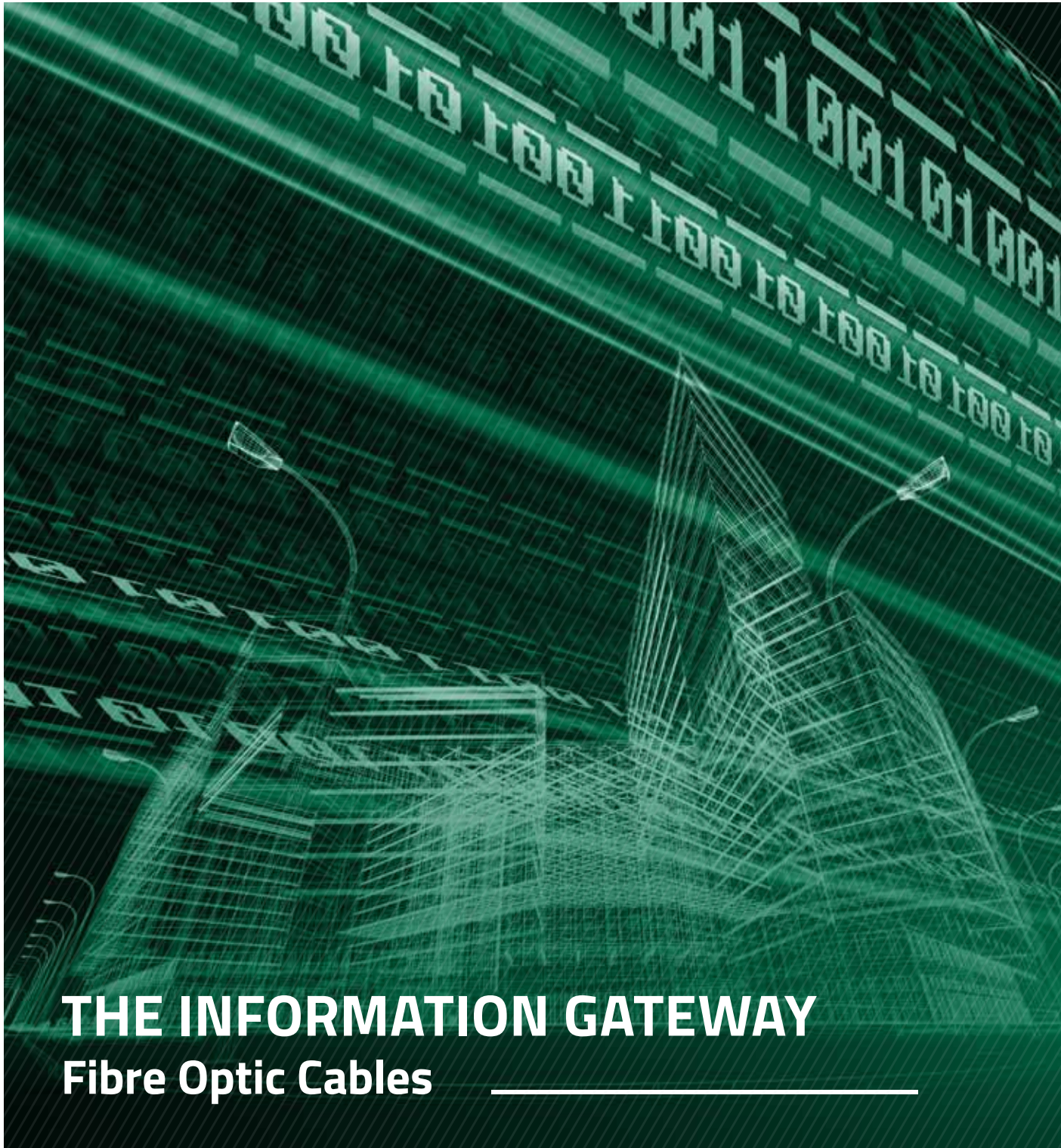




Connecting globally



THE INFORMATION GATEWAY

Fibre Optic Cables

Brighter future
in energy



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Description of pictograms used in catalogue



RoHS – Cable complies with requirements of RoHS directive



The cable meets the requirements of the EU directive



UV resistant jacket



Humidity resistant



Indoor cable



Halogen-free materials, limited harmful gases emission and smoke density



Universal cable, for outdoor and indoor installation



Positive result for vertical flame spread test acc. to IEC 60332-1-2



Outdoor cable



Construction Products Regulation class



For installation in the cable duct



Temperature of installation



Anti-rodent protection



Exploitation temperature



Self-supporting cable

Leading producer of cables and cable systems

4

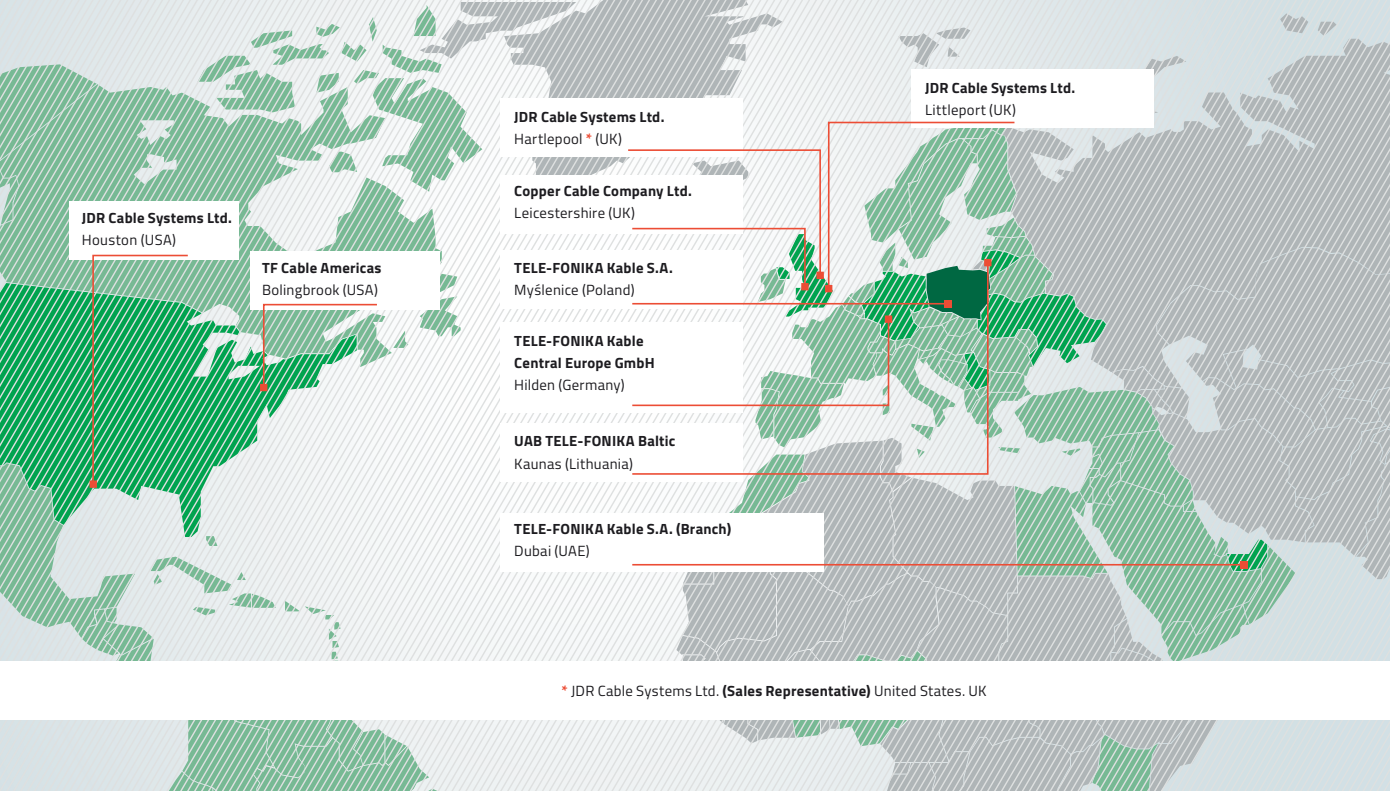
The TELE-FONIKA Kable Group has been present on the domestic and international cable industry market for more than 25 years. A stable development strategy based on market diversification enabled the strengthening of the position of our company among world's leading cable companies with significant development potential.

Services and products provided by TFKable have numerous applications in the most important industry sectors – they include more than 25,000 proven standard constructions. Furthermore, they include specialty cables tailored to the individual needs of business partners.

Additionally, our production facilities (in Poland, Serbia and Ukraine), the Bukowno-Poland recycling plant and commercial companies (responsible for the geo-regional distribution of products) demonstrate a significant development potential. This is also true in the case of our modern fire test laboratory in Krakow-Wielicka plant, which performs several hundred flammability pre-tests annually, and a laboratory of high and extra high voltages in Bydgoszcz.

As a result of implementation of our growth strategy, in August 2017 TFKable Group acquired JDR Cable Systems Ltd, the leading manufacturer of subsea umbilicals and power cables to the global offshore energy industry.

In the world's harshest environments and ever-increasing water depths, JDR's world-leading products and services bring power and control to offshore oil, gas and renewable energy systems.



Experience and competence of the TELE-FONIKA Kable Group

Global relations

Krakow-Wielicka plant – production of PVC or XLPE insulated 1 kV cables with copper or aluminium conductor, screened or armoured types, fire resistant and halogen free cables, overhead conductors as well as rubber insulated and/or rubber sheathed cables with voltage up to 30 kV for heavy industry, signaling and control cables for special applications

Krakow-Bieżanow plant – production of PCV or XLPE insulated copper wires and cables up to 1 kV, halogen free and fire resistant types and copper or silver-copper (Cu-Ag) overhead conductors for railway traction.

Bydgoszcz plant – the largest in Europe production center of medium, high and extra high voltage cables with voltage up to 500 kV

Myślenice plant – production copper and fiber optic telecommunication cables, data

telecommunication cables and automotive wires

Zajecar plant (Serbia) – production of low and medium voltage cables, signaling and control cables, telecommunication cables, as well as halogen-free cables and wires

Czernihov plant (Ukraine) – production of copper wires and cables up to 1 kV, fire resistant and flame retardant cables as well as insulated overhead aluminium conductors

FIBRE OPTIC CABLES

Today's economy is based on the efficient and smooth flow of knowledge and information. As the volume of information continues to grow, there is a requirement for bigger and bigger bandwidths. Data transmission based on copper cables is limited, despite continued progress, and will not be able to provide the capacity foreseen in the future. The future-proof solution to this ever increasing problem is fibre optic cable, with the crucial component – optical fibres.

Optical fibres transfer the data signals, in this case the electromagnetic waves, in the infrared frequency range. They are resistant to electromagnetic interference and have the ability to transfer data at huge rates, reaching hundreds of Gb/s.

The design and construction of fibre optic cables depends on the particular application. The location, installation technique and the transmission distance all have to be taken into consideration.

The basic elements of a fibre optic cable are:

- an optional central strength element
- optical fibres
- protective tube
- sealing
- reinforcement
- outer sheath

Depending on the number of transmitted modes (waves) of light, optical fibres are divided into singlemode and multimode..

Single mode optical fibres have low dispersion and attenuation making them suitable for long-distance transmission. Minimum attenuation (signal loss) occurs at specific wavelengths, the so called transmission windows at 1310 nm (II transmission window) and 1550 nm (III transmission window). Single-mode optical fibres allow for transmission using xWDM technology, which enables data throughput in the order of Tb/s.

Fibre optic cable manufacturers use various types of single mode fibre depending on the application:

J – 9/125. SM , G.652.

Jn – G.655.

Ja, Jb – G.657 A,B

Multi mode optical fibres transmit many modes of light. Because of the higher dispersion compared to single mode fibres their application is usually limited to indoor cables and transmission over short distances. For telecommunications, wavelengths of 850 nm and 1300 nm are used. Multi mode fibres are usually denoted by their core and protective layer (called the cladding) diameters. For example a fibre labelled 50/125 has a core diameter of 50mm and a cladding diameter of 125 mm. Another frequently used multi mode fibre is 62.5/125. Alternative descriptions (used interchangeably) are G50 and G62.5. respectively.

Depending on their construction and use, fibre optic cables can be divided into three basic types:

- Indoor – used inside buildings or building structures such as tunnels
- Outdoor – used for installation in the ground, in the open air, etc. This category includes self-supporting, sewer and special application cables
- Universal – can be used in both internal and external installations.

TELE-FONIKA Kable manufactures high quality tailored solutions to meet the specific requirements of the customer in all fibre and cable combinations.

TELE-FONIKA Kable began fibre optic cable manufacture in 1997 at the newly constructed, state-of-the-art production facility at Myślenice. From the beginning, emphasis was placed on supplying product of the highest quality and to this end the new plant was equipped with modern machinery and sophisticated control and measuring equipment. The high standard of production has been confirmed by the award of the ISO 9001 certification.

Wide product portfolio

Our product portfolio includes cables of various constructions up to 288 fibres. Such as, microcables for installation in microducts, self-supporting aerial cables for spans of varying length, mining, wind farm and special application cables as used by the military.

Uncompromising quality

The fibre optic department is equipped with sophisticated control and measuring equipment enabling comprehensive cable testing, thereby ensuring the highest quality. All tests are conducted according to IEC 60794 requirements.

Each cable production length is tested and the documented results supplied with the cable. Clients can rest assured that the cables supplied are free from defects and meet their required specifications.

Experience and competence

The Fibre Optic Cable Team engineers have many years experience in the design and manufacture of fibre optic cables. Their cable designs and finished products have been the basis for many fibre optic networks around the world. Their commitment is a guarantee of care and workmanship for each cable manufactured by TELEFONIKA Kable.

The Fibre Optic Team

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TFK CABLE IDENTIFICATION SCHEME

The identification scheme for fibre optic cables uses a combination of letters, symbols and numbers

Cable use

| | |
|-------------|-------------------------------|
| Z | – outdoor |
| ZKS | – outdoor for sewers |
| W | – indoors |
| ZW | – universal (indoor outdoor) |
| S | – self-supporting (8-shaped)) |
| ADSS | – self-supporting (O-shaped) |
| WD | – riser, easy access |

Outer sheath material

| | |
|-----------|--|
| X | – polyethylene (PE) |
| V | – polyamide (PA) |
| Xz | – polyethylene with a moisture barrier |
| yn | – flame-retardant polyvinyl |
| N | – flame-retardant Zero halogen material (LSOH) |
| Q | – polyurethane |

In case of a two-layer outer sheath, brackets are used, e.g (VX) – the sheath consists of a PE and PA layers.

Outer sheath material

| | |
|----------|--|
| X | – polyethylene (PE) |
| Y | – polyvinyl chloride (PVC) |
| N | – flame-retardant Zero halogen material (LSOH) |

Fibre optic cable designation

| | |
|-------------|-------------------------------|
| OTK | – fibre optic cable |
| OTKG | – fibre optic cable for mines |

Cable core

| | |
|-----------|----------------------------|
| ts | – dry sealed |
| tc | – central tube |
| S | – tight or semi-tight tube |
| tm | – micro tube |
| M | – micromodule |
| Mg | – gel filled micromodule |

Dielectric cable designation

| | |
|----------|--------------------|
| d | – dielectric cable |
|----------|--------------------|

Reinforcement

| | |
|-----------|---------------------------|
| D | – dielectric aramide yarn |
| Db | – dielectric glass yarn |

Armouring

| | |
|------------|-------------------------|
| Ff | – corrugated steel tape |
| Ftl | – lacquered steel tape |
| Fo | – round steel wires |
| abt | – Anti-ballistic tape |

Flat cable designation

| | |
|----------|--------------|
| p | – flat cable |
|----------|--------------|

Type and number of optical fibres

| | |
|---------------|---|
| J | – singlemode, non-shifted dispersion (matched cladding) G.652D |
| JA, JB | – singlemode, non-shifted dispersion (matched cladding) with higher bending resistance G.652D |
| Jn | – singlemode, non-zero dispersion G.655 |
| G50 | – gradient multimode (50/125 m), type OM2 (OM3 and OM4 types available) |
| G62,5 | – gradient multimode (62.5/125 m) |

When fibres of different types are mixed in a cable, they are separated by a '+' sign, e.g. 8G50 + 8J.

Rated working tension (in case of self-supported cables)


| |
|-----------|
| e.g. 8 kN |
|-----------|

Cables manufactured acc. to DIN VDE standards, e.g. A/I-DQ(ZN)BH, use the identification scheme described in DIN VDE 0888 standard.

COLOUR CODING SYSTEM OF CABLE ELEMENTS

1. Colour code of optical fibres in a tube.



When a tube contains more than one optical fibre, the primary coating is coloured acc. to IEC 304:

| | |
|--|---|
|  red |  grey |
|  green |  yellow |
|  blue |  brown |
|  white |  pink |
|  violet |  black |
|  orange |  turquoise |

When a tube contains more than 12 optical fibres, additional colour rings are used.





