



Commercial information		Properties	Unit
Product group		Hybrid cable	
Series		Combination cable	
Type		CombiCable HFFR	
Description	Cat.6 U/UTP + MDIC 4x SM G.657.A1		
Net weight		96	kg/km
Marking	TKF - COMBICABLE Cat.6 U/UTP + MDIC 4x SM G.657A LSZH 14828 {Batch} {Year} {Length}		

Article number / standard length	EAN number	Properties	Unit
14828	8713182121297	Drum à 1	m

This cable consists of the following cables

Article Nr.	No. of cables	Description
13996	1	Signal-/telecommunications cable Cat.6 U/UTP 4x2x23AWG LSZH oranje (crossmember)
69274	1	Fibre optic cable MDIC LSZH 4x SM G.657.A1

Construction	Properties	Unit
Computer data cable (copper)	Yes	
Computer data cable (fibre optic)	Yes	
Halogen free (acc. EN 50267-2-2)	Yes	
Low smoke (acc. EN50268-2)	Yes	
Flame retardant	Yes	
Core lay-up	Cat.6 UTP + MDIC 4x SM G.657A LSZH	
Material outer sheath	LSZH	
Colour outer sheath	White	
Flame retardant	IEC 60332-3-24 Cat. C	

Characteristics for use	Properties	Unit
Halogen free	IEC 60754-1	
Low smoke	Acc. EN 50268-1 /EN 50268-2	
acidity waste gas	IEC 60754-2	
Transportation and storage temperature	-30 / 70	°C
Operating temperature, flexible	0 / 50	°C
Operating temperature, fixed	-15 / 70	°C
Application	Inside	

Technical characteristics	Properties	Unit
Diameter over assembly	10.5 / 6.5	mm
Outer sheath thickness	1.0	mm
Max. outer diameter from/to	12.5 / 8.5	mm
Tensile load	150	N



Mechanical characteristics	Properties	Unit
Bending radius during installation	250	mm
Bending radius after installation	160	mm



Commercial information		Properties	Unit
Product group		Hybrid cable	
Series	Signal-/telecommunications cable		
Type	Cat.6 U/UTP		
Description	4x2x23AWG LSZH oranje (crossmember)		
Net weight		45	kg/km

Article number / standard length	EAN number	Properties	Unit
13996		Overig à 1	m
13996R X 305		Ring à 305	m

Construction		Properties	Unit
Standardization	ISO/IEC 11801, TIA/EIA 568 A/B		
Halogen free (acc. EN 50267-2-2)		Yes	
Low smoke (acc. EN50268-2)		Yes	
Flame retardant		Yes	
Stranding element		Pair	
Core identification		Colour	
Colour insulated wires	Wht-BI/Blue, Wht-Or/Orange, Wht-Gr/Green, Wht-Br/Brown		
Number of cores		8	
Number of stranding elements		4	
Number of conductors per group		2	
Conductor diameter		0.57	mm
Nominal cross section conductor		0.25	mm ²
Conductor material		Copper	
Conductor category		Class 1 = solid	
Core insulation		PE	
Material outer sheath		LSZH	
Colour outer sheath		Orange	

Characteristics for use		Properties	Unit
Insulation thickness		0.21	mm
Outer sheath thickness		0.5	mm
Outer diameter approx.		6.2	mm
Bending radius after installation		55	mm
Transportation and storage temperature		-30 / 70	°C
Operating temperature, flexible		5 / 40	°C
Operating temperature, fixed		-15 / 70	°C
Tensile load		80	N

Cat.6 U/UTP

Technical characteristics	Properties	Unit
Conductor DC resistance @ 20 °C	93	Ohm/km
Velocity factor	65	%
Heat content	0.45	MJ/m
Characteristic impedance	100	Ohm
Structural return loss @ 1-20 MHz	23	dB/100mtr
Return loss @ 1 MHz	20	dB/100mtr
Return loss @ 4 MHz	23	dB/100mtr
Return loss @ 10 MHz	25	dB/100mtr
Return loss @ 16 MHz	25	dB/100mtr
Return loss @ 20 MHz	25	dB/100mtr
Return loss @ 31.2 MHz	23.6	dB/100mtr
Return loss @ 62.5 MHz	21.5	dB/100mtr
Return loss @ 100 MHz	20.1	dB/100mtr
Return loss @ 200 MHz	18	dB/100mtr
NEXT @ 4 MHz	65.3	dB
NEXT @ 1 MHz	74.3	dB
NEXT @ 10 MHz	59.3	dB
NEXT @ 16 MHz	56.2	dB
NEXT @ 20 MHz	54.8	dB
NEXT @ 31.2 MHz	51.9	dB
NEXT @ 62.5 MHz	47.4	dB
NEXT @ 100 MHz	44.3	dB
PS NEXT @ 1 MHz	72.3	dB
PS NEXT @ 4 MHz	63.3	dB
PS NEXT @ 10 MHz	57.3	dB
PS NEXT @ 16 MHz	54.2	dB
PS NEXT @ 20 MHz	52.8	dB
PS NEXT @ 31.2 MHz	49.9	dB
PS NEXT @ 62.5 MHz	45.4	dB
PS NEXT @ 100 MHz	42.3	dB
Attenuation @ 1 MHz	20	dB/km
Attenuation @ 4 kHz	38	dB/km
Attenuation @ 10 MHz	60	dB/km
Attenuation @ 20 MHz	85	dB/km
Attenuation @ 16 MHz	76	dB/km
Attenuation @ 31.2 MHz	107	dB/km
Attenuation @ 62.5 MHz	154	dB/km
Attenuation @ 100 MHz	198	dB/km
Attenuation @ 200 MHz	290	dB/km
Attenuation @ 250 MHz	328	dB/km
EL FEXT @ 1 MHz	67.8	dB/100mtr
EL FEXT @ 4 MHz	55.8	dB/100mtr
EL FEXT @ 10 MHz	47.8	dB/100mtr
EL FEXT @ 16 MHz	43.7	dB/100mtr
EL FEXT @ 20 MHz	41.8	dB/100mtr
EL FEXT @ 31.2 MHz	37.9	dB/100mtr

