Rolling Stock Cable

This catalog covers rolling stock for underground, mass transit lines and tramlines as well as diesel and regional trains. The increasing need to reduce both volume and weight has lead to the development of miniaturized cables, as well as high temperature cables with enhanced performance. This leads to highly stressed materials being used in the harsh environment of rolling stock. Caledonian & Addison provides a full range of products from Medium Voltage to Low Voltage cables, and from Standard Wall, Medium Wall to Thin Wall designs. The materials used have been specially developed to improve mechanical and thermal properties, fire performance and extended life using advanced technologies, such as electron beam irradiation and silan.

New challenges in the rolling stock industry must be met due to long-awaited equipment upgrades, booming freight traffic and high-speed train projects, and the growing need for conventional subways, fully-automated metros,and light-rail suburban vehicles worldwide. Caledonian & Addison manufactures a complete range of rolling stock cables and components, meeting national and international standards, we supply wide range of rolling stock cables from 300V to 6kV in cross section area of 0.5mmsq to 400mmsq covering diverse railway standards. All cables meet strict technical requirements in terms of electrical safety, fire-performance (low-smoke and toxicity, continuous operation in the event of fire).

As an OEM, Caledonian rolling stock cables provide our railway customers with future headroom by meeting the following European Norms (EN) and international standards :

- EN 50264 European railway standard
- EN 50382 European railway standard
- NF F 63826 French railway standard
- BS 6853 British railway standard
- NF F 16 101 French railway standard
- EN 50306 European railway standard
- NF F 63808 French railway standard
- NF F 63827 French railway standard
- DIN 5510-2 German railway standard
- UIC (International Union of Railways) 895

CENELEC Standard

According to CENELEC standards, railway rolling stock cables are designed to meet the following critical requirements:

1) 2 levels of low temperature: -25 °C and -40 °C
2) 2 levels of fluid resistance: Mineral oil resistant, or mineral oil/fuel resistant
3) 3 levels of hazard: HL1, HL2, HL3, HL4

Low temperature, mineral oil resistant	(-25 °C, IRM 902)	A	B	C
Extra low temperature, mineral oil resistant	(-40°C, IRM 902)	D	E	F
Low temperature, mineral oil and fuel resistant	(-25 °C, IRM 902, IRM 903)	G	H	J
Extra low temperature, mineral oil and fuel resistant	(-40 °C, IRM 902, IRM 903)	K	L	M
Extra low temperature, not mineral oil and fuel resistant	(-40 °C)	O	O	O

Caledonian rolling stock cables, branded as FIREROL, are mainly classified as follows:

EN 50264

Caledonian standard wall and medium wall rolling stock cables conform to EN 50264 for use in power cars(The corresponding French railway standard is NF F 63826), diesel-electric locomotives, electric and diesel multiple units EMU / DMU, high-capacity rails, mono rail and light rail vehicles, sleeping cars and passenger coaches. FIREROL is a kind of widely used rolling stock cables.

Application:

- FIREROL wires combine the advantages of small size, lightweight, high oil resistance, halogen free, high mechanical properties. They are recommended for installation in railway vehicles (locomotives, trains, trolleybuses...).
- A 120°C conductor temperature is allowed for a 20000 hours cumulative working time.
- The external sheath is mineral oil and fuel oil resistant, ozone and UV resistant.

Conductors:

Flexible stranded tinned copper class 5 according to IEC 60228 with optional separator tape. Conductor temperature +90 °C

Standard:

EN 50264-1: General requirements applicable to cables, including detailed requirement for the insulating and sheathing materials

