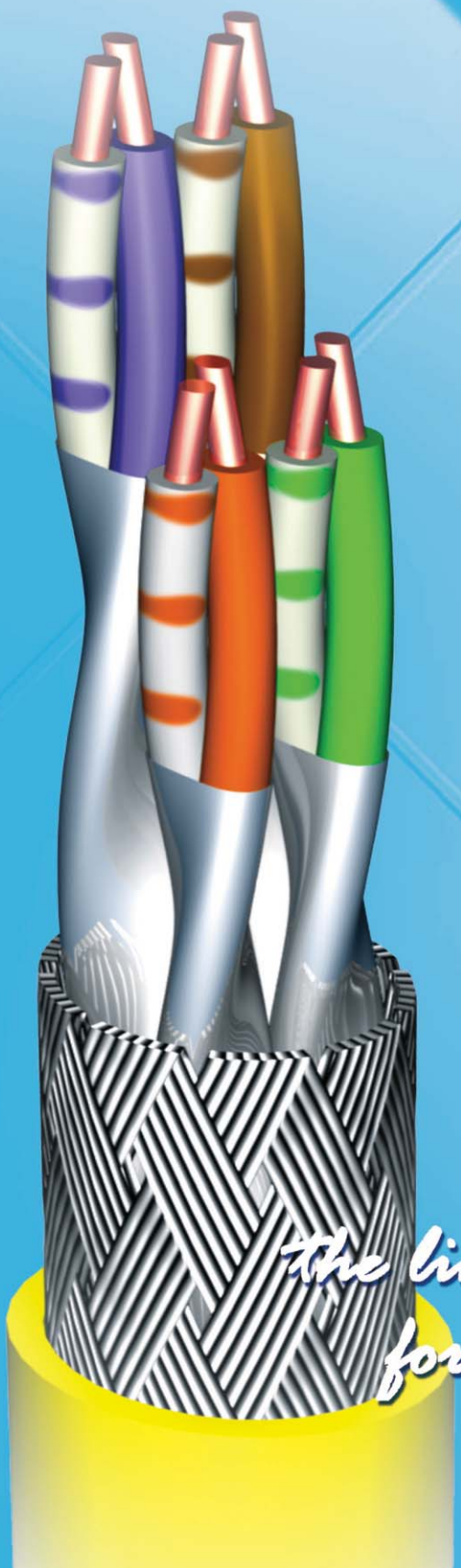
Caleb
Cable



the link to possibilities
for the next generation

LAN Cable

Caleb Cable

INDEX

Abbreviation

SBC Solid Bare Copper
BC Bare Copper
CCA Copper Clad Aluminum
TC Tinned Copper
PE Polyethylene
FEP Fluorinated Ethylene Propylene
PVC Polyvinyl Chloride
LSZH Low Smoke Zero Halogen
PUR Polyurethane

Overseas Branch

elbaC Cable in France
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ZAC sous le Beer - Rd836 27730 BUEIL France
www.elbac.fr

Micro Tek S.R.L in Italy
TEL: +39 - 02 57510830 FAX : +39 - 02 57510858
Via Lombardi 17/23 20090 Pieve Emanuele (MI) Italy
www.microteksrl.it

Caleb Cable Africa S.A.
TEL: +221 77 420 84 62
Keniammbour - Km. 5, Route de Popenguine
Sindia - Sénégal
www.calebcable.sn

COMPANY PROFILE
CALEB CABLE

www.calebcable.com

Vision

Caleb Cable is dedicated to providing the right links to all possibilities, and becoming a global-leading company offering top design, production, distribution and solutions of wires, cables and cable assembly to different applications.

We not only provide products, but also solutions, service and quality assurance.

Current Position

With this vision, innovative strength and commitment in fulfilling customers' needs, Caleb Cable has developed from a small plant to a medium-sized company with a 100 million USD turnover for overseas market and 150 million RMB turnover for China local market (2014), offering high performance products, good services and innovative solutions at very competitive prices.

History

Mr Yip Poon established Caleb Cable in 2001, having worked in the cable industry for more than 30 years. The name “Caleb” originates from the Bible, and means a "tireless courser that never stops running". He hoped to give this spirit to the young company, suggesting everything ahead is possible, yet running quickly.

As its name goes, Caleb Cable witnessed tremendous development over the last 10 years, offering top quality, innovation, competence and solutions besides cables.

Milestones

2001: Caleb Cable Industrial Ltd., ISO 9001:2000 Established;

2006: 25,000 m^2 New Plant A, ISO/TS 16949 Established;

2007: Antenna Cable Assembly Department Established;

2008: 25,000 m^2 New Plant B, ISO 14001 & QC 080000 Established; French Branch elbaC Cable Established;

2010: Joint Venture with MICRO TEK S.R.L. and Set up a New Warehouse in Italy;

2012: New Lab for Industrial Cables Built; New Industrial Cables Series, including Drag Chain Cable and Sensor Cable, Offered;

2015: New Factory in Dakar, Senegal, Africa Established.

MARKETS

Production Size

Main production site totals 50,000 m^2 in Caleb China.

