

Acorail®

SIGNALLING AND TELECOMMUNICATIONS CABLES
FOR RAILWAY NETWORKS



 **ACOME**



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ACOME

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Key figures

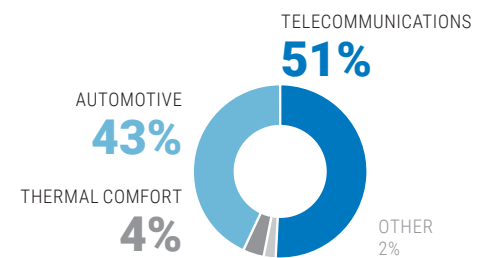
Founded as the first French cooperative industrial company, ACOME is a major player in the market for cables, wires and synthetic tubes. With a consolidated turnover of €510 million in 2018 (55% generated internationally), ACOME employs around 1,800 people worldwide and has earned a reputation both as a benchmark manufacturer and as a specialist in the automotive, telecommunications, railway and network infrastructure markets.

CONSOLIDATED REVENUE*

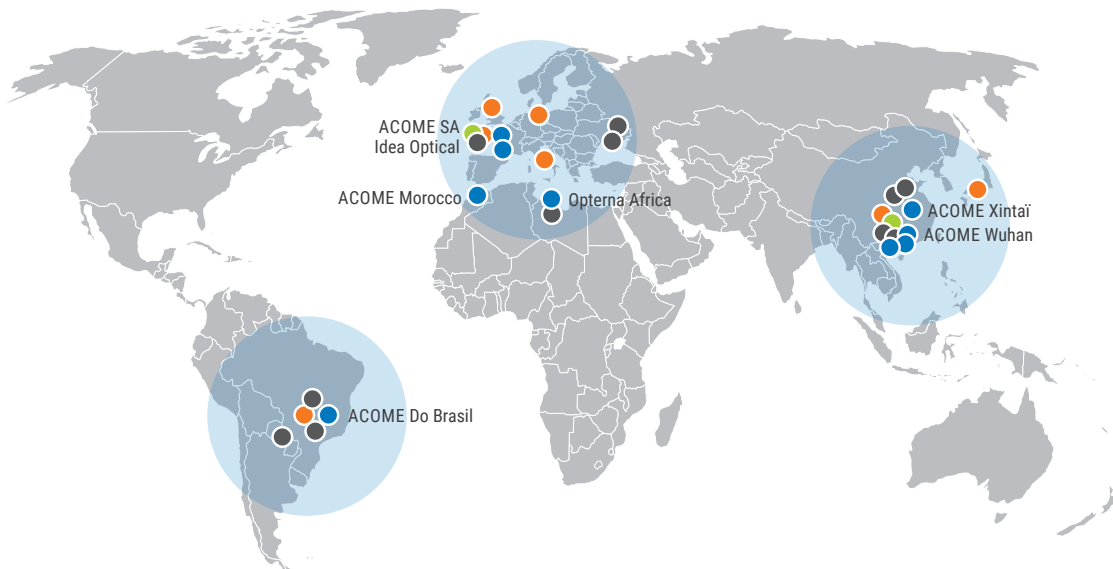


€510m

55% GENERATED INTERNATIONALLY



A PRESENCE ON 4 CONTINENTS



13 PRODUCTION FACILITIES

- 6 factories in France:** ACOME in Mortain, Idea Optical in Lannion
- 4 factories in China:** Xintai, Wuhan, Zhuhai (joint-venture with Hansen)
- 1 factory in Brazil:** Irati
- 2 factories in Africa:** Morocco and Tunisia

SALES OFFICES IN 7 COUNTRIES

- EMEA :** France, Germany, Italy, United Kingdom
- Asia :** China and Japan
- South America:** Brazil

2 RESEARCH & TECHNOLOGIES CENTERS

France and China

12 LOGISTICS HUBS (EMEA, South America and Asia)



**CONSOLIDATED
WORKFORCE***
AT THE END OF
DECEMBER 2018
1,800
people

76% EMEA
(EUROPE, MIDDLE EAST, AFRICA)

20% CHINA

4% BRAZIL

**A GLOBAL
CERTIFICATION APPROACH**

★ ISO 9001 Quality management	★ ISO 14001 Environment	★ OHSAS 18001 Health and safety at work	★ ISO/TS 16949 Automotive quality	★ ISO/CEI 17025 Cofrac testing laboratory	★ AEO Authorized economic operator

ACCREDITATION N°1-1114
Portée disponible sur
www.cofrac.fr

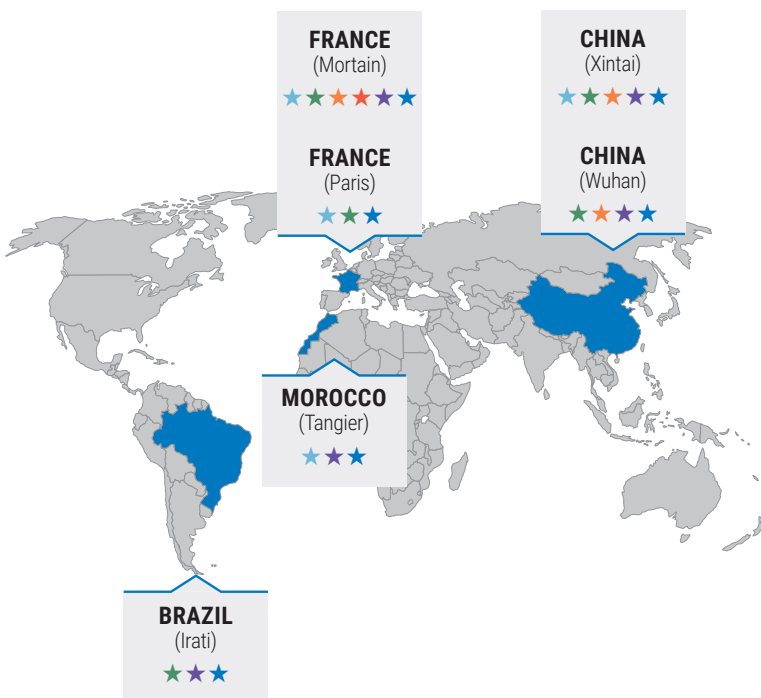
**CORPORATE SOCIAL
RESPONSIBILITY (CSR)
ASSESSMENT
ECOVADIS GOLD FOR
THE THIRD YEAR**



Since 2012, ACOME entrusts EcoVadis, the independent CSR ratings agency, with the evaluation of its practices in terms of corporate social responsibility (CSR).

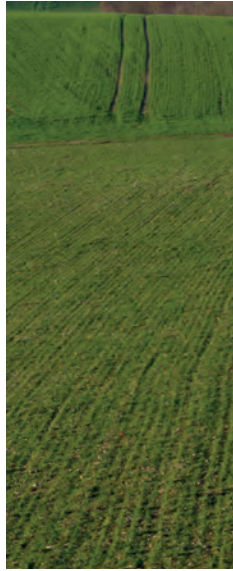
For the third consecutive year, ACOME was awarded Gold out of four CSR themes: environment, social, business ethics and sustainable procurement with the evaluation of 63/100.

This result demonstrates the performance of the Group in the exercise of its social responsibility.



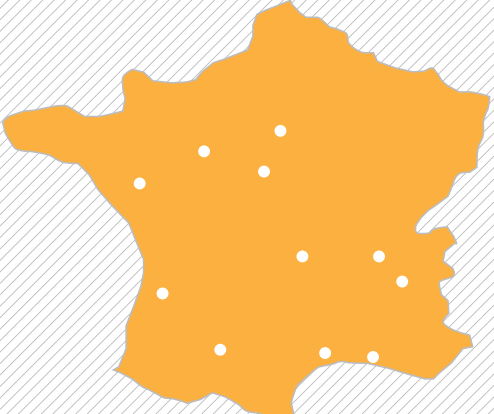
*At the end of December 2018.

ACOME intercity rail and High-Speed lines references



France
SNCF
 The entire traditional French rail network
 South-East TGV line
 Atlantic TGV line
 North TGV line
 PBKA TGV line (Paris-Brussels-Cologne-Amsterdam)
 Paris and Lyon bypasses
 Mediterranean TGV line
 East TGV line
 Rhine-Rhône TGV line
 East-European Ph2 TGV line
 LISEA South Europe Atlantic TGV line
 ERE Britain Pays-de-Loire TGV line
OC'VIA
 Nimes-Montpellier mixed line bypassing

France/United Kingdom
EUROTUNNEL
 Channel Tunnel Terminals



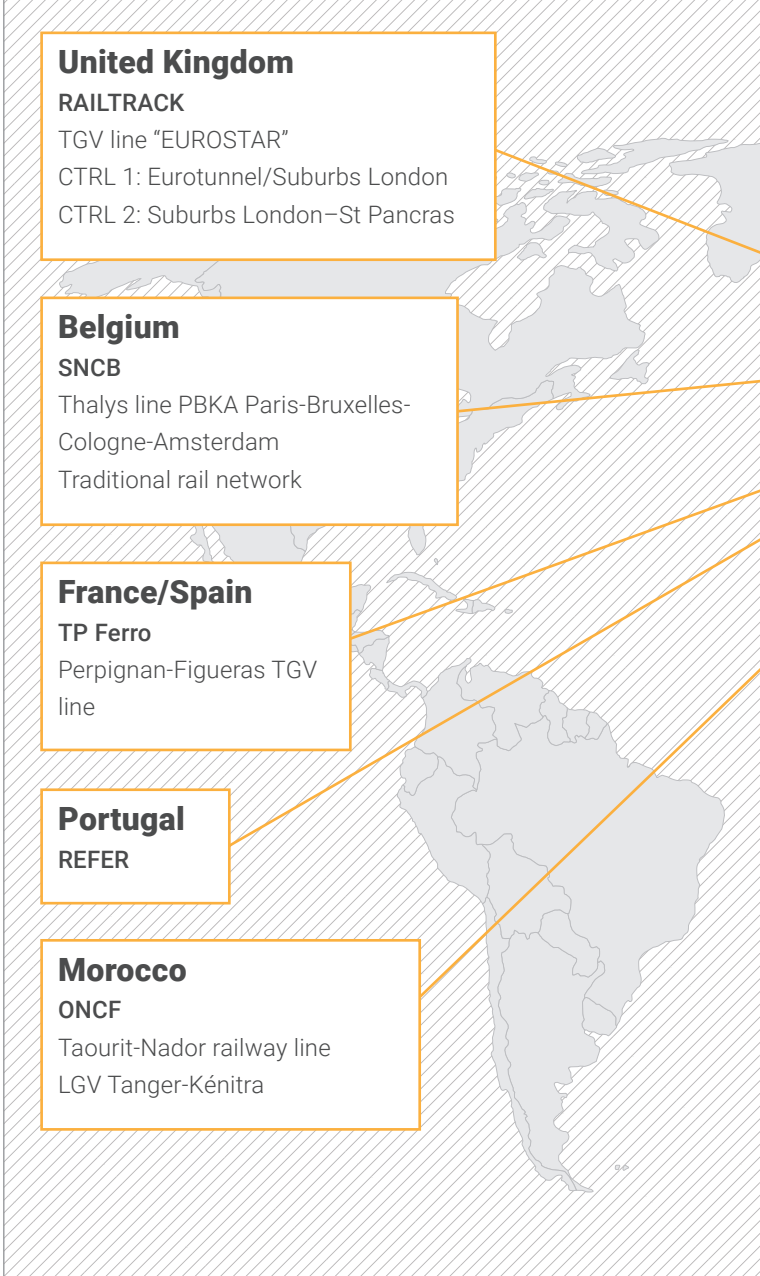
United Kingdom
RAILTRACK
 TGV line "EUROSTAR"
 CTRL 1: Eurotunnel/Suburbs London
 CTRL 2: Suburbs London–St Pancras