2. Colour code of tubes in a cable.

To differentiate the tubes in the cable, the following code is used:

| |
|--|
|  red colour – counter tube (the tube from which the counting starts) |
|  blue colour – directional tube (the tube that shows in which direction to count) |

The other tubes are colourless

3. Colour code of the outer sheath of indoor cables.

| | |
|--|--|
|  yellow | – singlemode fibres J (G.652D,G657) |
|  brown | – singlemode fibres Jn (G.655) |
|  orange | – multimode fibres G50 (OM2, OM3, OM4) |
|  green | – multimode fibres (G62.5) |

CABLE MARKING

The outer sheath of the cable is marked to denote the cable type, type and number of optical fibres, manufacturer's name, year of production, pictogram and length in metres:

FIBER OPTIC CABLE Z-XOTKtsd 16J TF-KABLE 1 2019  2,200 m

BASIC PARAMETERS OF OPTICAL FIBRES

SINGLEMODE FIBRES:

| Geometrical parameters | Unit | ITU-T G652D, J | ITU-T G657A1, G657A2 | ITU-TG655, Jn |
|--|---------------|----------------|----------------------|---------------|
| Mode field diameter at wavelength 1310nm | μm | 9,2±0,4 | 8,6 – 9,1 ± 0,4 | – |
| Mode field diameter at wavelength 1550nm | μm | 10,4±0,5 | 9,6 – 9,8 ± 0,5 | 9,6 ± 0,4 |
| Cladding diameter | μm | 125±0,7 | 125±0,7 | 125 ± 0,7 |
| Primary coating diameter | μm | 245±5 | 245±5 | 242 ± 5 |
| Mode field eccentricity | μm | ≤0,5 | ≤0,5 | ≤0,5 |
| Coating/cladding eccentricity | μm | ≤12 | ≤12 | ≤12 |
| Cladding ellipticity | % | ≤0,7 | ≤0,7 | ≤0,7 |

| Transmission parameters | Unit | ITU-T G652D, J | ITU-T G657A1, G657A2 | ITU-TG655, Jn |
|---|----------------------|--|--|---|
| Attenuation – at 1310 nm – at 1550 nm – at 1625 nm | dB/km | ≤0,35 ¹⁾ (maks. 0,4) ≤0,22 ¹⁾ (maks. 0,25) – | ≤0,35 ¹⁾ (maks. 0,4) ≤0,22 ¹⁾ (maks. 0,25) – | – ≤0,20 ¹⁾ (maks. 0,25) ≤0,25 ¹⁾ (maks. 0,28) |
| Chromatic dispersion – at 1550 nm – at 1625 nm | ps/(nm*km) | ≤18,0 ≤22,0 | ≤18,0 ≤23,0 | – – |
| Chromatic dispersion at C and L bands – at 1530 – 1565 nm – at 1565 – 1625 nm | ps/√km(nm*km) | – – | – – | 2-6 4,5-11,2 |
| Polarisation mode dispersion (PMD) | ps/√km | ≤0,1 | ≤0,2 | ≤0,1 |
| Zero dispersion wavelength | nm | 1300< λ_0 <1324 | 1300< λ_0 <1324 | ≤1460 |
| Cut off wavelength λ_{cc} | nm | ≤1260 | ≤1260 | – |

¹⁾ typical values for 95% of fibres measured in loose tube cables

MULTIMODE FIBRES:

| Geometrical parameters | Unit | ITU-T G-651 | |
|--|--------|--|--|
| | | Typ G50 (OM2) ¹⁾ | Typ G 62,5 |
| Core diameter | µm | 50±2,5 | 62,5±2,5 |
| Cladding diameter | µm | 125±2,0 | 125±2,0 |
| Primary coating diameter | µm | 242±5 | 242±5 |
| Core ellipticity | % | ≤5 | ≤5 |
| Cladding ellipticity | % | ≤1 | ≤1 |
| Core/cladding eccentricity | µm | ≤1,5 | ≤1,5 |
| Numerical aperture | – | 0,200±0,015 | 0,275±0,015 |
| Transmission parameters | | | |
| Attenuation – at 850 nm – at 1300 nm | dB/km | ≤2,6 ²⁾ (maks. 3,0) ≤0,6 ²⁾ (maks. 1,0) | ≤2,9 ²⁾ (maks. 3,5) ≤0,7 ²⁾ (maks. 1,0) |
| Bandwidth – at 850 nm – at 1300 nm | MHz*km | ≥500 ≥500 | ≥200 ≥500 |

¹⁾ OM3 & OM4 types are also available

²⁾ typical values for 95% of fibres measured in loose tube cables

Indoor cables

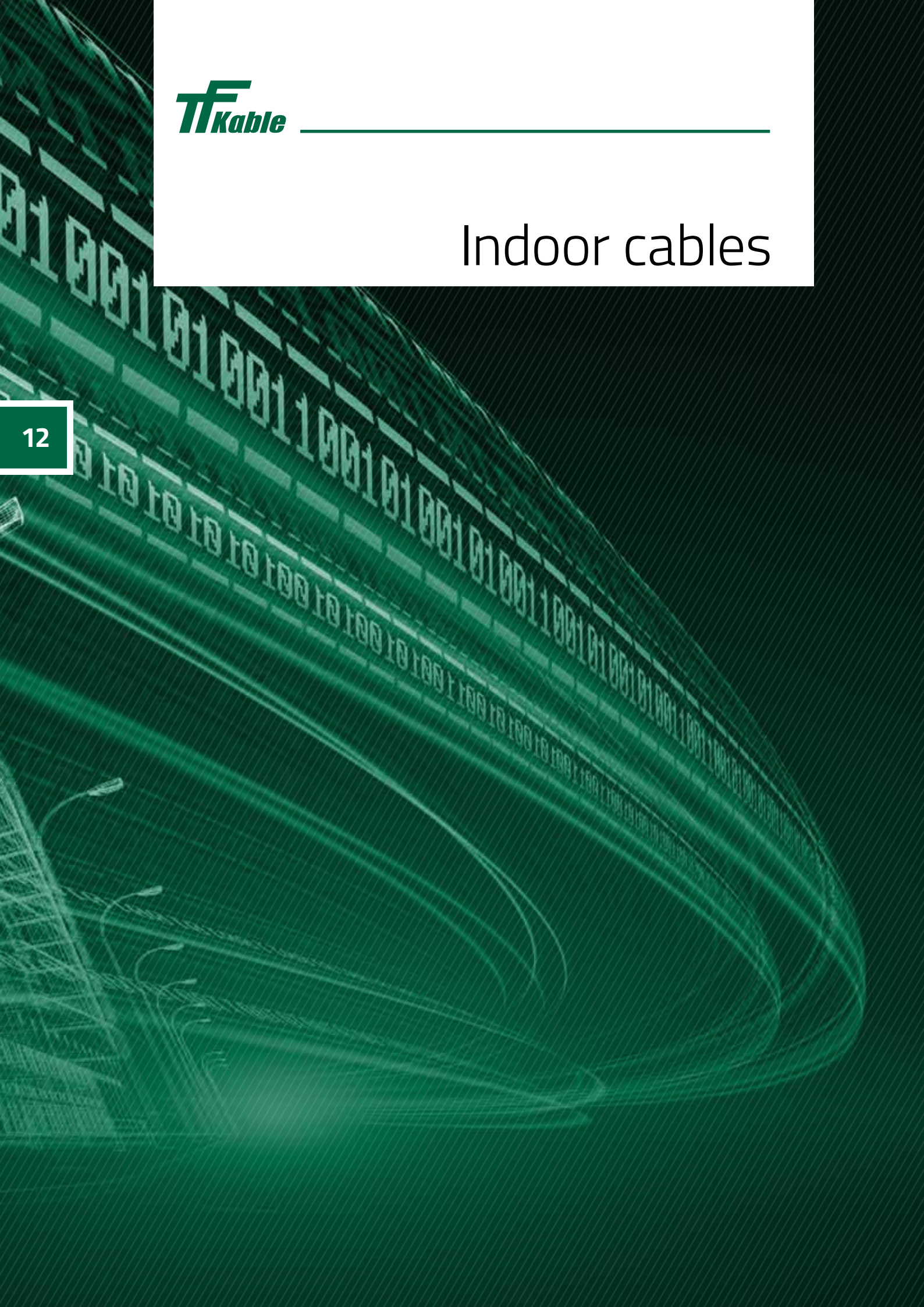


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Application

The indoor cables are designed for transmission of digital and analogue signals within the whole optical bandwidth, used in local networks. They are intended for installation in closed spaces to connect optoelectronic devices. Most frequently used as patch cords and pigtails.

Indoor cables:

- fully dielectric
- resistant to electromagnetic interferences
- flexible
- easy installation
- can be installed in the proximity of electric wiring
- can be used together with any kind of connectors
- the outer sheath is made of halogen free flame retardant materials
- the marking and metric overprint are printed on the outer sheath

Temperature ranges:

transport and storage: -30°C – +70°C
installation: -5°C – +60°C
operation: -20°C – +60°C

W-NOTKSd (simplex)

Analog acc. to VDE: I-V(ZN)H 1...

ZN-TF-12:2001

Optical fibre distribution cables with a single fibre

Description

W-NOTKSd – indoor (W), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d)



CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) single mode with improved macrobending performance (JA1, JA2) |
| Tube | tight tube Ø 0.9 mm |
| Reinforcement | Aramid yarns |
| Sheath | halogen free flame retardant, colour according to table on page 9 |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric, resistant to electromagnetic interferences, flexible, easy to install, can be installed in the proximity of electric wiring, can be used together with any kind of connectors. |
| Application | The indoor cables are designed for transmission of digital and analogue signals within the whole optical bandwidth, used in local networks. They are intended for installation in closed spaces to connect optoelectronic devices. Most frequently used as patch cords and pigtails. |
| Temperature ranges | Transport and storage: -30/+70°C Installation: -5/+60 °C Operation: -5/+60°C |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

PARAMETERS:

| Fibre count in cable n | Cable diameter mm | Cable weight kg/km | Max. pulling force | | Min. bending radius | |
|----------------------------------|-----------------------------|------------------------------|---------------------|--------|----------------------|--------|
| | | | Dynamic N | Static | Dynamic mm | Static |
| 1 | 1,7 | 3,2 | 200 | 100 | 17 | 25 |
| | 2,0 | 3,5 | 220 | 110 | 20 | 30 |
| | 2,4 | 4,4 | 300 | 150 | 24 | 35 |
| | 2,5 | 4,6 | 300 | 150 | 25 | 38 |
| | 2,8 | 7,2 | 380 | 190 | 28 | 42 |
| | 3,0 | 7,7 | 380 | 190 | 30 | 50 |

Packing length: to be agreed Packing: reels

W-NOTKSd (duplex)

Analog acc. to VDE: I-V(ZN)H 2x1...

ZN-TF-12:2001

Optical fibre distribution cables with two fibres

Description

W-NOTKSd – indoor (W), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d)



15

CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) single mode with improved macrobending performance (JA1, JA2) |
| Tube | tight tube Ø 0.9 mm |
| Reinforcement | aramid yarns |
| Sheath | halogen free flame retardant, colour according to table on page 9 |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric, resistant to electromagnetic interferences, flexible, easy to install, can be installed in the proximity of electric wiring, can be used together with any kind of connectors. |
| Application | The indoor cables are designed for transmission of digital and analogue signals within the whole optical bandwidth, used in local networks. They are intended for installation in closed spaces to connect optoelectronic devices. Most frequently used as patch cords and pigtails. |
| Temperature ranges | Transport and storage: -30/+70°C Installation: -5/+60°C Operation: -5/+60°C |

Reaction to fire

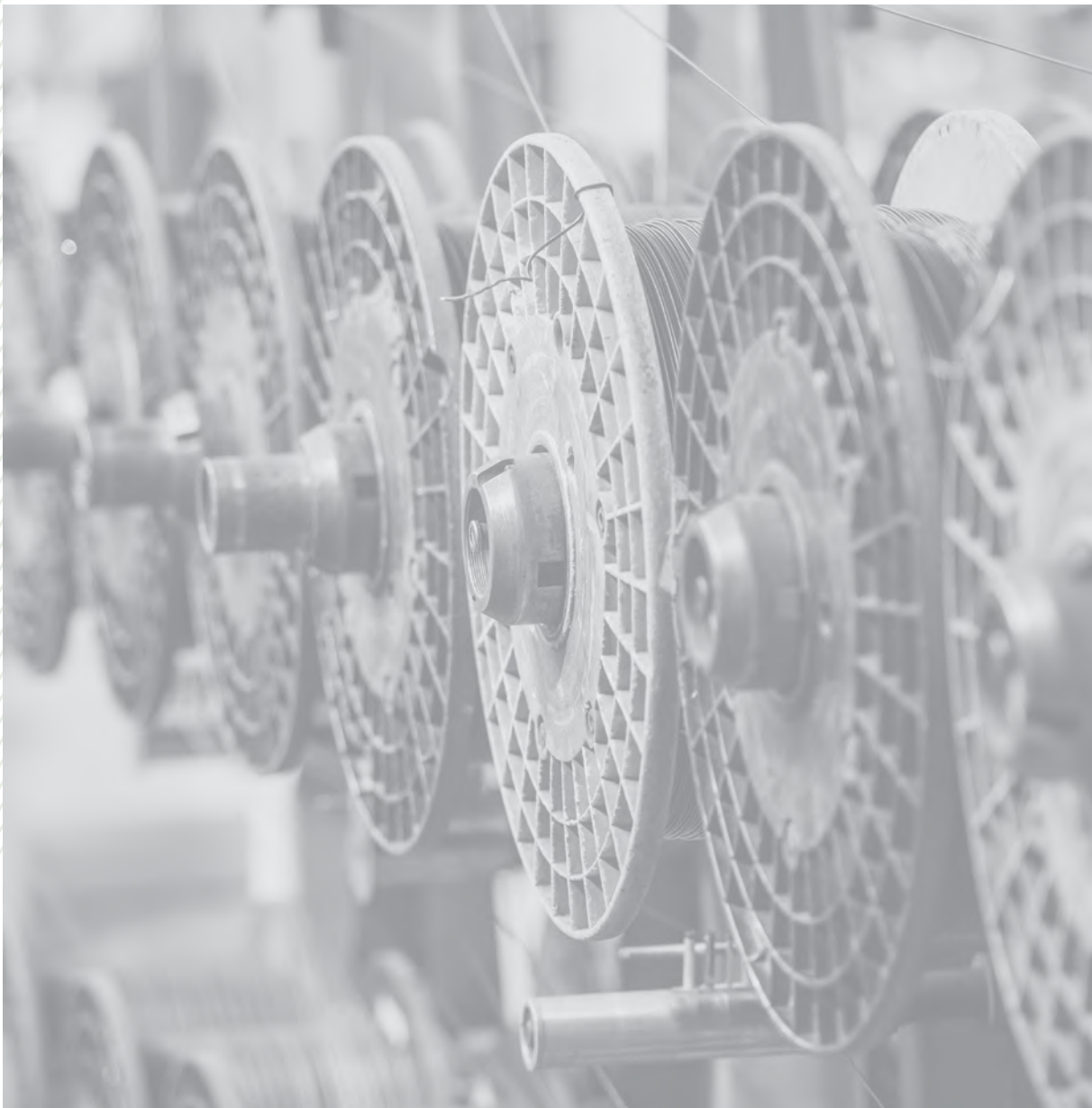
| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

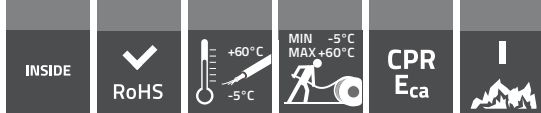
PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 | 2,0x4,0 | 7,0 | 440 | 220 | 20 | 30 |
| | 2,4x4,8 | 8,9 | 600 | 300 | 24 | 36 |
| | 2,5x5,0 | 9,2 | 600 | 300 | 25 | 38 |
| | 2,8x5,6 | 13,5 | 760 | 380 | 28 | 40 |
| | 3,0x6,0 | 16,5 | 760 | 380 | 30 | 50 |

Packing length: to be agreed

Packing: reels





W-NOTKSd

Analog acc. to VDE: I-V(ZN)H 4.6.8.12.24 ...

ZN-TF-12:2001

Optical fibre distribution cables, multiplex, terminating

Description

W-NOTKSd – indoor (W), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d)



CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50), gradient multimode (G/62.5) single mode with improved macrobending performance (JA1, JA2) |
| Tube | tight tube Ø 0.9 mm |
| Reinforcement | aramid yarns |
| Sheath | halogen free flame retardant, colour according to table on page 9 |

CHARACTERISTIC

| | | | | | | | |
|------------------------|--|------------------------|-----------|---------------|----------|------------|----------|
| Performance parameters | Fully dielectric, resistant to electromagnetic interferences, flexible, easy to install, can be installed in the proximity of electric wiring, can be used together with any kind of connectors. | | | | | | |
| Application | The indoor cables are designed for transmission of digital and analogue signals within the whole optical bandwidth, used in local networks. They are intended for installation in closed spaces to connect optoelectronic devices. | | | | | | |
| Temperature ranges | <table border="0"> <tr> <td>Transport and storage:</td> <td>-30/+70°C</td> </tr> <tr> <td>Installation:</td> <td>-5/+60°C</td> </tr> <tr> <td>Operation:</td> <td>-5/+60°C</td> </tr> </table> | Transport and storage: | -30/+70°C | Installation: | -5/+60°C | Operation: | -5/+60°C |
| Transport and storage: | -30/+70°C | | | | | | |
| Installation: | -5/+60°C | | | | | | |
| Operation: | -5/+60°C | | | | | | |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

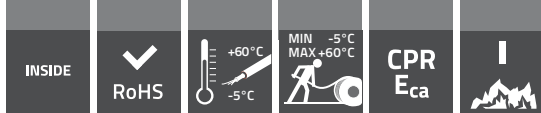
PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 | 3,5 | 13,5 | 700 | 350 | 40 | 60 |
| 4 | 4,3 | 14,4 | 800 | 400 | 45 | 70 |
| 6 | 4,6 | 17,2 | 900 | 450 | 50 | 75 |
| 8 | 4,8 | 19,7 | 1000 | 500 | 50 | 75 |
| 10 | 5,5 | 23,3 | 1100 | 550 | 55 | 80 |
| 12 | 5,5 | 27,7 | 1200 | 600 | 60 | 90 |
| 24 | 8,0 | 50,0 | 1200 | 600 | 90 | 140 |

Packing length: to be agreed

Packing: reels





W-NNOTKSd()^{*}

Analog acc. to VDE: I-V(ZN)HH

ZN-TF-12:2001, ZN-EK-106

Optical fibre distribution cables, multiplex

Description

W-NNOTKSd () – indoor (W), with a halogen free flame retardant sheath (N), halogen free flame retardant module sheath (N), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d), distributive (I)^{*}
^{*}Number of modules and number of fibres, e.g. 4x4 – 4 modules, 4 fibres each

CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50), gradient multimode (G/62.5) single mode with improved macrobending performance (JA1, JA2) |
| Tube | tight tube Ø 0.9 mm |
| Inner module | sheath is made of the same material as the cable sheath and may contain 1–12 optical fibres |
| Water barrier | swelling tape |
| Reinforcement | Aramid yarns |
| Sheath | halogen free flame retardant, colour according to table on page 9 |



CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric, resistant to electromagnetic interferences, flexible, easy to install, can be installed in the proximity of electric wiring, can be used together with any kind of connectors. |
| Application | The indoor cables are designed for transmission of digital and analogue signals within the whole optical bandwidth, used in local networks. They are intended for installation in closed spaces to connect optoelectronic devices. |
| Temperature ranges | Transport and storage: -30/+70°C Installation: -5/+60°C Operation: -5/+60°C |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

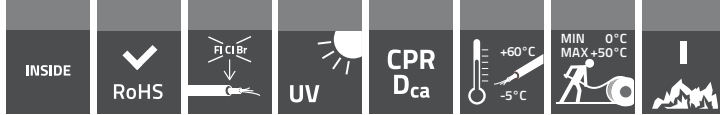
PARAMETERS:

| Fibre count in cable | Number of modules | Number of optical fibres in a module | Max. module diameter | Cable diameter | | Max. pulling force | | Min. bending radius | |
|----------------------|-------------------|--------------------------------------|----------------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | | Dynamic | Static | Dynamic | Static |
| n | n | n | mm | mm | kg/km | N | | mm | |
| 2 | 2 | 1 | 2,5 | 10,0 | 71 | | | 150 | 200 |
| 4 | 4 | 1 | 2,5 | 10,0 | 73 | | | 150 | 200 |
| 6 | 6 | 1 | 2,5 | 10,0 | 79 | | | 150 | 200 |
| 8 | 8 | 1 | 2,5 | 11,7 | 109 | 1200 | 2000 | 170 | 230 |
| 10 | 10 | 1 | 2,5 | 14,9 | 163 | | | 220 | 290 |
| 12 | 12 | 1 | 2,5 | 14,9 | 165 | | | 220 | 290 |
| do 48 | 4 | 4 – 12 | 5,5 | 18,0 | 170 | 4000 | 2000 | 270 | 360 |
| do 72 | 6 | 4 – 12 | 5,5 | 21,5 | 190 | 6000 | 3000 | 320 | 430 |
| do 96 | 8 | 4 – 12 | 5,5 | 27,5 | 300 | 8000 | 4000 | 410 | 550 |

Packing length: to be agreed, standard – 1 km

Packing: wooden drums





WD-NOTKMd

ZN/17-OPL-005-2; IEC/EN 60793; IEC/EN 60794-1

Easy acces, indoor cables

Description

WD-NOTKMd -indoor, easy access, riser (WD), with halogen free, flame retardant sheath(N), fibre optic cable (OTK), fibres in micromodule tubes (M), fully dielectric (d).



