



WE THINK THE WORLD OF PLASTICS



PRIMO

PRIMO OFFSHORE
RODS FOR SUBSEA CABLES



LET'S INNOVATE TOGETHER

IN PARTNERSHIP WITH OUR CUSTOMERS IN THE OFFSHORE INDUSTRY, WE CREATE OFFSHORE FIXTURE SOLUTIONS DESIGNED TO MAXIMIZE PERFORMANCE AND SAVE RESOURCES.

At Primo, we support the development and manufacturing of new innovative linear offshore products. In close cooperation with our customers, we always aim to find the optimum solution; together, we are often able to improve the result. This is only possible because we know our business – extrusion of plastic profiles – and yours as well, with 60 years' experience in the offshore industry.

It all starts with an idea

Everything is based on our customers' ideas or on the need to introduce a new linear offshore solution to the market, and in this phase we truly innovate together. This is where we put the idea or concept to the test regarding requirements, ease of use, agility in the production process, costs, sustainability, durability and many other important factors, including compliance with standards and legal requirements. Together with a team of specialists you will end up with an idea that will make a difference.

The right material

With the right choice of material, you can optimise

product features such as product lifetime, optical and thermal properties, stability, temperature as well as UV resistance. Plastics are non-corrosive and resistant to weather conditions, acids, lye, solvents and oil. Furthermore, product properties can be improved by mixing different types of materials or adjusted with colours and additives according to your needs. And always with respect to flexibility, sustainability and recyclability.

Our team of specialists continuously follows the development of plastics closely and will guide you to the best possible choice of material. Primo is also taking a leading role in improving and developing sustainable materials and manufacturing processes.

Endless design options

An extruded plastic profile can be made in almost any design you can imagine. In the design phase, the design options must be aligned with the properties you are aiming for.

To ensure an efficient process, we will use our project management platform including checkpoints and tests,



together with CAD computing, detailed drawings and 3D prints.

Fast time to market

Primo's project management and in-house tooling facilities are your guarantee for a smooth time-to-market process. This includes high flexibility and fast response times whenever refining or alteration work is required.

International partner and supplier

Primo was founded in Denmark in 1959; today, the Primo Group operates in nine countries in Northern and Eastern Europe and in China. You'll get an international partner with local support and business insight.

Let's innovate together!



Kristoffer Buhl Larsen
Group Sales Development Director

INNOVATIVE FIBER JACKETED POLYMER SOLUTIONS FOR BETTER SUBSEA CABLING

EVER SINCE THE FIRST SUBSEA CABLES WERE SUBMERGED ACROSS THE ENGLISH CHANNEL IN THE 1850s, DURABILITY, COST, AND CHOICE OF MATERIAL HAVE BEEN SIGNIFICANT CONCERNS.