Belgium
SNCF
 Thalys line PBKA Paris-Bruxelles-Cologne-Amsterdam
 Traditional rail network

France/Spain
TP Ferro
 Perpignan-Figueras TGV line

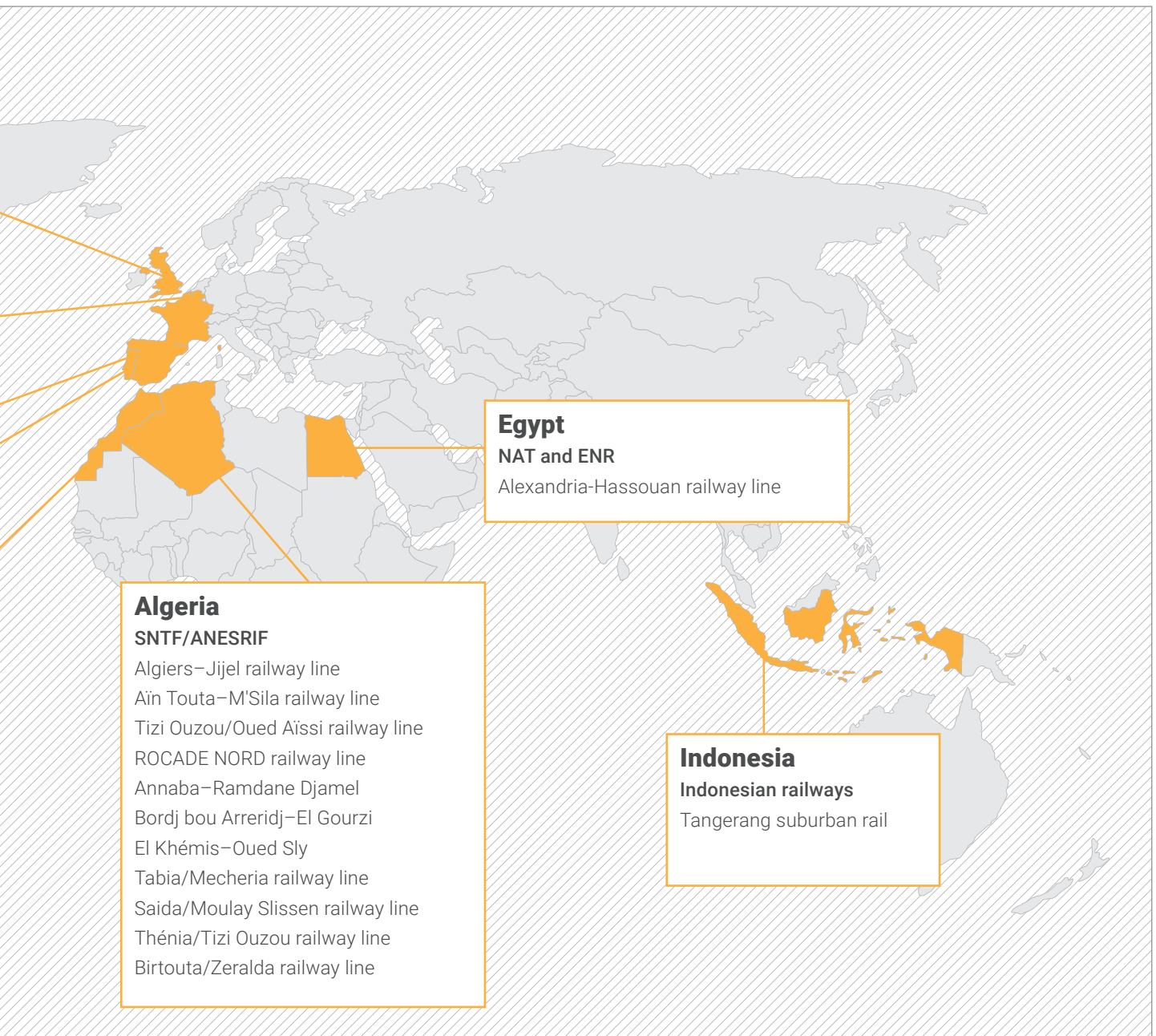
Portugal
REFER

Morocco
ONCF
 Taourit-Nador railway line
 LGV Tanger-Kénitra





Traditional French rail network



ACOME underground and urban networks references



France

Paris

RER - RATP

Underground (all network, Meteor, Ramses),
RATP, TELCITE

Tramway (T1, T2, T3, T6, T7, T8) - RATP

Marseille - Underground

Lyon - Underground (L1, L2), Tramway (T1, T2, LEA)