21

CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | ITU-T G.657A2 or according to the attached specifications |
| Tube | Flexible, easy peel compound, no tools required. |
| Reinforcement | Dielectric rods in the outer jacket |
| Sheath | Halogen free, flame retardant, white (FR LSOH) |

CHARACTERISTIC

| | | | | | | | |
|------------------------|--|------------------------|---------------|---------------|-------------|------------|--------------|
| Performance parameters | Full dielectric, resistant to electromagnetic interferences, can be installed near to electrical wiring, UV resistant, light and durable, easy access to cable modules, easy strippable secondary coating, can be peeled with fingers, with no tools required. | | | | | | |
| Application | Cables designed for FTTH system rising column cabling in buildings. They provide the subscriber connections at the floor distribution box. | | | | | | |
| Temperature ranges | <table border="0"> <tr> <td>transport and storage:</td> <td>-40°C – +70°C</td> </tr> <tr> <td>installation:</td> <td>0°C – +50°C</td> </tr> <tr> <td>operation:</td> <td>-5°C – +60°C</td> </tr> </table> | transport and storage: | -40°C – +70°C | installation: | 0°C – +50°C | operation: | -5°C – +60°C |
| transport and storage: | -40°C – +70°C | | | | | | |
| installation: | 0°C – +50°C | | | | | | |
| operation: | -5°C – +60°C | | | | | | |

Reaction to fire

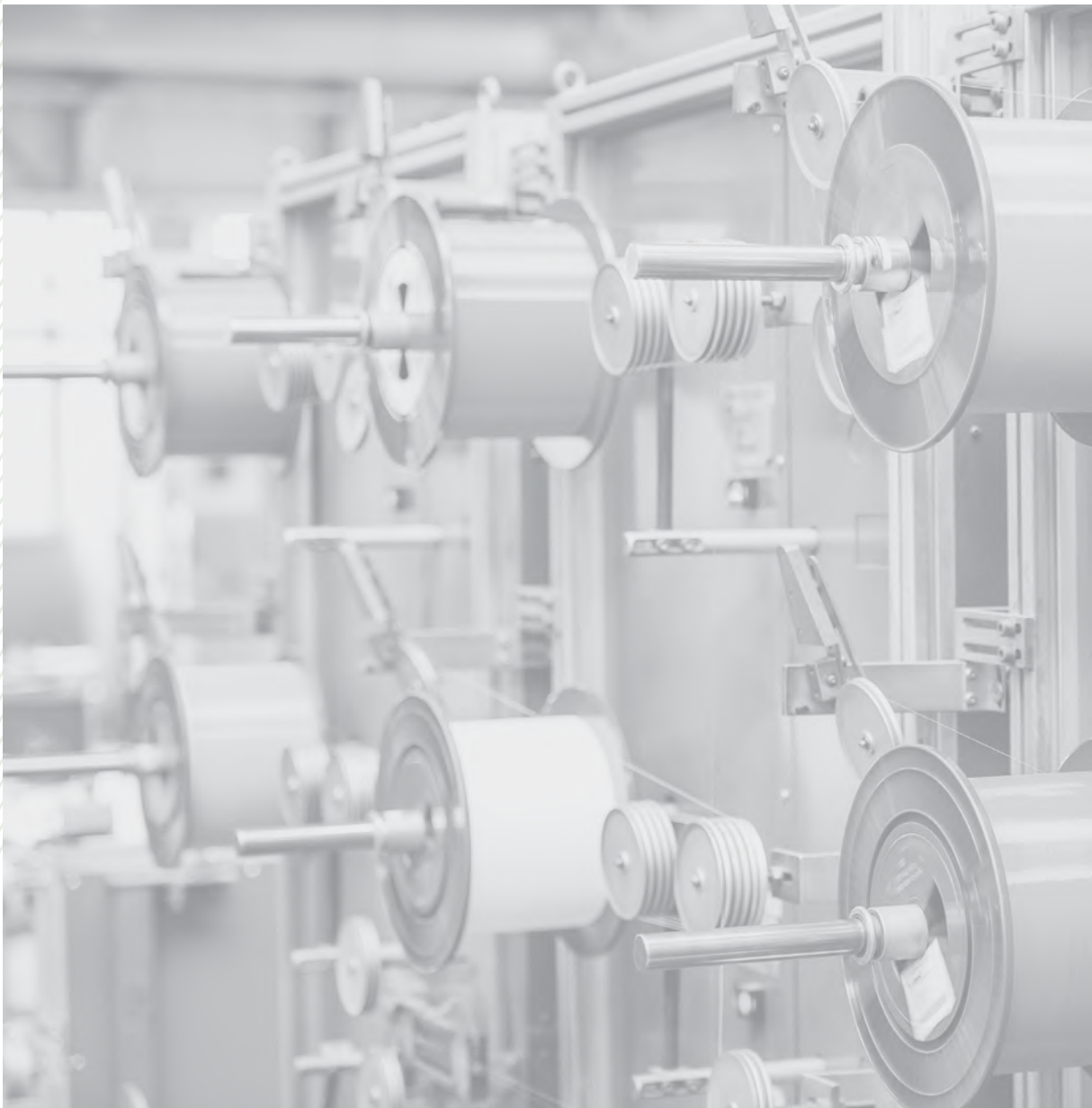
| | |
|---|-------------------------------|
| Flame propagation | IEC 60332-1-2, IEC 60332-3-24 |
| Corrosive gas emission | PN-EN50267-2-2 |
| Smog density | IEC 61034 |
| CPR - class reaction to fire (acc EN 50575) | Dca-s2,d0,a1 |

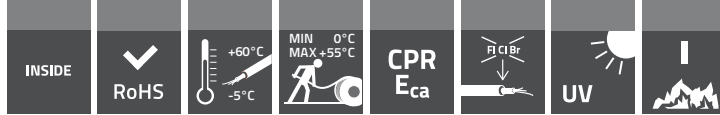
PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| up to 4x12 | 6.8 ± 0.3 | 45 | 450 | 200 | 100 | 130 |
| up to 6x12 | 8.5 ± 0.3 | 65 | 700 | 350 | 125 | 170 |
| up to 12x12 | 10.5 ± 0.3 | 90 | 950 | 450 | 150 | 210 |

Packing length: to be agreed, standard – 2 km

Packing: wooden drums





WD-NOTKSd

ZN/17-OPL-005-2; IEC/EN 60793; IEC/EN 60794-1

Easy access indoor cables

Description

WD-NOTKSd-indoor, easy access, riser (WD), with halogen free, flame retardant sheath(N), fibre optic cable (OTK), tight tubes (S), fully dielectric (d).



23

CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | ITU-T G.657A2 or according to the attached specifications |
| Tube | Flexible tight buffer tube, Ø 0.9 mm (approx.) easy strippable. |
| Reinforcement | Dielectric rods in the outer jacket |
| Outer sheath | Halogen free, flame retardant, white (FR LSOH) |

Reaction to fire

| | |
|---|---------------|
| Flame retardant | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | | |
|------------------------|--|---------------|
| Performance parameters | Full dielectric, resistant to electromagnetic interferences, can be installed near to electrical wiring, UV resistant, light and durable, easy access to tubes, easy strippable secondary coating, can be peeled with fingers, with no tools required. | |
| Application | Cables designed for FTTH system rising column cabling in buildings. They provide the subscriber connections at the floor distribution box. | |
| Temperature ranges | Transport and storage: | -40°C - +70°C |
| | Installation: | 0°C - +55°C |
| | Operation: | -5°C - +60°C |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| up to 12 | 8,5 ± 0,3 | 70 | 700 | 350 | 125 | 170 |
| up to 24 | 10,5 ± 0,3 | 95 | 950 | 450 | 150 | 210 |
| up to 36 | 13,5 ± 0,3 | 130 | 1400 | 700 | 200 | 270 |
| up to 48 | 13,5 ± 0,3 | 140 | 1400 | 700 | 200 | 270 |

Packing length: to be agreed, standard – 2 km

Packing: wooden drums

Uniwersal cables

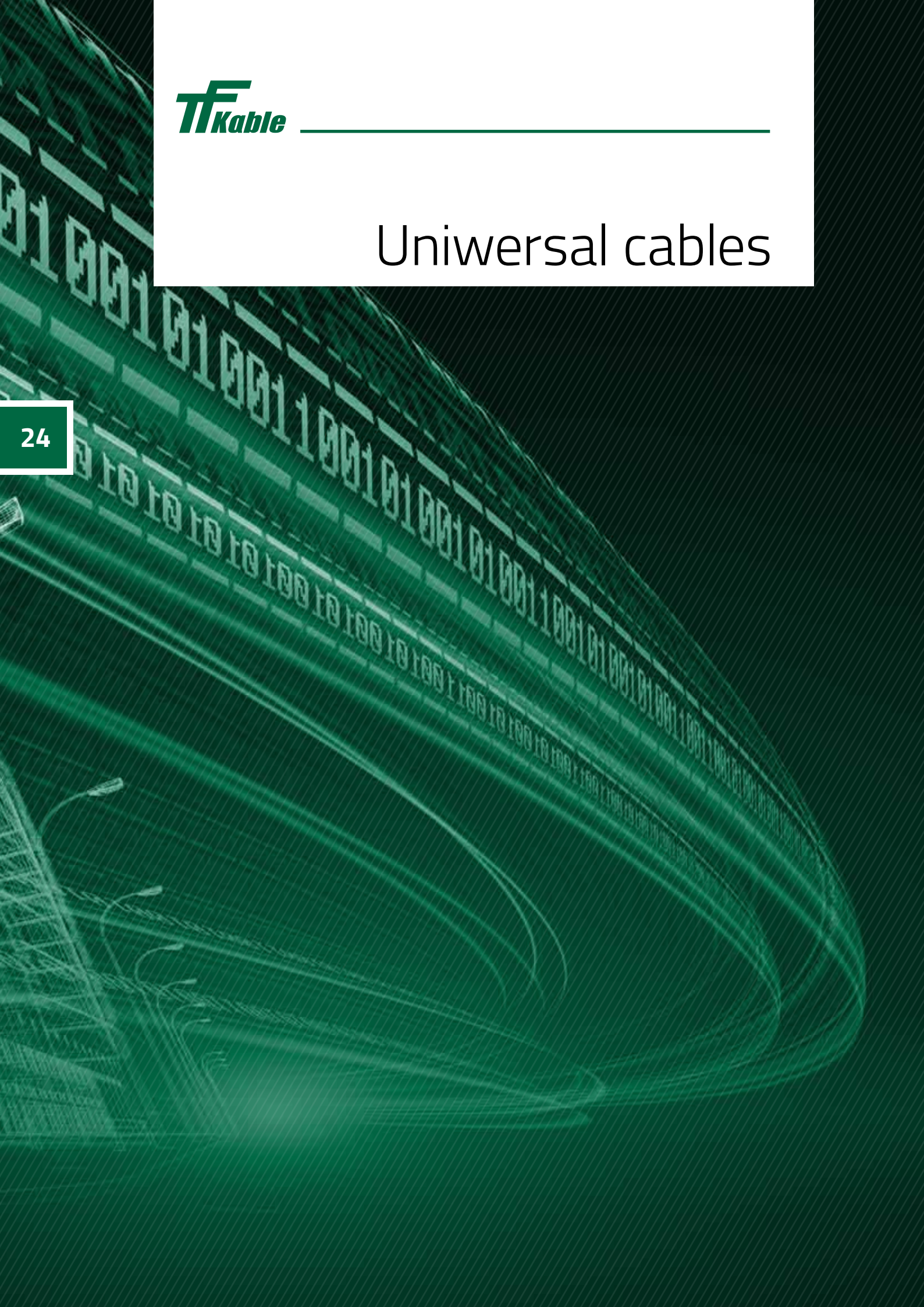
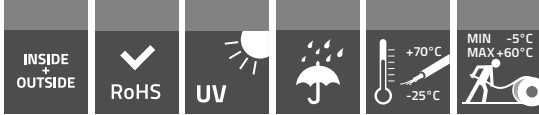


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Application

The universal cables are designed for transmission of digital and analogue signals within the whole optical bandwidth, used in local networks and for connecting optoelectronic devices inside and outside buildings. They are especially suitable for FTTH (Fibre To The Home) projects.



ZW-QOTKSd

TT1-2513/5/0

Universal drop cable

Description

ZW-QOTKSd – indoor/outdoor (ZW), polyurethane sheath (Q), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d)

CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | ITU-T G.652D; ITU-T G.657A or according to the attached specification |
| Tube | tight tube Ø 0.9 mm |
| Reinforcement | aramid yarn |
| Outer sheath | polyurethane |

CHARACTERISTIC

| | | | | | | | |
|------------------------|---|------------------------|---------------|---------------|--------------|------------|---------------|
| Performance parameters | <ul style="list-style-type: none"> fully dielectric resistant to electromagnetic interferences outer sheath resistant to abrasion, UV flexible | | | | | | |
| Application | <ul style="list-style-type: none"> for transmission of digital and analogue signals within the whole optical bandwidth used in the local, metropolitan and wide area networks modern FTTH and CCTV installations internal subscriber connections | | | | | | |
| Temperature ranges | <table border="0"> <tr> <td>transport and storage:</td> <td>-20°C – +70°C</td> </tr> <tr> <td>installation:</td> <td>-5°C – +60°C</td> </tr> <tr> <td>operation:</td> <td>-25°C – +70°C</td> </tr> </table> | transport and storage: | -20°C – +70°C | installation: | -5°C – +60°C | operation: | -25°C – +70°C |
| transport and storage: | -20°C – +70°C | | | | | | |
| installation: | -5°C – +60°C | | | | | | |
| operation: | -25°C – +70°C | | | | | | |



PARAMETERS:

| Fibre count in cable | Outer diameter of tube | No. of elements in a cable | Outer diameter of cable | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|------------------------|----------------------------|-------------------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | mm | [tubes/ fillers] | mm | kg/km | N | | mm | |
| 1 - 2 | 0.9 | 2 | 3.0 ±0.2 | 7.6 | 500 | 250 | 30 | 45 |
| 4 | 0.9 | 4 | 3.5 ±0.2 | 11.0 | 500 | 250 | 35 | 55 |
| 6 | 0.9 | 6 | 4.0 ±0.2 | 14.0 | 750 | 350 | 40 | 60 |
| 8 | 0.9 | 8 | 4.2 ±0.2 | 17.0 | 800 | 400 | 42 | 65 |
| 12 | 0.9 | 12 | 5.2 ±0.2 | 23.0 | 1000 | 500 | 52 | 78 |

Packing length: to be agreed, standard – 2.1 km (± 100 m)
Packing: wooden drums

ZW-NOTKSd

ZN-TF-12:2001

Universal fibre optic cable with multiple optical fibres in a tight tube

Description

ZW-NOTKSd – indoor/outdoor (ZW), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d)

CONSTRUCTION

| | |
|----------------|--|
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (In) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | tight tube Ø 0.9 mm (with an acrylic buffer) |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 1 |
| Sheath | halogen free flame retardant |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | fully dielectric, resistant to electromagnetic interferences, easy installable, can be installed in the proximity to electric installation, can be used together with any kind of connectors, the outer sheath is made of halogen free flame retardant material, the marking and the metric overprint are printed on the outer sheath, the marking can also be tailored to meet customer's requirements |
| Application | for making connections between optoelectronic devices inside and outside buildings and suitable for use in cable ducts |
| Temperature ranges | Transport and storage: -30°C – +70°C Installation: -15°C – +60°C Operation: -30°C – +60°C |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 – 8 | 10,5 | 100 | 1600 | 800 | 150 | 160 |
| 10 – 12 | 11 | 110 | 1600 | 800 | 210 | 220 |

Packing length: to be agreed, standard – 1 km

Packing: wooden drums





ZW-NOTKSd flex

ZN-EK-106

Universal flexible fibre optic cable with multiple optical fibres in a tight tube

Description

ZW-NOTKSd flex – indoor/outdoor (ZW), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), distribution type with tight tube (S), fully dielectric (d) flexible (flex)

CONSTRUCTION

| | |
|-------------------------|---|
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (In) gradient multimode (G/50), gradient multimode (G/62.5) single mode with improved macrobending performance (JA1, JA2) |
| Tube | tight tube Ø 0.9 mm (with an acrylic buffer) |
| Sealing | dry |
| Central strength member | dielectric FRP rod |
| Reinforcement | aramid yarns (glass yarns on request) |
| Sheath | halogen free flame retardant, orange or black |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | | | |
|------------------------|--|-----------------|--|
| Performance parameters | Fully dielectric. Resistant to electromagnetic interferences. Flexible. Easy installable. Can be installed in the proximity to electric installation. The outer sheath is made of halogen free flame retardant material. The marking and the metric overprint are printed on the outer sheath. The marking can also be tailored to meet customer's requirements. | | |
| Application | for making connections between optoelectronic devices inside and outside buildings, suitable for use in cable ducts | | |
| Temperature ranges | Transport and storage: | -30 °C – +70 °C | |
| | Installation: | -5 °C – +50 °C | |
| | Operation: | -30 °C – +70 °C | |

PARAMETERS:

| Fibre count in cable | Cable diameter | kg/km | Max. pulling force | | Min. bending radius | |
|----------------------|----------------|-------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | | N | | mm | |
| 2, 4, 6 | 6,2 | 61 | | | 62 | 125 |
| 8 | 6,8 | 67 | 1500 | 750 | 68 | 135 |
| 12 | 7,5 | 73 | | | 75 | 150 |

Packing length: to be agreed, standard – 2 km Packing: wooden drums





ZW-NOTKtcdD

Analog acc. to VDE: A/I-DQ(ZN)H U-DQ(ZN)H

ZN-TF-11:2001

Universal fibre optic cable with multiple optical fibres in a central tube

Description

ZW-NOTKtcdD – indoor/outdoor (ZW), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), central tube (tc), fully dielectric (d), reinforced with aramid yarns (D)



29

CONSTRUCTION

| | |
|----------------|--|
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | central tube filled with a thixotropic jelly |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Sheath | halogen free flame retardant, black |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

