Linking the Future

As the worldwide leader in the cable industry, Prysmian Group believes in the effective, efficient and sustainable supply of energy and information as a primary driver in the development of communities.

With this in mind, we provide major global organisations in many industries with best-in-class cable solutions, based on state-of-the-art technology.

Through two renowned commercial brands - Prysmian and Draka - based in almost 50 countries, we’re constantly close to our customers, enabling them to further develop the world’s energy and telecoms infrastructures and achieve sustainable and profitable growth.

For our energy business, we design, produce, distribute and install cables and systems for the transmission and distribution of power at low, medium, high and extra-high voltage.

For telecoms, the Group is a leading manufacturer of all types of copper and fibre cables, systems and accessories for voice, video and data transmission.

Drawing on over 130 years’ experience and continuously investing in R&D, we apply excellence, understanding and integrity to everything we do, meeting and exceeding the needs of our customers across all continents - while at the same time shaping the evolution of our industry.
What links global expertise to the wheels of industry?

High-performing cable solutions to keep the wheels of industry turning

On every continent, in applications that range from rolling stock and vehicles for high-speed trains and urban mass transit lines, to all types of rail transport infrastructure, Prysmian’s specialist cable solutions sit at the heart of significant international projects - supporting the work of major customers, with high-performing, durable and safe technology.

As the world leader in cabling, we draw on global expertise and local presence to work in close proximity with our customers in order to deliver product and service solutions built on workability, customized solutions and effective supply chain, that help them drive the wheels of industry and achieve sustainable growth and profitability.
When George Stephenson’s steam locomotive "The Rocket" emerged as the winner of the Rainhill Race in 1829, with an average speed of 12.5 mph = 20 km/h, no one could predict the triumphant progress the railways would make in the almost 200 year period that followed. Within just a few decades, the railway developed into a broadly integrated transport system, which drastically reduced travel times, and made it possible to develop infrastructure - especially in the New World on the continent of North America. The triumph of the railways began with a 330 km railway line, as early as 1830. Over the next fifty years, the industry grew exponentially and reached almost 370,000 km. Nowadays, the railway infrastructure extends to more than 1.1 million km.

With the advent of civil aviation, the railway lost its role as the main means of transport for middle and long distances, and has long been regarded as outdated, slow and uncomfortable. But in recent years, the railway has experienced a revival. With the introduction of electronic interlocking technology and agreement on a European system for the management and control of railway transport - ERTMS (European Rail Traffic Management System), the rail transport once again plays an important role especially over medium distances. Thanks to a variety of European and other internationally operating system providers in the field of interlocking technology, the ERTMS system, which originated in Europe, has been experiencing an explosive worldwide acceptance over the past few years.

Urbanisation

A major challenge for the railways as a means of mass transport, which is also an unparalleled opportunity, is represented by the increasing urbanisation of the world’s population. In 2013, approximately 51% of the 7 billion people inhabiting the planet resided in an urban environment. By 2050, not only will the world’s population have increased to approximately 9 billion people, but the proportion of people living in cities will have grown to about 70%. Thus, some 6.3 billion inhabitants will reside every day in large cities and be on the move. Car-bound private transport is destined to collapse and a change to rail-based transportation is therefore, without rival.

Tram and metro systems as well as regional trains and light rail vehicles will interconnect the cities into low-emission zones. Megacities are already in planning, such as the Chinese project “Turn The Pearl Delta Into One”, in which nine cities with a total of 42 million people are to be merged into a single city. The most modern railway systems will form the backbone of this metropolis. A total of 29 lines with a network of altogether 1500 km will service the region and allow transit times of maximum one hour from one end of town to the other.
The safety requirements for the railway technology are extraordinary and similar to that in aviation or aerospace. With increasing traffic volume in both directions on single track lines, continuous monitoring which provides permanent communication between the train conductor’s cab and the railway control center is essential for the railway line safety. The rail vehicles cannot leave their track in case of imminent collision by opposing traffic on the same track.

In Europe, there has been a number of train control technologies that worked well within the country borders, but, led to considerable additional costs in the cross-border traffic. Currently, locomotives have more than one train control system installed, which ensure safe participation in railway traffic in neighboring countries without the need to change the locomotive.

Research aimed at reducing the number of systems and develop a uniform operational management approach for railways across Europe already started in the 80’s on behalf of the International Union of Railways (UIC) and the European Rail Research Institute (ERRI). In April 2000, the guidelines for adopting specifications were presented under the name ERTMS - European Rail Traffic Management System.

The ERTMS system mainly consists of the following components:

- **ETCS (European Train Control System)** is a train control system, which is intended to prevent a train entering an occupied sector, or running at too high speed, using interlocking electronic control systems, with integrated train and trackside elements.

- **GSM-R (Global System for Mobile Communications - Railway)** is a mobile communications system for railway data and voice communications between moving trains and fixed locations, designed to satisfy the highest safety standards.

ERTMS was initially developed for intercity trains on routes of Trans-European Networks (TEN), but is gaining worldwide attention and it is being implemented outside Europe as well.

Another well recognized railway technology is **CBTC - Communication Based Train Control system**. CBTC systems are commonly used for urban rail traffic such as underground railways, light rail vehicles and trams, in urban areas with short transportation systems.

Both ETCS and CBTC systems are based on the same principles, namely high safety level in highly dense traffic. However, CBTC goes one step further and offers fully automated train operation. The train starts and stops automatically without a driver.

Even though CBTC complies with international standards the systems of each individual developer are not freely replaceable. The implementation of CBTC is highly complex and significantly more expensive than ERTMS on comparable routes. However, CBTC is unbeatable when it comes to achieving the shortest possible intervals between trains, down to 60-90 seconds. During the peak morning and evening periods, thousands of commuters can be comfortably transported and hence the streets can be relieved of congestion.
Prysmian Group has accompanied this development from the outset and today is able to offer a full range of cables for all applications in the railway sector.

Prysmian Group has the experience and the know-how to assist you and your projects worldwide.

Railway projects are unique!
Railway Main Line Cables
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Railway Main Line Cables

Cables for any application

Cables for rolling stock

Cables for track feeder
Cables for point machines
Cables for light signals
Cables for axle counters
As the leading worldwide supplier, Prysmian Group offers an extensive range of cabling solutions for different railway network applications.

Typical cable applications for main railway lines include:

**Substations and Transformers**
- HV cables to substations for traction power
- MV cables to transformers for power distribution networks

**Traction Tower Networks**
- MV cables for AC systems
- MV and LV cables for DC systems

**Railway Network Systems**
- MV and LV cables to distribute current to control and telecommunication systems, lighting, heating and real estate along the railway.

**Grounding of Electrical Systems**
- Bare conductors or insulated cables to guarantee the integrity of electrical systems.

**Overhead Catenary Lines**
- Cables to supply electric power to railway trains and to make them move.

**Control and Signalling Systems**
- Cables to cover a wide range of control and signalling applications to direct trains and keep trains clear of each other.

**Mobile Communication Systems (GSM-R)**
- Data and fiber optic cables for railway data and voice communication between moving trains and fixed locations.
Railway Main Line Cables
**Explanation of symbols**

- **Conductor temperature**
  Max. conductor temperature °C in continuous operation.

- **Flexible installation**
  Due to IEC 60228 class 5 multi-standed conductor.

- **Smoke density**
  Smoke propagation acc. to EN/IEC 61034.

- **Halogen free**
  Halogen free acc. to EN/IEC 60754-1 and EN/IEC 50267-1.

- **Acidity**
  Corrosivity acc. to EN/IEC 60754-2.

- **Fire retardant**

- **Screened or armoured**
  With either copper, aluminum or steel wire, foil and tape.

- **Fire resistant**
  Fire resistant acc. to EN/IEC 60331-1 & 2.

- **UV resistant**
  Filling and or outer sheath suitable for outdoor application.

- **EMC resistant**
  Fulfills EMC-directive with 100% dense screen with low coupling impedance.

- **Impact resistant**
  Against shocks.

- **Pull resistant**
  High tensile stress required to create cable failure.

- **Weather proof**

- **Watertight or proof**
  Axial and radial water blocking via water swellable tape or yarn.
## Index of data sheets

### 1 Electrification of Main Line

#### 1.1 Traction power network

- **Cables to feed traction power networks**
  - AL, water proof: AXL-J-TTCL (TSLF) 36 kV
  - AL, flame retardant: AXQ-J-TT (TSLI) 36 kV
  - AL, screened: AHCMK 52 kV

#### 1.2 Railway network system

- **Current distribution from transformer to different railway network systems**
  - CU, flexible, class D: ACEFLEX PURE 1 kV
  - AL, screened, class C: AXPK-PLUS 1 kV
  - CU, PVC, class E: MCMK 1 kV
  - CU, screened, class D: AXQ-J-EMC PURE 1 kV
  - AL, screened, class E: AXCMK-PLUS 1 kV
  - AL, screened, class C: AXCMK-HF-C-PRO 1 kV
  - AL, PVC, class E: AMCMK 1 kV
  - AL, PVC: AXCK 1 kV
  - AL, rubber: NSGAFÖU 1.8/3 kV
  - AL, PVC sheath: AXCMK 1.8/3 kV
  - AL, water proof: AXL-J-TT 12 kV
  - AL, water proof: AXL-J-TT 24 kV

#### 1.3 Grounding and inter-connection

- **Grounding of metal part of electrical systems and connection cables**
  - Annealed copper: HK
  - Hard drawn copper: KK
  - PVC insulated, class E: ML
  - PVC insulated, class E: MKEM 90
  - PVC insulated, class E: MK90
  - PVC insulated, class E: H07V-K
  - PVC insulated, class E: H07V-R

#### 1.4 Accessory

- **For LV and MV systems**
  - Multi-connector: FORMFIT 12-36 kV
  - Tee connector: ELASCON 12-36
  - Joint: SIXTY-SPEED 72.5 kV
  - Termination: COLDFIT 72.5 kV
  - Joint: ECOSPEED 24-36 kV
  - Joint: ELASPEED 12-36 kV

### 2 Overhead Catenary Line

#### 2.1 Catenary contact wire

- Pure copper: TRL
- Copper-silver alloy: TRL CuAg

#### 2.2 Catenary wire

- Stranded alloyed: KK Bz-II 50 mm²
- Stranded alloyed: KK Bz-II 10 mm²
- Stranded alloyed: KKM Bz-II 10 mm²

#### 2.3 Dropper

#### 2.4 Return wire

- Aluminium: AAC
- Aluminium & steel: ACSR
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- Balise, armoured: A-2YOF(L)2YB2Y [Page 60]
- Balise & axle counter: AJ-2YOF(L)2YDB2Y [Page 62]
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**3.2 Control**
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- EMC screened, FR: MCCMO-HF C-PRO 450/750 V [Page 73]
- HF: MKMO-HF C-PRO 450/750 V [Page 74]
- Screened, PE sheath: MCMOE-PE 450/750 V [Page 75]
- PVC insulation, FR: MMO 450/750 V [Page 76]

#### 4 Communication

**4.1 Along the track**
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- Direct buried/duct: FYOVD2PMU [Page 79]
- Direct buried/duct: FTMVDMSU [Page 80]
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- 19” universal: ORP 250 Distribution Panel [Page 93]
- IP68: XIK Joint Closure [Page 94]
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Many more cable types and tailor-made cables are available for your individual application.
### Application
Single core distribution cable suitable for installation outdoors in soil, air and water. Outer sheath of semi-conductive material enables electrical testing of the sheath and detection of sheath damage. For indoor installation the cables must be painted with fire retardant paint or laid in a duct.

### Technical data
- **Rated voltage:**
  - 18/30 (36) kV
- **Test voltage:**
  - Max 170 kV
- **Bending radius:**
  - During installation: 15 x D
  - Fixed: 10 x D
  - Ploughed down: 8 x D
- **Temperature range:**
  - Max. conductor temperature: +90°C
  - Short circuit temperature: +250°C
  - Lowest temp. at installation: -20°C
  - Below 0°C exercise caution

### Standard & Directive
- SS 424 14 16
- HD 620 part 10, section K and M

### Construction
- **Conductor:**
  - Round aluminium wires
  - Compacted and stranded
  - Acc. to IEC 60228 class 2.
  - Longitudinal watertight
- **Conductor screen:**
  - Extruded semi-conductive
- **Insulation:**
  - XLPE, min. thickness 7.1 mm
- **Insulation screen:**
  - Extruded, bonded
- **Longitudinal water blocking:**
  - Semi-conductive water swelling tape
- **Screen:**
  - Concentrically applied
  - Annealed copper wires
  - Aluminium tape - 100% coverage
- **Radial water blocking:**
  - Aluminium-PE laminate, fixed
  - Bonded to sheath
- **Rip cord:**
  - Kevlar
- **Outer sheath:**
  - PE, transparent
  - UV resistant
- **Conductive layer:**
  - Semi-conductive
  - Double extruded
  - Black

### Content
Content is subject to changes acc. to current product development and or any changes to standards.

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1. Electrification of main lines

TRACTION POWER NETWORK

AXQJ-TT (TSLI) 36 kV

FLAME RETARDANT & WATER PROOF

Application
Halogen free and flame retardant distribution cable for indoor use in 3-phase installations. Can be placed in pipes or directly in the ground. The cable is radially and axial waterproof.

Technical data
Rated voltage:
> 18/30 (36) kV AC
Test voltage:
> 125 kV AC
Bending radius:
> During installation: 15 x D
> Fixed: 10 x D

Temperature range
> Max. conductor temperature: +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -20°C
> Below 0°C exercise caution

Standard & Directive & Approval
Standard:
> HD 620 part 10 section K and M
> HD 604 halogen free sheath
Directive:
> Fulfills RoHS and REACH
Approval:
> CPR class: Dca-s2d2a2

Construction
Conductor:
> Round aluminium wires
> Compacted and stranded
> Acc. to IEC 60228 class 2.
> Longitudinal watertight
Conductor screen:
> Extruded semi-conductive
Insulation:
> XLPE, min. thickness 7.1 mm
Insulation screen:
> Extruded
> Bonded
Longitudinal water blocking:
> Semi-conductive water swelling tape
Screen:
> Concentrically applied
> Annealed copper wires
Radial water blocking:
> Aluminium/PD laminate, fixed

Outer sheath:
> Halogen free polymer
> Fire retardant
> Black

Material property
> Flame retardant: EN 60332-3-24
> Halogen free: IEC 60754-1
> Acidity: EN 60754-2
> Smoke density: EN 60134

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Content is subject to changes acc. to current product development and or any changes to standards.
Application
Single core distribution cable for outdoor installation in pipes, directly in the ground or for ploughing down.

Technical data
Rated voltage:
- 26/45 (52) kV

Phase induction:
- In trefoil: 0.37 mH/km
- Flat: 0.56 mH/km

Operating capacitance:
- 0.22 μF/km

Thermal short-circuit current:
- For phase conductor: max. 28.3 kA
- For metallic screen: max. 6.9 kA

Bending radius:
- Min. 0.76 m

Temperature range
- Max. conductor temperature: +90°C
- Short circuit temperature: +250°C

Standard
- IEC 60840
- IEC 60228

Construction
Conductor:
- Round aluminium wires
- Compacted and stranded
- Nom. diameter 20.3 mm
- DC resistance at 20°C max. 0.1 Ω/km

Conductor screen:
- Semi-conductive copolymer compound

Insulation:
- XLPE compound
- Nom. thickness 9.0 mm

Insulation screen:
- Semi-conductive copolymer compound

Wrapping:
- Semi-conductive creped paper tape

Screen:
- Helix of copper wires
- Counter helix of copper contact tape

Binder tape:
- PA tape

Outer sheath:
- HDPE compound
- Black

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1. Electrification of main lines

RAILWAY NETWORK SYSTEM

ACEFLEX PURE 0.6/1 kV
FLEXIBLE & HALOGEN FREE - CPR CLASS D

Application
Halogen free and low smoke installation cable with high flexibility and low bending radius. Suitable for installation in machines and factories either in cable pipes, trays or cabinets. The insulation is not UV resistant and must be protected against sun and artificial light.

Technical data
Rated voltage:
> 0.6/1 kV
Test voltage:
> 3,500 kV
Bending radius:
> 5 x D

Temperature range
> Max. conductor temperature: +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -20°C

Standard & Directive & Approval
Standard:
> Cenelec UNE 21123-4
> IEC 60502-1, EN 50575
Directive:
> Fulfills LVD, RoHS & REACH
Approval:
> CPR class: Dca, s2d2a2

Construction
Conductor:
> Round copper wires
> Multi-stranded
> Acc. to IEC 60228 class 5.
Insulation:
> XLPE
Core colouring:
> 3-core: Green/yellow, blue, brown
> 4-core: Green/yellow, brown, black, grey
Outer sheath:
> Halogen free polymer
> Black

Material property
> Flame retardant: IEC 60332-3-24 cat. 3
> Halogen free: IEC 60754-1
> Acidity: IEC 60754-2
> Smoke density: IEC 61034

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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<tr>
<td>3 G 1.5</td>
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<td>20217122</td>
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<td>5 G 6</td>
<td>14.8</td>
<td>444</td>
<td>500</td>
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<td>5 G 10</td>
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Content is subject to changes acc. to current product development and or any changes to standards.
**RAILWAY NETWORK SYSTEM**

**AXPK-PLUS 0.6/1 kV**

**XLPE INSULATED & HALOGEN FREE - CPR CLASS E**

**Application**
Halogen free and flame retardant power cable for fixed installation indoors in buildings or outdoors directly in the ground or ploughed down. Not suitable for installations with severe electrical interference.

**Technical data**
- **Rated voltage:** 0.6/1 (1.2) kV
- **Test voltage:** 4,000 V AC
- **Bending radius:**
  - During installation: 12 x D
  - Fixed: 8 x D
- **Pulling force:**
  - With grip: max. 15 N/mm²
  - With eye: max. 50 N/mm²

**Temperature range**
- Max. conductor temperature: +90°C
- Short circuit temperature: +250°C
- Lowest temp. at installation: -20°C
- Below 0°C exercise caution

**Standard & Directive & Approval**
- **Standard:**
  - SFS 4879
  - IEC 60502-1
- **Directive:**
  - Fulfills RoHS and REACH
- **Approval:**
  - CPR class: Eca

**Material property**
- Halogen free: IEC 60754
- Flame retardant: IEC 60332-1-2
- Smoke density: EN 60134

**Construction**
- **Conductor:**
  - Round aluminium wires
  - Stranded and annealed
  - 25 mm²: Compacted
  - 35-300 mm²: Compacted and sector shaped
- **Insulation:**
  - XLPE compound
  - Halogen free
- **Core colours:**
  - 4-core: yellow/green, brown, black, grey
- **Wrapping:**
  - Plastic tape
- **Rip cord:**
  - Kevlar
- **Outer sheath:**
  - PE compound
  - Halogen free
  - UV resistant
  - Black

**Conductor cross-section**

<table>
<thead>
<tr>
<th>Conductor cross-section</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating at 90°C in free air A</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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<tbody>
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<td>1500</td>
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<td>4 G 50</td>
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<td>820</td>
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1. Electrification of main lines

RAILWAY NETWORK SYSTEM

MCMK 0.6/1 kV

PVC INSULATED & SCREENED - CPR CLASS E

Application
Halogen free, flame retardant and screened power cable for fixed installation indoors in buildings or outdoors directly in the ground, water or ploughed down. Also suitable for switchgear and explosive areas. Not suitable for installations with severe electrical interference.

Technical data
- Rated voltage: 0.6/1 (1.2) kV
- Test voltage: 4,000 V AC
- Bending radius: during installation 12 x D
- Bending radius: fixed 8 x D

Temperature range
- Max. conductor temperature: +70°C
- Short circuit temperature: +160°C
- Lowest temp. at installation: -15°C
- Below 0°C exercise caution

Standard & Directive & Approval
Standard:
- SFS 4880
- HD 603-3F
- IEC 60502-1

Directive:
- Fulfills RoHS and REACH

Approval:
- CPR class: Eca

Construction
Conductor:
- Round copper wires
- Annealed
- 1.5-6 mm²: solid
- 10-16 mm²: stranded

Insulation:
- PVC compound
- Lead free

Core colours:
- 2-core: blue, brown
- 3-core: blue, brown, black
- 4-core: blue, brown, black, grey

Filler:
- Lead free compound

Screen:
- Helix of copper wires
- Counter helix of copper tape

Outer sheath:
- PVC compound
- Lead free
- Black

Material property
- Flame retardant: IEC 60332-1 & 3

Conductor cross-section mm² | Outer diameter mm | Weight kg/km | Current rating at 70°C in free air A | Standard length m | Prysmian article no.
--- | --- | --- | --- | --- | ---
2 x 1.5/1.5 | 12 | 170 | 15 | 1000 - K8 | 0602122
2 x 2.5/2.5 | 13 | 220 | 20 | 1000 - K8 | 0602123
2 x 6/6 | 17 | 400 | 34 | 500 - K8 | 0602125
2 x 10/10 | 20 | 610 | 67 | 500 - K9 | 0602126
3 x 1.5/1.5 | 12 | 190 | 14 | 1000 - K8 | 0602152
3 x 2.5/2.5 | 13 | 250 | 19 | 1000 - K8 | 0602153
3 x 6/6 | 17 | 470 | 31 | 500 - K5 | 0602155
3 x 10/10 | 20 | 710 | 63 | 500 - K9 | 0602156
3 x 16/16 | 23 | 1000 | 85 | 500 - K11 | 0602157
4 x 1.5/1.5 | 13 | 220 | 14 | 1000 - K8 | 0602172
4 x 2.5/2.5 | 14 | 290 | 19 | 1000 - K9 | 0602143
4 x 6/6 | 19 | 550 | 31 | 500 - K8 | 0602145
4 x 10/10 | 22 | 840 | 63 | 500 - K11 | 0602146
4 x 16/16 | 25 | 1,200 | 85 | 500 - K11 | 0602147

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RAILWAY NETWORK SYSTEM

MCMK-HF C-PRO 0.6/1 kV
HALOGEN FREE & SCREENED - CPR CLASS C

Application
Halogen free, flame retardant and screened power cable for fixed installation indoors in buildings or outdoors directly in the ground, water or ploughed down. Also suitable for switchgear and explosive areas. Not suitable for installations with severe electrical interference.

