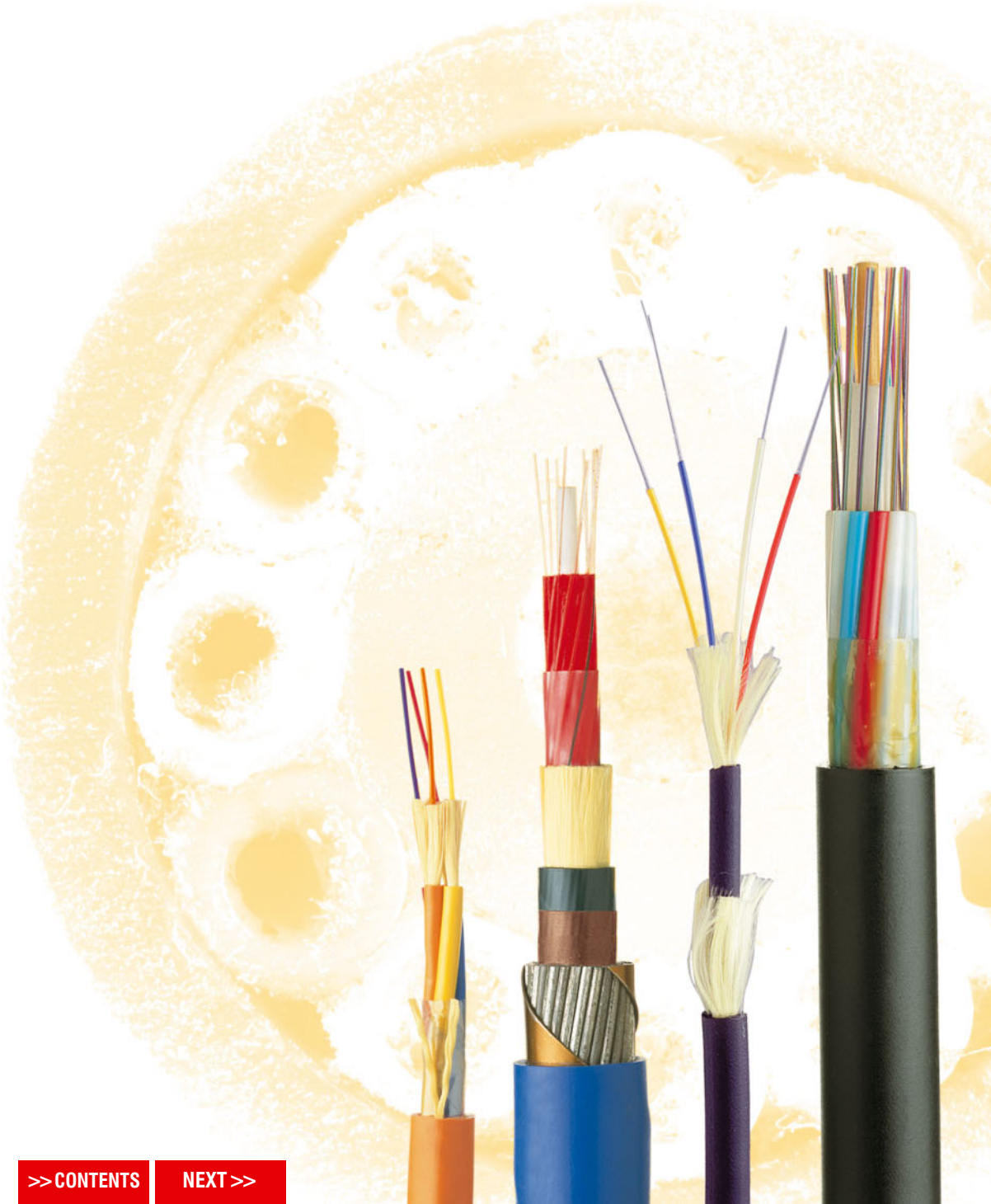
TELE-FONIKA Kable S.A.

FIBRE OPTIC CABLES



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History of Tele-Fonika Kable SA

1993

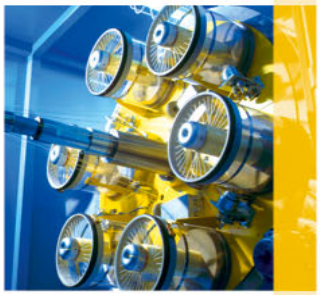
Elektrim Kable SA (formerly known as: Elektrim Kable Polskie SA or Bydgoska Fabryka Kabli SA) was established as a result of the transformation of the state-owned enterprise Bydgoska Fabryka Kabli, head office in Bydgoszcz, into a state-stock company, on March 15.

1994

Company was privatised and its shares were introduced to public trade on the Warsaw Stock Exchange (Giełda Papierów Wartościowych SA).

1999

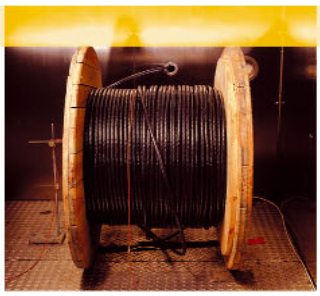
Following the initiative of Elektrim SA, acting as a majority shareholder of Bydgoska Fabryka Kabli SA (established 1920), Fabryka Kabli Ożarów SA (1929) and Fabryka Kabli Załom SA (1957) merged to be taken over by Bydgoska Fabryka Kabli SA and, as a result, a multi-plant enterprise, under the name of Elektrim Kable SA, was established. Elektrim SA was the Company's major shareholder.



2002

In January Tele-Fonika KFK SA bought the majority of shares of the Company. In February the name was changed to Tele-Fonika Kable SA, and the headquarters were moved to Myślenice.

The Tele-Fonika Capital Group, consisting of Tele-Fonika Kable SA and Tele-Fonika KFK SA, is the largest manufacturer of cables in Poland and one of the largest companies in this industry in Europe.



Identification system of fibre optic cables

Marking system is based on series of letters and numbers according to the following rules:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Z–	**X**	**X**	**OTK**	**ts**		**D**	**FtI**			**6**	**Jn**			

15. Additional informations

14. Permissible pulling force for ADSS cables
for example: 5.0 kN

13. Space

12. Optical fibre type: J -singlemode without reducing of refractive index in the cladding (matched cladding singlemode);
Jp -singlemode, dispersion shifted;
Jn -singlemode, non zero dispersion shifted;
G50 or G5 -multimode, graded index with diameter of the core 50 μm;
G62.5 or G6 -multimode, graded index with diameter of the core 62.5 μm.

11. Number of optical fibre in a cable
for example: **6J** -six single mode optical fibre.
Different optical fibres should be separate sign "+"
for example: **6G50 + 6J** -six multimode otical fibres 50/125μm and six singlemode optical fibres.
Sequence of writing different optical fibres:
G50; G62.5; J; Jd; Jp; Jn

10. Space

9. p -flat cable

8. Armouring: **FtI** -steel, varnished tapes; **Ff** -steel, corrugated tape; **Fo** -steel, zinc, round wires

7. Cable reinforcement: D -aramid yarn (or glassy yarn on request)

6. d-fully dielectric cable

5. Core construction: t -loose tube, jelly filled core; **ts** -loose tube, dry sealing core; **tc** -central tube; **S** -tight or semi-tight tube

4. Optical fibre cable symbol: OTK -optical fibre cable

3. Inner sheath: X -polyethylene; **Y** -polyvinyl chloride; **U** -polypropylene; **Q** -polyurethane; **V** -polyamide; **Xz** -polyethylene with moisture barier; **Xn** -polyethylene flame retardant; **Yn** -polyvinyl chloride flame retardant; **N** -halogen free flame retardant; **AL** -aluminium

2. Outer sheath*: X -polyethylene; **Y** -polyvinyl chloride; **U** -polypropylene; **Q** -polyurethane; **V** -polyamide; **Xz** -polyethylene with moisture barier; **Xn** -polyethylene flame retardant; **Yn** -polyvinyl chloride flame retardant; **N** -halogen free flame retardant

1. Application area: Z– -outdoor cables; **W**– -indoor cables; **ZW**– -universal cables; **S**– -self-supporting, 8-shaped cables; **ADSS**– -self-supporting for power lines; **ZKS**– -outdoor cables for sewerage system

*double layer sheath is signed by putting both type of sheath material into round bracket e.g. (VX).

