

Annex A.1.14.
(Non-Confidential version)

Special Applications Brochure

Fibre optic systems for special applications

Integrated network and sensing solutions for industrial, Oil & Gas, and special environments

Prysmian

General Cable

Draka





Contents

Introduction: Linking the future	4
Prysmian: Your specialist partner	6
Prysmian: A complete solution for every environment	8
Special application areas	
– Oil & Gas	10
– Underwater and flooded areas	12
– Industrial and harsh environments	14
– Tailored and universal solutions	15
Our sensing systems	16
Our optical fibre	17
Our connectivity products and accessories	17
Quality and testing	18
A complete service. Your perfect partner	19
References	19

Introduction: Linking the future

There is a new currency
driving the world today.

Hyper-connectivity, on-demand living, flexible business operations, mobile working, the explosion of e-commerce – there's one common element driving it all. And that element is interconnectivity.

Countries need it to grow. Communities need it to develop. Individuals need it to thrive. It's crucial that information exchange is treated as an essential supply: always available, and delivered effectively, efficiently and sustainably to all.

At Prysmian, we embrace our commitment to connecting people across the globe – no matter how challenging the circumstances. Our solutions go far beyond the cable, to include accessories, installation and sensing equipment.

This brochure introduces our fibre optic systems for Special Applications. So, whether you require solutions fit for the **Oil & Gas** (O&G) industry, within **underwater and flooded areas**, or **industrial and harsh environments**, Prysmian will provide both **tailored and universal solutions** to suit your exact requirements.

Innovation takes expertise. And Prysmian is your world-leading partner in finding innovative solutions for every challenge you face – today and tomorrow.