Employees

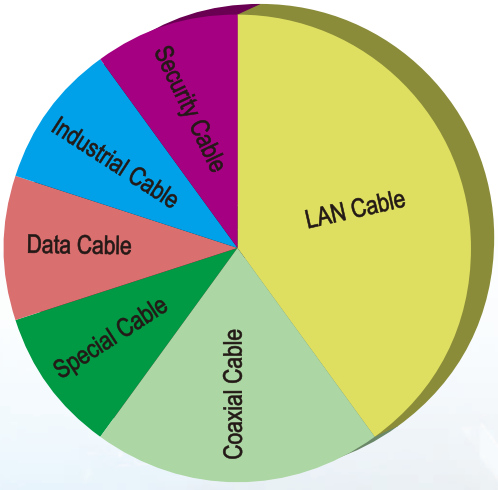
We have a big family of more than 550 employees, 20 of which are for marketing services, 30 are engineers, 40 are from the QA team, 60 are for assembly projects, and 400 are for cable and cable-related production.

Markets

Caleb Cable has a broad spectrum of customers from various industries across the globe with its main market in Europe. Our local business in China is also expanding.

Product Capacity

120 x 20' containers per month



Market Segment

molex · Volex · RS Component · CITROËN 东风雪铁龙 · PEUGEOT 东风标致

Telefónica · Alcatel·Lucent · Tyco Electronics · ifm electronic · FCI

ABB · Transport for London · ERICSSON TAKING YOU FORWARD · Ford

DB BAHN · BELDEN · MiSUMi · sky · BT

MATERIAL PRODUCTION

Incoming materials are 100 percent tested to meet the RoHS directive.

In order to ensure and further improve the quality of our raw materials, we begin to make by ourselves some of the materials that were sourced outside, which includes copper rod, copper clad aluminum (CCA), low smoke and zero halogen (LSZH) compound and aluminum-polyester foil (Al-PET). This not only gives us the benefit of cutting the cost, but most importantly, it can ensure the steady quality of our raw materials and our final products.

Al-PET production

LSZH compound production

For CCA, we adopt the environmental-friendly method of physical cladding.

The 8 mm diameter of the copper rod is made by melting the copper plate.

LAN CABLE PRODUCTION

Capacity

30 x 20' containers or 6000KM per month for Cat6a, Cat7, Cat7a PIMF;

Process	Number of Machine	Capcity (KM/Month)	Capcity (No of 20' Container/Month)
Insulation	3	6000	30
Pair Twisting	20		
Cabling	6		
Braiding	30		
Jacket	3		

20 x 20' containers or 5000KM per month for Cat5e and Cat6 UTP & FTP;

Process	Number of Machine	Capcity (KM/Month)	Capcity (No of 20' Container/Month)
Insulation	3	5000	20
Pair Twisting	28		
Cabling	5		
Jacket	2		

Delivery

Normal lead time—4 weeks;
Caleb starts to build cables without jacket stocks for our valued partners; Lead time can be reduced to 3 weeks, also 2 weeks for urgent delivery;

CABLE ASSEMBLY PRODUCTION

Size: 40,000 sqm production site (Patch cord, HDMI cord, USB cord and Fiber optics patch cord) in Dakar,Senegal, Africa

Capacity: 20 Million Pieces

Patch Cord

Optic Fiber Patchcord

RESEARCH & DEVELOPMENTS

R&D keeps the vigor and possibility of growth for any company. Our professional engineers specialize in product design, materials source, production processes, machinery, parts & components, etc. With the aid of several build-to-standard labs focusing on electrical performance, mechanical and chemical testing, our engineers become the driving engine of technical innovation and new product launches.

Industrial

Vertical Swag Tester
Flexing Test Machines
Drag Chain Tester
Abrasion Tester
Torsional Strength Tester
Horizontal Swag Tester

Mechanical

Environment Testing Chamber
Aging & Humidity Testing
Low Temperature Testing
Fire Resistant Testing Chamber: circuit integrity to BS 5389-1:2002 BS 8434-1:2003 BS 6387
Flame Resistant Chamber to IEC 60331& IEC 60332
Ladder Testing to IEC 60332-3
UV Test
Elongation & Tensile Strength

Chemical

Smoke Emission Chamber to IEC 61034, BS EN 50268
Spectrum Meter (RoHS)
Gas Acidity Testing to BS EN 50267-2-2:1999

IEC 60332-3-24 Fire Test

MATERIAL QUALITY CONTROL

RoHS Tester

Network Analyzer

Drag Chain Tester

We implement ISO 9001:2000 & ISO/TS16949 (for the automotive industry) as a spine of the quality system, and run continuous improvements.

We also developed strict materials specification and control on all raw materials, parts, components & products, so the products can meet RoHS, WEEE, and China RoHS. A QC 080000 approval is also granted to Caleb Cable.

Corporate Social Responsibility (CSR) is also getting more attention in Caleb Cable. Such attention does not end with an ISO 14001 certificate, but extends all aspects of the company.

Latest Products

NEW!

