Casico™ – Low smoke zero halogen flame retardant (LSZH)
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 pyrolysis of the acrylate copolymer, reaction with the chalk and the subsequent release of water and carbon dioxide. The second the formation of a tough char which starves the fire of oxygen thus inhibiting the propagation. Compared with hydrate filled FR compounds the filler content is modest with a consequent minor increase in electrical permittivity and low water permeability. Featuring low smoke density and combustion fume toxicity, Casico is the perfect solution for internal cable applications where, in the case of fire, smoke density, irritancy and toxicity are the principal concerns.

Visico™ – Cost effective crosslinked polyethylene
Over the past ten years the manufacturing of crosslinked cable insulation using scorch retardant polyethylene silane copolymers (Visico) has become widely established. Conventional extrusion plants, high line speeds, low scorch and excellent cable performance are important attributes. Recent Ambicat™ technology further develops its potential as a highly active tin-free catalyst system for the ambient curing of Visico.

FROCC – European Association of Producers of Flame Retardant Olefinic Cable Compounds
Borealis is a founding member and supporter of this association.

Borealis and Borouge – 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 Borealis and Borouge 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, Borealis and Borouge support key industries including infrastructure, automotive and advanced packaging. The Borouge 3 plant expansion in Abu Dhabi will be fully operational in 2014. Borouge 3 will deliver an additional 2.5 million tonnes of capacity when fully ramped up, bringing the total Borouge capacity to 4.5 million tonnes. Borealis and Borouge 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. This volume will increase to more than 5 million tonnes by the end of 2014. Borealis and Borouge 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. **For more information visit:** www.borealisgroup.com · www.borouge.com · www.waterfortheworld.net

For more information contact:
info@borealisgroup.com · info@borouge.com
www.borealisgroup.com · www.borouge.com
+43 1 22 400 000 · +65 6275 4100

BOREALIS Borouge

Solutions for Wire & Cable Buildings

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Segment	Application	Product name	Permittivity (Dielectric constant)	Density ISO 1872/ ISO 1183 [kg/m^3]	Heat of combustion [MJ/dm^3]	Composition	Hardness (15 sec) ISO 868 Shore D	Vertical FR
Energy distribution cable – 220/380 Volt								
VDE 0250 Pt 215, BS 7211 (Table 7)	Insulation	Visico™ LE4423	2.30	923	42	C, H, Si	48	**IEC60332-1**
	Insulation	Casico™ FR4820	2.85	1,150	29	C, H, O, Si	40	
	Insulation	PP4821	2.20	915	41	C, H	48	
	Jacket	Casico™ FR4804	2.88	1,150	28	C, H, O, Si, Ca	39	
	Jacket	Casico™ FR4803	2.88	1,150	29	C, H, O, Si, Ca	39	
BS 7629 (Fire resistant)	Insulation (over MICA)	Visico™ LE4423	2.30	923	42	C, H, Si	48	**IEC60322-1**
	Jacket	Casico™ FR4804	2.88	1,150	28	C, H, O, Si, Ca	39	
	Jacket	Casico™ FR4803	2.88	1,150	29	C, H, O, Si, Ca	39	
Communication cable								
Generic (horizontal + backbone) – EN 50288, EN 50173	Solid/skin (insulation)	HE4872	2.33	945	41	C, H	61	**IEC60332-1**
	Foam insulation (chemical)	Borcell™ HE1344	2.33	945	41	C, H	61	
	Skin (conductor)	ME6032	2.30	928	41	C, H	61	
	Foam insulation (gas injection)	Borcell™ HE4873	2.33	948	41	C, H	61	
	Cruciform (Cat 6)	LE6006	2.29	918	38	C, H	47	
	Jacket – (UTP)	Casico™ FR4807 or Casico™ FR4804	3.14	1,150	28	C, H, O, Si, Ca	31	
	Jacket (FTP, S/FTP, S/STP)	Casico™ FR4803	2.88	1,150	29	C, H, O, Si, Ca	39	
Internal telephone (backbone) – CW 1600, LD 611	Insulation (multipair)	Casico™ FR4820	2.90	1,150	29	C, H, O, Si, Ca	40	**IEC60332-1&3**
	Jacket	Casico™ FR4803	2.88	1,150	29	C, H, O, Si, Ca	39	
Optical fibre (backbone)	Buffer	LE6006	2.29	918	38	C, H	47	**IEC60332-1**
	Jacket	Casico™ FR4803	2.88	1,150	29	C, H, O, Si, Ca	39	
Campus	Insulation (multipair)	Casico™ FR4820	2.85	1,150	29	C, H, O, Si, Ca	40	**IEC60332-1&3**
	Buffer (optical fibre)	LE6006	2.29	918	38	C, H	47	
	Jacket	FR4810	4.00	1,270	27	C, H, O, Si, Mg	48	
	Jacket	Casico™ FR6082	–	1,225	–	C, H, O, Si, Ca	39	
Network and interconnect wiring								
TV Down lead	Solid insulation	LE6006	2.29	918	38	C, H	47	**IEC60332-1**
	Gas injection	Borcell™ HE1106	2.34	950	41	C, H	60	
	Jacket	Casico™ FR6082	–	1,225	–	C, H, O, Si, Ca	53	
Exchange cable	Gas injection	Borcell™ HE4873	2.33	948	41	C, H	61	**IEC60332-1**
	Jacket	Casico™ FR4803	2.88	1,150	29	C, H, O, Si, Ca	39	

Glossary of terms

Permittivity
For power applications, insulation electrical performance may be defined in terms of volume resistivity. However, for polyolefins these values are far in excess of any specified need and, as a result, of little concern. For communication cables working at higher frequencies, reactive losses are more important. Reactive losses correlate with polymer permittivity which is unity for air. Permittivity increases with density and can exceed 4.0 for a polyolefin or PVC highly filled with hydrate. Many Casico products have a permittivity of less than 3 which is considered satisfactory for many communication applications.

Heat of combustion
A key parameter by which given cable weights can be summed to generate cable heat of combustion expressed as MJ/m.

Hardness
The standard measure of hardness. LDPE has a Shore D (15 sec) of +/- 45 and HDPE +/- 65.

Vertical FR
Casico flame retardancy is more directed towards building applications where single wire burning is specified. However, fire performance is linked to cable construction so higher performance is sometimes possible.

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