Oil & Gas



**Underwater and
flooded areas**



**Industrial and harsh
environments**



**Tailored and
universal solutions**

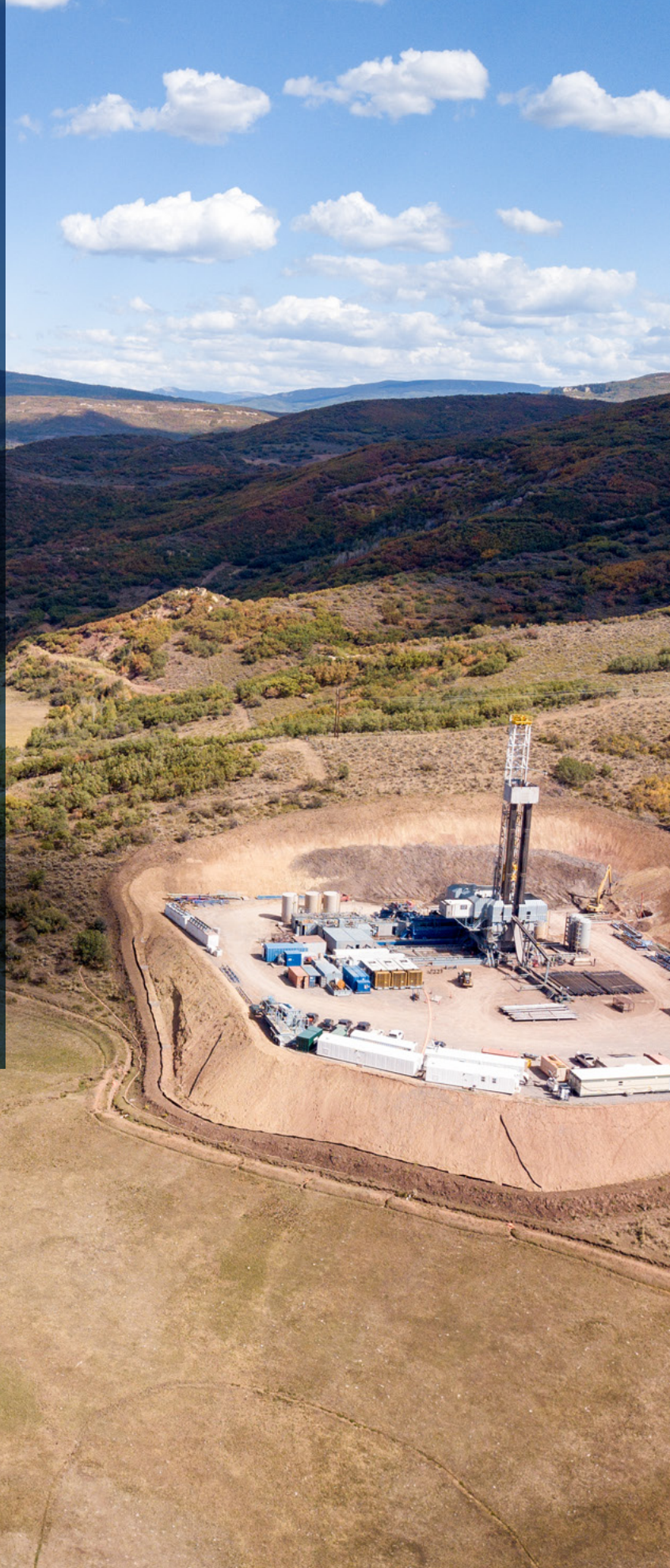


Prysmian: Your specialist partner

As the undisputed world leader in the telecoms cable systems industry, we offer the widest range of services and expertise in the business.

Our goal isn't just to provide the technology you need: it's to work with you to achieve your projects, and prove that you've made the best decision for your business by choosing us as your partner.

Our solutions prove their value to our customers every day – even in the most demanding, highly specialised environments.





High reliability. Proven experience.

We've installed over 200,000km of highly reliable fibre optic cables for special applications since 1983, working in 100 countries across all five global continents.



End-to-end partnering for guaranteed compatibility.

Because we can supply all necessary materials for your project, from conception to execution, we guarantee total product compatibility.

- Prysmian Group fibres produced in Europe and the USA
- Terrestrial, aerial and underwater cables
- Joint boxes, optical distribution frame and connection accessories
- Engineering and installation supervision services



Our production. Your solution.

Prysmian currently produces more than 20,000km of special fibre optic cables per year, across three different continents; Europe, America and Asia. So we can provide the perfect supply chain solutions for you, every time.



Sustainable and safe.

Sustainability is a broad issue, not only concerned with the preservation of the environment, but also with economic and social affairs – regionally and across the globe.

For any company concerned with sustainability, this ethos should be intrinsically linked with how its business operates, how it manages its employees, and where it operates. At Prysmian Group, sustainability is a key driver of not only our strategic activities, but of our organisation as a whole.

We hold ourselves to high standards of management and production. We continue to improve both environmental sustainability and safety at work, meeting OHSAS 18001 and ISO 14001 standards.



World-class production standards.

The Prysmian name has always been synonymous with quality. Our production processes feature a built-in multi-step quality assurance programme, covering everything from cable design and raw materials purchasing, to final inspection and testing documentation – meeting ISO 9001 standards.



The right solution. Every time.

Prysmian offers an unrivalled range of technologies, so we can provide the most appropriate and relevant technical solution for any project. And we do it all by taking a fresh approach each time, only ever recommending the products which meet your requirements exactly.