Residential Cat6 for Short Link Use Up to 80 Meters

- Smaller conductor and OD, 25 AWG or 0.44 mm / 0.017 inch. conductor and 4.6 mm / 0.18 inch. OD;
- Easier installation and space saving due to the smaller size;
- Cost-effective, more than 20% saving than standard 23 AWG Cat6;
- Ideal for residential use and short link use up to 80 Meters;
- Packed with patented 305 m / 1000 feet Easy Reel Box

SFTP Cat6a 26 AWG for Short Link Use Up to 60 Meters

- Smaller conductor and OD, 26 AWG or 0.40 mm / 0.016 inch. conductor and 6.0 mm / 0.236 inch. OD;
- Easier installation and space saving due to the smaller size;
- Cost-effective, more than 30% saving than standard 23 AWG Cat6a;
- Ideal for data center use and short link use up to 60 Meters;

Trunk Cable for Data Center (4 and 6 x 4 Pairs of Cat6a/Cat7)

- Fast and easier installation make it ideal for data center application;
- Length AWG23 from 5 to 80 m, AWG26 from 5 to 55 m;
- AWG26 up to 30% volume and weight reduction compared to AWG23;
- Exceeds Cat.6A ISO Class EA (500 MHz); ISO/IEC 11801 ed. 2.2


4 x 4 Pairs


6 x 4 Pairs


6 x 4 Pairs

Caleb Cable

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CAT 5E

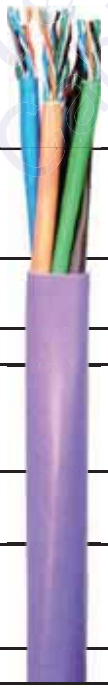
100 ~ 350 MHz

Indoor Outdoor Fire Resistant RoHS Compliant

UL Approval:CMP, CMR

Construction		UTP Cat 5E	FTP Cat 5E	UTP Cat 5E 25 Pairs
Conductor	AWG-no.	24 AWG	24 AWG	24 AWG
	material	SBC	SBC	SBC
	dia.mm	0.50	0.50	0.50
	inch	0. 020	0.020	0.020
Insulation	material	PE	PE	PE
	dia.mm	0.92	0.95	0.92
	inch	0.036	0.037	0.036
Inner jacket	material	---	---	PVC/LSZH
	construction	---	---	6 x 4pairs + 1pair
Mylar	coverage	---	125%	>=115%
Drain wire	material	---	TC	---
		---		---
		---		---
Screen		---	Al-PET	---
	material	---	125%	---
Jacket	coverage	PVC/LSZH	PVC/LSZH	PVC/LSZH
	material	5.20	6.00	17.00
	dia.mm	0.205	0.236	0.670
No. of pairs	inch	4	4	25





Technical data

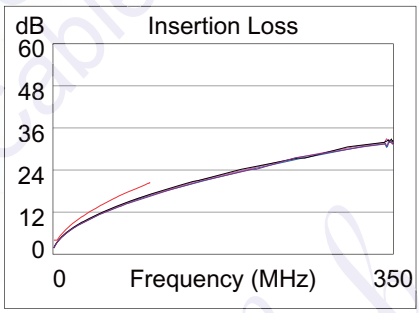
- **Temperature range (℃)**: -40 to 70
- **Velocity ratio(%)**: 69
- **Characteristic impedance :** 100±15 Ohm
- **Bending radius (min.) :** 8 x cable diameter
- **Flame retardancy** : IEC 60332-1; IEC 60332-3C; CMR; CMP
- **UL file number** : E334179

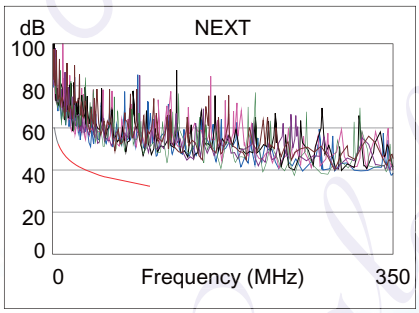
Standards and performances

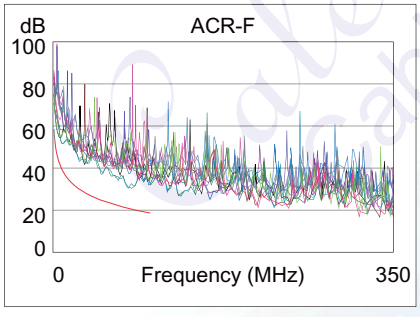
- ANSI/TIA-568-C.2
- UL444 and C22.2 No.214-02
- ISO 11801 Edition 2
- IEC 61156-5 Edition 2.0
- EN 50173, EN 50288

