



# Cables & Connectors

High Screening and Easy Installation



**KATHREIN**  
Digital Systems GmbH

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## Kathrein Coaxial Cables

### > CE Marking and Declaration of Performance According to Construction Products Regulation 305/2011

Communication cables that are permanently installed in structures are covered by the European Regulation 305/2011 (Construction Products Regulation, CPR).

The publication of standard EN 50575:2014 in the Official Journal of the European Union laid the foundation for the implementation of the CPR by all market participants. This standard describes "Power Cables and Lines, Control and

Communication Cables – Cables and Wires for general applications in structures relating to fire performance requirements". Since 1 July 2017, cable manufacturers must have their products tested and certified by a notified European testing institute and provide them with a CE marking and a corresponding declaration of performance.

#### Proposal of the ZVEI for the fire classes to be used for cables under the Construction Products Regulation

Fire classification				Safety requirements in buildings
Flame propagation/ heat development	Smoke development/ smoke density	Burning drops	Acid development/ corrosiveness	
B2ca	s1	d1	a1	Very high
Cca	s1	d1	a1	High
Dca	s2	d2	a1	Medium
Eca	–	–	–	Low
Fca	–	–	–	None

Cables of the fire classes Aca and B1ca are currently not required or relevant in Germany.

### > High-quality Coaxial Cable LCD 130 A+ With very high fire class B2ca

The new LCD 130 A+ coaxial cable (fire class B2ca) has a screening of typically 130 dB and extremely low attenuation values. **It can therefore be used for emergency exits, hospitals, schools, kindergartens, etc.** even over longer distances without intermediate amplifiers.



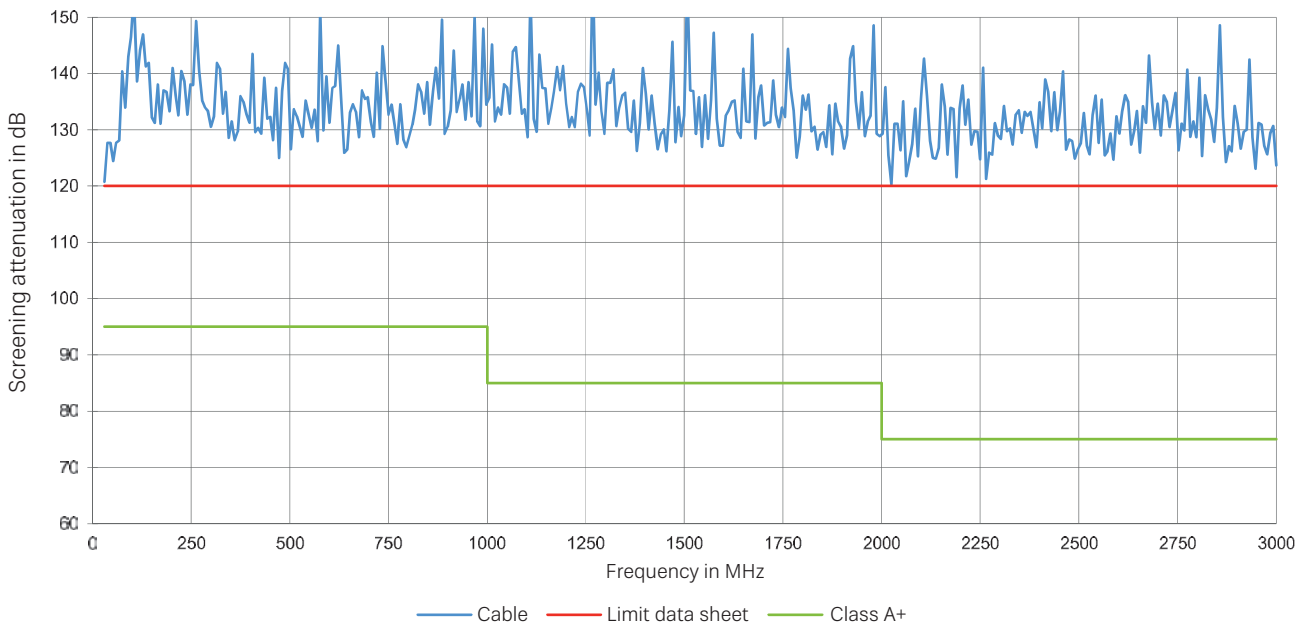
Cable types LCD 111 A+, LCD 115 A+, LCD 120 A+ and LCD 130 A+ are approved by Vodafone Kabel Deutschland and certified by dibkom (German Institute for Broadband Communication).