Standard wall rolling stock cables having special fire performance

EN50264-2 = pr EN50264-2-1	Standard wall single core cables with crosslinked elastomeric insulation 0.6/1kV Unscreened, unsheathed 1mm²-400mm² FRL-SW-1SU 1.8/3kV Unscreened, unsheathed 1mm²-400mm² FRL-SW-3SU 1.8/3kV Unscreened, sheathed 1mm²-400mm² FRL-SW-3S 3.6/6kV Unscreened, sheathed 1mm²-400mm² FRL-SW-6S
EN50264-3 = pr EN50264-2-2	Standard wall multicore cables with crosslinked elastomeric insulation 300/500V Unscreened or screened 1/1.5/2.5 mm² (2-40 Cores) FRL-SW-05M / FRL-SW-05M-OS 0.6/1kV Unscreened or screened 1 mm²-50 mm² (2,3,4 Cores) FRL-SW-1M / FRL-SW-1M-OS
Insulation Compounds:	Crosslinked halogen free rubber EI 101 (for A, B, C), EI 102 (for D, E, F), EI 103 (for G, H, J), EI 104 (for K, L, M) and EI 105 (for O, EPDM compound)
Sheathing Compounds:	Special crosslinked halogen free black rubber type: EM 101 (for A, B, C), EM 102 (for D, E, F), EM 103 (for G, H, J), EM 104 (for K, L, M)

Medium wall rolling stock cables having special fire performance

pr EN50264-3-1:	Medium wall single core cable with crosslinked elastomeric insulation 0.6/1kV Unscreened, unsheathed 1mm²-400mm² FRL-MW-1SU 1.8/3kV Unscreened, unsheathed 1mm²-400mm² FRL-MW-3SU 1.8/3kV Unscreened, sheathed 1mm²-400mm² FRL-MW-3S 3.6/6kV Unscreened, sheathed 1mm²-400mm² FRL-MW-6S
pr EN50264-3-2:	Medium wall multicore cables with crosslinked elastomeric insulation 300/500V Unscreened or screened 1/1.5/2.5 mm² (2-40 Cores) FRL-MW-05M / FRL-SW-05M-OS 0.6/1kV Unscreened or screened 1 mm²-50 mm² (2,3,4 Cores) FRL-MW-1M / FRL-SW-1M-OS
Insulation Compounds:	Crosslinked halogen free black rubber EI 106 (for A, B, C), EI 107 (for D, E, F), EI 108 (for G, H, J), EI 109 (for K, L, M) and EI 110 (for O, EPDM compound)
Sheathing Compounds:	Special crosslinked halogen free rubber type: EM 101 (for A, B, C), EM 102 (for D, E, F), EM 103 (for G, H, J), EM 104 (for K, L, M)

EN 50306

Caledonian thin wall rolling stock cables conform to EN 50306 (The corresponding French railway standard is NF F 63808) are ozone resistant, acid and alkali resistant, mineral oil, fuel oil and UV light resistant. Anti-termite cables and anti-rodent cables can also be offered upon customer request.

Application:

- FIREROL thin wall rolling stock cables combine the advantages of small size, lightweight, high oil resistance, halogen free, high mechanical properties. They are recommended for installation in railway vehicles (locomotives, trains, trolleybuses...).
- A 120 °C conductor temperature is allowed for a 20000 hours cumulative working time.
- The external sheath is mineral oil and fuel oil resistant, ozone and UV resistant.

Conductors:

Flexible stranded tinned copper class 5 according to IEC 60228 with optional separator tape. Conductor temperature +90/105 °C or +105/125 °C

Insulation:

Crosslinked halogen free polyethylene or polymer

Sheathing:

Cables sheathed with special S1 and S2 compounds (described in EN 50306-1) or EN 50264 sheathing compounds (EM 101. EM 102. EM 103 and EM 104)

Standard:

EN 50306-1: General requirements applicable to cables, including detailed requirement for the insulating and sheathing materials