Toulouse - Underground

Nantes - Tramway

Grenoble - Tramway

Clermont-Ferrand - Tramway

Montpellier - Tramway

Le Mans - Tramway

Orléans - Tramway

Bordeaux - Tramway



Germany

Munich Underground

Greece

ATTIKO.METRO A.E

Athens Underground

Portugal

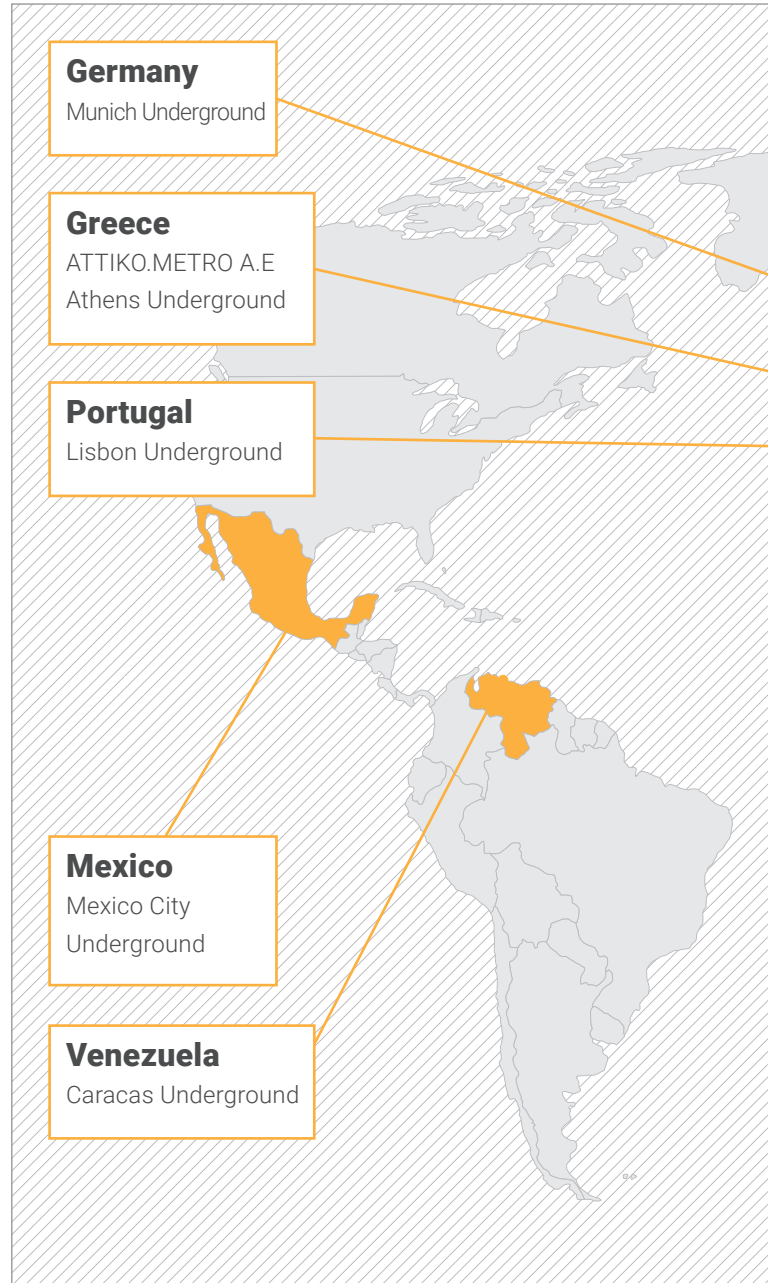
Lisbon Underground

Mexico

Mexico City
Underground

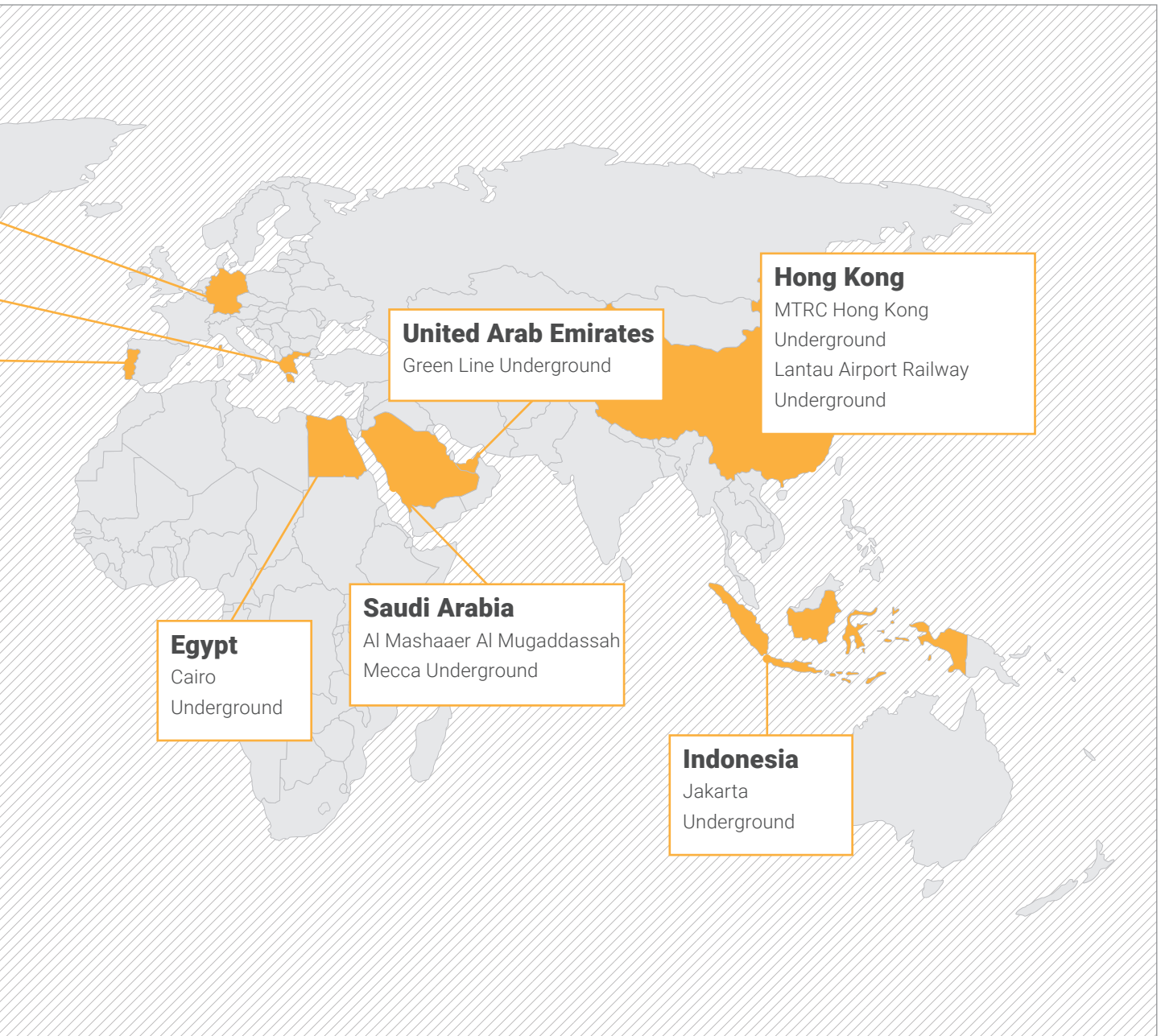
Venezuela

Caracas Underground





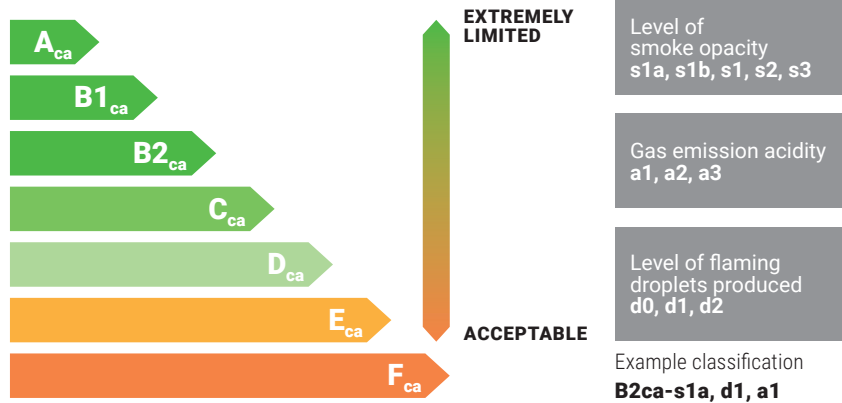
Paris Underground – South extension of Metro Line 4



Construction products regulations (CPR) applied to cables

The new european fire reaction classification


The Euroclass classification defines seven classes based on products and their reaction to fire. Euroclass Fire B2ca is the highest currently applicable to cables. There are also three additional criteria: smoke opacity, flaming droplets/particles and smoke acidity for the higher classes (from B1ca to Dca). The individual Euroclasses and their corresponding criteria are set out below, in decreasing order of severity.








A HIGHER LEVEL OF SAFETY

Before the CPR, only one criterion was applied (generally the spread of flames or fire) with classification levels differing from country to country. The CPR raises the level of safety by applying 9 criteria spread across 5 domains.

Pre-CPR

-  Flame propagation
- ➔ Usually 1 criterion
- ➔ 30 minutes of testing
- ➔ Conducted by the manufacturer

Post-CPR

-  Flame propagation: 2 criteria
-  Heat emission: 3 criteria
-  Flaming droplets: 1 criterion
-  Acidity: 1 criterion
-  Smoke: 2 criteria
- ➔ 9 criteria
- ➔ 1 day of testing
- ➔ Conducted by the certified laboratory

ACCEPTABLE

These more comprehensive and longer tests are carried out by an approved laboratory in accordance with 3 compliance certification systems.

System 1+ (Euroclass Fire rating Aca to Cca) is the most demanding, since the approved laboratory also conducts the initial type testing, conducts the initial inspection and has responsibility for monitoring and follow-up testing. It guarantees the highest level of safety.

CE Marking and Declaration of Performance

The regulatory obligations applying to manufacturers offering products in the market consist of preparing a Declaration of Performance (DoP) and applying the CE mark.


CE marking

In the context of the CPR, CE marking includes the CE symbol accompanied by other information about the manufacturer and the product. This information is displayed on the packaging label (see template below).

The Euroclass Fire rating is also shown on the marking applied to ACOME cables.

The Declaration of Performance

The DoP is a document in which the manufacturer provides clear identification of a product and details of its performance (relative to the CPR), the contents of which are legally binding. ACOME product DoPs are available from www.acome.com.



Notified body: 2658

DOP : N° 17K200001
Declaration of Performance:
<http://www.acome.com>

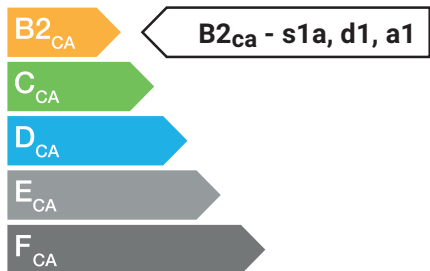
17

**EN 50575 : 2014
+ A1 : 2016**

Cable for general applications
in construction works subject
to reaction to fire requirements

Unique identification code:
17K200001

Euroclass Fire



B2_{CA}
C_{CA}
D_{CA}
E_{CA}
F_{CA}

B2_{ca} - s1a, d1, a1

CPR application

Railway station

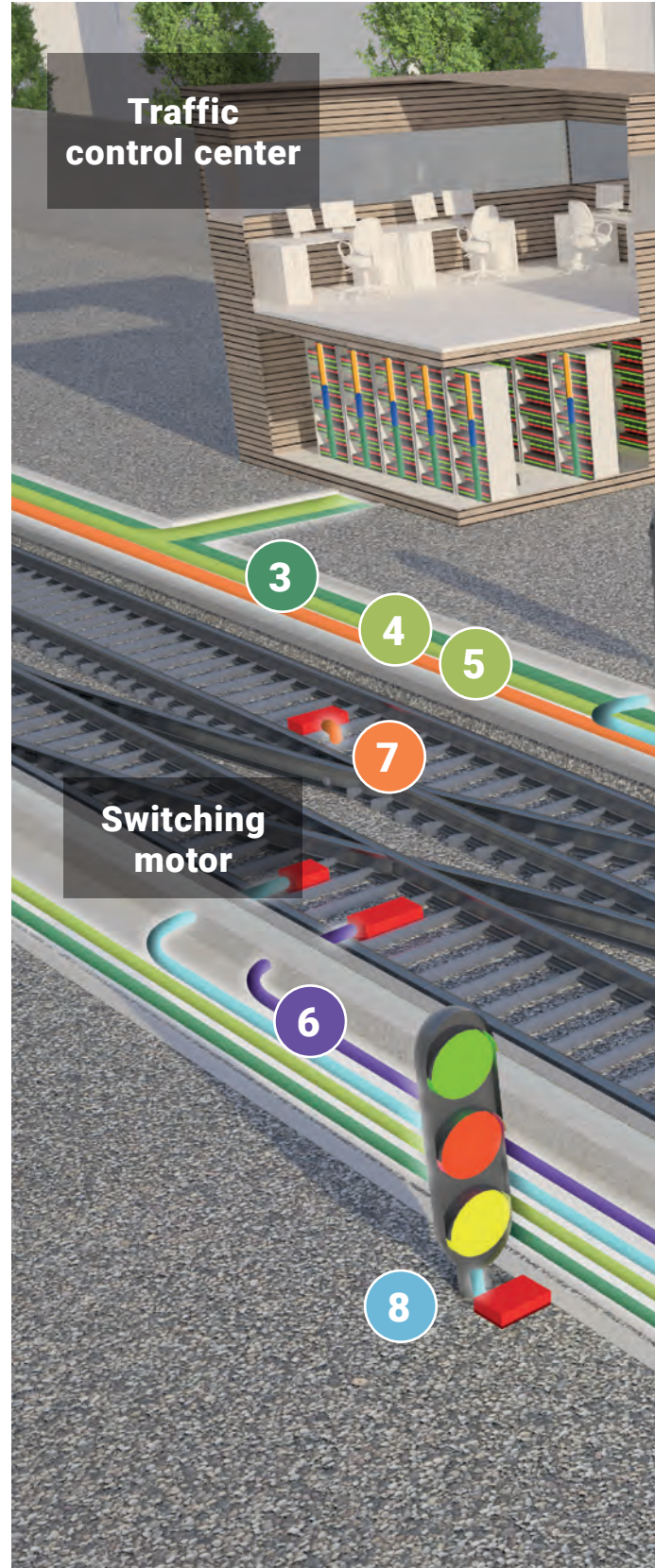
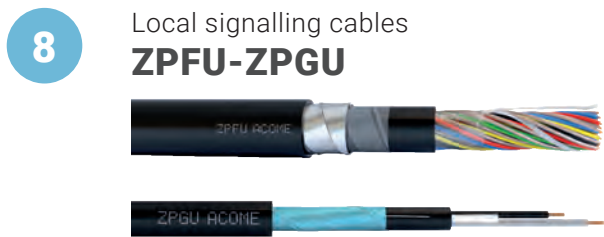
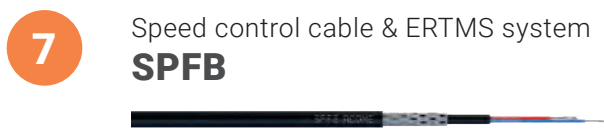
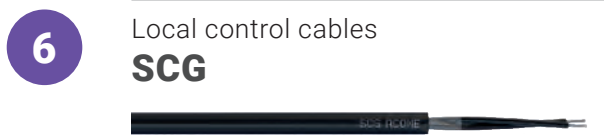
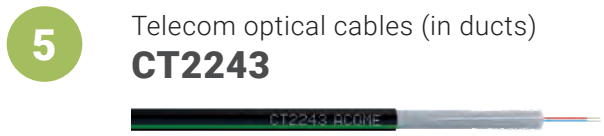
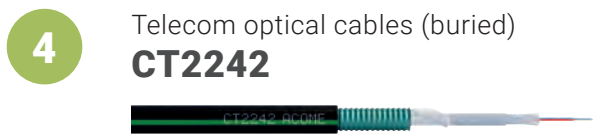
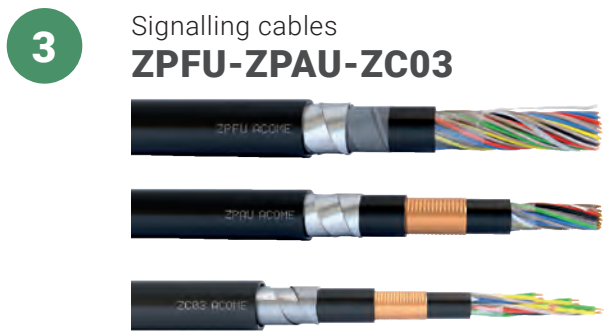
Each country is free to set national requirements concerning the minimum Euroclass level to be respected for railway stations. In the absence of regulations, the minimum **Cca-s1,d1,a1** Euroclass is recommended for railway stations regarding the high level of risk in case of fire.