**> Kathrein Coaxial Cables Compliant with CPR 305/2011**  
With high screening



Type	Fire classes EN 50575	
LCD 89	Eca	
LCD 90	Eca	
LCD 111 A+	Eca	
LCD 115 A+	Cca s1a d1 a1	
LCD 120 A+	Eca	
LCD 130 A+	B2ca s1a d0 a1	
LCM 14 A+	Dca s1a d1 a1	
LCM 17 A+	Fca	
LCM 33	Earth cable/Fca	
LCM 50	Earth cable/Fca	
LCM 96	Earth cable/Fca	

**> Measurement Diagram LCD 120 A+**  
Screening attenuation typ. 130 dB



## > Coaxial Connectors with High Screening and Easy Installation Properties



Type	Order No.	Description	
EMK 01	273167	F-type screw-on connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 90 dB; screening class A	
EMK 02	21210014	F-type quick screw-on connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 90 dB; screening class A	
EMK 104	273195	F-type cable fitting for cable LCM 33; for outdoor mounting; screening factor 90 dB; screening class A	
EMK 105	273196	F-type cable fitting for cable LCM 50; for outdoor mounting; screening factor 90 dB; screening class A	
EMK 106	273197	F-type cable fitting for cable LCM 96; for outdoor mounting; screening factor 90 dB; screening class A	
EMK 11	273263	F-type crimpable connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 90 dB; screening class A	
EMK 12	21210018	F-type compression connector for coaxial cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 120/105 dB; screening class A+	
EMK 15	273276	F-type screw-on connector for cable LCD 89; screening factor > 90 dB; screening class A	
EMK 17	273291	F-type screw-on connector for cables LCM 14 A+, LCM 17 A+; screening factor > 90 dB; screening class A	
EMK 18	21210013	F-type crimpable connector for cables LCM 14 A+, LCM 17 A+; screening factor > 90 dB; screening class A	
EMK 19	21210019	F-type compression connector for cables LCM 14 A+, LCM 17 A+; screening factor > 120/105 dB; screening class A	
EMK 20 Plus	212500023	Self-install F-type connector for cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 120/105 dB; screening class A+	
EMK 21	273120	IEC connector for cables with $\varnothing = 4-7$ mm: LCD 89, LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor VHF > 75 dB, UHF > 65 dB	
EMK 62	273123	IEC socket for cables with $\varnothing = 4-7$ mm: LCD 89, LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor VHF > 75 dB, UHF > 65 dB	
EMK 63	21210030	IEC compression connector for coaxial cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 85 dB; screening class A	
EMK 64	21210031	IEC compression socket for coaxial cables LCD 90, LCD 120 A+, LCD 111 A+, LCD 115 A+, LCD 130 A+; screening factor > 85 dB; screening class A	

## > Connector Installation Sets for Professional, Quick Installation

### ZAH 12 | 21410008

Compression connector set including:

- Plastic box
- 100 compression connectors EMK 12
- Compression tool ZAW 13 (suitable for EMK 12/EMK 19)
- Cable stripper RG 6/59

### ZAH 15 | 21410013





Self-install connector set including:

- Plastic box
- 100 self-install connectors EMK 20 Plus
- Cable stripper ZAW 16










## Features and Benefits of Kathrein Coaxial Cables

- The cables meet the electrical requirements of the cable companies (except LCD 89 and 90)
- The CE Declarations of Conformity comply with the following standards and directives: EN 50575, EN 60728-11, EN 50581, EN 50117-2-3/-2-4, RoHS

