

# 275 kV Submarine Cable Systems - First Wave

FOR OFFSHORE WIND INDUSTRY





# CONNECTING THE WORLD. TODAY AND IN THE FUTURE.

**Prysmian Group is world leader  
in the energy and telecom cables  
and systems industry.**

**With almost 150 years of experience,  
sales of over €12 billion, about 29,000  
employees in 50 countries and 108  
plants, the Group is strongly positioned  
in high-tech markets and offers the  
widest possible range of products,  
services, technologies and know-how.**

**150**

YEARS OF  
EXPERIENCE

**26**

R&D CENTRES  
AROUND  
THE WORLD



**We operate in the business of underground and submarine cables and systems for power transmission**

and distribution, of special cables for applications in many different industries and of medium and low voltage cables for the construction and infrastructure sectors. For the telecom industry, we manufacture cables and accessories for voice, video and data transmission, offering a comprehensive range of optical fibres, optical and copper cables and connectivity systems.



**Sustainability is in our DNA**

We are strongly committed to a low carbon future, and we are constantly reinforcing our technology offer in support of the energy transition. In fact, the transition towards renewable energy is very much linked to the capability to transmit and dispatch energy from one place to another, from where clean energy is produced to where it is consumed. The development of more reliable and capable grid infrastructures for power transmission and distribution is key for the integration of renewables. We are fully committed to do our part in the collective engagement to save the climate.

**As a company, we can play a crucial role in the global energy transition.**



# 275 kV cable technology, a powerful solution

The transition from fossil fuels to renewable energy requires powerful and efficient energy transmission systems. Larger wind farms are being constructed further offshore as developers seek to gain economies of scale and many close-to-shore areas have already been exploited. The offshore wind industry is requiring reliable submarine cable systems capable to transmit higher power over long distances.

**With this aim the offshore wind industry has introduced 220 kV export cables few years ago and is now introducing export cables at 275 kV. Prysmian Group developed 275 kV three-core submarine cables which are now available with conductor cross section up to  $3 \times 2000 \text{ mm}^2$ . These systems enable efficient and reliable power transmission over long distances.**

A new generation of 275 kV submarine cables – the Second Wave – is at an advanced development stage at the time of writing this brochure.

The innovative features of these cables will boost technical performances and enable a further cost reduction per MW transmitted. The second wave will be launched in 2023.

**INSULATION**  
XLPE

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**WATER  
BLOCKING TAPES**

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**FIBRE OPTIC ELEMENT**  
up to 3 elements, each  
with up to 48 fibres

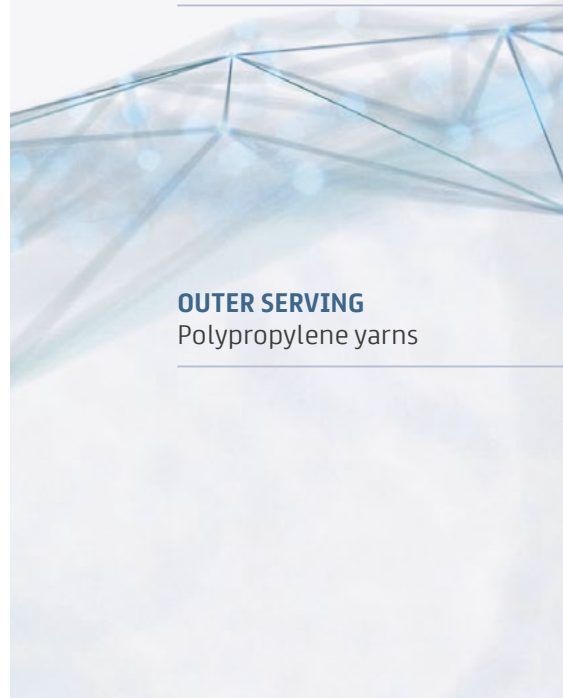
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**SHAPED FILLERS**  
Extruded  
Polyethylene