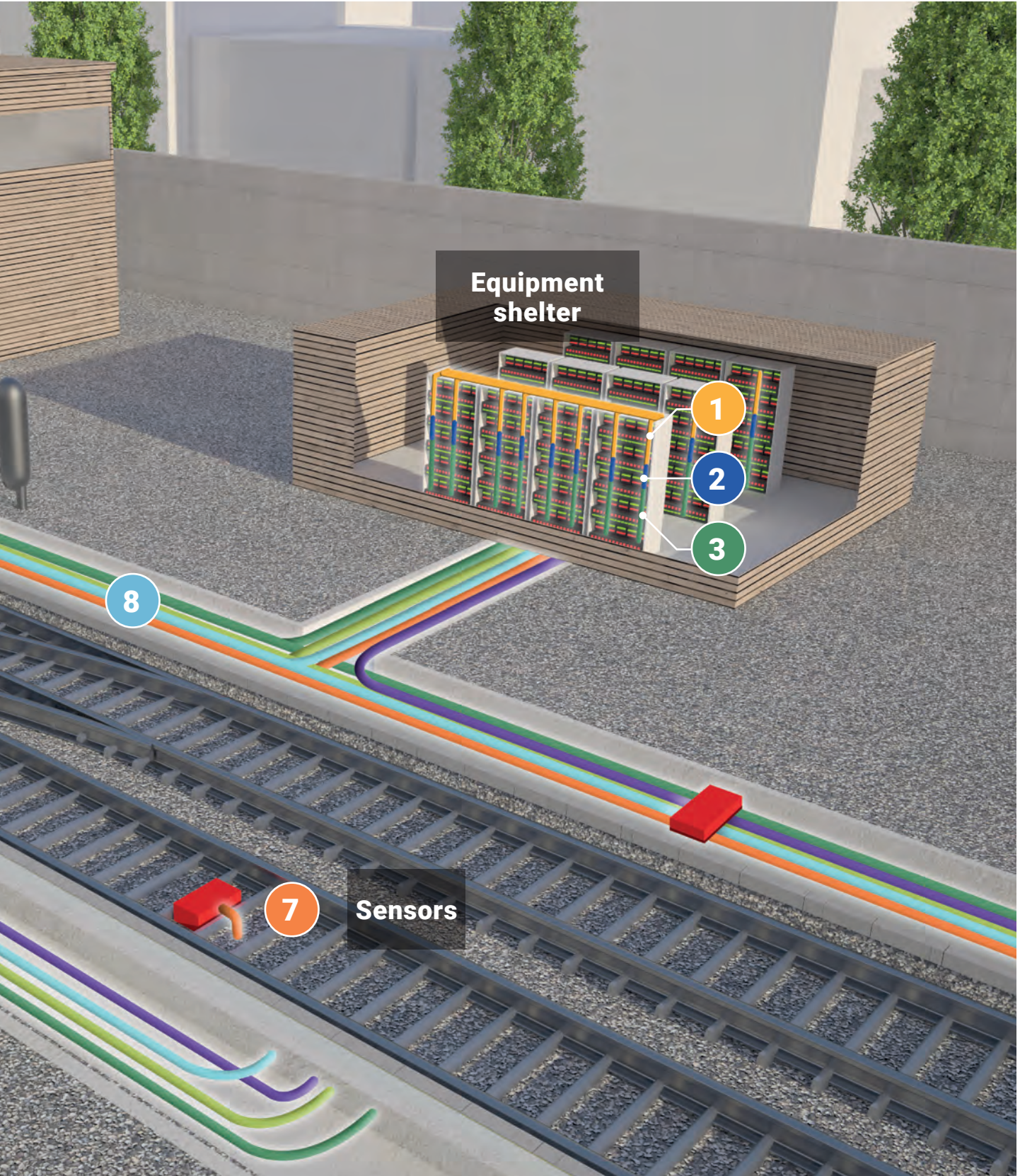
Tunnel

The European regulation (EU) 2019/776 of May 16th 2019 complements the Directive (EU) 2016/797 and specifies the **B2ca-s1a,a1** Euroclass in Europe for cables exposed in tunnels.



Typical wiring diagram for traffic control





Cabling system for railway stations

1

LAN Copper

- **Applications** : computers, dynamic display...
- **Cable range:**
F/UTP, U/FTP, F/FTP, S/FTP
- **Cca or B2ca Euroclass**



2

HEMERA

- **Applications** : video protection
- **Cable range:**
F/UTP Cat.6A indoor/outdoor
F/FTP B2ca armored

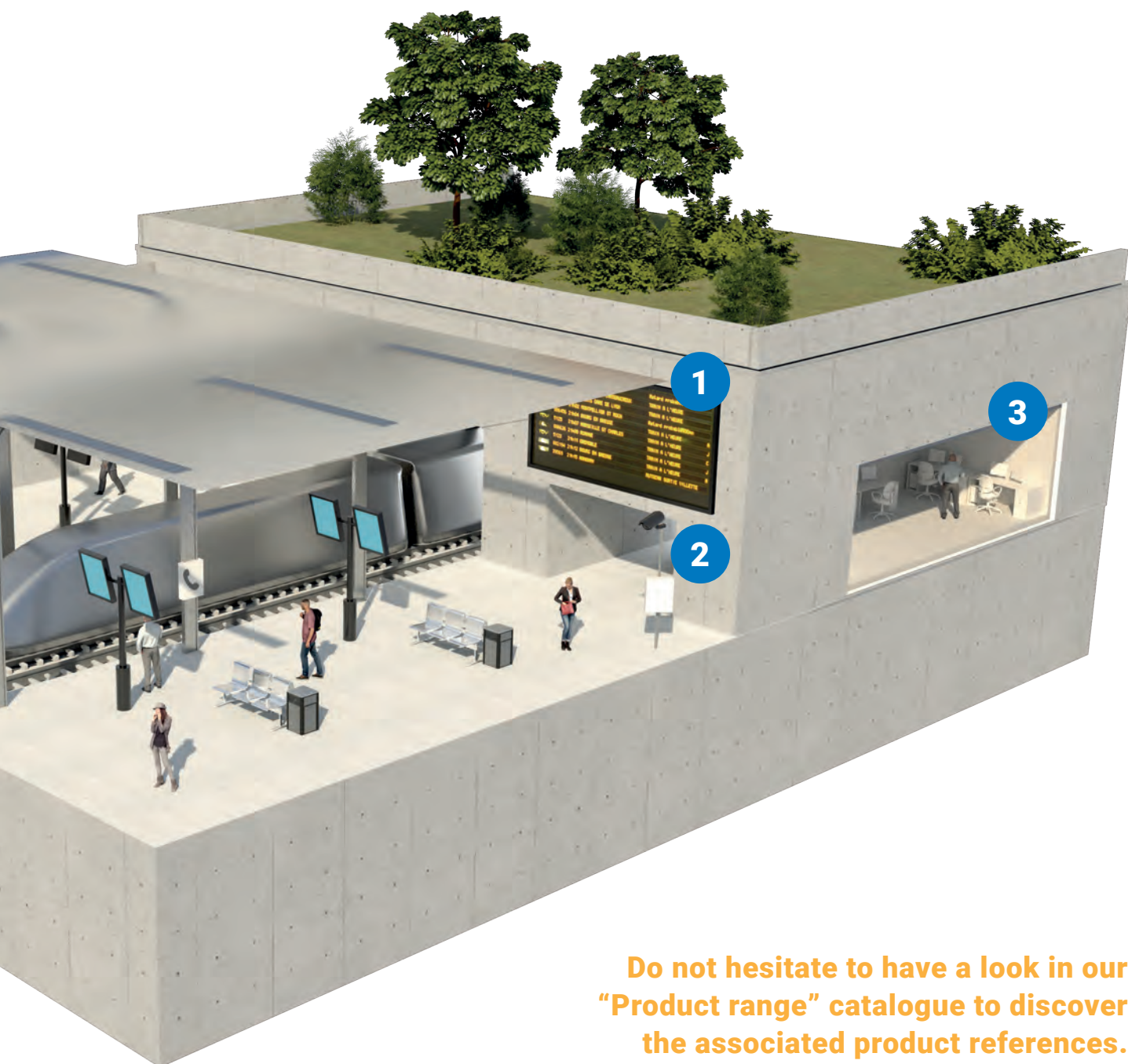


3

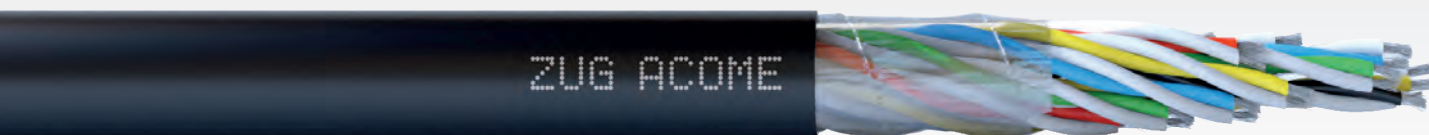
Optical cable

- **Applications** : optical links
- **Cable range:** K209B, PACe
- **B2ca Euroclass**





Do not hesitate to have a look in our “Product range” catalogue to discover the associated product references.



1 ZUG-SUG-ZUT

Link cables

Intercity railways – Traffic control centre and Shelter indoor equipment

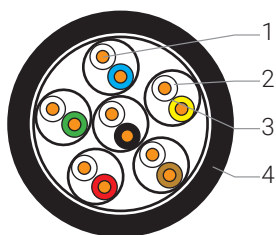
French Railway company CT 455 approved - Specification French Railway company approved

Applications

Connect the computing devices to the supports of relays and electronic equipment and also the supports between themselves.

Product specifications

1. Class 5 stranded tinned copper core
2. Coloured unleaded PVC insulation
3. Twisted pairs (ZUG/ZUT) or conductors (SUG) – tinned copper braid (only for ZUT version)
4. Black unleaded PVC outer jacket + marking + metric or LSOH brown (ZUG)



BENEFITS +

ZUT version is protected against electromagnetic disturbances

ZUG LSOH version has an optimal fire performance

Electrical properties

- Linear resistance:
1 mm²: 20.1 Ω/km
0,38 mm²: 52.5 Ω/km
- Operating voltage: 500 V

Mechanical and physicochemical properties

- Fire performance: NFC 32070.2.1 (flame retardant) and IEC 60332-1
- Euroclass B2ca-s1a,a1 (ZUG-SH version)
- Operating temperature: 70 °C
- Bending radius: static 4 x D, dynamic 8 x D
- Laid in cable trays and feedthroughs

RANGE OF PRODUCTS

	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Insulated core ø mm	Overall ø mm	Net weight kg/km	Drum type Length m
Multipairs ZUG-S PVC sheath							
L2791	1 p.	1	32 x 0,2	2,09	7,0	64	A 1 000
L2792	3 p.	1	32 x 0,2	2,09	10,0	120	A 500
S2316	6 p.	1	32 x 0,2	2,09	12,5	238	D 1 000
L2793	12 p.	1	32 x 0,2	2,09	15,7	390	C 500
U1730	28 p.	0,38	12 x 0,2	1,40	15,6	336	A 250
Multipairs ZUG LSOH sheath							
M3824	3 p.	1	32 x 0,2	2,09	10,0	116	B 1 000
M3825	6 p.	1	32 x 0,2	2,09	12,6	220	C 1 000
M3826	12 p.	1	32 x 0,2	2,09	15,7	363	D 1 000
Multiconducteurs SUG-S							
W2663	3 x	1	32 x 0,2	2,09	7,5	76	A 1 000
Multipairs ZUT-S							
M4134	2 p.	1	32 x 0,2	2,09	8,8	125	B 1 000
L7001	6 p.	1	32 x 0,2	2,09	13,0	275	D 1 000
M4133	12 p.	1	32 x 0,2	2,09	16,5	448	C 500

Other packing on request.