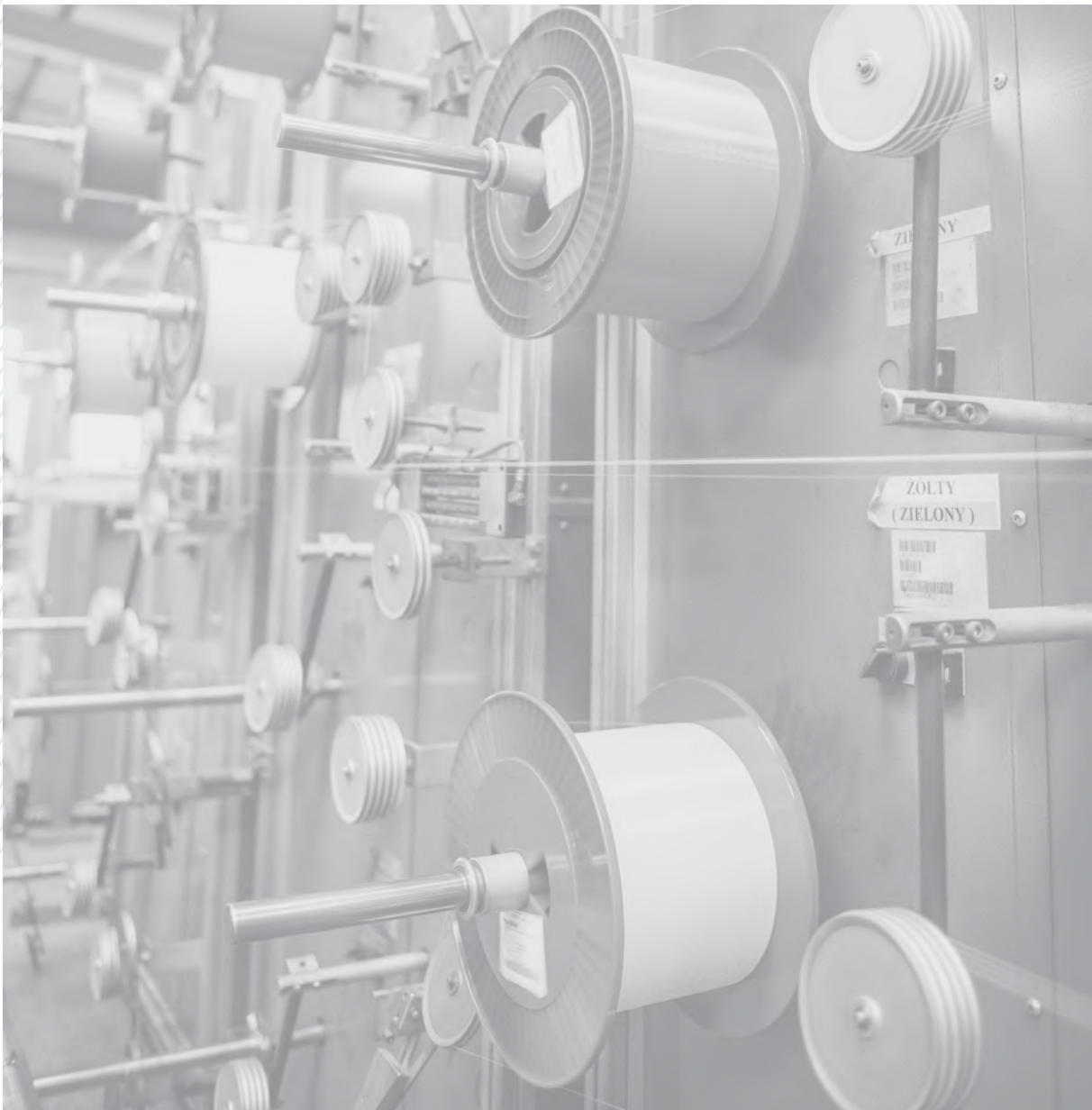
| | |
|------------------------|---|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Easy installable Can be installed in the proximity to electric installation The outer sheath is made of halogen free flame retardant material The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
| Application | For making connections between optoelectronic devices inside and outside buildings. Suitable for use in cable ducts |
| Temperature ranges | Transport and storage: -25°C – +70°C Installation: -5°C – +50°C Operation: -20°C – +70°C |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 - 12 | 8,5 | 100 | 2500 | 1250 | 130 | 170 |
| 2-12 | 3.6 | 14 | 600 | 300 | 55 | 70 |

Packing length: to be agreed, standard – 2 km

Packing: wooden drums





ZW-NOTKtsd

Analog acc. to VDE: A/I-DQH U-DQH

ZN-TF-11:2001; ZN-EK-103

Universal fibre optic cable with multiple optical fibres in a loose tube, flame retardant

Description

ZW-NOTKtsd – indoor/outdoor (ZW), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d)

CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Ripcord | 2 |
| Sheath | halogen free flame retardant, black |



Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Can be installed in the proximity to electric installation The outer sheath is made of halogen free flame retardant material The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
| Application | in telecommunication local, metropolitan and wide area networks in any spatial configuration for making connection between optoelectronic devices in closed spaces prepared for installation in closed spaces, road and railroad tunnels |

| | | |
|--------------------|------------------------|---------------|
| Temperature ranges | Transport and storage: | -40°C – +70°C |
| | Installation: | -15°C – +60°C |
| | Operation: | -40°C – +70°C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/ fillers | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 8 | 65 | 1000 | 500 | 120 | 160 |
| 28 – 96 | 8 | 1,8 | 9,2 | 85 | 1500 | 750 | 140 | 180 |
| 36 – 144 | 12 | 1,8 | 11,5 | 125 | 2200 | 1100 | 170 | 230 |
| 52 – 216 | 18 | 1,8 | 11,9 | 130 | 1000 | 500 | 180 | 240 |
| 76 – 288 | 24 | 1,8 | 13,6 | 165 | 2500 | 1250 | 200 | 270 |
| 4 – 72 | 6 | 2,4 | 11,2 | 125 | 2000 | 1000 | 170 | 230 |
| 28 – 96 | 8 | 2,4 | 12,8 | 160 | 2500 | 1250 | 190 | 260 |
| 36 – 144 | 12 | 2,4 | 15,8 | 230 | 2500 | 1250 | 240 | 320 |
| 52 – 216 | 18 | 2,4 | 16,3 | 240 | 2500 | 1250 | 240 | 320 |
| 76 – 288 | 24 | 2,4 | 18,5 | 310 | 2500 | 1250 | 280 | 370 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums





ZW-NOTKtsdD

Analog acc. to VDE: A/I-DQ(ZN)H U-DQ(ZN)H

ZN-TF-11:2001; ZN-EK-103

Universal fibre optic cable with multiple optical fibres in a loose tube, reinforced, flame retardant

Description

ZW-NOTKtsdD – indoor/outdoor (ZW), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with aramid yarn (D)

CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Sheath | halogen free flame retardant, black |



Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Can be installed in the proximity to electric installation</p> <p>Through the use of central dielectric strength member and aramid yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses</p> <p>The outer sheath is made of halogen free flame retardant material</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> |
|------------------------|---|

| | | |
|--------------------|--|---------------|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For making connection between optoelectronic devices in closed spaces For laying on the outer walls of buildings For laying in roads, railway tunnels or mine shafts For horizontal and vertical suspension | |
| Temperature ranges | Transport and storage: | -40°C – +70°C |
| | Installation: | -15°C – +60°C |
| | Operation: | -40°C – +70°C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/fillers | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 8,5 | 75 | 2700 | 1350 | 130 | 170 |
| 28 – 96 | 8 | 1,8 | 9,7 | 90 | 3000 | 1500 | 150 | 190 |
| 36 – 144 | 12 | 1,8 | 12,0 | 135 | 4000 | 2000 | 180 | 240 |
| 52 – 216 | 18 | 1,8 | 12,4 | 140 | 4000 | 2000 | 190 | 250 |
| 76 – 288 | 24 | 1,8 | 14,1 | 175 | 4000 | 2000 | 210 | 280 |
| 4 – 72 | 6 | 2,4 | 11,2 | 125 | 4000 | 2000 | 170 | 230 |
| 28 – 96 | 8 | 2,4 | 12,8 | 155 | 5000 | 2500 | 190 | 260 |
| 36 – 144 | 12 | 2,4 | 15,8 | 225 | 6000 | 3000 | 240 | 320 |
| 52 – 216 | 18 | 2,4 | 16,3 | 235 | 6000 | 3000 | 240 | 320 |
| 76 – 288 | 24 | 2,4 | 18,5 | 300 | 6000 | 3000 | 280 | 370 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



ZW-NOTKtsdDb

Analog acc. to VDE: A/I-DQ(ZN)BH U-DQ(ZN)BH

ZN-TF-11:2001; ZN-EK-103

Universal fibre optic cable with multiple optical fibres in a loose tube, reinforced, flame retardant

Description

ZW-NOTKtsdDb – indoor/outdoor (ZW), with a halogen free flame retardant sheath (N), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with glass yarn (Db)

CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8 or 12 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | glass yarns |
| Ripcord | 2 |
| Sheath | halogen free flame retardant, black |



35

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Can be installed in the proximity to electric installation</p> <p>Through the use of central dielectric strength member and glass yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses</p> <p>The outer sheath is made of halogen free flame retardant material</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> <p>* use of glass yarn protects cable from rodents</p> |
|------------------------|---|

| | | | |
|--------------------|---|---------------|--|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For making connection between optoelectronic devices in closed spaces For laying on the outer walls of buildings For laying in roads, railway tunnels or mine shafts for laying in primary and secondary cable ducts | | |
| Temperature ranges | Transport and storage: | -40°C – +70°C | |
| | Installation: | -15°C – +60°C | |
| | Operation: | -40°C – +70°C | |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/fillers | mm | mm | kg/km | N | | mm | |
| 4-72 | 6 | 1.8 | 9.5 | 100 | 2700 | 1350 | 140 | 190 |
| 28-96 | 8 | 1.8 | 10.7 | 125 | 3000 | 1500 | 160 | 210 |
| 36-144 | 12 | 1.8 | 12.9 | 175 | 4000 | 2000 | 190 | 260 |
| 4-72 | 6 | 2.4 | 11.2 | 135 | 4000 | 2000 | 170 | 230 |
| 28-96 | 8 | 2.4 | 12.8 | 170 | 5000 | 2500 | 190 | 260 |
| 36-144 | 12 | 2.4 | 15.8 | 240 | 6000 | 3000 | 240 | 320 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



ZW-NXOTKtsdD

Analog acc. to VDE: A/I-DQ2Y(ZN)H

ZN-TF-11:2001

Universal fibre optic cable with multiple optical fibres in a loose tube, reinforced, flame retardant

Description

ZW-NXOTKtsdD – indoor/outdoor (ZW), with an outer halogen free flame retardant sheath (N), inner polyethylene sheath (X), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced (D)

CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12 or 18 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Sheath | halogen free flame retardant, black |



Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Can be installed in the proximity to electric installation</p> <p>Through the use of central dielectric strength member and aramid yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses</p> <p>The outer sheath is made of halogen free flame retardant material</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> |
|------------------------|---|

| | | | |
|--------------------|--|---------------|--|
| Application | For making connection between optoelectronic devices in closed spaces For laying on the outer walls of buildings For laying in roads, railway tunnels or mine shafts For horizontal and vertical suspension | | |
| Temperature ranges | Transport and storage: | -40°C – +70°C | |
| | Installation: | -15°C – +60°C | |
| | Operation: | -40°C – +70°C | |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/fillers | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 9,6 | 90 | 2700 | 1350 | 140 | 190 |
| 28 – 96 | 8 | 1,8 | 10,8 | 110 | 3000 | 1500 | 160 | 220 |
| 36 – 144 | 12 | 1,8 | 13,1 | 160 | 4000 | 2000 | 200 | 260 |
| 52 – 216 | 18 | 1,8 | 13,5 | 160 | 4000 | 2000 | 200 | 270 |
| 76 – 288 | 24 | 1,8 | 15,2 | 200 | 4000 | 2000 | 230 | 300 |
| 4 – 72 | 6 | 2,4 | 12,3 | 145 | 4000 | 2000 | 180 | 250 |
| 28 – 96 | 8 | 2,4 | 13,9 | 180 | 5000 | 2500 | 210 | 280 |
| 36 – 144 | 12 | 2,4 | 16,9 | 255 | 6000 | 3000 | 250 | 340 |
| 52 – 216 | 18 | 2,4 | 17,4 | 265 | 6000 | 3000 | 260 | 350 |
| 76 – 288 | 24 | 2,4 | 19,6 | 350 | 6000 | 3000 | 290 | 390 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



ZW-NXOTKtsdDb

Analog acc. to VDE: A/I-DQ2Y(ZN)BH

ZN-TF-11:2001

Universal fibre optic cable with multiple optical fibres in a loose tube, reinforced, flame retardant

Description

ZW-NXOTKtsdDb – indoor/outdoor (ZW), with an outer halogen free flame retardant sheath (N), inner polyethylene sheath (X), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with glass yarn (Db)

CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8 or 12 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | glass yarns |
| Ripcord | 2 |
| Sheath | halogen free flame retardant, black |



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Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Can be installed in the proximity to electric installation</p> <p>Through the use of central dielectric strength member and glass yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses</p> <p>The outer sheath is made of halogen free flame retardant material</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> <p>* use of glass yarn protects cable from rodents</p> |
|------------------------|---|

| | | | |
|--------------------|---|---------------|--|
| Application | For making connection between optoelectronic devices in closed spaces For laying on the outer walls of buildings For laying in roads, railway tunnels or mine shafts For laying in primary and secondary cable ducts | | |
| Temperature ranges | Transport and storage: | -40°C – +70°C | |
| | Installation: | -15°C – +60°C | |
| | Operation: | -40°C – +70°C | |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/fillers | mm | mm | kg/km | N | | mm | |
| 4-72 | 6 | 1.8 | 9.6 | 95 | 2700 | 1350 | 140 | 190 |
| 28-96 | 8 | 1.8 | 10.8 | 120 | 3000 | 1500 | 160 | 220 |
| 36-144 | 12 | 1.8 | 13.1 | 170 | 4000 | 2000 | 200 | 260 |
| 4-72 | 6 | 2.4 | 12.9 | 165 | 4000 | 2000 | 195 | 260 |
| 28-96 | 8 | 2.4 | 14.5 | 200 | 5000 | 2500 | 220 | 290 |
| 36-144 | 12 | 2.4 | 17.5 | 275 | 6000 | 3000 | 265 | 350 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



ZW-(NV)OTKtsd

Analog acc. to VDE: A/I-DQ4YH U-DQ4YH

ZN-EK-103

Fibre optic cable with multiple optical fibres in a loose tube, anti-rodent

Description

ZW-(NV)OTKtsd – indoor/outdoor (ZW) with double layer sheath, outer, halogen free flame retardant, inner, polyamide, black (NV) optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d)



CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (In) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Ripcord | 2 |
| Sheath | two-layer sheath: halogen free flame retardant (outer layer) – polyamide (inner layer), black |

Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Can be installed in the proximity to electric installation Use of polyamide shell protects cables from rodents The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
|------------------------|---|

| | | | |
|--------------------|--|-------|-------|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For making connection between optoelectronic devices in closed spaces For laying on the outer walls of buildings For laying in roads, railway tunnels or mine shafts | | |
| Temperature ranges | Transport and storage: | -40°C | +70°C |
| | Installation: | -15°C | +60°C |
| | Operation: | -40°C | +70°C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|---------------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/ fillers | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 9,7 | 95 | 1000 | 500 | 150 | 190 |
| 28 – 96 | 8 | 1,8 | 10,9 | 115 | 1500 | 750 | 160 | 220 |
| 36 – 144 | 12 | 1,8 | 13,2 | 165 | 2200 | 1100 | 200 | 260 |
| 52 – 216 | 18 | 1,8 | 13,6 | 70 | 1000 | 500 | 200 | 270 |
| 76 – 288 | 24 | 1,8 | 15,3 | 210 | 2500 | 1250 | 230 | 310 |
| 4 – 72 | 6 | 2,4 | 11,6 | 125 | 2000 | 1000 | 170 | 230 |
| 28 – 96 | 8 | 2,4 | 13,2 | 160 | 2500 | 1250 | 200 | 260 |
| 36 – 144 | 12 | 2,4 | 16,2 | 230 | 2500 | 1250 | 240 | 320 |
| 52 – 216 | 18 | 2,4 | 16,7 | 240 | 2500 | 1250 | 250 | 330 |
| 76 – 288 | 24 | 2,4 | 18,9 | 305 | 2500 | 1250 | 280 | 380 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



ZW-(NV)OTKtsdD

Analog acc. to VDE: A/I-DQ(ZN)4YH U-DQ(ZN)4YH

ZN-EK-103

Fibre optic cable with multiple optical fibres in a loose tube, reinforced, anti-rodent

Description

ZW-(NV)OTKtsdD – outdoor/indoor (ZW), with double layer sheath, outer, halogen free flame retardant, inner, polyamide, black (NV) optical fibre cable (OTK), loose tube with dry core sealing (ts), dielectric (d), reinforced with aramide yarn (D)

OPTIONS – ZW-(NV)OTKtsdDb – reinforced with glass yarn (Db)

CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (In) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | central tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | aramid yarns (or glass yarns) |
| Ripcord | 2 |
| Sheath | two-layer sheath: halogen free flame retardant (outer layer) – polyamide (inner layer), black |



Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

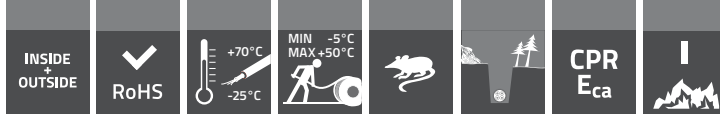
| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Can be installed in the proximity to electric installation</p> <p>Through the use of central dielectric strength member and aramid yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses</p> <p>Use of polyamide shell protects cables from rodents</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> |
| Application | <p>In telecommunication local, metropolitan and wide area networks in any spatial configuration</p> <p>For making connection between optoelectronic devices in closed spaces</p> <p>For laying on the outer walls of buildings</p> <p>For laying in roads, railway tunnels or mine shafts</p> <p>For horizontal and vertical suspension</p> |
| Temperature ranges | <p>Transport and storage: -40°C – +70°C</p> <p>Installation: -15°C – +60°C</p> <p>Operation: -40°C – +70°C</p> |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 10,2 | 100 | 2700 | 1350 | 150 | 200 |
| 28 – 96 | 8 | 1,8 | 11,4 | 125 | 3000 | 1500 | 170 | 230 |
| 36 – 144 | 12 | 1,8 | 13,7 | 175 | 4000 | 2000 | 210 | 270 |
| 52 – 216 | 18 | 1,8 | 14,1 | 180 | 4000 | 2000 | 210 | 280 |
| 76 – 288 | 24 | 1,8 | 15,8 | 220 | 4000 | 2000 | 240 | 320 |
| 4 – 72 | 6 | 2,4 | 12,2 | 140 | 4000 | 2000 | 180 | 240 |
| 28 – 96 | 8 | 2,4 | 13,8 | 175 | 5000 | 2500 | 210 | 280 |
| 36 – 144 | 12 | 2,4 | 16,8 | 250 | 6000 | 3000 | 250 | 340 |
| 52 – 216 | 18 | 2,4 | 17,3 | 260 | 6000 | 3000 | 260 | 340 |
| 76 – 288 | 24 | 2,4 | 19,5 | 325 | 6000 | 3000 | 290 | 390 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