		 LCD 89	 LCD 90	 LCD 111 A+	 LCD 115 A+
Order no.	100 m (one-way coil)	21510004	21510015	21510025	21510028
	250 m (dispenser box)	×	×	×	×
	250 m (one-way coil)	×	×	21510026	×
	500 m (one-way drum)	×	21510017	21510027	21510029
	Special lengths on request	×	×	×	×
Features	Attenuation	Low	Low	Very low	Very low
	Screening	Good	Good	Extremely good	Extremely good
	Cost per metre	Low	Very low	Low	Low
	Fire classification	Low	Low	Low	High
	Diameter	Extra thin/flex.	Standard	Standard	Standard
	UV resistant	✓	✓	✓	✓
Method of laying	Inside buildings	✓	✓	✓	✓
	Outside buildings	×	×	×	✓
	Underground	×	×	×	×
Dimensions	Inner conductor	0.75 mm Cu	1.0 mm Staku	1.13 mm Cu	1.13 mm Cu
	Outer sheath	5 mm	6.8 mm	6.9 mm	6.9 mm
Fire classification	CPR 305/2011	Eca	Eca	Eca	Cca s1a d1 a1
Outer sheath	Material	PVC white	PVC white	PVC white	Halogen free/black
Screening class		A	A	A++	A++
Screening attenu. typ./100 m	5–2400 MHz	90 dB	90 dB	130 dB	130 dB
Attenuation typ./100 m	50 MHz	6.3 dB	4.3 dB	4.1 dB	4.1 dB
	450 MHz	18.3 dB	13.4 dB	12.0 dB	12.0 dB
	862 MHz	26.1 dB	18.4 dB	17.1 dB	17.1 dB
	1000 MHz	28.0 dB	20.1 dB	18.5 dB	18.5 dB
	2150 MHz	43.1 dB	30.5 dB	28.4 dB	28.4 dB
	2400 MHz	45.0 dB	32.6 dB	29.9 dB	29.9 dB
Return loss. typ./100 m	5–2400 MHz	≥ 20–16 dB	≥ 26–20 dB	≥ 26–18 dB	≥ 26–18 dB
Coupling resistance DOCSIS 3.1 return path	5–30 MHz	< 5 mΩ/m	< 10 mΩ/m	≤ 0.9 mΩ/m DOCSIS 3.x	≤ 0.9 mΩ/m DOCSIS 3.x
Suitable Connectors	Threaded	EMK 15	EMK 01/ EMK 02/ EMK 21/EMK 62	EMK 01/ EMK 02/ EMK 21/EMK 62	EMK 01/ EMK 02/ EMK 21/EMK 62
	Crimpable F male	×	EMK 11	EMK 11	EMK 11
	Compress. F male	×	EMK 12	EMK 12	EMK 12
	Self-install F male	×	EMK 20 Plus	EMK 20 Plus	EMK 20 Plus
	Compress. IEC male	×	EMK 63	EMK 63	EMK 63
	Compress. IEC female	×	EMK 64	EMK 64	EMK 64








- The cables comply with the Construction Products Regulation 305/2011; valid since 1 July 2017 (Fire Safety Regulations)
- The cables have metre and jacket markings (manufacturer's name)