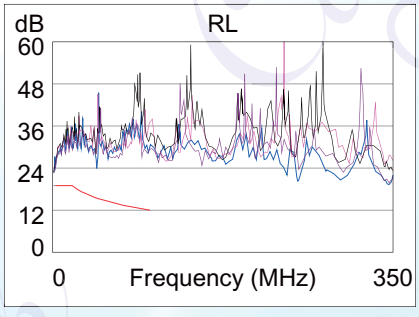
Packaging

- 1000 ft/Box, 1000 ft/Reel









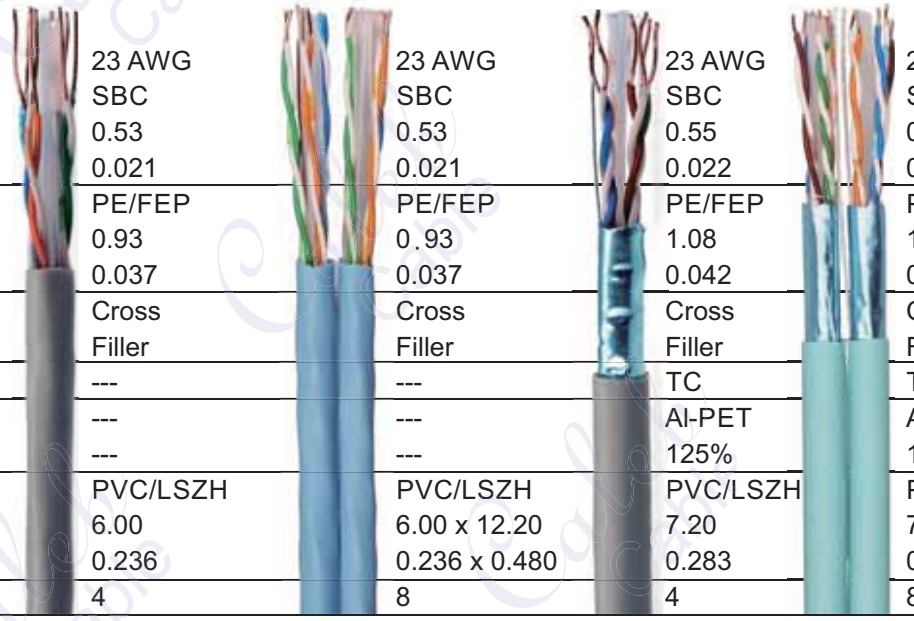
CAT 6

250 ~ 550 MHz

Indoor | Fire Resistant | RoHS Compliant

UL Approval:CMP, CMR

Construction		UTP Cat 6	UTP Cat 6 Dual	FTP Cat 6	FTP Cat 6 Dual
Conductor	AWG-no.	23 AWG	23 AWG	23 AWG	23 AWG
	material	SBC	SBC	SBC	SBC
	dia.mm	0.53	0.53	0.55	0.55
	inch	0.021	0.021	0.022	0.022
Insulation	material	PE/FEP	PE/FEP	PE/FEP	PE/FEP
	dia.mm	0.93	0.93	1.08	1.08
	inch	0.037	0.037	0.042	0.042
Filler	materia	Cross Filler	Cross Filler	Cross Filler	Cross Filler
Drain wire	material	---	---	TC	TC
Screen	material	---	---	Al-PET	Al-PET
	coverage	---	---	125%	125%
Jacket	material	PVC/LSZH	PVC/LSZH	PVC/LSZH	PVC/LSZH
	dia.mm	6.00	6.00 x 12.20	7.20	7.20 x 14.6
	inch	0.236	0.236 x 0.480	0.283	0.283 x 0.575
No. of pairs		4	8	4	8



Technical data

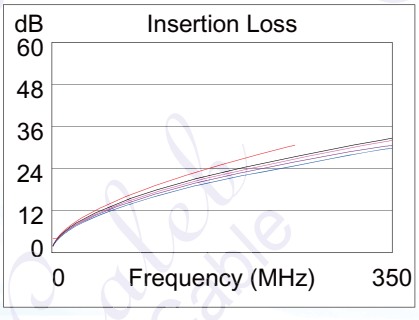
- **Temperature range(℃):** -40 to 70
- **Velocity ratio(%):** 72
- **Characteristic impedance:** (From 1 to 250 MHz)100±15 Ohm
- **Bending radius (min.):** 8 x cable diameter
- **Flame retardancy**: IEC 60332-1; IEC 60332-3C; CMR; CMP
- **UL file number**: E334179

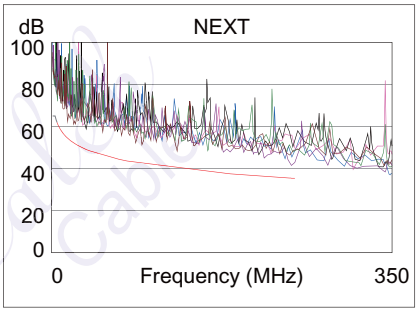
Standards and performances

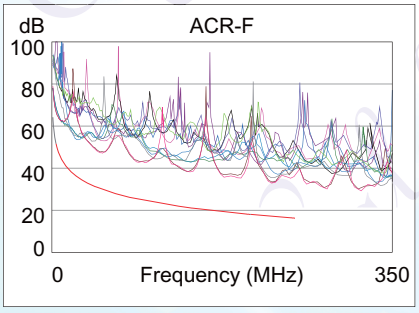
- ANSI/TIA-568-C.2
- UL444 and C22.2 No.214-02
- ISO 11801 Edition 2
- IEC 61156-5 Edition 2.0
- EN 50173, EN 50288

