RAILWAY NETWORKS CABLE SOLUTIONS AND SERVICES A PRACTICAL GUIDE





Railway Networks cable solutions and services A practical guide

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In a world which already counts around twenty megalopolies of more than 10 million inhabitants and whose urbanization is still expanding, urban, regional and long distance public transport networks are steadily developing.

These transportation solutions are privileged because they represent the most sustainable transport infrastructures versus all other transport means, particularly those using fossil fuels.

In this context the reliability of all these railways networks and their millions of passengers, is directly linked to the quality of their cabling installations dedicated to power, signalling and communication applications.

Cables

Railway networks probably contain the broadest range of cabling solutions, covering a lot of different functions :

- Catenary lines and their contact wires to power the train traction.
- High voltage and medium voltage power feeder.
- High, medium and low voltage distribution networks, as well as earthing / grounding connections.
- Signalling and control cables.
- Supervision & Communication cables with twisted pairs, coaxial or optical

elements, LAN cables & radiating cables.

Every cable family is linked to bundles of technical requirements based upon local or international standards, simultaneously fulfilling safety functionalities, like for instance fire behaviour.

Catenary cables

Contact wires for catenary lines, out of pure or alloyed copper, are based generally on national standards that integrate the type of engines, the frequency of the power feeding network and the climatic conditions.

And the mechanical requirements linked with the vibrations induced by the pantographs, has steadily increased proportionally with the historical development of the high speed traffic. The whole product family include:

- Feeding wires in continuous contact with the pantograph, according to the European EN 50149 or american ASTM B 47 standards.
- Suspension cables maintaining the contact wires.
- Earthing cables.



Power cables

High Voltage (HV) Cables: Underground cables generally feed the substations for traction power feeding. They deliver alternative currents with voltages between 46 and 345 kV, as a function of the national dedicated or non-dedicated transport grids. Various constructions exist with EPR insulations up to 138 kV and XLPE insulated conductors up to 345 kV.



Medium Voltage (MV) Cables:

They are deployed either : **1.** To feed the transformer stations of the standard power distribution network designed to power all lighting, security, supervision, ventilation or information systems of the railroad networks, typically with operation voltages between 15 and 45 kV.

2. To feed the single phased traction power network, either with 15 kV voltage for the countries applying 16.7 Hz frequency or 25 kV for most of the countries powering traction with 50 Hz frequency. The cables are generally comprising Class 2 copper or Aluminum conductors, with cross-linked polyethylene insulation (XLPE) covered with a screen (helically applied copper or aluminium wires).

protected either with helically applied galvanised steel tapes armour (GSTA) or with a longitudinal corrugated steel tape (CSTA) or for single core cables. The most used requirements correspond to Cenelec HD 620 or the international IEC 60502-2 specifications.

In many national standards,

they optionally can be

Low Voltage (LV) Cables are deployed either:

1. To distribute current from the transformer stations to all lighting, security, supervision or information systems of the railroad networks, typically with standard voltages 230 / 400 V. And distribution within the stations (escalators, elevators, doors, screens, cameras, ticketing systems,...) 2. To feed Direct Current (DC) powered regional or local public transport systems, with voltages between 750 and 1 500V. They generally correspond to the International standard IEC 60502-1, completed by national standards and requirements.

The specific requirements linked with safety regulations are presented in a specific chapter.





Signalling and control cables

Signalling cables cover a wide range of control command and signalling applications from plain electrical interconnect of line-side equipments to LF analog and HF digital data transmission up to 90 kHz.



TITITI

Domains covered by this kind of cabling are:



Signals





Point machines

Signalling cables interconnect electronic interlocks with signals, point machines, level crossings, supervision and control signals, axle counters and the speed and traffic control balises.

These cables are classified in 2 categories:

 Multicore cables, generally built with concentric layers of polyethylene or rubber insulated wires, with rather big cross sections between 0.9 and 2.5 mmØ.

anna a

• Twisted pairs or quad constructions, with typical wires of 0.6 to 2.2 mmØ. Given the fact that most of the signalling cables are operated in proximity of the single phase traction power supply, they are equipped wih a protection against electromagnetic perturbation defined by the reduction factor. This value is a measure of the reduction of the electromagnetic perturbation.

The typical constructions are based upon copper conductors with either paper, polyethylene, sometimes PVC or fire-retardant insulation, protected by thermoplastic or composite sheaths, composed of aluminium tape and polyethylene. There are also numerous possible combinations of electromagnetic protections and metallic armors. The importance of this product range reflects the big variety of services transmitted over these cables.









Track circuits

Axle counters

Eurobalises

The most well known European standards and specifications for signalling cables can be summarized by the following table:

Country	Cables	Standards / specifications				
S a alia	Copper Multicore Cables	RENFE E.T 03.365.051.6				
Spain	Copper pair/quad Cables	RENFE E.T 03.365.051.6				
Franco	Copper core Cables	NF F 55 622				
Trance	Copper pair/quad Cables	NF F 55-623 – CT445				
	Copper Multicore Cables filled and unfilled	DB 416.0113				
	Copper Multicore Cubies filled and unfilled	DB 416.0114				
Cormany		DB 416.0111 (Rail mounting)				
Germany	Conner nair (avad Cables	DB 416.0115				
	Copper pair/ duad Cables	DB 416.0120 (Balise)				
		DB 416.0116 (gen. Spec)				
Switzerland	Copper Multicore Cables	SBB/CFF/FFS 3001.82.1000				

Hybrid cables

The hybrid cables Energy / Telecom include all cables combining power supply, communication and / or signalling / control applications. They have to present a good level of protection against external electromagnetic perturbations generated by traction power because of the signalling or communication part of their uses.

These cables are designed as well to withstand harsh environmental conditions, with sometimes extreme temperatures, humidity, oil, ultraviolet rays. Most of these versions have also to present an improved behavior versus fire for tunnels and stations installations.

They can be composed of individual conductors, twisted pairs, triads or quads with sometimes up to 200 conductors or pairs generally with polyethylene insulation. As all other standard signalling cables, they can be protected with steel

armours.



Local Communication Cables



 For the STP families: ISO / IEC 11801 2002 ; ISO / IEC 61156-5 ; EN50173.

Optical fiber cables, with passive and active components

Optical fiber cables are

used for voice, data and

image transmissions on long, medium and short

They are classified in

distances

2 families:

• The Optical

and on the electric fields generated by the eventual power transmission line installed on the same infrastructure.

Generally, they correspond to national specifications depending on the installation method applied in the railway network.

Radiating Coaxial cables



The growing demand for wireless services obliges all railways and telecom operators to deploy solutions to cover also difficult areas like buildings, undergrounds or tunnels. In order to transmit various kinds of radio signals in tunnels, the most adapted broadband solution is radiating cable also sometimes called "Leaky" cable.

Based upon a pair of concentric conductors, they are used for the radiowave transmission of voice and data up to high frequencies (up to 2'600 MHz). Thanks to apertures in the outer conductor, they allow to transmit a broad range of radio frequencies in confined environment like tunnels, subways or buildings. They have been successfully deployed for GSM, GSM-R, tetrapol systems, as well as all the radio frequencies of emergency services (fire brigade, police, traffic control brigades,...).

Communication cables for Local Area Networks (LAN) are used for voice, data and image transmissions in stations or railways authority offices. Some fire resisting versions are also available. Basic constructions can be unscreened (UTP), or screened (F-FTP), and the highest transmission performances can be reached with constructions presenting an individual screen on each pair:

Following standards apply

- For the UTP families: ISO / IEC 11801 2002; ISO / IEC 61156-5; EN50173; TIA:EIA 586-B.2.
- For the F-FTP families: ISO / IEC 11801 2002 ; ISO / IEC 61156-5 ; EN50173 ; TIA:EIA 586-B .2

Underground Cables (OUC) to be installed along railtracks and whose construction depends on the installation method (gutters, ducts, microducts,

trenches, micro-trenches).
Overhead lines can be equipped with Optical Aerial Cables (OAC), with short, medium or long-span versions. In this case the detailed construction depends on the spans between poles

Fire reaction

Safety requirements common to all different types of cables

Indoor and tunnel or subway cablings are submitted to more stringent requirements concerning their behavior in the fire.



According to countries or continents, all these standards can be summarized by the following table:

Description	CENELEC	IEC / ISO	FRANCE	GERMANY	UK	UL NFA 130
Oxygen index		ISO 4589-2	NF.T.51071		BS 2782	
Temperature index		IEC 4589-3		VDE 304/21		
Gas and Smoke	EN 60754	IEC 60754	NF.C .20454	VDE 472/813	BS 6425/1	
Smoke density	EN 61034	IEC 61034	NF.X.10702 NF.C.20452 NF.C .32073	VDE 472/816	BS 7622/1*2	UL1 685
Flame retardant Single cable test	EN 60332-1	IEC 60332-1	NF.C.32070 C2	VDE 472 / 804B	BS-EN 60332-1	
Fire retardant Bunched cables test	EN 60332-3 *EN 50399 (*CPR)	IEC 60332-3 -22/-23/-24/-25	NF.C.32072 NF.C.32070 C1	VDE 472 / 804C	BS-EN 60332-3	IEEE 1202 UL 1685
Fire resistance Single cable test	EN 50200 (>20mm) EN 50263 (>20mm) EN 50282(FO)	IEC 60331 -1/-2/-3	NF.C.32070 CR1	VDE 472/814	BS 6387	IEC 60331 UL 2196



Fire rating of cables

IEC/EN 60332-1 - Tests for vertical flame propagation for a single insulated wire or cable



Standard defines the procedure for testing the resistance to vertical flame propagation for a single vertical electrical insulated conductor or cable, or optical fibre cable, under fire conditions. Flame shall be applied continuously for period of time corresponding to diameter of tested piece of cable, having initial length of 600 ± 25 mm.

Recommended

performance requirements: Cable shall pass the test if the distance between the lower edge of the top support and the onset of charring is greater than 50 mm. IEC/EN 60332-3 (cat. A, B, C and D) - Tests for vertical flame spread on vertically mounted bunched wires or cables



Different categories are defined in IEC 60332-3-10. This standard gives details of a test where a number of cables are bunched together to form various test sample installation. For easier use and differentiation of various test categories, the parts are

designated as follows:

Category	Flame application time	Volume of non metallic material
A - 22	10min	7.01
B - 23	40mm.	3.51
C - 24	20min	1.51
D - 25	2011111.	0.51

- Standard IEC/EN 60332-

3-22 defines the category A and relates to cables installed on the test ladder to achieve a nominal total volume of non-metallic material of 7.0 l/m of test sample. The flame application time is 40 minutes.

- Standard IEC/EN 60332-

3-23 defines the category B and relates to cables installed on the test ladder to achieve a nominal total volume of non-metallic material of 3.5 I/m of test sample. The flame application time is 40 minutes.

- Standard IEC/EN 60332-

3-24 defines category C and relates to cables installed on the test ladder to achieve a nominal total volume of non-metallic material of 1.5 I per metre of test sample. The flame application time is 20 minutes.

- Standard IEC/EN 60332-3-25 defines category D and relates only to small cables of overall diameter 12 mm or smaller and cross-section of 35 mm² or smaller installed on the test ladder to achieve a nominal total volume of nonmetallic material of 0.5 l/m of test sample. The flame application time is 20 minutes.

