



# TKF OFFSHORE WIND

FUTURE OUTLOOK 2023 - 2025  
"SMART CONNECTIVITY"

**TKF** CONNECTIVITY SOLUTIONS



INTRODUCTION  
TKF/TKH GROUP

REFERENCES

FUTURE OUTLOOK



NEXT VOLTAGE LEVEL  
132 kV



FLOATING WIND &  
DYNAMIC CABLES



SUSTAINABILITY &  
CIRCULARITY

SMART CONNECTIVITY & COLLABORATION

# TKF

## Founded in 1930

From cable manufacturer, to a technologically leading supplier of connectivity solutions

- Employees 830 (FTE)
- Head office in Haaksbergen, the Netherlands
- Member of TKH Group NV



## OUR MARKET SEGMENTS

- Building & Infrastructure
- Energy
- Subsea
- Marine & Offshore
- Industry
- Telecom
  
- SMART CONNECTIVITY SYSTEMS



## INTRODUCTION



**1930 Founding**  
NV Twentsche Kabelfabriek



**1949 First global export**  
Ceylon, Montevideo and Pakistan

1930 — 1935 — 1949 — 1953 — 1963 — 1980 — 1987 — 1990



**1935 Peninsula**  
Supply Marken energy cable

**1953 Stock listed**  
Amsterdam



**1963 New factory Lochem**  
Expansion production capacity

**1980 Founding Holding**  
NV Twentsche Kabel Holding

**1990 ISO-9001 certificate**  
First cable producer  
receiving ISO-9001

**1987 Fibre optic cable**  
Start of production





**1998 China TFO**  
Opening production location



**2010 Integration production locations**  
All under one roof, location Haaksbergen



**Expected 2023 opening factory**  
Opening production plant ready for 132 kV in Eemshaven

**1997 Achieving ISO-14001**  
Environment certificate

1996

1997

1998

2006

2010

2015

2017

2023

**1996 First solution assignment**  
PAN – network PTT



**2006 First offshore power cable project**



**Subsea production plant**  
Opening state-of-the-art subsea production plant Lochem (NL)



**2020 Celebrating 90 years**  
Connecting people and technology



## TKH GROUP NV FACTS & FIGURES 2022

### TURNOVER

1,816.6 € MLN

2021 1,523.8 € MLN

### TURNOVER GROWTH

19.2%

2021 18.2%

### NET CO<sub>2</sub>E FOOTPRINT REDUCTION

compared to reference year 2019

42.7%

2021 29.8%

### DIVERSITY

female executive and senior management

18.4%

2021 17.7%

### ROS

12.9%

2021 12.4%

### EBITA

234.8 € MLN

2021 189.6 € MLN

### TURNOVER LINKED TO SDGs

68%

2021 68%

### ACCIDENT RATE (LTIFR)

0.8

2021 0.7

### ROCE

23.2%

2021 20.5%

### DIVIDEND PROPOSAL

per (depository receipt of an) ordinary share

1.65 €

2021 € 1.50

### SATISFACTION SCORE

EMPLOYEE CUSTOMER

7.6 8.6

2021 7.4 2021 8.4

### ESG ASSURANCE

limited assurance on non-financial KPIs (number of KPIs)

11

2021 11





Inter-array cable offshore wind park  
Windplan Blauw – 33kV  
2022, Netherlands *Client: Ballast Nedam*



Inter-array cable offshore wind park  
Baltic Eagle – 66kV  
2021, Germany *Client: Van Oord*



Inter-array cable offshore wind park  
Hollandse Kust Noord – 66kV  
2021, Netherlands *Client: Van Oord*



Subsea cable connection Holwerd–  
Ameland connection –33kV  
2021, Netherlands *Client: Liander*



Inter-array cable offshore wind park  
Hollandse Kust Zuid – 66kV  
2020, Netherlands *Client: Vattenfall*



Inter-array cable offshore wind park  
Kaskasi – 33kV  
2020, Germany *Client: Seaway 7*



Subsea cable connection Windpark  
Fryslân – 33kV  
2020, The Netherlands *Client: Van Oord*

**A TRACK  
RECORD  
SINCE 2008 IN  
SUBMARINE  
CABLING**



TKF REFERENCES (2)



Inter-array cable offshore wind park  
Hohe See – 33kV  
2018, Germany *Client: EnBW*



Inter-array cable offshore wind park  
Albatros – 33kV  
2018, Germany *Client: EnBW*