Cat.6 U/UTP



Technical characteristics	Properties	Unit
EL FEXT @ 62.5 MHz	31.9	dB/100mtr
EL FEXT @ 100 MHz	27.8	dB/100mtr
EL FEXT @ 200 MHz	21.8	dB/100mtr
PS EL FEXT @ 1 MHz	64.8	dB/100mtr
PS EL FEXT @ 4 MHz	52.8	dB/100mtr
PS EL FEXT @ 10 MHz	44.8	dB/100mtr
PS EL FEXT @ 16 MHz	40.7	dB/100mtr
PS EL FEXT @ 20 MHz	38.8	dB/100mtr
PS EL FEXT @ 31.2 MHz	34.9	dB/100mtr
PS EL FEXT @ 62.5 MHz	28.9	dB/100mtr
PS EL FEXT @ 100 MHz	24.8	dB/100mtr
PS EL FEXT @ 200 MHz	21.8	dB/100mtr

Commercial information		Properties	Unit
Product group		Hybrid cable	
Series		Fibre optic cable	Single mode
Type		MDIC LSZH	
Description		4x SM G.657.A1	
Net weight		13	kg/km
Marking	ACE-TKF MDIC LSZH 4x SM G.657A 69274 {Year} {Batch} {Length}		

Article number / standard length	EAN number	Properties	Unit
69274	8713182108694	Drum à 1	m
69274H X 1000/20	8713182102739	Drum à 1000	m

Construction	Properties	Unit
Test procedures	IEC 60794-1-2	
Application	Inside	
Cable metal free	Yes	
Strain relief	Yes	
UV resistant	Yes	
Halogen free (acc. EN 50267-2-2)	Yes	
Low smoke (acc. EN50268-2)	Yes	
Longitudinal water blocking	No	
Number of fibres	4	
Fibre type	Single mode	
Optical fibre standard	ITU-T G.657.A1	
Type of strain relief	FRP	
Strip method	Double sided Rip seam	
Material outer sheath	LSZH	
Colour outer sheath	White	

Characteristics for use	Properties	Unit
UV-protection	ISO 4892/2	
Caloric value	0.194	MJ/m
Outer sheath thickness	1	mm
Outer diameter approx.	3.7	mm
Bending radius during installation	56	mm
Bending radius after installation	37	mm
Bending radius cable sinlge bend (max. 4x 90°)	30	mm
Bending radius fibre storage (<10 turns acc ITU rec)	15	mm
Tensile load short term (Tm)	150	N
Tensile load Long Term (TI)	50	N
Installation temperature	-10 / 50	°C
Operation temperature range	-30 / 70	°C
Transportation and storage temperature	-30 / 70	°C

MDIC LSZH



Technical characteristics	Properties	Unit
Attenuation @ 1310 nm	0.4	dB/km
Attenuation @ 1550 nm	0.3	dB/km
Crush resistance acc. meth.E3A	1400	N/dm
Crush resistance acc. meth.E3B	1100	N/dm
Mandrel diameter by Crush meth. E3B	50	mm
Impact strength	3	J
Striking surface radius	10	mm
Torsion resistance	1800	°/m
Kink resistance	30	mm

Product Characteristics - Optical fibres

Fibre:		
type of fibre	hydrogen passivated, dispersion unshifted, matched cladding bending loss insensitive singlemode fibre 9/125µm	
standard	IEC-60793-2-50, B6-a1	
standard	ITU-T G.657.A1	

Characteristics:	Properties	Unit
Mode field diameter; 1310nm	9.0 ± 0.3	µm
Mode field diameter; 1550nm	10.2 ± 0.4	µm
Core non-circularity	max. 6	%
Core/Cladding concentricity error	max. 0.4	µm
Cladding diameter	125.0 ± 0.5	µm
Cladding non-circularity	max. 0.6	%
Coating diameter, uncoloured	242 ± 5	µm
Coating diameter, coloured	254 ± 7	µm
Coating/Cladding concentricity error	max. 8	µm
Temperature sensitivity; -60°C to +85°C	max. 0.05	dB/km
Bending sensitivity - 10 turns around Ø30mm - 1550nm	max. 0.1	dB
Bending sensitivity - 10 turns around Ø30mm - 1625nm	max. 0.3	dB
Bending sensitivity - 1 turn around Ø20mm - 1550nm	max. 0.75	dB
Bending sensitivity - 1 turn around Ø20mm - 1625nm	max. 1.5	dB
Proof test level	min. 0.69	GPa
Fibre curl	min. 4	m
Cable cut-off wavelength	max. 1260	nm
Zero-dispersion wavelength	1300 - 1322	nm
Zero-dispersion slope	max. 0.090	ps/nm ² .km
Chromatic dispersion; 1285nm - 1330 nm	max. 3.0	ps/nm.km
Chromatic dispersion; 1550nm	max. 17.0	ps/nm.km
Chromatic dispersion; 1625nm	max. 21.0	ps/nm.km
Polarisation mode dispersion; PMD _Q	max. 0.20	ps/√km
Max. attenuation at 1383nm (α ₁₃₈₃) [note a]	< max. α ₁₃₁₀	
Effective Group Core Refractive Index; 1310 nm	1.465	-
Effective Group Core Refractive Index; 1550 nm	1.465	-
Effective Group Core Refractive Index; 1625 nm	1.465	-

note a: after hydrogen ageing