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SENDING ALL THE RIGHT SIGNALS

New Product Bulletin

NP 105E

Belden's Limited Fire Hazard Cables (according to LUL Engineering Standard E4156 Part 2) set a new standard of performance in protection of life, property, and equipment.

Belden® Offers an Extensive Range of Limited Fire Hazard Cables for Applications in Underground Railway Tunnels and Platforms.

There have been fires in several Metro or Underground transportation systems in the past decades all over the world, resulting in a high loss of human life.These historical events illustrate the prevalence of the issue, and the importance of fire retardancy.

Maintaining High Standards

Lessons learnt form the past have directed London Underground to develop standards and specifications which better protect people and property, enhance the safety of fire and emergency workers and restore public confidence in the safety of their tunnel system.

Following extensive work in the design and development of cables for use by engineers in the particularly onerous conditions experienced in underground railway tunnels, Belden® is now able to offer products specifically for use in this environment.

Current Project

London Underground Limited (LUL) was formed in 1985, but its history dates back to 1863 when the world's first underground railway opened in London. Today LUL is a major business, with over 3 million passenger journeys a day, some 500 peak time trains, 253 stations owned, 275 stations served, over 12,000 staff and vast engineering assets.

In 1998 the British Government announced its policy objectives to secure long-term, sustained levels of investment, vital to deliver London's network needs. The Government concluded that these objectives would best be met by retaining LUL in the public sector, responsible for customer services and safety, and creating three private sector companies (known as Infracos) which would maintain, renew and upgrade the Underground's infrastructure under long-term contracts, but would not own the assets.

Next Generation of Fire Specification

These Limited Fire Hazard cables are manufactured to meet the exact requirements of London Underground Ltd (LUL) Section 12 Approvals which far exceed the specifications detailed in CEI ISO 60332 in terms of fire spread, smoke and toxic gas emission.

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Cable Type And Criteria Met

All cables satisfy the mandatory requirements of LUL Standard 2-01001-002, BS ISO 4589 Pt 2 Flammability Temperature Index: > 280°C BS EN 50268 Smoke Emission (3 metre cube), and E1042 A6 Clause 3 for Toxic Fume Emission.

In addition the coaxial cables satisfy CEI IEC 332 Cat C Vertical Ladder as bunched cables, with the char height on completion of the test less than 1.5 m.

All tests are conducted by a certified third party test house and are stringently witnessed by LUL engineers before being awarded approval.

Applications

Cables within this new Belden® range are suitable for use in underground applications such as:

- Cables for CCTV video transmission
  - H124C02; 75 Ohms video coax
- Cables for Passenger Help Points and Telephones
  - YE00380; 1-pair, solid 22 AWG multi-conductor
  - YE00381; 3-pair, solid 22 AWG multi-conductor
- RF cables for Platform Announcement transmissions
  - YE00360; 50 Ohms RF transmission cable
- Multipair cables for Visual Information Displays in ticket halls and on platforms, Communications and CCTV signals
  - YE00358; Category 5e UTP, solid 24 AWG
  - YE00667; 25-pair,solid 24 AWG multi-conductor
- Fibre optic cables for Station Management Systems
  - YE00781; Breakout 4 fibres, simplex cable/0.9 mm buffered fibres
- CCTV signal with extra EMI/RFI protection
  - H124C01; 75 Ohms triax cable

Features and Benefits

Belden® Limited Fire Hazard cables feature specialist cables chosen to generate extremely low smoke, are non-toxic, toxic gas and halogen free in the event of a fire situation.

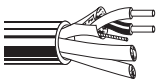
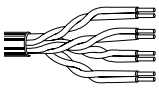
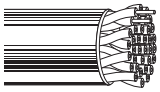
The cable sheath is also UV- resistant to reduce the ageing effects of sunlight should the cables be installed above ground.

Cables for use in Non-Section-12 Areas such as coax patch cables in wiring racks are also available; see detail for item numbers in the technical description below.

