TFKable

Connecting globally

THE INFORMATION GATEWAY

Fibre Optic Cables

Brighter future
in energy

TFK. Group

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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

Exploatation temperature

Self-supporting cable

Leading producer of cables and cable systems

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.

* JDR Cable Systems Ltd. **(Sales Representative)** United States. UK

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 hight 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 (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:

- ndoor – 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
- green
- blue
- white
- violet
- orange
- grey
- yellow
- brown
- pink
- black
- 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 elipticity	**%**	≤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**	$1300<\lambda_0<1324$	$1300<\lambda_0<1324$	≤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 elipticity	**%**	≤5	≤5
Cladding elipticity	**%**	≤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

TFKable

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

INSIDE | RoHS | +60°C -5°C | MIN -5°C MAX +60°C | CPR Eca

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	Cable diameter	Cable weight	Max. pulling force		Min. bending radius	
			Dynamic	Static	Dynamic	Static
n	**mm**	**kg/km**	**N**		**mm**	
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

INSIDE | RoHS | +60°C -5°C | MIN -5°C MAX +60°C | CPR Eca

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)

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**	
	2,0x4,0	7,0	440	220	20	30
	2,4x4,8	8,9	600	300	24	36
2	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

INSIDE | RoHS | +60°C -5°C | MIN -5°C MAX +60°C | CPR Eca

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	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

INSIDE | RoHS | +60°C -5°C | MIN -5°C MAX +60°C | CPR Eca

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 (())*

*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: Installation: Operation:	-30/+70°C -5/+60°C -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	1200	2000	150	200
8	8	1	2,5	11,7	109			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).

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	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

INSIDE | RoHS | +60°C -5°C | MIN 0°C MAX +55°C | CPR Eca | Fl Cl Br | UV

WD-NOTKSd

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

Easy acces 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).

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

TFKable

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.

INSIDE + OUTSIDE | RoHS | UV | +70°C -25°C | MIN -5°C MAX +60°C

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	▪ fully dielectric ▪ resistant to electromagnetic interferences ▪ outer sheath resistant to abrasion, UV ▪ flexible
Application	▪ 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	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 (J) singlemode with non-zero dispersion (Jn) 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

INSIDE + OUTSIDE | RoHS | +70°C -30°C | MIN -5°C MAX +50°C | CPR Eca | I

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 (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 (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		Max. pulling force		Min. bending radius	
			Dynamic	Static	Dynamic	Static
n	**mm**	**kg/km**	**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)

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

INSIDE + OUTSIDE | RoHS | +60°C -15°C | MIN -40°C MAX +70°C | CPR Eca

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 (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
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 (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	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 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 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 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 (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

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 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 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 * use of glass yarn protects cable from rodents

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 (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 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	Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Can be installed in the proximity to electric installation 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 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 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

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 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 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 * use of glass yarn protects cable from rodents

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 (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
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 (J) singlemode with non-zero dispersion (Jn) 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	Fully dielectric Resistant to electromagnetic interferences Protected from moisture and longitudinal water penetration Can be installed in the proximity to electric installation 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 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 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	**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

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

DEXTROM

TFKable

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.

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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)

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, 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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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)

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
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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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)

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	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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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

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

OUTSIDE | RoHS | +70°C -30°C | MIN -15°C MAX +60°C | UV | CPR Fca

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)

CONSTRUCTION

Central strength member	dielectric FRP rod
Optical fibres	singlemode (J) 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 ftth 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)

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	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

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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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 (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
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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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 aramide 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)

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

OUTSIDE | RoHS | UV | +60°C -30°C | MIN -10°C MAX +40°C | CPR Fca

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).

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	Fully dielectric and resistant to electromagnetic interferences. FEATURES Light and durable Easy strippable secondary coating Easy access to cable modules UV resistant	
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	
Temperature ranges	Transport and storage: Installation: Operation:	-40 °C – +70 °C -10°C – +40 °C -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

OUTSIDE | RoHS | UV | +70°C -40°C | MIN -15°C MAX +60°C | CPR Fca

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

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	No. of elements in a cable (tubes/ filers)	Cable dimensions		Mechanical properties					
			Outer diameter	Cable weigth	Rated working tension	Max. working tension	Rated tensile strength	Young module	Thermal expansion coefficient	Recommended span distance
	[mm]		**[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	5.8×10^{-6}	60
28 - 96	2.1	8	11.5 ± 0.2	105	2.5	5.0	15.0	9.6	8.8×10^{-6}	60
36 - 144	2.1	12	14.1 ± 0.2	150	2.5	5.0	12.0	5.2	17.6×10^{-6}	60
52 - 216	2.1	18 (6+12)	14.8 ± 0.2	155	2.5	5.0	17.0	6.7	11×10^{-6}	60
76 - 288	2.1	24 (9+15)	16.6 ± 0.2	200	2.5	5.0	17.0	6.0	12.1×10^{-6}	60

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

OUTSIDE | RoHS | +70°C -40°C | MIN -10°C MAX +50°C | UV | CPR Fca

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 (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
Water protection	dry
Inner sheath	polyethylene
Reinforcement	Aramid yarns
Ripcord	2
Outer sheath	polyethylene, black

CHARACTERISTIC

Performance parameters	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

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	Calcu-lated work force	Cable diameter	Cable weight	Cable cros-section	Aramid yarn cros-section	Central strength member crossection	Cable Young's Modulus	Coefficient of thermal expansion	Recom-mended span distance
n	**kN**	**kN**	**kN**	**mm**	**kg/km**	**mm²**	**mm²**	**mm²**	**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

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/ filers)	Cable dimensions		Mechanical properties				
			Outer diameter	Cable weight	Rated working tension	Max. working tension	Rated tensile strength	Young module	Thermal expansion coefficient
	[mm]		**[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	6.5×10^{-6}
Up to 96	2.1	8	15.8	195	4.5	9 (0.2% fiber strain)	24	7.4	8.1×10^{-6}
Up to 144	2.1	12	18.4	255	4.5	9 (0.2% fiber strain)	24	5.6	11.1×10^{-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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +55°C | UV | CPR Fca

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: Installation: Operation:	-40 °C – +70 °C -15 °C – +55 °C -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)

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

OUTSIDE | RoHS | +70°C -40°C | MIN -15°C MAX +60°C | UV | CPR Fca

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)

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
Bedding	PVC tape
Armouring	round steel wires
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 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 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 at the bottom of water reservoirs and river crossings
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	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

TFKable

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

OUTSIDE | RoHS | +70°C -40°C | MIN -40°C MAX +70°C

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	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
Additional Information	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.

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

RoHS | +70°C -40°C | MIN -15°C MAX +60°C

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 (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
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:

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**	
YOTKGtsFoyn								
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
YOTKGtsDFoyn								
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

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

RoHS | OUTSIDE | UV | MIN -15°C | +70°C -30°C | CPR Fca

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 TI3
Cable core	6, 8, 12, 18, - Z-XOTKts + H07V2-K 2.5mm2 6, 8, 12, 18, 24 - Z-XOTKts + H07V2-K 1.5mm2 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	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 weigth	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 $\mathbf{T_2 = \mu L W g + T_1}$
– a route with a slope α $\mathbf{T_2 = L W g (\sin\alpha + \mu \cos\alpha) + T_1}$
– a route with a twist β $\mathbf{T_2 = T_1 e_{\mu\beta}}$

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) (α= 0° for a horizontal route, α= 90° 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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