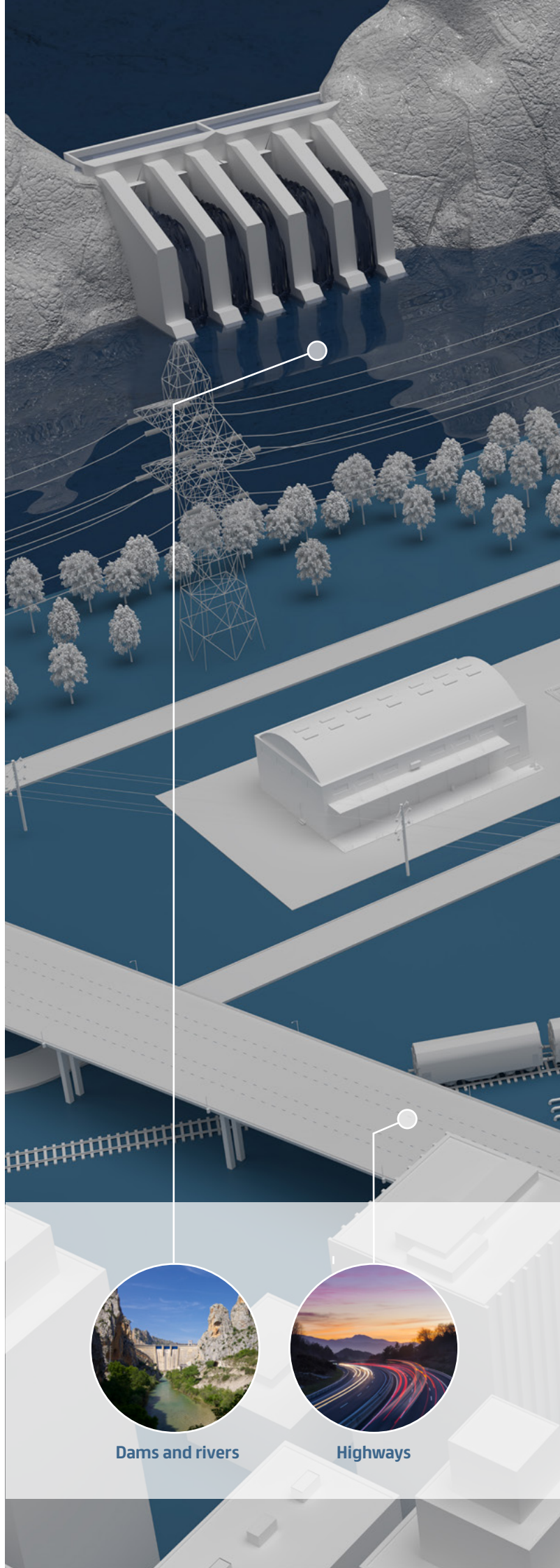
Prysmian: A complete solution for every environment

When you choose to work with Prysmian Group, you benefit from our unparalleled experience, gained from years of developing uniquely engineered cables. We offer quantifiable quality cabling solutions to suit all specialist needs; whether for indoor or outdoor installation, no matter the environmental challenge.

At Prysmian, we design our special fibre optic cables to overcome the obstacles presented in the creation of optical fibre networks today. We provide new solutions specifically for harsh environments, whilst minimising installation costs and ensuring durability, and long service life.

Prysmian can also offer a complete sensing system including specific fibres, optical cables and sensing equipment to monitor critical infrastructures.