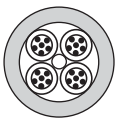
Limited Fire Hazard Cables compliant with London Underground Limited Standards

London Underground Limited (LUL) Standard 2-01001-002, A1, December 2003, Fire Safety Performance of Materials
LUL Engineering Standard E4156 A3, Cables Part 1 – General Requirements
LUL Engineering Standard E4156 A4, Cables Part 2 – Testing Methods and Requirements

Multi-Conductor - Type 2

Description	Part No.	No. of Pairs	Color Code	Standard Lengths ft.	Standard Lengths m	Standard Unit Weight lbs.	Standard Unit Weight kg	Conductor (stranding) Diameter Nom. DCR	Nominal Core OD inch	Nominal Core OD mm	Shielding Material Nom. DCR	Jacket Thickness inch	Jacket Thickness mm	Nominal OD inch	Nominal OD mm	Capacitance Unbalance Pair to Pair @ 1 kHz pF/ft.	Capacitance Unbalance Pair to Pair @ 1 kHz pF/m
1-Pair • Solid 22 AWG (0.63 mm) Tinned Copper • Aluminium-Foil • Solid 24 AWG (0.5 mm) Tinned Copper Drain Wire • Ripcord																	
Polyethylene Insulation • Purple LSNH Jacket																	
G7623	**YE00380**	1	White Blue	1640	500	32.1	14.6	0.63 Solid TC	0.044	1.12	Alu-foil 100%	0.031	0.80	0.217	5.50	91.5	300.0
																	
Also available as Type 1 cable: YE00382				Pulling Tension: 30 N													
3-Pair • Solid 22 AWG (0.63 mm) Tinned Copper • Aluminium-Foil • Solid 24 AWG (0.5 mm) Tinned Copper Drain Wire • Ripcord																	
Polyethylene Insulation • Purple LSNH Jacket																	
G7623	**YE00381**	3	1.Pair White-Blue 2.Pair White-Orange 3.Pair White-Green	1640	500	58.9	26.7	0.63 Solid TC	0.044	1.12	Alu-foil 100%	0.031	0.80	0.268	6.80	91.5	300.0
																	
Also available as Type 1 cable: YE00383				Pulling Tension: 90 N													
4-Pair 5e UTP • Solid 24 AWG (0.51 mm) Bare Copper • Twisted Pairs																	
Polyolefin Insulation • Grey LSNH Jacket																	
	YE00358	4	1.Pair White-Blue & Blue 2.Pair White-Orange & Orange 3.Pair White-Green & Green 3.Pair White-Brown & Brown	1640	500	33.1	15.0	0.51 Solid BC	0.035	0.90	Alu-foil 100%	0.039	1.00	0.236	6.00		
																	
Also available as Type 1 cable: 1583ENH				Pulling Tension: 80 N													
25-Pair • Solid 24 AWG (0.5 mm) Bare Copper • Twisted Pairs • Ripcord																	
Polyethylene Insulation • Purple LSNH Jacket																	
	YE00667	25		1001	305	162.7	73.8	0.5 Solid BC	0.039	0.98		0.069	1.75	0.571	14.50		
																	
				Pulling Tension: 500 N													

Fiber - Type 2

Description	Part No.	No. of Fiber	Color Code	Standard Lengths ft.	Standard Lengths m	Standard Unit Weight lbs.	Standard Unit Weight kg	Conductor (stranding) Diameter Nom. DCR	Nominal Core OD inch	Nominal Core OD mm	Shielding Material Nom. DCR	Jacket Thickness inch	Jacket Thickness mm	Nominal OD inch	Nominal OD mm	Typical / Maximum Attenuation (dB / km) pF/ft.	Typical / Maximum Attenuation (dB / km) pF/m
Breakout 4 Fibers • Simplex Cable / 0.9 mm Buffered Fiber • Central Element (Aramid Yarn) • PET Foil Wrapping • J-V(ZN)HH																	
Tight buffer • Black LSNH Jacket																	
	YE00781	4	Yellow SM 9/125 Green MM 50/125 Orange MM 62.5/125	3280	1000	154.3	70.0	0.9 Buffered Fiber	0.094	2.40	PET-foil	0.047	1.20	0.339	8.60	0.33/0.5* 2.5/3.2 2.8/3.3	0.25/0.4* 0.7/1.0 0.7/1.2
																	
				Pulling Tension: 1300 N													

* Singlemode with 1310 nm and 1550 nm • TC = Tinned Copper • BC = Bare Copper

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LUL Engineering Standard E4156 A3, Cables Part 1 – General Requirements
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Coax - Type 2