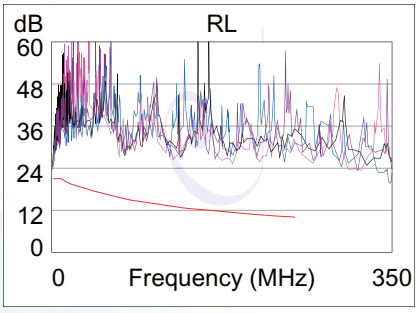
Packaging

- 1000 ft/Box, 1000 ft/Reel









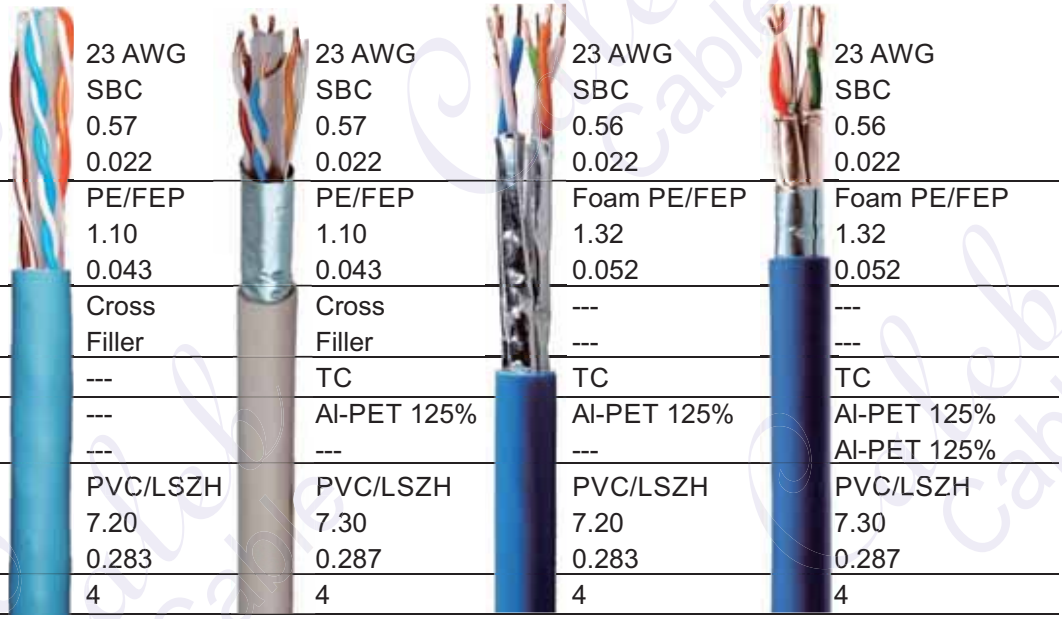
CAT 6A

550 ~ 650 MHz

Indoor | Fire Resistant | RoHS Compliant

UL Approval:CMP, CMR

Construction		UTP Cat 6A	FTP Cat 6A	U-FTP Cat 6A	F-FTP Cat 6A
Conductor	AWG-no.	23 AWG	23 AWG	23 AWG	23 AWG
	material	SBC	SBC	SBC	SBC
	dia.mm	0.57	0.57	0.56	0.56
	inch	0.022	0.022	0.022	0.022
Insulation	material	PE/FEP	PE/FEP	Foam PE/FEP	Foam PE/FEP
	dia.mm	1.10	1.10	1.32	1.32
	inch	0.043	0.043	0.052	0.052
Filler	materia	Cross Filler	Cross Filler	--- ---	--- ---
Drain wire	material	---	TC	TC	TC
Screen	individual	---	Al-PET 125%	Al-PET 125%	Al-PET 125%
	overall	---	---	---	Al-PET 125%
Jacket	material	PVC/LSZH	PVC/LSZH	PVC/LSZH	PVC/LSZH
	dia.mm	7.20	7.30	7.20	7.30
	inch	0.283	0.287	0.283	0.287
No. of pairs		4	4	4	4



Technical data

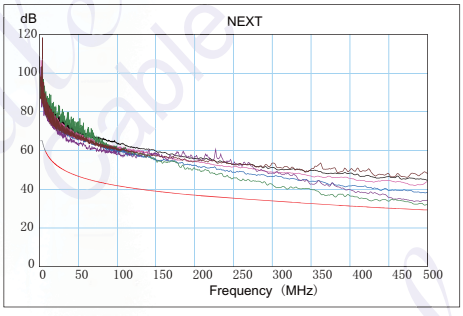
- **Temperature range(℃):** -40 to 70
- **Velocity ratio(%):** 78
- **Characteristic impedance**:
  (From 1 to 250 MHz)100±15 Ohm
  (From 250 to 500 MHz)100±20 Ohm
- **Bending radius (min.):** 8 x cable diameter
- **Flame retardancy**: IEC 60332-1; IEC 60332-3C; CMR; CMP
- **UL file number** : E334179

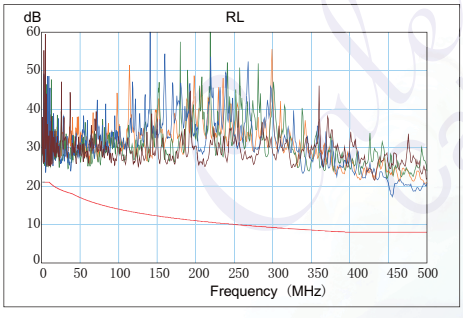
Standards and performances

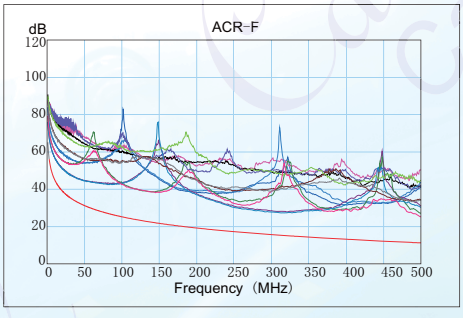
- ANSI/TIA-568-C.2
- UL444 and C22.2 No.214-02
- ISO 11801 Edition 2
- IEC 61156-5 Edition 2.0
- EN 50173, EN 50288