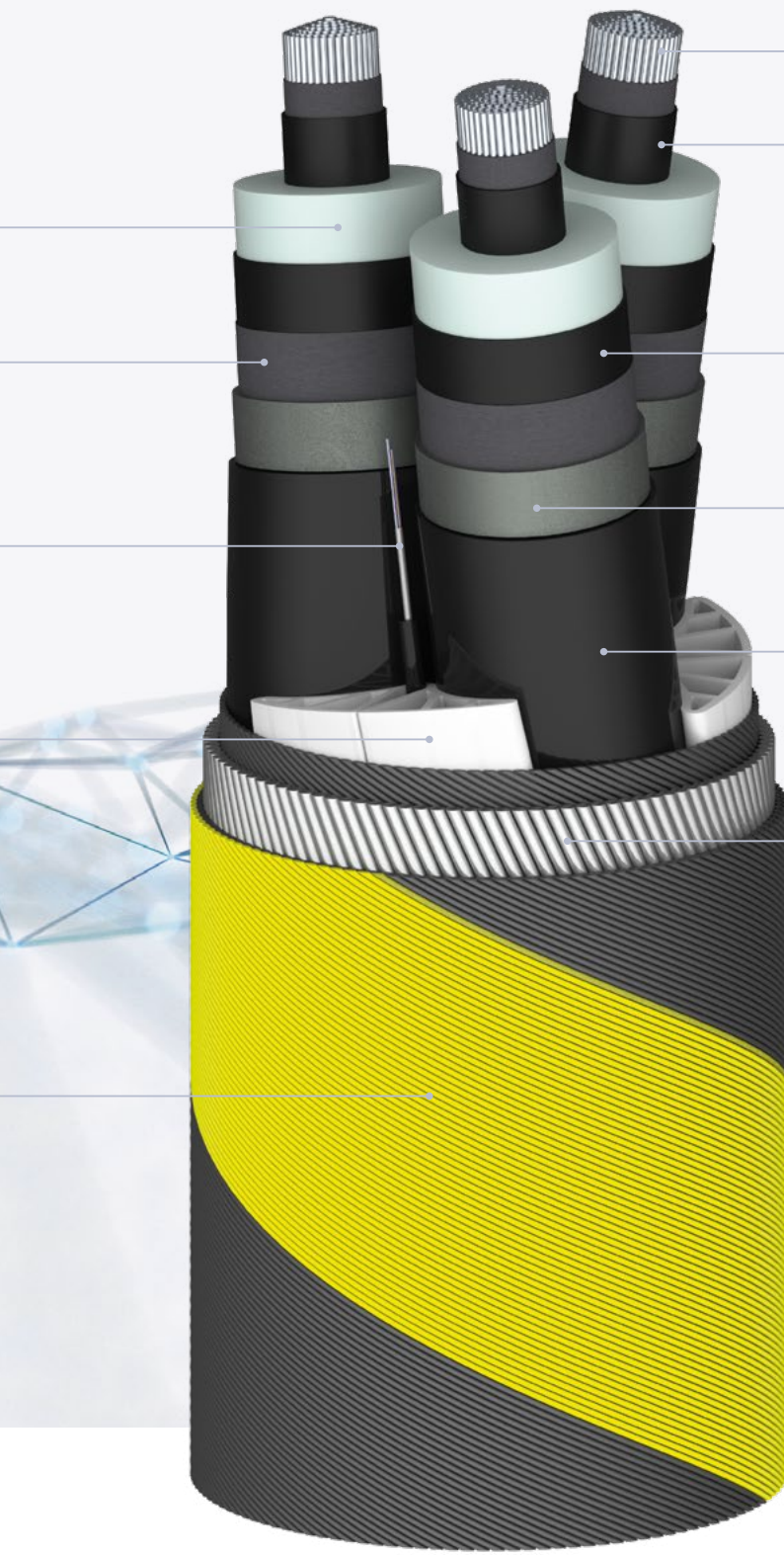
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**OUTER SERVING**  
Polypropylene yarns