 LCD 120 A+	 LCD 130 A+	 LCM 14 A+	 LCM 17 A+	 LCM 33	 LCM 50	 LCM 96
21510036	21510039	21510030	21510034	×	×	×
21510043	21510042	×	×	×	×	×
×	×	215500011	215500012	×	×	×
21510038	21510041	21510031	21510035	271623	271622	271624
×	×	×	×	24510061	24510062	24510063
Low	Very low	Very low	Very low	Extremely low	Extremely low	Extremely low
Extremely good	Extremely good	Extremely good	Extremely good	Extremely good	Extremely good	Extremely good
Very low	Low	Low	Low	Average	Average	Average
Low	Very high	Medium	Low	n/a	n/a	n/a
Standard	Standard	Large	Large	1 qKx broadb. cable	1 nKx broadb. cable	1 iKx broadb. cable
✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	×	×	×	×
×	×	✓	✓	✓	✓	✓
×	×	×	✓	✓	✓	✓
1.02 mm Cu	1.13 mm Cu	1.63 mm Cu	1.63 mm Cu	3.3 mm Cu	2.2 mm Cu	1.1 mm Cu
6.8 mm	6.9 mm	10.4 mm	10.4 mm	17 mm	12.5 mm	11.0 mm
Eca	<b>B2ca s1a d0 a1</b>	Dca s1a d1 a1	Fca	Earth cable/Fca	Earth cable/Fca	Earth cable/Fca
PVC white	Halogen free/white	Halogen free/black	PE black	PE black	PE black	PE black
A+	A++	A+	A+	A++	A++	A++
130 dB	130 dB	120 dB	120 dB	120 dB	120 dB	115 dB
4.3 dB	4.1 dB	2.8 dB	2.8 dB	1.2 dB	1.8 dB	3.6 dB
12.9 dB	12.0 dB	8.6 dB	8.6 dB	4.0 dB	6.0 dB	11.5 dB
18.2 dB	17.1 dB	12.2 dB	12.2 dB	5.5 dB	8.7 dB	16.0 dB
19.7 dB	18.5 dB	13.1 dB	13.1 dB	7.0 dB	10.0 dB	18.3 dB
29.9 dB	28.4 dB	20.3 dB	20.3 dB	10.6 dB	16.2 dB	29.2 dB
31.8 dB	29.9 dB	21.8 dB	21.8 dB	11.5 dB	17.7 dB	31.7 dB
≥ 26–18 dB	≥ 26–18 dB	≥ 26–20 dB	≥ 26–20 dB	≥ 28–20 dB	≥ 28–20 dB	≥ 28–20 dB
≤ 2.5 mΩ/m	≤ 0.9 mΩ/m DOCSIS 3.x	≤ 2.5 mΩ/m	≤ 2.5 mΩ/m	≤ 0.1 mΩ/m DOCSIS 3.x	≤ 0.1 mΩ/m DOCSIS 3.x	≤ 0.3 mΩ/m DOCSIS 3.x
EMK 01/ EMK 02/ EMK 21/EMK 62	EMK 01/ EMK 02/ EMK 21/EMK 62	EMK 17	EMK 17	EMK 104	EMK 105	EMK 106
EMK 11	EMK 11	EMK 18	EMK 18	×	×	×
EMK 12	EMK 12	EMK 19	EMK 19	×	×	×
EMK 20 Plus	EMK 20 Plus	×	×	×	×	×
EMK 63	EMK 63	×	×	×	×	×
EMK 64	EMK 64	×	×	×	×	×

## > Connecting Cables



Type	Order No.	Description	
ETG 15	274779	Receiver connection cable 1.5 m; F-pin/F-pin; class A	
ETG 30	274778	Receiver connection cable 3.0 m; F-pin; class A	
ETF 300/S	2040000011	Connecting cable 0.3 m; shielding 105 dB; class A+; F-type threaded	
ETF 400/S	2040000012	Connecting cable 0.4 m; shielding 105 dB; class A+; F-type threaded	
ETF 600/S	2040000013	Connecting cable 0.6 m; shielding 105 dB; class A+; F-type threaded	
ETF 800/S	2040000014	Connecting cable 0.8 m; shielding 105 dB; class A+; F-type threaded	
ETF 300/Q	2040000007	Connecting cable 0.3 m; shielding 105 dB; class A+; F-type quick connector	
ETF 400/Q	2040000008	Connecting cable 0.4 m; shielding 105 dB; class A+; F-type quick connector	
ETF 600/Q	2040000009	Connecting cable 0.6 m; shielding 105 dB; class A+; F-type quick connector	
ETF 800/Q	2040000010	Connecting cable 0.8 m; shielding 105 dB; class A+; F-type quick connector	
ETH 1500	20410042	Connecting cable 1.5 m; shielding 105 dB; class A+; IEC (socket) IEC (pin) straight	
ETH 3000	20410046	Connecting cable 3.0 m; shielding 105 dB; class A+; IEC (socket) IEC (pin) straight	
ETH 5000	20410050	Connecting cable 5.0 m; shielding 105 dB; class A+; IEC (socket) IEC (pin) straight	
EVL 165	20410005	Connecting cable F-type quick; length 165 mm; completely assembled with 2 straight F-type quick connectors; cable and connectors in black; class A	
EVL 340	20410030	Connecting cable F-type quick; length 340 mm; completely assembled with 2 straight F-type quick connectors; cable and connectors in black; class A	
EVL 980	20410031	Connecting cable F-type quick; length 980 mm; completely assembled with 2 straight F-type quick connectors; cable and connectors in black; class A	