Fibre optic cables of the loose tube construction

Colours of optical fibres in a tube

- 1 Red
- 2 Green
- 3 Blue
- 4 Natural or white
- 5 Violet
- 6 Orange
- 7 Grey
- 8 Yellow
- 9 Brown
- 10 Pink
- 11 Black
- 12 Turquoise

Tube identification:

- Count tube: Red
- Direction tube: Blue
- Subsequent tubes:* Natural or white

** Coloured upon request*

Optical fibre distribution cables of the tight tube construction

Colour of polyvinyl chloride sheath:

- singlemode cables (J) Yellow
- dispersion-shifted, singlemode (Jp) Red
- non zero dispersion-shifted, singlemode (Jn) Red
- multimode (G/50) Orange
- multimode (G/62.5) Green

Colour of tight tubes

- Single-fibre (simplex) selected colour
- Double-fibre (duplex) 1st tube - natural or white
  2nd tube - coloured with a selected distinctive colour

Transmission parameters of fibres

Parameter	Unit	Single mode fibre		Multimode fibre	
		ITU-T G.652 standard	ITU-T G.655 non zero dispersion shifted	ITU-T G.651 50/125	ITU-T G.651 62.5/125
Attenuation	[dB/km]				
850 [nm]				3.0	3.5
1310 [nm]		≤ 0.38 (0.33*)		1.0	1.0
1550 [nm]		≤ 0.25 (0.19*)	≤ 0.25 (0.19*)		
1625 [nm]			≤ 0.25		
Chromatic dispersion	[ps/(nm x km)]				
1288-1339 [nm]		≤ 3.5			
1550 [nm]		≤ 18			
1530-1565 [nm]			2.0 do 6.0		
1565-1625 [nm]			4.5 do 11.2		
Bandwidth	[MHz x km]				
850 [nm]				≥ 200	≥ 160
1300 [nm]				≥ 500	≥ 500
Polarisation mode dispersion	[ps/km$^{1/2}$]				
(PMD) individual fibre		≤ 0.2	≤ 0.1		
link design value		≤ 0.1	≤ 0.04		
Cut off wavelenght (in cable)	[nm]	≤ 1260	≤ 1300		

*typical value

Geometrical parameters of fibres

Parameter	Unit	Single mode fibre		Multimode fibre	
		ITU-T G.652 standard	ITU-T G.655 non zero dispersion shifted	ITU-T G.651 50/ 125	ITU-T G.651 62.5/125
Mode field diameter at wavelength	[μm]				
1310 [nm]		9.2 ± 0.4			
1550 [nm]		10.4 ± 0.8	9.2 ÷ 10.0		
Mode field noncircularity	[μm]	≤ 0.5			
Core diameter	[μm]			50 ± 2	62.5 ± 2
Cladding diameter	[μm]	125 ± 1.0		125 ± 2.0	
Cladding ellipticity	[%]	≤ 1		≤ 2	
Coating / cladding concentricity	[μm]	≤ 12			
Core / cladding concentricity	[μm]	≤ 0.5		≤ 3.0	
Core / cladding noncircularity	[%]	≤ 1.0		≤ 2.0	
Primary coating diameter natural fibre	[μm]	245 ± 5			
Primary coating diameter colured fibre	[μm]	245 ± 15			
Numerical aperture				0.200±0.015	0.275±0.015
Curl	[m]	≥ 4			

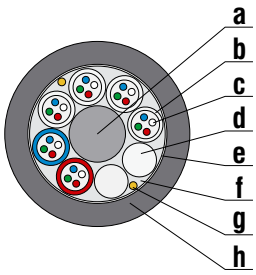
OUTDOOR

Optical fibre, duct cables of the loose tube construction

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) sheath: polyethylene, black



Options

option 1 - hydrophobic jelly filling
option 2 - aluminium moisture barrier

Cable types

Z-XOTKtsd - outdoor (**Z-**) with a polyethylene sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
Z-XOTKtd (option 1) - outdoor (**Z-**) with a polyethylene sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**), fully dielectric (**d**).
Z-XzOTKts (option 2) - outdoor (**Z-**) with a polyethylene sheath with aluminium moisture barrier (**Xz**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**).
Z-XzOTKt (option 1,2) - outdoor (**Z-**) with a polyethylene sheath with aluminium moisture barrier (**Xz**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
Cables can be installed in primary and secondary cable ducts.

Properties

Outdoor tube cables are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration,
- Can be installed close to the power lines.

Cable sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath.
Optional marking can be placed on the sheath upon request.

Minimum bending radius:
- Single 10 x cable outer diameter
- Multiple 20 x cable outer diameter

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Permissible pulling force during installation:

- Min. 2 x weigh of 1 km cable [N]
- Max. 2 500 [N]

Cable characteristics

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	10.8	95	108	216	2000	
42 ÷ 48		8	12.1	115	121	242	2300	
54 ÷ 72		12	15.0	190	150	300	2500	
8 ÷ 48	8	6	10.8	95	108	216	2000	2100±100
56 ÷ 64		8	12.1	115	121	242	2300	
72 ÷ 96		12	15.0	190	150	300	2500	4200±100
12 ÷ 72	12	6	11.3	105	113	226	2100	
84 ÷ 96		8	12.9	130	129	258	2500	
108 ÷ 144		12	16.4	215	164	328	2500	
156 ÷ 216	12	18	16.5	215	165	330	2500	

Packaging

Wooden drums

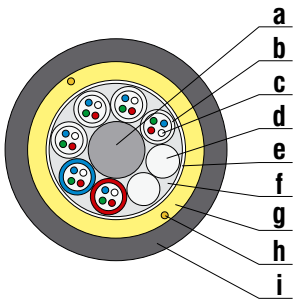
OUTDOOR, REINFORCED

Optical fibre, duct, suspended cables of the loose tube construction

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) reinforcing element: aramid yarns on the cable core
h) 2 rip cords for sheath ripping
i) sheath: polyethylene, black



Options

option 1 - hydrophobic jelly filling
option 2 - aluminium moisture barrier
option 3 - polyethylene inner sheath

Cable types

Z-XOTKtsdD - outdoor (**Z-**) with a polyethylene sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
Z-XzOTKtD (option 1,2) - outdoor (**Z-**) with a polyethylene sheath with aluminium moisture barrier (**Xz**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) with aramid yarn reinforcing element on a core (**D**).
Z-XXOTKtsdD (option 3) - outdoor (**Z-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
Z-XXzOTKtsD (option 2,3) - outdoor (**Z-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath with aluminium moisture barrier (**Xz**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) with an aramid yarn reinforcing element on a core (**D**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
Cables are designed for:
- primary and secondary cable ducts,
- direct burial in areas of low risk damages,
- suspension on aerial telecom lines, medium and low voltage power lines poles, railway tracks.

Properties

Reinforced tube cables are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration,
- Can be installed close to the power lines or suspended on poles of power lines.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral.
Cable sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius:

- Single 10 x cable outer diameter
- Multiple 20 x cable outer diameter

Permissible pulling force during installation:

- temporary / permanent 3 000 [N] / 1 000 [N]

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Cable characteristics Z-XOTKtsdD, Z-XzOTKtD

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	11.2	100	112	224	3000	
42 ÷ 48		8	12.5	120	125	250	3500	
54 ÷ 72		12	15.4	200	154	308	4000	
8 ÷ 48	8	6	11.2	100	112	224	3000	2100±100
56 ÷ 64		8	12.5	120	125	250	3500	
72 ÷ 96		12	15.4	200	154	308	4000	4200±100
12 ÷ 72	12	6	11.7	110	117	234	3000	
84 ÷ 96		8	13.3	135	133	266	3500	
108 ÷ 144		12	16.8	225	168	336	4000	
156 ÷ 216	12	18	17.3	220	173	346	4000	

Cable characteristics Z-XXOTKtdD, Z-XXzOTKtD

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	12.6	125	126	252	3000	
42 ÷ 48		8	13.9	150	139	278	3500	
54 ÷ 72		12	16.8	235	168	336	4000	
8 ÷ 48	8	6	12.6	125	126	252	3000	2100±100
56 ÷ 64		8	13.9	150	139	278	3500	
72 ÷ 96		12	16.8	235	168	336	4000	4200±100
12 ÷ 72	12	6	13.1	135	131	262	3000	
84 ÷ 96		8	14.7	165	147	294	3500	
108 ÷ 144		12	18.2	260	182	364	4000	
156 ÷ 216	12	18	18.7	255	187	374	4000	

Packaging
Wooden drums

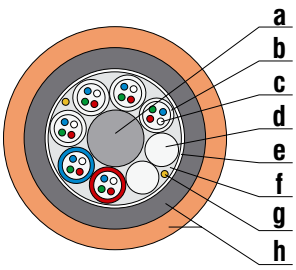
OUTDOOR, ANTIRODENT

Optical fibre, duct cables of the loose construction, reinforced and non-reinforced

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) double layer sheath: polyamide-polyethylene ((VX)-polyamide on the outside) or polyethylene-polyamide ((XV)-polyethylene on the outside); sheath colouring: black or orange



Options

option 1 - hydrophobic jelly filling
option 2 - aramid yarn reinforcement (glass yarn on request)

Cable types

Z-(VX)OTKtsd - outdoor (**Z-**) with a double layer polyamide-polyethylene sheath (**(VX)**) (polyamide on the outside) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
Z-(XV)OTKtsd - outdoor (**Z-**) with a double layer polyethylene-polyamide sheath (**(XV)**) (polyethylene on the outside) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
Z-(VX)OTKtdD (option 1,2) - outdoor (**Z-**) with a double layer polyamide-polyethylene sheath (**(VX)**) (polyamide on the outside) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
Z-(XV)OTKtdD (option 1,2) - outdoor (**Z-**) with a double layer polyethylene-polyamide sheath (**(XV)**) (polyethylene on the outside) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations. Cables can be installed in primary and secondary cable ducts.
Cables are designed for: direct burial in areas of low risk damages, suspension on poles.

