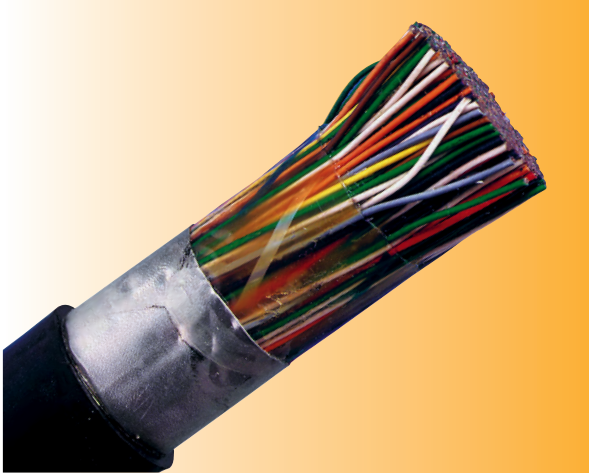


Solutions for
Wire & Cable
communication cables



Solutions for Wire & Cable communication cables

The selection of the correct insulation and sheath is key to producing optimum cables. Borouge and Borealis have communication cable covers many applications and each application has specific needs. Borealis has developed a large range of products tailored to meeting these needs. This document is intended to give a quick and easy overview of the available Borouge and Borealis solutions for communication applications. 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 on tailor-made solutions for your cables.

Borstar® – Enhanced polyethylene

The Borstar jacketing product family gives outstanding balance between all important properties for communication cables like:

- Low shrinkage
- Good processability
- Excellent ESCR
- Low abrasion/hard surface
- Good barrier properties

Chemically and physically foamed insulation compounds

To meet the growing need for enhanced electrical properties in telephone, TV and data cables, Borouge and Borealis have further developed its cellular insulation compounds. Borouge and Borealis have an extensive range of chemically and physically foamed polyethylene (PE) compounds offering improved transmission properties and processability.

Our PE cellular compounds are optimised to generate uniform and evenly distributed cells which enhance the transmission properties. In addition, improved flow properties, melt elasticity and purity allow high line speeds in combination with minimised capacitance variations.

Typical applications for the various PE insulation compounds include:

- Multipair telephone cables, smaller coaxial cables, such as Community Antenna Television Cables (CATV) and data cables produced with chemical foaming having expansion degrees of up to 50 %.
- High expansion (up to 80%) physically foamed insulation typically used for large 50 ohm antenna cables

Casico™ – Halogen-free flame retardant

In any fire, numerous aspects of the combustion process are important – propagation, heat release, combustion fume, toxicity and smoke. Although flame spread remains a key concern, it is now recognised that the fuel loading, potential size and nature of the fire as defined by parameters such as heat of combustion and toxicity indices cannot be ignored. The importance of heat release is recognised and some cable specifications reflect this by defining cable heat release (MJ/m) as a design parameter. The concept of ‘down-sizing’ to minimise heat and toxic gas release will become more and more accepted in performance based cable design codes.

Casico fire retardancy has two phases. The first involves the ester pyrolysis of the acrylate copolymer with the subsequent release of water. The second the formation of a tough char which starves the fire of oxygen thus inhibiting the propagation. Compared with hydrate filled Flame Retardant compounds the filler content is modest with a consequent minor increase in electrical permittivity and low water permeability.