Replacement subsea cable Perenco  
2016, Gabon *Client: Perenco*



Replacement subsea cable Perenco  
2015, Gabon *Client: Perenco*



Dynamic cable for Texel Tidal  
2015, The Netherlands *Client: Bluewater*



Subsea cable connection Germany  
2015, Germany *Client: Wiking Kabel*



Replacement subsea cable Perenco  
2015, Gabon *Client: Perenco*





- TKF UNIQUE INTER ARRAY CABLE DESIGN
- NEW FACTORY ARRAY CABLES EEMSHAVEN
- TRENDS IN ARRAY CABLING 2020 - 2030



NEXT VOLTAGE LEVEL 132 kV



FLOATING WIND & DYNAMIC CABLES



SUSTAINABILITY & CIRCULARITY

**READY FOR  
THE NEXT  
GENERATION  
OF OFFSHORE  
WIND**



## TKF CABLE DESIGN

- Dry design
- Aluminium or Copper conductors
- XLPE Isolation
- Smooth welded aluminium sheath
- Steel wire armouring
- Semi-conductive inner sheath, HDPE outer sheath
- Integration of Optical Fibre cables

### UNIQUE DESIGN RESULTING IN:

- Reduction of installation and termination time
- Reduction of risk during installation and termination (knife free installation)
- Superior life time



## INVESTMENT NEW FACTORY

LOCATED IN EEMSHAVEN, THE NETHERLANDS

- State of the art machinery
- 2023

	Lochem	Eemshaven
<b>Maximum Cable Conductor Size</b>	1000mm <sup>2</sup> Al (5km) 800mm <sup>2</sup> Cu (4.5 km) 170mm dia	1600mm <sup>2</sup> Al (15km max. ) 1200mm <sup>2</sup> Cu (13km) 270mm dia
<b>Voltage level</b>	33 and 66kV	33 – 132kV
<b>Maximum batch weight (without factory joints)</b>	350 tonnes	1500 tonnes