Properties

Antirodent tube cables are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration,
- Can be installed close to the power lines.

A double layer polyethylene-polyamide sheath protects cables from rodents. Sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request

Minimum bending radius:

- Single 10 x cable outer diameter
- Multiple 20 x cable outer diameter

Permissible pulling force during installation:

- For non-reinforced cables 2 500 [N]
- For reinforced cables (min.) 3 000 [N]

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Cable characteristics Z-(VX)OTKtd

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	11.6	130	116	232	2500	
42 ÷ 48		8	12.9	145	129	258	2500	
54 ÷ 72		12	15.8	225	158	316	2500	
8 ÷ 48	8	6	11.6	130	116	232	2500	2100±100
56 ÷ 64		8	12.9	145	129	258	2500	
72 ÷ 96		12	15.8	225	158	316	2500	4200±100
12 ÷ 72	12	6	11.7	130	117	234	2500	
84 ÷ 96		8	13.6	160	136	272	2500	
108 ÷ 144		12	16.4	230	164	328	2500	
156 ÷ 216	12	18	16.5	230	165	330	2500	

Cable characteristics Z-(VX)OTKtdD

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	12.2	135	122	244	3000	
42 ÷ 48		8	13.5	150	135	270	3500	
54 ÷ 72		12	16.4	235	164	328	4000	
8 ÷ 48	8	6	12.2	135	122	244	3000	2100±100
56 ÷ 64		8	13.5	150	135	270	3500	
72 ÷ 96		12	16.4	235	164	328	4000	4200±100
12 ÷ 72	12	6	12.7	135	127	254	3000	
84 ÷ 96		8	14.3	165	143	286	3500	
108 ÷ 144		12	17.5	235	175	350	4000	
156 ÷ 216	12	18	17.6	235	176	352	4000	

Packaging
Wooden drums

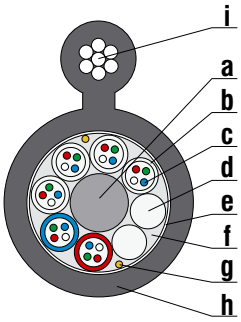
OUTDOORS, SELF-SUPPORTING

Optical fibre, self-supporting, 8-shaped cables of the loose tube construction

Standard: ZN-EK-105

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6,8 or 12 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) sheath: polyethylene connects a cable with a messenger by means of a web, black
i) messenger: steel strand



Options

option 1 - hydrophobic jelly filling
option 2 - dielectric messenger
option 3 - aramid yarn reinforcement (glass yarn on request)
option 4 - aluminium moisture barrier

Cable types

S-XOTKts - self-supporting, 8-shaped (**S-**) with a polyethylene sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**).
S-XOTKtsd (option 2) - self-supporting, 8-shaped (**S-**) with a polyethylene sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (with dielectric messenger)(**d**).
S-XOTKtD (option 1,3) - self-supporting, 8-shaped (**S-**) with a polyethylene sheath (**X**) optical fibre cables (**OTK**) of the loose tube construction with jelly filled core (**t**) with an aramid yarn reinforcing element on a core (**D**).
S-XzOTKtsD (option 4,3) - self-supporting, 8-shaped (**S-**) with a polyethylene sheath with aluminium moisture barrier (**Xz**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) with an aramid yarn reinforcing element on a core (**D**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
Cables are designed for suspension on poles of telecommunication lines. Cables with dielectric messenger may be suspended on poles: of railway tracks, low and medium frequency power lines.

Properties

Cores of self-supporting cables are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.

Cable sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius:

- Single 20 x cable outer diameter
- Multiple 30 x cable outer diameter

Permissible pulling force during installation:

- Temporary F/3
- Permanent F/6

(F - tensile force for a messenger)

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Cable characteristics

No. of optical fibre in a cable	Max. no. of optical fibre in a tube	No. of tubes or tubes and fillers	Max. outer dimensions [mm]	Web height x thickness [mm]	Cable mass [kg/km]	Messenger diameter [mm]	Min. tensile force for messenger [kN]	Min.bending radius (single) [mm]	Standard factory length [m]
1 ÷ 12	2	6	12.0x21.5	2.0x2.5	165	3.0	7.0	430	2100±100 4200±100
			12.0x22.5	2.0x3.5		4.0	12.5	450	
			12.0x23.5	3.0x3.5		5.0	16.5	470	
6 ÷ 24	4	6	12.5x22.0	2.0x2.5	195	3.0	7.0	440	
			12.5x23.0	2.0x3.5		4.0	12.5	460	
			12.5x26.0	3.0x3.5		5.0	16.5	520	
16 ÷ 48	8	6	15.0x24.5	2.0x2.5	240	3.0	7.0	490	
			15.0x25.5	2.0x3.5		4.0	12.5	510	
			15.0x28.5	3.0x3.5		5.0	16.5	570	
2 ÷ 16	2	8	13.0x22.5	2.0x2.5	185	3.0	7.0	450	
			13.0x23.5	2.0x3.5		4.0	12.5	470	
			13.0x26.5	3.0x3.5		5.0	16.5	530	
4 ÷ 48	6	8	14.5x24.0	2.0x2.5	220	3.0	7.0	480	
			14.5x25.0	2.0x3.5		4.0	12.5	500	
			14.5x28.0	3.0x3.5		5.0	16.5	560	
48 ÷ 64	8	8	17.0x26.5	2.0x2.5	260	3.0	7.0	530	
			17.0x27.5	2.0x3.5		4.0	12.5	550	
			17.0x30.5	3.0x3.5		5.0	16.5	610	
2 ÷ 24	2	12	16.0x25.8	2.0x2.5	200	3.0	7.0	520	
			16.0x26.5	2.0x3.5		4.0	12.5	530	
			16.0x29.5	3.0x3.5		5.0	16.5	590	
12 ÷ 72	6	12	17.5x27.0	2.0x2.5	230	3.0	7.0	540	
			17.5x28.0	2.0x3.5		4.0	12.5	560	
			17.5x31.0	3.0x3.5		5.0	16.5	620	

Recommended span lenght 50 m

Packaging
Wooden drums

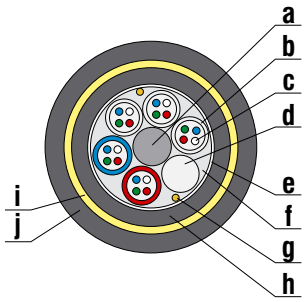
SELF-SUPPORTING

Optical fibre, self-supporting cables, reinforced, for power lines

Standard: ZN-EK-107.01 (draft)

Construction ADSS-XXOTKtsdD...kN

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8 or 12 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) inner sheath: polyethylene
i) core reinforcing element: aramid yarn on the cable core, hot-melted
j) outer sheath: polyethylene, black

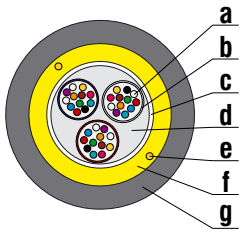


Cable types

ADSS-XXOTKtsdD...kN - self-supporting, multitube (**ADSS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**) of maximum working tension (**...kN**).

Construction ADSS-XXOTKtcdD...kN

a) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
b) colour wrapping filament
c) central tube with optical fibres filled
d) filling: hydrophobic jelly
e) 2 rip cords for sheath ripping
f) reinforcing element: aramid yarn
g) sheath: polyethylene, black



Options

option 1 - ADL (All Dielectric Lashed Cable)

Cable types

ADSS-XXOTKtcdD...kN - self-supporting, multitube (**ADSS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the central tube construction, jelly filled (**tc**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**) of maximum working tension (**...kN**).
ADL...kN - all dielectric lashed cable (**ADL**) of maximum working tension (**...kN**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
ADSS cables can be suspended on power lines, railway and tram poles.
ADL cables can be lashed to the ground wire or wrapped around it.

Properties

ADSS cables of tube construction are:

- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.

Suitable for suspension on telecommunication line poles, high, medium and low voltage power line poles, railway track and tram poles.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral.

An outer cable sheath is made of high density PE, resistant to abrasion, UV radiation and stress corrosion.

Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius:

- Single 15 x cable outer diameter
- Multiple 20 x cable outer diameter

Permissible pulling force during installation of ADSS cables: 15 % of RTS

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Standard factory length:

2100±50, 4200±100 m

Cable characteristics, construction and exploatation parameters (multitube construction)

Parameter	Unit	ADSS-XXOTKtsdD								
No. of fibres in the cable		4÷24								
Rated tensile strength (RTS)	[kN]	15	19	25	32	48	50	75	110	92
Maximum working tension (MWT)	[kN]	3.5	4.5	8.5	8	14	16.5	21	30	26
Outer diameter	[mm]	$12.8^{\pm0.2}$	$12.8^{\pm0.1}$	$13.2^{\pm0.2}$	$13.2^{\pm0.1}$	$14.3^{\pm0.1}$	$14.3^{\pm0.3}$	$15.5^{\pm0.1}$	$17.1^{\pm0.4}$	$15.5^{\pm0.1}$
Cable mass	[kg/km]	124	125	135	125	160	157	190	245	190
Cable cross section	[mm^2]	128	128	137	136	160	161	186	230	191
Aramid cross section*	[mm^2]	6.91	12.5	11.5	21	28	24.19	48	55	58
Cable Young's module	[GPa]	7.7	12.5	10.8	18.6	20.6	17.9	29.6	27.3	34.5
Cable temperature expansion coefficient	[$1/K \times 10^{-6}$]	7.41	5.8	4.99	2.9	2.3	2.07	0.80	0.45	0.50
Minimum bending radius	[mm]	190	200	200	200	215	220	230	260	240
Recomended Span distance	[m]	50	120	150	200	350	400	500	600	750

Parameter	Unit	ADSS-XXOTKtsdD								
No. of fibres in the cable		4÷48								
Rated tensile strength (RTS)	[kN]	15	19	25	32	48	50	75	110	92
Maximum working tension (MWT)	[kN]	3.5	4.5	8.5	8	14	16.5	21	30	26
Outer diameter	[mm]	$13.2^{\pm0.2}$	$13.6^{\pm0.1}$	$14.3^{\pm0.3}$	$14.2^{\pm0.1}$	$14.9^{\pm0.1}$	$14.6^{\pm0.4}$	$16.0^{\pm0.1}$	$17.5^{\pm0.4}$	$16.5^{\pm0.1}$
Cable mass	[kg/km]	140	145	148	155	175	169	200	247	215
Cable cross section	[mm^2]	137	145	161	158	174	167	201	240	213
Aramid cross section*	[mm^2]	6.91	12.5	11.5	21	28	24.19	50	55	60
Cable Young's module	[GPa]	7.4	11.3	9.5	16.3	19.2	17.5	28.7	26.3	32.2
Cable temperature expansion coefficient	[$1/K \times 10^{-6}$]	8.13	6.1	5.52	3.3	2.5	2.37	0.97	0.57	0.30
Minimum bending radius	[mm]	200	200	220	214	225	220	240	260	250
Recomended span distance	[m]	50	120	150	200	350	400	500	600	750

Cable characteristics, construction and exploatation parameters (multitube construction)

Parameter	Unit	ADSS-XXOTKtsdD							
No. of fibres in the cable		48÷72						72÷144	
Rated tensile strength (RTS)	[kN]	15	25	48	50	75	110	32	48
Maximum working tension (MWT)	[kN]	3.5	8.5	14	16.5	21	30	8	14
Outer diameter	[mm]	$15.6^{\pm0.4}$	$16.0^{\pm0.4}$	$15.9^{\pm0.2}$	$17.2^{\pm0.4}$	$17.0^{\pm0.2}$	$18.9^{\pm0.5}$	$17.3^{\pm0.2}$	$17.7^{\pm0.2}$
Cable mass	[kg/km]	165	175	190	206	219	255	235	247
Cable cross section	[mm^2]	191	201	198	232	227	280	235	246
Aramid cross section*	[mm^2]	6.91	12.05	28	28.55	51.5	56	23.4	31.2
Cable Young's module	[GPa]	5.9	8.5	17.4	15.1	26.6	23.3	12.6	15.6
Cable temperature expansion coefficient	[1/K$\times10^{-6}$]	10.2	6.75	2.7	2.7	0.98	0.87	8.0	5.6
Minimum bending radius	[mm]	230	240	240	260	260	280	260	270
Recomended span distance	[m]	50	150	350	400	500	600	200	350

Cable characteristics, construction and exploatation parameters (central tube construction)

Parameter	Unit	ADSS-XXOTKtcdD		
No. of fibres in the cable		4÷24		
Rated tensile strength (RTS)	[kN]	17	36	60
Maximum working tension (MWT)	[kN]	4.5	10	16
Outer diameter	[mm]	$10.5^{\pm0.1}$	$11.6^{\pm0.2}$	$12.7^{\pm0.2}$
Cable mass	[kg/km]	87	108	130
Cable cross section	[mm^2]	86	105	126
Aramid cross section*	[mm^2]	9.2	18.4	29
Cable Young's module	[GPa]	11.8	19.3	25.3
Cable temperature expansion coefficient	[1/K$\times10^{-6}$]	3.9	1.4	3.1
Minimum bending radius	[mm]	190	210	220
Recomended span distance	[m]	150	300	450

***Aramide reinforcement Young's module:** 115 GPa

Cable characteristics, construction and exploatation parameters (central tube construction)

Parameter	Unit	ADL							
No.of fibres in the cable (in a tube)		12		24		36		48	
Rated tensile strength (RTS)	[kN]	1.1	3.4	1.1	3.4	1.1	3.4	1.1	3.4
Maximum working tension (MWT)	[kN]	0.3	0.8	0.3	0.8	0.3	0.8	0.3	0.8
Outer diameter	[mm]	5.9	6.5	5.9	6.5	6.9	7.5	6.9	7.5
Cable mass	[kg/km]	27	32	28	33	39	44	39	45
Minimum bending radius	[mm]	120		140		150		150	

Others construction of ADSS cables can be design on customer request.

Packaging
Wooden drums

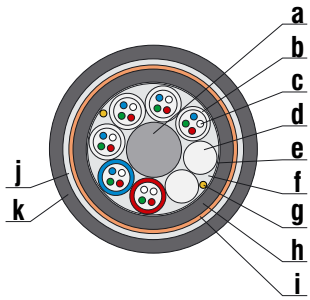
OUTDOOR, BURRIED

Optical fibre cables of the loose tube construction, armoured with steel, varnished tapes, reinforced and non-reinforced

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) inner sheath: polyethylene
i) cushion under the armour
j) armour: steel, varnished tapes
k) outer sheath: polyethylene, black



Options

option 1 - hydrophobic jelly filling
option 2 - aramid yarn reinforcement (glass yarn on request)

Cable types

Z-XXOTKtsFtl - outdoor (**Z-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) armoured with steel, varnished tapes (**Ftl**).
Z-XXOTKtsDFtl (**option 2**) - outdoor (**Z-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) with an aramid yarn reinforcing element on a core (**D**) armoured with steel, varnished tapes (**Ftl**).
Z-XXOTKtDFtl (**option 1,2**) - outdoor (**Z-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) with an aramid yarn reinforcing element on a core (**D**) armoured with steel, varnished tapes (**Ftl**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.

Cables are designed for:

- direct burial or installation on the ground, in areas of high risk damages,
- primary cable ducts.

Properties

Buried tube cables are:

- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral.
An outer cable sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius: 30 x cable outer diameter

Permissible pulling force during installation (temporary / permanent):

- Min. 2 700 [N] / 1 000 [N]
- Max.* 10 000 [N] / 5 000 [N]

** specified in the order*

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Cable characteristics Z-XXOTKtsFtl, Z-XXOTKtFtl, Z-XXzOTKtsFtl

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force (temporary) [N]	Factory length [m]
6 ÷ 36	6	6	14.8	250	444	2700	2100±100 4200±100
42 ÷ 48		8	16.1	300	483	2700	
54 ÷ 72		12	19.0	470	570	2700	
8 ÷ 48	8	6	14.8	250	444	2700	
56 ÷ 64		8	16.1	300	483	2700	
72 ÷ 96		12	19.0	470	570	2700	
12 ÷ 72	12	6	15.3	295	459	2700	
84 ÷ 96		8	16.9	360	507	2700	
108 ÷ 144		12	20.4	510	612	2700	
156 ÷ 216	12	18	20.5	520	615	2700	

Cable characteristics Z-XXOTKtsDFtl, Z-XXOTKtDFtl, Z-XXzOTKtDsFtl

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force [N]	Factory length [m]
6 ÷ 36	6	6	15.2	255	456	2700	2100±100 4200±100
42 ÷ 48		8	16.5	305	495	2700	
54 ÷ 72		12	19.4	475	582	2700	
8 ÷ 48	8	6	15.2	255	456	2700	
56 ÷ 64		8	16.5	305	495	2700	
72 ÷ 96		12	19.4	475	582	2700	
12 ÷ 72	12	6	15.7	300	471	2700	
84 ÷ 96		8	17.3	365	519	2700	
108 ÷ 144		12	20.8	515	624	2700	
156 ÷ 216	12	18	20.9	525	627	2700	

Packaging
Wooden drums

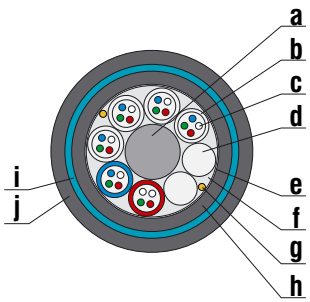
OUTDOOR, FOR SEWERAGE SYSTEM, BURRIED

Optical fibre cables of the loose tube construction, armoured with steel, corrugated tape, reinforced and non-reinforced

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) inner sheath: polyethylene
i) armour: steel, corrugated tape
j) outer sheath: polyethylene, black



Options

option 1 - hydrophobic jelly filling
option 2 - aramid yarn reinforcement (glass yarn on request)

Cable types

ZKS-XXOTKtsFf - outdoor for sewerage system (**ZKS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) armoured with steel, corrugated tape (**Ff**).
ZKS-XXOTKtsDFf (**option 2**) - outdoor for sewerage system (**ZKS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) with an aramid yarn reinforcing element on a core (**D**) armoured with steel, corrugated tape (**Ff**).
ZKS-XXOTKtDFf (**option 1,2**) - outdoor for sewerage system (**ZKS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) with an aramid yarn reinforcing element on a core (**D**) armoured with steel, corrugated tape (**Ff**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.