Technical data
- Rated voltage: 0.6/1 (1.2) kV
- Test voltage: 4,000 V AC
- Bending radius: fixed 8 x D
- Bending radius: during installation 12 x D
- Bending radius: ploughed down 8 x D

Temperature range
- Max. conductor temperature: +90°C
- Short circuit temperature: +250°C
- Lowest temp. at installation: -15°C
- Below 0°C exercise caution

Standard & Directive & Approval
Standard:
- SFS 5546
- IEC 60502-1
- EN 13501-6

Directive:
- Fulfills RoHS and REACH

Approval:
- CPR class: Cca-s1,d1,a1

Construction
Conductor:
- Round copper wires
- Annealed and stranded
- 25-35 mm²: Round
- 50-300 mm²: Compacted and sector shaped

Insulation:
- XLPE
- UV resistant

Core colours:
- 4-core: brown, black, grey, blue

Filler:
- Halogen free, extruded

Screen:
- Helix of copper wires
- Counter helix of copper tape

Outer sheath:
- Polymer
- Halogen free
- Black

Material property
- Halogen free: IEC 60754
- Flame retardant: IEC 60332-1-2
- Flame retardant: IEC 60332-3
- Smoke density: EN 60134

Conductor cross-section

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating at 90°C in free air A</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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</thead>
<tbody>
<tr>
<td>4 x 25/16</td>
<td>24</td>
<td>1,400</td>
<td>135</td>
<td>500 - K11</td>
<td>0602021</td>
</tr>
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<td>4 x 35/16</td>
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<td>1,800</td>
<td>165</td>
<td>500 - K12</td>
<td>0602023</td>
</tr>
<tr>
<td>4 x 50/25</td>
<td>29</td>
<td>2,400</td>
<td>200</td>
<td>500 - K12</td>
<td>0602024</td>
</tr>
<tr>
<td>4 x 70/35</td>
<td>33</td>
<td>3,300</td>
<td>250</td>
<td>500 - K14</td>
<td>0602025</td>
</tr>
<tr>
<td>4 x 95/50</td>
<td>38</td>
<td>4,500</td>
<td>310</td>
<td>500 - K16</td>
<td>0602026</td>
</tr>
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<td>4 x 120/70</td>
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<td>5,700</td>
<td>360</td>
<td>500 - K20</td>
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<tr>
<td>4 x 150/70</td>
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<td>6,850</td>
<td>410</td>
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<td>4 x 185/95</td>
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<td>8,650</td>
<td>470</td>
<td>500 - K24</td>
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<td>4 x 240/120</td>
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<td>11,500</td>
<td>560</td>
<td>500 - K24</td>
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<td>4 x 300/150</td>
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<td>13,900</td>
<td>640</td>
<td>500 - K26</td>
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</tr>
</tbody>
</table>

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1. Electrification of main lines

RAILWAY NETWORK SYSTEM

AXQJ-EMC PURE 0.6/1 kV
HALOGEN FREE & EMC SCREENED - CPR CLASS D

Application
EMC shielded power cable with aluminum conductor. Halogen free, flame retardant and self-extinguishing in case of fire. For fixed installation indoors and outdoors, in pipes, soil or water. Also for explosive environments. Can be ploughed down with caution. The copper screen has 100% coverage with low coupling impedance that fulfills the EMC-Directive when properly installed.

Technical data
Rated voltage:
> 0.6/1 kV
Test voltage:
> 4,000 kV
Bending radius:
> During installation: 12 x D
> Fixed: 8 x D
> Ploughed down: 8 x D

Temperature range
> Max. conductor temperature: +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -20°C

Standard & Directive & Approval
Standard:
> Cenelec HD 604-5D
Directive:
> Fulfills RoHS & REACH
Approval:
> CPR class: Dca, s2d2a2

Construction
Conductor:
> Round annealed aluminium wires
> 25 mm²: round.
> 50-240 mm²: stranded, compacted and sector shaped

Core colouring:
> 3-core: brown, black, grey
> 4-core: brown, black, grey, blue

Wrapping:
> Tape
> Halogen free

Screen:
> Copper foil with overlap - 100% coverage
> Counter helix of copper wires

Outer sheath:
> Halogen free compound
> Black

Material property
> Flame retardant: IEC 60332
> Halogen free: IEC 60754-1
> Acidity: IEC 60754-2
> Smoke density: IEC 61034

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Drum size</th>
<th>Prysmian article no.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>500</td>
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<td>500</td>
<td>K11</td>
<td>0022930</td>
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<td>3 x 95/29</td>
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<td>1,530</td>
<td>500</td>
<td>K14</td>
<td>0022950</td>
</tr>
<tr>
<td>3 x 150/41</td>
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<td>400</td>
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<td>0023110</td>
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</table>

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RAILWAY NETWORK SYSTEM

FXQJ-EMC PURE 0.6/1 kV
HALOGEN FREE & EMC SCREENED - CPR CLASS C & D

Application
EMC shielded power cable with copper conductor. Halogen free, flame retardant and self-extinguishing in case of fire. Applicable as power cable for fixed installation indoors and outdoors, in pipes, ground or water as well as in switchgear and explosive environments. Can with caution be ploughed down.

Technical data
> Rated voltage: 0.6/1 kV
> Test voltage: 4,000 V

Bending radius:
> Fixed installation 8 x D
> During installation 12 x D
> Ploughed down: 8 x D

Temperature area
> Max. conductor temperature: +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -20°C
> Below 0°C exercise caution

Standard & Direktive & Approval
Standard:
> Cenelec HD 604-5D

Direktive:
> Fulfills RoHS & REACH

Approval:
> CPR: Cca-s1d1a1 ≤ 16 mm²
> CPR: Dca-s2d2a2 ≥ 25 mm²

Construction
Conductor:
> Round copper wires
> 1.5-35 mm²: round
> 50-240 mm²: stranded, compacted and sector shaped

Insulation:
> XLPE

Core colouring:
> 3-core: brown, black, grey
> 4-core: brown, black, grey, blue

Wrapping:
> Halogen free tape

Screen:
> Copper foil with overlap - 100% coverage
> Counter helix of copper wires

Outer sheath:
> Halogen free compound
> Black

Material characteristics
> Flame retardant: IEC 6332-1 & 3
> Halogen free: IEC 60754-1
> Smoke density: IEC 61034-1,2
> Acidity: IEC 60754-2

<table>
<thead>
<tr>
<th>Conductor cross section mm²</th>
<th>Outer diameter mm</th>
<th>Weight Kg/km</th>
<th>Standard delivery m</th>
<th>Drum size</th>
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<td>49.9</td>
<td>8387</td>
<td>500</td>
<td>K22</td>
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</table>
RAILWAY NETWORK SYSTEM

AXCMK-PLUS 0.6/1 kV
HALOGEN FREE & SCREENED - CPR CLASS E

Application
Halogen free and screened power cable for fixed installation indoors in buildings or outdoors directly in the ground or ploughed down. Can also temporarily be installed in water. Not suitable for installations with severe electrical interference.

Technical data
Rated voltage:
  > 0.6/1 (1.2) kV
Test voltage:
  > 4,000 V AC
Bending radius:
  > During installation 12 x D
  > Fixed 8 x D

Temperature range
  > Max. conductor temperature: +90°C
  > Short circuit temperature: +250°C
  > Lowest temp. at installation: -20°C
  > Below 0°C exercise caution

Standard & Directive & Approval
  > Standard: SFS 4879, IEC 60502-1
  > Standard: HD 603-5D, IEC 60502-1
  > Directive: Fulfills RoHS and REACH
  > Approval: CPR class: Eca

Construction
Conductor:
  > Round aluminium wires
  > Annealed and stranded
  > Compact
  > 25 mm²: Round
  > 50–185 mm²: Sector shaped
Insulation:
  > XLPE compound
Core colours:
  > 4-core: blue, brown, black, grey
Wrapping:
  > Plastic tape
Screen:
  > Helix of copper wires
  > Counter helix of copper tape
Outer sheath:
  > Halogen free compound
  > Flame retardant
  > Black

Material property
  > Halogen free: IEC 60754
  > Flame retardant: IEC 60332-1
  > Smoke density: EN 60134

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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</thead>
<tbody>
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<td>29</td>
<td>1,100</td>
<td>1000</td>
<td>0621802</td>
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<td>4 x 95/29</td>
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<td>4 x 185/57</td>
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<td>3,600</td>
<td>1000</td>
<td>0621807</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Bending radius - fixed min. mm</th>
<th>DC resistance of PE-conductor at 20°C max. Ω/km</th>
<th>Current rating at 90°C in free air A</th>
<th>Short circuit current - conductor kA</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 x 25/16</td>
<td>0.22</td>
<td>1.15</td>
<td>105</td>
<td>2.3</td>
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<tr>
<td>4 x 50/16</td>
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<td>1.15</td>
<td>165</td>
<td>4.7</td>
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<tr>
<td>4 x 95/29</td>
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<td>0.641</td>
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</tr>
<tr>
<td>4 x 150/41</td>
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<td>0.443</td>
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<td>365</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
RAILWAY NETWORK SYSTEM

AXCMK-HF C-PRO 0.6/1 kV
HALOGEN FREE & SCREENED - CPR CLASS C

Application
Halogen free and screened power cable for fixed installation indoors in buildings or outdoors directly in the ground or ploughed down. Can also temporarily be installed in water. Not suitable for installations with severe electrical interference.

Technical data
Rated voltage: > 0.6/1 (1.2) kV
Test voltage: > 4,000 V AC
Bending radius:
> During installation 12 x D
> Fixed 8 x D

Temperature range
> Max. conductor temperature: +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -15°C
> Below 0°C exercise caution

Standard & Directive & Approval
Standard:
> SFS 5546
> IEC 60502-1

Directive:
> Fulfills RoHS and REACH

Approval:
> CPR class: Cca-s1d1a1

Construction
Conductor:
> Round aluminium wires
> Annealed and stranded
> Compacted
> 25 mm²: Round
> 50 - 185 mm²: Sector shaped

Insulation:
> XLPE compound
> UV resistant

Core colours:
> 4-core: blue, brown, black, grey

Wrapping:
> Plastic tape

Screen:
> Helix of copper wires
> Counter helix of copper tape

Outer sheath:
> Halogen free compound
> Flame retardant
> Black

Material property
> Halogen free: IEC 60754-1
> Flame retardant: IEC 60332-1 & 3
> Smoke density: EN 60134
1. Electrification of main lines

RAILWAY NETWORK SYSTEM

AMCMK 0.6/1 kV
PVC INSULATED & SCREENED - CPR CLASS E

Application
Halogen free, flame retardant and screened power cable for fixed installation indoors in buildings or outdoors directly in the ground, water or ploughed down. Also suitable for switchgear and explosive areas. Not suitable for installations with severe electrical interference.

Technical data
- Rated voltage: 0.6/1 (1.2) kV
- Test voltage: 4,000 V AC
- Bending radius: during installation 12 x D
- Bending radius: fixed 8 x D

Temperature range
- Max. conductor temperature: +70°C
- Short circuit temperature: +160°C
- Lowest temp. at installation: -15°C
- Below 0°C exercise caution

Standard & Directive & Approval
Standard:
- SFS 4880
- HD 603-3F
- IEC 60502-1

Directive:
- Fulfills RoHS and REACH

Approval:
- CPR class: Eca

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating at 70°C in free air A</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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<tbody>
<tr>
<td>3 x 16/10</td>
<td>20</td>
<td>460</td>
<td>64</td>
<td>1000 - K12</td>
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<td>680</td>
<td>83</td>
<td>1000 - K14</td>
<td>0622158</td>
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<td>3 x 50/16</td>
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<td>975</td>
<td>125</td>
<td>500 - K12</td>
<td>0622160</td>
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<td>3 x 95/29</td>
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<td>1,750</td>
<td>190</td>
<td>500 - K14</td>
<td>0622162</td>
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<td>3 x 150/41</td>
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<td>2,550</td>
<td>250</td>
<td>500 - K18</td>
<td>0622164</td>
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<td>46</td>
<td>3,200</td>
<td>285</td>
<td>500 - K20</td>
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<td>3 x 240/72</td>
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<td>4,050</td>
<td>330</td>
<td>500 - K22</td>
<td>0622166</td>
</tr>
<tr>
<td>3 x 300/88</td>
<td>48</td>
<td>5,000</td>
<td>380</td>
<td>500 - K24</td>
<td>0622167</td>
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<td>4 x 16/10</td>
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<td>64</td>
<td>1000 - K14</td>
<td>0621854</td>
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<td>4 x 25/16</td>
<td>27</td>
<td>820</td>
<td>83</td>
<td>1000 - K16</td>
<td>0621855</td>
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<td>125</td>
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<td>500 - K18</td>
<td>0621862</td>
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<tr>
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<td>3,150</td>
<td>250</td>
<td>500 - K20</td>
<td>0621864</td>
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<td>4 x 240/72</td>
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<td>500 - K24</td>
<td>0621866</td>
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<td>4 x 300/88</td>
<td>66</td>
<td>6,300</td>
<td>380</td>
<td>500 - K24</td>
<td>0621867</td>
</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
RAILWAY NETWORK SYSTEM

AXCK 0.6/1 kV
SCREENED & PVC INSULATION

Application
Single core screened and PVC insulated power cable for fixed installation indoors or outdoors directly in the ground or ploughed down.

Technical data
Rated voltage:
> 0.6/1 kV
Test voltage:
> 4,000 V
Bending radius:
> Min. 0.66 mm

Temperature range
> Max. conductor temperature: +70°C
> Short circuit temperature: +160°C
> Lowest temp. at installation: -15°C
> Below 0°C exercise caution

Standard
> IEC 60502-1

<table>
<thead>
<tr>
<th>Conductor cross-section (mm²)</th>
<th>Outer diameter (mm)</th>
<th>Weight (kg/km)</th>
<th>Standard length (m)</th>
<th>Prysmian article no.</th>
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<tr>
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RAILWAY NETWORK SYSTEM

NSGAFÖU 1.8/3 kV
OIL RESISTANT RUBBER CABLE

Application
Oil resistant rubber cable suitable for installation indoors and outdoors in pipe, trays, inside walls, in closed electrical circuits or boards with up to 1000 V.

Technical data
Rated voltage:
> 1.8/3 kV
Test voltage:
> 6,000 V AC

Temperature range
> Max. conductor temperature: +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -40°C
> Below 0°C exercise caution

Standard & Approval
Standard:
> DIN VDE 0250-602
> EN 60228
> IEC 602811-2-1
Approval:
> VDE

Conductor
Round
Aluminium wires
Tinned
Multi-stranded
Acc. to IEC 60228 class 5.

Insulation:
ERP rubber
Type 3G13 DIN VDE 0207
Nom. thickness 2.2 mm
White

Outer sheath:
CPE rubber
Type SGM3 DIN VDE 0207
Black

Material property
> Flame retardant: IEC 60332-1-2

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Max. current rating in free air A</th>
<th>Prysmian EAN no.</th>
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<tbody>
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<td>41</td>
<td>5701498016287</td>
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<td>77</td>
<td>55</td>
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<td>1 x 6</td>
<td>3.2</td>
<td>97</td>
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<td>1 x 10</td>
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<td>1 x 16</td>
<td>5.6</td>
<td>214</td>
<td>132</td>
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<td>6.8</td>
<td>324</td>
<td>176</td>
<td>5701498016331</td>
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<td>421</td>
<td>218</td>
<td>5701498016348</td>
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<td>564</td>
<td>276</td>
<td>5701498016355</td>
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<td>1540</td>
<td>566</td>
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<td>775</td>
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<td>898</td>
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<td>1050</td>
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</table>

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Application
Single core screened and PVC insulated power cable for fixed installation indoors or outdoors directly in the ground or ploughed down.

Technical data
Rated voltage: >3 kV
Bending radius: >Min. 0.66 m

Temperature range
>Max. conductor temperature: +90°C
>Short circuit temperature: +250°C
>Lowest temp. at installation: -15°C
>Below 0°C exercise caution

Standard
>IEC 60228
>IEC 60502-1

Conductor
Round aluminium wires
Stranded and compacted

Insulation
XLPE compound
Halogen free
Nom. thickness 2.2 mm
Black

Core colour:
1-core: black

Screen
Helix of copper wires
Nom. cross-section area: 300 mm²
DC resistance at 20°C: max. 0.06 Ω/km

Outer sheath
PVC compound
Nom. thickness 2.1 mm
Black

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>DC resistance at +20°C Ω/km</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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</thead>
<tbody>
<tr>
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<td>4,800</td>
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<td>500</td>
<td>20038090</td>
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</table>
TRACTION POWER NETWORK

AXCLJ-TT 12 kV
SCREENED & WATER PROOF

Application
3-core cable designed for replacement of bare overhead lines. Radial water sealed by an aluminum laminate bonded to outer sheath and axially water sealed with swellable tapes. The cable is primarily designed for ploughing down in ground, but can also handle installation in lakes without flowing water and of limited depth.

Technical data
Rated voltage:
> 6/10 (12) kV
Bending radius:
> During laying: 12 x D
> Fixed: 8 x D
> Ploughed down: 8 x D
Pulling force:
> With eye: Max. 30 x 5 (N)
> With grip: Max. 5 x D ^ 2 (N)

Temperature area
> Max. conductor temperature: +90°C
> Short-circuit temperature: +250°C
> Lowest temp. at installation: -20°C
> Below 0°C exercise caution

Standard
> SS 424 14 16
> Cenelec HD 620 part 10, section M

Construction
Conductor:
> Round aluminium wires
> Compacted and stranded
> Acc. to IEC 60228 class 2.
> Longitudinal watertight
Conductor screen:
> Extruded semi-conductive
Insulation:
> XLPE, min. thickness 2.96 mm
Insulation screen:
> Extruded
> Bonded
Longitudinal water blocking:
> Semi-conductive tape
Screen:
> Concentric layer of copper wires
Radial water blocking:
> Aluminium-PE laminate
> Bonded to sheath
Rip cord:
> Kevlar
Outer sheath:
> Composite PE
> Black

Conductor cross-section mm² | Outer diameter mm | Weight Kg/km | Max. short circuit current on conductor at 90°C - kA | Current rating at 90°C in free air - A | Standard length m | Drum size
--- | --- | --- | --- | --- | --- | ---
3 x 50/16 | 42.5 | 1.370 | 4.7 | 160 | 500 | K18
3 x 70/16 | 46.0 | 1.660 | 6.6 | 190 | 500 | K20
3 x 95/25 | 50.0 | 2.035 | 8.9 | 230 | 500 | K20
3 x 120/25 | 54.0 | 2.320 | 11.3 | 265 | 500 | K22
3 x 150/25 | 57.0 | 2.715 | 14.2 | 305 | 500 | K24
3 x 185/290 | 61.0 | 3.225 | 17.5 | 340 | 500 | K24
3 x 240/35 | 65.5 | 3.720 | 22.7 | 400 | 500 | K24
3 x 300/35 | 71.5 | 4.615 | 28.3 | 460 | 500 | K26

Content is subject to change as to current product development and/or any changes to standards.

Electrification of main lines
1. Electrification of main lines

TRACTION POWER NETWORK

AXCLJ-TT 24 kV
SCREENED & WATER PROOF

Application
3-core cable designed for replacement of bare overhead lines. Radial water sealed by an aluminum laminate bonded to outer sheath and axially water sealed with swellable tapes. The cable is primarily designed for ploughing down in ground, but can also handle installation in lakes without flowing water and of limited depth.