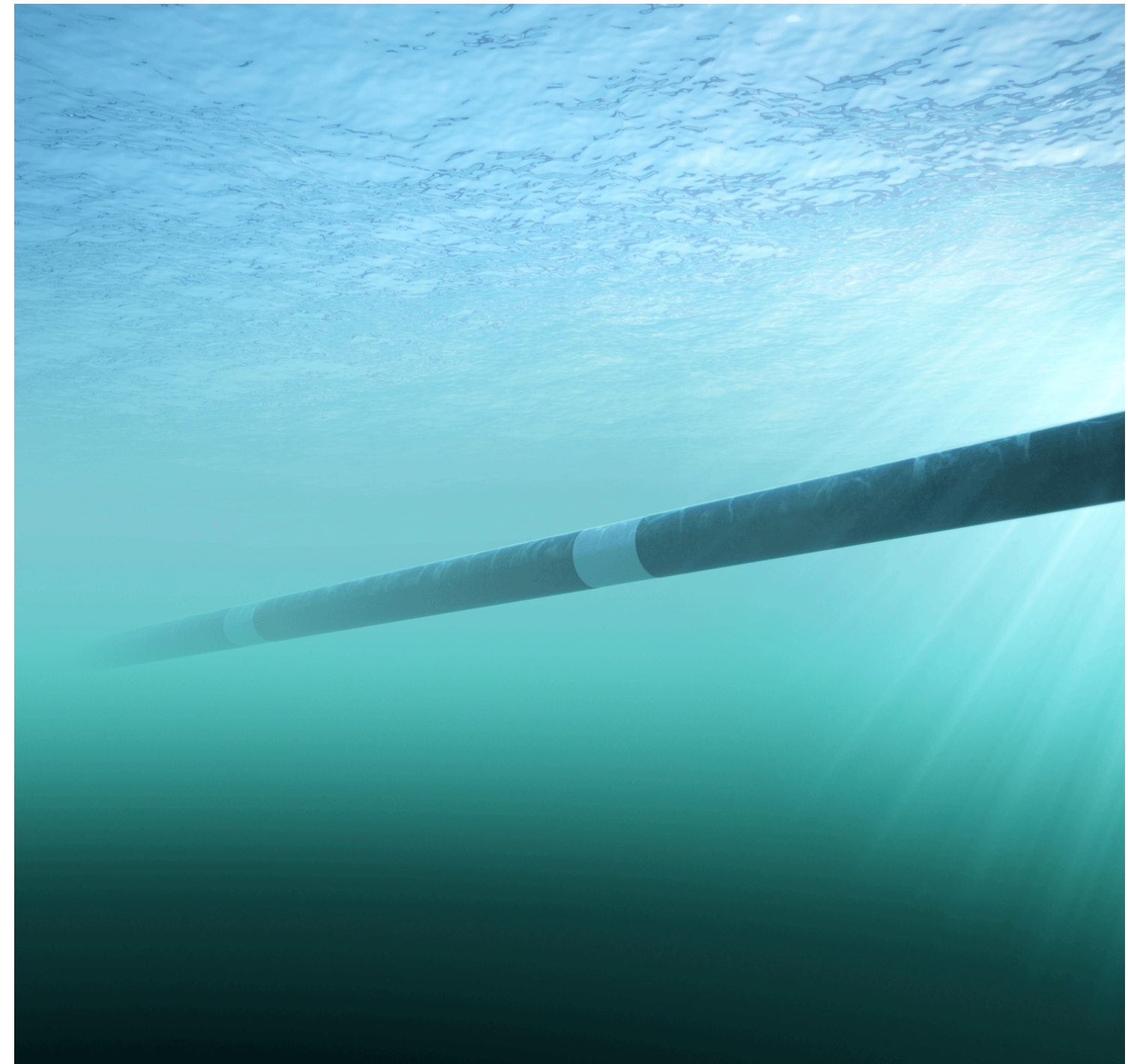
Today subsea cabling is all about material science, deep product knowledge, and research into new combinations of materials. In recent years, the use of polymer has shown to lower the total cost of operations as replacement of steel as protective cable rods.

Subsea cabling is a play with strong natural forces, and failures can be devastating. The developments of cable composition are today a science that improves continuously.

Primo Offshore is a dedicated supplier of components for subsea cables, with a specialized production facility solely for the offshore cabling market. The plant in Dals-

torp Sweden is producing shaped fillers, umbilicals, that ensure the stability of multiple cable piles in the same cable, insulating flowlines profiles and direct heating cables. Dalstorp has the largest number of production lines in the industry, securing rapid response to client's needs. This gives the possibility to run multiple lines in parallel to decrease the lead time. In order to secure a stable logistic supply chain, Dalstorp has a storage area for large scale projects wherefrom cable drums are delivered as needed directly to the site of operation.

In this whitepaper, we will take a closer look at the latest developments of protective rods for high-performance subsea cables.



Decades of experience and material knowledge

At Primo Offshore, we are constantly developing and improving existing fiber rods, and we have been doing so for years. This means that we can provide solid guidance and information on plastic rods and how to practically apply them.

Traditionally steel has been used to enforce subsea cables. Steel is a durable and strong material, but the weight of steel can adversely impact the complicated process of sinking cables.

Often subsea cabling is spanning hundreds of kilometers. This means that the weight of cables limits the total amount of cables that can be shipped in a single

operation on a given cable laying vessel. Also, the cable weight will stress equipment when sinking cables at deep sea. This means that more frequent cable connections are required with a higher cost of operation. The lower weight is, therefore, an often asked for feature. This can be accomplished by replacing parts of the steel rods with modern, durable plastic types. Plastic rods are extruded plastic jacketing around high-performance fibers, typically rounded. They are strong, durable and flexible.



Key Features and Benefits

- Reduced weight
- Protect the core from mechanical impact and elongation
- Replacement of steel rods
- Reduce electrical interference
- Cost savings
- Customized properties
- Color identification for easy tracking



THE EXTRUSION PROCESS

IN EXTRUSION, THE PLASTIC IS MELTED AND EXTRUDED THROUGH THE DIE INTO A PROFILE OF THE DESIRED FORM. PROFILES CAN BE DELIVERED TO THE CUSTOMER READY-MACHINED IF NECESSARY.