# Kathrein Hybrid and Network Cables

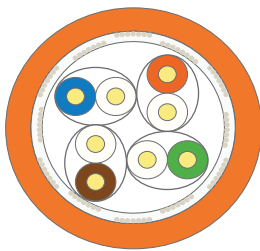
## > Designs

When designing network cables in general the distinction is made between simplex and duplex cables. In our case a hybrid cable consists of a combination of a network cable and a coaxial cable.

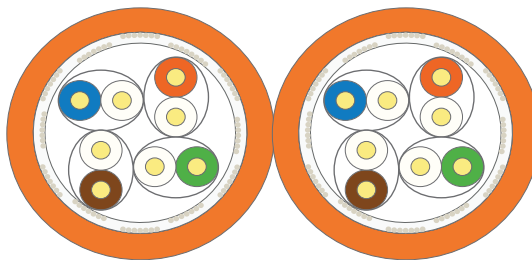
**Simplex:** 8 cores (4 pairs) => 4×2×AWG23/1 S/FTP (PIMF)

**Duplex:** 16 cores (8 pairs) => 2×4×2×AWG23/1 S/FTP

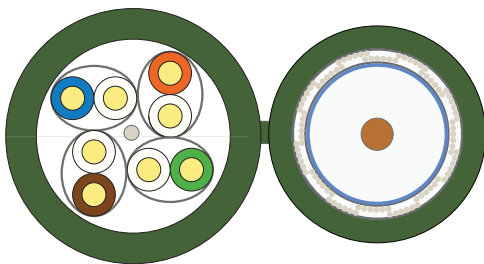
**Hybrid:** 8 cores (4 pairs) => 4×2×AWG24/1 U/FTP (PIMF) + coaxial cable



Simplex



Duplex



Hybrid

## > Designations by AWG

AWG is a standard coding for wire diameters in electrical technology. In particular it is used for the diameters of conductive copper wires and copper cross sections, disregarding the insulation or the sheathing. It originated with inch sizes in the USA, but the AWG designation is also used in Europe.

AWG stands for American Wire Gauge. The AWG number arises from the manufacturing process and describes the number of drawing operations for wire drawing. AWG23 for instance means that there were 23 successive drawing operations before the AWG23 diameter was achieved.

Table for conversion of AWG into metric, mm and mm<sup>2</sup>

AWG	d (mm)	A (mm <sup>2</sup> )	R (Ohm/km)	Metric (mm <sup>2</sup> )
22	0.6438	0.326	54.7	0.34
23	0.5733	0.258	67	LCL 110
24	0.5106	0.205	87	LCH 120
25	0.4547	0.162	110	–

## > Widely-used Types of Twisted-pair Cables

Category	Bandwidth	Type	Class	Examples of applications
Cat 5	100 MHz	UTP	D	100BASE-TX and 1000BASE-T or SONET
Cat 6/6A	250/500 MHz	UTP or STP	E	1000BASE-T, 10GBASE-T or 155-Mbit-ATM and 622-Mbit-ATM
Cat 7/7A	600/1000 (1200) MHz	S/FTP – U/FTP	F or FA	10GBASE-T
Cat 8	1600/2000 MHz	S/FTP	G	40GBASE-T and 100GBASE-T

## > Designation System for Twisted-pair Cables According to ISO/IEC 11801

### Overall screening, conductor pair screening and type of stranding

#### Overall screening

- U = no screen (unscreened)
- F = foil screen (coated plastic foil)
- S = braided screen (braided wire)
- SF = braided screen and foil screen