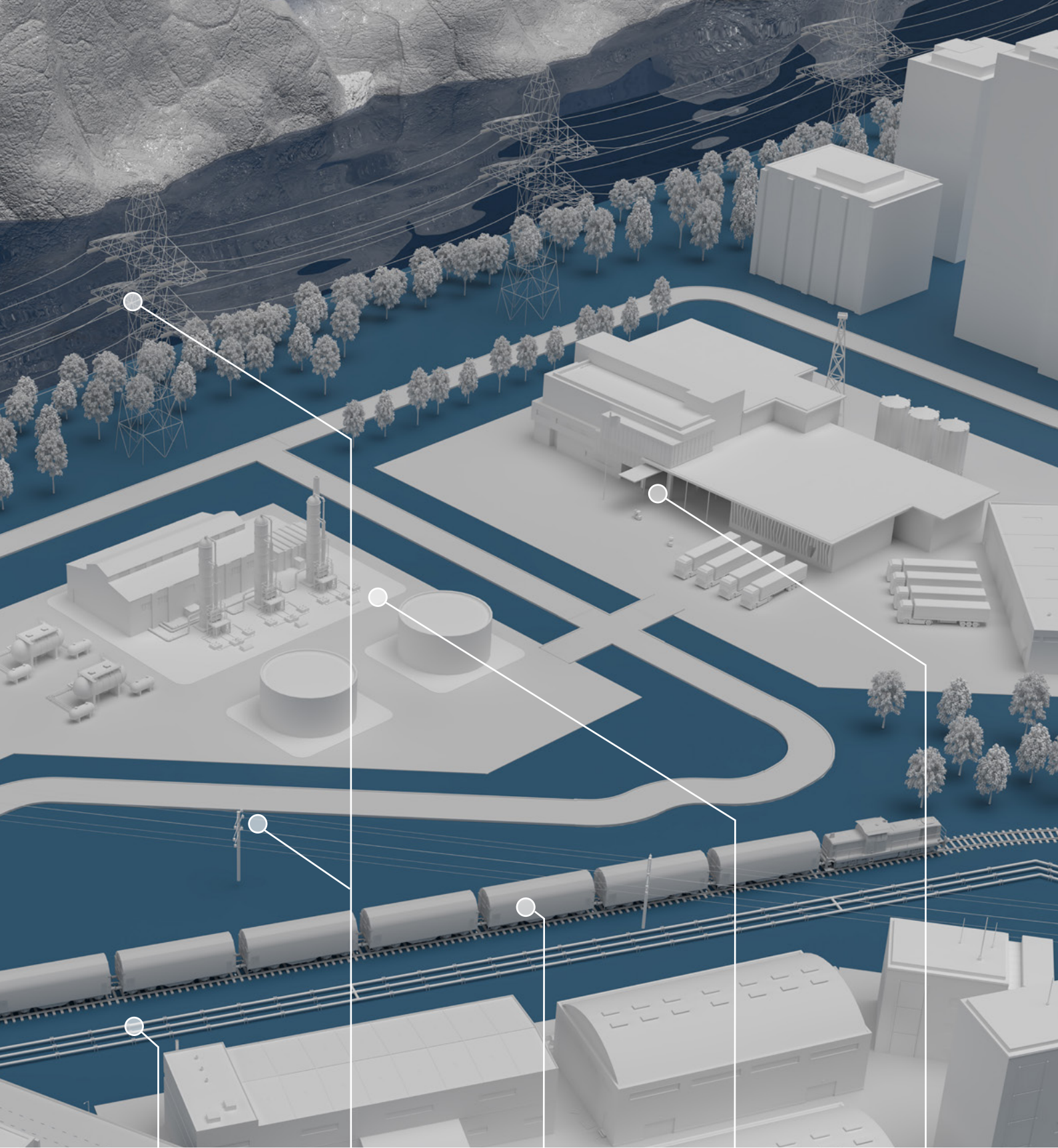
Customers who choose Prysmian Group are choosing a provider who's proven to succeed – from concept to installation and operations. For your business, that means professional project management throughout the supply process, true longevity from our installed technology and no unexpected costs from on-site delays.



Dams and rivers



Highways



Pipelines



**Transmission and
distribution overhead lines**



Railway



Refineries



Industrial

Oil & Gas

Prysmian Group's Oil & Gas industry (O&G) fibre optic systems are built to preserve the security of onshore and offshore applications.

We provide a number of unique cable solutions for O&G upstream, midstream and downstream applications, including, but not limited to:

Dielectric Family

Dielectric family prevents the conduction of electricity with Opsycom's non-metallic structure. Its fully dielectric design helps to avoid electrical risks and removes the need for grounding.

Flame Retardant Family

Flame retardant family is designed to resist the propagation and spread of fire into a new area by inhibiting combustion.

Fire Resistant Family (FIRS)

Fire resistant family is designed to preserve the vital communication and keeping the emergency systems functional during a fire by making sure the circuit integrity.

Lead Sheathed Family

Lead sheathed cables provide complete protection against the entry of hydrocarbons, moisture ingress and are resistant to corrosion.

ALPA® Family

Multi-layer inner sheath ALPA® delivers resistance to aggressive chemical elements, petrochemical fluids and harsh environments and is a flame retardant solution. ALPA® is an environment-friendly replacement for conventional lead sheathed cables, also providing better flexibility, lighter cables and easier handling while maintaining high standards of durability.