A/I-DQ(ZN)BH central tube

DIN VDE 0888-3

Outdoor fibre optic cable with multiple optical fibres in a central tube, with LSOH jacket

Description

A/I-DQ(ZN)BH – indoor/outdoor (A/I), central tube filled with thixotropic gel (D), dry cable sealing (Q), dielectric reinforcement (ZN), anti-rodent layer made of glass yarns (B) with a halogen free flame retardant sheath (H)

CONSTRUCTION

| | |
|----------------|--|
| Optical fibres | E9/125 (G652D) singlemode or singlemode with non – zero dispersion shifted (G.655), G50 – gradient multimode (50/125m) or G62.5 – gradient multimode (62.5/125m) (G.651) |
| Tube | central tube filled with a thixotropic jelly |
| Cable sealing | dry |
| Reinforcement | glass yarns |
| Sheath | halogen free flame retardant, black |



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Reaction to fire

| | |
|---|---------------|
| Flame propagation | ICE 60332-1-2 |
| CPR - class reaction to fire (acc EN 50575) | Eca |

CHARACTERISTIC

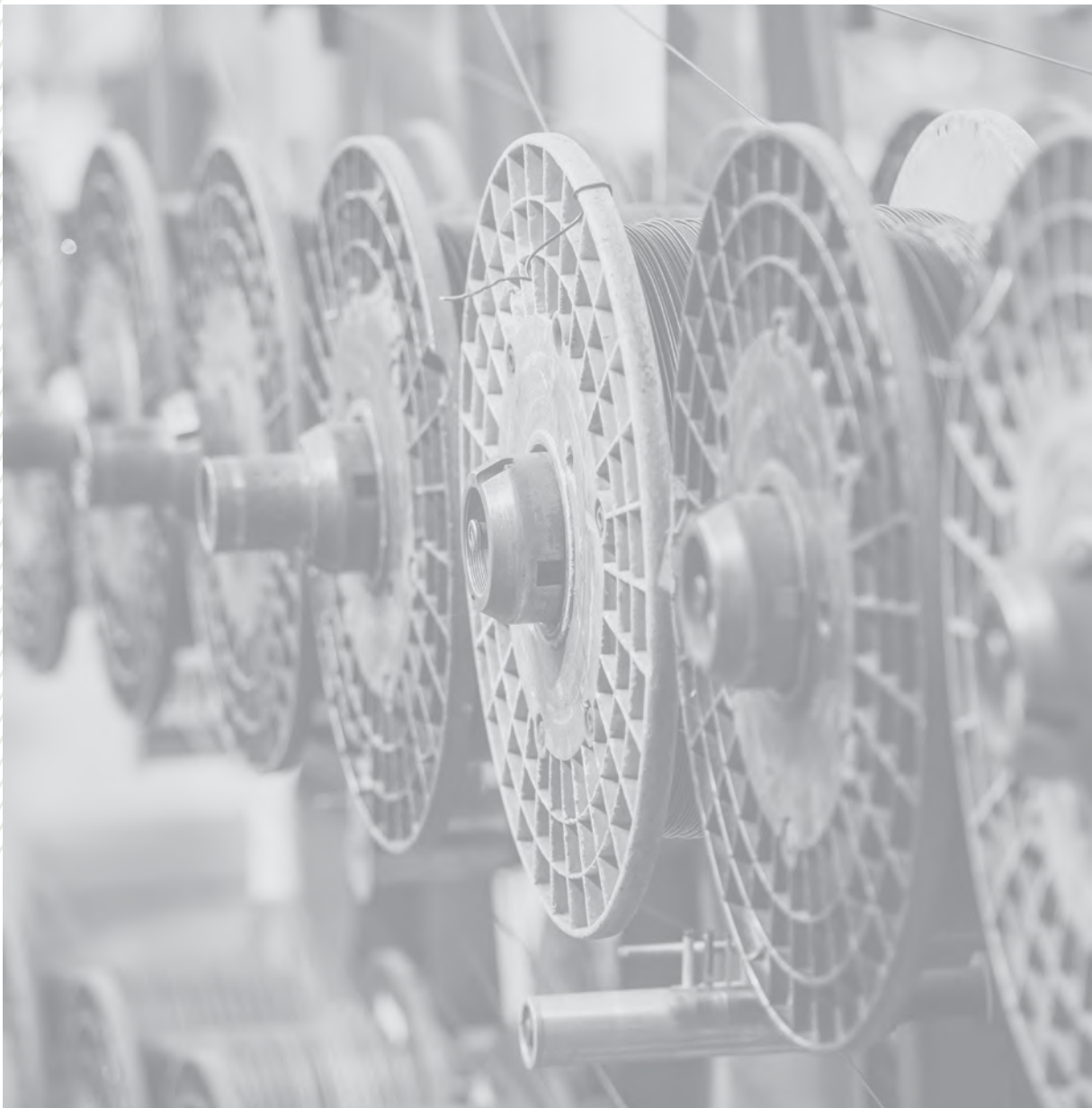
| | |
|------------------------|--|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Easy to install Use of glass yarn protects cable from rodents The outer sheath is made of halogen free flame retardant material The marking and the metric overprint are printed on the outer sheath. The marking can also be tailored to meet customer's requirements |
| Application | For quick connection between optoelectronic devices inside and outside buildings Suitable for use in cable ducts For laying in primary and secondary cable ducts |
| Temperature ranges | Transport and storage: -25 °C – +70 °C Installation: -5 °C – +50 °C Operation: -25 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|--------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 - 24 | 7.3 | 65 | 1000 | 500 | 120 | 160 |
| 2 - 24 | 7.8 | 70 | 1500 | 800 | 120 | 160 |
| 2 - 24 | 8.3 | 85 | 2000 | 1000 | 125 | 170 |
| 2 - 24 | 8.5 | 85 | 2500 | 1250 | 130 | 170 |
| 2 - 24 | 8.9 | 100 | 3000 | 1500 | 130 | 180 |

Packing length: to be agreed, standard – 2 km

Packing: wooden drums





Outdoor Cables

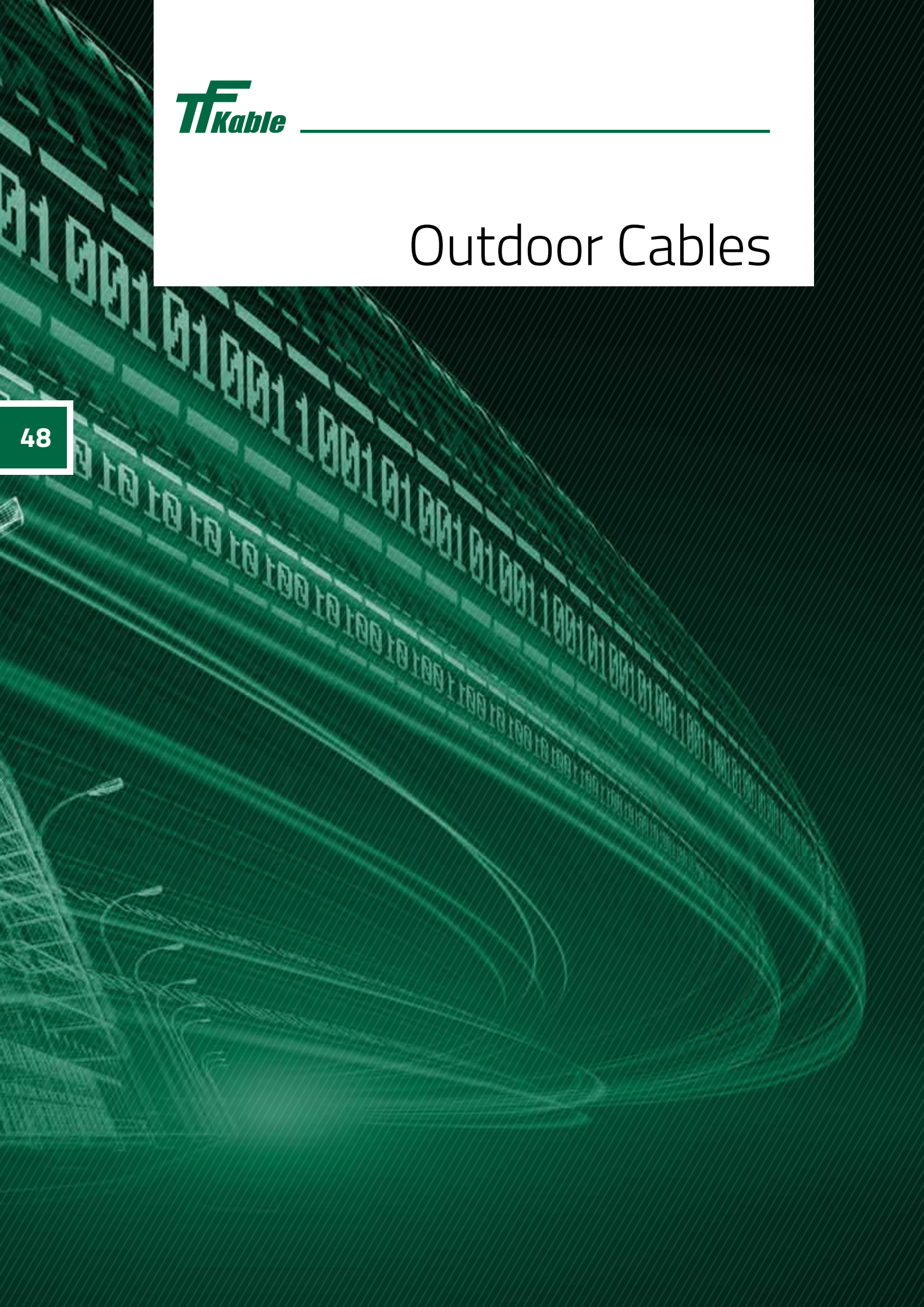


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Application

The outdoor cables are designed for the transmission of digital and analogue signals within the whole optical bandwidth. Used in all systems for voice and image transmission in local, metropolitan and wide area networks, in any spatial configuration. The cables are designed for installation in primary and secondary cable ducts. Fully dielectric cables can also be installed near low, medium and high voltage power lines.

Z-XOTKtsd

Analog acc. to VDE: A-DQ2Y

ZN-TF-11:2001; ZN-EK-103

Outdoor fibre optic cable with multiple optical fibres in a loose tube, duct

Description

Z-XOTKtsd – outdoor (Z), with a polyethylene sheath (X), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d)

OPTIONS –Z-XOTKtd – with core filled with hydrophobic jelly (t)

Z-XzOTKts – with moisture barrier made of aluminium tape under the sheath (Xz)



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CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18, 24 or 36 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Ripcord | 2 |
| Sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric (except for cables with al moisture barrier) Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
| Application | In telecommunication local, metropolitan and wide area networks in any spatial Configuration For laying in primary and secondary cable ducts Can be laid near high voltage cable lines |
| Temperature ranges | Transport and storage: -40 °C – +70 °C Installation: -15 °C – +60 °C Operation: -40 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 8 | 50 | 1000 | 500 | 120 | 160 |
| 28 – 96 | 8 | 1,8 | 9,2 | 70 | 1500 | 750 | 140 | 180 |
| 36 – 144 | 12 | 1,8 | 11,5 | 105 | 2200 | 1100 | 170 | 230 |
| 52 – 216 | 18 | 1,8 | 11,9 | 110 | 1000 | 500 | 180 | 240 |
| 76 – 288 | 24 | 1,8 | 13,6 | 140 | 2500 | 1250 | 200 | 270 |
| 2 - 72 | 6 | 2.1 | 9.8 | 75 | 1500 | 750 | 150 | 200 |
| 28 - 96 | 8 | 2.1 | 11.0 | 95 | 1500 | 750 | 165 | 220 |
| 36 - 144 | 12 | 2.1 | 13.6 | 145 | 1500 | 750 | 205 | 275 |
| 52 - 216 | 18 | 2.1 | 14.3 | 150 | 1500 | 750 | 215 | 290 |
| 76 - 288 | 24 | 2.1 | 16.1 | 195 | 1500 | 750 | 245 | 325 |
| 100 - 432 | 36 | 2.1 | 18.8 | 250 | 1500 | 750 | 285 | 380 |
| 4 – 72 | 6 | 2,4 | 11,2 | 100 | 2000 | 1000 | 170 | 230 |
| 28 – 96 | 8 | 2,4 | 12,8 | 125 | 2500 | 1250 | 190 | 260 |
| 36 – 144 | 12 | 2,4 | 15,8 | 190 | 2500 | 1250 | 240 | 320 |
| 52 – 216 | 18 | 2,4 | 16,3 | 200 | 2500 | 1250 | 240 | 320 |
| 76 – 288 | 24 | 2,4 | 18,5 | 255 | 2500 | 1250 | 280 | 370 |
| 100 - 432 | 36 | 2.4 | 21.4 | 325 | 2000 | 1000 | 320 | 430 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums

Z-XOTKtsdp

ZN-EK-108

Flat fibre optic cable with multiple optical fibres in a loose tube

Description

Z-XOTKtsdp – outdoor (Z) with a polyethylene sheath (X) optical fibre cable (OTK), loose tube (ts), dielectric (d), flat (p)



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CONSTRUCTION

| | |
|-----------------|--|
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Strength member | dielectric FRP rod with or without a PE cover, placed between two tubes or next to a single tube |
| Ripcord | 2 |
| Sheath | polyethylene, black or orange |

CHARACTERISTIC

| | |
|------------------------|--|
| Tube identification | 1-tube cables: any colour 2-tube cables: 1st tube red, 2nd tube natural |
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Easy installable Can be installed in the proximity to electric installation Can be installed in ducts The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
| Application | Telecommunications networks in each spatial configuration Broadband access networks Catv networks Local area network lan (academic, industrial, etc.) Temporary networks created for the purpose of transmission of sports events, culture, etc. Suitable to lay in primary and secondary ducts, especially with very limited space For temporary links, cables can be directly buried, laid on the ground or hung together With load-bearing ropes for spans up to 50 m. Cables are particularly useful for maintenance purposes and restoring damaged lines. |
| Temperature ranges | Transport and storage: -40°C – +70°C Installation: -15°C – +60°C Operation: -40°C – +70°C |
| Additional Information | The possibility to install the cables in partially filled secondary ducts using mechanical methods of pulling, stacking with small bending radii. Shorter cable joint preparation time through the use of ripcords. |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|---------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 4-12 | 5,5x8 | 45 | 1000 | 500 | 55/60 | 110/160 |
| 8-24 | 5,5x10,5 | 58 | 1000 | 500 | 55/60 | 110/210 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



Z-XOTKtsdD

Analog acc. to VDE: A-DQ(ZN)2Y

ZN-TF-11:2001; ZN-EK-103

Outdoor fibre optic cable with multiple optical fibres in a loose tube, duct, reinforced

Description

Z-XOTKtsdD – outdoor (Z), with a polyethylene sheath (X), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with aramid yarns (D)

OPTIONS - Z-XzOTKtD – with moisture barrier made of Aluminium tape under the sheath (Xz), and the core filled with hydrophobic jelly (t)



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CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric (except for cables with al moisture barrier) Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Through the use of central dielectric strength member and aramid yarns reinforcement On the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For laying in primary and secondary cable ducts. For installation on telegraph poles, low and medium voltage power lines or railway traction Can be laid near high voltage cable lines |
| Temperature ranges | Transport and storage: -40 °C – +70 °C Installation: -15 °C – +60 °C Operation: -40 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 8,5 | 60 | 2700 | 1350 | 130 | 170 |
| 28 – 96 | 8 | 1,8 | 9,7 | 75 | 3000 | 1500 | 150 | 190 |
| 36 – 144 | 12 | 1,8 | 12,0 | 115 | 4000 | 2000 | 180 | 240 |
| 52 – 216 | 18 | 1,8 | 12,4 | 115 | 4000 | 2000 | 190 | 250 |
| 76 – 288 | 24 | 1,8 | 14,1 | 150 | 4000 | 2000 | 210 | 280 |
| 4 – 72 | 6 | 2,4 | 11,2 | 100 | 4000 | 2000 | 170 | 230 |
| 28 – 96 | 8 | 2,4 | 12,8 | 125 | 5000 | 2500 | 190 | 260 |
| 36 – 144 | 12 | 2,4 | 15,8 | 190 | 6000 | 3000 | 240 | 320 |
| 52 – 216 | 18 | 2,4 | 16,3 | 200 | 6000 | 3000 | 240 | 320 |
| 76 – 288 | 24 | 2,4 | 18,5 | 255 | 6000 | 3000 | 280 | 370 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums

Z-XOTKtsdDb

Analog acc. to VDE: A-DQ(ZN)B2Y

ZN-TF-11:2001; ZN-EK-103

Outdoor fibre optic cable with multiple optical fibres in a loose tube, duct, reinforced

Description

Z-XOTKtsdDb – outdoor (Z), with a polyethylene sheath (X), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with glass yarns (Db)

OPTIONS - Z-XzOTKtsdDb – with moisture barrier made of Aluminium tape under the sheath (Xz),

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CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8 or 12 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | glass yarns |
| Ripcord | 2 |
| Sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric (except for cables with al moisture barrier) Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Through the use of central dielectric strength member and glass yarns reinforcement On the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements * use of glass yarn protects cable from rodents |
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For laying in primary and secondary cable ducts. Can be laid near high voltage cable lines |
| Temperature ranges | Transport and storage: -40 °C – +70 °C Installation: -15 °C – +60 °C Operation: -40 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4-72 | 6 | 1.8 | 9.5 | 75 | 2700 | 1350 | 140 | 190 |
| 28-96 | 8 | 1.8 | 10.7 | 100 | 3000 | 1500 | 160 | 210 |
| 36-144 | 12 | 1.8 | 12.9 | 140 | 4000 | 2000 | 190 | 260 |
| 4-72 | 6 | 2.4 | 11.2 | 110 | 4000 | 2000 | 170 | 230 |
| 28-96 | 8 | 2.4 | 12.8 | 130 | 5000 | 2500 | 190 | 260 |
| 36-144 | 12 | 2.4 | 15.8 | 200 | 6000 | 3000 | 240 | 320 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



Z-XOTKtmsd

Analog acc. to VDE: A-DQ2Y micro

IEC 60794-1

Outdoor fibre optic cable with multiple optical fibres in a micro-tube, duct

Description

Z-XOTKtmsd – outdoor (Z), with a polyethylene sheath (X), optical fibre cable (OTK), loose (micro) tube with dry core sealing (tms), fully dielectric (d)
OPTIONS Z-XOTKtmsdD – reinforced with aramid yarns (D)