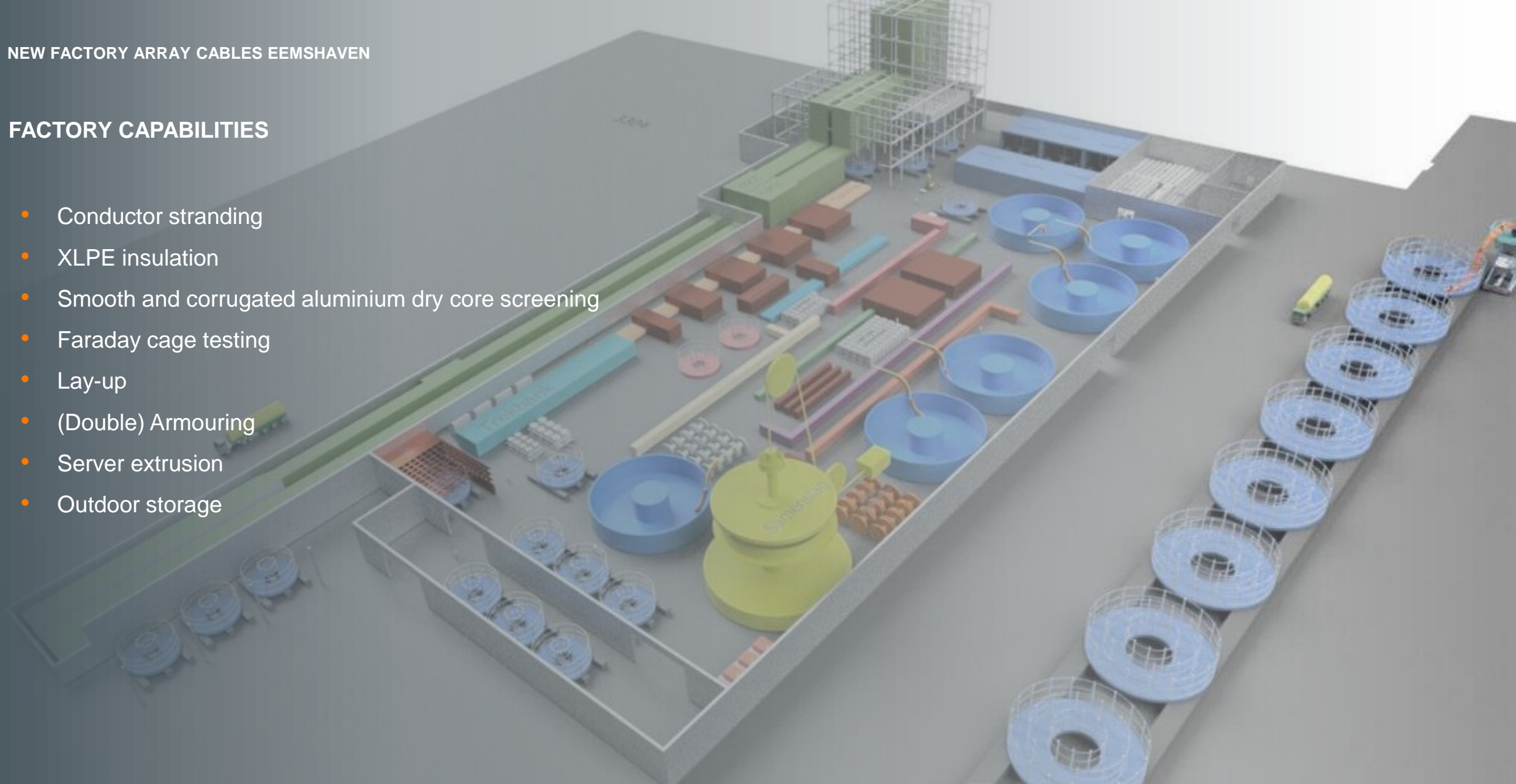


**TKF @ SEA**

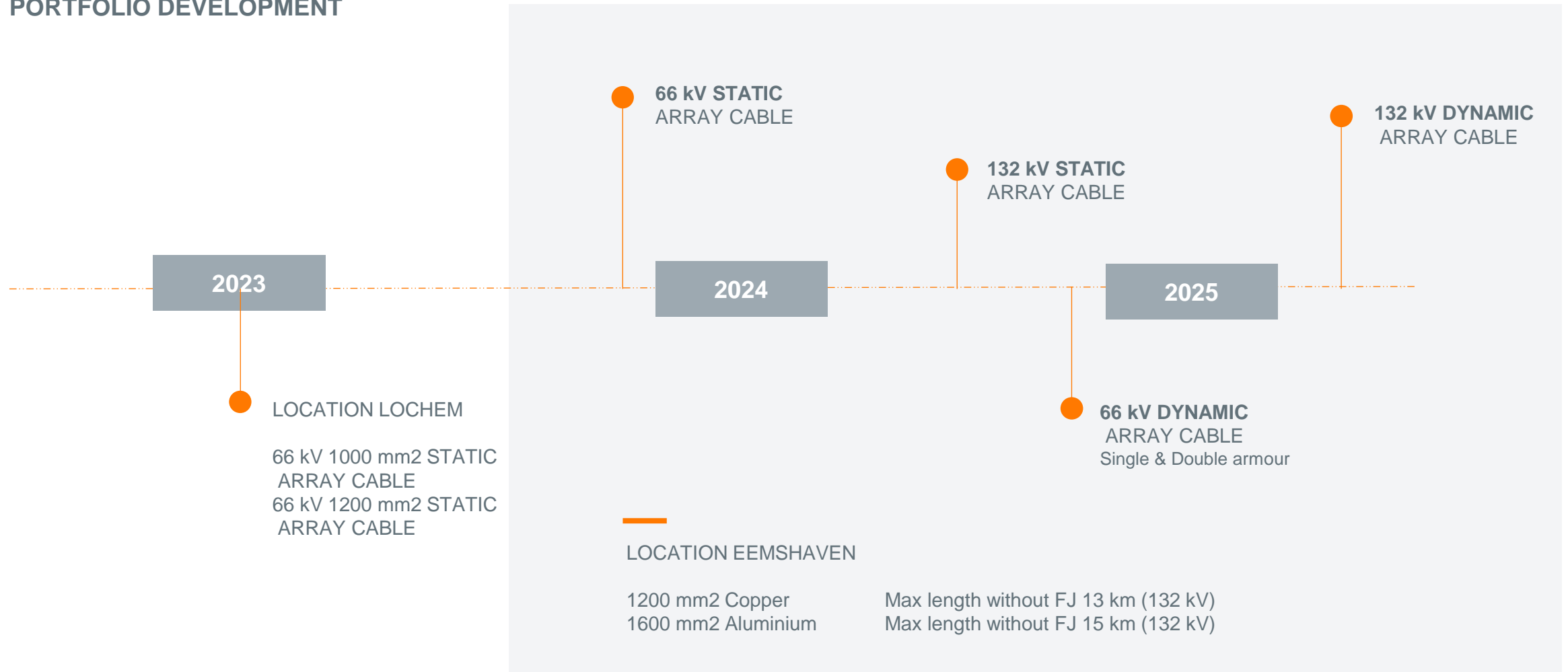


## FACTORY CAPABILITIES

- Conductor stranding
- XLPE insulation
- Smooth and corrugated aluminium dry core screening
- Faraday cage testing
- Lay-up
- (Double) Armouring
- Server extrusion
- Outdoor storage