Cables are designed for:

- direct burial or installation on the ground, in areas of high risk damages,
- primary cable ducts.

Properties

Buried tube cables are:

- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral.
An outer cable sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius: 30 x cable outer diameter

Permissible pulling force during installation (temporary / permanent):

- Min. 2 700 [N] / 1 000 [N]
- Max.* 10 000 [N] / 5 000 [N]

** specified in the order*

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Cable characteristics ZKS-XXOTKtsFf, ZKS-XXOTKtFf, ZKS-XXzOTKtsFf

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force (temporary) [N]	Factory length [m]
6 ÷ 36	6	6	14.2	240	426	2700	
42 ÷ 48		8	15.6	270	468	2700	
54 ÷ 72		12	18.5	400	555	2700	
8 ÷ 48	8	6	14.2	240	426	2700	2100±100
56 ÷ 64		8	15.6	270	468	2700	
72 ÷ 96		12	18.5	400	555	2700	4200±100
12 ÷ 72	12	6	14.8	250	444	2700	
84 ÷ 96		8	16.3	330	489	2700	
108 ÷ 144		12	19.2	410	576	2700	
156 ÷ 216	12	18	19.3	410	579	2700	

Cable characteristics ZKS-XXOTKtsDFf, ZKS-XXOTKtDFf, ZKS-XXzOTKtsDFf

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force (temporary) [N]	Factory length [m]
6 ÷ 36	6	6	14.6	245	438	2700	
42 ÷ 48		8	16.0	275	480	2700	
54 ÷ 72		12	18.9	405	567	2700	
8 ÷ 48	8	6	14.6	245	438	2700	2100±100
56 ÷ 64		8	16.0	275	480	2700	
72 ÷ 96		12	18.9	405	567	2700	4200±100
12 ÷ 72	12	6	15.2	255	456	2700	
84 ÷ 96		8	16.7	335	501	2700	
108 ÷ 144		12	19.6	415	588	2700	
156 ÷ 216	12	18	19.7	415	591	2700	

Packaging
Wooden drums

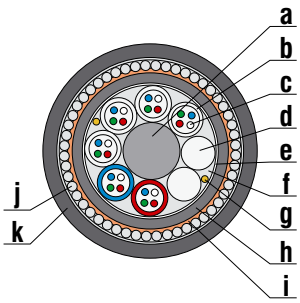
OUTDOOR, FOR SEWERAGE SYSTEM, BURRIED, UNDERWATER

Optical fibre cables of the loose tube construction, armoured with steel, round wires, reinforced and non-reinforced

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) inner sheath: polyethylene
i) cushion under the armour
j) armour: zinc, steel, round wires
k) outer sheath: polyethylene, black



Options

option 1 - hydrophobic jelly filling
option 2 - aramid yarn reinforcement (glass yarn on request)

Cable types

ZKS-XXOTKtsFo - outdoor for sewerage system (**ZKS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) armoured with steel, round wires (**Fo**).
ZKS-XXOTKtsDFo (**option 2**) - outdoor for sewerage system (**ZKS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) with an aramid yarn reinforcing element on a core (**D**), armoured with steel, round wires (**Fo**).
ZKS-XXOTKtDFo (**option 1,2**) - outdoor for sewerage system (**ZKS-**) with a polyethylene outer sheath (**X**) and a polyethylene inner sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) with an aramid yarn reinforcing element on a core (**D**), armoured with steel, round wires (**Fo**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
Cables are designed for:
• direct burial or installation on the ground, in areas of high risk damages,
• primary cable ducts.
Cables can be installed on the bottom of water reservoirs, under river crossings.

Properties

Buried, tube cables are:

- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral.
An outer cable sheath is resistant to abrasion, UV radiation as well as stress corrosion.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius: 30 x cable outer diameter

Permissible pulling force during installation (temporary / permanent):

- Min. 1 x weigh of 1km cable [N] / 0.5 x weight of 1km cable [N]
- Max.* 16 000 [N] / 8 000 [N]

** specified in the order*

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Cable characteristics ZKS-XXOTKtsFo, ZKS-XXOTKtFo, ZKS-XXzOTKtsFo

No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force (temporary) [N]	Factory length [m]
6 ÷ 36	6	6	17.7	560	531	5600	2100±100 4200±100
42 ÷ 48		8	19.1	625	573	6250	
54 ÷ 72		12	22.0	720	660	7200	
8 ÷ 48	8	6	17.7	560	531	5600	
56 ÷ 64		8	19.1	625	573	6250	
72 ÷ 96		12	22.0	720	660	7200	
12 ÷ 72	12	6	18.3	600	549	6000	
84 ÷ 96		8	19.8	680	594	6800	
108 ÷ 144		12	22.7	830	681	8300	
156 ÷ 216	12	18	22.8	830	684	8300	

Cable characteristics ZKS-XXOTKtsDFo, ZKS-XXOTKtDFo, ZKS-XXzOTKtsDFo

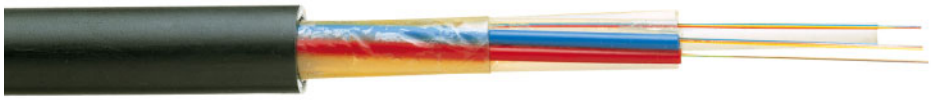
No. of fibres in a cable	Max. no. of fibres in a tube	No. of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force (temporary) [N]	Factory length [m]
6 ÷ 36	6	6	18.1	565	543	5650	2100±100 4200±100
42 ÷ 48		8	19.5	630	585	6300	
54 ÷ 72		12	22.4	725	672	7250	
8 ÷ 48	8	6	18.1	565	543	5650	
56 ÷ 64		8	19.5	630	585	6300	
72 ÷ 96		12	22.4	725	672	7250	
12 ÷ 72	12	6	18.7	605	561	6050	
84 ÷ 96		8	20.2	685	606	6850	
108 ÷ 144		12	23.1	835	693	8350	
156 ÷ 216	12	18	23.2	835	696	8350	

Packaging
Wooden drums

INDOOR

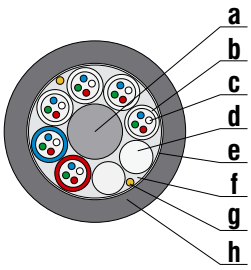
Optical fibre cables of the loose tube construction, flame retardant

Standard: ZN-EK-103



Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) sheath: halogen free flame retardant



Options

option 1 - polyvinyl chloride flame retardant sheath
option 2 - polyvinyl chloride sheath
option 3 - dry sealed loose tube on request

Cable types

W-NOTKtsd - indoor (**W-**) with a halogen free flame retardant sheath (**N**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
W-YnOTKtsd (option 1) - indoor (**W-**) with a polyvinyl chloride flame retardant sheath (**Yn**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
W-YOTKtsd (option 2) - indoor (**W-**) with a polyvinyl chloride sheath (**Y**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
W-NOTKtd - indoor (**W-**) with a halogen free flame retardant sheath (**N**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
Cables are designed for installation inside buildings, in railway and road tunnels.

Properties

Indoor tube cables are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.
- Can be installed close to the power lines

Metric overprint and cable marking is applied on the sheath.
Optional marking can be placed on the sheath upon request.