Thin wall rolling stock cables having special fire performance

EN 50306-2:	Thin wall single core rolling stock cables 300/500V Unscreened 0.5mm²-2.5 mm² FRL-TW-05SU
EN 50306-3:	Thin wall single core and multicore (pairs, triads, and quads) screened rolling stock cables 300/500V Screened 0.5mm²-2.5 mm² (1-4 Cores) FRL-TW-05S-OS or FRL-TW-05M-OS
EN 50306-4:	Thin wall multicore and multipair rolling stock cables Unscreened, sheathed for either exposed or protected wiring 0.5mm²-2.5mm² (2-48 Cores) FRL-TW-05M-SW, FRL-TW-05M-ESW Screened, sheathed for either exposed or protected wiring 0.5mm²-2.5mm² (2-8 Cores) FRL-TW-05M-SW-OS, FRL-TW-05M-ESW-OS Screened, sheathed for either exposed or protected wiring 0.5mm²-1.5mm² (2-7 Pairs/Cores) FRL-TW-05MP-SW-IOS, FRL-TW-05MP-ESW-IOS

EN 50382

Caledonian high temperature rolling stock cables conform to EN 50382 standard (The corresponding French railway standard is NF F 63827) is characterized by its lightweight and small size which provide high flexibility and easy handling required for high-speed train cable applications. High temperature cables imply higher current capacity for the same cross-section. The higher the continuous temperature load, the longer the life time of the cable at a given working temperature. Caledonian high temperature cable allow greater safety margins and higher current capacity, with the following features:

- Low weight cable
- Low size cable
- Thin wall cable
- Wide operating temperature range (+125 °C down to -60 °C)
- Low smoke density (>90% light transmission)
- Short circuit cable and Earth fault-proof cables (>250 °C)

Conductors:

For 120 °C class : Flexible stranded tinned copper
For 150 °C class : Flexible plain annealed copper
Class 5 (or class 6 on request) according to IEC 60228 with optional separator tape

Braiding:

Optional textile braid (for reinforced versions)

Insulation:

Type EI 111 or EI 112 (if sheathed) cross-linked halogen free silicone rubber

Sheathing:

Low temperature, oil resistant, ozone and UV resistant
For 120 °C class : special cross-linked black rubber type EM106 according to EN 50382-1
For 150 °C class : special cross-linked black silicone rubber type EM 107 according to EN 50382-1

Minimum Bending Radius:

Dynamic use : 5 to 8 x outer diameter
Static use : 4 x outer diameter

Standard:

EN 50382-1: General requirements applicable to cables, including detailed requirement for the insulating and sheathing materials

High temperature rolling stock cables having special fire performance

EN 50382-2	Single core, silicon rubber insulated cables for +120 °C and +150 °C 1.8/3 kV unscreened, unsheathed with or without textile braid 1.5mm²-400mm² FRL-HT-3SU 1.8/3 kV unscreened, sheathed with or without textile braid 1.5mm²-400mm² FRL-HT-3S 3.6/6 kV unscreened, unsheathed with or without textile braid 2.5mm²-400mm² FRL-HT-6SU 3.6/6 kV unscreened, sheathed with or without textile braid 2.5mm²-400mm² FRL-HT-6S

Cable design in accordance with EN 50264 & EN 50306

Cable Make Up

Conductors:

Tinned fine copper strands according to VDE 0295 / IEC 60228 class 5 are generally used for railway cables. For nominal cross section of over 50mmsq, 0.41mm strand wire may be used instead of 0.51mm as stipulated in IEC 60228. The IEC 60228 class 5 enhances flexibility and the ease of handling, thus lengthening the product life of the cable. These class 5 conductors are extremely flexible, and easy-to-install in the compact rolling stock environment.

Insulation and Outer Sheath:

Crosslinked polyolefine copolymer or EPR will generally be used for insulation whereas electron-beam cross-linked elastomer is employed for sheathing. Cross-linked elastomer compounds offer very good durability that can resist heat, oil, vibration, chemical aggression, etc.

Electrical Characteristics

Nominal Voltage:

Nominal voltage of a cable refers to the reference voltage for which the cable is intended to be used. In EN 50264. applicable to power cables, different voltage ranges ranging from 0.6/1 kV, 1.8/3 kV to 3.6/6 kV are defined. For each of these voltage ranges, specific insulation thickness requirements are also stipulated in this standard. The operating voltage should not exceed the corresponding max. nominal voltage allowed.