Fire resistance performances -IEC/EN 60331 and BS 6387 categories C, W, Z



- Standard IEC/EN 60331 gives the test procedure and performance requirement which includes flame application time, for cables which need to maintain circuit integrity when subjected to fire under specified conditions. It describes the means of continuity checking arrangements, electrical testing procedure, method of burning and gives requirements for evaluating test results. Standard covers low voltage power cables and control cables with rated voltage. Cable has to show electrical continuity, so its ability to continue to operate in the designated manner whilst subjected to a specified flame source for a specified period of time (90 minutes flame application is recommended).

- Standard BS 6387

specifies performance requirements and gives test methods for fire tests applicable to cables rated at voltages not over 450/750 V. Coverage includes definitions, bending characteristics, voltage designation and fire resistance characteristics. The cables are intended to be used for wiring and interconnection where it is required to maintain circuit integrity under fire conditions for longer periods than can be achieved with cables of conventional construction. Cables shall be categorized by a letter symbol or series of symbols according to the requirements for fire resistance characteristics they have to comply with, the test temperatures selected and the duration of the test for resistance to fire alone.

First letter symbol shall be have follows:	
 Resistance to fire alone: 650°C for hours 3 750°C for hours 3 950°C for hours 3 C 950°C for 20 min (pair of shorts duration) 	Symbol A B C
- Resistance to fire with water:	W
 Resistance to fire with mechanical shocks: 650°C 750°C 950°C 	x z

Problems with smoke emission

Human impact

During a fire, the smoke due to the combustion of various materials make rescue and evacuation of premises difficult and often represents a lethal trap for those caught in the incident.

Smoke forms a complex, heterogeneous, opaque and toxic environment.

Cables are involved because they are present in all the premises, go through the walls and can contain combustible materials. During the fire, they may play an aggravating role specifically with respect to the emission of opaque, corrosive and toxic smoke.

Materials which do not contain halogen products are used in the manufacture of HFFR (Halogen Free Fire Retardant) cables used to limit smoke emission and toxicity. HFFR materials can be used both for insulation and sheathing.

IEC/EN 61034 -Measurement of smoke density of cables burning under defined conditions Standard IEC/EN 61034 provides details of the test procedure to be employed for the measurement of the density of smoke emitted from cables burning under defined conditions. It describes the means of preparing and assembling cables for test, the method of burning the cables, and gives recommended

gives recommended requirements for evaluating test results.



IEC/EN 60754-1 - Test on gases evolved during combustion of electrical cables - Determination of the amount of halogen acid gas

Standard IEC/EN 60754-1 specifies a method for

the determination of the amount of halogenic acid gas, other than hydrofluoric acid, evolved during the combustion of compounds based on halogenated polymers and compounds containing halogenated additives taken from cable constructions. This method is not recommended for use where the amount of halogen acid evolved is less than 5 mg/g of the sample taken.

IEC/EN 60754-2 -

Determination of degree of acidity of gases evolved during combustion of electric cables by measuring pH and conductivity Standard IEC/EN 60754-2 specifies a method for the determination of the

acidity degree of gases

evolved during the combustion of compounds taken from cable components. Coverage includes procedure and conditioning of the samples.



CPR Euroclasses construction directive for cables

CPD means « Construction Products Directive » and was initiated in 1989 through EU Directive 89/106/EEC document.

It concerns "any product which is incorporated in construction works, including both buildings and civil engineering works". CPD is aiming at removing barriers to trade within EU for the very broad range of products used in construction of buildings and civil works. As a Directive the CPD had to be "transposed" in national legislations, which led to varying interpretations. CPD has now developed into a Regulation directly applicable as law in all EU countries, thus avoiding varying interpretations.

CPD/CPR does not in itself impose requirements on the level of performance of products. It provides a "common language" to be used by Member States in their national construction regulations and procedures.

CPR means "Construction Products Regulation" and was initiated in 2011 through document EU 305/2011. This regulation is fully applicable since July 2013 with an identical implementation of regulations throughout EU: same conditions throughout EU, no national deviations. There are no changes in requirements for cables (compared to CPD), but CE-marking mandatory, on 1 st of July 2017.

Hereafter a table summarizing different euroclasses for cables:

Euroclass	Criteria	Additional options				
А	Non combustible					
B1	Very low propagation - special for plenum	Smoke, Acidity, Droplets				
B2	Very low fire propagation Very low heat release + Low flame propagation	Smoke Acidity Droplets				
С	Low fire propagation Low heat release + Low flame propagation	Smoke Acidity Droplets				
D	High fire propagation Moderate heat release + Low flame propagation	Smoke Acidity Droplets				
E	Low flame propagation (only)	Smoke Acidity Droplets				
F	No performance determined					

NFPA 130 National Fire Protection Association: Standard for fixed Guideway Transit and Passenger Rail Systems gives the applicable test standards of performances in fire, depending of the application area. The minimum requirements of the cable characteristics, are the Fire retardant & Smoke deployment FT4 acc. to IEEE1202 & UL 1685, as the halogen contains of the evolving gases during Fire.



MAIN LINE POWER cables & components

Accessories for low high voltage cables

The accessories for XLPE-insulated HV-cables are used to connect the cables by means of premolded joints at route section lengths of approx. more than 800 - 900 m or to joint a cable to the network with terminations for outdoor / indoor use as well as for their insertion into transformers and GIS-switchgears. Accessories for high voltage XLPE cables are developed and produced by Nexans in line with international standards or to stricter internal guide lines which satisfy the highest demands and guarantee fault-free operation even under the most severe laying conditions.

SPLICE CLOSURES

TERMINATIONS

Accessories for LV/MV voltage cables

Accessories for underground networks and outdoor terminations for low and medium voltage cables (joint, termination and lugs) are developed and produced by Nexans in line with international standards or to stricter internal guide lines which satisfy the highest demands and guarantee fault-free operation even under the most severe laying conditions.

Low-high voltage feeder cables

Application examples: long-distance transmission networks power supply to the catenaries.

Cable families examples: HTA C33-220, N2XS2Y, RG50NR. See selection table p.36/37

Medium-voltage feeder cables

Application examples: power supply to the catenary.

Cable families examples: HTA C33-220, N2XS2Y, RG50NR. See selection table p.36/37

Medium-voltage power distribution cables

Application examples: medium voltage distribution near the stations or underground areas (tunnels, covered, areas ...).

Cable families examples: U3000 R2V, RG7M1NM1. See selection table p.36/37 - 38/39

Catenary contact line

Application examples: traction power (train, tramways, and light rail systems) through the pantograph.

EARTH CABLES

Cables are used to guarantee the integrity of the electrical systems and human safety.

Application : grounding for electrical systems metallic parts

Low-voltage power cables

Application examples: supply of heating referrals.

Cable families examples: U1000 R2V, NYY, EXVB, N2XH. See selection table p.32/33 - 34/35



MAIN LINE SIGNALLING & COMMUNICATION cables & com



ponents

Telecom copper long distances cables

Application examples: transmission of analog voice frequency signals or digital signals up to 1 MHz.

Cable families examples: AJ-02YSOF(L), 2YDB2Y. See selection table p.28/29 - 30/31

Paper insulated cables

Application examples:

transmission of analog signals or digital signals up to 1 MHz.

Cable families examples: A-PLEBZY, A-PWEZY. See selection table p.28/29 - 30/31

Radiating cables

Application examples:

radio transmission in confined spaces (tunnels, subways, buildings) for all frequency ranges (the FM band up to WiFi 2'600 MHz). Cable families examples: K26, Filoradio RL50, Filoradio RL75. See selection table p.28/29 - 30/31

Axle counter cables

Application examples: special cables for repatriating signals, axle counters.

Cable families examples: AJ-2Y(L)2YDB2Y, AZLM, XPS C41. See selection table p.28/29

Balise cables

Application examples: specific cables for the linking between control centers and positioning tags.

Cable families examples: BA-PE-ALT-CLT, A-2Y(L)2YB2Y. See selection table p.28/29 - 30/31

Point machine cables

Application examples: command of railroad points.

Cable families examples: ZPFU, A-2Y(L)2YB2Y. See selection table p.28/29



Your infrastructure growth

The efficiency of any train system is dependent on an infrastructure which provides reliable energy for rolling stock, and data and telecommunications for train management and control. Whether for highspeed train, operators are anxious to streamline costs, future-proof their systems, upgrade customer services, and assure a high level of public safety.

SIGNALLING



TRAIN & SUBWAY STATION POWER cables & components

Public access buildings

The regulations require for underground stations fire retardant cables (IEC 60332-1, class C1 in France) without releasing halogenated substances during combustion. For the French regulation, stations are PAB type GA. The electric lines supplying the safety lighting in the case of a centralized source must be independent of the other lines and be fire resistant (IEC 60331, Class CR1 in France).



Accessories for underground networks

Accessories for underground networks low and medium voltage cables (joint, termination and lugs) are developed and produced by Nexans in line with international standards or to stricter internal guide lines which

satisfy the highest demands and guarantee fault-free operation even under the most severe laying conditions.



AUDIO & VIDEO ON POLE Application examples: medium voltage distribution cables in and around station.

Cable families examples: HTA K20, RG7H1OM1 Alsecure. See selection table p.36/37 - 38/39

Fire retardant & fire resistant medium-voltage cables

Application examples: fire retardant or fire resistant distribution cables (medium voltage in technical galleries or in subterranean subways).

Cable families examples: Fire retardant: HTA K20, NA2X5(F)N, RG7M1NM1 Alsecure (C1 in France). Fire resistant: Special constructions on demand (CR1 in France). See selection table p.36/37 - 38/39

Fire retardant & fire resistant low-voltage cables

Application examples: fire retardant or fire resistant cables for Low-voltage distribution in and around stations, fire resistant version to feed security systems (video, ventilation, breakdown, emergency lighting).

Cable families examples: K25, K27, Alsecure premium, NX100-600. See selection table p.32/33

EARTH CABLES

Cables are used to guarantee the integrity of the electrical systems and human safety.

Application : grounding for electrical systems metal parts Low-voltage cables

Application examples: low-voltage distribution for installations (lighting, electrical engine).

Cable families examples: Alsecure, EAXeV. See selection table p.32/33 - 34/35



STATION COMMUNICATION & SAFETY cables & components

Specificities of data cables

Definitions of the classes of a symmetrical pair cable wiring system in an industrial and tertiary environment (EN 50173-1):

- Class D specified up to 100 MHz,
- Class E specified up to 250 MHz,
- Class F specified up to 600 MHz.
- Class EA specified
 up to 500 MHz,
- Class FA specified up to 1000 MHz,



LOUDSPEAKER

1



TURNSTILE



Optical fiber cables

Application examples:

optical cables for computer networks, video surveillance or control systems.

Cable families examples: K209. See selection table p.40/41

Lan cables

Application examples: data networks, computer networks, subway turnstile link...

Cable families examples: U/UTP – F/UTP – SF/UTP

Loudspeaker cables

Application examples: loudspeaker cables, version with fire retardant and fire resistant properties. Cable families examples: Alsecure Premium FE180. See selection table p.34/35

Safety circuits

The surface or underground stations (train or subway) are public access buildings. The PAB has to contain a fire safety system appropriate (peculiar) to the characteristics of every category of public building. Fire safety system (SSI) is defined at the European level by the standards series IN 54 ... According to the regulation of the construction products the new requirements of which in particular with the Euroclasses are applicable since July, 2013.