CV-CVZ ACCOHE

2 CV-CVZ

Traffic control centre and shelter indoor equipment Intercity railways

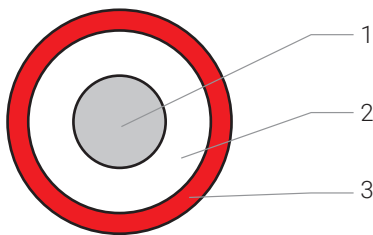
Specification French Railway company CT 500 - Specification French Railway company approved

Applications

- Cabling for the relays and cards to the chassis.
- Cabling wires for the relays and electronic signalling devices.
- CV for use only in Optical Control Panel (OCP) wiring.

Product specifications

1. Stiff wires (CV and CVZ): solid tinned copper core - class 1 or flexible wires (CV-S and CVZ-S): stranded tinned copper core - class 5.
2. Insulation: white (CVZ) or coloured (CV) unleaded PVC. CV and CV-S wires: no outer jacket.
3. CVZ and CVZ-S wires: coloured polyamide outer jacket + marking.



BENEFITS +

Wires highly resistant to cutting and sectioning on sharp edges

Electrical properties

- Operating voltage: 750 V

Mechanical and physicochemical properties

- Fire performance: EN 60332-1
- Operating temperature: 70 °C
- Mineral oil resistant
- Abrasion resistant
- Resistant to high temperatures under stress
- Bending radius:

Stiff wires – static: 5 x D - dynamic: 10 x D

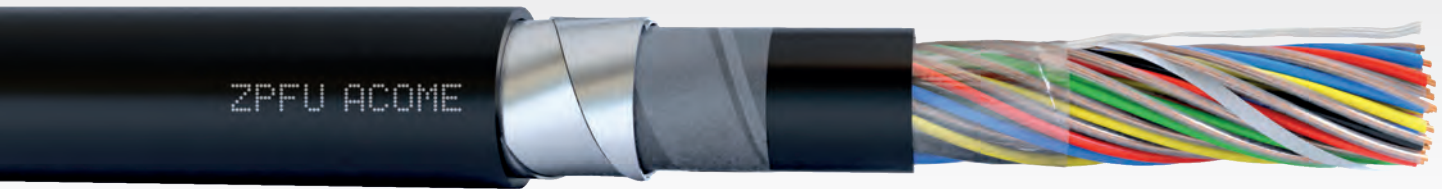
Flexible wires – static: 4 x D - dynamic: 8 x D

RANGE OF PRODUCTS

	Composition	C. S. A. mm ²	Conductor composition nb x ø mm	Insulated core ø mm	Overall ø mm	Net weight kg/km	Linear resistance Ohm/km	Drum type Length m
Stiff								
S2394	CV 1 x	0,5	1 x 0,80	1,60	-	6,0	36,70	200
R3526	CVZ 1 x	1,0	1 x 1,17	1,90	2,30	13,2	18,20	200
L5404	CVZ 1 x	2,5	1 x 1,78	2,70	3,10	29,3	7,56	200
Flexible								
L5405	CV-S 1 x	0,5	16 x 0,20	1,60	-	6,8	40,10	200
L2999	CVZ-S 1 x	0,5	16 x 0,20	1,60	2,30	7,6	40,10	200
R3527**	CVZ-S 1 x	1,0	32 x 0,20	2,10	2,50	14,0	20,00	200
L5406	CVZ-S 1 x	2,5	50 x 0,25	3,00	3,40	29,1	8,21	200
L5407	CVZ-S 1 x	6,0	84 x 0,30	4,20	4,60	57,0	3,39	100
R3823*	CVZ-S 1 p	1,0	32 x 0,20	2,10	2,50	29,0	20,00	200

*CVZ-S 1p. X 1 mm² = 2 CVZ-S 1 x 1 mm² wires twisted together.

**Wires in stock in black colour. Other colours on request according to models.



3 ZPFU

Signalling

Intercity railways (Electrified lines in DC)

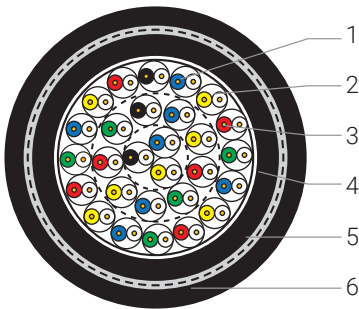
Specification French Railway company CT 445 - Specification French Railway company approved

Applications

- Connects the traffic control centre to the track-side equipment shelters.
- Laid in long lengths alongside unelectrified lines or 1 500 VDC electrified lines.

Product specifications

1. Solid red copper conductor – class 1
2. Insulation: coloured polyethylene
3. Twisted pairs
4. Inner polyethylene waterproof sheath
5. Armour: double steel tape
6. Black or LSOH brown unleaded PVC outer jacket + marking + metric



BENEFITS +

Laid in short lengths along 25 kilovolts electrified lines to connect Equipment Shelters to track equipment

Electrical properties

- Linear resistance: 18.1 Ω/km
- Operating voltage : 750 V
- Capacity < 55 nF/km
- Characteristic impedance: 120 Ω at 45 KHz
- Linear attenuation: < 2.5 dB/km at 45 KHz.

Mechanical and physicochemical properties

- Fire performance: NFC 32070.2.1 (flame retardant) and IEC 60332-1
- Euroclass B2ca-s1a, d2,a1 (ZPFU – LSOH cables)
- Operating temperature: 70 °C
- Mineral oils, acids and bases resistant
- Bending radius: static 8 x D, dynamic 16 x D
- Laid in gutters or buried

RANGE OF PRODUCTS

PVC	Halogen-free	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Overall ø mm	Net weight kg/km PVC/ZH	Drum type Length m
U3763	U3783	1 p.	1	1 x 1,12	11,4	165/210	C 1 000
U3764	U3784	2 p.*	1	1 x 1,12	12,6	218/255	D 1 000
U3765	U3785	4 p.	1	1 x 1,12	16,0	330/375	E 1 000
U3766	U3786	7 p.	1	1 x 1,12	19,5	615/690	F 1 000
U3767	U3787	14 p.	1	1 x 1,12	24,5	945/1010	F 500
U3768	U3788	21 p.	1	1 x 1,12	28,1	1216/1330	F 500
U3769	U3789	28 p.	1	1 x 1,12	31,0	1439/1560	G 500

Other packaging on request. Extended range: ZPFU in 1.5 mm² section.

The diameter on sheath is indicative and may vary slightly.

*Black-Colourless / Blue-Yellow quarter assembly.



3 ZPAU

Signalling

Intercity railways (High-speed lines and AC electrified lines)

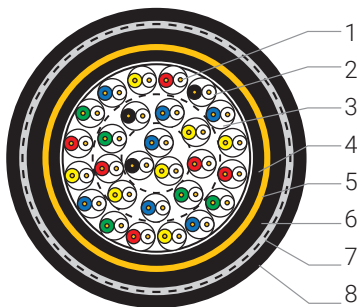
Specification French Railway company CT 445 - Specification French Railway company approved

Applications

- Connects the traffic control centre to the track-side equipment shelters.
- Laid in long lengths alongside electrified railway lines at 25 000 Volts AC.

Product specifications

1. Solid red copper conductor – class 1
2. Insulation: coloured polyethylene
3. Twisted pairs
4. Inner polyethylene or natural LSOH waterproof sheath
5. Corrugated copper shield
6. Polyethylene or natural LSOH separating sheath
7. Armour: double steel tape
8. Black or LSOH brown unleaded PVC outer jacket + marking + metric



BENEFITS +

Protected against induced electromagnetic disturbance caused by catenary

Anti-rodent

Electrical properties

- Linear resistance: 18.1 Ω/km
- Operating voltage: 750 V
- Capacity < 55 nF/km
- Protected against electromagnetic disturbances: reduction factor at 170 V/km < 0.24
- Characteristic impedance: 120 Ω at 45 KHz
- Linear attenuation: < 2,5 dB/km at 45 KHz

Mechanical and physicochemical properties

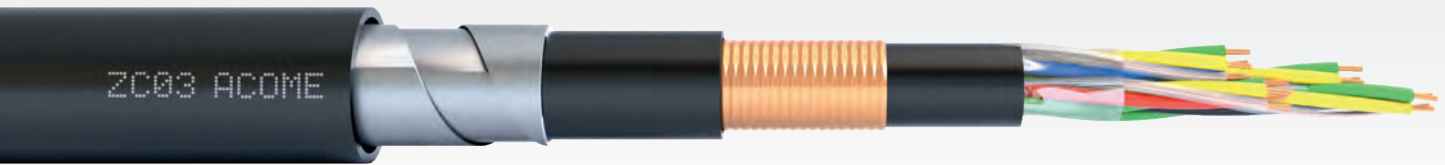
- Fire performance: NFC 32070.2.1 (flame retardant) and IEC 60332-1
- Euroclass B2ca-s1a, d2, a1 (ZPAU – LSOH cables)
- Operating temperature: 70 °C
- Mineral oils, acids and bases resistant
- Bending radius: static 8 x D, dynamic 16 x D
- Laid in gutters or buried

RANGE OF PRODUCTS

PVC	Halogen-free	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Overall ø mm	Net weight kg/km PVC/ZH	Drum type Length m
U3983		1 p.	2,5	1 x 1,78	18,5	688	F 1 000
U3771	U3791	4 p.	1	1 x 1,12	19,6	625/740	F 1 000
U3772	U3792	7 p.	1	1 x 1,12	22,5	805/920	F 500
U3773	U3793	14 p.	1	1 x 1,12	27,1	1122/1330	F 500
U3774	U3794	21 p.	1	1 x 1,12	32	1496/1675	G 500
U3775	U3795	28 p.	1	1 x 1,12	34,4	1755/2140	G 500

Other packaging on request. Extended range: ZPAU in 1 p. and 2 p. 1 mm², ZPAU in 1.5 mm²/2.5 mm² sections (1p, 2p, 4p, 7p, 14p, 21p, 28p).

2 special cables: ZPAU 2p. X 1.5 mm² TBL for Belgian High-speed lines, ZPAU 1p. X 2.5 mm² ERTMS for the Eurobalise system.



3 ZC03

High-speed lines Intercity railways - Signalling Main cables

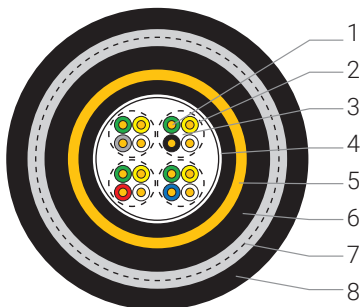
Specification French Railway company CT 445 approved - Specification French Railway company approved

Applications

- Connects the traffic control centre to the equipment shelters.
- Laid in long lengths along High Speed railway lines (used by the TGV), supplied at 25000 Volts AC.
- Controls the High-Speed line track circuits.