Technical data
Rated voltage:
> 12/20 (24) kV
Bending radius:
> During installation: 12 x D
> Fixed: 8 x D
> Ploughed down: 8 x D
Pulling force:
> With eye: Max. 30 x S (N)
> With grip: Max. 5 x D^2 (N)

Temperature area
> Max. conductor temperature: +90°C
> Short-circuit temperature: +250°C
> Lowest temp. at installation: -20°C
> Below 0°C caution must be exercised

Standard
> SS 424 14 16
> Cenelec HD 620 part 10, section M

Construction
Conductor:
> Round aluminium wires
> Compacted and stranded
> Acc. to IEC 60228 class 2.
> Longitudinal watertight
Conductor screen:
> Extruded semi-conductive
Insulation:
> XLPE, min. thickness 4.85 mm
Insulation screen:
> Extruded
> Bonded
Longitudinal water blocking:
> SWater swellable tape
> Semi-conductive
Wrapping:
> Conductive tape
Screen:
> Concentric layer of copper wires
Radial water blocking:
> Aluminium-PE laminate
> Bonded to sheath
Rip cord:
> Kevlar
Outer sheath:
> Composite PE
> Black

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight Kg/km</th>
<th>Max. short circuit current on conductor at 90°C - kA</th>
<th>Current rating at 90°C in free air - A</th>
<th>Standard length m</th>
<th>Drum size</th>
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<tbody>
<tr>
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<td>54</td>
<td>1,920</td>
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<td>160</td>
<td>500</td>
<td>K22</td>
</tr>
<tr>
<td>3 x 70/16</td>
<td>56</td>
<td>2,210</td>
<td>6.6</td>
<td>190</td>
<td>500</td>
<td>K22</td>
</tr>
<tr>
<td>3 x 95/25</td>
<td>60</td>
<td>2,690</td>
<td>8.9</td>
<td>230</td>
<td>500</td>
<td>K24</td>
</tr>
<tr>
<td>3 x 120/25</td>
<td>63.5</td>
<td>1,990</td>
<td>11.3</td>
<td>265</td>
<td>500</td>
<td>K24</td>
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<tr>
<td>3 x 150/25</td>
<td>66.5</td>
<td>3,400</td>
<td>14.2</td>
<td>305</td>
<td>500</td>
<td>K24</td>
</tr>
<tr>
<td>3 x 185/290</td>
<td>70.5</td>
<td>3,880</td>
<td>17.5</td>
<td>340</td>
<td>500</td>
<td>K26</td>
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<td>3 x 240/35</td>
<td>76</td>
<td>4,610</td>
<td>22.7</td>
<td>400</td>
<td>500</td>
<td>K26</td>
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<tr>
<td>3 x 300/50</td>
<td>83</td>
<td>5,380</td>
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<td>460</td>
<td>500</td>
<td>K26</td>
</tr>
</tbody>
</table>

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1. Electrification of main lines

GROUNDING

HK

STRANDED ANNEALED COPPER CONDUCTOR

Application
Bare copper conductor for grounding of metal parts for different railway network systems.

Technical data
Bending radius:
> During installation: 15 x D
> Fixed: 10 x D
Pulling force:
> Using eye or grip: max. 50 N/mm²

Standard & Directive
Standard:
> IEC 60228
Directive:
> Fulfills RoHs

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian EAN no.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>9</td>
<td>430</td>
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<td>1000 - K9</td>
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</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
GROUNDING

KK

STRANDED HARD COPPER CONDUCTOR

Application
Bare copper conductor for grounding of metal parts for different railway network systems.

Technical data
Bending radius:
> During installation: 15 x D
> Fixed: 10 x D

Standard
> IEC 60228

Content is subject to changes acc. to current product development and or any changes to standards.

<table>
<thead>
<tr>
<th>Conductor cross-section nom. mm²</th>
<th>No. of wires x diameter of wires</th>
<th>Outer diameter nom. mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x 25</td>
<td>7 x 2.1</td>
<td>6.3</td>
<td>218</td>
<td>1500 - K9</td>
</tr>
<tr>
<td>1 x 35</td>
<td>7 x 2.5</td>
<td>7.5</td>
<td>310</td>
<td>2000 - K10</td>
</tr>
<tr>
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<td>9.0</td>
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<td>19 x 2.1</td>
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<td>596</td>
<td>750 - K9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductor cross-section nom. mm²</th>
<th>Rated tensile strength kN</th>
<th>Final modulus of electricity GPa</th>
<th>Coefficient of linear expansion /°C</th>
<th>DC resistance at 20°C Ω/km</th>
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<td>17.0 x 10⁻⁶</td>
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</table>
1. Electrification of main lines

GROUNDING

ML 450/750 V
PVC INSULATED & FLAME RETARDANT

Application
Flame retardant PVC insulated wire for grounding of metal parts of different railway network systems.

Technical data
Rated voltage:
- > 450/750 V
Test voltage:
- > 2,500 V
Bending radius:
- During installation 8 x D
- Fixed: 3 x D
Pulling force:
- Max. 50 N/mm²

Temperature range
- Max. conductor temperature: +70°C
- Short circuit temperature: +160°C
- Lowest temp. at installation: -25°C
- Below 0°C exercise caution

Standard & Directive & Approval
Standard:
- SFS 5523
- EN 50525-2-31
Directive:
- Fulfills REACH and RoHS
Approval:
- CPR class: Eca
- DoP: 1002700

Material properties
- Flame retardant: IEC 60332-1

Construction
Conductor:
- Round copper wires
- Annealed
- Solid
- Acc. to IEC 60228 class 1.
Insulation:
- Linyl PVC
- Lead free
Core colouring:
- 1-core: green/yellow
- 3-core: green/yellow, blue, black
- 5-core: green/yellow, blue, brown, black, grey

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating in ground A</th>
<th>DC resistance of conductor at 20°C Max. Ω/km</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
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<tbody>
<tr>
<td>1 G 1.5</td>
<td>2.8</td>
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</table>

Content is subject to changes acc. to current product development and or any changes to standards.
1. Electrification of main lines

**GROUNDING**

**MKEM90 450/750 V**

**FLEXIBLE, PVC INSULATED & FLAME RETARDANT**

*Application*
Flame retardant PVC insulated and multi-stranded wire for grounding of metal parts from different systems of railway networks.

*Technical data*
- **Rated voltage:** 450/750 V
- **Test voltage:** 2,500 V
- **Bending radius:**
  - During installation: 8 x D
  - Final installation: 3 x D

*Temperature range*
- Max. conductor temperature: +90°C
- Short circuit temperature: +160°C
- Lowest temp. at installation: -25°C

*Standard & Approval*
- **Standard:**
  - SFS 5523
  - EN 50525-2-31
- **Approval:**
  - HAR
  - CPR class: Eca

*Construction*
- **Conductor:**
  - Round copper wires
  - Annealed
  - Multi-stranded and flexible
  - Acc. to IEC 60228 class 5.
- **Insulation:**
  - Linyl PVC
  - Lead free
  - Yellow/green

*Material property*
- Flame retardant: IEC 60332-1

**Conductor cross-section mm²** | **Outer diameter mm** | **Weight kg/km** | **Current rating in free air A** | **Standard length m** | **Prysmian article no.**
--- | --- | --- | --- | --- | ---
1 G 1.5 | 3.0 | 21 | 13.3 | 250 | 641000403108-7
1 G 2.5 | 3.6 | 32 | 7.98 | 200 | 641000403128-5
1 G 4 | 4.1 | 45 | 4.95 | 100 | 641000403148-3
1 G 6 | 5.0 | 70 | 3.3 | 100 | 641000403168-1
1 G 10 | 6.5 | 115 | 1.91 | 100 | 641000403188-9
1 G 16 | 7.6 | 170 | 1.21 | 100 | 641000403208-9
1 G 25 | 9.4 | 270 | 0.78 | 100 | 641000403218-3
1 G 35 | 11.0 | 370 | 0.554 | 500 - 6C | 641000453228-7
1 G 50 | 13.0 | 520 | 0.386 | 200 - 6C | 641000453238-6
1 G 70 | 15.0 | 730 | 0.272 | 200 - 7E | 641000402248-5

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1. Electrification of main lines

GROUNDING

MK90 450/750 V
PVC INSULATED & FLAME RETARDANT

Application
Flame retardant and PVC insulated wire for grounding of metal parts of different railway network systems.

Technical data
Rated voltage:
  > 450/750 V
Test voltage:
  > 2,500 V
Bending radius:
  > During installation 8 x D
  > Fixed: 3 x D
Pulling force:
  > Max. 50 N/mm²

Temperature range
  > Max. conductor temperature: +90°C
  > Short circuit temperature: +160°C
  > Lowest temp. at installation: -25°C
  > Below 0°C exercise caution

Standard & Approval
Standard:
  > SFS 5523
  > EN 50525-3-31
Approval:
  > HAR
  > CPR class: Eca
  > DoP: 1002700

Material property
  > Flame retardant: IEC 60332-1

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Direct current resistance of conductor at 20°C Ω/km</th>
<th>Standard length m</th>
<th>Prysmian EAN no.</th>
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GROUNDING

H07V-K 450/750 V
PVC INSULATED & FLAME RETARDANT

Application
Flame retardant and PVC insulated wire for grounding of metal parts from different systems of railway networks.

Technical data
Rated voltage:
- 450/750 V
Test voltage:
- 2.500 V
Bending radius:
- During installation 8 x D
- Final installation: 3 x D

Temperature range
- Max. conductor temperature: +70°C
- Short circuit temperature: +160°C
- Lowest temp. at installation: -40°C

Standard & Approval
Standard:
- EN 50525-3-31
Approval:
- HAR, EZU
- CPR class: Eca

Material property
- Flame retardant: IEC 60332-1

Conductor cross-section
<table>
<thead>
<tr>
<th>mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating in free air A</th>
<th>Standard length m</th>
<th>Prymian article no.</th>
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</thead>
<tbody>
<tr>
<td>1 G 1.5</td>
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<tr>
<td>1 G 4</td>
<td>4.4</td>
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<td>1 G 6</td>
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<tr>
<td>1 G 10</td>
<td>6.0</td>
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<td>1 G 25</td>
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<td>1 G 120</td>
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1. Electrification of main lines

GROUNDING

H07V-R 450/750 V
PVC INSULATED & FLAME RETARDANT

Application
Flame retardant and PVC insulated wire for grounding of metal parts from different systems of railway networks.

Technical data
Rated voltage:
> 450/750 V
Test voltage:
> 2,500 V
Bending radius:
> During installation 8 x D
> Final installation: 3 x D

Temperature range
> Max. conductor temperature: +70°C
> Short circuit temperature: +160°C
> Lowest temp. at installation: -40°C

Standard & Approval
Standard:
> EN 50525-3-31
Approval:
> HAR, EZU
> CPR class: Eca

Construction
Conductor:
> Round copper wires
> Stranded
> Acc. to IEC 60228 class 2.
Insulation:
> PVC
> Yellow/green

Material property
> Flame retardant: IEC 60332-1

<table>
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<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current carrying capacity Max. A</th>
<th>Standard length m</th>
<th>Prysmian EAN no.</th>
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<tr>
<td>1G 4</td>
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</table>

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1. Electrification of main lines

ACCESSORY

FORMFIT MULTI-CONNECTOR
12-36 kV SEPARABLE WITH TEST POINT

Application
Watertight separable connector suitable for connecting polymer up to 36 kV cables to transformers, switchgear units, motors etc. Available as a straight FMCS-400, elbow FMCE-400 or tee FMCT-400 connector. For indoor and outdoor application of:

- Single core cables
- PE, XLPE and ERP insulation
- CU or AL conductor
- Semi-conducting screen
- Screen of metal, wire or tape
- Insulation voltage up to 36 kV
- From 25-240 (300) mm²
- For continuous 400 A rms
- Overload 600 A rms
- Interface B

Installation features
- No need for special tools
- No need for heating, taping or filling
- Vertical, angled or inverted position
- No min. distance between phases
- Immediate energizing possible
- Individual clamping by steel brace

Construction
- Contact pin assembly
- Semi-conducting inner screen
- Semi-conducting outer jacket
- Insulating body of moulded EPDM
- Test point electrically protected by cap
- Adapter of EPDM moulding
- Locking brace of stainless steel
- Earthing cover of moulded EPDM
- Earthing eye

Standard
- VDE 0278- E 33-051, CC 33-001
- HD 629-1 og IEC 60502-4
- Cenelec EN 50180, EN 50181

Delivery
- Supplied as a kit of 3 single connectors containing all components.

<table>
<thead>
<tr>
<th>Diameter over insulation (mm)</th>
<th>Kit reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>18.5</td>
<td>20.5</td>
</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
ELASCON TEE CONNECTOR

12-36 kV SEPARABLE WITH MECHANICAL CONTACT

Application
Watertight connector type MSCT/EC-630-C suitable for connecting polymer MV cables to transformers, switchgear units, motors etc. For indoor and outdoor application of:

- Single core cables
- PE, XLPE and ERP insulation
- CU or AL conductor solid or stranded
- Semi-conducting screen
- Screen of metal, wire or tape
- Insulation voltage up to 18/30 (36) kV
- Conductor size: 25 - 300 mm²
- For continuous 630 A rms
- Overload 900 A rms

Installation features
- No need for special tools
- No need for heating, taping or filling
- Vertical, angled or inverted position
- No min. distance between phases
- Immediate energizing possible

Standard
- Cenelec HD 629.1 S2
- IEC 60502-4 NF C 33-051 - NF C 33-001
- IEC 61238-1 class A - mechanical contact

Construction
- Mechanical conductor contact
- M16 clamping screw
- Semi-conducting inner screen
- Semi-conducting outer envelope
- Insulating body mould EPDM
- Test point electrically protected by cap
- Insulating plug epoxy component
- Cap of moulded semi-conducting EPDM
- Earthing eye
- Moulded high permittivity reducer

Versions available
- Elascon is available in versions for 250, 400 and 630 continuous A rms.

Delivery
- Supplied as a kit of 3 single connectors containing all components.

Content is subject to changes acc. to current product development and or any changes to standards.

<table>
<thead>
<tr>
<th>Voltage kV</th>
<th>Diameter over insulation</th>
<th>Conductor size in mm² (for guidance only)</th>
<th>Prysmian order no.</th>
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<td>Max.</td>
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<td>36</td>
<td>30.5</td>
<td>40.6</td>
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</tbody>
</table>
ACCESSORY

SIXTY-SPEED JOINT 72.5 kV
ALL-IN-ONE FACTORY TESTED COLD SHRINK EPR

**Description**
- Factory pre-assembled
- Factory pre-tested
- Cold-shrink EPR joint
- All-in-one design
- Integrated link-devices
- Integrated elastic outer sheath
- Sectionalized version
- Non-sectionalized version
- Self-ejecting technology
- Shear bolts mechanical connector
- Tool free solution
- LEAN product - few components

**Application**
- Joint for single-core extruded cables (XLPE or EPR)
- Copper or aluminium conductor
- Copper wire screen or aluminium laminated sheath
- Cable sizes from 120 mm² (240 kcmil) up to 1000 mm² (2000 kcmil)
- Voltage: 36/69 (72.5 kV) (IEC)
- Voltage: 39.8/69 kV (BIL 350 kV crest) (IEEE)
- Suitable for buried installations also in presence of water table (1 m water-proof)

**Installation features**
- Easy to install: No special tools are required (tool-free solution).
- Quick assembling: Designed for reducing installation time. Main components are already expanded and placed in the correct position. Joint sealing simply done by removing supports from the outer sheath.
- Self-ejecting supports: No special skill required for the installation.
- 100% factory tested: Submitted to electrical test and partial discharges measurements before shipping.
- 2 years shelf-life.

**Additional options**
- Metallic casing as additional mechanical protection.
- Coffin-box filled with resin as additional water protection suitable for concentric cross-bonding cable.
- Heat-shrinkable outer protection instead of the integrated elastic outer sheath.

**Qualification**
- Qualified in accordance to IEC 60840 and IEEE-404.
- Short circuit tested (up to 40 kA/0.5 sec.)

<table>
<thead>
<tr>
<th>Product references</th>
<th>Rated voltage kV</th>
<th>Sixty-Speed model</th>
<th>Cross-section range mm²</th>
<th>Insulation range mm</th>
<th>Max. outer diameter mm</th>
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<tbody>
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<td>72.5 kV</td>
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<tr>
<td>CSJ(-X) 1072</td>
<td>72.5 kV</td>
<td>2</td>
<td>300 - 1000</td>
<td>52.0 - 71.0</td>
<td>89.0</td>
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</tbody>
</table>

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ACCESSORY

COLDFIT TERMINATION 72.5 kV
FACTORY EXPANDED WITH MODULAR DESIGN

Application
Factory-expanded cold shrink silicone termination designed with factory-assembled moisture sealing components. Modular design allows for different creepage distances. Suitable for outdoor installation subject to severe climatic conditions. Installation without use of special tools.

> Single core extruded cables (XLPE or EPR)
> With CU or AL conductor
> With wire screen or aminated sheath
> Conductor size from 150-1,200 mm²

Technical data
> Rated voltage: 36/69 (72.5) kV
> Terminal body creepage: 2,100 mm
> Modular creepage: 600 mm
> Total creepage distance: 2,700 mm
> Acc. to IEC 60815

Installation features
> Easy to install - not tools needed
> Quick assemble - LEAN few items
> Extractable support - on plastic carrier
> Vertical or angled position
> Shear bolts mechanical connector
> Excellent anti-tracking and hydrophobic
> 100% factory tested
> 2 year shelf-life

Construction
Insulation body:
> Cold shrink element
> Silicone rubber
> Expanded into a spiral support

Stress cone:
> Designed to ensure voltage control
> Suitable for all cables
> Semi-conducting silicone rubber

Sealing tube:
> Upper and lower (conductor/earth)
> Cold shrink silicone rubber
> Expanded into a spiral support

Tape:
> High permittivity tape
> Sealing mastic and silicone tape
> Ensures watertightness

Conductor lug:
> Suitable for copper or aluminium

Standard
> IEC 60840 / IEEE 404

<table>
<thead>
<tr>
<th>Rated voltage kV</th>
<th>Model type</th>
<th>Cross section mm²</th>
<th>Insulation thickness mm</th>
<th>Outer diameter mm</th>
<th>A mm</th>
<th>B mm</th>
<th>C mm</th>
<th>D mm</th>
<th>F creepage m</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.5 kV</td>
<td>1</td>
<td>150 - 500</td>
<td>33.5 - 48.8</td>
<td>57.0</td>
<td>750</td>
<td>146</td>
<td>186</td>
<td>1,000</td>
<td>&gt; 2.25</td>
</tr>
<tr>
<td>72.5 kV</td>
<td>2</td>
<td>500 - 1,200</td>
<td>42.8 - 66.0</td>
<td>74.0</td>
<td>750</td>
<td>156</td>
<td>196</td>
<td>1,000</td>
<td>&gt; 2.25</td>
</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
1. Electrification of main lines

ACCESSORY

ECOSPEED JOINT 24-36 kV
STRAIGHT THROUGH JOINT, COLD SHRINK

Application
Suitable for jointing of polymeric insulated cables of different specifications, for example as transition joint between extruded and paper insulated cables. Joint can be laid underground in tunnels, on horizontal racks or directly buried.

Cable types
- Single core polymeric insulation
- Insulation voltage up to 36 kV (Um)
- Copper or aluminium conductor
- Conductor sizes 50 to 630 mm²
- Tape, wire or poly lam metallic screen
- Non-armoured
- Semi-conducting screen

Selection guide
Select in the table below, the kit model corresponding to the insulation voltage Um (up to 24 kV or 36 kV), the diameter over insulation and over outer sheath.

Specify insulation voltage Um for 24 or 36 kV.
Select the screen continuity device according to the type of metallic screen of cable. T1 for poly lam screen, T2 for tape screen and T3 for wire screen.

Construction
- Three layers sleeve
- Two layers sheath
- Copper mesh
- High permittivity tape
- PVC tape
- Sealing mastic tape
- Embossed copper tape
- PVC strip
- Identification label

Standard
- Fulfills IEC 60502-4
- Fulfills CENELEC HD 629-1-2

Installation characteristics
- All-in-one compact design
- Factory expanded onto a support
- No special skills or experience required
- Easy assembling
- No special tools or heating needed
- Wide cables size range
- Immediate energizing after jointing
- Great flexibility
- Suitable for compact insulated cables

<table>
<thead>
<tr>
<th>Rated voltage kV</th>
<th>Elaspeed model</th>
<th>Min. outer insulation diameter mm</th>
<th>Max. outer sheath diameter incl. screen mm</th>
<th>Conductor size range (for guidance only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 kV</td>
<td>Ecospeed 151556</td>
<td>19</td>
<td>40</td>
<td>50 - 240</td>
</tr>
<tr>
<td>24 kV</td>
<td>Ecospeed 162662</td>
<td>24</td>
<td>44</td>
<td>95 - 240</td>
</tr>
<tr>
<td>36 kV</td>
<td>Ecospeed 151656-0</td>
<td>23</td>
<td>40</td>
<td>50 - 120</td>
</tr>
<tr>
<td>36 kV</td>
<td>Ecospeed 202070-1</td>
<td>28</td>
<td>55</td>
<td>95 - 240</td>
</tr>
<tr>
<td>36 kV</td>
<td>Ecospeed 202070-3</td>
<td>34</td>
<td>55</td>
<td>300 - 630</td>
</tr>
<tr>
<td>36 kV</td>
<td>Ecospeed 252580-4</td>
<td>36</td>
<td>62</td>
<td>500 - 630</td>
</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
ELASPEED JOINT 12-36 kV
STRAIGHT THROUGH JOINT, ELASTIC

Application
For jointing of 1- or 3 core polymeric insulated cables of different specifications, conductor sizes, round or sector shaped. Joint has injected outer protection and integrated electrode. Suitable for jointing cables laid underground, in tunnels, on horizontal racks or aerial. Can be directly buried (after curing of resin). Supplied as a kit containing all the necessary components except the ferrules (supplied on request).

Elaspeed™ utilize cold shrink technology which doesn’t require any special tools or torches for installation. The EPR rubber insulation is manufactured on a vertical extruder to ensure complete concentricity to the tightest tolerance possible.