URBAN MASS TRANSIT POWER cables & components

Medium-voltage power and feeder cables

MV feeder cables (6/10, 12/20 or 18/30 kV depending of country) carry power to substations along metro lines. Special solutions include ethylene propylene rubber or silicone insulations for flexibility, and special XPLE insulations that can withstand water, oil, heat, stress, and extreme temperatures, while meeting Low Fire Hazard (LFH) cable requirements thanks to newest developed sheathing compounds.

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High requirements for fire retardancy (C1) or even fire resistance (CR1) are met by several product ranges of low voltage cables in different sizes.

C1

Application examples:

3-Phase power supply to Medium Voltage transformer stations, in standard cable versions, or in fire retardant alternative or in fire resistant execution.

Cable families examples: EXECWB, HTA K20.

See selection table p.36/37-38/39

Medium-voltage traction feeder cables

Application examples:

Single phase power supply to 3rd rail (subways) or catenary line (tramways), in standard cable versions, or in fire retardant alternative or in fire resistant execution.

Cable families examples: NA2XS(F)N.

See selection table p.36/37

Low-voltage power distribution cables

Application examples:

3-Phase low voltage distribution, in standard cable versions, or in fire retardant alternative or in fire resistant execution.

Cable families examples: Alsecure Premium, NX100, NX600.

See selection table p.32/33

Low-voltage traction cables

Application examples:

Single phase Low Voltage power supply to subways' third rail, in standard cable versions, or in fire retardant alternative or in fire resistant execution. Cable families examples: K25, K27. See selection table p.32/33

Catenary contact cables

Application examples: supply of traction (locomotive) via the pantograph for RER or tramway.

Grounding/earthing cables

Application examples: grounding for electrical systems metal parts.

Cable families examples: CDTE, CORETAG® antitheft cable, earthing cable. See selection table p.32/33



MV TRANSFORMER STATION

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URBAN MASS TRANSIT SIGNALLING & COMMUNICA

Ensure your infrastructure growth

The efficiency of any train system is dependent on an infrastructure which provides reliable energy for rolling stock, and data and telecommunications for train management and control. Whether for a tramway, subway or high-speed train, operators are anxious to streamline costs, future-proof their systems, upgrade customer services, and assure a high level of public safety.



Optical fiber cables

Application examples: optical cables for computer networks, video surveillance or control systems.

Cable families: K209, A-DQ(ZN)HB2Y. See selection table p.40/41

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RAILWAYS NETWORKS innovating technologies

DUOTRACK® cables, the all-in-one solution for the trunk cabling of regional railways lines

DUOTRACK® represent a complete cabling system consisting of a specific cable and custom-designed clamps, splice and branch joints and an adapted laying technology.

This system is able to transmit all copper and optical fiber services through a single cable line:

- Signalling, axle counter, wheel sensors... and LV power supply through copper.
- Electronic interlock bus, GSM-R or general carrierservices through optical fibers.

Where conventional cabling in concrete troughs requires the laying of several cables, this is performed through one DUOTRACK® cable in a single installation step. This range of cable is a new development of NEXANS, with an optical fiber and a copper cable firmly but separably inter-linked.



DUOTRACK® installation

SIGNAL 60 45

The DUOTRACK® cable is installed directly at the track with custom-designed clamps, cable branches and a newly developed laying technology utilizing a customized laying vehicle configuration.

CORETAG® cables, the anti-theft marking soluti on

For many industries, utilities and railways, cable (i.e.metal) theft is a serious problem ; leading to heavy Financial losses and threats to public safety. This patented solution, wich interleaves a coded copper tape into the conductor, is the simplest and best answer to copper robbery.

Since thieves burn off insulations to eliminate telltale signs, a thin 10 x 0.1 mm copper tape is intertwined with the conductors. At regular intervals, a punched legend in dot matrix format contains information about the original cable owner. Because burning heat blackens the tape, it becomes easy to read.





		Design	Construction					
				Cu Con	ductors			
Country	Designation	Standard / Specification	Туре	Number	Size			
	ZPAU	CT 445 (SNCF)	Р	156	1.0 - 2.5 mm ²			
	ZPFU	CT 445 (SNCF)	P	1 56	1.0 mm ²			
	ZPGU	CT 445 (SNCF)	P	114	1.0 mm ²			
	ZCO3	CT 445 (SNCF)	Q	4	1.0 mm ²			
	ZUG		P	112 (28)	1.0 mm ² (0.4 mm ²)			
	SPEB K22	CT 440 (SINCF)	P	2 40	0.5mm ²			
E	K23	NF F 55-623 / RATP-N20	P	1 56	$0.6 \cdot 0.8 \cdot 1.0 \cdot 1.2 \text{ mm}$			
•	K24	NF F 55-624 / RATP-K20	PT	1 112	0.8 - 1.0 - 1.2 - 1.4mmØ			
	K26-L-50-7/8" - Radiating Cable	NF F 55-626 / RATP-K20	Coax	1	-			
	Type 88 - 89 armoured	NF C 93-526 / NF C 93-527 L2	Q	41344	0.4 - 0.6 - 0.8mmØ			
	SNCF Paper long distance AGMBG	CT 227 CT2005	Q	4139	0.9 - 1.2 - 1.3mmØ			
	SNCF Paper long distance AGMBG	CT295 CT2005	QC	4139	0.9 - 1.2 - 1.3mmØ			
	SNCF Paper long distance AGMBG	CT 237 CT 2005	Q	4139	0.9 - 1.2 - 1.3mmØ			
	SRS13	RATP ST-SRS13	P	2 28	1.0 - 1.2mmØ			
	A-2Y2YV H 95, 115, 145	DB 416.0113, DB 416.0114	W	2 200	0.9 - 1.4 - 1.8mmØ			
-	A-2Y2YB2Y H 95, 115, 145	DB 416.0113, DB 416.0114	W	2200	0.9 - 1.4 - 1.8mmØ			
	AJ-2Y2YDB2Y H 95, 115, 145	DB 416.0113, DB 416.0114	W	2200	0.9 - 1.4 - 1.8mmØ			
		DB 416.0115	2	140	0.9 - 1.4mmØ			
	A-21(L)21B21	DB 410.0115	Q	140	0.9 - 1.4111110			
	AJ-2Y(L)2YDB2Y	DB 416.0115	Q	140	0.9 - 1.4mm⊘			
	A-2YOF(L)2YV H 95, 115, 145	DB 416.0114 -V2.1, DB 416.0113-V2.1	W	2200	0.9 - 1.4 - 1.8mmØ			
	A-2YOF(L)2YB2Y H 95, 115, 145	DB 416.0114 -V2.1, DB 416.0113-V2.1	W	2 200	0.9 - 1.4 - 1.8mmØ			
_	AJ-2YOF(L)2YDB2Y H 95, 115, 145	DB 416.0114 -V2.1, DB 416.0113-V2.1	W	2200	0.9 - 1.4 - 1.8mmØ			
	Balise cable A-2Y(L)2YB2Y	DB 416.0120	Q	1	1.4 - 1.53mmØ			
	Balise cable AJ-2Y(L)2YDB2Y	DB 416.0120	Q	1	1.4 - 1.53mmØ			
	Trunk-Cable ALU A-PLEB2Y / AJ-PLEB2Y / AJ-PLDEB2Y	Dlk 1.01.106	Q	369	0.9 - 1.2 - 1.4mmØ			
	Trunk-Cable STEEL A-PWE2Y	Dlk 1.01.106	Q	369	0.9 - 1.2 - 1.4mmØ			
	Trunk-Cable LEAD A-PMz2Y / A-PMzB2Y	Dlk 1.01.106	Q	318	0.9 - 1.2 - 1.4mmØ			
	Trunk-Cable with CCITT coax. pairs A-PWE2Y	Dlk 1.01.106	Ø	1280	0.9 - 1.2 - 1.4mmØ coax. 1.2/4.4 & 2.6/9.5mmØ			
	A-02YSTF(L)2YDB2Y STI TNP 02	Arcor TNP 02/05	Q	1030	0.9 - 1.4mmØ			
	B Types	NR/PS/SIG 00005	W	148x	Cl2 0.75 -95mm ²			
	C Types	NR/PS/SIG 00005		112x	Flex Cl5 2.5mm ²			
	D Types	NR/PS/SIG 00005	r W	1 X	$(2075 150 \text{ mm}^2)$			
	E Types	NR/PS/SIG 00005	W/	1 16x	$Elev Cl5 2 5mm^2$			
	Track side COMM cable	G7621 (IUII)	P	13	0.63 - 0.9mmØ			
			P	8308	0.63mmØ			
UK	Irack side COMM cable	G/622	Р	8108	0.9mmØ			
	Internal COMM cable	G7623 (LUL)	Р	1320	0.5 - 0.6mmØ			
	RG22 Hybrid Type C73,228 mm	2-1001-002	Р	1	Cl2 7X0.39mmØ			
	Concentric Data Cable C12	JNP-ENG-G7210-A1	CP	1 - 3 - 7	1.53mmØ			
	Concentric Data Cable C14	JNP-ENG-G7210-A1	CP	1 - 3 - 7	1.53mmØ			
	Docking Loop C22	2-1001-002	W	5	Flex CI5 1.5mm ²			
	XDS C41-Axle Counter	NR/12/510/50000	P	224	0.9-1.4mm			
	ALC COULICI	I NIL/ LZ/ JIG/ JUUUU	1 1	224	0.7111110			

Other Countries: according to Local, European & International Standards.

