Base Load Power Hub (BLPH)

DATA SHEETS - T-CONNECTORS

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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
Andrea Padoschi	15/01/2024

Rev.	Date	Description	Prepared	Reviewed	Approved
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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.

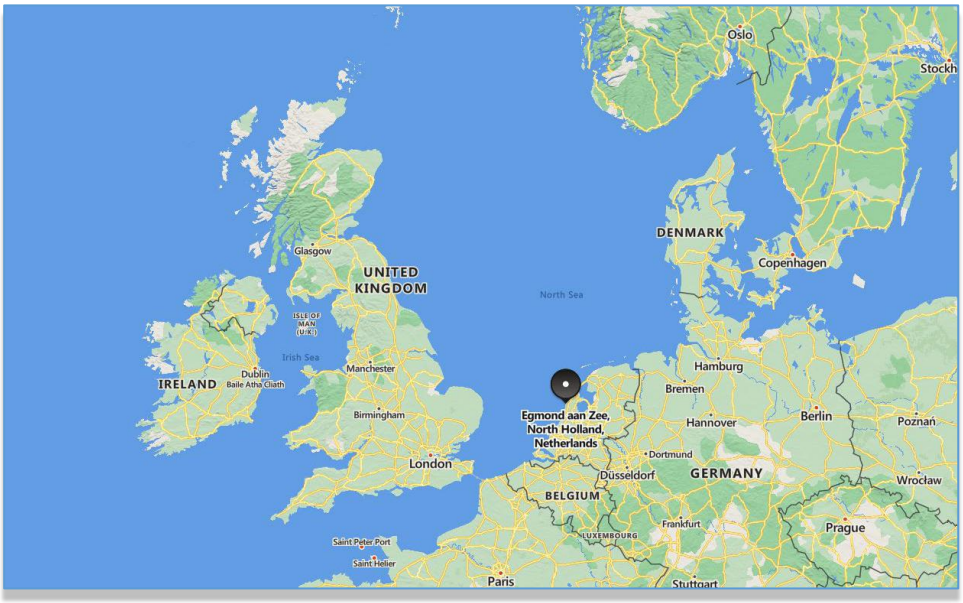


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



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.

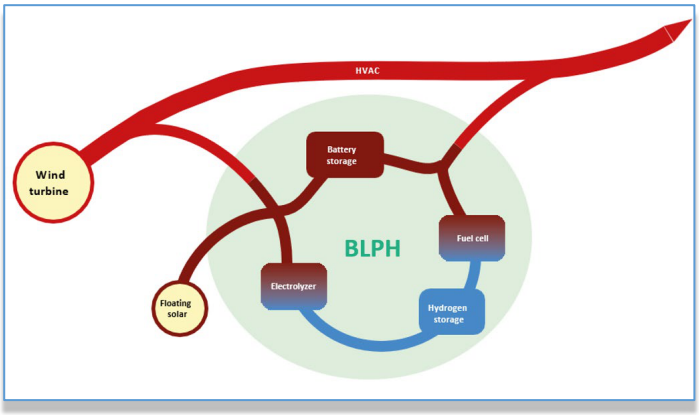


Figure 3 – BLPH Concept

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 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

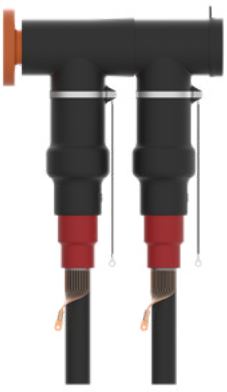
TE's Raychem Screened T-connectors for interface F RSTF up to 72.5 kV



- 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.

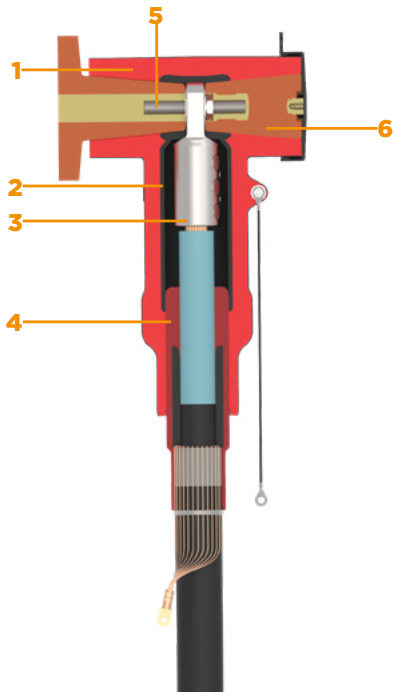
2. Inner screen
A conductive inner layer around the mechanical cable lug that works as a Faraday cage to prevent corona at rated voltage.

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

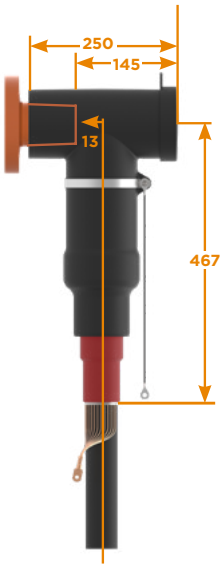
4. Stress cone adapter
Relieves electrical stress around the cable's screen cut. The insulated section is extending beyond the cable's oversheath to provide sealing against water ingress.

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.