Benefits of the production method:

Large batches, tailored product lengths, cost-effectiveness, consistency of quality.

1. STORAGE AND DRYING

The raw materials are stored in silos and flexible intermediate bulk containers (1t). Before the process, the raw material is dried according to the raw material manufacturer's instructions. Depending on the requirements for the end product, we choose among 40+ traceable polymer types from licensed suppliers. The range includes recycled material.

2. DOSING

The raw material is dosed into the extruder using a gravimetric scale. Masterbatches (colouring agents or other additives) can be added to the raw material to improve the properties of the extruded profile to meet customer requirements such as durability, flexibility, color etc.

5. CALIBRATION AND COOLING

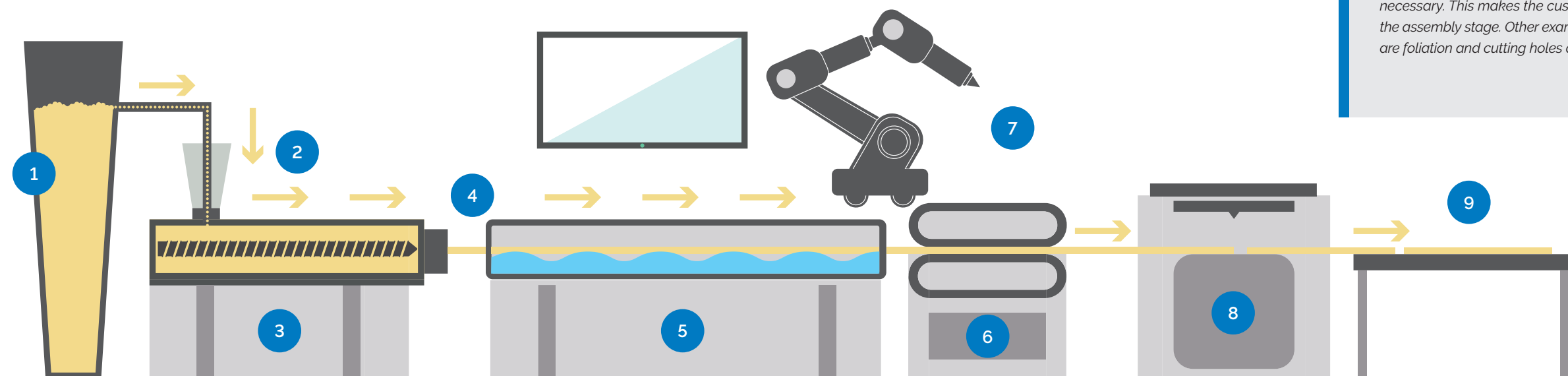
The calibrator cools the profile and shapes the final form by using vacuum and water or air. High-quality calibration and cooling ensure surface appearance, dimensional accuracy and the desired form.

6. HAUL-OFF UNIT

Two opposite belts that rotate in uniform speed keep the process going. During the process, inkjet marking is applied to the profile, to ensure production data and traceability of the final product.

7. INLINE MACHINING (OPTION)

The profile can be milled, drilled, punched and stamped and seals or adhesive tapes can be added if necessary. This makes the customer's work easier at the assembly stage. Other examples of inline machining are foliation and cutting holes and edges for assembly.



3. EXTRUDER

The cylinder's zone-based electric heaters and screw melts the plastic raw material into a 110-260-degree homogenous mass. A specially designed screw pushes the solid mass towards the die with steady pressure. At this stage more processes can be integrated to optimize the production process, to ease finishing and mounting, and to ensure tightness: Can be co-, tri-og even quad extrusion or an inlet process combining two processes in one; for instance the extruded plastic profile with a metal wire.

4. DIE

The pressure pushes the hot mass through the die that gives it its form. The width of the profile can be up to 25 cm and height up to 15 cm. Preparing this phase and the tool, we have challenged your design to improve quality and properties regarding functionality, tolerances, material consumption, sustainability, assembly options etc. The tooling phase is the 'point of no return' and a decisive factor for the final result.

8. CUTTING

The profile is cut in the desired length already inline (min 0.02 m, max 16 m). The cutting method is selected according to the profile's shape and raw material. The methods include rotary saw, guillotine, and hot knife. Additional services can be included, such as an-tistatic coating and welding/assembly of the profiles.