Current Carrying Capacity:

Current carrying capacity is defined as the amperage a conductor can carry before melting either the conductor or the insulation. There are many factors which will limit the amount of current that can be passed through a wire. These major determining factors are:

① Conductor Size:

The larger the circular mil area, the greater the current carrying capacity. The amount of heat generated should never exceed the maximum temperature rating of the insulation.

② Ambient Temperature:

The higher the ambient temperature, the less heat required to reach the max.temperature rating of the insulation.

③ Conductor Number:

Heat dissipation is lessened as the number of individually insulated conductors, bundled together, is increased.

④ Installation Conductors:

Restricting the heat dissipation by installing the conductors in conduit, duct, trays or raceways lessens the current carrying capacity. This restriction can be alleviated somewhat by using proper ventilation methods, forced air cooling, etc.

According to EN 50343. “Railway applications - Rolling stock – Rules for installation of cabling” current carrying capacity are based on max. conductor temperatures of 90°C and 150 °C defined in 3 b. The ambient temperature is 45 °C. The following table shows the current carrying capacities for a cable installed in mid air.

Current carrying capacity for cables in accordance with EN 50264

Nominal Cross Section of Copper Conductor mm²	Current Carrying Capacity Conductor Temp. 90 °C (Max.) Ambient Temp. 45 °C I [A]	Current Carrying Capacity Conductor Temp. 150 °C (Max.) Ambient Temp. 45 °C I [A]
0.5	14	-
0.75	16	-
1	20	-
1.5	25	-
2.5	33	46
4	46	64
6	60	84
10	85	119
16	110	154
25	150	211
35	190	267
50	240	337

Nominal Cross Section of Copper Conductor mm²	Current Carrying Capacity Conductor Temp. 90 °C (Max.) Ambient Temp. 45 °C I [A]	Current Carrying Capacity Conductor Temp. 150 °C (Max.) Ambient Temp. 45 °C I [A]
70	300	422
95	360	506
120	425	598
150	490	689
185	560	788
240	675	950
300	775	1091
400	950	1337

⑤ Ambient Temperature

External conditions such as ambient temperature and some external factors such as bundling, installation must be taken into account when determining actual current carrying capacity. The following tables show the corresponding k1 modification factors depending on an ambient temperature differing from 45 °C. Current carrying capacity decreases or increases depending on these factors.

Max. conductor temperature 90 °C

Temperature °C	10	20	30	40	45	50	60	70
k1	1.33	1.25	1.15	1.05	1	0.94	0.82	0.66

Max. conductor temperature 150 °C

Temperature °C	-50	–30	–10	10	30	45	60	80	100	120
k1	1.38	1.3	1.23	1.15	1.06	1	0.92	0.81	0.69	0.53

Physical Characteristics

Temperatures and Overload Temperatures:

EN 50264 defines two overload categories for cables at 90 °C and 150 °C : 160 °C/50 h for 90 °C and 250 °C /50 h for 150 °C. This means that for a period of less than or equal to 50 hours, increased conductor temperatures can be withstood, while the operability of the cables remains unimpaired. This has the advantage that short-time temperature increases can be identified and more serious damage such as fires can be prevented.

Environmental Conditions:

Cables are suitable for fixed installation in rail vehicles down to – 40 °C and are resistant to oil according to EN 50305. EN 60811-2-1. UIC 895 and resistant to fuel according to EN 50305, EN 60811-2-1, UIC 895.

Fire Performance

EN 50264 and EN 50306 only describe cables and wires made from halogen free materials that minimise the risk of damage to persons and property. These materials refer to hazard levels 1 – 4 as defined in EN 45545-1 (fire protection on railway vehicles). These levels define the degree of possibility of personal injury as the result of a fire. Amongst other things, they also form the basis of the requirements for materials used in rail vehicles.

Halogen Free:

The test is for determination of the amount of halogen acid gas, other than the hydrofluoric acid evolved during combustion of compound. When tested in accordance with IEC 60754-1, the hydrochloric acid yield should be less than 0.5% (5mg/g) for LSOH compound.