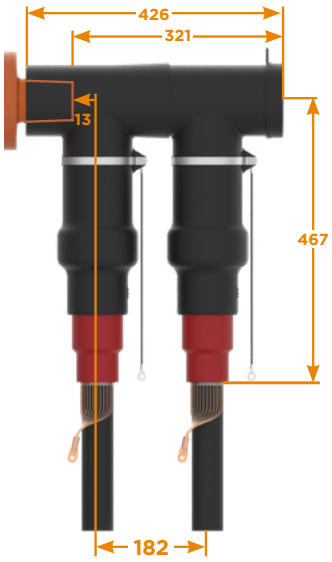
6. Rear plug with test point
Removable rear plug with capacitive test point that enables to check for presence of voltage.



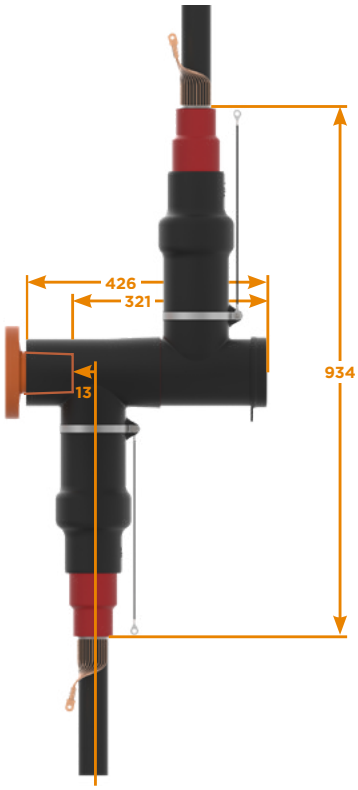
OFFERING A VARIETY OF APPLICATIONS



Single connection



Parallel connection



Inline connection

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4 DATA SHEET OF NEXANS EUROMOLD K480TB/G-21-95.240CU-FLEX+MWS+KIT MT/RS)-MT-AS044

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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

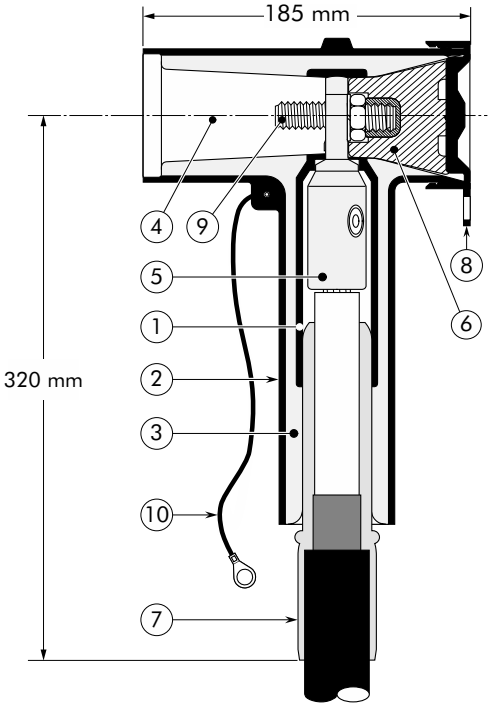
- A thick conductive EPDM jacket provides a total safe to touch screen.
- Each separable connector is tested for AC withstand and partial discharge prior to leaving the factory.

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.

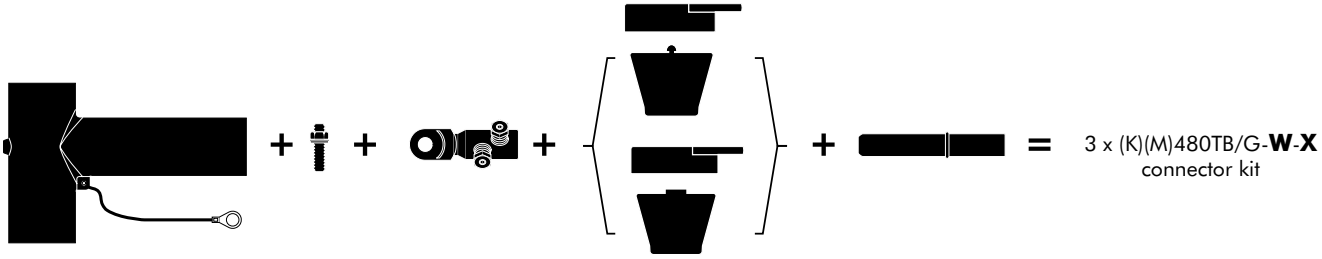
Separable connector type	Voltage Um (kV)	Current Ir (A)	Conductor sizes (mm^2)	
			min	max
480TB/G	12	1250	16	300
K480TB/G	24	1250	16	300
M480TB/G	36	1250	50	300

08/2020

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.



3 x (K)(M)480TB/G-**W**-**X** connector kit

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:

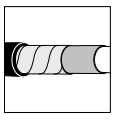
The cable is 24 kV, 185 mm^2 compact stranded copper with a diameter over core insulation of 27.5 mm.
Order 3 x K480TB/G-018-95.300UN5 tee connector kit.

TABLE W

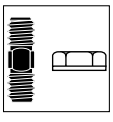
Ordering part number	Dia. over core insulation (mm)	
	min	max
3 x 480TB/G-011-**X**	12.0	19.0
3 x 480TB/G-015-**X**	16.0	26.5
3 x 480TB/G-018-**X**	19.0	32.6
3 x 480TB/G-021-**X**	22.0	34.6
3 x 480TB/G-027-**X**	28.5	37.5

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.



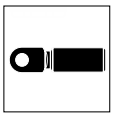
This product can also be installed using a stud & flange nut. Please contact our representative.



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



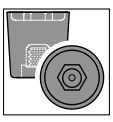
For applications outdoors and in humid climate. Order: +MWS.



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