Minimum bending radius:
- Single 10 x cable outer diameter
- Multiple 20 x cable outer diameter

Permissible pulling force during installation:
2 500 [N]

Range of temperatures:
- Installation: -5°C ÷ +50°C
- Transport and storage: -30°C ÷ +60°C
- Operating: -20°C ÷ +50°C

Cable characteristics

No.of fibres in a cable	Max.no. of fibres in a tube	No.of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	10.8	119	108	216	2000	2100±100 4200±100
42 ÷ 48		8	12.1	144	121	242	2300	
54 ÷ 72		12	15.0	238	150	300	2500	
8 ÷ 48	8	6	10.8	119	108	216	2000	
56 ÷ 64		8	12.1	144	121	242	230	
72 ÷ 96		12	15.0	238	150	300	2500	
12 ÷ 72	12	6	11.3	131	113	226	2100	
84 ÷ 96		8	12.9	163	129	258	2500	
108 ÷ 144		12	16.4	269	164	328	2500	
156 ÷ 216	12	18	16.5	269	165	330	2500	

Packaging
Wooden drums

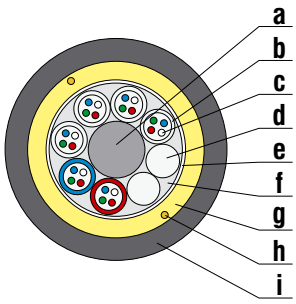
INDOOR, REINFORCED

Optical fibre cables of the loose tube construction, flame retardant, reinforced

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) reinforcing element: aramid yarns on the cable core
h) 2 rip cords for sheath ripping
i) sheath: halogen free flame retardant



Options

option 1 - hydrophobic jelly filling
option 2 - polyvinyl chloride flame retardant sheath
option 3 - polyvinyl chloride outer sheath

Cable types

W-NOTKtsdD *(recommended for application)* - indoor (**W-**) with a halogen free flame retardant sheath (**N**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
W-YnOTKtsdD (option 2) - indoor (**W-**) with a polyvinyl chloride flame retardant sheath (**Yn**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
W-YOTKtdD (option 3) - indoor (**W-**) with a polyvinyl chloride sheath (**Y**) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**)

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.
Cables are designed for:
- installation inside buildings,
- installation on walls outside buildings,
- installation in tunnels: railway, roads, in pit shafts,
- horizontal and vertical suspension.

Properties

Reinforced cables of the tube construction are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.
- Can be installed close to the power lines or suspended on poles of power lines.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius:

- Single 15 x cable outer diameter
- Multiple 20 x cable outer diameter

Permissible pulling force during installation (temporary / permanent):

- Min. 3 000 [N] / 1 000 [N]
- Max.* 10 000 [N] / 4 000 [N]

** specified in the order*

Range of temperatures:

- Installation: -15°C ÷ +50°C
- Transport and storage: -30°C ÷ +60°C
- Operating: -20°C ÷ +50°C

Cable characteristics

No.of fibres in a cable	Max.no. of fibres in a tube	No.of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	11.2	125	112	224	3000	2100±100
42 ÷ 48		8	12.5	150	125	250	3500	
54 ÷ 72		12	15.4	250	154	308	4000	
8 ÷ 48	8	6	11.2	125	112	224	3000	
56 ÷ 64		8	12.5	150	125	250	3500	
72 ÷ 96		12	15.4	250	154	308	4000	4200±100
12 ÷ 72	12	6	11.7	138	117	234	3000	
84 ÷ 96		8	13.3	169	133	266	3500	
108 ÷ 144		12	16.8	281	168	336	4000	
156 ÷ 216	12	18	17.3	275	173	346	4000	

Packaging
Wooden drums

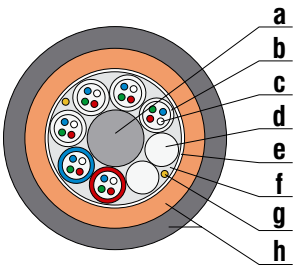
INDOOR & OUTDOOR, ANTIRODENT

Optical fibre indoor cables of the loose tube construction, reinforced and non-reinforced

Standard: ZN-EK-103

Construction

a) central strength member: a dielectric FRP rod with or without PE coating
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) filler: polyethylene
e) cable core: tubes or tubes and fillers stranded around central member; there are 6, 8, 12 or 18 elements in the core
f) core filling: dry sealing
g) 2 rip cords for sheath ripping
h) double layer sheath: polyamide-polyvinyl chloride ((VY)-polyamide on the outside) or polyvinyl chloride-polyamide ((YV)-polyvinyl chloride on the outside); sheath colouring: black or orange



Options

option 1 - hydrophobic jelly filling
option 2 - aramid yarn reinforcement (glass yarn on request)
option 3 - halogen free flame retardant instead of polyvinyl chloride

Cable types

ZW-(VY)OTKtsd - outdoor-indoor (**ZW-**) with a double layer polyamide-polyvinyl chloride sheath (**(VY)**) (polyamide on the outside) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
W-(YV)OTKtsd - indoor (**W-**) with a double layer polyvinyl chloride-polyamide sheath (**(YV)**) (polyvinyl chloride on the outside) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**).
ZW-(VY)OTKtdD (option 1,2) - outdoor-indoor (**ZW-**) with a double layer polyamide-polyvinyl chloride sheath (**(VY)**) (polyamide on the outside) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
W-(YV)OTKtdD (option 1,2) - indoor (**W-**) with a double layer polyvinyl chloride-polyamide sheath (**(YV)**) (polyvinyl chloride on the outside) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
ZW-(VN)OTKtsdD (option 3) - outdoor-indoor (**ZW-**) with a double layer polyamide-halogen free flame retardant sheath (**(VN)**) (polyamide on the outside) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).
W-(NV)OTKtdD (option 1,3) - indoor (**W-**) with a double layer halogen free flame retardant-polyamide sheath (**(NV)**) (halogen free flame retardant on the outside) optical fibre cable (**OTK**) of the loose tube construction with jelly filled core (**t**) fully dielectric (**d**) with an aramid yarn reinforcing element on a core (**D**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission, used in long-distance, wide-spread and local data networks in all area configurations.

Cables are designed for: installation inside buildings, on walls outside buildings, in tunnels: railway, roads, in pit shafts. Reinforced cables are designed for horizontal and vertical suspension.

Properties

Antirodent tube cables are:

- Fully dielectric,
- Resistant to electromagnetic interference,
- Tubes and core protected from moisture and longitudinal water penetration.
- Can be installed close to the power lines.

A dielectric central strength member as well as reinforcement on a core made of aramid yarn, joint by hot-melt, result in cable resistance to stress both longitudinal and lateral. A double layer polyvinyl chloride-polyamide cable sheath protects cables from rodents. Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius:

- Single 15 x cable outer diameter
- Multiple 20 x cable outer diameter

Permissible pulling force during installation:

- Min. 2 500 [N]
- Max.* 2 x weigh of 1 km cable [N]

** for reinforced cables*

Range of temperatures:

- Installation: -5°C ÷ +50°C
- Transport and storage: -30°C ÷ +60°C
- Operating: -20°C ÷ +50°C

Cable characteristics ZW-(VY)OTKtsd, W-(NV)OTKtsd (for non-reinforced cables)

No.of fibres in a cable	Max.no. of fibres in a tube	No.of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	11.6	150	116	232	2500	
42 ÷ 48		8	12.9	167	129	258	2500	
54 ÷ 72		12	15.8	259	158	316	2500	
8 ÷ 48	8	6	11.6	150	116	232	2500	2100±100
56 ÷ 64		8	12.9	167	129	258	2500	
72 ÷ 96		12	15.8	259	158	316	2500	4200±100
12 ÷ 72	12	6	11.7	150	117	234	2500	
84 ÷ 96		8	13.6	184	136	272	2500	
108 ÷ 144		12	16.4	265	164	328	2500	
156 ÷ 216	12	18	16.5	265	165	330	2500	

Cable characteristics ZW-(VY)OTKtsd, W-(NV)OTKtsdD (for reinforced cables)

No.of fibres in a cable	Max.no. of fibres in a tube	No.of tubes or tubes and fillers	Outer diameter [mm]	Cable mass [kg/km]	Min. bending radius		Permissible pulling force [N]	Factory length [m]
					single [mm]	multiple [mm]		
6 ÷ 36	6	6	12.2	155	122	244	3000	
42 ÷ 48		8	13.5	173	135	270	3500	
54 ÷ 72		12	16.4	270	164	328	4000	
8 ÷ 48	8	6	12.2	155	122	244	3000	2100±100
56 ÷ 64		8	13.5	173	135	270	3500	
72 ÷ 96		12	16.4	270	164	328	4000	4200±100
12 ÷ 72	12	6	12.7	155	127	254	3000	
84 ÷ 96		8	14.3	190	143	286	3500	
108 ÷ 144		12	17.5	270	175	350	4000	
156 ÷ 216	12	18	17.6	270	176	352	4000	

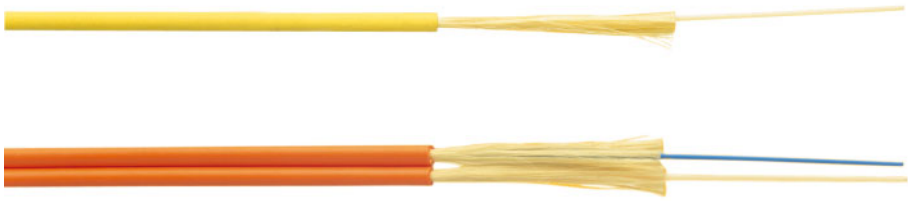
Packaging

Wooden drums

INDOOR

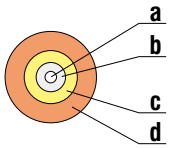
Optical fibre distribution cables of the tight tube construction, simplex and duplex