W = Wires (Multicore)

P = Pairs

CP = Concentric Pairs (coaxial pairs)Q = Quads

PE = Polyethylen, XLPE = x-linked PE, FS = Foam skin, PVC = Polyvinylchlorid

Main signalling and telecom copper cables



			Fire					Application					
	Co	able construction		behav	iour				Ou	utdo	or	Indo	or
Insulation	Longitudinal watertightness	Screen / Inductive protection	Armour	Fire	Halogen free acc. to IEC 60754-1/-2	Low Smoke acc. to IEC 61034- 1/-2	CPR Euroclass	NFPA130 FT4 IEEE1202 & UL1685	On hooks	Concrete trough	Direct Buried	Public building	Tunnels
PE		Corrugated Cu Tape	Steel tapes	NF C 32-070 C2 (C1 opt)									
PE		_	Steel tapes	NF C 32-070 C2 (C1 opt)									
PE		Alu Tape		NF C 32-070 C2 (C1 opt)									
PE		Corrugated Cu Tape	Steel tapes	NF C 32-070 C2 (C1 opt)									
PVC (opt. LSZH)		_		NF C 32-070 C2 (C1 opt)									
PE			D-Steel Braid	NF C 32-070 C2 (C1 opt)									
XLPE		LAP sheath	Steel tapes	NF C 32-070/C1 - C2									
PE		LAP sheath	Steel tapes	NF C 32-070/C1 - C2									
PE		Alu Tape	Steel tapes	NF C 32-070/C1 - C2									
FS		Cu-leaky-tape		NF C 32-070/C1 - C2									
PE		LAP sheath	Steel tapes										
Paper		Alu Extruded	Steel tapes										
Paper		Alu Extruded	Steel tapes	-									
Paper		Alu Extruded	Steel tapes										
FS	Jelly Filling	LAP sheath	Steel tapes	IEC 60332-1									
PE													
PE		_	Steel tapes										
PE		Cu Wires + Steel tapes	Steel tapes										
PE		LAP sheath	Steel tapes										
PE		LAP sheath	Steel tapes	~			ite						
PE		LAP Sheath + Cu Wires + Steel tapes	Steel tapes	-			Nebs						
FS	Jelly Filling	LAP sheath		-			SL						
FS	Jelly Filling	LAP sheath	Steel tapes				xa						
FS	Jelly Filling	LAP Sheath + Cu Wires + Steel tapes	Steel tapes	-			n Ne						
PE		LAP sheath	Steel tapes				Ro						
PE	-	LAP Sheath + Cu Wires + Steel tapes	Steel tapes				ACKE						
Paper	-	Welded ALU + for AJ: Cu Wires + Steel tapes	Steel tapes (AJ)	_			S TR/						
Paper		-	Welded Steel Tube	-			XAN						
Paper		Lead-Sheath	Steel tapes (B)				Ž						
Paper	-	-	Welded Steel Tube	-									
FS	Swelling Yarns + Tapes	LAP sheath	Corrugated steel tape	-									
EPR				BS4066 part1 / IEC 60332-1									
EPR	-	_		BS4066 part1 / IEC 60332-1									
EPR		-		BS4066 part1 / IEC 60332-1									
XHFFR		_		BS4066 part1 / IEC 60332-1									
XHFFR		-		BS4066 part1 / IEC 60332-1									
FS													
FS		LAP sheath		BS4066 part3 / IEC 60332-3-24									
FS													
PE													
PE	Optional	Cu braid + alu foil		BS4066 part1 / IEC 60332-1									
XLPE		_		BS 4066 part3 / IEC 60332-3-24									
XLPE		Cu braid + alu foil		BS 4066 part3 / IEC 60332-3-24									
PE				BS4066 part1 / IEC 60332-1									
PE		LAP sheath		-									
PE	Jelly Filling	LAP sheath		-									

Yes

Optional = means that these cables can be proposed with HFFR sheath, thus compatible with indoor / public building application

No



		Design		Constr	uction					
			Cu Conductors							
Country	Designation	Standard / Specification	Туре	Number	Size					
	UG7OG7K	IS 200D	W	216	Cl1 & Cl2 1 - 25mm ²					
	UG7OG7KNR	IS 200D	W	216	Cl1 & Cl2 1 - 25mm ²					
	UG100G10M2	IS 409C	W	216	Cl1 & Cl2 1 - 25mm ²					
	UG100G10M2NM1	IS 409C	W	216	Cl1 & Cl2 1 - 25mm ²					
	FG7(O)H1M1 ALSECURE	CEI 20-13	W	524	Cl5 1.5 - 2.5 mm ²					
	FG10(O)H1M1 ALSECURE	CEI 20-13	W	524	Cl5 1.5 - 2.5 mm ²					
п	TE-Q/A5E	11241/S and 11465/96	Р	898	$2x2x0.5 + nx2x0.7 mm \emptyset$					
	IEJ-Q/ADE	11242/5 and 11465/96	P	898	2x2x0.5 + nx2x0.9mm					
		FF.33.413	Q	10 200	0.7 mmØ					
		1.3. 47 5	1	10200	0.7 millo					
	TA-Q/AE	F.S. 566	Р	846 (+ 2)	0.9mmØ					
	TA-Q/LILIE	Special design	Q +P	3x2x + 4x4x + 16x2x1.5mm	1.3 & 1.5mm					
	SXCAV F2	Intrabel S-21	P	130	1.5 mm ²					
		Infrabel 5-21	۲	130	1.5 mm ²					
BE	JYAY F2 VS F2	Intrabel 5-21	VV \A/	2 30	2.3 or 0 mm ²					
	VST F2	Infrabel S-21	W/	26 18	1.5 mm ²					
	VST F2	Infrabel S-21	0	1 or 3	0.8 mm ²					
┝──┤	SWx4/ PE-T	SBB/CFF/FFS 3001 82 1000	Q	1 30	1.0 - 1.5 - 2.2mmØ					
	SWx4/ PE-CLT	SBB/CFF/FFS 3001.82.1000	Q	130	1.0 - 1.5 - 2.2mmØ					
	SWx4/ PE-T-F	SBB/CFF/FFS 3001.82.1000	Q	130	1.0 - 1.5 - 2.2mmØ					
	FMK PE4-ALT-CLT	SBB/CFF/FFS 3001.52.1000	Q		0.40.8 mmØ					
СН	BK PE4D-ALT	SBB/CFF/FFS 3001.52.1000	Q	540	1.0 mmØ					
	BK PE4D-ALT-CLT	SBB/CFF/FFS 3001.52.1000	Q	315	1.0 mmØ					
	BA-PE-ALI-CLI Balise	SBB/CFF/FFS 3001.52.2000	Q	1	1.53 mmØ					
	FILORADIO Radiating-Cable-RL-L-50	Nexans 7/4	Coax	1						
	Balise Transmission Cable	3NSS005227D001	P	2-10	0.9 mmØ					
	Balise Transmission Cable	3NSS005577 / 5813	P	1, 2, 4, 7,10	0.9-1.0 mmØ					
	ECALLEV 210x2x0,9	Customer/3NSS950001	Р	2, 4, 7,10	0.9 mmØ					
	ECALWLEV 210x2x0,9	Customer/3NSS005227-0X	Р	2, 4, 7,10	0.9 mmØ					
	ELAQQBEV 210x2x0,9	Customer/3NSS006157-0X	Р	2, 4, 7,10	0.9 mmØ					
	ELAQWQBEV 210x2x0,9	Customer/3NSS005813-0X	P	2, 4, 7,10	0.9 mmØ					
	ECALFPLEV 2x2x0,9	Customer/ IPRI-1001983	P	2, 4, 7,10	0.9 mmØ					
		BVS 518 1102 (Swedish Railway)	P	5-100	0.63mmØ					
	TRV-ECLAIPLE	Swedish Railway	P	15-50	0.00mmØ					
C14/	TRV-ELALE	BVS 518.1112 (Swedish Railway)	Q	1	0.9mmØ					
300	EQPLR 12x1,5 450/750V	Swedish Standard + Customer	W	12	1.5 mm ²					
	EQPLR 12x2,5 450/750V	Swedish Standard + Customer	W	12	2.5 mm ²					
	EQPLR 12x4 450/750	Swedish Standard + Customer	W	12	4 mm ²					
		Swedish Standard + Customer	VV VV	2	1.5 mm ²					
	EXPOLENC 1KV 3G10/10	Swedish Standard + Customer		3	3 mm ²					
	EQLR 748X1.5 500V F4C	Swedish standard	W	7 14 19 27 36 48	1.5 mm ²					
	10i.005 S/FTP Outdoor 4pr AWG 23 CAT6A LSZH + PE	Nexans Standard								
	10i.002 LANmark-7 Industry S/FTP 4pr AWG23 CAT7 PUR	Nexans Standard								
	TRV-ENUBB 1X		W	1, 2	0.8, 1.5					
	A-2Y(L)HV nx4x1,4		14/	4 100	1.4. 0					
	Multiconductor EAPSP			4100	1.4 mmØ					
	Multiconductor EAPSP-R		W	4100].4 mmØ					
	Multiconductor EAPSP-8		W	4100	1.4 mmØ					
	Multiconductor CCPSSP 400, 500, 600		W	448	0.9 - 1.4 mmØ					
	Multiconductor CCPSSP-R 400, 500, 600		W	448	0.9 - 1.4 mmØ					
	Multiconductor CCTSST 400, 500, 600		W	448	0.9 - 1.4 mmØ					
	Pairs EAPSP Dairs EATST		P	3150	0.04 - 0.9 - 1.3 mm					
	Pairs EAPSP-R		P	3150	0.64 - 0.9 - 1.3 mmØ					
SP	Pairs EAPSP-8	EI 03.365.051.6 issue 2 March 2005 +	Р	3150	0.64 - 0.9 - 1.3 mmØ					
	Pairs CCPSSP 400, 500, 600	modif august 2005	Р	224	0.9 - 1.4 mmØ					
	Pairs CCPSSP-R 400, 500, 600		Р	224	0.9 - 1.4 mmØ					
	Pairs CCTSST 400, 500, 600		P	224	0.9 - 1.4 mmØ					
	Quads EAFSP Quade EATST		Q	148	0.9 - 1.3 - 1.4 mm					
	Quads EAPSP-R		Q	148	0.9 - 1.3 - 1.4 mmØ					
	Quads EAPSP-8		Q	148	0.9 - 1.3 - 1.4 mmØ					
	Quads CCPSSP 400, 500, 600		Q	148	0.9 - 1.4 mmØ					
	Quads CCPSSP-R 400, 500, 600		Q	148	0.9 - 1.4 mmØ					
	Quads CCTSST 400, 500, 600		Q	148	0.9 - 1.4 mmØ					
ти	AJ-02Y52YD2YB2Y	TCDD Signal and Power Cables	Q \A/	1-3-5-/	0.9 mmØ					
11	AI-2XY(ST)2YB2Y	TCDD Signal and Power Cables	VV ()	440	1.5 mm ²					
	Countries: according to local European & Internati	onal Standards CP - Concentric P		l pairel	1.5 mm					

op W = Wires (Multicore)

P = Pairs

Q = Quads PE = Polyethylen, XLPE = x-linked PE, FS = Foam skin, PVC = Polyvinylchlorid