Packaging

- 1000 ft/Box, 1000 ft/Reel





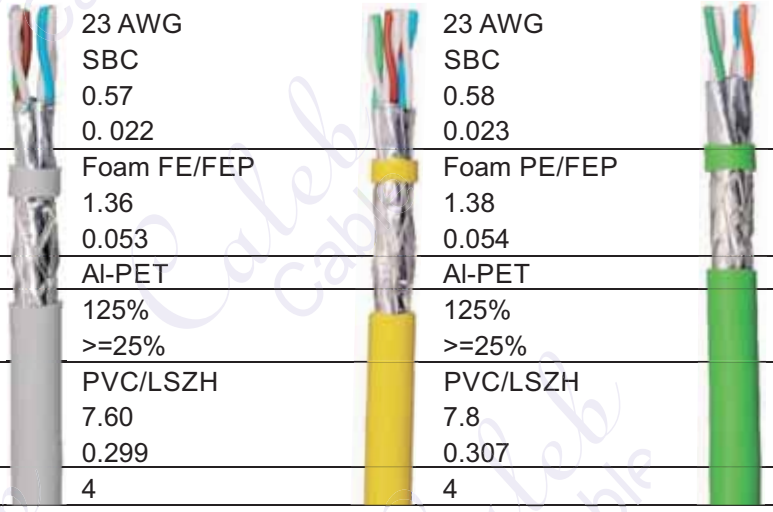


CAT 7(A)
600 ~ 1200 MHz

Indoor | Fire Resistant | RoHS Compliant

UL Approval:CMP, CMR, CM

Construction		Cat 7	Cat7A 1000 MHz	Cat 7A 1200MHz
Conductor	AWG-no.	23 AWG	23 AWG	22 AWG
	material	SBC	SBC	SBC
	dia.mm	0.57	0.58	0.62
	inch	0. 022	0.023	0.024
Insulation	material	Foam FE/FEP	Foam PE/FEP	Foam PE/FEP
	dia.mm	1.36	1.38	1.45
	inch	0.053	0.054	0.057
Screen	material	Al-PET	Al-PET	Al-PET
Braiding	coverage	125%	125%	125%
	coverage	>=25%	>=25%	>=25%
Jacket	material	PVC/LSZH	PVC/LSZH	PVC/LSZH
	dia.mm	7.60	7.8	8.2
	inch	0.299	0.307	0.323
No. of pairs		4	4	4



Technical data

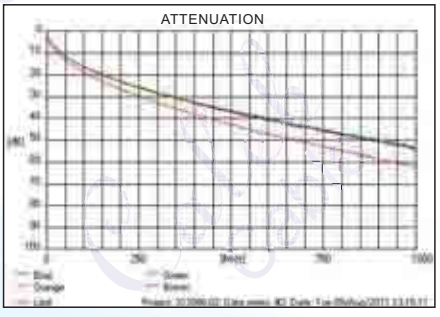
- **Temperature range(℃)**: -40 to 70
- **Velocity ratio(%):** 80
- **Characteristic impedance:**
  (From 1 to 100 MHz)100±15 Ohm
  (From 100 to 250 MHz)100±20 Ohm
  (From 250 to 600 MHz)100±25 Ohm
  (From 600 to 1000 MHz)100±30 Ohm
- **Bending radius (min.) :** 8 x cable diameter
- **Flame retardancy**: IEC 60332-1; IEC 60332-3C; CMR; CMP
- **UL file number**: E334179

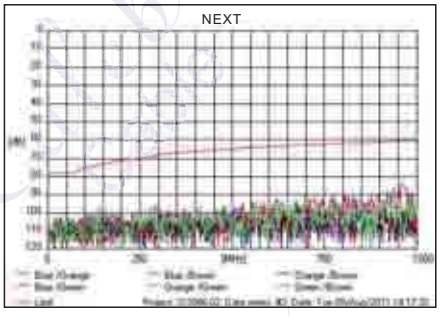
Standards and performances

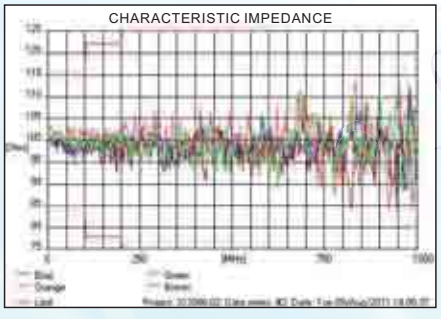
- UL444
- ISO 11801 Edition 2
- IEC 61156-5 Edition 2.0
- EN 50173, EN 50288

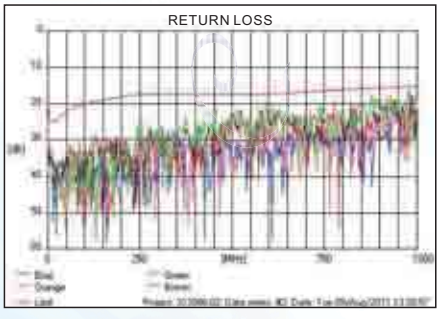
Packaging

- 1000 ft/Reel









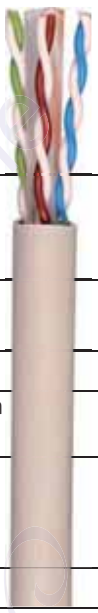
CAT 6(A)