De-scription	Part No.	Standard Lengths		Standard Unit Weight		Conductor (stranding) Diameter Nom. DCR	Nominal Core OD		Shielding Material Nom. DCR	Nominal OD		Nom. Imp. (Ω)	Nom. Vel. of Prop.	Nominal Capacitance		Nominal Attenuation		
		ft.	m	lbs.	kg		inch	mm		inch	mm			pF/ft.	pF/m	MHz	dB/ 100 ft.	dB/ 100 m
RF Transmission • Solid 2.62 mm Bare Copper, Copper-Foil • Bare Copper Shield																		
Gas-Injected Polyethylene Insulation • Black LSNH Jacket																		
	YE00360	1640	500	155.4	70.5	2.62 Solid BC 12.3 Ω/km* 3.5 Ω/km**	0.281	7.15	Cu-foil 49% BC Braid 8.8 Ω/km*	0.406	10.30	50	83%	24.4	80.0	5 50 100 230 400 800 862 1000 1350 1750 2150 10000	0.2 0.9 1.2 1.9 2.6 3.8 4.2 4.3 5.1 5.9 6.7 18.1	0.8 2.8 4.0 6.1 8.4 12.3 13.8 14.0 16.7 19.5 22.1 59.3
	Return loss at	5-470 MHz: ≥ 23 dB 470-862 MHz: ≥ 20 dB 862-2.150 MHz: ≥ 18 dB					Screening attenuation at 30-1.000 MHz: > 90 dB Pulling Tension: 325 N											
Also available as Type 1 cable: YE00364																		
Coaxial • Solid 1.0 mm Bare Copper, Copper-Foil • Bare Copper Shield																		
Gas-Injected Polyethylene Insulation • black LSNH Jacket																		
	H124C02	1640	500	57.9	26.3	1.0 Solid BC 41 Ω/km* 23 Ω/km**	0.173	4.40	Cu-foil 38% BC Braid 19 Ω/km*	0.276	7.00	75	84%	16.2	53.0	5 50 100 230 400 800 862 1000 1350 1750 2150 2400	0.4 1.3 1.9 2.8 3.9 5.6 5.8 6.4 7.5 8.7 9.8 10.4	1.3 4.3 6.1 9.2 12.7 18.5 19.0 20.9 24.7 28.6 32.1 34.2
	Return loss at	5-470 MHz: ≥ 23 dB 470-862 MHz: ≥ 20 dB 862-2.150 MHz: ≥ 18 dB					Screening attenuation at 30-1.000 MHz: > 75 dB Pulling Tension: 55 N											
Also available as Type 1 cable: YE00361																		
Triaxial • Solid 1.0 mm Bare Copper, Copper-Foil • Bare Copper Shield																		
Gas-Injected Polyethylene Insulation • LSNH Jacket (Black or Grey)																		
	H124C01	1640	500	109.1	49.5	1.0 Solid BC 41 Ω/km* 23 Ω/km**	0.173	4.40	Cu-foil 38% BC Braid 19 Ω/km* 60% BC Braid 14 Ω/km*	0.406	10.30	50	84%	16.2	53.0	5 50 100 230 400 800 862 1000 1350 1750 2150 2400	0.4 1.3 1.9 2.8 3.9 5.6 5.8 6.4 7.5 8.7 9.8 10.4	1.3 4.3 6.1 9.2 12.7 18.5 19.0 20.9 24.7 28.6 32.1 34.2
	Return loss at	5-470 MHz: ≥ 23 dB 470-862 MHz: ≥ 20 dB 862-2.150 MHz: ≥ 18 dB					Screening attenuation at 30-1.000 MHz: > 75 dB Pulling Tension: 65 N											

* DC loop resistance • ** DC resistance inner conductor • TC = Tinned Copper • BC = Bare Copper

Cables for use in the LUL metro system are sub-divided into two types depending upon the environment in which they are to be used.
The types are classed as - Type 1: For use in open locations, and Type 2: For use in tunnel or underground locations (LFH).
Type 2 cables are suitable for installation in stations covered by Section 12 of the Fire Precautions (Sub-surface Railway Stations) Regulations 1989.