Cable types
> 1- or 3-core polymeric insulation
> Copper or aluminium conductor
> Metallic screen of tape or wire
> Semi-conducting screen (extruded/taped)
> Insulation voltage up to 36 kV (Um)
> Conductor sizes from 25-500 mm²
> Non-armoured or armoured.

Construction
> Conductor ferrule, crimped
> Joint body, extruded EPR
> Removable carrier, pre-loaded
> Core screen, copper
> Outer protection, watertight

Installation features
> No need for special tools or heating.
> Injection of resin with disposable injection device can be supplied directly in the kit - in this case, letter “F” to be added at the end of kit reference.
> Energizing of cable 30 minutes after injecting.
> Polymerisation of synthetic resins at ambient temp. +5°C to +45°C

Standard
> C 33 001 - DIN 57 278
> IEEE 404 - IEC 60502-4
> ENEL DJ 4853 - C 33 050-Al
> CENELEC HD 629-1

Content is subject to changes acc. to current product development and or any changes to standards.

<table>
<thead>
<tr>
<th>Rated voltage kV</th>
<th>1 core cable</th>
<th>3 core cable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max. OD sheath mm</td>
<td>Max. conductor size mm²</td>
</tr>
<tr>
<td>12</td>
<td>38</td>
<td>95 - 150</td>
</tr>
<tr>
<td>12</td>
<td>49</td>
<td>195 - 300</td>
</tr>
<tr>
<td>12</td>
<td>50</td>
<td>240 - 400</td>
</tr>
<tr>
<td>12</td>
<td>57</td>
<td>300 - 500</td>
</tr>
<tr>
<td>17.5</td>
<td>34</td>
<td>70 - 120</td>
</tr>
<tr>
<td>17.5</td>
<td>44</td>
<td>150 - 240</td>
</tr>
<tr>
<td>17.5</td>
<td>46</td>
<td>195 - 300</td>
</tr>
<tr>
<td>17.5</td>
<td>52</td>
<td>240 - 500</td>
</tr>
<tr>
<td>24</td>
<td>39</td>
<td>50 - 95</td>
</tr>
<tr>
<td>24</td>
<td>48</td>
<td>95 - 240</td>
</tr>
<tr>
<td>24</td>
<td>50</td>
<td>120 - 300</td>
</tr>
<tr>
<td>24</td>
<td>57</td>
<td>195 - 400</td>
</tr>
<tr>
<td>36</td>
<td>50</td>
<td>50 - 150</td>
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<tr>
<td>36</td>
<td>57</td>
<td>95 - 300</td>
</tr>
<tr>
<td>36</td>
<td>67</td>
<td>195 - 630</td>
</tr>
</tbody>
</table>
CATENARY CONTACT WIRE

TRL
PURE COPPER CONDUCTOR

Application
Copper wire for power transmission to electric railway lines. Suitable as catenary wire for AC and DC systems.

Standard
> EN 50149 type A

Construction
Conductor:
> Single strand
> Pure copper - ETP
> Hard drawn
> Grooved
> Identification marks acc. to EN 50149

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Conductor diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian article no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>10.6</td>
<td>710</td>
<td></td>
<td>0104008</td>
</tr>
<tr>
<td>100</td>
<td>12.0</td>
<td>890</td>
<td></td>
<td>0104010</td>
</tr>
<tr>
<td>120</td>
<td>13.2</td>
<td>1,067</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Rated tensile strength (RTS) kN</th>
<th>Coefficient of linear expansion 1/°C</th>
<th>Final modulus of elasticity GPa</th>
<th>Thermal oxide resistance kA</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>28.4</td>
<td>$17 \times 10^{-6}$</td>
<td>120</td>
<td>12</td>
</tr>
<tr>
<td>100</td>
<td>35.5</td>
<td>$17.0 \times 10^{-6}$</td>
<td>120</td>
<td>15</td>
</tr>
<tr>
<td>120</td>
<td>42.0</td>
<td>$17.0 \times 10^{-6}$</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

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2. Overhead catenary lines

CATENARY CONTACT WIRE

TRL CuAg
COPPER-SILVER ALLOYED CONDUCTOR

Application
Copper-silver alloyed wire for power transmission to electric railway lines. Suitable as catenary wire for AC and DC systems.

Construction
Conductor:
- Single strand
- Silver alloyed copper
- Hard drawn
- Grooved
- Identification marks acc. to EN 50149

Standard
> EN 50149

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian EAN no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>12.0</td>
<td>980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>13.2</td>
<td>1,067</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Rated tensile strength (RTS) kN</th>
<th>Coefficient of linear expansion /°C</th>
<th>Final modulus of elasticity GPa</th>
<th>DC resistance at 20°C Ω/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>36.0</td>
<td>17 x 10⁻⁶</td>
<td>120</td>
<td>0.183</td>
</tr>
<tr>
<td>120</td>
<td>42.0</td>
<td>17 x 10⁻⁶</td>
<td>120</td>
<td>0.153</td>
</tr>
</tbody>
</table>

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CATENARY WIRE & DROPPER

**KK Bz-II 10 mm² or 50 mm²**

STRANDED BRONZE ALLOYED COPPER CONDUCTOR

**Application**
Stranded bronze alloyed 1.35 or 3.0 mm copper wire concentrically stranded acc. to DIN 48201 part 2.

KK Bz-II 10 mm² suitable as dropper wire and KK Bz-II 50 mm² suitable as catenary wire in railway applications.

**Technical data**

- **Tensile strength:**
  - Min. 618 N/mm²
- **Resistivity:**
  - Max.: 27.78 n Ω m

**Standard**

- DIN 48201 part 2.
- DIN 48200 part 2. Bz-II

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian EAN no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (7 x 1.35)</td>
<td>4.1</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 (7 x 3.0)</td>
<td>9.0</td>
<td>446</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Rated tensile strength (RTS) kN</th>
<th>Coefficient of linear expansion /°C</th>
<th>Final modulus of elasticity GPa</th>
<th>DC resistance at 20°C Ω/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (7 x 1.35)</td>
<td>5.88</td>
<td>$17 \times 10^{-6}$</td>
<td>113</td>
<td>2.8</td>
</tr>
<tr>
<td>50 (7 x 3.0)</td>
<td>28.58</td>
<td>$17 \times 10^{-6}$</td>
<td>113</td>
<td>0.569</td>
</tr>
</tbody>
</table>

Content is subject to changes acc. to current product development and or any changes to standards.
2. Overhead catenary lines

DROPPER

**KKM Bz-II 10 mm²**

MULTI-STRANDED COPPER ALLOYED CONDUCTOR

**Application**
Stranded bronze alloyed 0.5 mm copper wire concentrically bundled acc. to DIN 48201 part 2.

KKM Bz-II 10 mm² is suitable as dropper wire in railway applications.

**Technical data**
- **Tensile strength:**
  - Min. 618 N/mm²
- **Resistivity:**
  - Max. 27.78 n Ω m

**Standard**
- DIN 48201 part 2.
- DIN 48200 part 2. Bz-II

**Construction**
- Conductor:
  - Round
  - Multi-stranded
  - Bronze alloyed copper wires
  - Hard drawn
  - Nom. diameter 0.5 mm
  - Bunched sub-conductor 7 x 0.5 mm
  - Outer layer “S” stranded

---

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Sub-conductor diameter nom. mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (7 x 7 x 0.5)</td>
<td>4.5</td>
<td>1.37</td>
<td>89</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Rated tensile strength (RTS) kN</th>
<th>Coefficient of linear expansion /°C</th>
<th>Final modulus of elasticity GPa</th>
<th>DC resistance at 20°C Ω/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (7 x 7 x 0.5)</td>
<td>589</td>
<td></td>
<td></td>
<td>2.98</td>
</tr>
</tbody>
</table>

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RETURN WIRE

AAC

STRANDED ALUMINIUM CONDUCTOR

Application
Cable for energy transmission designed with concentric layers. Suitable for fixed installation as return wire for railway application outdoors.

Technical data
Bending radius:
  > During installation: min. 0.2 m
  > Fixed: min. 0.14 m
Conductor initial modulus:
  > 41,000 N/mm²
Resistor module:
  > 60,000 N/mm²

Temperature range
  > Max. conductor temperature: +80°C
  > Short circuit temperature: +160°C

Standard & Directive
Standard:
  > EN 50182
  > IEC 61089
  > SFS 5701
Directive:
  > Fultills REACH and RoHS

Construction
Conductor:
  > Round
  > Aluminium wires 4.42 mm
  > Stranded
  > Acc. to EN 50182
  > Outer layer “Z” stranded

Content is subject to changes acc. to current product development and or any changes to standards.
RETURN WIRE

ACSR

STEEL REINFORCED ALUMINIUM CONDUCTOR

Application
Cable for energy transmission designed with concentric layers of aluminium wires and inside of galvanized and fat enclosed steel wires. Suitable for fixed installation as return wire for railway application outdoors.

Temperature range
- Max. conductor temperature: +80°C
- Short circuit temperature: +160°C

Standard
- EN 50182
- IEC 61089
- SFS 5701

Construction
- Round
- Outer cores of aluminium wires
- Inner core of steel wires
- Stranded
- Acc. to IEC 60228 class 2.
- Outer layer right handed "Z"

Content is subject to changes acc. to current product development and or any changes to standards.

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Number of AL wires</th>
<th>Number of steel wires</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Prysmian EAN no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.5 (34/6)</td>
<td>6</td>
<td>1</td>
<td>8.04</td>
<td>137</td>
<td>2500</td>
<td>6410001202022</td>
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<tr>
<td>671 (42/25)</td>
<td>12</td>
<td>7</td>
<td>10.6</td>
<td>310</td>
<td>2500</td>
<td>6410001202282</td>
</tr>
<tr>
<td>62.4 (54/9)</td>
<td>6</td>
<td>1</td>
<td>10.1</td>
<td>216</td>
<td>2200</td>
<td>6410001202053</td>
</tr>
<tr>
<td>99.3 (85/14)</td>
<td>6</td>
<td>1</td>
<td>12.8</td>
<td>344</td>
<td>2000</td>
<td>6410001202091</td>
</tr>
<tr>
<td>142 (89/52)</td>
<td>6</td>
<td>7</td>
<td>15.4</td>
<td>654</td>
<td>2500</td>
<td>6410001202132</td>
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<tr>
<td>177 (152/25)</td>
<td>26</td>
<td>7</td>
<td>17.3</td>
<td>613</td>
<td>2500</td>
<td>6410001202152</td>
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<tr>
<td>281 (242/39)</td>
<td>26</td>
<td>7</td>
<td>21.3</td>
<td>976</td>
<td>2500</td>
<td>6410001202183</td>
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<td>344 (305/39)</td>
<td>54</td>
<td>7</td>
<td>24.1</td>
<td>1,151</td>
<td>2200</td>
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<td>454.5 (402/52)</td>
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<td>7</td>
<td>27.7</td>
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<tr>
<td>637 (565/72)</td>
<td>54</td>
<td>11</td>
<td>32.9</td>
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</table>

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>39.5</th>
<th>671</th>
<th>62.4</th>
<th>99.3</th>
<th>142</th>
<th>177</th>
<th>281</th>
<th>344</th>
<th>454.5</th>
<th>637</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated tensile strength min. kN</td>
<td>12.2</td>
<td>13.52</td>
<td>17.11</td>
<td>24.13</td>
<td>33.37</td>
<td>54.8</td>
<td>84.9</td>
<td>96.8</td>
<td>123.75</td>
<td>174</td>
</tr>
<tr>
<td>Coefficient of linear expansion /°C</td>
<td>19.2x10⁻⁶</td>
<td>15.6x10⁻⁶</td>
<td>19.2x10⁻⁶</td>
<td>19.2x10⁻⁶</td>
<td>15.6x10⁻⁶</td>
<td>19.2x10⁻⁶</td>
<td>19.2x10⁻⁶</td>
<td>19.2x10⁻⁶</td>
<td>19.3x10⁻⁶</td>
<td>19.3x10⁻⁶</td>
</tr>
<tr>
<td>Final modulus of elasticity GPA</td>
<td>78</td>
<td>102</td>
<td>78</td>
<td>78</td>
<td>102</td>
<td>76</td>
<td>76</td>
<td>67</td>
<td>68</td>
<td>63</td>
</tr>
<tr>
<td>DC resistance at 20°C Ø/km</td>
<td>0.848</td>
<td>0.682</td>
<td>0.536</td>
<td>0.337</td>
<td>0.323</td>
<td>0.190</td>
<td>0.120</td>
<td>0.0949</td>
<td>0.0719</td>
<td>0.0512</td>
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<tr>
<td>Short circuit current max kA</td>
<td>3.7</td>
<td>5.4</td>
<td>5.8</td>
<td>9.2</td>
<td>11.4</td>
<td>16.5</td>
<td>26.1</td>
<td>32.5</td>
<td>43.7</td>
<td>60.1</td>
</tr>
</tbody>
</table>
**BALISE**

**A-2Y(L)2YB2Y**

**STAR QUAD STRANDED & STEEL TAPE ARMOURED**

### Application
For railway safety equipment, used for train detection according to ETCS (European Train Control System) technology. Maximum installation distance up to 2000 meters.

### Technical data

**Design:**
- \( n \times 4 \times 1.4 \) (1.53 mm)

**Bending radius:**
- During installation: \( \geq 10 \times D \)
- Fixed: \( \geq 7.5 \times D \)

**Resistance per 1.4 or 1.53 mm:**
- Conductor: \( \leq 23.4 \) or \( 19.8 \ \Omega/km \)
- Insulation: \( \geq 10 \ \Omega/km \)

**Mutual capacitance per 1.4 or 1.53 mm:**
- \( \leq 52 \) or \( 43 \) nF/km

**Capacitance unbalance per 1.4 or 1.53 mm:**
- \( k_{\text{p}}: \leq 650 \) or \( 240 \) pF/500 m
- \( e_{\text{c}}: \leq 1,300 \) or \( 650 \) pF/500 m

**Impedance:**
- At 8 kHz: \( 147 \ \Omega \pm 15 \% \)
- At 200-600 kHz: \( 120 \ \Omega \pm 10 \% \)

**Attenuation per 1.4 or 1.53 mm:**
- At 8.8 kHz: \( \leq 2 \) or \( 0.8 \) dB/km
- At 280 kHz: \( \leq 5 \) or \( 3 \) dB/km
- At 560 kHz: \( \leq 7 \) or \( 4.2 \) dB/km
- At 1,800 kHz: \( \leq N/A \) or \( 8 \) dB/km

**Near-end-crosstalk-attenuation at 1 MHz:**
- For 1.4 mm: \( \geq 55 \) dB/km
- For 1.53 mm: \( \geq 60 \) dB/km

**Test voltage at 50 Hz:**
- Core/core: \( 2,500 \) V rms
- Core/screen: \( 2,500 \) V rms

### Temperature range
- During installation: -10°C to +60°C
- In operations: -40°C to +60°C

### Construction

**Conductor:**
- Solid copper wires
- Soft annealed
- Diameter 1.4 or 1.53 mm

**Insulation:**
- PE (2Y)

**Quad colouring:**
- Natural
- Black ring marking

**Twisting:**
- Star quads
- Concentric layers

**Moisture barrier sheath:**
- Laminate of aluminium tape 0.15 mm
- Coated with copolymer on one side
- Bonded to inner sheath

**Inner sheath:**
- PE
- Black

**Armouring:**
- Galvanized steel tape
- One layer 0.2 mm
- Helically applied

**Outer sheath:**
- PE
- Black

**Material property**
- Smoke density: EN 60134

---

### Conductor diameter

<table>
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<tr>
<th>Conductor diameter mm</th>
<th>No. of quads</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
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Content is subject to changes acc. to current product development and or any changes to standards.
3. Signalling & control

**BALISE**

**A-2YOF(L)2YB2Y**

**HALOGEN FREE, WATERTIGHT & ARMOURING**

**Application**
For railway signalling applications, such as wiring of light signals, point machines, balises, axle counters and similar wayside equipment, up to 420 V AC or 600 V DC. The cable is longitudinally watertight with stranded copper conductor and steel tape armouring.

**Technical data**
- **Design:** \( n \times 1 \times \text{diameter mm} \)
- **Bending radius:**
  - Flexible: \( \geq 20 \times D \)
  - Fixed: \( \geq 15 \times D \)
- **Temperature range**
  - During installation: -10°C to +60°C
  - In operations: -40°C to +60°C
- **Standard**
  - PH 416.0113 V2.1
- **Material property**
  - Halogen free: IEC 60754-1 & 2

**Construction**
- **Conductor:**
  - Solid copper
  - Soft annealed
  - Diameter 0.9 or 1.4 or 1.8 mm
- **Insulation:**
  - PE (2Y)
  - Naturally coloured
  - Blue marking/tracer core in each layer
- **Twisting:**
  - Cores twisted in concentric layers
- **Filling:**
  - Longitudinal watertight
  - Low capacitance filling compound
  - Drip point > 80 °C
- **Moisture barrier wrapping:**
  - Swellable material
  - Longitudinally applied with overlap
- **Inner sheath:**
  - Laminated with AL tape 0.15 mm
  - One side copolymer coated
  - Bonded with PE sheath
  - Black
- **Armouring:**
  - 1 or 2 layers of galvanized steel tape
  - 0.2 or 0.3 mm
  - Helically applied
- **Outer sheath:**
  - PE (2Y)
  - Black

Content is subject to changes acc. to current product development and or any changes to standards.
### Signalling & control

#### Characteristics

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<th>Characteristics</th>
<th>Unit</th>
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<td>Insulation resistance</td>
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#### Test voltage at 50 Hz - 1 min

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\(^1\) ≤ 120 nF/km for single core in center
\(^2\) ≤ 155 nF/km for single core in center

#### Table of Specifications

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3. Signalling & Control

BALISE & AXLE COUNTER

AJ-2YOF(L)2YDB2Y
HALOGEN FREE & WATERTIGHT

Application
For railway signalling applications, such as wiring of light signals, point machines, balises and axle counters and similar wayside equipment, up to 420 V AC or 600 V DC. Protected against inductive interferences, for example on AC electrified railroads. The cable is longitudinally watertight with stranded copper conductor and steel tape armouring.

Technical data
Design:
- n x 1 x diameter mm

Bending radius:
- Flexible: ≥ 20 x D
- Fixed: ≥ 15 x D

Temperature range:
- During installation: -10°C to +60°C
- In operation: -40°C to +60°C

Material property
- Halogen free: IEC 60754-1 & 2

Construction
Conductor:
- Solid copper wires
- Soft annealed
- Diameter 0.9 or 1.4 or 1.8 mm

Insulation:
- PE (2Y)
- Naturally coloured
- Blue marking/tracer core in each layer

Twisting:
- Cores twisted in concentric layers

Filling:
- Longitudinal watertight
- Low capacitance filling compound
- Drip point > 80 °C

Moisture barrier wrapping:
- Water swellable material
- Longitudinally watertight
- Applied with overlap

Sheath:
- Laminated with AL tape 0.15 mm
- One side copolymer coated
- Bonded with PE sheath
- Black

Screen (Inductive Protection):
- Concentric screen of copper wires
- 0.9, 1.2, 1.4 or 1.8 mm
- 2 layers of galvanized steel tape
- 0.5 or 0.8 mm

Outer sheath:
- PE
- Black

Content is subject to changes acc. to current product development and or any changes to standards.
### Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>0.9 mm</th>
<th>1.4 mm</th>
<th>1.8 mm</th>
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<tr>
<td>Conductor resistance</td>
<td>Ω/km</td>
<td>≤ 28.9</td>
<td>≤ 11.9</td>
<td>≤ 7.2</td>
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<tr>
<td>Insulation resistance</td>
<td>GΩxkm</td>
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<tr>
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<td>nF/km</td>
<td>≤ 115 (1)</td>
<td>≤ 145 (2)</td>
<td>≤ 145 (2)</td>
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<tr>
<td>Operating voltage DC/AC</td>
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<td>≤ 600/ ≤ 420</td>
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1) ≤ 120 nF/km for single core in center
2) ≤ 155 nF/km for single core in center

### Table

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3. Signalling & control

SIGNALLING

A-2Y2YB2Y
HALOGEN FREE & ARMoured

Application
PE insulated and halogen free signalling cable, with cores in concentric layers and armouring. Suitable for railway application directly in the ground or in ducts.

