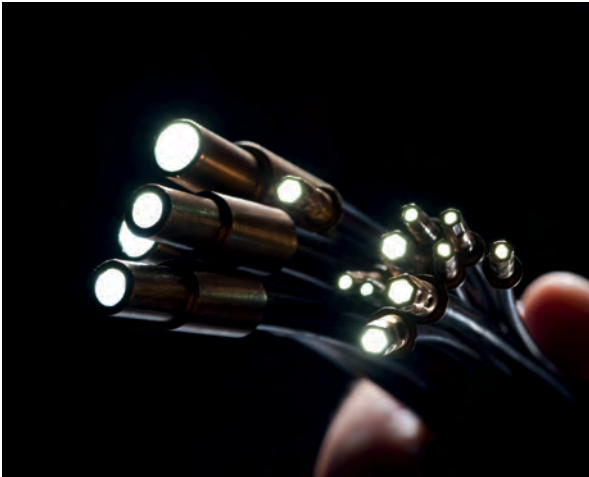
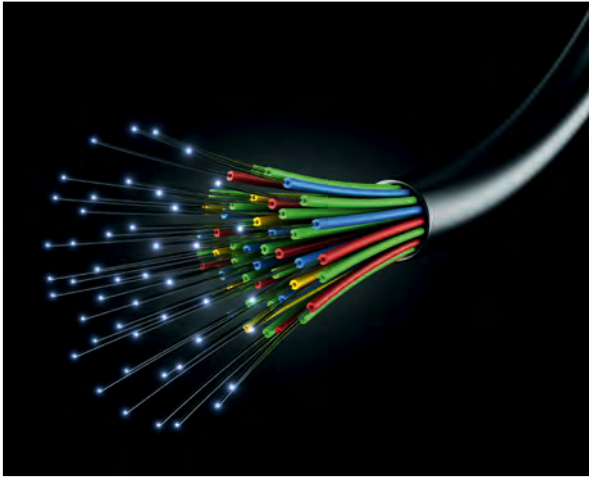


Solutions for
**Fibre Optic
Systems Cables**



Fibre Optic System solutions

Optical fibre infrastructure is now recognised as the main building block for future proof high speed data transfer. Cables are aerial, direct buried, inserted in a modular duct system or under water.

This puts severe demands on the material that protects the cable from the outside environment.

The selection of the correct duct, jacket and tube is essential to produce an easy to install, robust and future-proof system. Borouge and Borealis have developed a large range of globally available products tailored to meeting these needs.

This document is intended to give a quick and easy overview of the available Borealis solutions for fibre optic systems. In case of in depth questions always contact a local technical service engineer. Specific needs require specific solutions and Borouge and Borealis have the expertise to advise and tailor solutions for your fibre optic systems.

Borstar® – Enhanced polyethylene

To satisfy the progressively evolving needs of fibre optic systems solutions, Borouge and Borealis offer a range of Borstar polyethylene and polypropylene materials which provide enhanced performance reliability through protection of the optical fibres during cable laying in the ground or sub-sea, as well as their in-service environment.

Borstar grades use Borealis' proprietary bimodal technology; deliver property combinations and performance levels not available with conventional PE. These include:

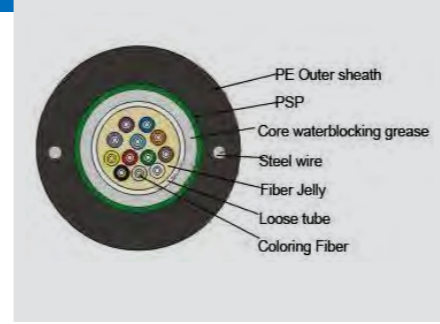
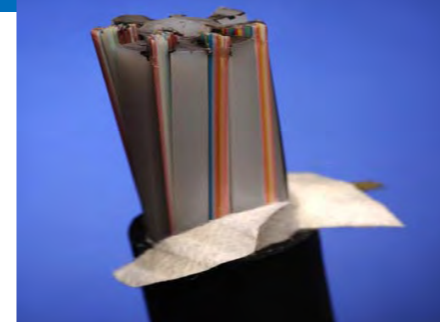
- High abrasion and impact resistance
- Thermal stability at high and low ambient temperatures
- Excellent balance of physical and water barrier properties
- Good ageing performance for long service life
- Optimal Environmental Stress Cracking Resistance
- Easy low temperature processability with very low shrink back