#### Conductor pair screening

- U = no screen (unscreened)
- F = foil screen (coated plastic foil)
- S = braided screen (braided wire)

#### Type of stranding

TP = Twisted Pair (as a rule)

QP = Quad Pair

**Overview of twisted pair cables**

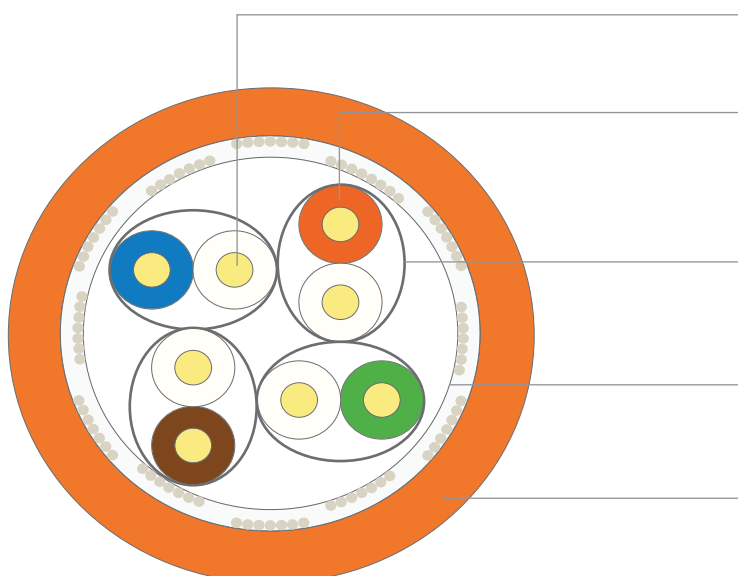
Twisted pair cables (TP)		U/UTP	S/UTP	U/FTP	S/FTP	F/FTP	SF/FTP
Overall screen	Wire braiding (S)	–	yes	–	yes	–	yes
	Foil (F)	–	–	–	–	yes	yes
Conductor pair screen	Wire braiding (S)	–	–	–	–	–	–
	Foil (F)	–	–	yes	yes	yes	yes

**> Network Cable LCL 110**

- LCL 110/250 m** 215500001
- LCL 110/500 m** 215500003
- LCL 110/1000 m** 215500004



- Network cable Cat 7A S/FTP
- Metre marking
- Complies with: ISO/IEC 11801 2nd ed., IEC 61156-5, EN 50173-1, EN 50288-9-1
- Construction Products Regulation 305/2011, EN 50575  
Fire classification: Cca s1a,d1,a1
- Halogen-free
- Suitable for installation in the home
- Available in 250 m, 500 m and 1000 m lengths
- Compatible RJ45 network connector: EML 12 (order no.: 212500001), field configurable without tools



Bare copper conductor AWG23

Insulation of a special PE mixture, colour code: TIA 568 70°C, EN 50290-2-23

Cable pairs screened with plastic-coated aluminium foil, 100% coverage

Cable screened with braided tinned copper wires

LSZH/LSOH – RAL 2003 orange, Ø 7.7 mm 70°C, EN 50290-2-27

## Technical data

Type   Order no.		LCL 110/250m 215500001	LCL 110/500m 215500003	LCL 110/1000m 215500004
Length	m	250	500	1000
Packaging		One-way reel	One-way drum	One-way drum
Inner conductor AWG23	mm	8 × 0.259		
Insulation	mm	8 × 0.573		
Outer conductor		Al/PET foil – CuSn mesh		
External sheathing		LSZH/LSOH – RAL 2003 orange, 7.7 mm		
Bending radius	mm	> 31		
Attenuation at	1 MHz	dB/100 m	1.9	
	4 MHz		3.5	
	10 MHz		5.4	
	100 MHz		17.4	
	200 MHz		24.9	
	250 MHz		27.8	
	500 MHz		40.1	
	600 MHz		43.8	
	800 MHz		50.1	
	1000 MHz		59.0	
1200 MHz	64.0			
Return loss 862–1000 MHz	dB	≥ 23		
Copper content <sup>1)</sup>	kg/km	25.4		
Maximum permissible tensile force	N	120		
Permissible ambient temperature	°C	-20 to +60		
CPR 305/2011 – Fire classification		Euro classification Cca s1a d1 a1		
Installation location		Indoors		
Weight	kg/100 m	6.3		

