke length screen	[mm]	: 611		
Diameter over screen	[mm]	: 43.9		
Number of copper wires	[n]	: 46		
Thickness copper wires armouring	[mm]	: 1.15		
		: 1.15		

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BV TWENTSCHE KABELFABRIEK

Quality Certificate

Results of Final Inspection according to specification : IEC 60840

Cable Identification

Construction	: 58239 Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240 / 50
Cable number	: 5126600005
Drum number	: 25228484
Length [m]	: 1006
Inspection date	: 15-01-2025

These results concern the total tested length of cablenumber :5126600005
The total length was dispatched.

Thickness of insulation screen	[mm]	: 0.82 : 0.79	Avg: Min:	0.80 0.75
Thickness of insulation	[mm]	: 9.45 : 9.40	Avg: Min:	9.50 9.00
Thickness of conductor screen	[mm]	: 0.85 : 0.75	Avg: Min:	0.80 0.75
Diameter over conductor	[mm]	: 19.03	Max:	19.100
Sheathmarking according datasheet		: Yes		

Sheathmarking:
{Length} TKF - Cu/XLPE/CWS/LAT/LSZH 36/66 kV 1 x 240/50 IEC 60840 - 2025 512660

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5 T-CONNECTORS TEST REPORTS (TE CONNECTIVITY)

Not available yet

6 T-CONNECTORS TEST REPORTS (NEXANS)

Not available yet