ALPAM® Family

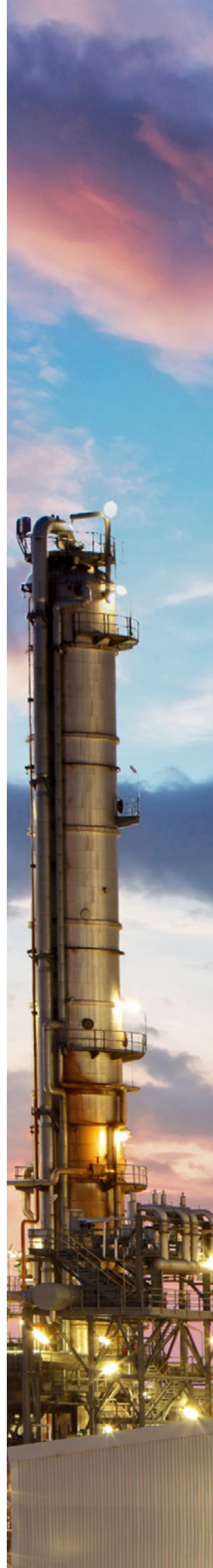
Fire resistant ALPAM® provides enhanced circuit integrity during incidences of fire, with the same multi-layer inner sheath as ALPA® technology designed to resist aggressive chemical elements, petrochemical fluids and harsh environments. Like ALPA®, the ALPAM® family of solutions provide an environment-friendly replacement for conventional lead sheathed cables, with better flexibility, lighter cables and easier handling while maintaining high standards of durability.

ALPAM 2.0® Family

ALPAM 2.0® uses stainless steel tube technology to protect fibres, while its robust technology provides resistance to aggressive chemical elements and fluids of the petrochemical industry. Complete with extreme circuit integrity during fires up to 1000°C, ALPAM 2.0® is designed with a smaller cable diameter and higher fibre optic capacity compared to conventional fibre optic cables.

Bio Sheath Family

Bio sheath family uses an ecological secondary product as a raw material in the cable sheath manufacturing. This family keeps the reliability and resistance, required for the harsh environment of the industry, adding biomaterials replacing a fraction of hydrocarbons products used in the cable structure. This change, in addition to keeping the cable performance, contributes to having a lower carbon footprint by offering a sustainable and environmentally friendly product.



Key features:



**Low corrosive
fume emissions**



**Increased
flexibility**



**Mechanical
resistant**



**Hydrocarbons
resistant**



**Extreme-weather
resistant**



**Heavy-
duty**



**Fire
resistant**



**Flame
retardant**



**Directly buried
installation**



**Abrasive environment
resistant**

Thanks to our verticalised production capabilities, all the above cables can be produced with different inner/outer sheath materials plus a wide variety of armouring, for a truly bespoke solution.

Underwater and flooded areas

The Subaqua range has been designed to provide the ultimate waterproof protection, and the ability to withstand fresh and saltwater environments and sewer networks.

The fibres are hermetically sealed in a metal tube (FIMT) preventing water ingress and delivering guaranteed durability in extreme conditions. Compared with standard corrugated steel cables, Subaqua's steel tube design is the only solution to ensure full water protection.

We have a full portfolio of single wire armour (SA) and double armour (DA) subaqua cables with different tensile strengths.

Key features:



**Underwater
up to 3000m**



**Mechanical
resistant**



**Directly buried
installation**



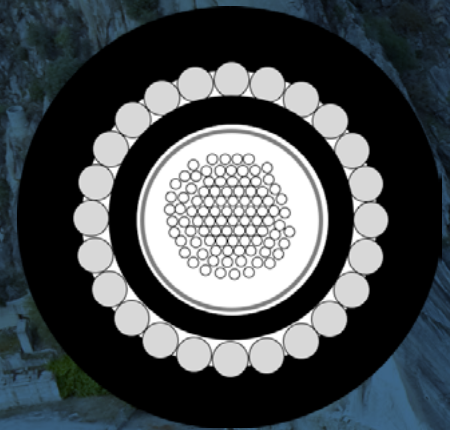
**Compact
design**



**Sea-to-ground
connections**



**High fibre
count available**





Industrial and harsh environments

Prysmian's heavy-duty cables are designed for those applications where extreme mechanical durability is vital. They're ideal for forming stable, robust infrastructure in chemical processing, mining, railways or military network applications.