Product specifications

1. Solid red copper conductor – class 1
2. Coloured polyethylene insulation
3. Twisted quads
4. Inner polyethylene watertight sheath
5. Corrugated copper shield
6. Polyethylene separating sheath
7. Double steel tape armour
8. Black unleaded PVC outer jacket + marking + metric



BENEFITS +

High-performance protection against induced electromagnetic disturbance caused by catenary and High-Speed Train

Electrical properties

- Linear resistance: 18.1 Ω/km
- Operating voltage: 750 V
- Capacity < 40 nF/km
- Protected against electromagnetic disturbance: minimum reduction factor at 150 V/km < 0.14

Mechanical and physicochemical properties

- Fire performance: NFC 32070.2.1 (Flame retardant) and IEC 60332-1
- Operating temperature: 70 °C
- Mineral oils, acids and bases resistant
- Bending radius – static: 8 x D, dynamic: 16 x D
- Laid in channels or buried

RANGE OF PRODUCTS

	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Overall ø mm	Net weight kg/km PVC/ZH	Drum type Length m
U3777	4 q.	1	1 x 1,12	26,6	1285	G 1 200

Other packing on request. Extended range: ZC03 1q. x 1 mm².



8 ZPGU

Signalling – Local cables

Intercity railways

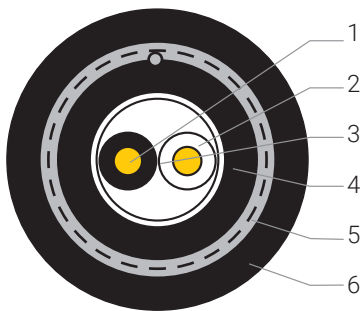
Specification French Railway company CT 445 approved - Specification French Railway company approved

Applications

- Inside cabling of an Equipment Shelter, or short length outside connections.
- Signalling shielded cable for local circuits.

Product specifications

1. Solid red copper conductor – class 1
2. Coloured polyethylene insulation
3. Twisted pairs (except 2p.: 1 star quad)
4. Inner polyethylene watertight sheath
5. Aluminium/polyester tape screen + tinned copper drain wire
6. Black unleaded PVC outer jacket + marking + metric



BENEFITS +

Protected against electrostatic disturbances

Electrical properties

- Linear resistance: 18.1 Ω/km
- Operating voltage: 750 V
- Capacity < 55 nF/km

Mechanical and physicochemical properties

- Fire performance: NFC 32070.2.1 (Flame retardant) ex-IEC 60332-1
- Operating temperature: 70 °C
- Mineral oils, acids and bases resistant
- Minimum bending radius – static: 8 x D, dynamic: 16 x D
- Laid in channels or cable tray

RANGE OF PRODUCTS

	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Overall ø mm	Net weight kg/km	Drum type Length m
U3758	1 p.	1	1 x 1,12	9,8	95	A 500
U3759	2 p.	1	1 x 1,12	10,6	130	A 500
U3760	3 p.	1	1 x 1,12	13,2	179	B 500
U3761	7 p.	1	1 x 1,12	18,3	301	C 500
U3762	14 p.	1	1 x 1,12	21,3	532	E 500

SPGU: 1 mm² c.s.a. multiconductor extended range. Other packing on request.



6 SCG

Signalling – Local cables Intercity railways

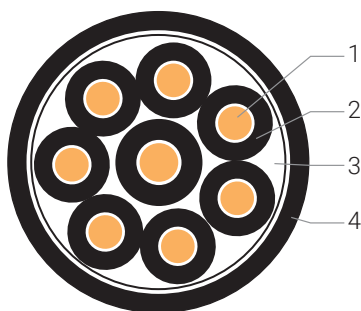
French Railway company CT 466 - Specification French Railway company approved

Applications

- Connects the Equipment Centre to the device concerned.
- Local control or power supply cables for trackside and between the rails equipments.

Product specifications

1. Solid tinned copper core - class 1
2. Cross-linked black polyethylene insulation numbered
3. Multiconductor stranding
4. Black unleaded PVC outer sheath + marking + metric



BENEFITS +

Can be used in short lengths along 25 kV AC electrified lines to connect the Equipment Centre to track devices

Electrical properties at 20°C ± 5°C

- Linear resistance:
2.5 mm²: 7.56 Ω/km
6 mm²: 3.11 Ω/km
- Operating voltage: 750 V

Mechanical and physicochemical properties

- Fire performance: NF C 32-070.2.1 (flame retardant) and IEC 60332-1
- Operating temperature: 70°C
- Bending radius: static 5 x D, dynamic 10 x D
- Laid in channels or in short ducts

RANGE OF PRODUCTS

	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Insulated core ø mm	Overall ø mm	Net weight kg/km	Drum type Length m
L5408	2 x	2,5	1 x 1,78	4	12,9	225	D 1 000
L5409	4 x	2,5	1 x 1,78	4	15,8	335	E 1 000
L5410	6 x	2,5	1 x 1,78	4	18,6	475	E 1 000
L5411	8 x	2,5	1 x 1,78	4	19,9	545	F 1 000
L5412	2 x	6	1 x 2,75	5.4	17	385	D 1 000
L5413	4 x	6	1 x 2,75	5.4	19,6	550	E 1 000
L5414	6 x	6	1 x 2,75	5.4	22,3	780	G 1 000
L5415	8 x	6	1 x 2,75	5.4	24,1	940	G 1 000

Other packing on request.



7 SPFB

Speed control system (French system KVB) Intercity railways – Balise cables

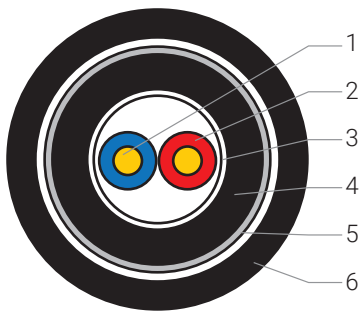
Specification French Railway company CT 446 approved - Specification French Railway company approved
 Halogen-free version available

Applications

- Cable laid along railway lines, used for the train speed control system (French system KVB).
- Connects the speed sensors (located between the rails) to the encoder located inside the trackside equipment shelter.

Product specifications

1. Class 2 stranded tinned copper core
2. Coloured polyethylene insulation
3. Twisted pair
4. Inner polyethylene watertight sheath
5. Galvanised steel braid armour
6. Black unleaded PVC outer jacket + marking + metric



BENEFITS +

Can be used over short distances in ERTMS systems

Electrical properties

- Linear resistance: 36 Ω/km
- Operating voltage: 500 V
- Characteristic impedance: 120 Ω at 100 kHz
- Linear attenuation: < 5 dB/km at 50 kHz

Mechanical and physicochemical properties

- Flexible cable
- Fire performance: NFC 32070.2.1 (flame retardant) and IEC 60332-1
- Operating temperature: 70 ° C
- Mineral oil, liquid fuel and ozone resistant
- Bending radius:
static: 8 x D,
dynamic: 16 x D
- Laid in channels

RANGE OF PRODUCTS

	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Insulated core ø mm	Overall ø mm	Net weight kg/km	Drum type Length m
M1321	2 x	0,5	7 x 0,32	1,9	9,7	97	B 1 000

Other packing on request.



4 CT2242

Buried optical fibre cables Intercity railways Telecommunications

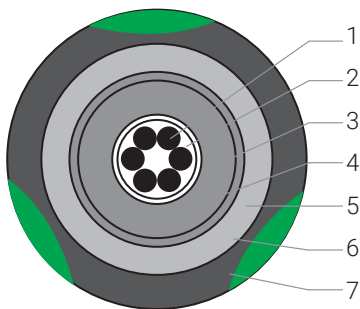
Specification French Railway company CT 2242.V.10 - Specification French Railway company approved

Applications

- Long distance telecom links on optical fibres along railway tracks.
- Cables laid in channels or directly buried.

Product specifications

1. Compact Tube® : 6 or 12 optical fibres under thermoplastic skin
2. Hydrogen dry seal
3. Central Unit: rigid thermoplastic tube
4. Reinforcements: glass yarns
5. Armour: 25/100 corrugated steel armour
6. Final sheath: black high density polyethylene
7. 3 green lines placed at 120 °



BENEFITS +

- Excellent mechanical protection with corrugated steel armour
- Protection against rodents
- Resistance to shocks and crushing

Mechanical and physicochemical properties

- Operating temperature: from -30°C to +70°C
- Installation temperature: from -5°C to +50°C
- Max. laying tension:
 2250 N (from 36 to 144 FO), FO elongation ≤ 0,3%
 2750 N (from 36 to 144 FO), cable elongation ≤ 0,5%, reversible FO elongation
- Crush resistance: 300N /cm
- Minimum bending radius:
 180 mm (up to 36 FO)
 200 mm (72 FO)
 225 mm (144 FO)
- Net weight of the cable:
 182 kg/km (up to 36 FO)
 200 kg/km (72 FO)
 235 kg/km (144 FO)
- Longitudinal sealing according to IEC 60794-1-F5

RANGE OF PRODUCTS

	Fibres number	Distribution	Overall Ø mm	Drum type Length m
N9065	12	2 tubes of 6	13	H 4800 according to CT2242
N9066	36	6 tubes of 6	13	H 4800 according to CT2242
N9067	72	6 tubes of 12	14	H 4800 according to CT2242
N9593	144	12 tubes of 12	15,3	H 4800 according to CT2242

Possible delivery on G drum with 50 mm standard guard to specify when ordering.

Optical fibre specifications available on request.

5

CT2243

Telecommunications – Optical Main Cables Intercity (High-Speed and traditional lines)

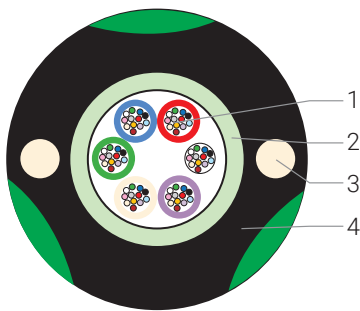
Specification French Railway company CT2243.V.06 of 05/13/2016
Specification French Railway company approved

Applications

- Long-distance cabling of telecom lines along railway tracks.
- Installation in ducts by pulling/blowing.

Product specifications

1. Compact Tube: 6 or 12 optical fibres under thermoplastic skin
2. Strength members: glass yarns
Tightness: water blocking elements
3. Lateral strength members: FRP
4. Black high density polyethylene outer sheath with 3 green lines



BENEFITS +

Compact and robust cable for installations in ducts or gutters

Installation by pulling, air blowing or water porting

CompactTube® dielectric structure up to 144 fibres

Longitudinal sealing

Electrical properties

- Operating temperature: -30 ° C / +70 ° C (6 to 144 FO),
- Application temperature: -5 ° C / +50 ° C
- Maximum laying tension: 2250 N (6 to 72 FO), 2750 N (144 FO)
- Crush resistance: 300 N/cm
- Minimum bending radius: 100mm (6 and 12 FO), 120mm (36 and 72 FO), 180mm (144 FO)
- Net weight of the cable: 83kg/km (12 FO), 98kg/km (36 to 72 FO), 130kg/km (144 FO)
- Longitudinal sealing according to IEC 60794-1-F5

RANGE OF PRODUCTS

	Fibres number	Distribution	Overall Ø mm	Drum type Length m
N9640	6	1 tube of 6	10,9	G 4 800
N8315	12	2 tubes of 6	10,9	G 4 800
N8316	36	6 tubes of 6	11,4	G 4 800
N8317	72	6 tubes of 12	11,4	G 4 800
N8368	144	12 tubes of 12	13,0	H 4 800

Specifications on optical fibres available on request.