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CONSTRUCTION

| | |
|-------------------------|---|
| Central strength member | dielectric FRP rod |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) single mode with improved macrobending performance (Ja, Jb) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube Ø 1,5 mm filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Water protection | water swellable yarns |
| Ripcord | 1 |
| Outer sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Small outer diameter Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath. The marking can also be tailored to meet customer's requirements |
| Application | Small outer diameter In telecommunication local, metropolitan and wide area networks in any spatial configuration Cable for fth systems for laying in micro-ducts Suitable for blowing up to 2,000m |
| Temperature ranges | Transport and storage: -40 °C – +70 °C Installation: -15 °C – +60 °C Operation: -30 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Cable weight | Cable diameter | Max. pulling force | | Min. bending radius | |
|----------------------|--------------|----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | kg/km | mm | N | | mm | |
| 4 – 72 | 27 | 5.7 | 700 | 220 | 90 | 115 |
| 74 – 96 | 40 | 6.6 | 1200 | 250 | 100 | 130 |
| 98 – 144 | 55 | 8.0 | 1500 | 300 | 120 | 160 |
| 146 – 216 | 70 | 9.0 | 700 | 220 | 135 | 180 |
| 218 – 288 | 90 | 10.5 | 1200 | 250 | 160 | 210 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



Z-XXOTKtsdD

Analog acc. to VDE: A-DQ2Y(ZN)2Y

ZN-TF-11:2001; ZN-EK-103

Outdoor fibre optic cable with multiple optical fibres in a loose tube, duct, reinforced

Description

Z-XXOTKtsdD – outdoor (Z), with outer and inner polyethylene sheath (XX), optical fibre cable (OTK), loose tube with dry core sealing (ts), dielectric (d), reinforced with aramid yarns (D)

OPTIONS –Z-XXOTKtdD – with core filled with hydrophobic jelly (t)



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CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Through the use of central dielectric strength member and aramid yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements</p> |
|------------------------|---|

| | | | |
|---------------------------|--|-----------------|--|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For laying in primary and secondary cable ducts. For installation on telegraph poles, low and medium voltage power lines or railway traction Can be laid near high voltage cable lines | | |
| Temperature ranges | Transport and storage: | -40 °C – +70 °C | |
| | Installation: | -15 °C – +60 °C | |
| | Operation: | -40 °C – +70 °C | |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 9,6 | 70 | 2700 | 1350 | 140 | 190 |
| 28 – 96 | 8 | 1,8 | 10,8 | 90 | 3000 | 1500 | 160 | 220 |
| 36 – 144 | 12 | 1,8 | 13,1 | 135 | 4000 | 2000 | 200 | 260 |
| 52 – 216 | 18 | 1,8 | 13,5 | 135 | 4000 | 2000 | 200 | 270 |
| 76 – 288 | 24 | 1,8 | 15,2 | 175 | 4000 | 2000 | 230 | 300 |
| 4 – 72 | 6 | 2,4 | 12,3 | 115 | 4000 | 2000 | 180 | 250 |
| 28 – 96 | 8 | 2,4 | 13,9 | 145 | 5000 | 2500 | 210 | 280 |
| 36 – 144 | 12 | 2,4 | 16,9 | 215 | 6000 | 3000 | 250 | 340 |
| 52 – 216 | 18 | 2,4 | 17,4 | 225 | 6000 | 3000 | 260 | 350 |
| 76 – 288 | 24 | 2,4 | 19,6 | 290 | 6000 | 3000 | 290 | 390 |

Packing length: do uzgodnienia, standardowo 4 km

Packing: wooden drums

Z-(XV)OTKtsd

Analog acc. to VDE: A-DQ4Y2Y

ZN-EK-103

Outdoor fibre optic cable with multiple optical fibres in a loose tube, duct, anti-rodent

Description

Z-(XV)OTKtsd – outdoor (Z), with a two-layer sheath: polyethylene (outer)-polyamide (inner) (XV), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d)

OPTIONS – Z-(VX)OTKtsd – with a two-layer sheath: polyamide (outer)-polyethylene (inner) (VX)

Z-(XV)OTKtd, Z-(VX)OTKtd – with core filled with hydrophobic jelly (t)



CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Ripcord | 2 |
| Sheath dwuwarstwowa | black: polyethylene (outer)-polyamide (inner layer) orange: polyamide (outer layer)-polyethylene (inner layer) |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Use of polyamide sheath protects cables from rodents Polyethylene sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
|------------------------|--|

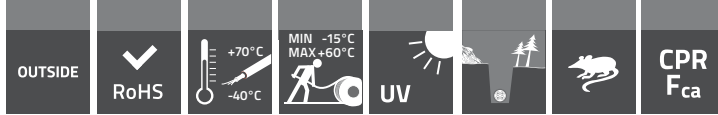
| | | | |
|--------------------|--|-------|-------|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For laying in primary and secondary cable ducts Can be laid near high voltage cable lines | | |
| Temperature ranges | Transport and storage: | -40°C | +70°C |
| | Installation: | -15°C | +60°C |
| | Operation: | -40°C | +70°C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 9,7 | 75 | 1000 | 500 | 150 | 190 |
| 28 – 96 | 8 | 1,8 | 10,9 | 95 | 1500 | 750 | 160 | 220 |
| 36 – 144 | 12 | 1,8 | 13,2 | 140 | 2200 | 1100 | 200 | 260 |
| 52 – 216 | 18 | 1,8 | 13,6 | 140 | 1000 | 500 | 200 | 270 |
| 76 – 288 | 24 | 1,8 | 15,3 | 180 | 2500 | 1250 | 230 | 310 |
| 4 – 72 | 6 | 2,4 | 11,6 | 105 | 2000 | 1000 | 170 | 230 |
| 28 – 96 | 8 | 2,4 | 13,2 | 135 | 2500 | 1250 | 200 | 260 |
| 36 – 144 | 12 | 2,4 | 16,2 | 200 | 2500 | 1250 | 240 | 320 |
| 52 – 216 | 18 | 2,4 | 16,7 | 210 | 2500 | 1250 | 250 | 330 |
| 76 – 288 | 24 | 2,4 | 18,9 | 270 | 2500 | 1250 | 280 | 380 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



Z-(XV)OTKtsdD

Analog acc. to VDE: A-DQ(ZN)4Y2Y

ZN-EK-103

Outdoor fibre optic cable with multiple optical fibres in a loose tube, duct, anti-rodent

Description

Z-(XV)OTKtsdD – outdoor (Z), with a two-layer sheath: polyethylene (outer)-polyamide (inner) (XV), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with aramid yarns (D)

OPTIONS – Z-(VX)OTKtsdD – with a two-layer sheath: polyamide (outer)-polyethylene (inner) (VX)

Z-(XV)OTKtdD – filled with hydrophobic jelly (t)



CONSTRUCTION

| | |
|-------------------------|---|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Sheath | black two layers polyethylene (outer)-polyamide (inner) sheath or orange two layers polyamide (outer)-polyethylene (inner) sheath |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Use of polyamide sheath protects cables from rodents Polyethylene sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
|------------------------|--|

| | | | |
|---------------------------|---|-------|-------|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For laying in primary and secondary cable ducts For installation on telegraph poles, low and medium voltage power lines or railway traction Can be laid near high voltage cable lines | | |
| Temperature ranges | Transport and storage: | -40°C | +70°C |
| | Installation: | -15°C | +60°C |
| | Operation: | -40°C | +70°C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 10,2 | 85 | 2700 | 1350 | 150 | 200 |
| 28 – 96 | 8 | 1,8 | 11,4 | 105 | 3000 | 1500 | 170 | 230 |
| 36 – 144 | 12 | 1,8 | 13,7 | 150 | 4000 | 2000 | 210 | 270 |
| 52 – 216 | 18 | 1,8 | 14,1 | 150 | 4000 | 2000 | 210 | 280 |
| 76 – 288 | 24 | 1,8 | 15,8 | 190 | 4000 | 2000 | 240 | 320 |
| 4 – 72 | 6 | 2,4 | 12,2 | 115 | 4000 | 2000 | 180 | 240 |
| 28 – 96 | 8 | 2,4 | 13,8 | 145 | 5000 | 2500 | 210 | 280 |
| 36 – 144 | 12 | 2,4 | 16,8 | 215 | 6000 | 3000 | 250 | 340 |
| 52 – 216 | 18 | 2,4 | 17,3 | 225 | 6000 | 3000 | 260 | 340 |
| 76 – 288 | 24 | 2,4 | 19,5 | 290 | 6000 | 3000 | 290 | 390 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums

A-DQ(ZN)B2Y

DIN VDE 0888-3

Outdoor fibre optic cable with multiple optical fibres in a central tube

Description

A-DQ(ZN)B2Y – outdoor (A), central tube filled with thixotropic gel (D), dry cable sealing (Q), dielectric reinforcement (ZN), anti-rodent layer made of glass yarns (B) with a polyethylene sheath (2Y)

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CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | singlemode E9/125 (G.652D) or singlemode with non zero dispersion shifted (G.655) gradient multimode 50/125 (G50) or 62.5/125 (G62.5) |
| Tube | central loose tube filled with a thixotropic jelly |
| Cable sealing | dry |
| Reinforcement | glass yarn |
| Sheath | polyethylene, black |



CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Easy to install Use of glass yarn protects cable from rodents The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath. The marking can also be tailored to meet customer's requirements |
| Application | For quick connection between optoelectronic devices inside and outside buildings Suitable for use in cable ducts For laying in primary and secondary cable ducts |
| Temperature ranges | Transport and storage: -25 °C – +70 °C Installation: -5 °C – +50 °C Operation: -25 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Cable diameter | Masa kabla | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|--------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 - 24 | 7.3 | 50 | 1000 | 500 | 120 | 160 |
| 2 - 24 | 7.8 | 55 | 1500 | 800 | 120 | 160 |
| 2 - 24 | 8.3 | 65 | 2000 | 1000 | 125 | 170 |
| 2 - 24 | 8.5 | 70 | 2500 | 1250 | 130 | 170 |
| 2 - 24 | 8.9 | 75 | 3000 | 1500 | 130 | 180 |

Packing length: to be agreed, standard – 2 km

Packing: wooden drums



ADSS-XOTKMgd

IEC 60794

Outdoor fibre optic cable with multiple optical fibres in a loose tube, reinforced, selfsupported.

Description

ADSS-XOTKMgd – All Dielectric Self Supporting (ADSS), polyethylene outer sheath (X), fibre optic cable (OTK), micromodule gelled tubes (Mg), fully dielectric (d).

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CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | Singlemode (ITU-T G.657A2) |
| Tube | Flexible, easy peel compound filled with thixotropic gel. |
| Reinforcement | Dielectric rods in the outer jacket |
| Outer sheath | Polyethylene |



CHARACTERISTIC

| | | | | | | | |
|------------------------|---|------------------------|-----------------|---------------|----------------|------------|-----------------|
| Performance parameters | <p>Fully dielectric and resistant to electromagnetic interferences.</p> <p>FEATURES</p> <ul style="list-style-type: none"> Light and durable Easy strippable secondary coating Easy access to cable modules UV resistant | | | | | | |
| Application | <p>Cables are designated for transmission of digital and analogue signals within the whole optical bandwidth used in the local, metropolitan and wide area networks.</p> <ul style="list-style-type: none"> - external access networks - modern FTTH & cctv - subscriber connections | | | | | | |
| Temperature ranges | <table border="0"> <tr> <td>Transport and storage:</td> <td>-40 °C – +70 °C</td> </tr> <tr> <td>Installation:</td> <td>-10°C – +40 °C</td> </tr> <tr> <td>Operation:</td> <td>-30 °C – +60 °C</td> </tr> </table> | Transport and storage: | -40 °C – +70 °C | Installation: | -10°C – +40 °C | Operation: | -30 °C – +60 °C |
| Transport and storage: | -40 °C – +70 °C | | | | | | |
| Installation: | -10°C – +40 °C | | | | | | |
| Operation: | -30 °C – +60 °C | | | | | | |

PARAMETERS:

| Fibre count in cable | Number of elements | Outer diameter of module | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|--------------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | tubes/fillers | mm | mm | kg/km | N | | mm | |
| up to 12 | 1 | 1.4 | 7.0± 0.3 | 35 | 1000 | 500 | 105 | 140 |
| up to 24 | 2 | 1.4 | 7.0± 0.3 | 35 | 1000 | 500 | 105 | 140 |
| up to 36 | 3 | 1.4 | 7.0± 0.3 | 35 | 1000 | 500 | 105 | 140 |
| up to 48 | 4 | 1.4 | 7.0± 0.3 | 35 | 1000 | 500 | 105 | 140 |
| up to 60 | 5 | 1.4 | 8.5 ± 0.3 | 45 | 1000 | 500 | 130 | 170 |
| up to 72 | 6 | 1.4 | 8.5 ± 0.3 | 45 | 1000 | 500 | 130 | 170 |
| up to 84 | 7 | 1.4 | 8.5 ± 0.3 | 45 | 1000 | 500 | 130 | 170 |
| up to 96 | 8 | 1.4 | 8.5 ± 0.3 | 45 | 1000 | 500 | 130 | 170 |

Packing length: to be agreed, standard – 4200+/- 100m km

Packing: wooden drums

ADSS-XOTKtsdD

Analog acc. to VDE: ADSS-DQ(ZN)2Y

IEC 60794

Outdoor fibre optic cable with multiple optical fibres in a loose tube, reinforced, selfsupported.

Description

ADSS-XOTKtsdD – All Dielectric Self Supporting (ADSS), polyethylene outer sheath (X), fibre optic cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with aramid yarns (D).

OPTIONS: It is possible to work out ADSS according to customer requirements with various mechanical properties ie: Max. working tension up to 14kN
Number of optical fibres up to 288 Span distance up to 200m

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CONSTRUCTION

| | |
|-------------------------|---|
| Central strength member | Dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (G652.D, A1, A2) singlemode with non-zero dispersion (G655) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | Loose tube filled with thixotropic jelly |
| Filler | Polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | Dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Outer sheath | Polyethylene |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric and resistant to electromagnetic interferences. Secured from longitudinal water penetration. Resistant to abrasion, UV and stress corrosion. |
| Application | Cable is designated for a long distance transmission of digital and analogue signals within the whole optical bandwidth used in wide and local telecom networks of any spatial configuration. Suitable for aerial installations. |
| Temperature ranges | Transport and storage: -40 °C – +70 °C Installation: -15 °C – +60 °C Operation: -40 °C – +70 °C |

PARAMETERS:

| No. of fibres in a cable | Outer diameter of tube [mm] | No. of elements in a cable (tubes/filers) | Cable dimensions | | Mechanical properties | | | | | |
|-----------------------------------|--------------------------------|---|------------------|--------------|-----------------------|----------------------|------------------------|--------------|-------------------------------|---------------------------|
| | | | Outer diameter | Cable weight | Rated working tension | Max. working tension | Rated tensile strength | Young module | Thermal expansion coefficient | Recommended span distance |
| | | | [mm] | [kg/km] | [kN] | [kN] | [kN] | [GPa] | [1/°C] | [m] |
| ADSS-XOTKtsdD 2.1mm tube diameter | | | | | | | | | | |
| 2 - 72 | 2.1 | 6 | 10.3 ± 0.2 | 80 | 2.5 | 5.0 | 17.0 | 13.1 | 5.8 x 10 ⁻⁶ | 60 |
| 28 - 96 | 2.1 | 8 | 11.5 ± 0.2 | 105 | 2.5 | 5.0 | 15.0 | 9.6 | 8.8 x 10 ⁻⁶ | 60 |
| 36 - 144 | 2.1 | 12 | 14.1 ± 0.2 | 150 | 2.5 | 5.0 | 12.0 | 5.2 | 17.6 x 10 ⁻⁶ | 60 |
| 52 - 216 | 2.1 | 18 (6+12) | 14.8 ± 0.2 | 155 | 2.5 | 5.0 | 17.0 | 6.7 | 11 x 10 ⁻⁶ | 60 |
| 76 - 288 | 2.1 | 24 (9+15) | 16.6 ± 0.2 | 200 | 2.5 | 5.0 | 17.0 | 6.0 | 12.1 x 10 ⁻⁶ | 60 |

Packing length: to be agreed, standard – 4200+/- 100m km

Packing: wooden drums

ADSS-XXOTKtsdD

Analog acc. to VDE: ADSS-DQ2Y(ZN)2Y

ZN-TF-14:2001

Outdoor fibre optic cable with multiple optical fibres in a loose tube, reinforced, selfsupported

Description

ADSS-XXOTKtsdD...kN – all dielectric self supported (ADSS-), with outer and inner polyethylene sheath (XX), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with aramid yarns (D), working tension (... kN))

OPTIONS - ADSS cables with up to 144 fibres, tube sizes 2.1, 2.4 and 2.8mm depending on fibre count



CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (In) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Water protection | dry |
| Inner sheath | polyethylene |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Outer sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | <p>Fully dielectric</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Through the use of central dielectric strength member and aramid yarns reinforcement on the core with hot melt adhesive, cables are resistant to longitudinal and transverse stresses</p> <p>The outer sheath is resistant to abrasion, uv and stress corrosion cracking</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> |
|------------------------|---|

| | | |
|--------------------|---|-----------------|
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For installation on telegraph poles, low and medium voltage power lines or railway traction Can be installed near high voltage cable lines | |
| Temperature ranges | transport and storage: | -40 °C – +70 °C |
| | Installation: | -10 °C – +50 °C |
| | Operation: | -40 °C – +70 °C |

PARAMETERS:

| Fibre count in the cable | Rated Tensile strength (RTS) | Max. working tension | Calculated work force | Cable diameter | Cable weight | Cable cross-section | Aramid yarn cross-section | Central strength member cross-section | Cable Young's Modulus | Coefficient of thermal expansion | Recommended span distance |
|---------------------------------|------------------------------|----------------------|-----------------------|----------------|--------------|---------------------|---------------------------|---------------------------------------|-----------------------|----------------------------------|---------------------------|
| n | kN | kN | kN | mm | kg/km | mm ² | mm ² | mm ² | GPa | 1/K*10 ⁻⁶ | m |
| ADSS-XXOTKtsdD with 2.1mm tubes | | | | | | | | | | | |
| 4-24 | 19 | 8 | 3,5 | 12,8 | 125 | 128 | 12,5 | 4,15 | 12,5 | 5,8 | 120 |
| | 32 | 14 | 8 | 13,2 | 145 | 136 | 21 | 4,15 | 18,6 | 2,9 | 200 |
| | 48 | 20 | 14 | 14,3 | 160 | 160 | 28 | 4,15 | 20,6 | 2,3 | 350 |
| | 75 | 27 | 21 | 15,5 | 190 | 186 | 48 | 4,15 | 29,6 | 0,8 | 500 |
| ADSS-XXOTKtsdD with 2.4mm tubes | | | | | | | | | | | |
| 4-48 | 19 | 8 | 3,5 | 13,6 | 145 | 145 | 12,5 | 4,9 | 11,3 | 6,1 | 120 |
| | 32 | 14 | 8 | 14,2 | 155 | 158 | 21 | 4,9 | 16,3 | 3,3 | 200 |
| | 48 | 20 | 14 | 14,9 | 175 | 174 | 28 | 4,9 | 19,2 | 2,5 | 350 |
| | 75 | 27 | 21 | 16,0 | 200 | 201 | 50 | 4,9 | 28,7 | 0,97 | 500 |
| ADSS-XXOTKtsdD with 2.8mm tubes | | | | | | | | | | | |
| 48-72 | 19 | 8 | 3,5 | 14,8 | 166 | 172 | 14,8 | 7,06 | 11,6 | 5,7 | 120 |
| | 32 | 14 | 8 | 15,4 | 178 | 186 | 21,8 | 7,06 | 14,9 | 3,7 | 200 |
| | 48 | 20 | 14 | 15,9 | 190 | 198 | 28 | 7,06 | 17,4 | 2,7 | 350 |
| | 75 | 27 | 21 | 17,0 | 219 | 227 | 51,5 | 7,06 | 26,6 | 0,98 | 500 |
| 74-96 | 19 | 8 | 3,5 | 16,3 | 200 | 208 | 12,0 | 4,91 | 9,1 | 9,2 | 120 |
| | 32 | 14 | 8 | 16,6 | 210 | 216 | 16,8 | 4,91 | 11,6 | 6,5 | 200 |
| | 48 | 20 | 14 | 17,2 | 225 | 235 | 25,2 | 4,91 | 15,8 | 4,2 | 350 |
| 98-144 | 19 | 8 | 3,5 | 19,7 | 290 | 305 | 12,0 | 4,91 | 6,6 | 13,6 | 120 |
| | 32 | 14 | 8 | 20,0 | 300 | 314 | 16,8 | 4,91 | 8,4 | 10,0 | 200 |
| | 48 | 20 | 14 | 20,6 | 315 | 334 | 25,2 | 4,91 | 11,6 | 6,6 | 350 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums

ADSS-XXOTKtsdDabt

IEC 60794

Outdoor fibre optic cable with multiple optical fibers in a loose tube, reinforced, self supporting, anti-ballistic.