Interpretation Control of particular and partin and particular and particular and particular and part		Construction			Fire			ction Fire					Арр	olicat	ion	
Insolution bunching Longendulation bunching production prod		C	able construction		behaviour					0	utdo	or	Indo	or		
HFRAC7 HE (503322) HE (503322) LOT HARR CV See Input See Input HE (50332) <td< th=""><th>Insulation</th><th>Longitudinal watertightness</th><th>Screen / Inductive protection</th><th>Armour</th><th>Fire</th><th>Halogen free acc. to IEC 60754-1/-2</th><th>Low Smoke acc. to IEC 61034-1/-2</th><th>CPR Euroclass</th><th>NFPA130 FT4 IEEE1202 & UL1685</th><th>On hooks</th><th>Concrete trough</th><th>Direct Buried</th><th>Public building</th><th>Tunnels</th></td<>	Insulation	Longitudinal watertightness	Screen / Inductive protection	Armour	Fire	Halogen free acc. to IEC 60754-1/-2	Low Smoke acc. to IEC 61034-1/-2	CPR Euroclass	NFPA130 FT4 IEEE1202 & UL1685	On hooks	Concrete trough	Direct Buried	Public building	Tunnels		
IPPA-67 See logs EC 60332-1 IPPA-67 IPPA-67 See logs CE 60332-324 IPPA-67 IPPA-67 CE 60332-324 IPPA-67 IPPA-7 Mela locen IPPA-67 IPPA-7 Mela locen IPPA-7 IPPA-7 IPPA-7 IPPA-7 IPPA-	HEPR-G7		-		IEC 60332-2-1											
DSH Hake (10)	HEPR-G7			Steel tapes	IEC 60332-2-1											
Diffictor of Di	LSOH Rubber G10		-	-	CEI 20-22/3-4											
HTMKOD Mobile AUU IEC 0003/21 IEC 0003/21 FE Welded AUU	LSOH Rubber G10	-	—	Steel tapes	CEI 20-22/3-4											
Invertor	HEPR-G/		Metal screen		IEC 60332-3-24											
PE					IEC 80332-1											
Piper	PF		Welded ALU													
Proper Lead Headh	PE		-	Corrugated Steel tape	-											
Paper Piper Image: Piper Image: Piper Image: Piper Image: Piper Image: Piper Image: Piper Pip	Paper		_	Lead sheath	_											
Popper - Lood shoch - - - Lood shoch -	Paper + PPE / PVC (safety)	-	Welded ALU	-	-											
XIPE Cu Wres or Topo Steel lappes NBN C30004 F2 Co	Paper	-	_	Lead sheath	-											
XIPE Gu Wres or Tope Steel topes NIN C36X04/12 Image: Steel topes Image: Steel topes </td <td>XLPE</td> <td>-</td> <td>Cu Wires or Tape</td> <td>Steel tapes</td> <td>NBN C30-004 F2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	XLPE	-	Cu Wires or Tape	Steel tapes	NBN C30-004 F2											
PYC Stel logas NEN C30C04 F2 Image: Calibration of the calibration of t	XLPE		Cu Wires or Tape	Steel tapes	NBN C30-004 F2											
PVC Shet lops <td>PVC</td> <td></td> <td></td> <td>Steel tapes</td> <td>NBN C30-004 F2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	PVC			Steel tapes	NBN C30-004 F2											
Prv: Sete tops: PVC - Sete tops: <td>PVC</td> <td></td> <td>-</td> <td>Steel tapes</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	PVC		-	Steel tapes	-											
International optimise Optise Optimise <thoptimise< <="" td=""><td>PVC</td><td></td><td></td><td>Steel tapes</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thoptimise<>	PVC			Steel tapes												
PF	PF		-	Jieel lupes	optional IEC 60332.3											
PF Fils See Twins optional IEC 20332.3 FS WoteBlocking Topes WP shoosh FS WoteBlocking Topes WP shoosh Steel Topes FS WoteBlocking Topes WP shoosh Steel Topes FS Cut tope with opertures EE 60331 / IEC 60332.324 FS Cut tope with opertures EE 60332.324 FS Jally Filing IAP-shooth Compadd Stee Tope FS Jally Filing IAP-shooth Stee Topes	PF		_	Steel tapes	optional IEC 60332-3											
FS UAP sheath Steel Topes -	PE		-	Flat Steel wires	optional IEC 60332-3											
FS WaterBocking Topes LAP sheath Image: Constraint of the cons	FS		LAP sheasth	Steel tapes	optional IEC 60332-4											
FS UAP sheash Sheel topes - - UAP sheash Sheel topes - UAP sheash UAP sheash Congated Sheel topes -	FS	Water-Blocking Tapes	LAP sheasth	-	-											
PE LAP sheath Steel topes Could pay with opertures EC: 60331 / IEC 60332:324 FS Cutope with opertures EC: 60331 / IEC 60332:324 EC: 60331 / IEC 60332:324	FS	Water-Blocking Tapes	LAP sheasth	Steel tapes	_											
FS — Cu lope with apertures — IEC 60331 / IEC 60332.324 FS Jelly Filing UA-sheath Compated Seel type — FS Jelly Filing UA-sheath — EC 60331 / IEC 60332.324 FS Jelly Filing UA-sheath — — — FS Jelly Filing UA-sheath — — — FS VoterBocking types HFR Compated Seel type — — — FS WoterBocking types HFR Compated Seel type — … … … FS WoterBocking types HFR Compated Seel type — … … … … FS WoterBocking types … <td>PE</td> <td>-</td> <td>LAP sheasth</td> <td>Steel tapes</td> <td></td>	PE	-	LAP sheasth	Steel tapes												
13 Let View December 2011 Let Construct See type F3 Jely Filling LAP-sheath Construct See type F5 Jely Filling LAP-sheath	F5 ES		Cu tape with apertures		IEC 60331 / IEC 60332-3-24											
PE Wein/Electrong pages UP-Paisenth Compared shall page IEC 60332.3.2.4 FS Jelly Filling UP-Paisenth	FS FS				IEC 00331 / IEC 00332-3-24							_				
FS Jally Filling IAP-sheath Compared Seel tope	PF	Water-Blocking Tapes	LAT-sheath	Corrugated Steel tape	 IFC 60332-3-24			e				_				
FS july Filling LA2-bach Compared Stell type -	FS	Jelly Filling	LAP-sheath		-			bsit								
FS Wote-Bicking Topes HFFR IEC 60332-324 FS FS Jely Filling LAP-sheath Steel topes 6 PE Jely Filling LAP-sheath Steel topes IEC 60332-324 9 KIPE HFFR Steel topes IEC 60332-324 9 9 KIPE HFFR Steel topes IEC 60332-324 94 9 9 KIPE HFFR Steel topes IEC 60332-324 94 9 <td< td=""><td>FS</td><td>Jelly Filling</td><td>LAP-sheath</td><td>Corrugated Steel tape</td><td>_</td><td></td><td></td><td>Ve</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	FS	Jelly Filling	LAP-sheath	Corrugated Steel tape	_			Ve								
FS Water Bocking Topes HFR Compated See tope IEC 60332-32-4 See See <th< td=""><td>FS</td><td>Water-Blocking Tapes</td><td>HFFR</td><td>-</td><td>IEC 60332-3-24</td><td></td><td></td><td>ns '</td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	FS	Water-Blocking Tapes	HFFR	-	IEC 60332-3-24			ns '								
FS Jally Filling LAP-sheath Steel topes	FS	Water-Blocking Tapes	HFFR	Corrugated Steel tape	IEC 60332-3-24			exa								
PC Jeily Filling LAP-sheath Steel topes - 6 6 6 PE - LAP-sheath Steel topes - 6 6 6 FS - HAP-sheath Steel topes - 6 6 6 FS - HFR Steel topes IEC 60323:2:4 2 6 6 KUPE - HFFR Steel topes IEC 60323:2:4 2 6 6 KUPE - HFFR Steel topes IEC 60332:3:2:4 2 6 6 KUPE - HFFR Steel topes IEC 60332:3:2:4 2 6 6 KUPE - HFFR Steel topes IEC 60332:3:2:4 6 6 6 VUP - PE - IEC 60332:3:2:4 6 <td< td=""><td>FS</td><td>Jelly Filling</td><td>LAP-sheath</td><td>Steel tapes</td><td></td><td></td><td></td><td>Ž</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	FS	Jelly Filling	LAP-sheath	Steel tapes				Ž								
FS - DAP sheadh Siled rights - <td>PE DE</td> <td>Jelly Filling</td> <td>LAP-sheath</td> <td>Steel tapes</td> <td>-</td> <td></td> <td></td> <td>o</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	PE DE	Jelly Filling	LAP-sheath	Steel tapes	-			o								
PE Jelly Filling LAP-sheath	ES		LAT-sheath	Steel tapes				ER.								
XUPE Image: Construction of the second	PE	Jelly Filling	LAP-sheath	-				∆ C								
XLPE HFFR Steel topes IEC 60332-324 Steel	XLPE	-	HFFR	Steel tapes	IEC 60332-3-24			TR,								
XLPE - HFFR Steel topes IEC 60332-324 2 2 1 XLPE - HFFR Steel topes IEC 60332-324 2 1 1 XLPE - HFFR Steel topes IEC 60332-324 2 1 1 XLPE - HFFR Steel topes IEC 60332-324 1	XLPE		HFFR	Steel tapes	IEC 60332-3-24			NS								
XUPE - HHFR Steel topes IEC 603323:2:4 2 <	XLPE		HFFR	Steel tapes	IEC 60332-3-24			X								
XIPE HFR Steel topes IEC 60332-3:24 PE HFR IEC 60332-3:24 PUR PE PVR PUR PA PE PE PE PE LAT sheath Corrugated Steel tope PE Cu wires or topes Steel topes PE LAP sheath Corrugated Steel tope PE LAP sheath Corrugated Steel tope PE LAP sheath Corrugated Steel tope PE	XLPE		HFFR	Steel tapes	IEC 60332-3-24			z								
NLC HFR IEC 603323324 PE PE PVR PA PA				Steel tapes	IEC 60332-3-24											
Pic P	PF		HEFR	Jieel lupes	IEC 60332-3-24											
PUR			PE													
PA - - - - IEC 60332-3-24 IEC 60332-3-24 PE - IAT sheath Corrugated Steel tope - IEC 60332-3-24 IEC 60332-3-24 PE - IAT sheath Corrugated Steel tope - IEC 60332-3-24 IEC 60332-3-24 PE Jelly Filling IAP sheath Corrugated Steel tope - IEC 60332-3-24 IEC 60332-3-24 PE - Cu wires or topes Steel topes - IEC 60332-3-24 IEC 60332-3-24 PE - Cu wires or topes Steel topes - IEC 60332-3-24 IEC 60332-3-24 PE - IAP sheath Corrugated Steel tope - IEC 60332-3-24 IEC 60332-3-24 PE - IAP sheath Corrugated Steel tope - IEC 60332-3-24	PUR		PUR													
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rc / ALFC CU lape Steel tapes	PE / XLPE		Cu Tape	Steel tapes	-											
	FL / ALPE	-		Sieel tapes	-											

Yes

Optional = means that these cables can be proposed with HFFR sheath, thus compatible with indoor / public building application