250 ~ 650 MHz

Indoor | Fire Resistant | RoHS Compliant

UL Approval:CM

Construction		UTP Cat 6	FTP Cat 6	U-FTP Cat 6A	F-FTP Cat 6A
Conductor	AWG-no.	26 AWG	26 AWG	26 AWG	26 AWG
	material	Strand BC/TC	Strand BC/TC	Strand BC/TC	Strand BC/TC
	dia.mm	0.16x7	0.16x7	0.16x7	0.16x7
	inch	0.006x7	0.006x7	0.006x7	0.006x7
Insulation	material	PE	PE	Foam PE	Foam PE
	dia.mm	0.78	0.80	1.02	1.02
	inch	0.031	0.032	0.040	0.040
Filler	materia	Cross	Cross	---	---
		Filler	Filler	---	---
Drain wire	material	---	TC	TC	TC
Screen	insulation	---	Al-PET 125%	Al-PET 125%	Al-PET 125%
	overall	---	---	---	Al-PET 125%
Jacket	material	PVC/LSZH	PVC/LSZH	PVC/LSZH	PVC/LSZH
	dia.mm	5.20	6.00	5.80	6.00
	inch	0.205	0.236	0.228	0.236
No. of pairs		4	4	4	4



Technical data

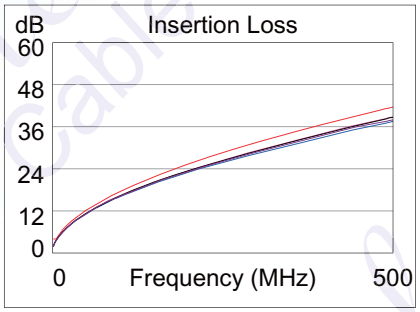
- **Temperature range(℃):** -40 to 70
- **Velocity ratio(%):** 78
- **Characteristic impedance**:
  (From 1 to 250 MHz)100±15 Ohm
  (From 250 to 500 MHz)100±20 Ohm
- **Bending radius (min.):** 8 x cable diameter
- **Flame retardancy**: IEC 60332-1; CM
- **UL file number** : E334179

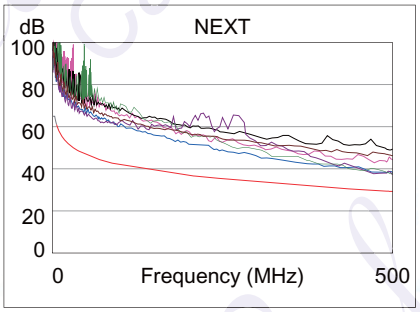
Standards and performances

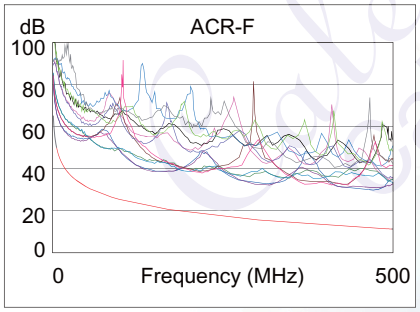
- ANSI/TIA-568-C.2
- UL444 and C22.2 No.214-02
- ISO 11801 Edition 2
- IEC 61156-5 Edition 2.0
- EN 50173, EN 50288

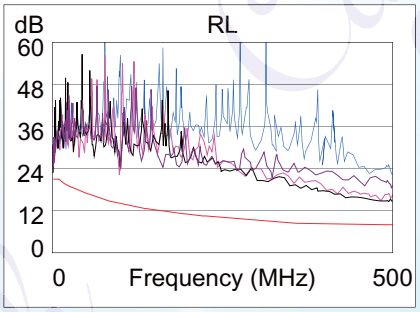
Packaging

- 1000 ft/Box, 1000 ft/Reel









EXTRA PROTECTION for LAN CABLE

With the dedicated work of our R&D department, we have the following optional structure to provide the additional features of anti-rodent, water-proof, heat-resistant, and etc. for the general LAN cable

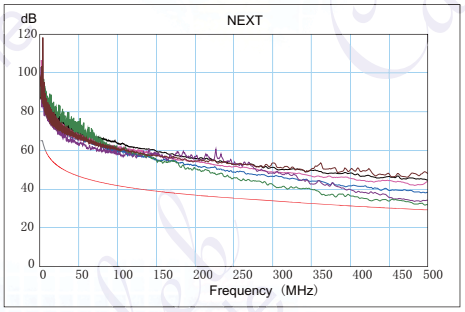

Underground

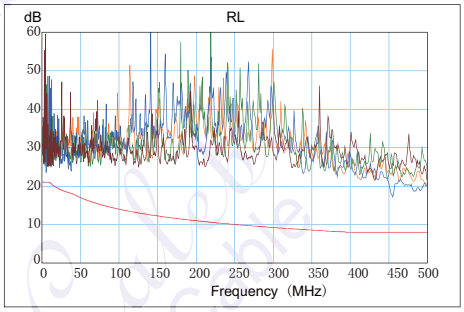

Fire Resistant

Dual Layers of PE

SWA

PUR





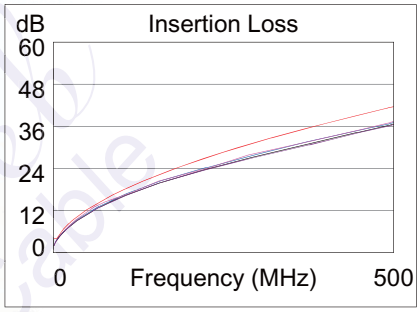
Jacket Type	Feature	Application
PUR	Abrasion-resistant	Automation
LSZH	Low smoke and Halogen-free	Indoor
PE	Water-resistant	Outdoor
Double layers of PE	Two layers protection	Underground
SWA	Rodent-resistant	Direct Burial