Technical data
Design:
> n x 1 x diameter mm
Bending radius:
> ≥ 10 x D

Temperature range
> Drung installation: -10°C to + 60°C
> In operations: -40°C to + 60°C

Standard
> PH 416.0115 V1.1

Material property
> Halogen free: IEC 60754-1 & 2

Construction
Conductor:
> Solid copper wires
> Soft annealed
> Diameter 0.9 or 1.4 or 1.8 mm
Insulation:
> PE
> Natural coloured
> Blue marking/tracer core in each layer
Twisting:
> Cores twisted in concentric layers
> 2 perforated pilot cores if ≥ 14 cores
> 0.5 mm
Wrapping:
> Non-hygroscopic foil
Inner sheath:
> PE
> Black
Armouring:
> 1 layers of galvanized steel tape 0.2-3 mm
> 2 layers of galvanized steel tape 0.1 mm
> Helically applied
Outer sheath:
> PE
> Black

Content is subject to changes acc. to current product development and or any changes to standards.
### Characteristics

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<th>Characteristics</th>
<th>Unit</th>
<th>0.9 mm</th>
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<td>Conductor resistance</td>
<td>Ω/km</td>
<td>≤ 28.9</td>
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<tr>
<td>Insulation resistance</td>
<td>GΩ/km</td>
<td>≥ 10</td>
<td>≥ 10</td>
<td>≥ 10</td>
</tr>
<tr>
<td>Mutual capacitance at 800 Hz</td>
<td>nF/km</td>
<td>≤ 115</td>
<td>≤ 145</td>
<td>≤ 145</td>
</tr>
<tr>
<td>Operating voltage DC/AC</td>
<td>V</td>
<td>≤ 600/</td>
<td>≤ 600/</td>
<td>≤ 600/</td>
</tr>
<tr>
<td>Test voltage at 50 Hz - 1 min</td>
<td></td>
<td>≤ 420</td>
<td>≤ 420</td>
<td>≤ 420</td>
</tr>
<tr>
<td>core/core</td>
<td>Vrms</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>core/screen</td>
<td>Vrms</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
</tbody>
</table>

1 ≤ 120 nF/km for single core in center
2 ≤ 155 nF/km for single core in center

### Table

<table>
<thead>
<tr>
<th>No. of cores</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>14.0</td>
<td>190</td>
<td>1000</td>
</tr>
<tr>
<td>7</td>
<td>15.5</td>
<td>260</td>
<td>1000</td>
</tr>
<tr>
<td>10</td>
<td>18.0</td>
<td>340</td>
<td>1000</td>
</tr>
<tr>
<td>14</td>
<td>19.0</td>
<td>420</td>
<td>1000</td>
</tr>
<tr>
<td>20</td>
<td>21.0</td>
<td>550</td>
<td>1000</td>
</tr>
<tr>
<td>24</td>
<td>22.0</td>
<td>360</td>
<td>1000</td>
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<td>30</td>
<td>23.0</td>
<td>750</td>
<td>1000</td>
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<td>40</td>
<td>25.0</td>
<td>940</td>
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<tr>
<td>50</td>
<td>28.0</td>
<td>1140</td>
<td>1000</td>
</tr>
<tr>
<td>60</td>
<td>30.0</td>
<td>1320</td>
<td>1000</td>
</tr>
</tbody>
</table>
3. Signalling & control

SIGNALLING

AJ-2Y(L)2YDB2Y
ARMOURED & INTERFERENCE PROTECTED

Application
For railway signalling application for transmission of low frequent signal through symmetric circuits, for example axle counter devices and similar wayside equipment. Protected against inductive interferences, for example on AC electrified railroads. The cable is star quad stranded with steel tape armouring.

Technical data
Design:
> n x 4 x diameter mm
Bending radius:
> ≥ 10 x D

Temperature range
> Upon installation: -10°C to +60°C
> In operations: -40°C to +60°C

Standard
> PH 416.0115 V1.1

Material property
> Halogen free: IEC 60754-1 & 2

Construction
Conductor:
> Solid copper wires
> Soft annealed
> Diameter 0.9 or 1.4 mm

Insulation:
> PE (2Y)
> Natural colour with black ring marketing
> Quad in each layer carry open blue helix

Twisting:
> Cores twisted to star quads
> Quads laid up in concentric layers
> 2 perforated pilot cores if ≥ 7 quads

Wrapping:
> Non-hygroscopic plastic tape

Moisture barrier:
> Laminated sheath
> Aluminium tape 0.15 mm
> One side copolymer coated
> Bonded with inner sheath

Inner sheath:
> PE
> Black

Armouring:
> Copper wires
> Helically applied

Outer sheath:
> PE (2Y)
> Black

Content is subject to changes acc. to current product development and or any changes to standards.
### Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>0.9 mm</th>
<th>1.4 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor loop resistance</td>
<td>Ω/km</td>
<td>≤ 56.6</td>
<td>≤ 23.4</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>GΩxkm</td>
<td>≥ 10</td>
<td>≥ 10</td>
</tr>
<tr>
<td>Mutual capacitance at 800 Hz</td>
<td>nF/km</td>
<td>≤ 45 nF</td>
<td>≤ 45 nF</td>
</tr>
<tr>
<td>Capacitance unbalance at 800 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k₁ (100 % / 50 % of all values)</td>
<td>pF/500 m</td>
<td>≤ 650 / ≤ 150</td>
<td>≤ 650 / -</td>
</tr>
<tr>
<td>k₉₋₁₂ neighboured quads</td>
<td>pF/500 m</td>
<td>≤ 500 / ≤ 150</td>
<td>≤ 500 / -</td>
</tr>
<tr>
<td>k₉₋₁₂ over-neighboured quads</td>
<td>pF/500 m</td>
<td>≤ 150</td>
<td>≤ 150</td>
</tr>
<tr>
<td>Eₚₘ/2</td>
<td>pF/500 m</td>
<td>≤ 1300</td>
<td>≤ 1300</td>
</tr>
<tr>
<td>Far-end crosstalk attenuation at 90 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 % / 80 % of all values</td>
<td>dB/km</td>
<td>≥ 58 / ≥ 62</td>
<td>≥ 33 / -</td>
</tr>
<tr>
<td>Attenuation at 90 kHz</td>
<td>dB/km</td>
<td>≤ 3.3</td>
<td>≤ 2.6</td>
</tr>
<tr>
<td>Test voltage at 50 Hz - 1 min</td>
<td></td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>Core/core</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Vₚₘ</td>
<td></td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>Core/screen</td>
<td></td>
<td>2500</td>
<td>2500</td>
</tr>
</tbody>
</table>

1) ≤ 52 nF/km for 1 x 4 x ø and for central quads, where 1st layer consist only of one quad, as well as in the outer layer of armoured cables.

### Reduction factor class

<table>
<thead>
<tr>
<th>No. of</th>
<th>Reduction factor class</th>
<th>Outer diameter</th>
<th>Weight</th>
<th>Standard length</th>
<th>Outer diameter</th>
<th>Weight</th>
<th>Standard length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rₖ</td>
<td>mm</td>
<td>kg/km</td>
<td>m</td>
<td>mm</td>
<td>kg/km</td>
<td>m</td>
</tr>
<tr>
<td>3</td>
<td>600</td>
<td>21.0</td>
<td>800</td>
<td>1000</td>
<td>-</td>
<td>-</td>
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<td>600</td>
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<td>28.0</td>
<td>1430</td>
<td>1000</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>600</td>
<td>35.0</td>
<td>2130</td>
<td>1000</td>
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<td>-</td>
</tr>
<tr>
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<td>600</td>
<td>40.0</td>
<td>2800</td>
<td>1000</td>
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<td>-</td>
<td>-</td>
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<td>45.0</td>
<td>3380</td>
<td>1000</td>
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<td>-</td>
</tr>
<tr>
<td>3</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>25.0</td>
<td>1350</td>
<td>1000</td>
</tr>
<tr>
<td>5</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>29.0</td>
<td>1760</td>
<td>1000</td>
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<td>500</td>
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<td>-</td>
<td>-</td>
<td>37.0</td>
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<tr>
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<td>500</td>
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<td>6550</td>
<td>500</td>
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<td>-</td>
<td>-</td>
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<td>8070</td>
<td>250</td>
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<td>400</td>
<td>31.0</td>
<td>2250</td>
<td>1000</td>
<td>39.0</td>
<td>3610</td>
<td>1000</td>
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<td>400</td>
<td>38.0</td>
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<td>1000</td>
<td>49.0</td>
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<td>500</td>
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<td>30</td>
<td>400</td>
<td>43.0</td>
<td>4080</td>
<td>500</td>
<td>56.0</td>
<td>6690</td>
<td>500</td>
</tr>
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<td>40</td>
<td>400</td>
<td>48.0</td>
<td>4800</td>
<td>500</td>
<td>63.0</td>
<td>8070</td>
<td>250</td>
</tr>
</tbody>
</table>
3. Signalling & control

SIGNALLING

A-H(L)HV
HALOGEN FREE & STAR QUADS TWISTED

Application
For railway signalling application for transmission of low frequent signal through symmetric circuits or for laying directly in the ground or ducts. Concentrically stranded into star quads and steel tape armoured.

Technical data
Design:
> n x 4 x diameter mm
Bending radius:
> ≥ 7.5 x D

Temperature range
> During installation: - 5°C to + 50°C
> In operations: - 30°C to + 70°C

Standard
> PH 416.0115

Material property
> Halogen free: IEC 60754-1
> Flame retardant: IEC 60332-3
> Smoke density: EN 60134

Construction
Conductor:
> Solid copper wires
> Soft annealed
> Diameter 0.9 or 1.4 mm

Insulation:
> PE, halogen free
> Natural colour with black ring marking
> Quad in each layer carry open blue helix

Twisting:
> Cores twisted to star quads
> Quads laid up in concentric layers
> 2 perforated pilot cores if ≥ 7 quads

Wrapping:
> Foil or plastic
> Flame retardant

Moisture barrier:
> Lamintated sheath
> Aluminium tape 0.15 mm
> One side copolymer coated
> Bonded with sheath

Outer sheath:
> PE, flame retardant
> Black

Content is subject to changes acc. to current product development and or any changes to standards.
### Signalling & control

**Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>0.9 mm</th>
<th>1.4 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor loop resistance</td>
<td>Ω/km</td>
<td>≤ 56.6</td>
<td>≤ 23.4</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>GΩxkm</td>
<td>≥ 10</td>
<td>≥ 10</td>
</tr>
<tr>
<td>Mutual capacitance at 800 Hz</td>
<td>nF/km</td>
<td>≤ 45 †</td>
<td>≤ 45 †</td>
</tr>
<tr>
<td>Capacitance unbalance at 800 Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k₁ (100 % / 50 % of all values)</td>
<td>pF/500 m</td>
<td>≤ 650 / ≤ 150</td>
<td>≤ 650 / -</td>
</tr>
<tr>
<td>k₉₋₁₂ neighboured quads</td>
<td>pF/500 m</td>
<td>≤ 500 / ≤ 150</td>
<td>≤ 500 / -</td>
</tr>
<tr>
<td>k₉₋₁₂ over-neighboured quads</td>
<td>pF/500 m</td>
<td>≤ 150</td>
<td>≤ 150</td>
</tr>
<tr>
<td>e₉₋₁₂</td>
<td>pF/500 m</td>
<td>≤ 1300</td>
<td>≤ 1300</td>
</tr>
</tbody>
</table>

**Far-end crosstalk attenuation at 90 kHz**

- 100 % / 80 % of all values dB/km ≥ 58 / ≥ 62 ≥ 33 / -
- Attenuation at 90 kHz dB/km ≤ 3.3 ≤ 2.6

**Test voltage at 50 Hz - 1 min**

- Core/core V<sub>rms</sub> 2500 2500
- Core/screen V<sub>rms</sub> 2500 2500

- ≤ 52 nF/km for 1 x 4 x ø and for central quads, where 1st layer consist only of one quad, as well as in the outer layer of armoured cables.

### Table

<table>
<thead>
<tr>
<th>No. of quads</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard length m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n x 4 x 0.9 mm (H45)</td>
<td></td>
<td></td>
<td>n x 4 x 1.4 mm (H45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>10.0</td>
<td>130</td>
<td>1000</td>
<td>12.0</td>
<td>200</td>
<td>1000</td>
</tr>
<tr>
<td>3</td>
<td>14.5</td>
<td>250</td>
<td>1000</td>
<td>19.0</td>
<td>430</td>
<td>1000</td>
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<td>5</td>
<td>17.0</td>
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<td>1000</td>
<td>22.5</td>
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<tr>
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<td>18.0</td>
<td>430</td>
<td>1000</td>
<td>24.5</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>10</td>
<td>21.5</td>
<td>570</td>
<td>1000</td>
<td>29.5</td>
<td>1,080</td>
<td>1000</td>
</tr>
<tr>
<td>14</td>
<td>24.0</td>
<td>720</td>
<td>1000</td>
<td>33.5</td>
<td>1,450</td>
<td>1000</td>
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<tr>
<td>20</td>
<td>27.5</td>
<td>950</td>
<td>1000</td>
<td>39.5</td>
<td>1,960</td>
<td>1000</td>
</tr>
<tr>
<td>30</td>
<td>33.0</td>
<td>1,350</td>
<td>1000</td>
<td>46.5</td>
<td>2,780</td>
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<td>37.5</td>
<td>1,730</td>
<td>1000</td>
<td>53.0</td>
<td>3,590</td>
<td>1000</td>
</tr>
</tbody>
</table>
### SIGNALLING

#### A-2Y2YDB2Y

**HALOGEN FREE & INTERFERENCE PROTECTED**

**Application**
PE insulated and halogen free signalling cable, with cores in concentric layers and protected against inductive interferences. Suitable for railway application directly in the ground or in ducts.

**Technical data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>&gt; n x 1 x diameter mm</td>
</tr>
<tr>
<td>Bending radius</td>
<td>&gt; ≥ 7.5 x D</td>
</tr>
<tr>
<td>Temperature range</td>
<td>&gt; Drung installation: -10°C to +60°C</td>
</tr>
<tr>
<td></td>
<td>&gt; In operations: -40°C to +60°C</td>
</tr>
<tr>
<td>Standard</td>
<td>&gt; PH 416.0113 v 1.1</td>
</tr>
<tr>
<td>Material property</td>
<td>&gt; Halogen free: IEC 60754</td>
</tr>
</tbody>
</table>

**Construction**

**Conductor:**
- Solid copper wires
- Soft annealed
- Diameter 0.9 or 1.4 or 1.8 mm

**Insulation:**
- PE (2Y)
- Natural coloured
- Blue marking/tracer core in each layer

**Twisting:**
- Cores twisted in concentric layers
- 2 perforated pilot cores if ≥ 14 cores
- 0.5 mm

**Wrapping:**
- Non-hygroscopic plastic tape

**Inner sheath:**
- PE (2Y)
- Black

**Protective screen:**
- Concentric layer of copper wires
- Diameter 0.9, 1.4 or 1.8 mm
- 2 layers of galvanized steel tape
- Diameter 0.5 or 0.8 mm

**Outer sheath:**
- PE (2Y)
- Black

Content is subject to changes acc. to current product development and or any changes to standards.
### Signalling & control

#### Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Unit</th>
<th>0.9 mm</th>
<th>1.4 mm</th>
<th>1.8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductor resistance</td>
<td>Ω/km</td>
<td>≤ 28.9</td>
<td>≤ 11.9</td>
<td>≤ 7.2</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>GΩxkm</td>
<td>≥ 10</td>
<td>≥ 10</td>
<td>≥ 10</td>
</tr>
<tr>
<td>Mutual capacitance at 800 Hz</td>
<td>nF/km</td>
<td>≤ 115</td>
<td>≤ 145</td>
<td>≤ 145</td>
</tr>
<tr>
<td>Operating voltage DC/AC</td>
<td>V</td>
<td>≤ 600/ ≤ 420</td>
<td>≤ 600/ ≤ 420</td>
<td>≤ 600/ ≤ 420</td>
</tr>
<tr>
<td>Test voltage at 50 Hz - 1 min</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>core/core</td>
<td>Vrms</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
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<tr>
<td>core/screen</td>
<td>Vrms</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
</tbody>
</table>

1) ≤ 120 nF/km for single core in center
2) ≤ 155 nF/km for single core in center

### Table

<table>
<thead>
<tr>
<th>No. of cores</th>
<th>Outer diameter (mm)</th>
<th>Weight (kg/km)</th>
<th>Standard length (m)</th>
<th>Outer diameter (mm)</th>
<th>Weight (kg/km)</th>
<th>Standard length (m)</th>
<th>Outer diameter (mm)</th>
<th>Weight (kg/km)</th>
<th>Standard length (m)</th>
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<td>8</td>
<td>16</td>
<td>470</td>
<td>1000</td>
<td>-</td>
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<td>-</td>
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n x 1 x 0.9 mm | n x 1 x 1.4 mm | n x 1 x 1.8 mm
3. Signalling & Control

CONTROL

MCMO 450/750 V
FLAME RETARDANT & SCREENED

Application
Cable for control, measuring and signal circuits of electrical equipment. Suitable for fixed surface and flush-mounted installations indoors and outdoors as well as for direct burial in the ground. The concentric copper conductor forms a good electromechanical protection and a moderate protection against electrical interference.

Technical data
Rated voltage: > 450/750 V
Pulling force: > Max. 50 N/mm²
Test voltage: > 2.500 V
Capacitance at 20°C:
> Between 2 adjacent cores: 130-160 nF/km
> To earth for 1 core: 200-280 nF/km

Temperature range
> In operations: max. +70°C
> Short circuit temperature: +160°C
> Lowest temp. at installation: -15°C

Material property
> Flame retardant: IEC 60332-1

Content is subject to changes acc. to current product development and or any changes to standards.

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating in free air A</th>
<th>Standard delivery m</th>
<th>Prysmian article no.</th>
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CONTROL

MCCMO-HF C-PRO 450/750 V
EMC SCREENED & FLAME RETRADANT

Application
EMC shielded control cable with copper conductors. Halogen free, flame retardant and self-extinguishing in the event of fire. For fixed installation, indoors, outdoors, in pipes, ground or water. Suitable for switchgear and potentially explosive areas. Can be plowed down with caution. The copper screen has 100% coverage and meets EMC Directive with appropriate installation.

Technical data
Rated voltage:
> 450/750 V
Test voltage:
> 2,500 V
Bending radius:
> During installation: 10 x D
> Fixed: 8 x D

Temperature range
> In operation: max. +90°C
> Short circuit temperature: +250°C
> Lowest temp. at installation: -15°C

Standard & Directive
Standard:
> HD 627 7B2
Directive:
> Fulfills RoHS and REACH
Approval:
> CPR class: Cca-s1d1a1

Construction
Conductor:
> Round copper wires
> Solid and annealed
> Acc. to IEC 60228 class 1.
Insulation:
> HFFR
> White
> Black numbering
Filling:
> Halogen free
Screen:
> Helix of copper wires
> Counter helix of copper wires or tape
> Min. cross-section area 6 mm²
Outer sheath:
> Halogen free polymer
> Black

Material property
> Halogen free: IEC 60754-1
> Flame retardant: IEC 60332-1 & 3
> Smoke density: EN 60134

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Standard delivery m</th>
<th>Prysmian EAN no.</th>
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Content is subject to changes acc. to current product development and or any changes to standards.
MKMO-HF C-PRO 450/750 V
LOW SMOKE & HALOGEN FREE

Application
Cable for the control, measuring and signal circuits of electrical equipment for fixed surface and flush-mounted installations. Suitable for indoors and outdoors installation especially in places where the cable is exposed to vibration. Not suitable for installation directly in the ground, vibrated concrete or exposed to electrical interference.

Technical data
- Rated voltage: > 450/750 V
- Pulling force: > Max. 50 N/mm²
- Test voltage: > 2,500 V
- Max. DC resistance at 20°C: > 12 Ω/km
- Capacitance at 20°C: > Between 2 adjacent cores: 120-150 nF/km

Temperature range
- In operations: max. +70°C
- Short circuit temperature: +160°C
- Lowest temp. at installation: -20°C

Construction
- Conductor: Round copper wires
- Stranded and annealed
- Acc. to IEC 60228 class 2.
- Insulation: Halogen free compound
- Black
- Core colouring/marking: Acc. to EN 50334
- 7-core(N): White numbering
- 7-core(S): Yellow/green, white numbering
- 12-37 core: White numbering
- Wrapping: Plastic tape
- Outer sheath: Halogen free compound
- White

Material property
- Halogen free: IEC 60754-1
- Smoke density: IEC 61034

Standard & Directive & Approval
- Standard: EN 50363 and SFS 3714
- IEC / EN 60332-1-2
- IEC / EN 61034
- EN 50267
- Directive: Fulfills REACH and RoHS
- Approval: CPR class: Cca

<table>
<thead>
<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current rating in free air A</th>
<th>Standard delivery m</th>
<th>Prysmian article no.</th>
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Content is subject to changes acc. to current product development and or any changes to standards.
Application
PE insulated and sheated control cable with concentric copper conductor especially for railway application.

Technical data
Rated voltage: > 450/750 V
Test voltage: > 2,500 V
Pulling force: Max. 50 N/mm²

Temperature range
> In operations: max. +70°C
> Short circuit temperature: +130°C

Standard & Directive
Standard:
> SFS 3713
> IEC 502
> IEC 60228
> IEC 60502-1

Directive:
> Fulfills RoHS

Construction
Conductor:
> Round copper wires
> Solid and annealed
> Acc. to IEC 60228 class 1.

Insulation:
> PE, extruded acc. to IEC 502
> Black
> White numbering

Filling:
> Extruded covering/seperation sheath

Screen:
> Helix of copper wires
> Counter helix of copper wires

Outer sheath:
> Extruded PE
> Type 5T
> Acc. to IEC 60502-1
> Black

Content is subject to changes acc. to current product development and or any changes to standards.
3. Signalling & Control

CONTROL

MMO 450/750 V
PVC INSULATED & FLAME RETARDED

Application
Cable for control, measuring and signal circuits of electrical equipment. Suitable for fixed surface or flush-mounted installations, indoors and outdoors. Direct sunlight may change the colour of the sheath.