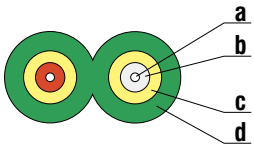
Standard: ZN-EK-106



Construction

a) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
Number of optical fibres in a cable: 1, 2.
c) tube: tight tube ∅ 0.9 mm
d) reinforcing element: aramid yarn
e) sheath: halogen free flame retardant





Options

option 1 - polyvinyl chloride flame retardant sheath
option 2 - polyvinyl chloride sheath

Cable types

W-NOTKSd (option 1) - indoor (**W-**) with a halogen free flame retardant sheath (**N**) optical fibre cable (**OTK**) distribution of the tight tube construction (**S**) fully dielectric (**d**).
W-YnOTKSd - indoor (**W-**) with a polyvinyl chloride flame retardant sheath (**Yn**) optical fibre cable (**OTK**) distribution of the tight tube construction (**S**) fully dielectric (**d**).
W-YOTKSd (option 2) - indoor (**W-**) with a polyvinyl chloride sheath (**Yn**) optical fibre cable (**OTK**) distribution of the tight tube construction (**S**) fully dielectric (**d**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission.
Cables are designed for:
- indoor installations,
- indoor, for connections between optoelectronic devices.

Cables can be used for optical installation and measuring cables (patch cord and pigtail).

Properties

Distribution cables with tight tubes are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Flexible and easy to install.
- Can be installed close to the power lines.
- Suitable for all types of cable connectors

Metric overprint and cable marking situated on the jacket.
Optional marking can be placed on the jacket upon request.

Minimum bending radius:

• Single	10 x cable outer diameter
• Multiple	20 x cable outer diameter

Range of temperatures:

- Installation: -5°C ÷ +50°C
- Transport and storage: -30°C ÷ +60°C
- Operating: -20°C ÷ +50°C

Cable characteristics

No. of fibres in a cable	Tight tube diameter [mm]	Cable outer dimensions [mm]	Cable mass [kg/km]	Permissible pulling force [N]	Min. bending radius (multiple) [mm]	Factory length [m]
1	$0.90^{+0.5}_{-0.10}$	$1.7^{\pm0.1}$	4	200	34	500±5
		$2.0^{\pm0.1}$	5		40	
		$2.4^{\pm0.2}$	9		48	
		$2.5^{\pm0.2}$	9		50	
		$2.8^{\pm0.2}$	10		60	
		$3.0^{\pm0.2}$	12		60	
2	$0.90^{+0.5}_{-0.10}$	$5.0^{(\pm0.5)} \times 2.5^{(\pm0.2)}$	18	500	50	
		$5.6^{(\pm0.5)} \times 2.8^{(\pm0.2)}$	20		60	
		$6.0^{(\pm0.5)} \times 3.0^{(\pm0.2)}$	24		60	

Packaging

Wooden or plastic drums

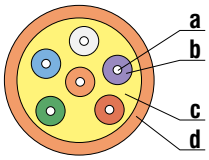
INDOOR

Optical fibre distribution cables of the tight tube construction, multiplex, terminating

Standard: ZN-EK-106

Construction

a) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
Number of optical fibres in a cable: 4, 6, 8, 12.
c) tube: tight tube ∅ 0.9 mm
d) reinforcing element: aramid yarn
e) sheath: halogen free flame retardant



Options

option 1 - polyvinyl chloride flame retardant sheath
option 2 - polyvinyl chloride sheath

Cable types

W-NOTKSd (option 1) - indoor (**W-**) with a halogen free flame retardant sheath (**N**) optical fibre cable (**OTK**) distribution, multi-fibre, terminating of the tight tube construction (**S**) fully dielectric (**d**).
W-YnOTKSd - indoor (**W-**) with a polyvinyl chloride flame retardant sheath (**Yn**) optical fibre cable (**OTK**) distribution, multi-fibre, terminating of the tight tube construction (**S**) fully dielectric (**d**).
W-YOTKSd (option 2) - indoor (**W-**) with a polyvinyl chloride sheath (**Yn**) optical fibre cable (**OTK**) distribution, multi-fibre, terminating of the tight tube construction (**S**) fully dielectric (**d**).

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission.
Cables are designed for:
- indoor installations,
- indoor, for connections between optoelectronic devices.

Properties

Distribution cables with tight tubes are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Flexible and easy to install.
- Can be installed close to the power lines.
- Suitable for all types of cable connectors

Metric overprint and cable marking situated on the jacket.
Optional marking can be placed on the jacket upon request.

Minimum bending radius:
- Single 10 x cable outer diameter
- Multiple 20 x cable outer diameter

Range of temperatures:

- Installation: -5°C ÷ +50°C
- Transport and storage: -30°C ÷ +60°C
- Operating: -20°C ÷ +50°C

Cable characteristics

No. of fibres in a cable	Tight tube diameter [mm]	Cable outer dimensions [mm]	Cable mass [kg/km]	Permissible pulling force [N]	Min. bending radius [mm]	Factory length [m]
4	$0.90^{+0.5}_{-0.10}$	5.0	30	1000	100	500±5
6			30		100	
8			40		100	
12		6.0	40		120	

Packaging

Wooden or plastic drums

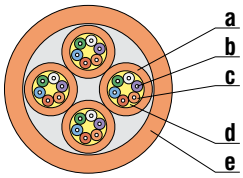
INDOOR

Optical fibre distribution cables of the tight tube construction, multiplex

Standard: ZN-EK-106

Construction

a) module with optical fibres (a module is made of the same material as the cable sheat and may contain from 4 to 12 optical fibre)
b) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
c) tube: tight tube ∅ 0.9 mm
d) reinforcing element: aramid yarn
e) sheath: halogen free flame retardant



Options

option 1 - polyvinyl chloride flame retardant sheath
option 2 - polyvinyl chloride sheath

Cable types

W-NNOTKSd () (option 1) - indoor (**W-**) with a halogen free flame retardant sheath (**N**) and a halogen free flame retardant module sheath (**N**) optical fibre cable (**OTK**) distribution, multi-fibre, distributing (**()**)* of the tight tube construction (**S**) fully dielectric (**d**).
W-YnYOTKSd () - indoor (**W-**) with a polyvinyl chloride flame retardant sheath (**Yn**) and a polyvinyl chloride module sheath (**Y**) optical fibre cable (**OTK**) distribution, multi-fibre, distributing (**()**)* of the tight tube construction (**S**) fully dielectric (**d**).
W-YYOTKSd () (option 2) - indoor (**W-**) with a polyvinyl chloride sheath (**Y**) and a polyvinyl chloride module sheath (**Y**) optical fibre cable (**OTK**) distribution, multi-fibre, distributing (**()**)* of the tight tube construction (**S**) fully dielectric (**d**).
**number of module in cable and number of optical fibres in a module e.g. (4x4)*

Application

Cables are designed for digital and analogue transmission in the whole range of the optical band, applied to all types of systems for: data, audio and video transmission.

Cables are designed for:
- indoor installations,
- indoor, for connections between optoelectronic devices and distributing networks inside buildings.

Properties

Distribution cables with tight tubes are:
- Fully dielectric,
- Resistant to electromagnetic interference,
- Flexible and easy to install.
- Can be installed close to the power lines.
- Suitable for all types of cable connectors.

Metric overprint and cable marking situated on the jacket.
Optional marking can be placed on the jacket upon request.

Minimum bending radius:

- Single 10 x cable outer diameter
- Multiple 20 x cable outer diameter

Range of temperatures:

- Installation: -5°C ÷ +50°C
- Transport and storage: -30°C ÷ +60°C
- Operating: -20°C ÷ +50°C

Cable characteristics

No. of fibres in a cable	No. of modules	No. of fibres in a module	Module diameter [mm]	Max. outer diameter [mm]	Cable mass [kg/km]	Min. bending radius [mm]	Permissible pulling force [N]	Factory length [m]
4	4	1	2.5	10.5	50	210	1600	500±5
6	6	1	2.5	11.5	60	230	2000	
8	8	1	2.5	14.5	90	280	3000	
12	12	1	2.5	17.0	100	340	4000	
16	4	4	5.0	17.5	160	350	4000	
24		6	5.0	17.5	160	350	6000	
32		8	5.0	17.5	180	350	8000	
48		12	6.0	19.0	180	380	10000	
24	6	4	5.0	19.5	180	390	4000	
36		6	5.0	19.5	180	390	6000	
48		8	5.0	19.5	200	390	8000	
72		12	6.0	22.5	200	450	10000	
32	8	4	5.0	24.5	200	490	4000	
48		6	5.0	24.5	300	490	6000	
64		8	5.0	24.5	400	490	8000	
96		12	6.0	28.5	430	570	10000	