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**CONDUCTOR**

copper or aluminum compacted strands up to 2000 mm<sup>2</sup>

**INNER SEMI-CONDUCTIVE LAYER**

**OUTER SEMI-CONDUCTIVE LAYER**

**RADIAL WATER BARRIER**

Lead alloy sheath

**ANTICORROSION SHEATH**

extruded Polyethylene

**ARMOUR**

Steel or synthetic wires

**XLPE IS A CROSS LINKED  
POLYETHYLENE-BASED  
INSULATION MATERIAL.**

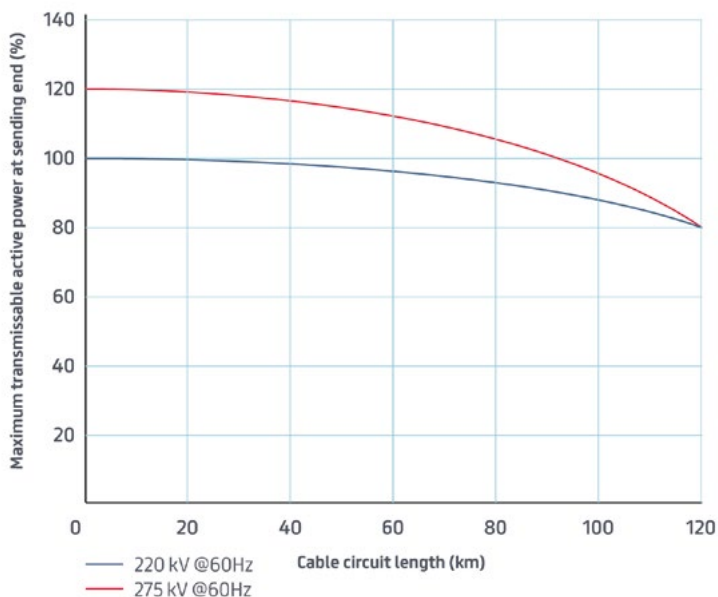
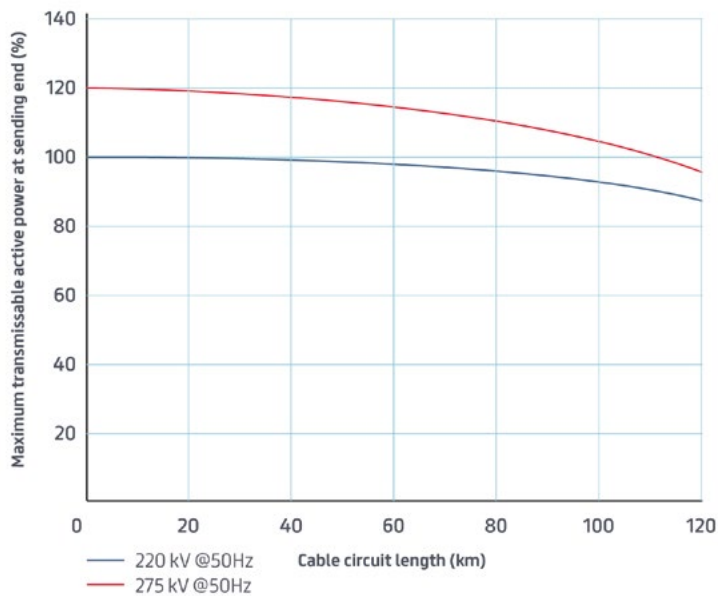


**It is applied together  
with semiconducting  
layers by triple extrusion.**

# INCREASING PERFORMANCE

## LONG DISTANCE POWER TRANSMISSION

Long distance AC power transmission by cables is feasible, without intermediate compensation, up to 100-120 km distance, as shown in the following plots (above: 50 Hz, below: 60 Hz).







up to **20%**  
MORE  
TRANSMISSIBLE  
POWER

## POWER TRANSMISSION UP TO 400-500 MW IS ACHIEVABLE WITH ONE 275 KV THREE-CORE CABLE SYSTEM

**When compared to 220 kV, use of 275 kV voltage yields up to 20% more transmissible power which, considering also the cost of cable installation, enables a significant cost reduction per MW transmitted.**

Depending on project specific conditions, power transmission up to 400-500 MW is achievable with one 275 kV three-core cable system.