Description

ADSS-XXOTKtsdDabt – All Dielectric Self Supporting (ADSS), with outer and inner polyethylene sheath (XX), fibre optic cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d), reinforced with aramid yarns (D), anti-ballistic (abt)

OPTIONS - It is possible to work out ADSS according to customer requirements with various mechanical properties i.e.: Max. working tension up to 27kN
Number of optical fibres up to 144



74

CONSTRUCTION

| | |
|------------------------------|--|
| Central strength member | Dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | Loose tube filled with thixotropic jelly |
| Filler | Polyethylene |
| Cable core | 6, 8, 12 tubes or tubes and fillers stranded around central strength member |
| Water protection | dry |
| Reinforcement | Aramid yarns |
| Ripcord | 2 |
| Inner sheath | Polyethylene |
| Anti-ballistic reinforcement | Aramid tape |
| Ripcord | 2 |
| Outer sheath | Polyethylene |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric and resistant to electromagnetic interferences. Secured from longitudinal water penetration. Resistant to abrasion, UV and stress corrosion. Resistance to damage caused by shotguns or other firearms (anti-ballistic). |
| Application | Cable is designated for a long distance transmission of digital and analogue signals within the whole optical bandwidth used in wide and local telecom networks of any spatial configuration. Suitable for aerial installations. Tightly woven tape ensures adequate ballistic protection of the optical core. |

| | | |
|--------------------|------------------------|-----------------|
| Temperature ranges | transport and storage: | -40 °C – +70 °C |
| | Installation: | -15 °C – +60 °C |
| | Operation: | -40 °C – +70 °C |

PARAMETERS:

| No. of fibres in a cable | Outer diameter of tube | No. of elements in a cable (tubes/fibers) | Cable dimensions | | Mechanical properties | | | | |
|--------------------------|------------------------|---|------------------|--------------|-----------------------|-----------------------|------------------------|--------------|-------------------------------|
| | | | Outer diameter | Cable weight | Rated working tension | Max. working tension | Rated tensile strength | Young module | Thermal expansion coefficient |
| | | | [mm] | [kg/km] | [kN] | [kN] | [kN] | [GPa] | [1/°C] |
| Up to 72 | 2.1 | 6 | 15.0 | 170 | 4.5 | 9 (0.2% fiber strain) | 30 | 11.1 | 6.5 x 10 ⁻⁶ |
| Up to 96 | 2.1 | 8 | 15.8 | 195 | 4.5 | 9 (0.2% fiber strain) | 24 | 7.4 | 8.1 x 10 ⁻⁶ |
| Up to 144 | 2.1 | 12 | 18.4 | 255 | 4.5 | 9 (0.2% fiber strain) | 24 | 5.6 | 11.1 x 10 ⁻⁶ |

SPECIAL FEATURES

| | | |
|--|-----------------|----------------------|
| Resistance to damage from hunting pellet | IEC 60794-1-E13 | pellet size 10,8,6,4 |
|--|-----------------|----------------------|

Packing length: to be agreed, standard – 2100+/- 100m km

Packing: wooden drums

S-XOTKtsd

ZN-TF-016

Outdoor fibre optic cable with multiple optical fibres in a loose tube, selfsupporting, 8-type

Description

S-XOTKtsd – self-supporting, eight shape cable (S), with a polyethylene sheath (X), optical fibre cable (OTK), loose tube with dry core sealing (ts), fully dielectric (d)

OPTIONS - S-XOTKts – cable messenger: steel rope

S-XOTKtsD – reinforced with aramid yarns (D)



CONSTRUCTION

| | |
|----------------|--|
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Cable sealing | dry |
| Sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath The marking can also be tailored to meet customer's requirements |
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For hanging on telegraph poles Cables with dielectric strength members are suitable for hanging on poles of low and medium voltage power lines or railway traction |
| Temperature ranges | transport and storage: -40 °C – +70 °C Installation: -15 °C – +55 °C Operation: -40 °C – +70 °C |

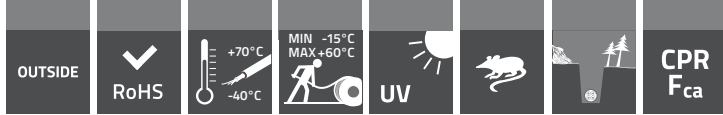
PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-----------------------|------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 2,4 | 10,6 x 18,6 | 120 | 3200 | 1600 | 220 | 320 |
| 28 – 96 | 8 | 2,4 | 12,2 x 20,2 | 150 | 3200 | 1600 | 250 | 370 |
| 36 – 144 | 12 | 2,4 | 15,2 x 23,2 | 210 | 3200 | 1600 | 310 | 460 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums





ZKS-XXOTKtsFf

Analog acc. to VDE: A-DQ2Y(SR)2Y

ZN-TF-13:2001

Outdoor fibre optic cable with multiple optical fibres in a loose tube, armoured with corrugated steel tape, for sewage ducts

Description

ZKS-XXOTKtsFf – outdoor cable for sewage systems (ZKS), with polyethylene outer sheath (X) and polyethylene inner sheath (X), fibre optic cable (OTK), loose tube with dry core sealing (ts), armoured with corrugated steel tape (Ff)

OPTIONS -ZKS-XXOTKtsDff – reinforced with aramid yarn (D) (or with glass yarns (Db))

ZKS-XXOTKtFf – with core filled with hydrophobic jelly (t)

ZKS-(VX)XOTKtsFf – with two layered sheath, outer polyamide, inner polyethylene (VX)



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CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Inner sheath | polyethylene |
| Armouring | corrugated steel tape |
| Ripcord | 2 |
| Outer sheath | polyethylene, black |

CHARACTERISTIC

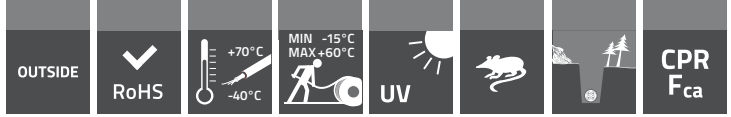
| | |
|-------------------------------|---|
| Performance parameters | Fully dielectric core Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Through the use of corrugated steel tapes, armoured cables are resistant to transverse and longitudinal stresses and rodent attack The outer sheath is resistant to abrasion, uv and stress corrosion cracking The marking and the metric overprint are printed on the outer sheath. The marking can also be tailored to meet customer's requirements |
| Application | In telecommunication local, metropolitan and wide area networks in any spatial configuration For laying in sewage ducts For burying directly in the ground in areas with higher risk of mechanical damage For installation in primary cable ducts |
| Temperature ranges | Transport and storage: -40°C – +70°C Installation: -15°C – +60°C Operation: -40°C – +70°C |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 1,8 | 12,3 | 140 | 1000 | 500 | 180 | 250 |
| 28 – 96 | 8 | 1,8 | 13,5 | 175 | 1500 | 750 | 200 | 270 |
| 36 – 144 | 12 | 1,8 | 15,8 | 230 | 2200 | 1100 | 240 | 320 |
| 52 – 216 | 18 | 1,8 | 16,2 | 230 | 1000 | 500 | 240 | 320 |
| 76 – 288 | 24 | 1,8 | 17,9 | 280 | 2500 | 1250 | 270 | 360 |
| 4 – 72 | 6 | 2,4 | 14,2 | 185 | 2700 | 1350 | 210 | 280 |
| 28 – 96 | 8 | 2,4 | 15,8 | 230 | 2700 | 1350 | 240 | 320 |
| 36 – 144 | 12 | 2,4 | 18,8 | 305 | 2700 | 1350 | 280 | 380 |
| 52 – 216 | 18 | 2,4 | 19,3 | 315 | 2700 | 1350 | 290 | 390 |
| 76 – 288 | 24 | 2,4 | 21,5 | 385 | 2700 | 1350 | 320 | 430 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



ZKS-XXOTKtsFo

Analog acc. to VDE: A-DQ2Y(SWA)2Y

ZN-TF-13:2001

Outdoor fibre optic cable with multiple optical fibres in a loose tube, armoured with steel wires, for sewage ducts, ground or under river installations

Description

ZKS-XXOTKtsFo – outdoor cable for sewage systems (ZKS), with polyethylene outer sheath (X) and polyethylene inner sheath (X), optical fibre cable (OTK), central tube (ts), armoured with round steel wires (Fo)

OPTIONS - ZKS-XXOTKtsDFo – reinforced with aramid yarns (D) (or with glass yarns (Db))

ZKS-XXOTKtFo – with core filled with hydrophobic jelly (t)

ZKS-XXzOTKtsFo – with an aluminium moisture barrier under the inner sheath (Xz)



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CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Inner sheath | polyethylene |
| Bedding | PVC tape |
| Armouring | round steel wires |
| Ripcord | 2 |
| Outer sheath | polyethylene, black |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | <p>Fully dielectric core</p> <p>Resistant to electromagnetic interferences</p> <p>Protected from moisture and longitudinal water penetration</p> <p>Through the use of a central dielectric strength member, aramid yarn reinforcement on the core with hot melt adhesive; steel wire armoured cables are extremely resistant to longitudinal and transverse stresses and rodent attack</p> <p>The outer sheath is resistant to abrasion, uv and stress corrosion cracking</p> <p>The marking and the metric overprint are printed on the outer sheath</p> <p>The marking can also be tailored to meet customer's requirements</p> |
| Application | <p>In telecommunication local, metropolitan and wide area networks in any spatial configuration</p> <p>For laying in sewage ducts</p> <p>For burying directly in the ground in areas with higher risk of mechanical damage</p> <p>For installation at the bottom of water reservoirs and river crossings</p> |
| Temperature ranges | <p>Transport and storage: -40°C – +70°C</p> <p>Installation: -15°C – +60°C</p> <p>Operation: -40°C – +70°C</p> |

PARAMETERS:

| Fibre count in cable | Number of elements | Tube diameter | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | mm | mm | kg/km | N | | mm | |
| 4 – 72 | 6 | 2,4 | 14,0 | 290 | 10000 | 5000 | 220 | 290 |
| 28 – 96 | 8 | 2,4 | 15,6 | 350 | 12000 | 6000 | 240 | 320 |
| 36 – 144 | 12 | 2,4 | 19,3 | 580 | 15000 | 7500 | 290 | 380 |

Packing length: to be agreed, standard – 2 km

Packing: wooden drums

Special application cables

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Application

Cables for special military and mining applications are used for transmission of digital and analogue signals within the whole optical bandwidth. Used in voice and data transmission lines, built to endure extreme conditions and so require high mechanical resistance

PSKD

ZN-TF-017

Field fibre optic cables for special applications

Description

PSKD – field (P), fibre optic cable (SK), reinforced with aramid yarns (D)

CONSTRUCTION

| | |
|--------------------------|--|
| Optical fibres w buforze | singlemode (J) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) with a special elastic buffer in a tight tube |
| Tube | tight tube Ø 0.9 mm |
| Inner sheath | halogen free polyurethane, flame retardant |
| Reinforcement | aramid yarns |
| Outer sheath | halogen free polyurethane, flame retardant, black or grey |



CHARACTERISTIC

| | | |
|------------------------|---|---------------|
| Tube identification | Colours of tubes at customer's discretion. The marking and the metric overprint are printed on the outer sheath. The marking can also be tailored to meet customer's requirements. | |
| Performance parameters | Fully dielectric Light and durable due to double aramid reinforcement Resistant to electromagnetic interferences Highly flexible in low temperatures due to double polyurethane sheaths Suitable for repeated winding and unwinding Highly resistant to chemical agents, abrasion, mechanical vibrations Fire resistant due to flame retardant zero halogen polyurethane Resistant to longitudinal water penetration Can be installed in the proximity to electric installation | |
| Application | For military tactical field communication systems For use in heavy environmental conditions where high resistance to mechanical damage is required In places where geological, archeological or mining works are being carried out, both in the open air and underground Recommended if frequent winding and unwinding is required For television communications vehicles transmission and cameras Use of high-speed automated cable pulling methods (such as from a moving car, car combat, etc.) | |
| Temperature ranges | transport and storage: | -55°C – +75°C |
| | Installation: | -40°C – +70°C |
| | Operation: | -40°C – +70°C |

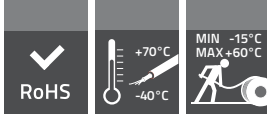
| | |
|------------------------|---|
| Other cable parameters | <p>Max tensile force 2.5 Kn Resistance to deformation (crash test) 3 kn Resistance to impact 3 nm Resistance to multiple bending 5,000 times Resistance to multiple rewinding 100.000 Times</p> |
| Additional Information | <p>The unique combination of features make the PSKD cables very versatile, lightweight and durable. The durability comes from double aramid fibre reinforcement. Flexibility and resistance to fire have been achieved using flame retardant polyurethane. Swellable aramid yarns provide water resistance and a special flexible buffer allows for operation in very low temperatures. Tight tubes protect the optical fibres and allow for quick and easy cable termination with an appropriate connector, also in the field.</p> |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 | 5,8 | 24 | | | 85 | 110 |
| 4 | 5,8 | 25 | | | 85 | 110 |
| 6 | 6,3 | 29 | 2500 | 1250 | 85 | 110 |
| 8 | 6,5 | 32 | | | 90 | 120 |
| 12 | 7,1 | 38 | | | 100 | 130 |

Packing length: to be agreed, standard – 1 km

Packing: wooden drums



YOTKGtsFoyn

ZN-TF-115

Mining fibre optic cable with multiple optical fibres in a loose tube, armoured with steel wires, flame retardant

Description

YOTKGtsFoyn – with PVC inner sheath (Y), fibre optic cable for mining (OTKG), loose tube with dry core sealing (ts), armoured with round steel wires (Fo), flame retardant PVC outer sheath (yn)

OPTIONS - YOTKGtsDFoyn – reinforced with aramid yarns (D)

NOTKGtsFoN – with halogen free flame retardant inner sheath (N) and halogen free flame retardant outer sheath (N)



CONSTRUCTION

| | |
|-------------------------|--|
| Central strength member | dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (I) singlemode with non-zero dispersion (Jn) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | loose tube filled with a thixotropic jelly |
| Filler | polyethylene |
| Cable core | 6, 8, 12, 18 or 24 tubes or tubes and fillers stranded around central strength member |
| Sealing | dry |
| Inner sheath | polyethylene |
| Bedding | PVC tape |
| Armouring | round steel wires |
| Ripcord | 2 |
| Outer sheath | flame retardant PVC, blue |

CHARACTERISTIC

| | |
|-------------------------------|---|
| Performance parameters | Dielectric cable cores Resistant to electromagnetic interferences Through the use of a dielectric strength member, aramid reinforcement (option) and armour made of round steel wires, cables are resistant to longitudinal and transverse stress Resistant to longitudinal water penetration Outer sheath is flame retardant and uv resistant The marking and the metric overprint are printed on the outer sheath Cable markings can be tailored to customer's requirements |
| Application | For laying on the ground or underground in mines For hanging – horizontally or vertically in pit shafts |
| Temperature ranges | Transport and storage: -40 °C – +70 °C Installation: -15 °C – +60 °C Operation: -40 °C – +70 °C |

PARAMETERS:

87

| Fibre count in cable | Number of elements | Fibre count in tube | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | n | mm | kg/km | N | | mm | |
| YOTKGtsFoyñ | | | | | | | | |
| 4-24 | 6 | 4 | 15,2 | 500 | 4000 | 2000 | 300 | 450 |
| 6-36 | 6 | 6 | 17,0 | 600 | 6000 | 2000 | 340 | 500 |
| 8-48 | 6 | 8 | 17,0 | 600 | 6000 | 2000 | 340 | 500 |
| 12-72 | 6 | 12 | 17,0 | 600 | 6000 | 2000 | 340 | 500 |
| YOTKGtsDFoyñ | | | | | | | | |
| 4-24 | 6 | 4 | 16,0 | 520 | 6000 | 2000 | 320 | 480 |
| 6-36 | 6 | 6 | 17,9 | 620 | 8000 | 3000 | 360 | 540 |
| 8-48 | 6 | 8 | 17,9 | 620 | 8000 | 3000 | 360 | 540 |
| 12-72 | 6 | 12 | 17,9 | 620 | 8000 | 3000 | 360 | 540 |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums



A/I-DQ(ZN)BH; U-DQ(ZN)BH PH90 FE180

VDE 0888-3

Description

A/I-DQ(ZN)BH – indoor/outdoor (A/I), central tube filled with thixotropic gel (D), dry cable sealing (Q), dielectric reinforcement (ZN), anti-rodent layer made of glass yarns (B) with a halogen free flame retardant sheath (H)

U-DQ(ZN)BH – Universal (U), central tube filled with thixotropic gel (D), dry cable sealing (Q), dielectric reinforcement (ZN), anti-rodent layer made of glass yarns (B) with a halogen free flame retardant sheath (H)