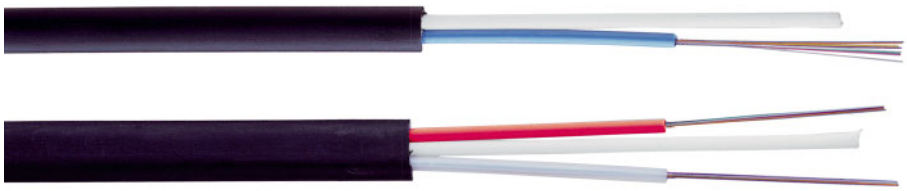
Packaging

Wooden or plastic drums

UNIVERSAL (INDOOR & OUTDOOR)

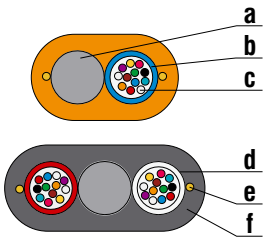
Optical fibre, flat cables of the loose tube construction

Standard: ZN-EK-108



Construction

a) strength member: a dielectric FRP rod
b) tube: loose tube with optical fibres filled with hydrophobic jelly
c) optical fibre: singlemode (J); singlemode, non zero dispersion shifted (Jn); multimode (G/50); multimode (G/62.5)
d) dry sealing water absorbing powder
e) 2 rip cords for sheath ripping
f) sheath: polyethylene, black or orange colour



Options

option 1 - antirodent sheath of double layer polyethylene-polyamide
option 2 - halogen free flame retardant sheath
option 3 - polyvinyl chloride flame retardant sheath

Cable type

Z-XOTKtsdp - outdoor (**Z-**) with a polyethylene sheath (**X**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with dielectric strength member symmetrically placed between tubes (or by side of one tube), flat shape (**p**).
Z-(XV)OTKtsdp (option 1) - outdoor (**Z-**) with antirodent double layer polyethylene-polyamide sheath (**(XV)**) (polyethylene on the outside) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with dielectric strength member symmetrically placed between tubes (or by side of one tube), flat shape (**p**).
ZW-NOTKtsdp (option 2) - outdoor-indoor (**ZW-**) with a halogen free flame retardant sheath (**N**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with dielectric strength member symmetrically placed between tubes (or by side of one tube), flat shape (**p**).
ZW-YnOTKtsdp (option 3) - outdoor-indoor (**ZW-**) with a polyvinyl chloride flame retardant sheath (**Yn**) optical fibre cable (**OTK**) of the loose tube construction with dry sealing core (**ts**) fully dielectric (**d**) with dielectric strength member symmetrically placed between tubes (or by side of one tube), flat shape (**p**).

Identification of tube

- **one tube cable** up to 12 fibres: tube of any colour
- **two tubes cable** up to 24 fibres: 1- tube red, 2- tube natural

Application/Properties

The outdoor cable designed for digital or analogue signals transmission (data, voice, video) in full optical band, in telecommunication networks of any space configuration e.g.
- broadband acces networks,
- CATV networks,
- LAN (scientific, college, industrial etc.),
- temporary networks for transmissions of sport , entertainment and public events etc.

Cable can be laid into primary or secondary duct systems - particularily when space limitations occurs.
For temporary applications burry of cable as well as hanging up to aerial low voltage power lines (span distance up to 50 m) is allowed.
The cable is especially recommended for servicing and retrieval of damaged cable lines.

Z-XOTKtsdp cable featuring:

- fully dielectric, corrosion proof, electromagnetic surge proof,
- electromagnetic disturbance proof,
- protection against ingress of humidity or water (dry absorber technology)
- can be laid close to the low voltage power lines,
- can be laid inside standard secondary ducts pipes.

Cable sheath guarantees high protection to abrasion, UV radiation and environmental stress cracking.
Optionally applied colour sheath shall make easier and faster to recognize the cable among others in cable bunch.
Metric overprint and cable marking is applied on the sheath. Optional marking can be placed on the sheath upon request.

Minimum bending radius (y-z axis):

- Once 55 mm
- Repeated 110 mm

Minimum bending radius (x-z axis):

- Once 60 mm
- Repeated 160 mm (one tube cable) / 210 mm (two tubes cable)

Range of temperatures:

- Installation: -15°C ÷ +60°C
- Transport and storage: -40°C ÷ +70°C
- Operating: -40°C ÷ +70°C

Others mechanical parameters of cable (approximately)

- Impact: 10 Nm
- Crush 3000 N

Cable characteristics

No. of optical fibres in cable	Max. no. of optical fibres in a tube	No. of tubes	Outer dimensions [mm]	Cable mass [kg/km]	Min. bending radius once y-z / x-z [mm]	Min. bending radius repeated y-z / x-z [mm]	Permissible pulling force [N]	Standard factory length [m]
4 ÷ 12	12	1	5.5x8.0	45	55/60	110/160	1000	1000, 2000
4 ÷ 24	24	2	5.5x10.5	58	55/60	110/210	1000	4200±100

Cable packaging

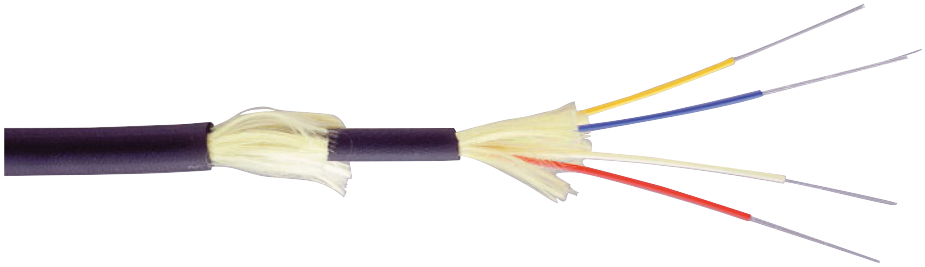
Wooden drums, the end of cables sealed against water and accessible for measurements.

Supplementary information

On account the cable allows very small bending radius it can be also installed into previously occupied secondary duct pipes, by means of mechanical pulling. Service friendly dry sealing (no gel inside cable core) and use of rip cords result in reducing time of making necessary works and provide good quality, low loss splice (average 0,03 dB).

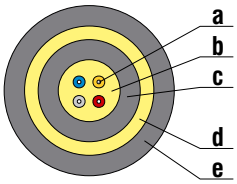
TACTICAL

Optical fibre field cables of the semitight tube construction, distributing



Construction

a) optical fibre: multimode (G/50); multimode (G/62.5)
c) tube: tight tube ∅ 0.9 mm
d) inner layer reinforcing element: aramid yarn
e) inner sheath: halogen free polyurethane
d) outer layer reinforcing element: aramid yarn
e) outer sheath: halogen free polyurethane



Options

option 1 - optical fibre singlemode (J) or singlemode, non zero dispersion shifted (Jn)
option 2 - number of fibre in a cable up to 12

Cable types

PSKD 1x2G - distribution field cable with 2 multimode graded fibres.
PSKD 1x4G - distribution field cable with 4 multimode graded fibres.

Identification

Color of tube: 1-red, 2-blue, 3-natural, 4-yellow.
Color of sheath: black or gray.
Metric overprint and cable marking situated on the jacket.
Optional marking can be placed on the jacket upon request.

Application

Cables PSKD are designed for:

- military tactical field communications systems,
- field communications systems on areas of mining, geological, archeological explorations, as well on as under ground
- field communications systems on industrial areas, especially chemical plants or oil refineries whereas building and restoring of installations, in presence of industrial hazards, as well on as under ground
- temporary field communication and video signals transfer systems - TV coverage of new events on open area or in town
- temporary watch and guard systems of restricted areas or building when high data transfer rates are requested e.g. video camera signals.

Properties

- Lightweight, strong, aramid yarn reinforced cable designed for military tactical field use or commercial applications; provides easy way to set the field communication network,
- designed for use in adverse environments where reduced size and weight are important (weight of cable ca. 27 kg/km), outdoors on the ground in all terrain, for deployment/retrieval applications in presence of mechanical damage hazard,
- double polyurethane jacketed for abrasion, environmental and chemical resistance; reduced flame propagation
- crush resistant and resilient, with aramid yarn reinforced thus providing good protection of optical fibres,
- high speed data transfer capable; due to optical transmission the cable is noise proof and tap protected

Minimum bending radius:
- Single 85 mm
- Multiple 110 mm

Range of temperatures:
- Transport and storage: -55°C ÷ +75°C
- Operating: -30°C ÷ +50°C

Cable characteristics

No. of fibres in a cable	Diameter of semitight tube [mm]	Max. outer diameter [mm]	Cable mass [kg/km]	Min. bending radius (single) [mm]	Min. bending radius (multiple) [mm]	Max. allowable tensile load [N]	Factory length [m]
2	$0.90^{+0.05}_{-0.10}$	$6.0^{\pm 0.5}$	27	85	110	2500	500
4	$0.90^{+0.05}_{-0.10}$	$6.0^{\pm 0.5}$	28	85	110	2500	

Repeated bending resistance: 5000 bends

Flexing around rollers resistance: 100000 cycles

Packaging

Wooden drums