### PRE-QUALIFICATION AND TYPE TEST, ACCOMPLISHED

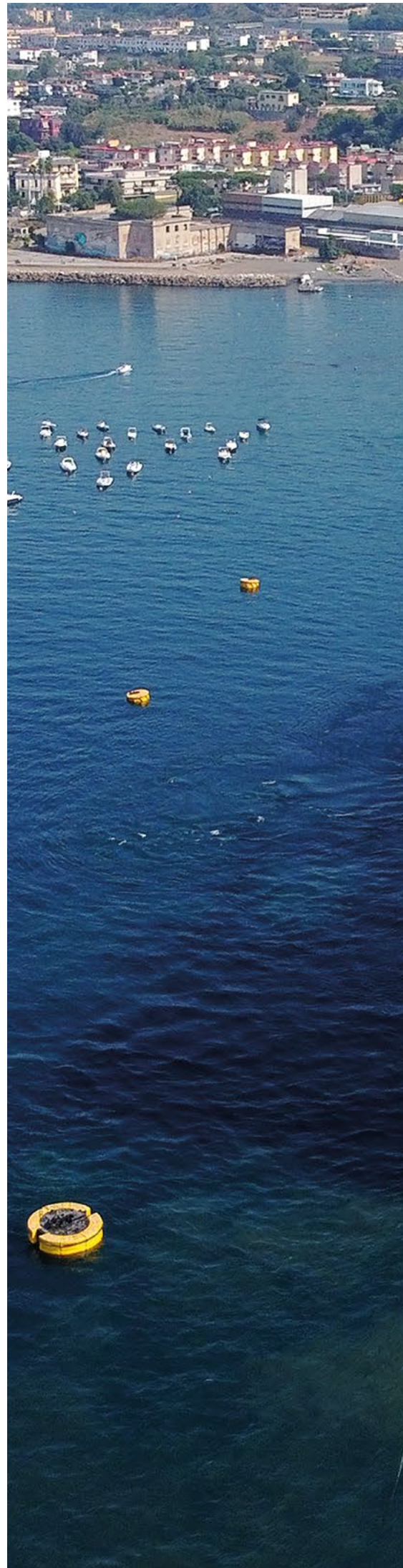
Prysmian finalised the qualification of a three core 275 kV cable system

including cables from both Pikkala (Finland) and Arco Felice (Italy) factories and all the relevant accessories. Both a Prequalification Test and a Type Test according to CIGRE TB 490 and TB 623 have been accomplished. Tests have been carried out in Prysmian laboratories in Bishopstoke (UK) and Milan (Italy), with third party witnessing. The tested cable system is qualified for installation conditions representative of offshore wind applications.

# Installation

**275 kV three core cables are very powerful, but they are also among the bulkiest submarine cables. Thanks to the new Leonardo Da Vinci cable laying vessel, Prysmian can install very long 275 kV submarine cables minimising the number of field joints.**

With a length of approximately 170 m and a breadth of about 34 m, Leonardo da Vinci offers several advanced features such as: deep water installation capabilities for depths of more than 3,000 m; maximum speed slight above 16 knots; 2 carousels of 7,000 and 10,000 tonnes, which ensure the highest carousel capacity in the market; two independent laying lines in order to increase operative flexibility; bollard pull in excess of 180 tonnes conferring the capability to perform complex installation operations and supporting a variety of burial tools. In addition, the vessel is equipped with state-of-the-art DP3 positioning and seakeeping systems. All cable handling and installation equipment has been designed by Prysmian.







## A CUTTING-EDGE LAYING VESSEL

The high cable load capacity of Leonardo da Vinci also allows the number of cable installation campaigns of any project to be significantly reduced.