Technical data
Rated voltage:
> 450/750 V
Test voltage:
> 2,500 V
Bending radius:
> During installation: 10 x D
> In operation: 3 x D

Temperature range
> In operations: max. +70°C
> Short circuit temperature: +160°C
> Lowest temp. at installation: -15°C

Standard & Approval
Standard:
> EN EVS 722
> SFS 3714
> HD 627
Approval:
> CPR class: Eca

Material property
> Flame retardant: IEC 60332-1

<table>
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<tr>
<th>Conductor cross-section mm²</th>
<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Current resistance of conductor at 20°C - max.0/km</th>
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Content is subject to changes acc. to current product development and or any changes to standards.
ALONG THE TRACK

FZOMVDMU-SD
OUTDOOR & ARMOURED STRANDED LOOSE TUBE

Application
Applications include outdoor data communication connections, telecom trunk lines, telecom access net connections and CATV trunk lines. The intended installation method for this cable is for direct burial under general conditions or with risk of severe rodent attack.

Technical data
Tensile strength:
- Max. installation: 5 kN
- Max. operation: 3.4 kN
Crush:
- 6,000 N, 100 mm, max 15 min.
- 2,000 N, 25 mm, max 15 min.
Impact:
- 40 J, 3 impacts, R=300 mm
Repeated bending:
- 30 reverse bends, R = 300 mm
Torsion:
- 100 N, ± 180°C, 10 cycles
Repeated bending:
- R=20 x D, 100 N, 35 cycles
Cable bend:
- R=20 x D, 4 turns, 3 cycles
Bending radius:
- Loaded:15 x D
- Unloaded: 20 x D
Water penetration:
- Sample=3 m, water column = 1 m
- No water leakage after 24 hours

Temperature range
- Storage: -40°C to + 60°C
- Installation: -30°C to + 60°C
- Operation: -40°C to +70°C

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<th>Fibre count</th>
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<th>Loose tube diameter mm</th>
<th>CSM diameter m</th>
<th>CMS oversheat diameter m</th>
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</table>

Fibre colour code:
- 1 blue, 2 white, 3 yellow, 4 green
- 5 grey, 6 orange, 7 brown, 8 aqua
- 9 black, 10 violet, 11 pink, 12 red

Loose tube:
- Thermoplastic material
- Watertight compound
- 12 fibers in each

Filler:
- Thermoplastic rods, when needed

Stranding:
- Loose tubes and fillers
- SZ stranded around CSM

Water blocking:
- Longitudinal watertight
- Water swellable elements
- Dry core

Rip cord:
- 2 rip cords

Inner sheath:
- PE, 1.0 mm

Peripheral reinforcement:
- Aramid yarns

Rip cord:
- 2 rip cords

Armouring:
- Corrugated steel tape with overlap
- Both sides copolymer coated

Outer sheath:
- HDPE 1.5 mm
- Black

Standard:
- IEC 60794-3-10
ALONG THE TRACK

FY0VD2PMU
ARMoured & WATERTight LOOSE TUBE

Application
Optical fibre cable with dry core and longitudinal watertight. Armoured with corrugated steel tape for extra protection. Suitable for direct buried applications.

Technical data
- **Tensile strength:**
  - Max. installation: 5 kN
- **Crush:**
  - 6000 N per 100 mm
- **Impact:**
  - 30 Nm, 3 impacts, R=300 mm
- **Torsion:**
  - 100 N, ± 1 turn, 5 cycles
- **Repeated bending:**
  - R=15 x D, 100 N, 35 cycles
- **Cable bend:**
  - R=20 x D, 5 turns, 3 cycles
- **Bending radius:**
  - Loaded: 25 x D
  - Unloaded: 20 x D
- **Water penetration:**
  - Sample=3 m, water column = 1 m
  - No water leakage after 24 hours

Standard
- IEC 60794-3-10

Temperature range
- Storage: -45°C to +60°C
- Installation: -15°C to +40°C
- Operation: -45°C to +60°C

Construction
- **Central loose tube:**
  - Thermoplastic material
  - Filled with water tightness compound
  - 12 single-mode optical fibres

- **Fibre colour code:**
  - 1 blue, 2 white, 3 yellow, 4 green
  - 5 grey, 6 orange, 7 brown, 8 aqua
  - 9 black, 10 violet, 11 pink, 12 red

- **Yarn colours:**
  - 1 blue, 2 white, 3 yellow, 4 green

- **Water blocking:**
  - Water swellable tape
  - Longitudian watertight
  - Dry core

- **Armouring:**
  - Corrugated steel tape with overlap
  - 0.15 mm
  - Copolymer coated
  - 1 rip cord

- **Strength element:**
  - 2 steel wires
  - Diagonally opposed
  - Longitudinally applied
  - Nom. diameter 1.6 mm

- **Outer sheath:**
  - PE
  - Black

<table>
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<tr>
<th>Fibre count</th>
<th>No. of tubes x no. fibres</th>
<th>Loose tube diameter mm</th>
<th>Cable diameter mm</th>
<th>Cable weight kg/km</th>
<th>Standard length km</th>
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4. Communication

ALONG THE TRACK

FTMVDMSU
UNIVERSAL, ARMOURED & WATERTIGHT

Application
Universal distribution or mini-break-out cable for indoor and outdoor application in LAN and WAN backbones, central office interconnections and backbones in data centres. Suitable for installation in ducts, on trays and directly buried. Designed with double sheathing where the outer one is both UV stabilised, water and moisture resistant. Between the two sheaths there is a steel tape armouring making the cable rodent proof.

Technical data
Impact:
> 20 Nm
Crush:
> 3,000 N / 100 mm
Torsion:
> 5 cycles ± 1 turn
Kink:
> No kink at bending radius 12 x D
Bending radius:
> For stranded fibres: min. 20 mm
> For MaxCap-BB-Omx fibres: min. 7.5 mm
> For BendBright XS fibres: min. 7.5 mm

Temperature range
Storage: - 40°C to + 70°C
Installation: - 20°C to + 70°C
Operation: - 20°C to + 70°C

Material property
> Flame retardant: IEC 60332-1-2
> Acidity: IEC 60754-2
> Smoke density: IEC 61034

Construction
Fibre:
> 2-24 tight buffered fibres
> 900 μm ± 50 μm
Fibre colour code:
> 1 red, 2 green, 3 blue, 4 yellow, 5 white
> 6 grey, 7 brown, 8 violet, 9 turquoise,
> 10 black, 11 orange, 12 pink
Fibre colour code with mark every 70 mm
> 13 yellow, 14 white, 15 grey, 16 turquoise,
> 17 orange, 18 pink
Fibre colour code with mark every 35 mm
> 19 yellow, 20 white, 21 grey, 22 turquoise
> 23 orange, 24 pink

Strength member:
> Ultra-high modulus aramid yarns

Inner sheath:
> Thermoplastic sheathing compound
> Acc. to EN 50290-2-27.
> Halogen free and flame retardant
> UV stabilised

Armouring:
> Corrugated steel tape 0.15 mm

Outer sheath:
> 1.5 mm FireBur® material
> Flame retardant and UV stabilised
> Acc. to EN 50290-2-27
> Blue

Standard & Approval
Standard:
> ISO 11801 2nd edition, EN 187 000
> IEC 60794-1 & 2, EN 50 173-1
> IEC 60794-2-20

Approval:
> CPR class: Eca

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<th>Outer diameter mm</th>
<th>Weight kg/km</th>
<th>Installation load max. N</th>
<th>Tensile strength N</th>
<th>Bending radius</th>
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ALONG THE TRACK

FTMRMSU
UNIVERSAL, WATERTIGHT & ROBUST

Application
Universal distribution or mini-break-out cable suited for indoor and outdoor applications such as LAN and WAN backbones, central office inter-connections, backbones in data centres and many other applications. Suitable for installation on trays or directly buried in ducts that occasionally floods. Designed with double sheathing that makes it UV stabilised, water and moisture resistant. Between the two sheaths there is a layer of coated and water blocking glass yearns, giving the cable a very high tensile strength and a degree of rodent protection.

Technical data
Impact:
> 15 Nm
Crush:
> 2,000 N / 100 mm
Torsion:
> 5 cycles ± 1 turn
Bending radius:
> For stranded fibres: min. 20 mm
> For Max-Cap-BB-Omx fibres: min. 7.5 mm
> For BendBright XS fibres: min. 7.5 mm

Temperature range
> Storage: - 40°C to + 70°C
> Installation: - 20°C to + 70°C
> Operation: - 20°C to + 70°C

Material property
> Flame retardant: IEC 60332-1
> Acidity: IEC 60754-2
> Smoke density: IEC 61034

Construction
Fibre:
> 2-24 tight buffered fibres
> 900 μm ± 50 μm
Fibre colour code:
> 1 red, 2 green, 3 blue, 4 yellow, 5 white
> 6 grey, 7 brown, 8 violet, 9 turquoise,
> 10 black, 11 orange, 12 pink
Fibre colour code with mark every 70 mm
> 13 yellow, 14 white, 15 grey, 16 turquoise,
> 17 orange, 18 pink
Fibre colour code with mark every 35 mm
> 19 yellow, 20 white, 21 grey, 22 turquoise
> 23 orange, 24 pink
Strength member:
> Ultra-high modulus aramid yarns
Inner sheath:
> LZSH compound
> Acc. to EN 50290-2-27.
> Halogen free and flame retardant
> UV stabilised
Reinforcement:
> Coated glass yarns
Ripcord:
> Polyester
Outer sheath:
> 1.2 mm FireBur® material
> Flame retardant and UV stabilised
> Acc. to EN 50290-2-27
> Blue

Standard
> ISO 11801 2nd edition
> EN 187 000
> IEC 60754-2
> EN 50173-1
> IEC 60754-2-20

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<tr>
<th>Fibre count</th>
<th>Outer diameter nom. mm</th>
<th>Weight nom. kg/km</th>
<th>Tensile strength short term N</th>
<th>Tensile strength permanent N</th>
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Content is subject to changes acc. to current product development and or any changes to standards.
ALONG THE TRACK

FZORMU-SD
OUTDOOR STRANDED LOOSE TUBE

Application
Outdoor cable for LAN, MAN and telecom backbone installations direct in the ground or in trenches using ploughing method. Designed with a layer of coated and water blocking glass yarns, giving the cable a very high tensile strength and a degree of rodent protection.

Technical data
Short term tensile strength:
- > 5,000 N
Permanent tensile strength:
- > 3,500 N
Crush:
- > 3,000 N
Impact:
- > 20 Nm
Torsion:
- > 5 cycles ± 1 turn
Kink:
- No kink at bending radius 12 x D

Bending radius:
- For 72 fibres: min. 150 mm
- For 96 fibres: min. 175 mm

Water penetration:
- No water on free end

Temperature range
- Storage: - 40°C to + 70°C
- Installation: - 40°C to + 70°C
- Operation: - 40°C to + 70°C

Construction
Central strength member:
- > 2.5 mm diameter, FPR rod
Loose tube:
- Gel filled loose tube
- > 2.3 mm diameter
- 12 fibres in each
- Up to 18 tubes in to layers
Water blocking:
- Swellable tape and yarn
Wrapping:
- Swellable tape
Reinforcement:
- Heavy layer of glass yarns
Rip cord:
- Polyester
Outer sheath:
- MDPE 1.5 mm
- Black
- Acc. to IEC 60811 & 60708

Standard
- EN 187 000
- IEC 60794-3
- IEC 60794-3-10
- IEC 60794-3-12
- ISO 11801 2nd edition
- EN 50 173-1

Table: UC FIBRE O ST D DA PE 5.0 kN

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<tr>
<th>Cable type description</th>
<th>Fibre count no.</th>
<th>Outer diameter nom.mm</th>
<th>Weight nom. kg/km</th>
<th>Bending radius min. mm</th>
<th>Fibre type</th>
<th>Prysmian article no.</th>
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**ALONG THE TRACK**

**FZOMVDMSU-SD**

**OUTDOOR & ARMOURED STRANDED LOOSE TUBE**

**Application**
Armoured outdoor cable for data communication connections, CATV trunk lines, telecom trunk lines and telecom access net connections. For direct burial in general conditions or with risk of severe rodent attacks.

**Technical data**
- **Short term tensile strength:**
  - > 1,800 N
- **Permanant tensile strength:**
  - > 1,200 N
- **Crush:**
  - > 3,000 N
- **Impact:**
  - > 20 Nm
- **Repeated bending:**
  - > 30 reverse bends, R = 300 mm
- **Torsion:**
  - > 5 cycles ± 1 turn
- **Kink:**
  - No kink at bending radius 12 x D
- **Bending radius:**
  - Min. 290 mm
- **Water penetration:**
  - No water on free end (core only)

**Temperature range**
- Storage: -60°C to +60°C
- Installation: -30°C to +60°C
- Operation: -60°C to +70°C

**Construction**
- **Central strength member:**
  - 2.5 mm diameter, FPR rod
- **Fibre colour code:**
  - 1 red, 2 green, 3 blue, 4 yellow, 5 white, 6 grey, 7 brown, 8 violet, 9 turquoise, 10 black, 11 orange, 12 pink
- **Loose tube:**
  - Gel filled loose tubes
  - 2.3 mm diameter
  - 12 fibers in each
- **Water blocking:**
  - Swellable tape and yarn
- **Wrapping:**
  - Polyester tape
- **Rip cord:**
  - 1 rip cord
- **Inner sheath:**
  - Blue FireBur® acc. to EN 50290-2-27
- **Rip cord:**
  - 1 rip cord
- **Armouring:**
  - Corrugated steel tape 0.155 mm
- **Outer sheath:**
  - Blue FireBur® 1.5 mm
  - Ac. to EN 50290-2-27
- **Standard**
  - IEC 60794-3
  - IEC 60794-3-10
  - IEC 60794-3-12
  - EN 50173-1
  - ISO 11801 2nd edition

**Material property**
- Flame retardant: IEC 60332-1
- Halogen free: IEC 60754-1
- Acidity: IEC 60754-2
- Smoke density: IEC 61034

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<table>
<thead>
<tr>
<th>Fibre count</th>
<th>Outer diameter mm</th>
<th>Weight nom. kg/km</th>
<th>Tensile strength short term N</th>
<th>Bending radius min.mm</th>
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</table>
4. Communication

ALONG THE TRACK

FZOMU-SD
WEATHER PROOF & DRY CORE LOOSE TUBE

Application
Outdoor weather proof and robust cable with HDPE sheath for blowing in pipes or direct installation in ducts. Both metal and halogen free. Core is dry with swellable materials and grease-filled fibre tubes to prevent longitudinal water penetration.

Technical data
Short term tensile strength:
- > 2,700 N (24 - 144 mm²)
- > 2,000 N (192 mm²)
Permanent tensile strength:
- > 1,000 N
Crush:
- > 3,000 N
Impact:
- > 15 Nm
Bending:
- > < 0.05 dB no damage
Kink:
- > < 0.05 dB no damage
Water penetration:
- > < 3 m/24 hours

Temperature range
- Storage: - 40°C to + 70°C
- Installation: - 15°C to + 60°C
- Operation: - 40°C to + 70°C

Construction
Central strength member:
- > 2.1 - 3.5 mm diameter, FPR rod
Loose tube:
- > 2.5 or 3.0 mm diameter
- > Grease filled
- > SZ twisted around FPR rod
Water blocking:
- > Swellable material
- > Dry core
Rip cord:
- > 1 rip cord
Outer sheath:
- > HDPE 1.5 mm
- > Black

Standard
- > EN 187000, EN 1871000
- > EN 187101, EN 188000
- > EN 60793, IEC 60794
- > ITU-T REC G650, REC G652

Material property
- > Halogen free: IEC 60754-1

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<th>Weight nom. kg/km</th>
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<th>Bending radius min.mm</th>
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ALONG THE TRACK

FYORVDMU
OUTDOOR & ARMoured CENTRAL LOOSE TUBE

Application
Suitable for LAN and WAN backbones, telecom access lines, fibre to business and fibre to the building drop connections as well as fibre to the home drop and access connections. MDPE sheathing ideal for outdoor installation and corrugated steel tape armouring makes it rodent proof. Applicable for installation in ducts and on trays as well as for direct burial with proper sand back filling.

Technical data
Short term tensile strength:
> 1,000 N
Permanent tensile strength:
> 500 N
Crush:
> 2,000 N
Impact:
> 10 Nm
Torsion:
> 5 cycles ± 1 turn
Kink:
> No kink at loop diameter of 100 mm
Bending radius:
> Min. unloaded: R=55 mm
> Min. loaded: R=110 mm

Temperature range
> Storage: - 40°C to + 70°C
> Installation: - 40°C to + 70°C
> Operation: - 40°C to + 70°C

Construction
Loose tube:
> 2.8 or 3.5 mm diameter
> Gel-filled
> 2-6 or 24 fibers in each

Fibre colour code:
> 1 red, 2 green, 3 blue, 4 yellow, 5 white
> 6 grey, 7 brown, 8 violet, 9 turquoise, 10 black, 11 orange, 12 pink

Fibre colour code with mark every 70 mm
> 13 yellow, 14 white, 15 grey
> 16 turquoise, 17 orange, 18 pink

Fibre colour code with mark every 35 mm
> 19 yellow, 20 white, 21 grey, 22 turquoise
> 23 orange, 24 pink

Strength member:
E-glass yarns

Armouring:
Corrugated steel tape 0.15 mm

Outer sheath:
> MDPE 1.5 mm
> Acc. to IEC 60811, IEC 60708
> Black

Standard
> IEC 60794-1
> EN 50 173-1
> ISO 11801 2nd edition

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4. Communication

**ALONG THE TRACK**

**FZOMSU-SD**

**INDOOR/OUTDOOR STRANDED LOOSE TUBE**

**Application**
Indoor/outdoor backbone cable for LAN, WAN and telecom backbone installations. Robust dielectric design with a wide temperature range. The core is dry and water protected by dry water blocking technology.

**Technical data**
- **Short term tensile strength:** > 2,700 N
- **Tensile strength:** > 900 N
- **Crush:** > 3,000 N
- **Impact:** > 15 Nm, R=300
- **Torsion:** > 100 N, 10 cycles
- **Repeated bending:** R=20 x D, 100 N, 35 cycles
- **Cable bend:** R=20 x D, 4 turns, 3 cycles
- **Bending radius:** Loaded: min. 20 x D, Unloaded: min. 10 x D
- **Water penetration:** > 3 m/24 hours - no water leakage

**Temperature range**
- **Storage:** - 40°C to + 70°C
- **Installation:** - 30°C to + 60°C
- **Operation:** - 40°C to + 70°C

**Standard**
- IEC 60794-3-10

---

**Construction**
- **Central strength member (CSM):**
  - Glass fibre reinforced plastic rod, FPR
  - Plastic oversheathing when needed
- **Loose tube:**
  - Thermoplastic material
  - Up to 12 fibres per tube
  - Filled with watertight compound
- **Fibre colour code:**
  - 1 blue, 2 yellow, 3 red, 4 white, 5 green
  - 6 violet, 7 orange, 8 grey, 9 aqua
  - 10 black, 11 brown, 12 pink
- **Filler:**
  - Thermoplastic rods, where needed
- **Stranding:**
  - SZ stranded around the CSM rod
- **Water blocking:**
  - Longitudinal watertight
  - Water swellable material
  - Dry core
- **Strength member:**
  - Glass yarns, when needed
- **Rip cord:**
  - 2 rip cords
- **Outer sheath:**
  - HFFR compound
  - Black

**Material property**
- Flame retardant: IEC 60332-1
- Halogen free: IEC 60754-1
- Acidity: IEC 60754-2
- Smoke density: IEC 61034

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Content is subject to changes acc. to current product development and or any changes to standards.
FZOMSU-SD NANO
INDOOR/OUTDOOR STRANDED NANO CABLE

Application
Indoor/outdoor backbone cable for LAN, WAN and telecom backbone installations. Robust dielectric design with a wide temperature range. The core is dry and water protected by dry water blocking technology.

Technical data

**Tensile strength:**
- > 750 N

**Crush:**
- > 1,000 N

**Impact:**
- > 1 Nm, 3 impacts, R=300 mm

**Torsion:**
- > 45 N, ± 180°, 100 cycles

**Repeated bending:**
- > 150 mm, 10 N, 100 cycles

**Cable bend:**
- > 150 mm, 6 turns, 10 cycles

**Bending radius:**
- Loaded: min. 20 x D
- Unloaded: min. 10 x D

**Water penetration:**
- > 3 m/24 hours - no water leakage

**Temperature range**
- Storage: - 40°C to + 70°C
- Installation: - 30°C to + 60°C
- Operation: - 30°C to + 70°C

**Standard**
- > IEC 60794

**Construction**

**Central strength member (CSM):**
- Glass fibre reinforced plastic rod, FPR

**Loose tube:**
- Thermoplastic material
- Up to 12 fibres per tube
- Filled with water tightness compound

**Fibre colour code:**
- 1 white, 2 red, 3 yellow, 4 green, 5 blue, 6 grey, 7 brown, 8 black, 9 violet, 10 aqua, 11 orange, 12 pink

**Filler:**
- Thermoplastic rods, where needed

**Stranding:**
- Loose tubes (and fillers)
- SZ stranded around the CSM rod

**Water blocking:**
- Longitudinal watertight
- Water swellable material
- Dry core

**Rip cord:**
- 1 rip cord

**Outer sheath:**
- HFFR compound
- Black

**Material property**
- Flame retardant: IEC 60332-1
- Halogen free: IEC 60754-1
- Acidity: IEC 60754-2
- Smoke density: IEC 61034

<table>
<thead>
<tr>
<th>No. of fibres</th>
<th>24</th>
<th>48</th>
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<tbody>
<tr>
<td>No. tubes x no. fibres</td>
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<td>4 x 12</td>
<td>8 x 12</td>
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**AERIAL**

**FZORMU-SD - CLASS A**

**OUTDOOR ADSS STANDED LOOSE TUBE**

**Application**
Aerial outdoor ADSS (ADSS-All Dielectric Self Support design) cable for LAN, MAN and telecom backbone installations. The robust design include double sheathing, with a thick layer of aramid yarn in between. The cable is also suitable for duct installation. The core is dry and water protected by dry water blocking technology.