PH90 FE180 - Circuit integrity

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CONSTRUCTION

| | |
|----------------------------|---|
| Optical fibres | singlemode E9/125 singlemode with non-zero dispersion E9/125 gradient multimode (G50/125) gradient multimode (G62.5/125) |
| Tube | Central tube - thermoplastic material 2 - 24 fibres with thixotropic gel |
| Flame retardant protection | Mica tape |
| Sealing | dry |
| Reinforcement | Waterblocking glass yarns |
| Ripcord | 2 |
| Outer sheath | halogen free flame retardant, black |

CHARACTERISTIC

| | |
|------------------------|---|
| Performance parameters | Fully dielectric. Resistant to electromagnetic interferences Resistant to longitudinal water penetration Can be installed in the proximity to electric installation Easy to install |
| Application | Cables are designated for transmission of digital and analogue signals within the whole optical bandwidth. They are prepared for making fast connection between optoelectronics devices, laying in cable ducts or indoor, use in places with high risk of rodents attack. Suitable for fixed installation everywhere, where in case of fire human life and material assets are to be protected, e.g. in industrial complexes, public buildings, hotels, airports, underground railway networks, hospitals. |
| Temperature ranges | Transport and storage: -25 °C – +70 °C installation: -15 °C – +55 °C operation: -25 °C – +60 °C |

PARAMETERS:

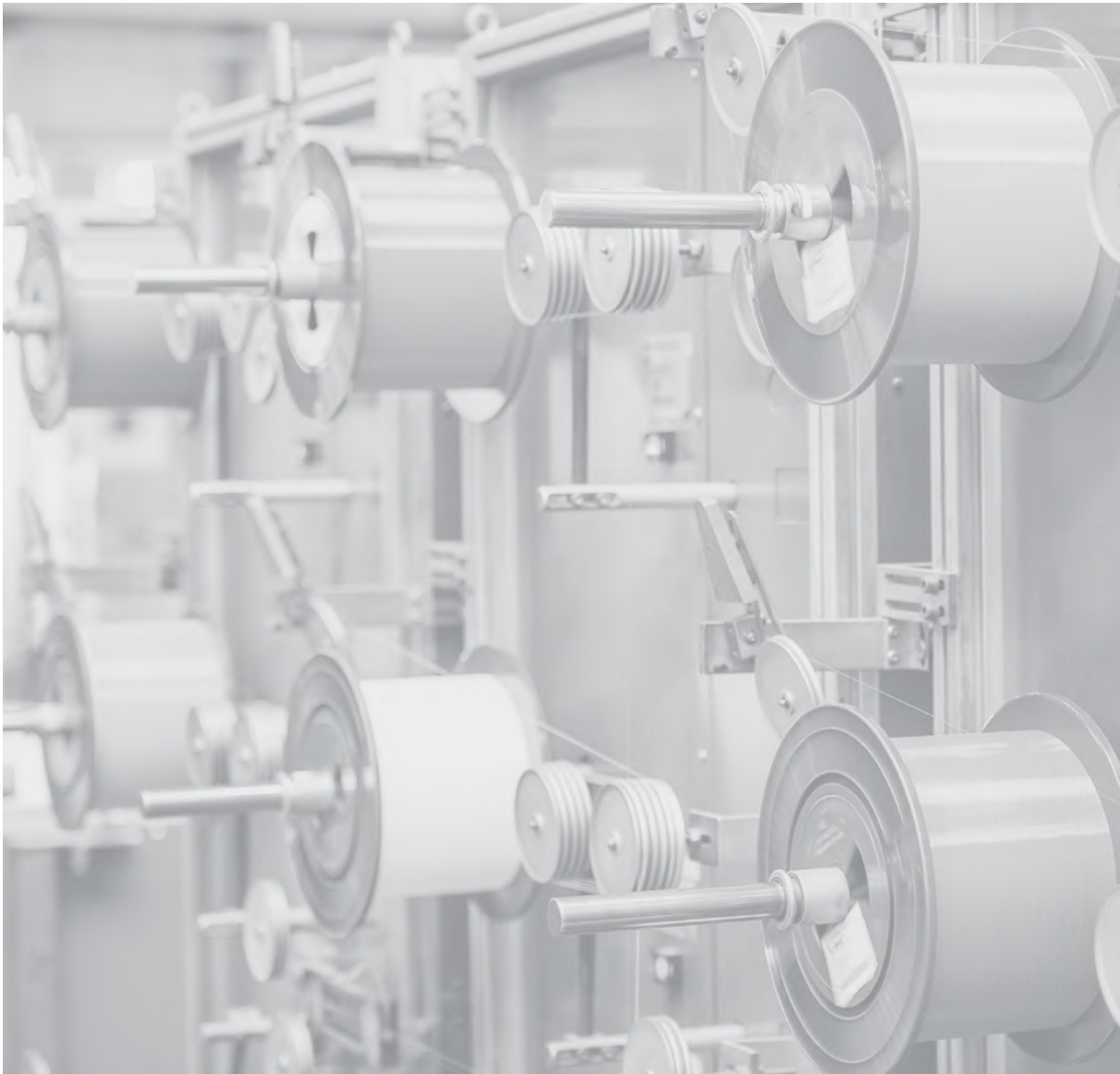
| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|-------------------------|-------------------|-----------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 - 24 | 7.8 | 70 | 1000 | 500 | 120 | 160 |

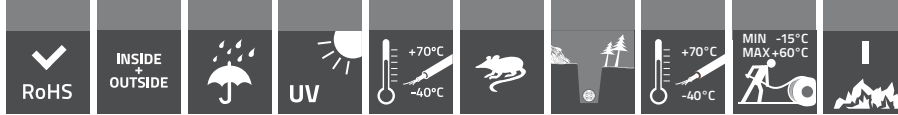
ENVIRONMENTAL SPECIFICATIONS

| | | |
|-------------------|-------------------------------|-------|
| Flame retardant | PN-EN 60332-1-2 | |
| Flame retardant | PN-EN 60332-3-22 (Category A) | |
| Circuit integrity | IEC 60331-25 | FE180 |
| Circuit integrity | PN-EN 50200 | PH90 |

Packing length: to be agreed, standard – 2 km +/- 100m

Packing: wooden drums





A/I-DQ(ZN)BH; U-DQ(ZN)BH PH90 FE180

VDE 0888-3

Description

A/I-DQ(ZN)BH – indoor/outdoor (A/I), central tube filled with thixotropic gel (D), dry cable sealing (Q), dielectric reinforcement (ZN), anti-rodent layer made of glass yarns (B) with a halogen free flame retardant sheath (H)

U-DQ(ZN)BH – Universal (U), central tube filled with thixotropic gel (D), dry cable sealing (Q), dielectric reinforcement (ZN), anti-rodent layer made of glass yarns (B) with a halogen free flame retardant sheath (H)

PH90 FE180 - Circuit integrity



CONSTRUCTION

| | |
|----------------------------|---|
| Central strength member | Dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode E9/125 singlemode with non-zero dispersion E9/125 gradient multimode (G50/125) gradient multimode (G62.5/125) |
| Tube | Loose tube filled with a thixotropic gel |
| Filler | Polyethylene |
| Cable core | 6, 8, 12, tubes or tubes and fillers stranded around central strength member |
| Sealing | Dry |
| Flame retardant protection | Mica tape |
| Reinforcement | Waterblocking glass yarns |
| Ripcord | 1 |
| Outer sheath | halogen free flame retardant, black |

CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric. Resistant to electromagnetic interferences Resistant to longitudinal water penetration an be installed in the proximity to electric installation Easy to install |
|------------------------|--|

| | | | |
|--------------------|---|-----------------|--|
| Application | Cable is designated for transmission of digital and analogue signals within the whole optical bandwidth used in long distance, wide and local telecom networks of any spatial configuration. Suitable for use in primary and secondary cable ducts or in the proximity to HV lines. They are prepared for laying in the closed spaces, road and railroad tunnels, on buildings walls and for hanging, use in places with high risk of rodents attack. | | |
| Temperature ranges | Transport and storage: | -40 °C – +70 °C | |
| | installation: | -15 °C – +60 °C | |
| | operation: | -40 °C – +70 °C | |

PARAMETERS:

| Fibre count in cable | Number of elements | Fibre count in tube | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|--------------------|---------------------|----------------|--------------|--------------------|--------|---------------------|---------|
| | | | | | Dynamic | Static | Dynamic | Static |
| n | n | n | mm | kg/km | N | | mm | |
| 4 - 72 | 6 | 1.8 | 9.8 | 105 | 3000 | 1500 | 15 x OD | 20 x OD |
| 28 - 96 | 8 | 1.8 | 11.0 | 140 | 3000 | 1500 | 15 x OD | 20 x OD |
| 36 - 144 | 12 | 1.8 | 13.3 | 190 | 3000 | 1500 | 15 x OD | 20 x OD |

ENVIRONMENTAL SPECIFICATIONS

| | | |
|-------------------|-------------------------------|--------|
| Flame retardant | PN-EN 60332-1-2 | |
| Flame retardant | PN-EN 60332-3-22 (Category A) | |
| Circuit integrity | IEC 60331-25 | FE 180 |
| Circuit integrity | PN-EN 50200 | PH90 |
| Smog density | IEC 61034 | |

Packing length: to be agreed, standard – 4 km

Packing: wooden drums

DAC

IEC 60794

CONSTRUCTION

| | |
|----------------|---|
| Optical fibres | singlemode (G652.D, A1, A2) singlemode with non-zero dispersion (G655) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | Central tube - thermoplastic material 2 - 12 fibres with thixotropic gel |
| Sealing | Dry |
| Reinforcement | aramid yarns and dielectric rods in the outer jacket |
| Outer sheath | Polyethylene |



CHARACTERISTIC

| | |
|------------------------|--|
| Performance parameters | Fully dielectric light and durable Resistant to electromagnetic interferences Resistant to longitudinal water penetration UV resistant Easy to install |
| Application | Cables are designated for transmission of digital and analogue signals within the whole optical bandwidth used in the local, metropolitan and wide area networks. external access networks modern FTTH & cctv subscriber connections for installation directly in the ground |
| Temperature ranges | Transport and storage: -30 °C – +70 °C installation: -15 °C – +55 °C operation: -30 °C – +70 °C |

PARAMETERS:

| Fibre count in cable | Cable diameter | Cable weight | Max. pulling force | | Min. bending radius | |
|----------------------|----------------|--------------|--------------------|--------|---------------------|--------|
| | | | Dynamic | Static | Dynamic | Static |
| n | mm | kg/km | N | | mm | |
| 2 - 12 | 6.0 | 30 | 1200 | 360 | 90 | 120 |

Packing length: to be agreed, standard – 2 km +/- 100m

Packing: wooden drums

Z-XOTKts + H07V2-K 1.5mm² or 2.5mm²

IEC 60794

Hybrid - Outdoor fibre optic cable with insulated copper wire (H07V2-K)

Description

Z-XOTKts – Outdoor (Z), polyethylene outer sheath (X), fibre optic cable (OTK), loose tube with dry core sealing (ts)

CONSTRUCTION

| | |
|-------------------------|---|
| Central strength member | Dielectric FRP rod with or without PE jacket |
| Optical fibres | singlemode (G652.D, A1, A2) singlemode with non-zero dispersion (G655) gradient multimode (G/50) gradient multimode (G/62.5) |
| Tube | Loose tube filled with thixotropic jelly |
| Filler | Polyethylene |
| Cu wire | Flexible strand (class 5) |
| Wire insulation | PVC type T13 |
| Cable core | 6, 8, 12, 18, - Z-XOTKts + H07V2-K 2.5mm ² 6, 8, 12, 18, 24 - Z-XOTKts + H07V2-K 1.5mm ² tubes and insulated copper wire or tubes and insulated copper wire and fillers stranded around central strength member |
| Sealing | Dry |
| Ripcord | 2 |
| Outer sheath | Polyethylene |



CHARACTERISTIC

| | | | | | | | |
|------------------------|---|------------------------|-----------------|---------------|-----------------|------------|-----------------|
| Performance parameters | Unified construction Resistant to longitudinal water penetration Outer sheath abrasion and UV resistant | | | | | | |
| Application | Cables are designated for transmission of digital and analogue signals within the whole optical bandwidth. They are prepared for making fast connection between optoelectronics devices, laying in cable ducts. For monitoring, including cameras power supply. | | | | | | |
| Temperature ranges | <table border="0"> <tr> <td>Transport and storage:</td> <td>-40 °C – +70 °C</td> </tr> <tr> <td>installation:</td> <td>-15 °C – +60 °C</td> </tr> <tr> <td>operation:</td> <td>-40 °C – +70 °C</td> </tr> </table> | Transport and storage: | -40 °C – +70 °C | installation: | -15 °C – +60 °C | operation: | -40 °C – +70 °C |
| Transport and storage: | -40 °C – +70 °C | | | | | | |
| installation: | -15 °C – +60 °C | | | | | | |
| operation: | -40 °C – +70 °C | | | | | | |

PARAMETERS:

| No. of fibres in a cable | Outer diameter of tube | No. of elements in a cable | Cable dimensions | | Mechanical properties | | | |
|---|------------------------|----------------------------|------------------|----------------|-------------------------------------|--------------------------------------|-------------------------------------|--------------------------------------|
| | | | Outer diameter | Cable weight | Max. tensile load [N] | | Min. bending radius [mm] | |
| n | [mm] | (tubes/ filers) | [mm] | [kg/km] | Dynamic (during instalation) | Static (during the operation) | Dynamic (during instalation) | Static (during the operation) |
| (cable with e.g. 4 Cu wire 2.5mm²) | | | | | | | | |
| Up to 24 fibres (with 2 Cu wire up to 48 fibres) | 3.5 | 6 el. 2 tubes + 4 wire | 14.5 ± 0.5 | 235 | 2000 | 1000 | 220 | 290 |
| Up to 48 fibres (with 2 Cu wire up to 72 fibres) | 3.5 | 8 el. 4 tubes + 4 wire | 16.7 ± 0.5 | 280 | 2000 | 1000 | 250 | 335 |
| Up to 96 fibres (with 2 Cu wire up to 120 fibres) | 3.5 | 12 el. 8 tubes + 4 wire | 21.2 ± 0.5 | 400 | 2000 | 1000 | 320 | 420 |
| Up to 168 fibres (with 2 Cu wire up to 192 fibres) | 3.5 | 18 el. 14 tubes + 4 wire | 21.8 ± 1.0 | 415 | 2000 | 1000 | 330 | 440 |
| PARAMETERS (cable with e.g. 4 Cu wire 1.5mm²) | | | | | | | | |
| Up to 24 fibres (with 2 Cu wire up to 48 fibres) | 2.8 | 6 el. 2 tubes + 4 wire | 12.5 ± 0.5 | 160 | 2000 | 1000 | 190 | 250 |
| Up to 48 fibres (with 2 Cu wire up to 72 fibres) | 2.8 | 8 el. 4 tubes + 4 wire | 14.4 ± 0.5 | 195 | 2000 | 1000 | 215 | 285 |
| Up to 96 fibres (with 2 Cu wire up to 120 fibres) | 2.8 | 12 el. 8 tubes + 4 wire | 17.8 ± 0.5 | 280 | 2000 | 1000 | 265 | 350 |
| Up to 168 fibres (with 2 Cu wire up to 192 fibres) | 2.8 | 18 el. 14 tubes + 4 wire | 18.4 ± 1.0 | 295 | 2000 | 1000 | 280 | 370 |
| Up to 240 fibres (with 2 Cu wire up to 264 fibres) | 2.8 | 24 el. 20 tubes + 4 wire | 21.0 ± 1.0 | 370 | 2000 | 1000 | 315 | 420 |

ELECTRIC PARAMETER 2.5mm²

| | |
|-----------------------|------------------------|
| Cu wire resistance | max 7.98 Ω/km @20°C |
| Insulation resistance | min 0.0095 MΩ*km @90°C |
| Rated voltage | 450V/750V |

ELECTRIC PARAMETER 1.5mm²

| | |
|-----------------------|-----------------------|
| Cu wire resistance | max 13.3 Ω/km @20°C |
| Insulation resistance | min 0.010 MΩ*km @70°C |
| Rated voltage | 450V/750V |

Packing length: to be agreed, standard – 4200+/- 100m km

Packing: wooden drums

Handling Fibre Optic Cables

GENERAL PRINCIPLES

1. Transport and storage of fibre optic cables

The same rules apply to fibre optic cables as to those for the transportation of copper cables.

Cable drums must be secured from slipping during transport to avoid damage.

Cable drums should only be transported in an upright standing position – on their flanges.

Use fork-lift trucks, trucks with lifting arms or external cranes to remove the drums from the delivery truck.

Do not drop cable drums on the ground.

Temperature range for transport and storage – this should be in accordance with the manufacturer's data sheets. Typically these are, for outdoor cables -40 °C to +70 °C; indoor cables -30 °C to +70 °C.

Avoid direct exposure to solar radiation, rain and snow. We recommend storing cables indoors on a concrete floor in a secure building.

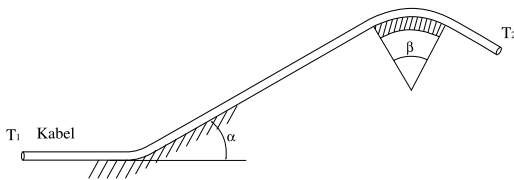
The cable ends must be secured with end caps to prevent moisture penetration.

2. Installation of fibre optic cables

The general principles for handling fibre optic cables during installation are described in Annex C of IEC 60794-1-1 Ed 3.

Installation contractors and telecom operators may have their own additional standards and procedures..

Installing cables in cable ducts



The cable tensile stress expected during installation should be calculated at the planning stage. The tensile stresses (T) acting on a cable during installation are determined by the following formulas and are dependent on the cable route:

- a straight route $T_2 = \mu L W g + T_1$
- a route with a slope α $T_2 = L W g (\sin \alpha + \mu \cos \alpha) + T_1$
- a route with a twist β $T_2 = T_1 e_{\mu\beta}$

where:

- T_n – tensile stress at the end (2)/beginning (1) of a section
- L – length in metres
- μ – coefficient of friction between the cable and the duct
- W – cable weight in kg/m
- α – angle in radians („+“ upwards, „-“ downwards) ($\alpha = 0^\circ$ for a horizontal route, $\alpha = 90^\circ$ for a vertical route)
- β – a twist angle in radians (in the horizontal plane)
- g – acceleration of gravity (9.81 m/s²).

During the first installation of a fibre optic cable, the maximum tensile force stated on the data sheet should never be exceeded.

If the estimated value of tensile force during installation in any section of a cable duct exceeds the limit, the method of cable installation should be changed (e.g. use blowing). The tensile force should be monitored during the installation of the cable, and if possible – recorded. The tensile stress exerted on the cable should be released after installation. Do not leave the fibre optic cable under permanent long-lasting tensile stress. Aerial suspension cables however are specially adapted to remain under tensile stress after installation.

The minimum bending radius stated on the cable data sheet should never be exceeded.

Adhering to these guidelines will ensure that the optical fibres remain undamaged and the cable will provide long-term performance and reliability.



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Edition II

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