No



					Construction			
			Condu	ctor	Insulation	T° Conductor		
Country	Designation	Standards Specifications	Material	Class	Insulation material	°C		
	ALSECURE® 0.6/1kV	NF C32-323	Cu	12	XLPE	90		
	ALSECURE® PREMIUM 0.6/1kV	NF C32-323	Cu	12	XLPE	90		
	ALSECURE® PLUS	NF C32-323	Cu	12	XLPE	90		
	ALSECURE® FLEX	NF C32-323	Cu	5	XLPE	90		
-	ALSECURE® MPRX	NF C32-323	Cu	12	XLPE	90		
	U1000R2V	NF C32-321	Cu	12	XLPE	90		
	U1000RVFV	NF C32-322	Cu	12	XLPE	90		
E	U1000AR2V	NF C32-321	Al	12	XLPE	90		
r	U1000ARVFV	NF C32-322	Al	12	XLPE	90		
	U3000R2V	IEC 60502-1	Cu	12	XLPE	90		
	U3000AR2V	IEC 60502-1	Al	12	XLPE	90		
	CDTE	CT 452	Cu	2	-	-		
	750 NE	CT 442	Cu	2	Special XHFFR	90		
	750 ANE	CT 442	Al	2	Special XHFFR	90		
	K25 RATP	NF F 55-625 - RATP K20	Cu	12	XLPE	90		
	K27 RATP	NF F 55-627 - RATP K20	AI 1 2 XLPE 90 AI 1 2 XLPE 90 Cu 2 Cu 2 Special XHFFR 90 AI 2 Special XHFFR 90 20 Cu 1 2 XLPE 90 20 Cu 1 2 XLPE 90 604 Cu 1 2 XLPE 90	90				
	ALSECURE RHEYHALON N2XH-O/J	VDE 0266 / VDE 0276-604	Cu	12	XLPE	90		
	ALSECURE RHEYHALON N2XCH-O/J	VDE 0266 / VDE 0276-604	Cu	12	XLPE	90		
	ALSECURE RHEYHALON NHMH-O/J	VDE 250-T 215	Cu	12	PP	70		
	ALSECURE RHEYHALON NHXH-O/J	VDE 0266 / VDE 0276-604	Cu	12	XHFFR	90		
	ALSECURE RHEYHALON NHXCH-O/J	VDE 0266 / VDE 0276-604	Cu	12	XHFFR	90		
	ALSECURE RHEYHALON N2XH-O/J E30 / E90	VDE 0266 / VDE 0276-604	Cu	12	MT - XLPE	90		
	ALSECURE RHEYHALON N2XH-O/J E30 / E90	VDE 0266 / VDE 0276-604	Cu	12	MT - XLPE	90		
	ALSECURE RHEYHALON NHXH-O/J FE180-E30	VDE 0266 / VDE 0276-604	Cu	12	XHFFR	90		
	ALSECURE RHEYHALON NHXCH-O/J FE180-E30	VDE 0266 / VDE 0276-604	Cu	12	XHFFR	90		
	NYY	VDE 0276-603	Cu	12	PVC	70		
	NYCY	VDE 0276-603	Cu	12	PVC	70		
	NYCWY	VDE 0276-603	Cu 12		PVC	70		
	ALSECURE NX 600	BS 7846	Cu 2		MT - XLPE	90		
שוו	ALSECURE NX 400	BS 7846	Cu 2		MT - XLPE	90		
UK	ALSECURE NX 200-BB PH120	BS 4729	Cu	12	SIR	90		
	ALSECURE NX 100	BS 7211	Cu	12	MT - XLPE	90		

Other Countries: according to Local, European & International Standards.

PE = Polyethylen, XLPE = x-linked PE, FS = Foam skin, PVC = Polyvinylchlorid, XHFFR = X-linked HFFR, PP = Polypropylen, SIR = Silicone Rubber

Main low voltage cables



	Construction		Fire Application									
Voltage level	Screen	Armour		behaviou	r				Outdoo	r	Ind	oor
v			Fire	Halogen free acc. to IEC 60754-1/-2	Low Smoke acc. to IEC 61034-1/-2	CPR Euroclass	NFPA130 FT4 IEEE1202 & UL1685	On hooks	Concrete trough	Direct Buried	Public Buildings	Tunnels
600/1000		-	IEC 60332-3-24									
600/1000		STA	IEC 60331									
600/1000		STA	IEC 60332-3-24									
600/1000		STA	IEC 60332-1									
600/1000		opt.	IEC 60331									
600/1000			IEC 60332-1									
600/1000		STA	IEC 60332-1									
600/1000		-	IEC 60332-1									
600/1000		STA	IEC 60332-1									
1800/3000		-	IEC 60332-1									
1800/3000		-	IEC 60332-1									
-	Lead	-				þ						
750		-	IEC 60332-3-24			/ebsi						
750		-	IEC 60332-3-24			ns V						
7501800V		STA opt.	IEC 60332-3-24			lexa						
600/1000		STA opt.	IEC 60332-3-24			∠ uo						
600/1000		-	IEC 60332-3-24			(ER						
600/1000	Cu wires		IEC 60332-3-24			RAC						
300/500			IEC 60332-1			IS TR						
600/1000		_	IEC 60332-3-24			XAN						
600/1000	Cu wires	-	IEC 60332-3-24			Ë						
600/1000		_	DIN 4102-T12 / 30'-90'									
600/1000	Cu wires	-	DIN 4102-T12 / 30'-90'									
600/1000		_	DIN 4102-T12 / 30'									
600/1000	Cu wires	-	DIN 4102-T12 / 30'									
600/1000		-	IEC 60332-1									
600/1000	Cu wires	-	IEC 60332-1									
600/1000	Cu wires	_	IEC 60332-1									
600/1000		SWA	IEC 60331 BS									
600/1000		SWA	IEC 60331 BS									
300/500	Alu	-	EN 50200 (ann E) BS									
300/500		-	IEC 60331 BS									

Yes

Optional = means that these cables can be proposed with HFFR sheath, thus compatible with indoor / public building application

No



					Construction	
			Condu	ctor	Insulation	T° Conductor
Country	Designation	Standards Specifications	Material	Class	Insulation material	°C
	FG7(O)M1 ALSECURE	CEI 20-13	Cu	5	HEPR-G7	90
IT	FG7(O)H1M1 ALSECURE	CEI 20-13	Cu	5	HEPR-G7	90
	FG10(O)M1 ECOTOX	CEI 20-13	Cu	5	LSOH Rubber G10	90
	EAXeV 0.6/1 kV F2	NBN HD 603 5-A	Al	1	XLPE/PVC-F2	90
	Torsade EAXV 0.6/1 kV F2	NBN HD 603 5-A	Al	1	XLPE/PVC-F2	90
	EXVB F2	NBN HD 603 5-A	Cu	12	XLPE/PVC-F2	90
BE	XVB F2	NBN HD 604 4-G	Cu	12	XLPE/PVC-F2	90
	XGB F2+NH	NBN HD 604 5-L	Cu	12	XLPE/G	90
	Cables PVC isolated	Infrabel S-62	Cu	2	PVC	70
	AXV 150mm ² (37x2.3)	Infrabel T-16-I	Al	2	XLPE/PVC-F1	90
	Π (CLN - CUCLN)06./1.0kV	SEV 1101 - HD 603	Cu	12	PVC	70
	ALSECURE FEO	HD604 - TP20B/3c	Cu	125	PE	70
СН	ALSECURE FE05	HD604 - TP20B/3c	Cu	125	XLPE	90
	ALSECURE Premium FE180	HD604 - TP20B/3c	Cu	125	XHFFR (Infit)	90
	GKN-(CLN - CLCUN)	SEV - HD603	Cu	12	HEPR	90
	XKN- (CLN - CUCLN)	SEV - HD603	Cu	12	XLPE	90
	2YB2Y / 2XB2Y	TCDD Signal and Power Cables	Cu	12	PE / XLPE	70
ТК	ALSECURE N2XH	IEC 60502-1	Cu	12	XLPE	90
	ALSECURE PLUS N2XH FE 180	IEC 60502-1	Cu	12	XLPE	90
	H05V-U/R/K	EN 50525	Cu	125	PVC	70 (105)
	H07V-U/R/K	EN 50525	Cu	125		70 (105)
	H07Z1-U/R/K	EN 50525	Cu	125	HFFR	70
FU	H07Z-U/R/K	EN 50525	Cu	125	XHFFR	90
	H05S-U/R/K	EN 50525	Cu	125	SIR	180
	H07RN-F	EN 50525	Cu	5	R	60
	H07RN8-F	EN 50525	Cu	5	R	60
	H07Z1Z1-U/R	EN 50525	Cu	12	HFFR	70
ww	IEC 60502-1	IEC 60502-1	Cu	125	XLPE	90

Other Countries: according to Local, European & International Standards. PE = Polyethylen, XLPE = x-linked PE, FS = Foam skin, PVC = Polyvinylchlorid, XHFFR = X-linked HFFR, PP = Polypropylen, SIR = Silicone Rubber

	Construction		Fire				Application						
Voltage level	Screen	Armour		behaviou	r				Outdoo	r	Ind	oor	
V			Fire	Halogen free acc. to IEC 60754-1/-2	Low Smoke acc. to IEC 61034-1/-2	CPR Euroclass	NFPA130 FT4 IEEE1202 & UL1685	On hooks	Concrete trough	Direct Buried	Public Buildings	Tunnels	
600/1000		-	IEC 60332-3-24										
600/1000	Alu	-	IEC 60332-3-24										
600/1000		-	IEC 60332-3-24										
600/1000		_	NBN C30-004 F2										
600/1000		-	NBN C30-004 F2										
600/1000		_	NBN C30-004 F2										
600/1000		-	NBN C30-004 F2										
600/1000		-	NBN C30-004 F2										
1000		-											
1000		-	NBN C30-004 F1			क							
600/1000	optional	optional	IEC 60332-1			/ebsi							
600/1000	optional	optional	IEC 60332-1			su S							
600/1000	optional	optional	IEC 60332-3-24			lexa							
600/1000	optional	optional	IEC 60331			∠ uo							
600/1000		optional	IEC 60332-1			KER							
600/1000		optional	IEC 60332-1			SAC							
600/1000	-	Steel Tape	-			L SY							
600/1000	optional	optional	IEC 60332-3-24			XAN							
600/1000	optional	optional	IEC 60331			Z							
300/500		_	IEC 60332-1										
450/750	-	-	IEC 60332-1										
450/750		_	IEC 60332-1										
450/750		-	IEC 60332-1										
300/500		_	IEC 60332-1										
450/750		-	IEC 60332-1										
450/750		_	IEC 60332-1										
450/750	optional	optional	IEC 60332-3										
600/1000	optional	optional	IEC 60332-3-22 /-24										

Yes

Optional = means that these cables can be proposed with HFFR sheath, thus compatible with indoor / public building application

No



			Construction									
			Condu	ctor	Insulation	T° Conductor	Voltage level					
Country	Designation	Standards Spécification	Material	Class	Insulation material	°C	kV					
	U3000R2V	IEC 60502	Cu	125	XLPE	90	1.8/3.6					
U	U3000AR2V	IEC 60502	Alu	125	XLPE	90	1.8/3.6					
	HTA C33-220	NF C 33-220 / IEC 60502-2	Cu or Alu	2	XLPE	90	3.6/6 – 18/30					
	HTA C33-223	NF C 33-223	Cu or Alu	2	XLPE	90	6/10 – 26/45					
	HTA C33-226	NF C 33-226	Cu or Alu	2	XLPE	90	6/10 – 26/45					
F	HTA K20	NF C 33-226 + K20	Al	2	XLPE	90	12/20					
	RRDFASHSH-ET	IEC 60502-2	Cu	2	XLPE	90	6/10 – 26/45					
	RRDCSH	IEC 60502-2	Cu	2	XLPE	90	6/10 – 26/45					
	ARRDFSH	IEC 60840	Al	2	XLPE	90	6/10 - 26/45					
	FR-N20XA8E-AR	NF C 33-226	Cu	2	XLPE	90	6/10 - 26/45					
	RRDFAE / C2-SNCF	IEC 60840-SNCF	CF Cu 2		XLPE	90	6/10 - 26/45					
	AGS 400 (Z) NG (403-AL3)	EN 50182	Al	2	XLPE	90	6/10 - 26/45					
	N2XS2Y	IEC 60502-2 / VDE 0276-620	Cu	2	XLPE	90	6/10 - 18/30					
	NA2XS2Y	IEC 60502-2 / VDE 0276-620	Al	2	XLPE	90	6/10 - 18/30					
D	NA2XS(F)2Y	IEC 60502-2 / VDE 0276-620	Al	12	XLPE	90	6/10 - 18/30					
	NA2XS(F)N	IEC 60502-2 / VDE 0276-620	Al	12	XLPE	90	6/10 - 18/30					
	NA2XS(FL)2Y	IEC 60502-2 / VDE 0276-620	Al	2	XLPE	90	6/10 – 18/30					
ПК	MV 25kv Power Cables	NR/PS/ELP 00008 + BS6622	Cu or Alu	2	XLPE	90	19/33(36)					
UK	MV 33kv Power Cables	NR/PS/ELP 00008 + IEC 60840	Cu or Alu	2	XLPE	90	25/44(52)					
	RG5ONR	IS 385/82	Cu Sn	2	HEPR G5	90	2.3/3.0					
	RG5ONM1	IS 410/88	Cu Sn	2	HEPR G6	90	2.3/3.0					
IT	RG7M1NM1	CEI 20-13	Cu	2	HEPR G5	90	1.8/3.0 – 26/45					
	RG7H1M1 ALSECURE	CEI 20-13	Cu	2	HEPR G5	90	12/20 18/30					
	RG7H1OM1 ALSECURE	CEI 20-13	Cu	2	HEPR G5	90	6/10 - 26/45					