**Technical data**

- **Tensile strength:**
  - 15 kN
  - 2,200 N

- **Impact:**
  - 10 Nm

- **Bending radius:**
  - Loaded: min. 20 x D
  - Unloaded: min. 10 x D

- **Modulus of electricity:**
  - 70.8 kN/mm²

- **Effective area:**
  - 11.1 mm²

- **Thermal expansion coefficient:**
  - 4-72 fibres: 11.6 x 10⁻⁶ C⁻¹
  - 96 fibres: 16.2 x 10⁻⁶ C⁻¹

- **Tension in operation:**
  - Max. 7 kN

- **Installation span:**
  - 80 m, sag 0.6 m at 0°C

- **Water penetration:**
  - 3 m/24 hours - no water leakage

**Temperature range**

- **Storage:** -45°C to + 70°C
- **Installation:** -10°C to + 60°C
- **Operation:** -45°C to + 70°C

**Construction**

- **Central strength member (CSM):**
  - Glass fiber reinforced plastic rod, FPR
  - Plastic oversheathing when needed

- **Loose tube:**
  - Thermoplastic material
  - Up to 12 fibres per tube
  - Filled with watertight compound

- **Fibre colour code:**
  - 1 blue, 2 white, 3 yellow, 4 green, 5 grey
  - 6 orange, 7 brown, 8 aqua, 9 black
  - 10 violet, 11 pink, 12 red.

- **Buffered tube colour code:**
  - 1 blue, 2 white, 3 yellow, 4 green
  - 5 grey, 6 orange, 7 brown, 8 aqua.

- **Filler:**
  - Thermoplastic rods, where needed

- **Stranding:**
  - SZ stranded around the CSM rod

- **Water blocking:**
  - Longitudinal watertight
  - Water swellable material
  - Dry core

- **Peripheral reinforcement:**
  - Aramid yarns

- **Rip cord:**
  - 1 rip cord

- **Outer sheath:**
  - HDPE, 1.4 mm
  - Black

- **Standard**
  - IEC 60794-1-2

**Additional versions**
- Class B with 50 m span and 4.5 kN

<table>
<thead>
<tr>
<th>Fibre count</th>
<th>4 - 12</th>
<th>24</th>
<th>48</th>
<th>72</th>
<th>96</th>
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<td>No. tubes x no. fibres</td>
<td>6 x 12</td>
<td>6 x 12</td>
<td>6 x 12</td>
<td>6 x 12</td>
<td>8 x 12</td>
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<tr>
<td>Loose tube diameter mm</td>
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Content is subject to changes acc. to current product development and or any changes to standards.
AERIAL

FZOMURK

OUTDOOR FIGURE 8 STRANDED LOOSE TUBE

Application
Optical cable for aerial installation on poles. The outer sheath is made of abrasion resistant polyethylene. The cable has a non-metallic FRP messenger wire suitable for up to 250 m span lengths. Span length is dependent on ice load, wind load and installation sag. The figure-8 construction allows easy installation with cable grips attached to the messenger wire. The core is dry and water protected by dry water blocking technology. The cable is completely non-metallic to eliminate any problem with induced electrical currents.

Technical data
Short term tensile strength: > 9,000 N
Permanent tensile strength: > 9,000 N
Crush: > 1,000 N
Impact: > 15 Nm, 3 impacts, R=300 mm
Cable bend: R > 250 mm with messenger
          R > 10 x D, 4 turns, 3 cycles
Bending radius:
  > Loaded: min. 15 x D
  > Unloaded: min. 10 x D
Water penetration:
  > 3 m/24 hours - no water leakage
Web dimensions (WxH):
  > 2.5 ± 0.5 x 3.0 ± 1.0
Temperature range
  > Storage: -40°C to +70°C
  > Installation: -15°C to +60°C
  > Operation: -40°C to +70°C

Standard
> IEC 60794-1-2

Construction
Messenger:
> Glass fibre reinforced plastic rod, FPR
> 7.0 mm
Central strength member (CSM):
> Glass fibre reinforced plastic rod, FPR
> Plastic oversheathing when needed
Loose tube:
> Thermoplastic material
> Up to 24 fibres per tube
> Filled with watertight compound
Fibre colour code:
> 1 white, 2 red, 3 yellow, 4 green, 5 blue
> 6 grey, 7 brown, 8 black, 9 violet, 10 aqua
> 11 orange, 12 pink.
Tube colour code:
> 1 red, 2 green, 3-12 white
Stranding:
> SZ stranded around the CSM rod
> White-red identification thread
Water blocking:
> Longitudinal watertight
> Water swellable material
> Dry core
Rip cord:
> 2 rip cords
Outer sheath:
> HDPE, minimum 1.5 mm
> Black

Delivery
> Standard length: 2 or 4 km

<table>
<thead>
<tr>
<th>Fibre count</th>
<th>12</th>
<th>24</th>
<th>48</th>
<th>72</th>
<th>96</th>
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<td>2 x 12</td>
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Content is subject to changes acc. to current product development and or any changes to standards.
**CONNECTIVITY**

**ORP 250 DISTRIBUTION PANEL**

**INDOOR UNIVERSAL 19” RACK WITH STORAGE**

**Application**
Robust metallic ORP distribution panel designed for dry indoor termination and distribution of fibre optic cables in telecommunications, CATV and LAN networks. In a fibre optic network this panel works as a cross-connection and testing point between the optical cable network and the equipment.

Universal type of FO distribution panel for 19” racks. Contains a splicing section, patch panel and cover. Position of the panel can be adjusted freely.

ORP-250 also contains a storage shelf for excess lengths of patch cords.

The constructions of the panel is simple and modular and independent of cable constructions. Easy to install, maintain and upgrade to higher capacity systems.

Entrance for two cables or multiple small size cables from the back of the panel. Fusion splice protection sleeve holders of rubber material attached to the bottom of the panel.

Additional materials such as adaptors, pigtails, slice protectors and grounding parts must be ordered separately.

**Construction**

**Distribution panel:**
- For 19” racks
- Splicing section
- Patch panel, adjustable
- Protection sleeve holder
- Cover
- Storage shelf, adjustable
- Modular designed
- Powder painted and zinc coated steel

**Entry ports:**
- On back
- For 2 large or several small cables

**Splice section capacity:**
- 48 - 96 fusion splices
- Double connector adaptors (SC-D)
- Heat shrinkable

**Patch panel capacity:**
- 24 connection adaptors
- SC, SC-D (SC duplex), LC duplex, LC Quad
- ST, FC*D or 12 RJ45

**Grounding of metallic parts:**
- Use part KT-1070 - order separately
- Use part FT-920- order separately

**Dimensions (h x w x d):**
- 60 (2U) x 440 (19”) x 230 mm

**Weight:**
- 2.9 kg

<table>
<thead>
<tr>
<th>Product type and name</th>
<th>Prysmian part no.</th>
</tr>
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<tbody>
<tr>
<td>ORP-250 SC ODF</td>
<td>XEXSO1664</td>
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<td>ORP-250 SC-D ODF</td>
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<td>ORP-250 LC ODF</td>
<td>XEXSO1923</td>
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<td>ORP-250 ST/FC*D ODF</td>
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<td>ORP-250 LC-Q ODF</td>
<td>XEXSO2051</td>
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Content is subject to changes acc. to current product development and or any changes to standards.
CONNECTIVITY

ORP 260 DISTRIBUTION PANEL

INDOOR UNIVERSAL 19” METALLIC RACK

Application
Robust metallic ORP distribution panel designed for dry indoor termination and distribution of fibre optic cables in telecommunications, CATV and LAN networks. In a fibre optic network this panel works as a cross-connection and testing point between the optical cable network and the equipment.

Universal type of FO distribution panel for 19” racks. Contains a splicing section, patch panel and cover. Position of the panel can be adjusted freely.

The constructions of the panel is simple and modular and independent of cable constructions. Easy to install, maintain and upgrade to higher capacity systems.

Entrance for two cables or multiple small size cables from the back of the panel. Fusion splice protection sleeve holders of rubber material attached to the bottom of the panel.

Additional materials such as adaptors, pigtails, slice protectors and grounding parts must be ordered separately.

Construction

Distribution panel:
- For 19” racks
- Splicing section
- Patch panel, adjustable
- Protection sleeve holder
- Cover
- Modular designed
- Powder painted and zink coated steel

Entry ports:
- On back
- For 2 large or several small cables

Splice section capacity:
- 48 - 96 fusion splices
- Double connector adaptors (SC-D)
- Heat shrinkable

Patch panel capacity:
- 24 connection adaptors
- SC, SC-D (SC duplex), LC duplex, LC Quad ST, FL* D or 12 RJ45

Grounding of metallic parts:
- Use part KT-1070 - order separately
- Use part FT-920 - order separately

Dimensions (h x w x d):
- 45 (1U) x 440 (19”) x 230 mm

Weight:
- 1.9 kg

Product type and name | Prysmian part no.
--- | ---
ORP-260 SC ODF | XEXSC01664
ORP-260 12xRJ45 ODF | XEXSC01862
ORP-260 SC-D ODF | XEXSC01668
ORP-260 LC-Q D DF | XEXSC02052
ORP-260 LC ODF | XEXSC01924
FT-920 Guiding support | XEXSC01785
ORP-260 ST/FC*D ODF | XEXSC01669
KT-1070 Grounding part for ORP-250/260 | XEXSC02104

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**XOK JOINT CLOSURE**

**MULTIPLE OUTDOOR APPLICATION IP68**

**Application**
Universal joint closure designed to provide water and pressure tight environmental protection for optical fibres and optical fibre splices, regardless of the cable design.

Application ranges from aerial pole or tower, duct to buried or manhole installations. The closure has anchoring points for strength members and facilities for earthing of metallic elements.

The splice organizer trays offer holders for heat shrink splice protectors and sufficient space for storage of spare fibres. The closure is easily assembled and re-entered.

The closure is available in seven basic configurations with two, three or four cable entrances. XOK A3/A4 branch joint closures and extension collars for more cable outlets are also available. Additional materials such as adaptors, pigtails, splice protectors and grounding parts must be ordered separately.

**Technical data**
- **Impact resistance:** > 30 Nm acc. to IEC 60794-1-E4
- **Crush resistance:** > 1,000 N
- **Bending radius:**
  - For fibres: 30 mm
- **Cable retention:** > 1,000 N acc. to IEC 60794-1-E1
- **Water resistance:**
  - Rating IP68
- **Torsion resistance:** < 0.1 dB acc. to IEC 60794-1-E7
- **Temperature range**
  - Storage: - 40°C to + 50°C
  - Installation: - 10°C to + 50°C
  - Operation: - 45°C to + 80°C

**Construction**
- **Joint closure:**
  - Universally applicable
  - Modular design - 3 sizes
  - Stainless steel housing 1.5 mm
  - Acid and weather resistant
  - No additional protection needed
- **Entry ports:**
  - Several configurations
  - From 2 to 4 cable entry ports
  - Round or oval
- **Splice capacity:**
  - XOK 103: 4 trays x 48 splices = 192
  - XOK 107: 7 trays x 48 splices = 336
  - XOK A3: 4 trays x 48 splices = 1000 using extension collars or splice trays for fibre ribbons
- **Closure sealing:**
  - Mechanical entry port sealing
  - Heat shrink entry port sealing
  - Watertight seal, IP68
  - High cable pull strength
- **Anchoring point:**
  - Anchor points for strength member
- **Storage tray:**
  - For spare fibres
- **Dimensions (h x w x d):**
  - XOK 103: 560 x 230 x 100 mm
  - XOK 107: 560 x 230 x 140 mm
  - XOK A3: 560 x 230 x 140 mm

<table>
<thead>
<tr>
<th>Joint closure model</th>
<th>Cable port placement</th>
<th>Splices max. numbers</th>
<th>Prysmian order no.</th>
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<tr>
<td>XOK 1030</td>
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<td>XJTSC00839</td>
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Content is subject to changes acc. to current product development and or any changes to standards.
CONNECTIVITY

PK-300 TERMINATION BOX
INDOOR WALL MOUNTED METALLIC IP54

Application
Robust and dust-proof cabinet with lockable door for the termination, branching and distribution of fibre optic cables in telecommunication, CATV and LAN networks under dry indoor conditions.

Suitable for wall-mounted installations with small or intermediate numbers of fibres. The constructions of the box is clear and simple and independent of cable constructions and is easy to install, maintain and upgrade.

A patch panel divides the box into splicing and cross-connection sections. Cross-connection section has cable entrances to both up and down directions. Two cable inlets on the top and on the bottom can be connected to one wide inlet that gives the possibility to bring in and take out the cable from the box without cutting all the fibres.

The cabinet is delivered with frame and cover, mounting and grounding bar, splice tray, entrance material for one outdoor cable, stress relief bars for 24 pcs. of diameter 2 mm patch cords of 2 pcs, cable ports and patch panel.

Additional materials such as adaptors, pigtails, slice protectors and grounding parts must be ordered separately.

Construction
Termination box:
> Steel plate
> Powder painted
> Wall mountable
> Dust-proof
> Patch panel divider
> Splice section with separate door
> Cross-connection section

Entry ports to splicing section:
> 6 cable entry port in total
> 3 on top and 3 on bottom

Entry ports to cross-connection section:
> Entry plates
> In up and down direction

Splice section capacity:
> 5 trays x 24 splices = 120 splices

Patch panel capacity:
> 48 connection adapters
> SC, LC-D (LC-duplex) or ST/FC*D

Sealing:
> Rating of IP54

Dimensions (h x w x d):
> 400 x 480 x 155 mm

Weight:
> 11 kg

Product type | Special feature | Prysmian order no.
--- | --- | ---
PK-300 | SC | XCPSC01559
PK-300 | ST/FC*D | XCP5CD01560
Splice tray | KT-1412/24 | XJTSC00884

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**CONNECTIVITY**

**PK-100 TERMINATION BOX**

**INDOOR WALL MOUNTED METALLIC**

**Application**
Robust metallic termination box suitable for indoor installations with splicing, cable branching and cross connection functions.

Capacity for 48 splices and 12 SC, LC-D (LC-duplex), ST or FC*D (D-hole) adapters. In addition there is space for two more splice trays with holder for 24 splice protectors (heat shrinkable) per tray.

The box has three cable inlets on the bottom with maximum cable diameter of 20 mm. Metallic cables can be grounded with earthing screw on the outer surface of the bottom part.

The distribution box is delivered with metallic box, bottom and cover, mounting and grounding bar, splice tray KT-1412 for 12/2 and entrance material KT-1016 with mechanical seal for one cable.

Additional materials such as adaptors, pigtales, slice protectors, additional splice trays and grounding parts must be ordered separately.

**Construction**

**Distribution box:**
- Metal
- Powder painted
- Splicing section
- Splice tray - room for 2 more
- Cross-connection section
- Cable branching
- Cover
- Bottom

**Entry ports:**
- 3 on the bottom
- Max. cable diameter 20 mm

**Splice section capacity:**
- 48 fusion splices
- Space for 2 more splice trays
- Heat shrinkable

**Cross-connection capacity:**
- 12 connection adaptors
- SC, LC-D (LC-duplex), ST or FC*D (D-hole) adapters

**Grounding:**
- Earthing screws on the bottom

**Dimensions (h x w x d):**
- 350 x 210 x 66 mm

**Weight**
- 3.0 kg

---

**Product**

<table>
<thead>
<tr>
<th>Product type</th>
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<td>Splice tray</td>
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<tr>
<td>Entrance material</td>
<td>KT-1016 with mechanical seal for one cable</td>
<td>XJTSC00879</td>
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</table>

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COMMUNICATION

PK-100A TERMINATION BOX
INDOOR WALL MOUNTED METALLIC

Application
Robust metallic termination box suitable for indoor installations with splicing, cable branching and cross connection functions.

Capacity for 24 splices and 12 SC or LC-D (LC-duplex) adaptors.

The box has two cable inlets on the bottom with maximum cable diameter of 20 mm. Metallic cables can be grounded with earthing screw on the outer surface of the bottom part.

The distribution box is delivered with metallic box, bottom and cover, mounting and grounding bar, splice protector holder for 24 splices and entrance material KT-1020 with mechanical seal for one cable.

Additional materials such as adaptors, pigtails, slice protectors, additional entry material and grounding parts must be ordered separately.

Construction
Distribution box:
- Metal
- Powder painted
- Splicing section
- Cross-connection section
- Cable branching
- Cover
- Bottom

Entry ports:
- 2 on the bottom
- Max. cable diameter 20 mm

Splice section capacity:
- 24 fusion splices
- Heat shrinkable

Cross-connection capacity:
- 12 connection adaptors
- SC, LC-D (LC-duplex) adapters

Grounding:
- Earthing screws on the bottom

Dimensions (h x w x d):
- 160 x 360 x 50 mm

Weight
- 1.9 kg

Product type | Special feature | Prysmian order no.
--- | --- | ---
Termination box | PK-100A SC | XCPSCO1555
Entrance material | KT-1020 with mechanical seal for one cable | XJTSC00880

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4. Communication

CONNECTIVITY

PK-107 TERMINATION BOX
OUTDOOR SMALL METALLIC

Application
Robust metallic termination box suitable for outdoor installations with a small number of fibres. No need for extra protection of fibres when using central tube type optical cables.

Capacity for 12 splices and 2 SC-D or LC-Q (LC-quad) adapters. Suitable for installation inside traffic signs and display poles.

The box has three cable inlets on the bottom with maximum cable diameter of 11 or 16 mm. Metallic grounding of two cables is possible.

The distribution box is delivered as a metallic cabinet with a bottom and cover, adapter plate, wall fixing accessories, mounting and grounding bar, splice protector holder for twelve 12 splice protectors and entrance material for three cables and two heat shrinkable tubes and one mechanical seal.

Additional materials such as adaptors, pigtails, splice protectors and grounding parts must be ordered separately.

Construction
Distribution box:
- Metal - aluminium
- Powder painted
- Adaptor plate
- Splice protector holder
- Cover
- Bottom
- Wall fixing accessory

Entry ports:
- 3 on the bottom
- Max. cable diameter 1 x 11 or 2 x 16 mm
- 2 heat shrinkable and 1 mechanical

Splice protection capacity:
- 12 splices protectors
- Heat shrinkable

Cross-connection capacity:
- 2 connection adaptors
- SC-D or LC-Q

Grounding:
- Possible for two metallic cables

Dimensions (h x w x d):
- 336 x 88 x 40 mm

Weight
- 0.7 kg

<table>
<thead>
<tr>
<th>Product type</th>
<th>Special feature</th>
<th>Prysmian order no.</th>
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Content is subject to changes acc. to current product development and or any changes to standards.
**CONNECTIVITY**

**PK-200 TERMINATION BOX**
**INDOOR WALL MOUNTED METALLIC**

**Application**
Robust metallic termination box suitable for indoor installations with splicing, cable branching and cross connection functions.

Capacity for 96 splices and 24 SC, LC-D (LC-duplex), ST or FC*D (D-hole) adapters.

The box has three cable inlets on the bottom with maximum cable diameter of 20 mm. Grounding of metallic cables is possible via earthing screws on the outer surface of the bottom part.

The termination box is delivered with bottom and cover, mounting and grounding bar, one splice tray KT-1412/24 for 24 splices and entrance material KT-1016 with mechanical seal for one cable.

Additional materials such as adaptors, pigtails, splice protectors, splice tray KT-1412, entrance material KT-1016 and grounding parts must be ordered separately.

**Construction**
Distribution box:
- Metal
- Powder painted
- Mounting and grounding bar
- One splice tray (space for 2 in total)
- Cover
- Bottom

Entry ports:
- 3 on the bottom
- Max. cable diameter 20 mm
- Heat shrinkable

Splice tray capacity:
- Up to 4 splice trays
- Holder for 24 splice protectors per tray
- Heat shrinkable

Cross-connection capacity:
- 24 connection adaptors
- SC, LC-D (LC-duplex), ST or FC*D (D-hole)

Grounding:
- Possible to ground metallic cables
- Earthing screws on the bottom

Dimensions (h x w x d):
- 400 x 210 x 120 mm

Weight
- 3.5 kg

<table>
<thead>
<tr>
<th>Product type</th>
<th>Special feature</th>
<th>Prysmian order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Termination box PK-200</td>
<td>SC</td>
<td>XCPSC01557</td>
</tr>
<tr>
<td>Termination box PK-200</td>
<td>ST/FC*D</td>
<td>XCPSC01558</td>
</tr>
<tr>
<td>Splice tray</td>
<td>KT-1412/24</td>
<td>XJTSC00884</td>
</tr>
<tr>
<td>Entrance material</td>
<td>KT-1016 with mechanical seal for one cable</td>
<td>XJTSC00879</td>
</tr>
</tbody>
</table>
Parallel laid railway cables on electrified tracks using alternating current or under high voltage power lines are exposed to the influence electromagnetic fields. These electromagnetic fields induce current in the cables, which can lead to disturbances and destruction of the equipment connected to them as well as present a hazard to life and limb. In order to reduce this influence to a non-hazardous level, the cables are provided with a metallic shield according to their cross-section. This shield has to be earthed on both sides of the cable.