PORTFOLIO DEVELOPMENT



## NEXT VOLTAGE LEVEL 132 kV

### OPPORTUNITY TKF CABLE DESIGN

- TKF is best prepared; SWAS Smooth Welded Aluminium Sheath, the ultimate solution for dry 132kV IAC
- SWAS is TKF's standard proven screen technology for 33 kV and 66 kV IAC
- TKF-SWAS single core is type tested up to 2500 mm<sup>2</sup> 150 kV
- Investment new factory ready for 132 kV
- TKF's new factory will be equipped with our proven SWAS technology for 132 kV 1600 mm<sup>2</sup> IAC
- Type test certification is foreseen in 2024



## FLOATING WIND & DYNAMIC CABLES

### OPPORTUNITY TKF CABLE DESIGN

- Dynamic cables under development by corrugated welded Aluminium sheath to improve fatigue resistance
- All other advantages and opportunities are applicable for TKF dynamic design
- Especially the welded sheath is a competitive advantage for this application because it contributes in a dry design.
- Single or double armour, depending on the severeness of the application
- Implementation of new test facility in progress (Cage of Faraday and relevant test equipment)



## TKF DESIGN FOR DYNAMIC CABLE

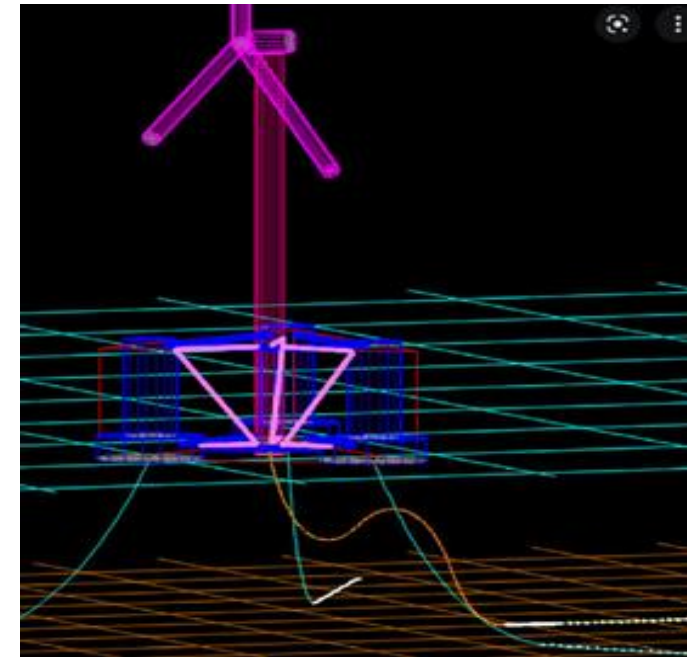


### DRY DESIGN ACCORDING TO IEC & CIGRE

- XLPE insulation
- CWAS, Corrugated welded aluminium sheath
- ST7 HDPE core sheath
- Extruded interstice filler
- Optical fibre cables
- Single armour for shallow water
- Double armour for deep water
- PE serving