The lower number of transits enable an overall decrease in CO<sub>2</sub> emissions and a reduction in fuel consumption of approximately 40% compared to a traditional cable-laying vessel.

Leonardo da Vinci is a cutting-edge vessel also in terms of sustainable performance as it ensures reduced environmental footprint: over 80% of its lighting fittings consists of low consumption LEDs, which means a cut of the emissions produced by the generators.

Moreover, it is powered by the most efficient and greenest engines that shrink by 85% the emissions of NOx and enable the vessel to be compliant with the most stringent international environmental requirements.

## Unique technical features

- ↔ 171 m length
- ↑↓ 34 m breadth
- ⤵ Deepest power cable installations of up to 3,000 metres
- ⚖ Bollard pull in excess of 200 tonnes
- ⚖ 100 tonnes capstan capacity
- ⚙ 2 carousels of 7,000 tonnes & 10,000 tonnes



# A further step towards energy transition

## STATE OF THE ART OFFSHORE WIND PROJECTS

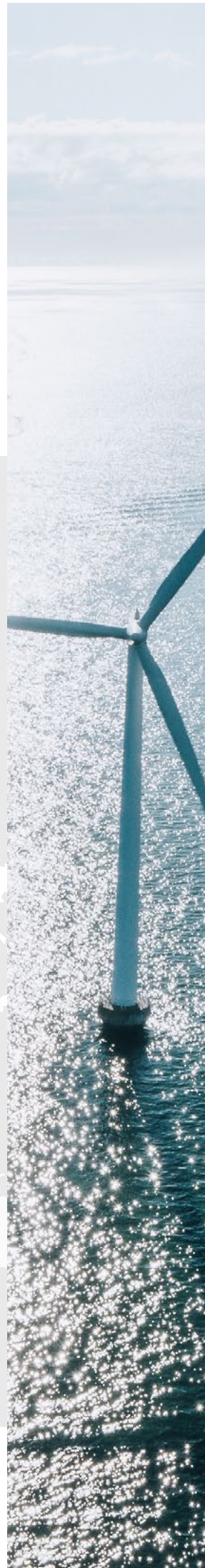
Prysmian will manufacture and install export cables as part of two major offshore wind projects, namely Parkcity Wind and Commonwealth Wind.

The first project will connect the **804 MW Park City offshore wind farm to the electricity grid in the state of Connecticut**. The two 275 kV export cables for this project will be manufactured in the Group's centres of excellence Arco Felice, Italy, and Pikkala, Finland, and will be installed by the Leonardo da Vinci and Ulisse vessels. Delivery and commissioning are planned for 2026.

The **Commonwealth Wind project** will deliver 1,200 MW of offshore wind farm capacity. Prysmian will design, supply and install three 275 kV export submarine cable systems to connect the Commonwealth Wind Farm to the electricity grid in Massachusetts.

As part of the Commonwealth Wind project agreement and subject to several customary conditions precedent, Prysmian intends to build a state-of-the-art manufacturing facility for submarine transmission cables in Massachusetts (USA).

The submarine cables for Commonwealth Wind project are planned to be produced partly in this future plant, and partly in Arco Felice and Pikkala. Cables will be installed by the Leonardo da Vinci and Ulisse vessels. Delivery and commissioning of the export cables are scheduled for 2027.







PRYSMIAN GROUP  
CABLE MANUFACTURING  
CENTRES  
OF EXCELLENCE:  
**ARCO FELICE  
AND PIKKALA**

## 804 MW Park City Wind

FROM WIND FARM  
TO THE STATE  
OF CONNECTICUT

## 1,200 MW Commonwealth Wind

FROM WIND FARM  
TO THE STATE  
OF MASSACHUSSETS

**THE NEW AWARDED CONTRACTS  
CONFIRM PRYSMIAN'S LEADING ROLE  
IN THE DEVELOPMENT OF POWER GRIDS  
INFRASTRUCTURES TO SUPPORT ENERGY  
TRANSITION ALSO IN THE US.**

**Prysmian**  
**Draka**  
**General Cable**

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