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Solutions for Fibre Optic System cables



	Application	Component	Type	Grade EU	Material + MB*	Features
Tight Buffer Unit	Buffer	Outer Fiber coating	Natural	Casico FR4807	LSZH Compound	Soft fibre protection, easily strippable and LSZH
Multi Loose tube	Standard Typical diameter: 8,5mm	Jacket	Black	Borstar® HE6062	HDPE	High Strength, very good crush resistance, good ESCR
			Natural	Borstar® HE6063	HDPE + color MB	Natural version of HE6062, UV stabilised
			Black	Borstar® LE6067	HDPE	High Strength, very good crush resistance, good ESCR
			Natural	Borstar® LE6068	HDPE + color MB	Natural version of HE6067, UV stabilised
			Black	Borstar® LE8707	LLDPE	High Strength, crush resistance, good ESCR
			Natural	Borstar® LE8706	LLDPE + color MB	Natural version of LE8707, UV stabilised
			Black	Borstar® ME6052	MDPE	Slightly less hard and lower shrinkage than HE6063, good processing
			Natural	Borstar® ME6053	MDPE + color MB	Natural version of ME6052
	Mini cables Typical diameter: 6,5mm	Jacket	Black	Borstar® HE6067	HDPE	Very low shrink back, low extrusion temperatures, high strength, very good crush resistance, UV protected
	Natural	Borstar® HE6068	HDPE + color MB	Natural version of HE6067		
Central tube	Central tube	Reinforced Jacket	Black	Borstar® HE6062	HDPE	High Strength, very good crush resistance, good ESCR, UV protected
			Natural	Borstar® HE6063	HDPE + color MB	Natural version of HE6062
			Black	Borstar® LE8707	LLDPE	High Strength, crush resistance, good ESCR, UV protected
			Natural	Borstar® LE8706	LLDPE + color MB	Natural version of LE8707
			Black	Borstar® ME6052	MDPE	Slightly less hard and lower shrinkage than HE6063, good processing, UV protected
			Natural	Borstar® ME6053	MDPE + color MB	Natural version of ME6052
Slotted core	Slotted core	Jacket	Black	Borstar® HE6062	HDPE	High strength, very good crush resistance, good ESCR, UV protected
		Core	Natural	HE1110	HDPE	High dimensional stability, optimal processability
Speciality	ADSS aerial	Jacket	Black	Borstar® HE6081	HDPE	Track resistant
	Submarine	Jacket	Natural	Borstar® HE6068	HDPE	High cleanliness, low shrink back, low extrusion temperature

Subduct	Tube Typical diameter: 16 - 50+mm, Mono-Bilayer	Outer layer	Natural	BA415E	PP + UV MB	Downgauging possibilities. Optimal robustness during installation.	
			Natural	BS2541	HDPE + UV MB	Easy processability. Optimal coiling.	
		Inner layer	Natural	BA415E	PP + Slip MB	Mono layer option, maximise downgauging.	
			Natural	BS2541	HDPE + Slip MB	Mono layer option, easy processability, optimise coiling.	
Microducts	Minicable Duct Typical outer diameter: 10 - 16mm, Bi-Trilayer (Skin colouring)	Outer layer	Natural	BS2541	HDPE	Easy processability. Optimal coiling.	
			Inner layer	Natural	BS2541	HDPE ribbed	Easy processability. Optimal coiling.
		Fibre Unit Duct Typical outer diameter: 3 - 10mm, Bi-Trilayer (Skin colouring)	Outer layer	Natural	FA3227	LDPE	Optimal coiling. Most flexible installation. UV stabilised.
				Natural	FA3221	LDPE	Optimal coiling. Most flexible installation.
	Inner layer		Natural	FB4230	LLDPE	Good coiling. Most flexible installation. Excellent ESCR.	
			Natural	FA3227	LDPE	Optimal coiling. Most flexible installation. UV stabilised.	
	Natural	FA3221	LDPE	Optimal coiling. Most flexible installation.			
	Natural	FB4230	LLDPE	Good coiling. Most flexible installation. Excellent ESCR.			