The measure of quality used to shield cables in railway applications is referred to as the reduction factor. The reduction factor is the ratio of induced tension with shielding to the induced tension without shielding. A reduction factor of 1 would mean "no shielding effect". A reduction factor of 0.5, for example, would mean a reduction of the induced tension by one half.

The effect of shielding of the materials used (copper, steel, aluminium, etc.) is dependent on the conducting cross-section of shielding as well as the frequency of the interfering signal.

Depending upon the local circumstances, the cable design and hence the resultant reduction factor can be optimised to best match the expected field strength along the railway track. A typical description for the request for a cable protected against inductive interference shall include disturbing frequency and field intensity as well as the requested reduction factor. For example:

- Reduction factor < 0.5 at 16.7 Hz in the range of 80 – 150 V/km
- Reduction factor < 0.3 at 50 Hz in the range of 80 – 250 V/km.

The tension induced in the cable increases with the length the cable is exposed to the electrical field. A cable which is exposed over a length of 2000 m to the field can require a lower (better) reduction factor than the same cable, which is only exposed to the induced field over a length of 1000 m.

The calculation of the actually required reduction factor is very complicated and depends on a multitude of different parameters:

- Distance of the cable to be shielded from the interfering cable (overhead line...),
- Type of installation (underground, in conduits, on the ground...),
- Characteristics of the ground,
- etc.

A respective calculation of the required reduction factor can only be carried out by experts. The cable manufacturer then develops the correct cable design based on the given factors.

As a supplier of cables for railway applications and development partners of well-known European railway operators of long standing, We are pleased to develop the right cable design for you according to your needs.
Picture: Magnetic field compensation by inductive protection

Picture: Cable Aj-2Y(L)2YDB2Y 10x4x1.4 mm S (H45) rk 600 of Deutsche Bahn with protection against inductive interference
Railway Main Line Cables

Requirements for fire characteristics of cable installations in tunnels or stations

Prysmian provides a complete product range of cables and circuits for the railway infrastructure sector. We also take into consideration the special requirements needed for laying cables in closed environments.

Most railway infrastructure operators specify cables with a black polyethylene (PE) outer sheath for use in the open air. PE is extremely robust and resistant, has very good UV resistance due to the black colouring and guarantees a cable life of about 35 years. PE is halogen-free and burns with low smoke emissions without releasing toxic gases.

In closed areas and narrow spaces, in applications such as tunnels or railway stations, the requirements for the cables are very demanding.

Even though PE is halogen-free and burns with low smoke, it is not recommended for such applications. PE is not self-extinguishing and contributes to further propagation of fire. The fire can penetrate into adjacent rooms and cause more damage. Cables with PVC outer sheath are no alternative either, although PVC is flame retardant and usually self-extinguishing, it burns producing dark soot and releases toxic gases.

The ideal materials combine the advantages of PE and PVC, are halogen free, produce little smoke, and are flame retardant and self-extinguishing. Such materials are manufactured, refined and improved in Prysmian's material laboratories.

Known halogen-containing materials are, for example, chloroprene rubber (CR), ethylene tetrafluoroethylene (ETFE), perfluoroethylene propylene (FEP) or polyvinyl chloride (PVC). Halogen-free materials are, among others, silicone rubber (SIR), polyamide (PA), ethylene propylene polymers (EPR), thermoplastic elastomers (PE) or polyethylene (PE).

There are European and international standards regarding the unique and comparable classification of flammability properties of cables. We want to briefly introduce to you the most important test procedures.
Fire testing

**EN/IEC 60332-1**
(Tests on electric and optical fibre cables under fire conditions: test for vertical flame propagation for single insulated wire or cable)

The flame propagation is tested according to IEC 332-1 on a single cable. A vertical sample of cable about 600 mm in length is exposed to a flame for 60 s and/or 120 s in an area 100 mm above the lower end with a 1 kW Bunsen burner. After removing the burner, the flame must self-extinguish. The zones of the cable damaged by the flame should not reach to the upper end of the cable. The flaming time is dependant on the diameter of the cable.

Comparable tests are DIN VDE 0482-332-1-2, EN 50265-2-1, NF C 32-070 C2, BS 4066-1.

**EN/IEC 60332-3**
(Tests on electric and optical fibre cables under fire conditions: test for vertical flame spread of vertically mounted bunched wires or cables)

The test for the spread of the flame with an array of several cables, i.e. a bunch of cables, is normally carried out according to IEC 332-3 (EN 50266-2, test method A, B, C or D – for use of different volumes of non-metallic materials).

The test specimens, mounted in a vertical frame, are exposed to a flame over a length of 3600 mm starting in the lower section using a special burner with a high output. During and/or after exposure to the intensive flame for 20 and/or 40 minutes, the cables may not continue to burn to their upper end.

Comparable tests are DIN VDE 0482-266-2-4, EN 50266, NBN C30-004 Cat. F2, BS 4066-3.
IEC 331
(Cable with insulation integrity)
A horizontal cable sample is exposed to a flame over a width of 1200 mm with a flame temperature of at least 750 °C for a recommended duration of at least 90 minutes. The cable is connected up electrically and under tension. During flaming and a cooling down time of an additional 15 minutes, no short-circuiting or interruption of the current may arise.
Comparable tests are EN 50200, EN 50263, NF C 32070 CR1, BS 6287.

DIN 4102 part 12
(Cable with functional integrity – system testing of cable and the cable mounting system)
This test is very extensive. As it is a test of the system which includes the cable and the cable mounting system, the product to be tested is completely walled into a closed space. The cables are connected up electrically and are kept under tension during the test. The entire room is set alight with a defined temperature unit curve. After at least 30 minutes flame exposure, neither short-circuiting or interruption of circuit may arise. It is extremely difficult to pass the test, as the cable mounting system has a considerable influence on the result. Cable clips, ducts or conductors exert mechanical loads on the cable, as the material changes during flaming: cable ducts start to bend through the load exerted by the cable and the originally smooth cable suddenly hangs down at several points. This mechanical change of position of the burned cable can lead to interruption or short-circuiting.
IEC 61034
(Measurement of smoke density of cables burning under defined conditions)
A plastic sample is burned under controlled conditions. In this way, the light transmission through the combustion gases which arise is measured.
Comparable tests are DIN VDE 0482-286-1 and -2, NFX 10702, BS 7622-2.

IEC 60754-1
(Test on halogen acid gases evolved during combustion of materials from cables)
A plastic sample is burned under controlled conditions. In this way, the smoke gases are measured for their halogen content.
Comparable tests are DIN VDE 0482-267-2-1 and EN 50267-2, NF C 20454, BS 6425-1.

IEC 60754-2
(Test on acidity of gases evolved during combustion of materials from cables)
A plastic sample is burned under controlled conditions. In this way, the pH-value and the conductivity of the smoke gases are measured.
A comparable test is DIN VDE 0276-604.

With the exception of the small fire test according to EN/IEC 60332-1, the cable is normally destroyed during the flame test. Although no short-circuiting or interruptions should arise, it is difficult to speak about defined electrical values such as operating capacity or characteristic impedance. In this case we are talking about either: current flowing or not. This may in reality be adequate for loudspeaker announcements or sprinkler systems. Control and safety technology using electronic interlocking is during or after a cable fire, if at all, hardly still sensible and feasible. Under these circumstances, the need to maintain fire testing standards according to EN/IEC 60331 (insulation integrity) and/or DIN 4102 part 12 (functional integrity) makes little sense for railway signalling cables for electronic interlocking.
Railway Main Line Cables

Construction Product Regulation

Since 01/07/2013, the “Construction Product Directive” (CPD) in the EU has been replaced by the "Construction Product Regulation" (CPR) and is thus valid law in all member states of the EU. The CPR and/or the building product directive (BPVo) affects all cables which are intended for permanent installation in a building. Products have to fulfil requirements in terms of behaviour and/or resistance in the case of fire.

CPR itself does not define any performance requirements regarding the affected products. The definition of safety requirements remains the responsibility of the national authorities.

CPR has introduced binding performance requirements (Declaration of Performance, DoP) and the corresponding CE-mark for labelling the products. The cable’s fire characteristics shall be marked in the future with a combination of different classes (The index “ca” stands for “cable”):

CPR classes are: \( A_{ca}, B1_{ca}, B2_{ca}, C_{ca}, D_{ca}, E_{ca}, F_{ca} \) (see table to the right)

Smoke classes are: \( s1, s1a, s1b, s2, s3 \) (EN 50399/EN 61034-2)

Acidity classes are: \( a1, a2, a3 \) (EN 60754-2)

Flaming droplets classes are: \( d0, d1, d2 \) (EN 50399)

The CPR has no class or guideline for railway cables laid in exposed outdoor areas. These cables may continue to be designed, produced and installed as previously. For railway cables in tunnels or train stations, the relevant cable manufacturers associations recommend a classification according to the EU regulation (1303/2014), clause 4.2.2.4: “In case of fire, exposed cables shall have the characteristics of low flammability, low fire spread, low toxicity and low smoke density. These requirements are fulfilled when the cables fulfil as a minimum the requirements of classification B2_{ca}, s1a, a1, as per Commission Decision 2006/751/EC.”

Prysmian Group will observe these obligations and, as far as they do not satisfy existing cable designs, will provide cables and products to the market with the corresponding properties.
<table>
<thead>
<tr>
<th>Class</th>
<th>Test method(s)</th>
<th>Classification criteria</th>
<th>Additional classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_{CA}</td>
<td>EN ISO 1716</td>
<td>PCS ≤ 2.0 MJ/kg and PCS ≤ 2.0 MJ/kg and</td>
<td></td>
</tr>
<tr>
<td>B_{1,CA}</td>
<td>EN 50399 and</td>
<td>FS ≤ 1.75 m and THR1200s ≤ 10 MJ and Peak HRR ≤ 20 kW and FIGRA ≤ 120 Ws-1</td>
<td>Smoke production and Flaming droplets/particles and Acidity</td>
</tr>
<tr>
<td></td>
<td>EN 50265-2-1</td>
<td>H ≤ 425 mm</td>
<td></td>
</tr>
<tr>
<td>B_{2,CA}</td>
<td>EN 50399 and</td>
<td>FS ≤ 1.5 m; and THR1200s ≤ 15 MJ; and Peak HRR ≤ 30 kW; and FIGRA ≤ 150 Ws-1</td>
<td>Smoke production and Flaming droplets/particles and Acidity</td>
</tr>
<tr>
<td></td>
<td>EN 50265-2-1</td>
<td>H ≤ 425 mm</td>
<td></td>
</tr>
<tr>
<td>C_{CA}</td>
<td>EN 50399 and</td>
<td>FS ≤ 2.0 m; and THR1200s ≤ 30 MJ; and Peak HRR ≤ 60 kW; and FIGRA ≤ 300 Ws-</td>
<td>Smoke production and Flaming droplets/particles and Acidity</td>
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<tr>
<td></td>
<td>EN 50265-2-1</td>
<td>H ≤ 425 mm</td>
<td></td>
</tr>
<tr>
<td>D_{CA}</td>
<td>EN 50399 and</td>
<td>THR1200s ≤ 70 MJ; and Peak HRR ≤ 400 kW; and FIGRA ≤ 1300 Ws-1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EN 50265-2-1</td>
<td>H ≤ 425 mm</td>
<td></td>
</tr>
<tr>
<td>E_{CA}</td>
<td>EN 50265-2-1</td>
<td>H ≤ 425 mm</td>
<td></td>
</tr>
<tr>
<td>F_{CA}</td>
<td>no performance determined</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table: Overview of the CPR classifications
Transport and storage of cable drums

Even if cable and drum look very strong, there are certain rules to follow to avoid damage of the cable and an accompanying impairment of mechanical and electrical characteristics.

**Transport and storage of cable drum**

It is possible to store cable drums outdoors. When storage has occurred in heated rooms, a minimum 24-hour acclimatisation period must be observed before installation (possible condensation build-up in the cable!).

For outdoor storage the ground must be even and clean. Stones or bumps in the ground should be removed or smoothed out. Damage to the wound goods/cable should be avoided at all costs.

Cables should be secured against accidental rolling away. Under no circumstances should the drum flange of neighbouring cables touch any wound goods.

Cable drums should always be stored and transported standing on both flanges.

They should not be pushed along the ground standing on the flanges. It is possible that the strength of the cable drum would then no longer be guaranteed.

Observe the rolling direction. The arrow printed on the drum flange indicates the rolling direction so that the wound goods do not become loose.

Always uncoil the cable at a tangent, never over the flange, since the torsion thus resulting would damage the cable and laying would not be possible.

**Cable ends**

Finally it remains for us to point out the necessity of having faultless cable ends. Pressure-tight and impermeable cable ends are particularly essential for cables which are not longitudinally water-proof, as well as for cables which are insulated with paper, cellular-PE and foam-skin-PE. Carelessness in this area can lead to moisture penetration which is accompanied by a drastic deterioration in the electrical transmission rate. Power failures and expensive replacement work are the result. Pressure-tight and impermeable cable ends can be achieved, for example, through the use of synthetic sealing resin or compressed air sealing stoppers.
Important physical characteristics

**Temperature range**
The temperature range of the cable is of great importance for both the user and fitter. After all the cable is meant to function equally well in cold and hot temperatures. It is particularly during the fitting process that powerful mechanical forces act on the cable. The plastic used serves as the limiting element for the possible temperature range. At overly warm temperatures the plastic becomes very soft and can change into a thermoplastic state (up to melting point), which causes irreversible changes in the cable.

At very cold temperatures, however, the material stiffens and becomes hard and inflexible. Here, too, irreparable damage can occur.

Tears in the sheath allow dampness and moisture in and impair the transmission rate. Details about the permissible temperature range during laying and use (following successful fitting) can be found in the information sheets of the cable manufacturer. Since the mechanical strain on the cable in its laid form is significantly less, the permissible temperature range is greater than the range valid for the installation period.

**Bending radius**
Regarding the bending radius we distinguish between multiple and single bending (shaping into the final position).

Multiple bending occurs mainly during the laying process. Cables are laid under tension around deflector rolls. The particular stress of multiple bending lies in the alternating stress on the materials, which can be stretched several times as well as compressed during the laying process.

To prevent permanent damage there are prescribed minimum bending radii of, for example, 10 x cable external diameter for multiple bending.

The stress on the material during final bending is not characterised by alternating stress. The cable is bent into form a final time and stays in this position for the duration of its use. The minimum bending radius in this case is, for example, 7.5 x cable external diameter. During final bending the cable can, therefore, be bent more tightly.

Exact minimum bending radii for specific cables can be found in the information sheets of the cable manufacturer.

**Tension**
During laying of the cable particular attention must be paid to the maximum possible tension. The cable is very quickly damaged by the use of too much force and must then be replaced. The maximum possible tension depends in the first place on the overall cross section and the tensile strength of the conducting materials used.

For cables with steel tape or copper wire spiral armouring it is the internal copper conductors alone which determine the maximum tension! The armouring has no influence on the maximum tension or can possibly reduce it through additional weight. For armouring with steel or steel profile wires, however, the tension is determined solely by the steel and steel profile wires.

**Cable weight**
The cable weight of larger cable dimensions can take weights of up to more than 10 t/km (without the reel!).
Certifications and compliance

Certifications of Railway and Infrastructure Authorities
Being a very complex system with a high safety integrity level, railway products are subject to detailed requirements and strong supervision. Many railway infrastructure operators issued dedicated cable specifications which require homologation and frequent auditing. Prysmian Railway Cables are designed and produced according to a number of railway cables standards, like DB, SBB, ÖBB, SNCF, TCDD, ADIF/RENFE, RFI, RATP and many more in Europe and around the globe. High quality manufacturing processes, many decades of experience in cable design and engineering as well as intense testing procedures guarantee state-of-the-art cable products and satisfied customers worldwide.

REACH (Registration, Evaluation and Authorisation of Chemicals)
Adopted on December 18th, 2006, the Regulation of the European Parliament and the European Union Council, modernized the European legislation regarding chemical substances, and set up a unique integrated system of chemical substances in the European Union. Its objective is to improve the protection of the human health and of the environment, while maintaining the European chemical industry’s competitiveness and strengthening its spirit of innovation. All Prysmian railway cables are REACH compliant.

RoHS (Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment)
The RoHS directive aims at restricting the use of certain dangerous substances commonly used in electric and electronic equipment (EEE). Cables concerned by this directive are any cables rated below 250V, which function is the connection or the extension of an EEE to electrical outlet or the connection of two or more EEE to each other. All Prysmian railway cables are RoHS compliant.

Management Systems
• Quality Management System EN ISO 9001:2008
• Environmental Management System EN ISO 14001:2005
• Energy Management System EN ISO 50001:2011
Our responsibilities

Social Responsibility
Within the social dimension of its business, the Prysmian Group recognises its commitment and responsibility towards the persons who work as part of the Organisation, as well as those who form the local communities in the territories in which the Group is active. Accordingly, consistent with its values, Prysmian constantly seeks to ensure the personal and professional satisfaction of its human resources, and to communicate with and involve local populations, in order to generate value for these important categories of stakeholder.

Environmental responsibility
The Group’s commitment to safeguarding the environment and conserving natural resources is expressed not only by the intrinsic characteristics of our products, but also by how our production systems are managed. In particular, the prevention and reduction of their environmental impact is achieved, for example, by the efficient use of natural resources, the optimisation of logistics flows and the responsible management of waste.

During 2015, HSE further consolidated its activities at various levels within the Group (corporate, country or geographical area, business unit, production unit), centralising activities and coordinating the work of the local HSE functions. Group policies for Health, Safety and Environment, as well as the related Operating Procedures and Technical Standards, have been adopted and applied at operating unit level. The HSE function, with support from the Group audit team, periodically checks the effectiveness and proper application of the HSE rules at local level.

The aspects monitored by HSE using indicators include compliance with health and safety at work standards, energy consumption, waste management, water usage and greenhouse gas emissions. In particular, with reference to the greenhouse gas emissions, the Group has begun to collect energy consumption data in order to track both “direct” emissions (deriving from production processes) and “indirect” emissions (deriving from the energy purchased). This system of monitoring and reporting enabled the Group to participate in 2015, once again, in the Carbon Disclosure Project (CDP), which seeks to contribute to the pursuit of the objectives agreed in the Kyoto Protocol regarding the global reduction of greenhouse gas emissions.

Product responsibility
Quality and innovation are the hallmarks of Prysmian’s approach, both in sectors where the level of technology, the ability to innovate constantly and the commitment to offering high value-added services together establish a differentiated competitive positioning, and in those sectors where products are more standardised, such as medium and low-voltage cables. The Group applies a customer-centric approach, reflecting an ability to anticipate and satisfy the needs of customers with the maximum possible attention.
Prysmian Group has been supplying the railway industry for many decades. We supply all renowned European railway infrastructure companies, often as part of long-term master agreements. Many important projects have been completed in the recent years all around the world, even more are yet to come. There is always our office close to you.

The following excerpt of our success records shall give you an idea about our local and global presence.

**North Europe:**
- Denmark: ERTMS Signalling Program, Electrification of Danish Railways, Renewal of Danish Rail Infrastructure, Copenhagen Metro and S-Bane, Aarhus Tram
- Finland: Länsi Metro, Helsinki Metro, Rail Safety Project, Electrification of Jyväskylä–Äänekoski Line
- Norway: LKAB Narvik–Kiruna Line, InterCity Project, GSM-R Network for the ERTMS Signalling Program
- Sweden: Renewal of Stockholm Metro
- Latvia: Modernization of LZD-infrastructure

**Rest of the world:**
- Australia: Queensland Rail, conversion to axle counter detection technology
- Egypt: Cairo – Alexandria line
- Bulgaria: Plovdiv-Bourgas line
- Chile: Rancagua project
- Germany: Framework contract and development partner of Deutsche Bahn
- Israel: Ashkelon – Netivot line
- Canada: Toronto Transit Authority
- Croatia: Zagreb Central Station
- Malaysia: Thomson Line project
- Morocco: Casablanca – Tanger line
- Mexico: Metro Monterey
- Saudi Arabia: North-South-Rail project, Mecca Metro
- Switzerland: Framework contract with SBB
- Singapore: Singapore Metro Subaquatic Cable
- Spain: Vandellos-Tarragona line, Madrid – Leon – Burgos high speed Line
- Turkey: Ankara-Konya high speed line, Eskisehir – Balikesir line, Metro Istanbul, Metro Ankara
- USA: JFK Air Train, New York City Transit, Oakland Bay Area Rapid Transit
We are here for you
You are always welcome to contact us directly with technical questions or sales inquires.

Contact
Phone: +372 647 7466

E-mail
info.keila@prysmiangroup.com

Website
www.drakakeila.ee

Draka Keila Cables AS
Paldiski Road 31
Keila 76606
Estonia

www.drakakeila.ee