Corrosivity:

Corrosive gases produced in case of fire cause damage to vehicles and facilities and therefore should be avoided. According to EN 50267-2-2, a material is not corrosive if its combustion gases meet the stipulated target values for conductivity (≤ 10s/mm) and pH value (≥ 4.3).
This is equivalent to IEC 61034.

Toxicity:

In accordance with EN 50305- 9.2. or NFC-20454 a toxicity index (ITC) is calculated following analysis and titration of combustion gases.
The aforementioned hazard levels require that certain toxicity indices are not exceeded.
The toxicity indices for power cables listed in the following table are derived from EN 50264.

The required toxicity indices for cables and wires, depending on hazard level, in accordance with EN 50264 are displayed in the following table:

HL	ITC
HL 1	not specified
HL 2 / HL 3	5 (Max.)
HL 4	3 (Max.)

The required toxicity indices for cables and wires, depending on hazard level, in accordance with EN 50306 (thin wall) are displayed in the following table:

HL	ITC	
	Insulation and Sheath S1	EM101-104 and Sheath S2
HL 1	not stipulated	not stipulated
HL 2 / HL 3	10 (Max.)	5 (Max.)
HL 4	6 (Max.)	3 (Max.)

Toxic Fumes:

Naval standard NES713 burns a set amount of material and analyses the gases given off. The volume of each gas is multiplied by the toxicity index for each gas. The toxicity index for each gas are added together to give an overall toxicity index for the material. LFH materials should have a toxicity index max.of 10.

Flame Retardance:

In accordance with EN 50265- 2-1 or IEC 60332-1, testing is carried out for a single insulated wire or cable. The specimen is deemed to have passed this test, if after burning has ceased, the charred or affected position does not reach within 50mm of the lower edge of the top clamp.
In accordance EN 50266-2-4, EN 50305 9.1 and IEC 60332-3, testing is carried out for bunched cables. A gas burner flame is applied to the bottom of a vertically arranged conductor bundle in a test furnace. Following completion of the flame test, the specimen consisting of 3.5m, is deemed to have met the requirements, if after burning has ceased, the extent of charred or affected portion does not reach a height exceeding 2.5m above the bottom edge of the burner.

Smoke Density:

For smoke density testing, the cube test is employed according to EN 50268-2-1 or IEC 61034. The 3 metre cube test measures the generation of smoke from electric cables during fire. A light beam emitted from a window is projected across the enclosure of a photo cell connected to a recorder at the opposite window.
The recorder is adjusted to register from 0 % for complete obscuration to 100 % luminous transmission. A 1 metre cable sample is placed in the centre of the enclosure and then subjected to fire. The minimum light transmission of the smoke is then measured.
The following table shows the minimum percentages of light transmission depending on hazard level:

HL	Light Transmission
HL 1	not specified
HL 2 / HL 3	60 %
HL 4	70 %

BS 6853

In 1999 BS 6853 was introduced in UK and whose highest categories are probably the most demanding in the world. BS 6853 covers both smoke emission testing and flammability testing. BS 6853 also introduced the concept of an R-Index, which is a single number quantification of the toxic gas risk associated with composite materials for use in railway rolling stock. The R-Indices are split into the following categories:
Category 1a Trains which predominantly use tunnels R < 1.0
Category 1b Trains which use tunnels, but infrequently R < 1.6
Category 2 Trains which run, predominantly, overground R < 3.6
The R-Index is generated by analysing eight gases of combustion, for which critical concentrations have been established by NIOSH/OSHA and reported as IDLH (Immediately Dangerous to Life and Health) values.
Toxicity is the most important factor to address during the cable design. Toxicity limit for the UK and France are identical because both require the same test method for elastomers (NF X 70-100). The only difference is that the U.K.'s specification requires an addendum for nitrous oxides. Toxicity limits for French and the U.K. standards are developed from the IDLH values published in the National Institute for Occupational Safety and Health (NIOSH) Guide. IDLH (Immediately Dangerous to Life or Health) values are calculated based on levels of gas in a particular atmosphere for 30 minutes that would pose an immediate risk U.K.'s BS 6853 specification is the most stringent, closely followed by the French, and finally the Germany introduced the toxicity test in 2009.