Key features:



Impact resistant



Circuit integrity



Easy to handle



Flame retardant



Resistance to pest damage



Resistance to extreme temperatures



In industrial or harsh environments, the presence of aggressive chemicals such as hydrocarbons, solvents, acids, and bases can destroy a traditional fibre cable. But the application of special sheath materials and compounds can protect cables from damage.









For some applications, versatile indoor or outdoor cables may be required with low smoke and emission characteristics, and without the presence of halogen. Prysmian's Low Smoke Zero Halogen (LSZH) cables have been developed to meet the highest fire safety standards, specifically for use in demanding environments. So, you can ensure vital communication and emergency systems will maintain their circuit integrity and function in the event of fire.

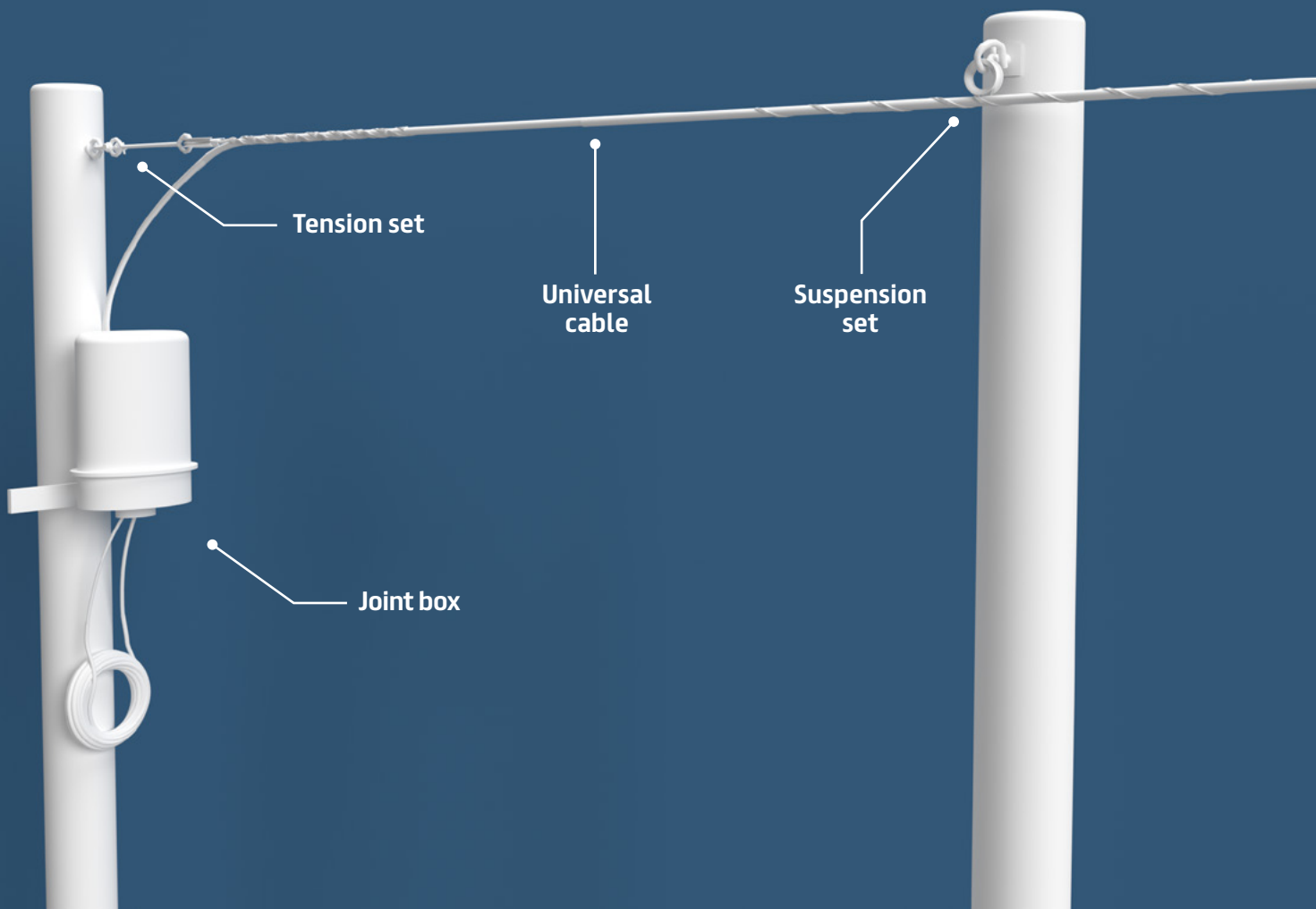
Tailored and universal solutions

At Prysmian, we're proud to design solutions fit for your business needs.

We can provide customised cabling and infrastructure solutions on a project or industry-specific basis, combining our expertise with the very latest technology on the market. For instance, **eco-design cables** with a special bio sheath compound made from sugarcane with lower CO₂ footprint is an innovative product and it shows the key role of Prysmian to shift towards a low-carbon economy and contributes to the transition to smarter, more reliable and more sustainable telecom infrastructures.

Key features of the Universal cable:

-  Above ground installation
-  Directly buried installation
-  Subaqua
-  Aerial
-  **One compact cable for all environments**
-  **Lower installation costs and faster installation capabilities**
-  **Long cable distances without closure**
-  **Flexibility**



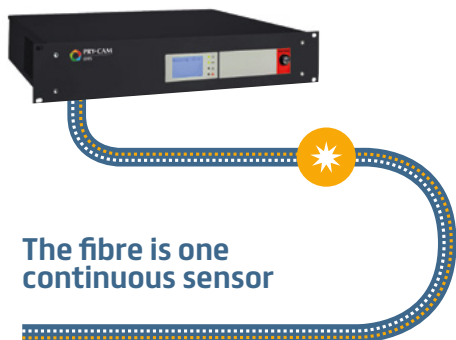
Our sensing systems