9. PACKAGING

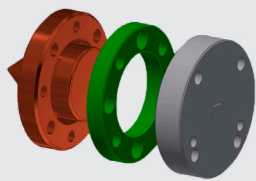
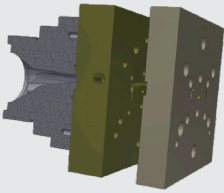
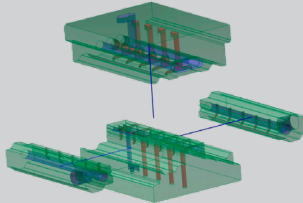
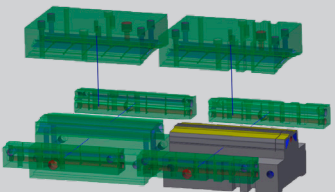
The packaging method is individually designed for each profile type. The profiles are typically packed in cardboard boxes or wooden crates to ensure sufficient protection and easy unloading, always tailored to your needs and requirements, to ease further handling and to minimize logistic risks. Another service is warehousing of your product for fast delivery and minimizing supply chain risks.



CHOOSING THE RIGHT TOOL TYPE

PRIMO DESIGNS AND MANUFACTURES TOMORROW’S PROFILES TO OPTIMISE PERFORMANCE AND SAVE RESOURCES.

The extrusion tool consists of a die and a calibrator. In the process, the plastic is melted and extruded through a die into a profile of the desired shape. Then, the shaped plastic is drawn through a calibrator where it reaches its final form assisted by vacuum and cooling.

TYPE OF TOOL	PROTO TOOL	VOLUME TOOL
DIE		
CALIBRATION Actual sizes: Proto: 10 x 5 cm Volume: 2x15 cm x 10 cm		
Tool parts and their functions	Profile specific flat head die . Plastic is pressed through the die. A spike torpe-do is usually a standard component that improves the flow.	The die has between one and five conically machined die blades. They direct the melt-ed mass into each cavity of the die.
Calibration	Calibration of proto tool consist of 1-2 calibration blocks located after the die where the profile is cooled and calibra-ted to the correct dimensional accuracy.	Calibration of the volume tool consists of 2-4 parts performing the cooling by using vacuum and water. Complex profiles re-quire additional water and vacuum tank.
Suitable profiles	Simple, open profiles.	Complex profiles with cavities or varying wall thicknesses.
Cost of the tool*	2,000 - 10,000 €	> 10,000 €
Manufacturing batch	Short production runs and proto testing.	Volume production and long runs.
Quality	Adequate for simple end products.	Small tolerances, good surface quality and consistence of quality.
Performance	Higher consumption of the raw material and low production speed of the profile.	Quick start up of production, little waste and high production speed of the profile.