Gases	U.K. (mg/m³) BS 6853	French (mg/m³) NF X 70-100	U.S. (ppm) SMP 800C
CO	1,400	1,750	3,500
CO_2	73,000	90,000	90,000
HCl	76	150	500
HBr	101	170	100
HCN	56	55	100
HF	25	17	100
NO/NO_2	38		100
SO_2	270	260	100

NF F 16-101/2

In France the French Railway's standard NFF 16-101/2 combines reaction to fire, (M rating), with smoke and toxicity, (F rating), to provide a true FST evaluation of the fire safe properties of a composite material.
As with the UK BS 6853 standard, the M/F rating required in NFF 16-101 is dependent on the type of rolling stock, the extent to which it uses tunnels and the position and orientation of the composite part in the vehicle.

Test Methods

The standard comprises the following test methods:

Flammability
NF-EN 60695-2 Glowing Wire at 850+/-15 °C and 960+/-15 °C
NF-EN ISO 4589-2 Oxygen index determination
Smoke Density
NFX 10-702 Smoke density determination
Toxicity
NFX 70-100 Pyrolysis and combustion gas analysis

M Rating

M rating refers for the fire resistance classification of the materials to be used in the transportation industry
This classification rates the material in five categories:
M0: incombustible
M1: non flammable
M2: burns with difficulty
M4: easily inflammable
M5: very easily inflammable

I/F Rating

I/F rating refers to ignition resistance and fume classification of non metallic electrical components used in the underground transporation industry.

Test Description

1. Ignition

The ignition characteristics is determined by a combination of glow wire test (GWT) and oxygen index.
The material under test is categorized in the following tables:

I Class	Oxygen Index	Glow Wire
I0	≥70	No ignition at 960 °C
I1	≥45	No ignition at 960 °C
I2	≥32	No ignition at 850 °C
I3	≥28	Ignition does not persist at 850°C after glow wire is withdrawn
I4	≥20	
NC	<20	(Not classified)

2. Fume Composition

The parameters tested are fume opacity and analysis of pyrolysis as well as combustion gases.
All 3 parameters are used to calculate the Smoke Index (SI) which in turns determines the fume class F as follows:

F Class	S.I Values
F0	≤ 5
F1	≤20
F2	≤40
F3	≤80
F4	≤120
F5	>120

Classification

Each material will receive I/F rating, the smaller the number, the better. Unfortunately, good I and good F are difficult to achieve: low I values frequently means addition of fire retardant packages which in turns leads to high F values. Consequently, 4 overall I/F performance classes are defined as follows:

	I0	I1	I2	I3	I4	I5
F0	IV	IV	IV	II	I	I
F1	IV	IV	IV	II	I	I
F2	IV	IV	III	II	I	I
F3	IV	III	III	I	I	I
F4	IV	III	I	I	I	I
F5	IV	I	I	I	I	I

I Performance class 1, least demanding
II Performance class 2
III Performance class 3
IV Performance class 4, most demanding

DIN 5510-2

DIN 5510-2 is the latest rolling stock standard adopted in Germany. This relates to preventive fire protection in railway vehicles. Part 2 of this standard defines the fire behaviour and fire side effects of materials and parts, classification, requirement and test methods. DIN 5510-2 determines the fire classification of railway vehicle material and structure by burning behaviour, smoke density, dropping behaviour and toxic. This classification is then used to determine requirement on the combustion characteristics and fire side effects for the materials and components used in the vehicles.