ZTP-S

Temporary works cable

Intercity railways – Temporary works cables

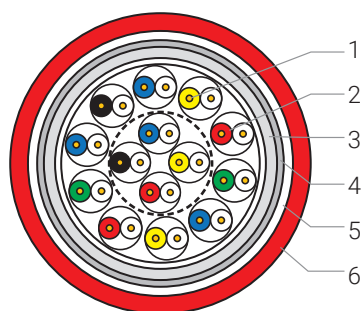
French Railway company CT 457 approved - Specification French Railway company approved

Applications

- Emergency cable or cable used for temporary railway work.
- Replaces temporarily signalling or telephone circuits disconnected during works.
- Quick connection by waterproof plugs (not supplied).

Product specifications

1. Class 5 stranded copper core
2. Coloured polyethylene insulation – pair cabling
3. Inner polyethylene watertight sheath
4. Galvanized steel braid armour
5. Water repellent tape
6. Red unleaded PVC outer jacket + marking + metric



BENEFITS +

All conditions weather- and sun-resistant cable

Electrical properties

- Linear resistance: 19.5 Ω/km
- Operating voltage: 750 V
- Capacitance: < 65 nF/km.

Mechanical and physicochemical properties

- Flexible cable
- Fire performance: NFC 32070.2.1 (flame retardant) and IEC 60332-1
- Operating temperature: 70°C
- Crack, fold, mineral oil, liquid fuel and UV resistant
- Bending radius: Static 4 x D, Dynamic 8 x D
- Laid on the ground

RANGE OF PRODUCTS

	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Overall ø mm	Net weight kg/km	Drum type Length m
L6531	3 p.	1	32 x 0,2	15,6	248	B 500
S1617	7 p.	1	32 x 0,2	18,0	340	C 500
S1618	14 p.	1	32 x 0,2	22,0	587	D 500

Other packing on request.



SV

“Stick” or shunt cables

Intercity railways – Temporary works cables

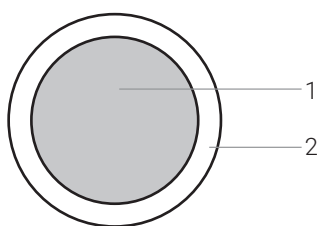
Specification NF F 42-640 approved - French Railway company approved

Applications

- “Stick” cable to connect catenary to the rails in order to allow works on it.
- Connects “stick” head to rail anchoring clamps.
- Other uses: rail shunting to light and maintain signals on red.

Product specifications

1. Stranded red copper core for 60² and tinned copper for 25²
2. Crystal polyurethane outer sheath + marking



BENEFITS +

Transparent insulation/sheath helps to check the conductor's condition

Electrical properties

- Able to drain off a large amount of short-circuit current in case of an accidental power supply reset during works on catenary.

Mechanical and physicochemical properties

- Extra-flexible cable
- Mineral oils and UV resistant
- Mechanical stress resistant

RANGE OF PRODUCTS

	For catenary supplied with	Composition	C.S.A. mm ²	Conductor composition nb x ø mm	Insulated core ø mm	Net weight kg/km	Drum type Length m
M3114	25 kv alt.	1 x	25	800 x 0,2	10,0	265	A 500
U4363	1,5 kv cont.	1 x	60	1911 x 0,2	13,6	605	C 500

Other packing on request.



K23

Signalling Underground railways

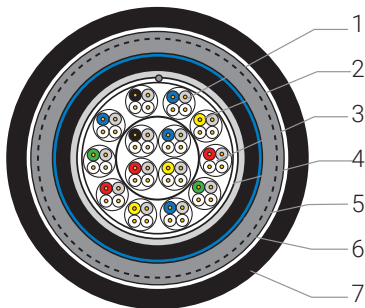
LSOH - NF F 55-623 Standard approved

Applications

- Main signalling, remote control and teletransmission cable, laid in channel, cable trays or on hooks.
- Halogen-free, flame retardant cable laid along underground electrified lines up to 1500 VDC.
- Destination: underground train system.
- Other possible destinations: tunnel or underground sections of the Express Regional System (local trains) and Tramlines.

Product specifications

1. Solid red copper core
2. Coloured polyethylene insulation
3. Quad cabling (except 4p: pair cabling)
4. Alupe tape shield with drain wire
5. LSOH watertight inner sheath
6. Double steel tape armour
7. LSOH coloured outersheath + marking + metric



BENEFITS +

International reference of cables

Fire behaviour and exceptional mechanical properties

Electrical properties

- Linear resistance:
6/10 cores: 64 Ω /km,
10/10 cores: 23 Ω /km,
12/10 cores: 16 Ω /km
- Operating voltage:
6/10 cores: 150 volts,
10/10 cores: 500 volts,
12/10 cores: 750 volts
- Capacities:
1 pair: < 67 nF/km,
4 pairs: < 62 nF/km,
others: < 57,5 nF/km
- Average capacity imbalances for 500 m:
in quad: 90 pF,
between quads or adjacent pairs: 45 pF

Mechanical and physicochemical properties

- Operating temperature: 60°C
- Mineral oil resistant
- Acid and alkaline resistant
- Resists tearing, damage and cracking
- CPR Fire performance : Euroclass B2ca-s1a,d0,a1
- Bending radius: static 8 x D, dynamic 16 x D



K23

Signalling Underground railways

RANGE OF PRODUCTS

	Pairs number	Insulated core ø mm	Overall ø mm	Net weight kg/km	Drum type Length m
6/10 Range					
U3636	2 p.	0,9	9,1	150	A 500
U3637	4 p.	0,9	10,3	175	A 500
U3638	8 p.	0,9	11,9	230	A 500
10/10 Range					
U3656	2 p.	1,8	10,8	210	A 500
U3657	4 p.	1,8	14,1	310	B 500
U3658	8 p.	1,8	17,3	460	D 500
U3659	14 p.	1,8	19,5	610	D 500
U3660	20 p.	1,8	22,8	775	E 500
U3661	28 p.	1,8	25,4	1 020	E 500
12/10 Range					
U3666	1 p.	2,0	11,0	210	A 500
U3667	2 p.	2,0	11,8	245	A 500
U3668	4 p.	2,0	15,4	375	B 500
U3669	8 p.	2,0	18,4	545	C 500
U3670	14 p.	2,0	21,3	745	C 500
U3671	20 p.	2,0	24,3	1 010	D 500
U3672	28 p.	2,0	27,4	1 270	E 500





SRS13

Signal cables for surface networks Urban railways (K23 watertight version)

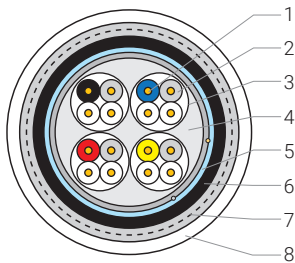
LSOH

Applications

- Main cable for signalling, control and remote transmission for laying on cable trays, in gutters or buried.
- LSOH water tight cable with jelly laid along DC electrified lines up to 1500 Volts.
- Designed to equip the tramway, subway and surface train networks.

Product specifications

1. Solid core copper wire Ø1 or 1.2 mm
2. Coloured polyethylene insulation
3. Star quad cabling (except 4 pair pairs)
4. General assembly with sealing material
5. Alu-Pe tape
6. Black polyethylene sheath
7. Steel armour laid helically
8. LSOH coloured sheath



BENEFITS +

Transverse and longitudinal sealing

K23 cables compatible

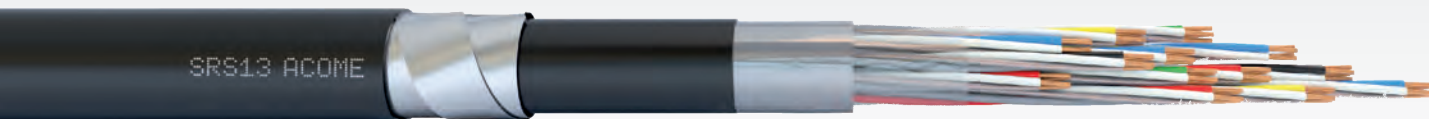
Improved fire behaviour

Electrical properties

- Linear resistance:
10/10 $\leq 23.06 \Omega/\text{km}$, 12/10 $\leq 16.02 \Omega/\text{km}$
- Operating voltage:
10/10 500V 10/12 750V
- Capacity / pair:
 $\leq 62 \text{ nF/km}$ for 4-pair cables
 $\leq 57.5 \text{ nF/km}$ for the other cables
- Average capacity imbalances for 500 m:
In the quad: $\leq 90 \text{ pF}$
Between quads or adjacent pairs $\leq 45 \text{ pF}$

Mechanical and physicochemical properties

- Operating temperature: from -20°C to $+60^\circ\text{C}$
- Minimum bending radius:
static $\geq 8 \times \varnothing$, dynamic $\geq 16 \times \varnothing$
- Mineral oil, acids and bases resistant
- UV, weather and low temperatures resistant
- Fire behaviour:
NF C 32070.2.1 (Non-propagating flame EN60332-1)
- Corrosivity of the combustion gases:
 $\text{pH} \geq 4.3$ (EN 50267-2-2)
- Longitudinal watertightness: H2O penetration $< 3 \text{ cm}$
(NF EN 50289-4-2 method B)



SRS13

Signal cables for surface networks
Urban railways (K23 watertight version)

RANGE OF PRODUCTS

	Number of pairs	Insulated core ϕ mm	Overall ϕ mm	Net weight kg/km	Drum type Length m
10/10 Range					
U4128	2 p.	1,0	12,0	210	B 1 000
U4129	4 p.	1,0	14,6	350	D 1 500
U4130	8 p.	1,0	18,0	480	F 2 000
U4131	14 p.	1,0	23,5	650	D 500
U4132	28 p.	1,0	29,0	1 160	E 500
U4308	56 p.	1,0	38,5	2 045	G 500
U4309	112 p.	1,0	51,5	3 710	H 500
12/10 Range					
U4133	2 p.	1,2	13,7	245	C 1 000
U4134	4 p.	1,2	17,1	415	C 500
U4135	8 p.	1,2	21,5	650	E 1 000
U4136	14 p.	1,2	23,7	900	E 500
U4137	28 p.	1,2	31,0	1 540	F 500
U4310	56 p.	1,2	41,0	2 810	G 500
U4311	112 p.	1,2	54,0	5 150	H 500





T13

Tramway signalling cable Urban railways – Signalling – Main cables

Inside of cable Standard NF F 55-623 - Identical to K23 - Armour NF C 32-050 Standard

Applications

- Main control and transmission cable laid in multitude ducts, under roadways or pavements, alongside 1500 Vdc electrified lines.
- For “rail” or “tyre” tramway lines in own sites.