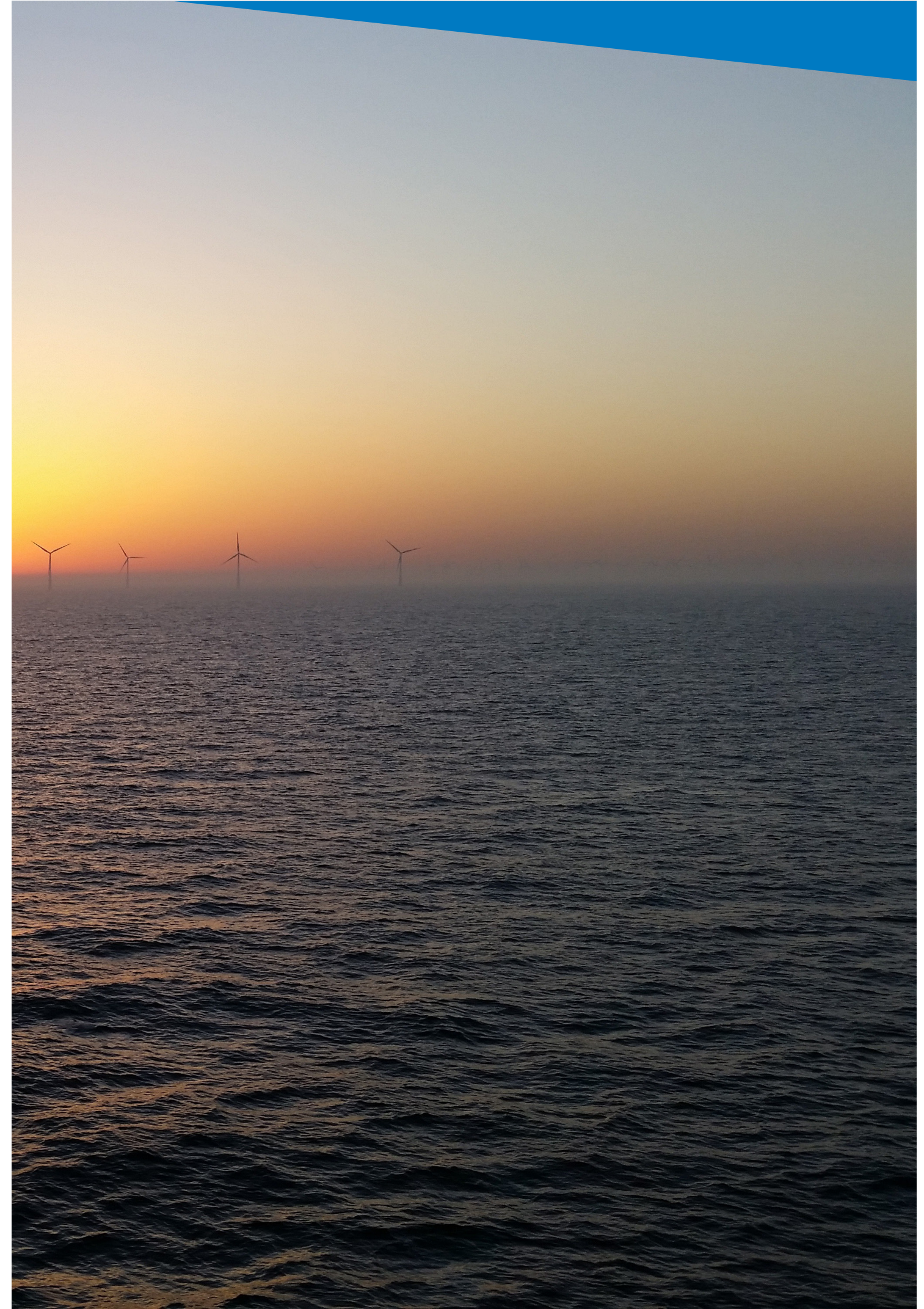
*The total cost of the tool is based on the design, materials used for the tool, wire cutting, milling and electrical discharge machining of the tool parts and test runs. The cost of the tool is always fixed on a case-by-case basis.