#### Applicable voltage levels

- 33kV, 66kV and 132kV



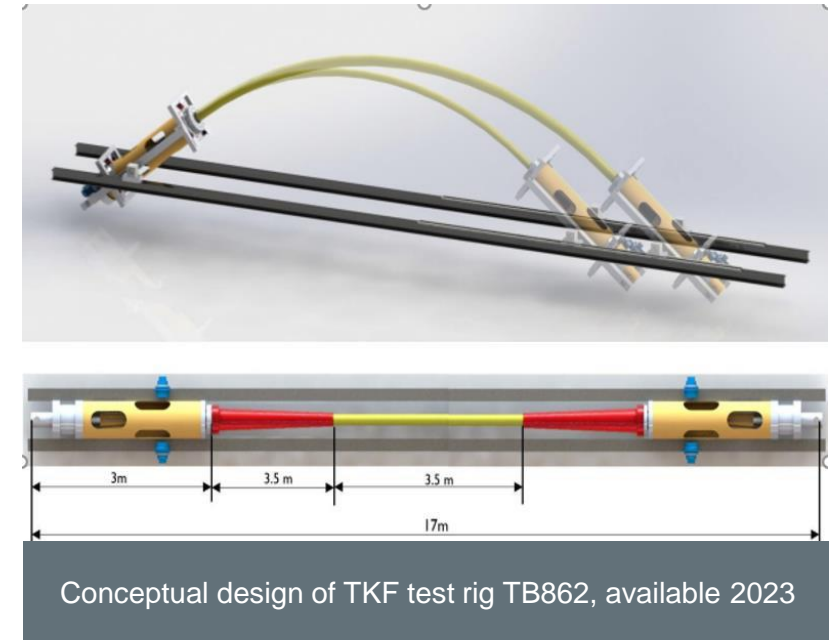
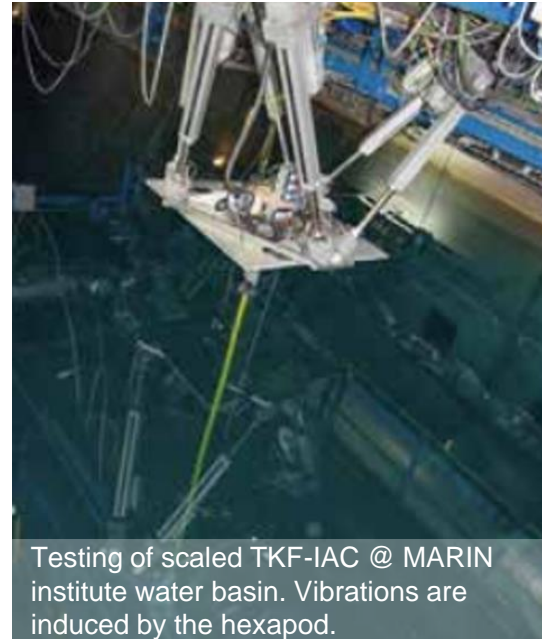


## DEVELOPMENT & PLANNING DYNAMIC CABLES

- TKF's design principles are based on analytical research and scale simulations in water basins
- Product development and proof of concept 2023
- Qualification 66kV in 2024/25

## CONDITIONS FOR QUALIFICATION

- Type test standard according to IEC 63026 & Cigre TB623
- Type test dynamic according to Cigre TB862



## SUSTAINABILITY & CIRCULARITY

### OPPORTUNITY TKF CABLE DESIGN

- Compared to competition, TKF design results in highest level of recyclability.
- TKF design allows implementation of negative footprint polymers (implementation from 2023).



**GREEN ENERGY  
CALLS FOR  
GREEN CABLES**



## A SUSTAINABLE CABLE DESIGN

### LEAD FREE DESIGN

- Without the use of lead, a carcinogenic heavy metal

### NO USE OF BITUMEN

- No risk of leaking of chemicals into the marine environment

### EASY RECOVERABLE

- Due to the extruded outer sheath the cable is easy recoverable without the risk of polluting the marine environment

### RECYCLABILITY

- The metals and the polymers can be easy recycled and can be used for similar applications (not down graded).



# Resourcepassport

Article number: 307630  
 Design number: CONF151060  
 Product description: Uitgeladen Subsea kabel op locatie 306630 3x1x630 mm² + 1x36 SM-FO  
 Supplier: TKF (B.V. Twentsche Kabelfabriek)  
 Date: 25 July 2022  
 Total weight: 32101.6 kg/km

The weights shown are an approximation of the actual ratios per kilometer product.