Fibre optic sensing systems detect and monitor the activities and processes of critical infrastructure. From detecting physical intrusions, tremors or leaks, to monitoring offshore windfarms' performance or the throughput of a gas pipeline. These cabling solutions offer a complete sensing system, delivering the highest possible value in key projects.

Prysmian's portfolio of **sensing cables** has been designed for use within challenging environments. Many of our products have been manufactured with specific installation methods and difficulties in mind, so you're guaranteed optimum performance for your Distributed Temperature Sensing (DTS), Distributed Strain Sensing (DSS) and Distributed Acoustic Sensing (DAS) systems in any environment.

- End-to-end solutions, for quality assurance and accountability at every stage
- Single and multimode fibres available, designed for your specifications
- Tight and loose designs, fit for every project
- Bespoke project assessments for appropriate, reliable and cost-effective solutions

Through the careful assessment of your exact needs, Prysmian can provide a solution which delivers reliable and cost-effective systems, every time.



Fibres for sensing and monitoring applications

BendBright^{XS} Sensing fibre (ITU-T G.657.A2)

- Higher Brillouin and Raman gain compared to standard ITU-T G.652.D single-mode fibres
- Compliant with ITU-T G.657.A2 and IEC 60793-2-50 B6
- Featuring a tightly controlled MFD over the length of the fibre, with minimum variation between fibres
- High bend loss resistance for reduced space and harsh environments

BendBright Multimode DTS fibres

- Optimised for Distributed Temperature Sensing (DTS) applications
- Features low attenuation at 850, 1064 and 1550 nm
- Bend-insensitive
- Can be used in both stringent tight-buffer cables or within loose tube constructions

Our optical fibre

With more than 40 years' experience manufacturing optical fibres and over 500 million kilometres of fibre produced, Prysmian Group offers an unrivalled quality and product portfolio. Each product is designed to the highest levels of quality and performance.