Key:
 UV: Ultra-violet
 ESCR: Environmental stress crack resistance
 ADSS: All dielectric self supporting
 FR: Flame retardant
 LSZH: Low smoke zero halogen

* Masterbatch to be added during duct/cable production

Solutions for Fibre Optic Systems Cables

Borouge and Borealis – Dedicated to Wire & Cable solutions

Borealis and Borouge are the world's leading providers of innovative, value creating plastics solutions for the wire and cable industry. Our solutions are customer-driven and designed to satisfy the industry's continuously evolving demands for higher technical performance. Consequently, they can be found in the most challenging EHV and HV cable applications, as well as MV and LV energy transmission and distribution cables, building wires, and communications cables.

In answer to the need for production, installation and cable system lifetime enhancements, we create the innovation links that secure world-class, step-change solutions and benefit the whole wire and cable value chain. Through the introduction of unique polymer technologies, which include Borlink™, Visico™/Ambicat™, Borstar®, and Casico™, we continue to pioneer the development of advanced insulation and jacketing systems for both energy and communication cables.

Built on more than 50 years experience, Borealis and Borouge have a well-established track record in serving customers' needs with the consistently high quality products expected of

global leaders. We are committed to extending that leadership position and our role as reliable partners for the long-term – a commitment not only supported by our forward thinking in innovative solutions, but also confirmed by ongoing investments for our customers' continued success.

Putting customers' needs at the centre of our planning is reflected in Borealis' largest investment in Europe to date, the new 350,000 t/y high-pressure, low-density PE plant in Stenungsund, Sweden, was inaugurated in June 2010, further strengthening Borealis' capabilities to meet the needs of the growing wire and cable markets. Furthermore, Borouge's expansion of Borstar® and Borlink™ capacity in Abu Dhabi, UAE, allows us to satisfy growing customer demand for wire and cable products in the Middle East and Asia Pacific markets and other emerging markets.

Through ongoing research and development, investment in the future and a dedicated team with solid industry knowledge, we aim to remain fully responsive to our customers' needs throughout the world.

About Borouge and Borealis Borealis is a leading provider of innovative solutions in the fields of polyolefins, base chemicals and fertilizers. With headquarters in Vienna, Austria, Borealis currently employs around 6,400 and operates in over 120 countries. It generated EUR 8.1 billion in sales revenue in 2013. The International Petroleum Investment Company (IPIC) of Abu Dhabi owns 64% of the company, with the remaining 36% owned by OMV, the leading energy group in the European growth belt. Borealis provides services and products to customers around the world in collaboration with Borouge, a joint venture with the Abu Dhabi National Oil Company (ADNOC). Building on its proprietary Borstar® and Borlink™ technologies and 50 years of experience in polyolefins, Borouge and Borealis support key industries including infrastructure, automotive and advanced packaging. The Borouge plant expansion in Abu Dhabi will be fully operational in 2014. Borouge will deliver an additional 2.5 million tonnes of capacity when fully ramped up, bringing the total Borouge capacity to 4.5 million tonnes. Borouge and Borealis will then have approximately 8 million tonnes of polyolefin capacity. Borealis offers a wide range of base chemicals, including melamine, phenol, acetone, ethylene, propylene, butadiene and pygas, servicing a wide range of industries. Together with Borouge the two companies will produce approximately 6 million tonnes of Base Chemicals in 2014. Borealis also creates real value for the agricultural industry with a large portfolio of fertilizers. The company distributes approximately 2.1 million tonnes per year. Borouge and Borealis aim to proactively benefit society by taking on real societal challenges and offering real solutions. Both companies are committed to the principles of Responsible Care®, an initiative to improve safety performance within the chemical industry, and contribute to solve the world's water and sanitation challenges through product innovation and their Water for the World™ programme.

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