Base material	Recycled [%]	Re/Down in [%]	Reusable [%]	Re/Down out	Supplier Tier 1	(Base) Product	Supplier Tier 2	Source	(Base) material	Weight [kg/km]
Copper (electronic purity)	40	R	100	R	Various suppliers (EU)	Copper	Worldwide	Copper mine	Copper ore	37,5
XLPE Insulation (natural)	0	N.A.	97	D	Various suppliers (EU)	Polyethylene	Worldwide	Oil extraction	Petroleum	2885
PE	0	N.A.	95	D	Various suppliers (EU)	Polyethylene	Worldwide	Oil extraction	Petroleum	3830
PE	0	N.A.	95	D	Various suppliers (EU)	Polyethylene, Pigment	Worldwide	Oil extraction	Petroleum	24,2
Aluminium (electronic purity)	0	N.A.	100	R	Various suppliers (EU)	Aluminium	Worldwide	Bauxite mine	Bauxite	5711
PP	0	N.A.	100	D	Various suppliers (EU)	Polypropylene	Worldwide	Oil extraction	Petroleum	84
PP	0	N.A.	100	R	Various suppliers (EU)	Polypropylene	Worldwide	Oil extraction	Petroleum	302
Zinc plated steel	18	R	100	D	Various suppliers (EU)	Iron	Worldwide	Iron mine	Iron ore	9885
XLPE Semiconductive (black with carbon)	0	N.A.	97	D	Various suppliers (EU)	Polyethylene	Worldwide	Oil extraction	Petroleum	609
Steel	0	N.A.	100	D	Various suppliers (EU)	Iron	Worldwide	Iron mine	Iron ore	28
Ink	0	N.A.	0	N.A.	Various suppliers (EU)	Acrylate	Worldwide	Oil extraction	Petroleum	0,02
Waterblocking tape	0	N.A.	0	N.A.	Various suppliers (EU)	Unknown	Worldwide	Unknown	Unknown	194
Waterblocking tape	7,3	N.A.	0	N.A.	Various suppliers (EU)	Polyester, SAPs, carbon black	Worldwide	Unknown	Unknown	108
Optical fibre	0	N.A.	0	N.A.	Worldwide	Fused silica, Acrylate	Worldwide	Silica Mine, Oil extraction	Silica, Petroleum	7,2
Polymeric filler compound	0	N.A.	100	D	Various suppliers (EU)	Polymeric filler compound	Worldwide	Oil extraction	Petroleum	8418

## RECYCLABILITY

- Per 2022 partly Downgrade (waste during production and installation)
- After Operational lifetime: 99% reusable (polymers by pyrolysis)

## RECYCLED IN:

- Copper 40%, steel 18% , tapes 7%

## WORK IN PROGRESS:

- Increase % copper, steel, others
- Introduction of non-fossil polymers
- Recycling Aluminium alloy conductors

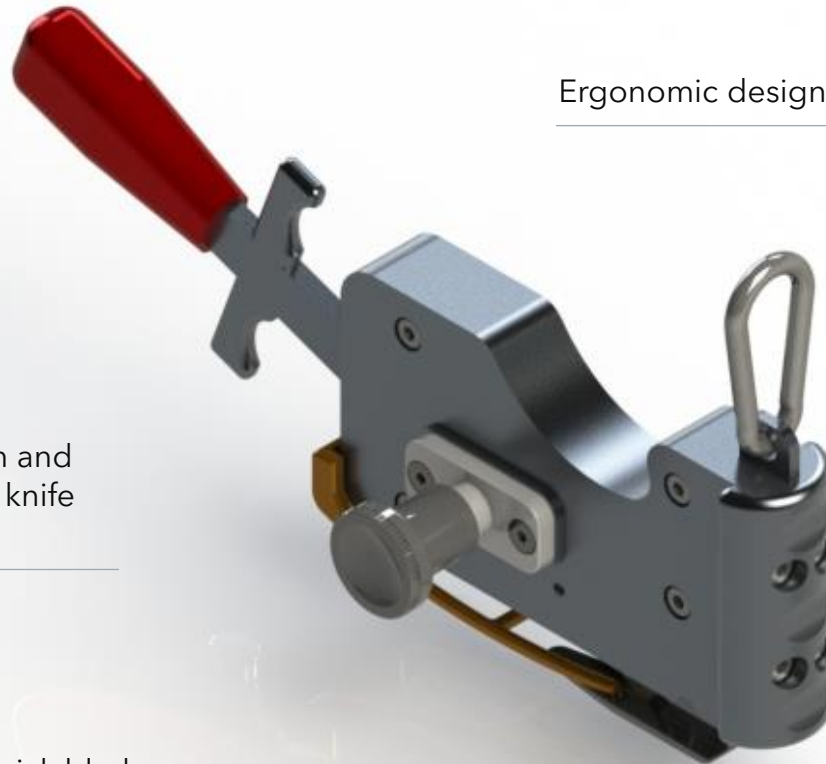


## TKF SUPER SHEATH CUTTER®

Robust aluminium design  
and light weighted

Blade construction and  
compliant with no knife  
policies

Easy and quick blade  
exchange



Ergonomic design

Safe for underlying cable  
components

Designed for rope access  
stripping activities

### Partnership success

Stripping cable without the use of a knife. To support a no knife policy.

Dedicated tools for individual cable layers to support efficient off-shore works.

TKF organizes inhouse stripping sessions to show the best practise with regards to safety, efficiency and lowest risk for cable damages



## Thank you