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Network Segments	Cable Type	Application	Type	Compound Name	Description	Features
Trunk	Buried Fibre Optic	Sheath	Black	Borstar® LE8707	Bimodal LLDPE	Very low shrink back, good crush resistance (LE8706 natural uv stabilised version).
				Borstar® HE6062	Bimodal HDPE	High strength, very good crush resistance, good ESCR (HE6063 natural uv stabilised version).
				Borstar® ME6052	Bimodal MDPE	Similar HE6062. Slightly less hard and lower shrinkage (ME6053 natural uv stabilised version).
	Aerial Fibre Optic	Steath	Black	Borstar® HE6081	Bimodal HDPE	Track resistance. Suitable for ADSS cable.
	Submarine Fibre Optic	Sheath	Natural	Borstar® HE 6068	Bimodal HDPE	High cleanliness, low shrink back, low extrusion temperature.
Access	Copper Multipair	Insulation	Solid	ME6032	Natural highly stabilised MDPE containing MDA	High extrusion line speed, also suitable as conductor skin.
				Borstar® HE3366	Natural highly stabilised HDPE containing MDA	Very high extrusion line speed, tough, crush resistant, also suitable as insulation skin.
			Cellular	ME1244	Natural highly stabilised MDPE containing chemical blowing agent and MDA	Very process tolerant, very high extrusion line speed, suitable for expansion 30 - 50%.
				HE1345	Natural highly stabilised HDPE containing chemical blowing agent and MDA	Tough, high extrusion line speed, suitable for expansion 30-40% (see HE1344 for higher expansion).
		Sheath	Black	LE6022	Low Density Copolymer	Long established meeting many standards, easy processing.
				Borstar® LE8707	Bimodal LLDPE	Crush and abrasion resistant, high strength (LE8706 natural uv stabilised version).
	Coax 50 Ohm (Mobile antenna cable)	Insulation	Cellular	HE1123	Stabilised very low dielectric loss HDPE for gas injection	Blending component, to be used in combination with LE1120.
				LE1120	Unstabilised broad MWD LDPE for gas injection	Blending component that provides melt stiffness. To be used in combination with HE1123.
		Sheath	Black	Borstar® LE8707	Bimodal LLDPE	High strength, crush resistance and very good ESCR (LE8706 natural uv stabilised version).
	Coax 75 Ohm (CATV, Satellite drop, OEM,...)	Insulation	Cellular	HE1106	Low dielectric loss HDPE containing stabiliser and nucleant for gas injection	Expansion up to 75%.
				Solid	LE6006	Stabilised low dielectric loss LDPE
		Sheath	Black	Borstar® LE8707	Bimodal LLDPE	Crush and abrasion resistant, high strength (LE8706 natural uv stabilised version).
	FTTX	Sheath	Black	Borstar® HE6067	Bimodal HDPE	Low shrink back, low extrusion temperature, good crush resistance (HE6068 natural uv stabilised version).
			Duct	Black	Borstar® HE6062	Bimodal HDPE
Building	Symmetric copper data cable (Cat 5E, 6A,...)	Insulation	Solid	HE4872	Natural stabilised modified HDPE containing MDA	High extrusion line speed. Suitable for outer skin of foam-skin constructions.
				PP4874	Stabilised PP Compound	High extrusion line speed with faster twisting speed and tougher mechanical performance.
			Cellular	HE1344	Natural highly stabilised HDPE containing chemical blowing agent and MDA	High extrusion line speed. Expansion 40-50% (See HE1345 for lower expansion).
				HE4873	HDPE containing stabiliser, MDA and nucleant for gas injection	Very high line speed and fine cell structure.
	Sheath	Flame Retardant	Casico™ FR4804	Natural LSZH Flame Retardant	Meets single wire burning EN60332-1-2. Suitable for Category 5 cables.	
			Casico™ FR4803	Natural LSZH Flame Retardant	Meets single wire burning EN60332-1-2. Suitable for Category 7 (and bigger) cables.	
	Optical Fiber Data cable	Sheath	Flame Retardant	Casico™ FR4803	Natural LSZH Flame Retardant	Sheath for internal FOC & telephone cables. Suitable for campus application.
				FR4810	Black LSZH Flame Retardant	Good FR and weatherability. Suitable for campus FOC & telephone cables.

MDA - Metal deactivator
 UV - Ultra-violet
 ESCR - Environmental stress crack resistance
 ADSS - All dielectric self supporting
 FR - Flame retardant
 FOC - Fibre Optic Cable
 LSZH - Low smoke zero halogen

Solutions for Wire & Cable communication 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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