<sup>1)</sup> DEL quotation, copper base €150/100 kg (copper surcharge in €/km)

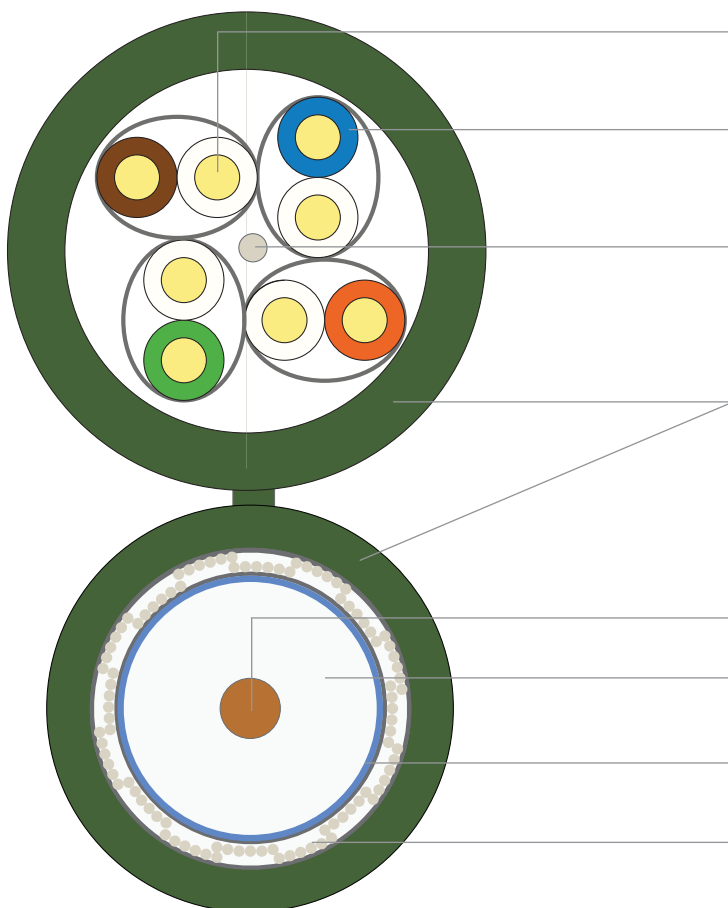
## > Hybrid Cable LCH 120

LCH 120/100 m 215500002

LCH 120/250 m 215500005



- Hybrid network and coaxial cable
- Cat 7 U/FTP and coaxial cable, screening class A+
- Complies with: EN 50117, IEC 61156
- Metre marking
- Construction Products Regulation 305/2011, EN 50575  
Fire classification: Eca
- Halogen-free
- Suitable for installation in the home
- Available in 100 m and 250 m lengths
- Compatible RJ45 network connector: EML 12  
(order no.: 212500001), field configurable without tools



Bare copper conductor AWG24

Insulation of a special PE mixture,  
colour code: TIA 568, 70°C, EN 50290-2-23

Cable pairs screened with plastic-coated aluminium foil 100% coverage and with braided tinned copper wires

LSZH – RAL 6010 green,  $\varnothing 6.5 \pm 0.20 \times 13.00 \pm 0.40$  mm, 70°C, EN 50290-2-27  
coax side:  $\varnothing 5.5 \pm 0.20$  mm

Bare copper conductor,  $\varnothing 0.50 \pm 0.01$  mm

Insulation of a special PE mixture,  
 $\varnothing 3.50 \pm 0.10$  mm 70°C, EN 50290-2-23