Other Countries: according to Local, European & International Standards. PE = Polyethylen, XLPE = x-linked PE, FS = Foam skin, PVC = Polyvinylchlorid, HEPR = High density Ethylen-Propylen Rubber,

Main medium voltage cables



C	Construction		Application								
Screen	Protection		behaviour				c	Outdoo	or	Ind	oor
		Fire	Halogen free acc. to IEC 60754-1/-2	Low Smoke acc. to IEC 61034-1/-2	CPR Eurodass	NFPA130 FT4 IEEE1202 & UL1685	On hooks	Concrete trough	Direct Buried	Public building	Tunnels
	-	IEC 60332-1									
	-	IEC 60332-1									
Cu Tapes	-	IEC 60332-1									
Alu	Long. Watertight	IEC 60332-1 NF C 32-070 C2									
Alu	Long. Watertight	IEC 60332-1 NF C 32-070 C2									
Alu	Long. Watertight	IEC 60332-1 & -3 NF C 32-070 C1									
Cu wires	-	IEC 60332-1 (opt)									
Cu wires	_	IEC 60332-1 (opt)			ite	site					
Cu wires	-	IEC 60332-1 (opt)			Webs						
Cu wires	-	IEC 60332-1 (opt)			(ans						
Cu wires	-	IEC 60332-1 NF C 32-070 C2			on Ne _{>}	u v v v v v v v v v v v v v v v v v v v					
Cu wires	-	-			CKER						
Cu wires	_	_			TRA						
Cu wires	_	_			ANS						
Cu wires	Long. Watertight				N N N N						
Cu wires	Long. Watertight	IEC 60332-1 & -3									
Cu wires	Alu (watertight)	IEC 60332-1 (-3 opt.)									
Cu wires	_	_									
Cu wires	_	_									
-	Steel tapes	IEC 60332-1									
-	Steel tapes	IEC 60332-1									
	Alu Tapes	IEC 60332-3-22									
Cu Wires	_	IEC 60332-3-24									
Cu Tapes	_	IEC 60332-3-24									

Yes

Optional = means that these cables can be proposed with HFFR sheath, thus compatible with indoor / public building application

No



			Construction								
			Condu	ctor	Insulation	T° Conductor	Voltage level				
Country	Designation	Standards Spécification	Material	Class	Insulation material	°C	kV				
	EGCG F2 + NH	NBN HD 620	Cu	5	R	90	3.6/6				
	EXECV F2	NBN HD 620	Cu	2	XLPE	90	6/10				
	EXECWB	NBN HD 620	Cu	2	XLPE	90	8.7/15				
	EXECVB F2	NBN HD 620	Cu	2	XLPE	90	8.7/15				
	EXECVB F2	NBN HD 620	Cu	2	XLPE	90	12/20				
BE	EAXECWB	NBN HD 620	Al	2	XLPE	90	20.8/36				
	EAXECVB F2	NBN HD 620	Al	2	XLPE	90	20.8/36				
	EXECEG F2 + NH	NBN HD 620	Cu	2	XLPE	90	6/10				
	EXECEG F2 + NH	NBN HD 620	Cu	2	XLPE	90	8.7/15				
	ASTER	NFC 34-125	Al+ Steel	2			3 DC				
	ASTER	NFC 34-125	Al+ Steel	2			25 AC				
	XKDT	HD620 IEC 60502-2	Cu or Alu	2	XLPE	90	6/10 - 18/30				
	XKDT-F	HD620 IEC 60502-2	Cu	2	XLPE	90	6/10 - 26/45				
	XKDT-FT	HD620 IEC 60502-2	Cu	2	XLPE	90	6/10 – 26/45				
	XKDT-Fg	HD620 IEC 60502-2	Cu	2	XLPE	90	6/10 - 26/45				
сн	XKDT-Y	HD620 IEC 60502-2	Cu or Alu	2	XLPE	90	6/10 - 26/45				
	XKDT-YT	HD620 IEC 60502-2	Cu or Alu	2	XLPE	90	6/10 - 26/45				
	XDCuT CFF NOF	HD620 IEC 60502-2 SBB/CFF/FFS-3001.72.1000	Cu	2	XLPE	90	6/10 – 26/45				
	XKDCuT	IEC 60840 IEC 62067	Cu	2	XLPE	90	26/45220				
	XKDAIT	IEC 60840 IEC 62067	Alu	2	XLPE	90	26/45220				
	AX⊔ 36 kV	HD620 IEC 60502-2	Al	2	XLPE	90	18/30				
SW	AXQJ 3 kV F4B	IEC 60502-1	Al	2	XLPE	90	1.8/3				
	AXCLIGHT-H 24KV LT	HD 620	Al	2	XLPE	90	12/20				
60	RHZ1FA3Z1-2OL (S)	HD620; IEC 60502-2; ET 03.354.022-0	Cu or Alu	2	XLPE	90	6/10 - 36/66				
32	RHZ1FA3Z1-2OL (AS)	HD620; IEC 60502-2; ET 03.354.022-0	Cu or Alu	2	XLPE	90	6/10 36/66				
	YXC7V-R	TSEK	Cu	2	XLPE	90	20.3/35				
тк	YXC7Z1-R	TSEK	Cu	2	XLPE	90	20.3/35				
	ҮХС7Z1-К	Cu	5	XLPE	90	1.8/3					

Other Countries: according to Local, European & International Standards. PE = Polyethylen, XLPE = x-linked PE, FS = Foam skin, PVC = Polyvinylchlorid, R = Rubber

C	Construction		Fire					Ар	plicati	on	
Screen	Protection		behaviour				c	Outdoo	or	Inde	oor
		Fire	Halogen free acc. to IEC 60754-1/-2	Low Smoke acc. to IEC 61034-1/-2	CPR Euroclass	NFPA130 FT4 IEEE1202 & UL1685	On hooks	Concrete trough	Direct Buried	Public building	Tunnels
Cu W	-	NBN C30-004 F2									
Cu W	-	NBN C30-004 F2									
Cu W	-	_									
Cu W	-	NBN C30-004 F2									
Cu W	-	NBN C30-004 F2									
Cu W	-	-									
Cu W	-	NBN C30-004 F2									
Cu W	AluFoil	NBN C30-004 F2									
Cu W	AluFoil	NBN C30-004 F2									
-	-	6/10 - 26/45									
-		_			ம						
Cu - wires	Ν	_			/ebsi						
Cu - wires	Flat Steel Wires	-			l Su	S sub					
Cu - wires	Flat Steel Wires	_			Vexo						
Cu - wires	Flat Steel Wires	_			u o						
Cu - wires	_	_			CKER						
Cu - wires	_	_			TRA						
Cu - Tapes	Long. Watertight	IEC 60332-3-24			NEXANS						
Cu - wires	Long. Watertight	IEC 60332-3 (opt.)									
Cu - wires	Long. Watertight	IEC 60332-3 (opt.)									
Cu - wires	_	_									
Cu - wires	-	EN/IEC 60332-3-23									
Cu - wires	_	_									
Cu - wires	Corrugated AluFoil	IEC 60332-1									
Cu - wires	Corrugated AluFoil	EN-50266-2-3									
Cu wires + Cu tape	-	IEC 60332-1									
Cu wires + Cu tape	-	IEC 60332-1									
Cu wires + Cu tape	_	IEC 60332-1									

Yes

Optional = means that these cables can be proposed with HFFR sheath, thus compatible with indoor / public building application

No



			Construction										
						Fibres							
	Designation		Nexans Type Specification	Standard / Specification	Mx. Fibre Count	(Tubes/Bundles)xFO	Structure						
UG	A-DQ(7N)2Y(7)	Micro loose blown	SP 1647	ITI I-T	24	1x24	Tube						
MG	A-DQ(ZN)B2Y	Multitube	SP 1466	ITU-T	72	6x12	Tube						
MG	A-DQ(ZN)B2Y	Multitube	SP 1504	ITU-T	96	8x12	Tube						
MG	A-DQ(ZN)B2Y	Multitube	SP 1500	ITU I-T	144	12x12	Tube						
UB	7100(211)021	Multibundle	SP 1557	ITU-T	72	6x12	Bundle						
UD	A-DQ(ZN)B2Y(7)	Unitube	SP 0680	ITU-T	12	1x12	Tube						
UD	A-DQ(ZN)B2Y(7)	Unitube	SP 0.593	ITULT	24	1x24	Tube						
MD		Unitube	SP 0694	ITILT	72	6x12	Tube						
	A-DQ(ZN)(SP)B2Y(Z)	Micro Joose blown	SP 0495	ITI LT	24	1x24	Tube						
MC		Multitubo	SP 1505		72	6x12	Tubo						
MC		Multitube	SP 1507		96	8×12	Tube						
MC		Multitubo	SP 1501		144	12,12	Tube						
	A-DQ(ZN)(JK)DZT	Multilumelle	SP 1240	K200	72	12X12	Bundla						
			SF 1349	K209	72	0x12 01 0	Bundle						
			SF 1757	K209	90	12,12,57,0	Bundle						
		Multibundle	SF 1736	K209	24		Bundlo						
		Multibundle	SF 1344	K209	30	9x6 or 4	Bundle						
		Multibundle	SF 1400	K209	40	12x6 or 4	Bundle						
		Batahaand	SF 1346		1	1200014	Tinht						
SC LSZH		Patchcora	SP 0404		1		Tight						
		Patchcora	SP 0520		2	2x1	Tight						
DC LSZH	I-VHH	Patchcord	SP 0524	IIU-I	2	2x1	Tight						
HD LSZH		Patchcord	SP 0772	IIU-I	12	12x1	Tight						
IBU LSZH	I-V(ZN)BH		SP 1/24	IIU-I	24	1x24	light						
ТВС	I-V(ZN)H(SR)BH		SP 1703	IIU-I	24	1x24	light						
	GRHLDV 24SM G657A1 (SD1.6)	Loose tube	GRHDLV SD 1.6	ITU-T	96	x12	Tube						
	TRV-GASLLDV XXSM G652D (4.0 mm FRP)	Ribbon	GASLDV	ITU-T	480	ribbonx4x8	Ribbon						
	TRV-GASQBDUV XXSM G652D	Ribbon	GASQBDUV	ITU-T	1000	ribbonx4x8	Ribbon						
	GASQWQBUV xxSM G652D (S12)	Ribbon	GASQWBUV	ITU-T	480	ribbonx4x8	Ribbon						
Fire resistant	LE-1LF(DMN-DGGN/100)	Unitube	LE-1LF(DMN-DGGN/100)	ITU-T	24	1x24	Tube						
Fire resistant	LE-SG xLF(DMN-GAcWN/150)	Loose tube	LESG 612LF[DMNGAcWN/150]	ITU-T	144	x12	Tube						
	Patchcords SM												
	Pigtails SM												
	Adapters SM												
	Attenuators SM												
	ODFs												
	Patchcord shelfs												
	Attenuators SM												