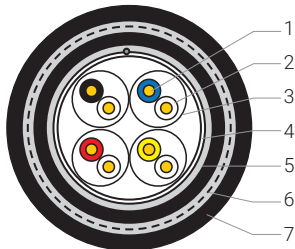
Product specifications

Inside the cable

1. Solid copper core Diameter 10/10 or 12/10
2. Coloured polyethylene insulation
3. Quad cabling (except in 4 pairs: pair cabling)
4. Alu-Pe tape shield with drain wire

Protection

5. Polyethylene internal watertight sheath
6. Armour made of corrugated steel tape laid lengthwise with cover or by double hellicoidal steel tape
7. High density polyethylene outer sheath + marking + metric



BENEFITS +

Transversal watertightness

No halogen component

Electrical properties

- Linear resistance:
10/10: 23.06 Ω /km,
12/10: 16.02 Ω /km
- Operating temperature: 750 Volts
- Capacities:
4 pairs: < 62 nF/km,
others: < 57.5 nF/km
- Average capacity unbalance for 500 m:
in quad: 90 pF,
between quads or adjacent pairs: 45 pF

Mechanical and physicochemical properties

- Operating temperature: 60°C
- Mineral oil, acid and bases resistant
- Resistant to UV, bad weather and low temperatures
- Resistant to injury and cracking
- Bending radius:
Static: 10 x D,
Dynamic: 20 x D
- Excellent friction coefficient for an easy pulling in ducts



T13

Tramway signalling cable Urban railways – Signalling – Main cables

RANGE OF PRODUCTS

	Armouring	Number of pairs	Overall ϕ mm	Net weight kg/km	Drum type Length m
10/10 Range					
U3673	corrugated	2	12,7	185	C 1000
U3674	corrugated	4	16,2	270	B 500
U3675	corrugated	8	19,2	380	C 500
U3676	corrugated	14	21,7	570	C 500
U3677	helicallly	20	22,9	690	D 500
U3678	helicallly	28	25,7	850	D 500
12/10 Range					
U3682	corrugated	2	12,8	200	C 1000
U3683	corrugated	4	16,4	300	B 500
U3684	corrugated	8	19,5	440	C 500
U3685	corrugated	14	22,1	650	D 500
U3687	helicallly	28	27,5	1120	E 500

Other packing on request.

Note: 28p. cables have a double tape steel armour as standard. For the other references, choice between corrugated tape and double hellicoidal tape armour.





Cat.6 100 Ω A K20

Data transmission

Urban railways

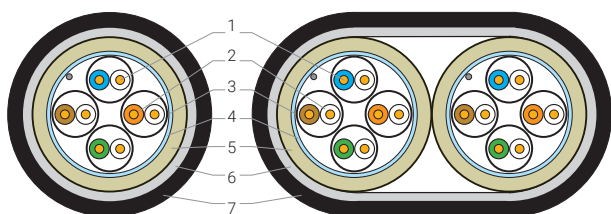
Specification 100 ohms K20 Paris subway (Metro) - Specification Paris subway (Metro) approved

Applications

- Category 6 cable for high-speed data transmission (1 Gbit Ethernet).
- Laid in cable trays, gutters or on hooks in subway, tunnel and underground network infrastructures.

Product specifications

1. Conductor type: solid red copper conductor, Ø 0.560 mm (23AWG)
2. Insulation: coloured polyethylene, Ø 1.45 mm
3. Type of assembly: Alu/Polyester shield on each pair
4. General shielding: Alu/Polyester shield + drain wire
5. Sheath: Halogen-free inner sheath, LSOH
6. Armour: galvanized steel braid
7. Sheath type: LSOH (halogen-free), black outer jacket



Electrical properties

- Conductor resistance $\leq 146.4 \Omega/\text{km}$
- Resistance imbalance $\leq 2\%$
- Dielectric strength: DC 1 kV for 1 minute
- Insulation resistance (500 V) $\geq 5000 \text{ M}\Omega.\text{km}$
- Characteristic impedance at 100 MHz: $100 \pm 5 \Omega$

BENEFITS +

Halogen-free, flame retardant

K20 compliant fire behaviour (Paris subway - Metro)

Protected against rodents

Mechanical and physicochemical properties

- Bending radius:
dynamic (when laying) $\geq 276 \text{ mm}$, $24 \times \text{Ø}$,
static (laid) $\geq 138 \text{ mm}$, $12 \times \text{Ø}$
- Temperature range:
in operation -20°C to $+60^\circ\text{C}$,
at the installation 0°C to $+50^\circ\text{C}$,
transport and storage 0°C to $+50^\circ\text{C}$
- Fire resistance: Euroclass B2ca-s1a,d1,a1
- Opacity smoke emissions 27 m3: NF EN 61034, transmittance $\geq 80\%$

Transmission characteristics at 20° C

	4	20	100	500
• Frequency (MHz)	4	20	100	500
• Max attenuation (dB/100m)	3,6	8	18,1	41,2
• Next (dB)	90	90	85	74
• Return Loss (dB)	26	26	24	18

RANGE OF PRODUCTS

	Composition	Conductor Ø mm	Overall Ø mm	Net weight kg/km	Max tension of installation (N)	Length m	Drum
U4148	4p	0,56	11,5	160	1 400	1 000	B
U4149	2 x 4p	0,56	12,3x21,4	300	1 400	500	B

K209B ACOME

K209B

Halogen-free, flame retardant optical cables Urban railways - Telecommunications

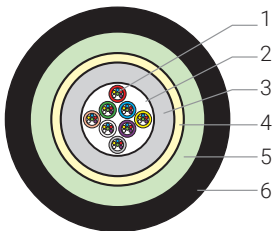
K209B Specification

Applications

- Telecommunications and signalling links using optical fibres in suburban infrastructure.
- Halogen-free, flame retardant cables laid on hooks, pulled through ducts or cable trays with a maximum recommended length of 500 m
- These cables are specially designed for installation in tunnels (road, underground, railway) and to ensure the safety of people in public buildings

Product specifications

1. "Compact Tube": 6 or 12 single mode optical fibres G652 or multimode 50/125 assembled under thermoplastic "peelable" skin
2. Watertightness by water-swelling elements
3. Thermoplastic tube
4. Reinforcements by water-swelling glass yarns
5. Corrugated copolymer steel tape armour
6. Black halogen-free, flame retardant outer jacket interior/exterior



Please contact us for more information about the references associated with this range.

BENEFITS +

Excellent resistance to impact and crushing

Protection against rodents

Installation in tunnels or in establishments open to the public

Mechanical properties

- CPR Fire performance: B2ca-s1a, d1, a1
- Crush resistance: 300 N/cm
- Static bending radius: mini 20 x diameter
- Mineral oil, acid and alkaline resistant
- Operating temperature: from -30°C to +60°C
- Maximum laying tension: from 2000 N to 4000 N according to Fo capacity in the cable



K26

Halogen free, flame retardant coaxial cables Urban railways - Telecommunications

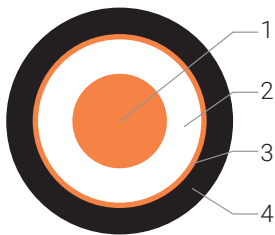
K26 Specification - Specification Paris subway (Metro) approved

Applications

- 50 Ohm RF transmission coaxial cables for GSM antennas.
- HFR cables laid on hooks, pulled through walls or through technical ducts.

Product specifications

1. Conductor:
3/8", 1/2": solid copperclad aluminium
7/8", 1"1/4: copper tube
2. Dielectric: cellular polyethylene
3. Outer conductor:
3/8" XF: copper tape + braid
Other: corrugated copper tape
4. Black HFR outer jacket + marking + metric



BENEFITS +

Extra-flexible XF 3/8 version for connection to antennas

Mechanical and physicochemical properties

- Mineral oil resistant
- Acid and alkaline resistant
- Resists to tearing, injury and cracking
- CPR Fire performance : B2ca-s1 a,d1,a1
- Operating temperature: from -40°C to +85°C
- Laying temperature: from -20°C to +60°C

RANGE OF PRODUCTS

Type of cable	Inner conductor ø mm	Outer conductor ø mm	Overall ø mm	Attenuation at 1000 MHz dB/100 m	Velocity	Net weight kg/km	Drum type Length m
Extra Flexible Version							
M5333Z	3/8" XF	2,76	8,00	10,10	13,00	85	109 500
Flexible Version							
M5322Z	1/2" F	4,80	13,70	16,00	7,28	88	264 500
M5323Z	7/8" F	9,25	24,70	27,40	3,78	90	525 500
M5358Z	1"1/4 F	13,10	35,70	40,00	2,85	88	1 000 500

F = flexible - XF = extraflexible.

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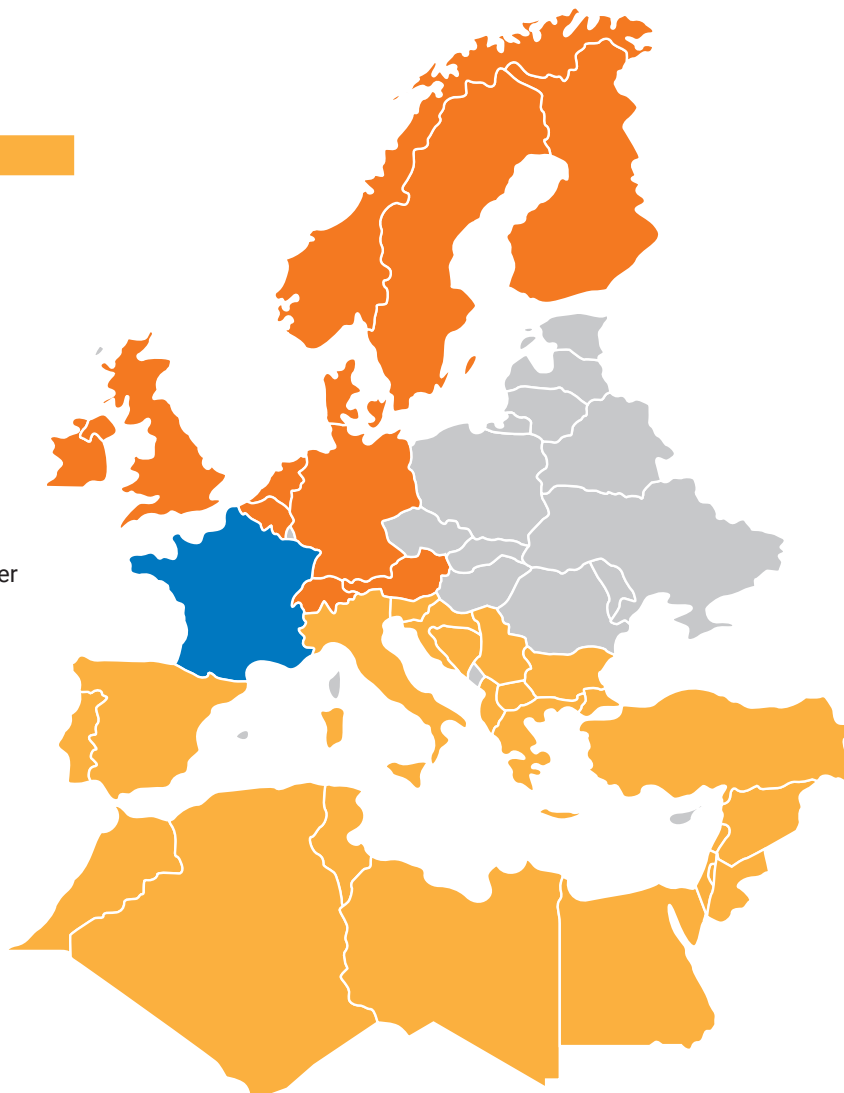
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