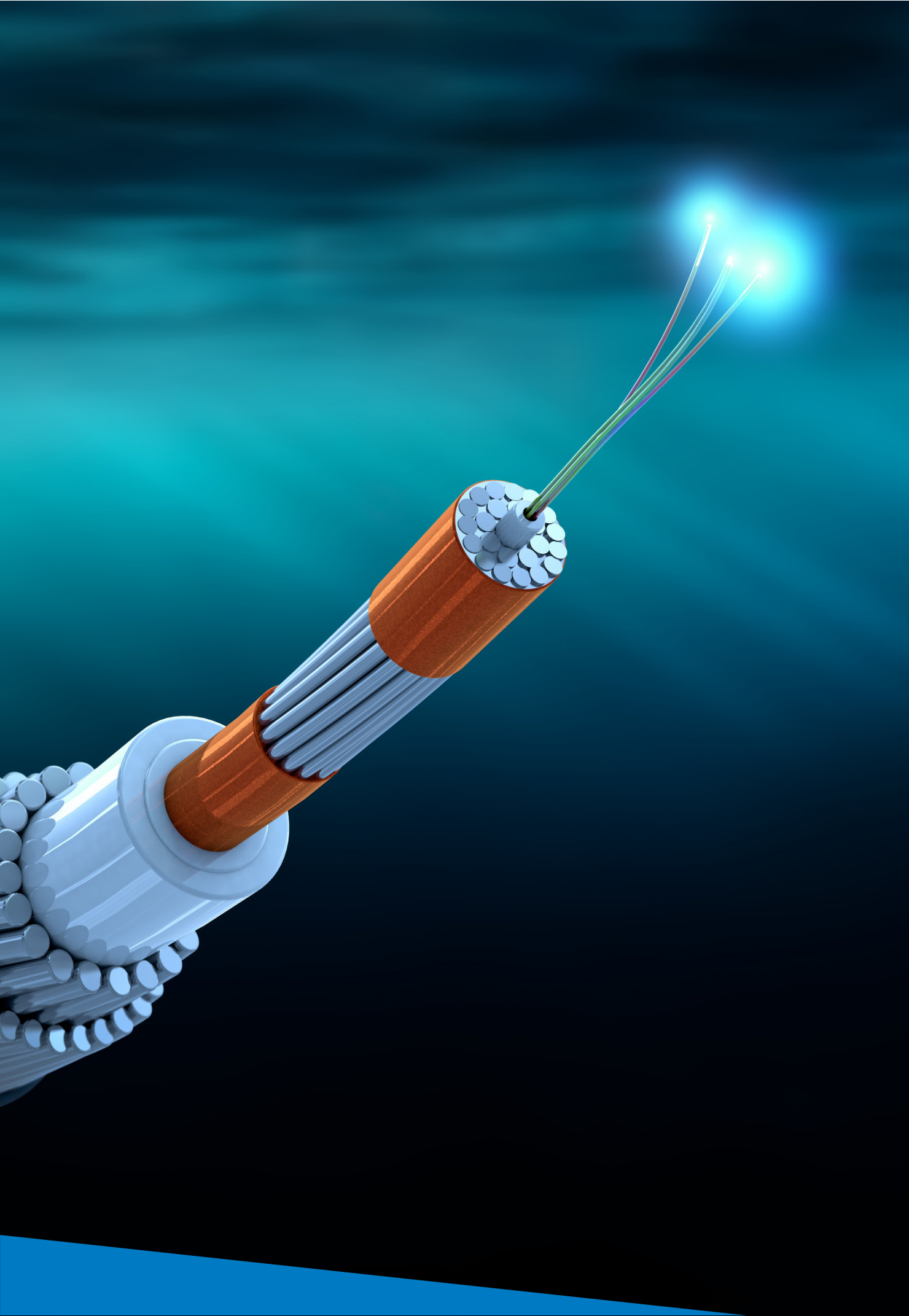


CHOOSING THE RIGHT MATERIAL FOR THE JOB

Plastic rods rarely substitute steel completely. Rather, a combination is preferred depending on the nature of the cable. Modern material analysis and practical experiences with thousands of kilometers subsea cabling suggest that between 33 to 50 pct. replacement is optimal for balancing durability and weight.

Multiple factors come into play when designing the optimal cable composition. At Primo, we work with a range of thoroughly tested materials. Some fibers are better than others for specific applications. Properties that distinguish the different fibers include among others tensile strength, modulus, elongation and conductive.





Fiber properties

Polymer selection is based on application, temperature resistant, friction and the necessity of chemical adhesion

	GLASS FIBER (GF)	POLYESTER (PET)	LIQUID CRYSTAL POLYMER (LCP)	CARBON FIBER (CB)	PARA ARAMID (PAR)
N/tex	0,59	0,60		1,67	2,30
N/mm2	1 520	830		3 000	3 330
Elongation %	2 - 3	8 - 15		0,4 - 1,8	2 - 3,7
Working temperature	240	135		530	180
Sg	2,60	1,38		1,80	1,45

Jacketing selection

Polymer selection is based on application, temperature resistant, friction and the necessity of chemical adhesion

	GLASS FIBER (GF)	POLYESTER (PET)	LIQUID CRYSTAL POLYMER (LCP)	CARBON FIBER (CB)	PARA ARAMID (PAR)
PP	X ¹	X	X	X	
HDPE	X	X	X		
TPE	X	X	X		X
XLPE	X	X	X		
PVC (Flexible)	X	X	X	X	X

- Available sizes range from 3,0 mm – 12,0 mm
- Can be delivered as round and flat shape
- Delivered on standard drum between K10 - K14, customized drums or coils





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PRIMO GROUP

PRIMO DESIGNS AND MANUFACTURES TOMORROW'S PROFILES TO OPTIMISE PERFORMANCE AND SAVE RESOURCES.

Primo creates solutions with our customers to design and extrude the profiles of tomorrow that will optimise performance and save resources.

The Primo Group is a leading, international plastic extrusion technology expert. We develop and produce tailored and competitive solutions, know-how, products and services for the industrial sectors of construction, building offshore, medical and many more. Quality, customer satisfaction, environmental matters and safety are of paramount importance to our operations. All of Primo's operating units are certified and comply with the following management system standards, among others:

OHSAS 18001:2007 | **ISO 14001:2015** | **ISO 9001:2015**

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