FRP = Fibreglass Reinforced Plastic

Main optical fibres cables



		Construction		Fire						Application						
		Armoring		behavid	our						Outo	loor			Ind	oor
Dielectric	Metallic	Armouring/Reinforc.	Rodent Protection 1:Glass 2:FRP 3:Steel	Fire		Low Smoke acc. to IEC 61034-1/-2	CPR Eurodass	NFPA 130 FT4 IEEE 1202 & UL 1685	On hooks	Outdoor (Watertight)	Duct (Pulling)	Duct (Blowing)	Concrete trough	Direct Buried	Public building	Tunnels
•	-	GI/FRP	1	_												
•	-	Glass	1	_												
•	-	Glass	1	-												
•	-	Glass	1													
•	-	Glass	1	-												
•	-	FRP	2	_												
•	-	FRP	2	-												
•	-	FRP	2	_												
-	•	Steel	3													
-	•	Steel	3													
-	•	Steel	3	-			-									
-	•	Steel	3	_			ø									
-	•	Steel	3	NF C 32-070/C1 - C2 / IEC 60332-1 & -3			bsit									
-	•	Steel	3	NF C 32-070/C1 - C2 / IEC 60332-1 & -4			×									
-	•	Steel	3	NF C 32-070/C1 - C2 / IEC 60332-1 & -5			ans									
-	•	Steel	3	NF C 32-070/C1 - C2 / IEC 60332-1 & -6			Se)									
-	•	Steel	3	NF C 32-070/C1 - C2 / IEC 60332-1 & -7			Б									
-	•	Steel	3	NF C 32-070/C1 - C2 / IEC 60332-1 & -8			KER									
•	-	Aramid	0	IEC 60332-1 & -3			SAC									
•	-	Aramid	0	IEC 60332-1 & -3			S TF									
•	-	Aramid	0	IEC 60332-1 & -3			AN AN									
•	-	Aramid	0	IEC 60332-1 & -3			Ê Z									
•	-	Glass	1	IEC 60332-1 & -3												
-	•	Steel	3	_												
•	-	FRP	0													
•	-	FRP	0													
•	-	FRP	0	IEC 60332-3-24												
-	•	Steel	3	IEC 60332-3-24												
٠	-	Glass	1	EN 50200 - EC 60332-1&-3												
-	•	Steel	3	EN 50200 - EC 60332-1&-3												



Armoured cable : A cable provided with a wrapping of metal, usually steel wires, flat tapes, or interlocked tapes, primarily for the purpose of mechanical protection.

Automatic Train Control (ATC) : The system for automatically controlling train movements and directing train operations. ATC requires automatic train operation (ATO) and automatic train protection (ATP) subsystems and has features which enhance operational safety, e.g., through the separation of trains by implementing a conflict free timetable, train detection and interlocking of routes. ATC allows the automatic control of trains throughout a railway network, obviating the need for train drivers.

Axle : The circular shaft connecting two wheels to form a 'wheelset'. The wheels are an interference fit to ensure the gauge is maintained. Wheels are removed by forcing them off after injecting oil under high pressure into the wheel hub through a specially designed aperture drilled in the hub.

Axle counter : An axle counting system is a failsafe system that detects the presence or absence of a train within given track sections. The axle counter is the electronic equipment physically realising the counting.

Ballast : Selected material placed on the roadbed to support it and to hold track in line and surface. Ballast preferably consists of sized hard particles easily handled in tamping, which distribute the load, drain well and resist plant growth.

Block : In signalling terminology, a physical length of track protected by a fixed signal which indicates to a driver when it is safe to proceed into the section.

C1, CR1 : abbreviations used in France to indicate Fire non propagating (C1) or Fire resisting (CR1) cables. Catenary : Originally the term used to denote an overhead power line support wire derived from the curve a suspended wire naturally assumes under the force of gravity. Now adopted to mean the whole overhead line system.

Catenary System : A system of wires suspended between poles and bridges supporting overhead contact wires normally energized with electricity.

Contact (Trolley) Wire : The overhead wire, sometimes referred to as trolley wire, which the pantograph of an electric locomotive rides against (contacts) to collect its electrical current (source of power).

CPR : Construction Product Regulation.

Cross linking : The establishment of chemical bonds between polymer molecule chains. It may be accomplished by heat, vulcanization, irradiation or the addition of a suitable chemical agent.

Cross-linked : Intermolecular bonds between long chain thermoplastic polymers are changed by chemical or electron bombardment means. The properties of the resulting thermosetting material are usually improved.

Crosstalk : Signal interference between nearby conductors caused by pickup of stray energy. It is also called induced interference.

CTC-Centralized Traffic Control : The manipulation of automatic and/or cab signals and power operated switches from a central location where signals supersede the superiority of trains.

Ethylene Propylene Rubber (EPR) : An ozone resistant rubber consisting primarily of ethylene propylene copolymer (EPM) or ethylene propylene diene monomer (EDPM).

ETCS : European Train Control System.

Eurobalise: A balise is an electronic beacon or transponder placed between the rails of a railway as part of an Automatic Train Protection (ATP) system. The Balises constitute an integral part of the European Train Control System, where they serve as 'beacons' giving the exact location of a train. A balise which complies with the European Train Control System Specification is called a Eurobalise.

Figure 8 cable : An aerial cable configuration in which the conductors and the steel strand which supports the cable are integrally jacketed. A cross section of the finished cable approximates the figure 8.

Galvanized Steel Wire : Steel wire coated with zinc.

Grounding conductor : A conductor in a transmission cable or line that is grounded.

Hybrid cables : Multifunctional cables which can integrate LV power conductors, copper telecom conductors (pairs, triads, quads) and / or optical fibres in the same circular or 8-shaped envelope (sheath).

Interlocking : An arrangement of signals, switch lock, and signal appliances so interconnected that their movements succeed each other in a predetermined order. It may be operated manually or automatically.

Level crossing : A place where a railway and a road, or two railway lines, cross at the same level.

LSOH : Low Smoke Zero Halogen compound.

Metro : The term used to denote an urban railway, often partly or wholly underground, carrying large numbers of passengers on trains at close headways. In the US synonymous with the term "subway". The word is a diminution of the Metropolitan Railway of London, the first urban underground railway in the world. It has since been adopted. Pantograph : Folding traction current collection device mounted on the roof of a vehicle on a railway employing an overhead supply system. Nowadays, pantographs are sophisticated aero-dynamically designed devices which can operate at high speeds without loss of contact and with built-in safety devices which reduce the risk of damage to wires in the event of a fault. A common problem is when a pantograph catches above the wire and pulls it down for considerable distances before it is noticed by the crew and the train stopped. Modern pantographs are fitted with automatic detection and lowering devices. The horns (curved edges) of the pantograph are equipped with frangible pneumatic sensors which, if broken by a wire support, cause the detector system to lower the pantograph. Point machine is the actuator that drives the switch blade from one position to the opposite

position in order to offer different routes to trains. Quad : A structural unit employed in cables, consisting of four separately insulated conductors twisted together. Shield : A metallic layer placed around an insulated conductor or aroun of conductors to prevent electrostatic of

Shield : A metallic layer placed around an insulated conductor or group of conductors to prevent electrostatic or electro magnetic interference

between the enclosed wires and external fields. This shield can be braided or served wires, foil wrap, foil backed tape.

Signalling, automatic block: A system of signals of fixed location, each located at the entrance to a block, to govern trains and engines entering and using that block. Such signals govern movements over a series of consecutive blocks and are actuated by a train or engine or by other conditions affecting the use of the block, such as a broken rail, switch not properly lined, car standing on a turnout foul of a main track or other track obstruction. **Signals**: Visual indication passed to a train driver to advise the speed, direction or route of the train. There are almost as many types of signals as there are railways but they fall into the following main categories:

• handsignals : used mainly where there are no fixed signals or where the fixed signalling has failed.

• semaphore signals : fixed lineside signal where the stop indication is displayed as a horizontally positioned arm and proceed as a 45° or vertical arm.

• colour light signal : a fixed lineside signal showing light indications to drivers.

• cab signals : where the indications are displayed in the driver's cab.

Spark Test : A test designed to locate pinholes in an insulated wire by application of an electrical potential across the material for a very short period of time while the wire is drawn through an electrode field.

Splice : A joint used for connecting two lengths of conductor or cable with good mechanical strength as well as good conductivity.

Substation : A location where power is received at high voltage and changed to required voltages and characteristics for distribution to the catenary system, third rail, and other electric apparatus.

Tensile strength : The longitudinal stress required to break a specimen of prescribed dimension divided by the original cross-sectional area at the point of rupture.

Third Rail System : Traction current collection system which uses an additional rail to transmit the electrical supply and which is collected by shoes attached to the train.

Track Circuits : Means by which the passage of trains is detected and the information used to control signals provided for train safety and control. The simple track circuit consists of a relay energised by a low voltage circuit fed through the running rails of a section of track. Each section is electrically isolated from others. The energised relay detects no train present and can be used to switch power to a green signal light. If a train enters the section, its wheelsets will short cut the circuit, causing the relay to de-energise and switch off the green signal. The relay will now switch on the red signal light. The light remains red until the last wheelset of the train clears the section, allowing the track circuit to be restored and the signal to return to green.

Traction Current : Term used for electric power supply used on electric railways for trains. Normally supplied by overhead wire or third rail and collected by a pantograph on the roof of the train in the former case or by shoes attached to the bogies in the latter.

XHFFR : Cross-linked fire retardant sheathing compound (Halogen Free Fire Retardant).

XLPE : Cross-linked polyethylene.



About Nexans

Nexans brings energy to life through an extensive range of cables and cabling solutions that deliver increased performance for our customers worldwide. Nexans' teams are committed to a partnership approach that supports customers in four main business areas: Power transmission and distribution (submarine and land), Energy resources (Oil & Gas, Mining and Renewables), Transportation (Road, Rail, Air, Sea) and Building (Commercial, Residential and Data Centers). Nexans' strategy is founded on continuous innovation in products, solutions and services, employee development, customer training and the introduction of safe, low-environmental-impact industrial processes. In 2013, Nexans became the first cable player to create a Foundation to introduce sustained initiatives for access to energy for disadvantaged communities worldwide.

Nexans is an active member of Europacable, the European Association of Wire & Cable Manufacturers, and a signatory of the Europacable Industry Charter. The Charter expresses its members' commitment to the principles and objectives of developing ethical, sustainable and high-quality cables. We have an industrial presence in 40 countries and commercial activities worldwide, employing close to 26,000 people and generating sales in 2015 of 6.2 billion euros. Nexans is listed on NYSE Euronext Paris, compartment A. For more information, please consult: www.nexans.com

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