The main related tests are as follows:

Smoke & Toxicity Test: EN 5659-2
Test for Vertical flame spread of vertically mounted bundled wires and cables: DIN 50266-2-4; DIN 50266-2-5
Smoke Density Test: DIN EN 61034-2
Test for Vertical flame propagation for a single insulated wire and cable: DIN EN 60332-1-2

EN 45545

En 45545 is a new EU standard used to replace the existing national regulations for fire safety in trains and track-guided vehicles. This new standard constitutes a harmonising of the existing national standards based on the highest common denominator – and will therefore represent a stiffening of the fire safety regulations applied in the individual countries. The new standard divides railway vehicles into four operation categories. As seen below, it particularly targets safety in connection with tunnels and bridges.

Category	Services	Infrastructure
1	Mainline, regional, urban and suburban	Operation not determined by underground sections, tunnels and/or elevated structures
2	Urban and suburban	Operation determined by underground sections, tunnels and/or elevated structures with walkways or other means for safe side evacuation from the vehicles
3	Mainline and regional	Operation determined by underground sections, tunnels and/or elevated structures with walkways or other means for safe side evacuation from the vehicles
4	Mainline, regional, urban and suburban	Mainline, regional, urban and suburban operation determined by underground sections, tunnels and/or elevated structures without any means for safe side evacuation from the vehicles

The standard also establishes four hazard levels that determine the requirements for protection against fire and smoke formation. Most new railway vehicles will be designed to hazard level 3. but some vehicles, for example for light rail systems, will have to conform to hazard level 4.

Category	Design Category			
	Standard Vehicles	Automatic Vehicles	Double-decked Vehicles	Sleeping Cars
1	HL 2	HL 2	HL 2	HL 2
2	HL 2	HL 3	HL 3	N/A
3	HL 3	HL 4	HL 3	HL 4
4	HL 4	HL 4	HL 4	HL 4

HL1 Long distance train
HL2 Regional train without tunnel
HL3 High speed trains
City and regional trains
Trams with party going through tunnels.
HL4 Metro
Night train with sleeping coaches

Ordering Code

FRL-A-B-C-D-E-F-G

A- Wall Type
SW=Standard Wall; MW=Medium Wall
TW=Thin Wall; HT=High Temperature
C- Core Type
S=Single Core; M=Multicore; MP=Multi Pair
E- Screen Type
OS=Overall Screen; IOS=Individual & Overall Screen
G- Cross Section Areas
1.5=1.5mm^2

B- Voltage Type
05=300/500 V; 1=0.6/1KV
3=1.8/3KV; 6=3.6/6KV
D- Insulation or Sheath Type
U=Unsheathed; SW=Standard Wall Sheath
ESW=Exposed Standard Wall Sheath; RI=Reinforced Insulation; EF=Extra-Flexible
F- Number of Cores and Pairs
10C=10 Cores

EN 50305

Special test are stipulated in EN 50305 for each European railway rolling stock.

Below is the test method for the rolling stock cables to En 50264 and EN 50306 and EN 50382 :

For Standard Wall and Medium Wall Cables according to EN 50264	
Ageing Test at 120 °C	
Fluid Resistance:	IRM 902 for mineral oil resistance
	IRM 903 for fuel resistance
	N oxalic acid
	N sodium hydroxide
Test at Low Temperature:	-25 °C or -40 °C
Fire Propagation:	Single core test EN 50265-2-1 (IEC 60332-1) Bundle core test EN 50266-2-4 (IEC 60332-3C) + EN 50305
Toxicity Test	Toxicity EN 50305
Smoke Density Test:	Low smoke EN 50268-2 (IEC 61034)
Halogen Test:	Acid and toxic gases EN 50267-2-1/8-2-2 (IEC 60754-1&2)
Electrical Test:	Dielectric test and direct current stability test at +85 °C
For Thin Wall Cables according to EN 50306	
Standard Wall Tests Plus	
Long Term Ageing Test:	(20.000 h at +125 °C) EN 50305
Notch Propagation Test:	EN 50305
Abrasion Test:	EN 50305
For High Temperature Cables according to EN 50382	
Standard Wall Tests Plus	
Ageing Test	For silicon insulation at +200 °C and long term sheath ageing test (20.000 h at +140 °C)