Plastic-coated aluminium foil,  
100% coverage

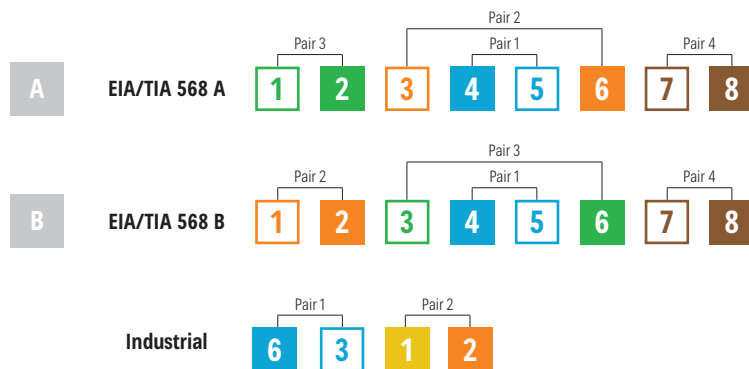
Cable screened with braided tinned copper wires

## Technical data

Type   Order no.			LCH 120/100 m 215500002	LCH 120/250 m 215500005
Length		m	100	250
Packaging			One-way reel	
Inner conductor Cat 7 AWG24		mm	8 × 0.5/U/F24	
Insulation Cat 7			Plastic coated aluminium 100%	
Coaxial outer conductor			Al/PET foil – CuSn mesh	
External sheathing			LSZH/LS0H – RAL 6018 green, 6.5 mm and 6 mm	
Bending radius		mm	> 65	
Attenuation for (Cat 7)	10 MHz	dB/100 m	6.3	
	100 MHz		21.3	
	250 MHz		35.7	
	500 MHz		49.0	
	600 MHz		58.0	
Attenuation for (coaxial)	5 MHz	dB/100 m	2.13	
	50 MHz		5.95	
	400 MHz		16.64	
	862 MHz		24.82	
	1350 MHz		31.53	
	2150 MHz		40.62	
Return loss for	862–1000 MHz	dB	≥ 16	
	1000–2150 MHz		≥ 15	
DC resistance		Ω/km	95	
Screening loss 30–1000 MHz		dB	≥ 95 (A+)	
Coupling resistance 5–30 MHz		mΩ/m	≤ 2.5	
Maximum permissible tensile force		N	150	
Permissible ambient temperature		°C	-20 to +60	
CPR 305/2011 – Fire classification			Euro classification Eca	
Installation location			Indoors	
Weight		kg/100 m	7.5	

## > Different Pin Assignments on Network Connectors

The standards for RJ45 pin assignments differ above all by swapping over the conductor pairs green and orange. Whilst for RJ45 pin assignments according to the standard EIA/TIA 568A the conductor pair 2 is white/orange and the conductor pair 3 is white/green, for RJ45 pin assignments according to the standard EIA/TIA 568B this is exactly the opposite way round.



## >

The abbreviation “RJ” stands for “Registered Jack”, which means a standard socket. RJ45: This standard specifies the layout of connectors and sockets and also the pin assignments.

### Pin assignment

	TIA/EIA T568A	TIA/EIA T568B	Industrial
1	White/green	White/orange	Yellow
2	Green	Orange	Orange
3	White/orange	White/green	White
6	Orange	Green	Blue
4	Blue	Blue	
5	White/blue	White/blue	
7	White/brown	White/brown	
8	Brown	Brown	

## > Network Connector EML 12

EML 12 212500001



- RJ45 connector Cat 6A 500 MHz screened
- Very high quality RJ45 connector (can be assembled quickly and easily in the field – without special tools)
- POE+ compatible
- Compact cable pre-sorter for AWG22/7 to AWG27/7
- Fully screened zinc die-cast housing with separate dust-proof cap and anti-kink sleeve
- Best EMC characteristics, especially in an industrial environment

- Insulation displacement contact technology and low contact resistances
- Pair management according to TIA/EIA 568 A/B colour codes
- Service life: >750 plug-in cycles
- Temperature range: -40°C to +66°C
- Contact coating: 50 µ" gold-plated
- Protection class IP20

### Technical data

Type   Order no.		EML 12   212500001
Colour coding standard		TIA/EIA 568 A and TIA/EIA 568 B
Permissible ambient temperature	°C	-10 to +60
Packaging unit/weight	pc./kg	1 (50, 500)/0.022

Your specialist supplier:

#### **Sales Germany**

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