Prysmian's superior fibre characteristics are achieved through its proprietary PCVD (Plasma Chemical Vapour Deposition) process and OVD (Outside Vapour Deposition) process that enable an optimised range of products fit for any application.

The innovative fibre designs, coupled with highly protective COLORLOCK-XS™ coatings or Prysmian's High Temperature coatings, provide the benefit of enhanced performance, durability and reliability – even in the harshest environments.

BendBright Multimode fibre 50 µm core

- OM2, OM3, OM4 and OM5
- Bend-insensitive multimode fibres with outstanding bending performance
- Supports use of compact, high-density cable management systems

OM1 Multimode fibre 62.5 µm core

- Specially designed to offer superior fibre characteristics and increased bandwidth

ESMF Single-mode fibre (ITU-T G.652.D)

- ESMF (Enhanced Single Mode Fibre)
- Compliant with ITU-T G.652.D and IEC 60793-2-50 B1.3
- Optimum performance from 1260 nm to 1625 nm
- Low attenuation in the 1383 nm water-peak region
- Also offered in low cable loss version

NZDSF Single-mode fibre (ITU-T G.655.C/D)

- Non-Zero Dispersion Shifted Fibres (NZDSF)
- Compliant with ITU-T G.655.C/D and IEC 60793-2-50 B4_c/d
- Low dispersion values from 1530 nm to 1625 nm

All fibre types can be optimised for harsh environments like radiation, high and low temperature, and hydrogen rich and high-pressure environments.

Our connectivity products and accessories

Your ongoing challenge is to improve network performance. A challenge, when space limitations, component integration and optical power budgets all need to be managed throughout every section of the network. Our solution lies in providing an optical connectivity portfolio which enables you to create and manage the networks which will meet today's demand – and tomorrow's too.

Prysmian provides a complete range of connectivity solutions and accessories to complement our Special Fibre Optic Cables range.



**XOK2020 Underwater
Joint box up to 200 m**



Stainless steel box XOK



Sub-Rack Systems (SRS1)

Quality and testing

Prysmian's experience doesn't just stop at design: we apply our expertise to testing and qualifying our cables, too.

Our in-house facilities enable us to personally certify all cables, ensuring they're manufactured in compliance with design specifications and to the highest standards.

Some of the tests we can run in-house include:

- Tensile performance
- Bend resistance
- Crush testing
- Impact testing
- Water tightness
- Temperature cycling
- Fire resistance and vertical flame spread
- Smoke emissions
- Oxygen index
- UV ageing
- Oil resistance
- OTDR tests on fibres

Prysmian Group has agreements with international laboratories, allowing us to achieve cable qualifications which meet international standards for particular tests. Optical fibre parameters such as cut-off wavelength, MFD, spectral attenuation, chromatic dispersion and PMD can all be measured and reported. We also have access to tensile machines, for the characterisation of metallic wires and plastic sheathing.

Prysmian's manufacturing plants are ISO 9001 and ISO 14001 certified, with our quality assurance systems managed accordingly.



A complete service. Your perfect partner

At Prysmian, we offer our clients a full package which includes services and supervision.

Our teams are made up of highly experienced individuals, equipped with the latest tools on the market. We can offer site supervision, for erection and assembly, and technical advisors during supply supervisory or specialist services. All of Prysmian's people are qualified and experienced, for a seamless integration into your project. For pre-commissioning, commissioning, start-up, site performance and testing, you can be sure you have the right expert on hand for support.

At your request, we can include technical training on supplied materials, and installation best-practice – so your teams can benefit even more from Prysmian's world-leading experience.

References

Since 1983, Prysmian Special FO cables technology has been used in over 100 countries with complete customer satisfaction.

Linking communications to communities

Specials FOC HQ Prysmian Group

Crta. C-15, Km 2, 08800 Vilanova i la Geltru (Barcelona) SPAIN

T +34 938116181

specialsFOC@prysmiangroup.com

prysmiangroup.com

Follow us