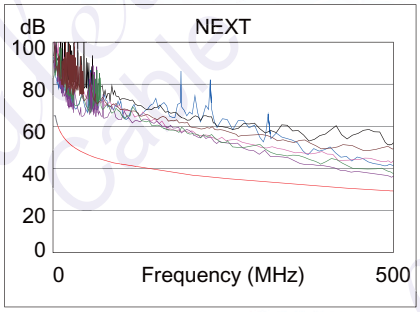
CAT 6A Patch Cord
500 MHz

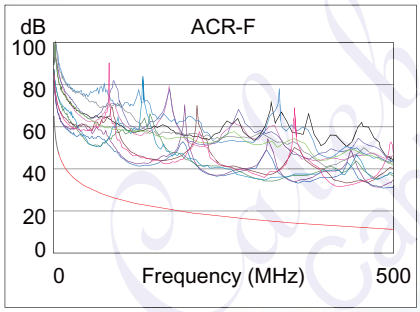
Indoor | Fire Resistant | RoHS Compliant

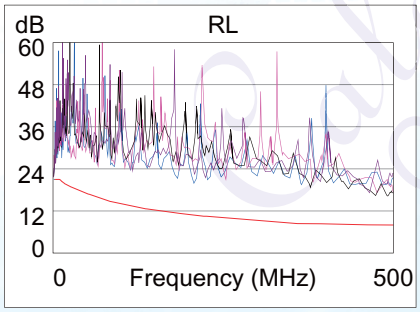
Features and benefits
- Exceed CAT6a standard specifications
- 8C gold-plated contacts 50 µ
- Available in different lengths and colors
- Tested to Channel and Patch Cord standard
- Flame Retardancy: IEC 60332-1; CM
- UTP, FTP, U/FTP and S/FTP Construction Available
- Cat5e and Cat6 Patch Cords Available

Standards and performances
- ANSI/TIA-568-C.2
- ISO 11801 Edition 2
- EN 50173
- 61935-2









CAT5E to CAT7A STANDARD

Cat7a IEC61156-5-2009

Frequency (MHz)	Attenuation (dB/100m)	NEXT (dB)	Psnext (dB/100m)	Return Loss (dB)	Elfext (dB/100m)	Pselfext (dB/100m)	Propagation Delay(ns)	Delay Skew (μs)	ACR (dB/100m)	PS-ACR (dB/100m)
1	2.1	78.0	75.0	20.0	78.0	75.0	570.0	<0.025	75.9	72.9
4	3.7	78.0	75.0	23.0	78.0	75.0	552.0	<0.025	74.3	71.3
10	5.8	78.0	75.0	25.0	75.3	72.3	545.4	<0.025	72.2	69.2
16	7.3	78.0	75.0	25.0	71.2	68.2	543.0	<0.025	70.7	67.7
31. 25	10.3	78.0	75.0	23.6	65.4	62.4	540.4	<0.025	67.7	64.7
62. 5	14.6	78.0	75.0	21.5	59.4	56.4	538.6	<0.025	63.4	60.4
100	18.5	75.4	72.4	20.1	55.3	52.3	537.6	<0.025	56.9	53.9
250	29.7	69.4	66.4	17.3	47.3	44.3	536.3	<0.025	39.7	36.7
300	32.7	68.2	65.2	17.3	45.8	42.8	536.1	<0.025	35.6	32.6
350	35.4	67.2	64.2	17.3	44.4	41.8	535.9	<0.025	31.8	28.8
400	38.0	66.4	63.4	17.3	43.3	40.3	535.8	<0.025	28.4	25.4
550	45.0	64.3	61.3	17.3	40.5	37.5	535.5	<0.025	19.3	16.3
600	47.1	63.7	60.7	17.3	39.7	36.7	535.5	<0.025	16.6	13.6
650	49.2	63.2	60.2	17.3	39.0	36.0	535.4	<0.025	14.1	11.1
750	53.1	62.3	59.3	17.3	37.8	34.8	535.3	<0.025	9.2	6.2
850	54.9	61.9	58.9	17.3	37.2	34.2	535.3	<0.025	6.9	3.9
900	58.5	61.1	58.1	17.3	36.2	33.2	535.2	<0.025	2.6	-0.4
1000	61.9	60.4	57.4	17.3	35.3	32.3	535.1	<0.025	-1.5	-4.5

Cat7 IEC61156-5-2009

Frequency (MHz)	Attenuation (dB/100m)	NEXT (dB)	PSNEXT (dB/100m)	Return Loss (dB)	ELFEXT (dB/100m)	PSELFEXT (dB/100m)	Propagation Delay(ns)	Delay Skew (μs)	ACR (dB/100m)	PS-ACR (dB/100m)
1	2.0	78.0	75.0	20.0	78.0	75.0	570.0	<0.25	76.0	73.0
4	3.7	78.0	75.0	23.0	78.0	75.0	552.0	<0.25	74.3	71.3
10	5.9	78.0	75.0	25.0	75.3	72.3	545.4	<0.25	72.1	69.1
16	7.4	78.0	75.0	25.0	71.2	68.2	543.0	<0.25	70.6	67.6
31. 25	10.4	78.0	75.0	23.6	65.4	62.4	540.4	<0.25	67.6	64.6
62. 5	14.9	75.5	72.5	21.5	59.4	56.4	538.6	<0.25	60.6	57.6
100	19.0	72.4	69.4	20.1	55.3	52.3	537.6	<0.25	53.4	50.4
250	31.0	66.4	63.4	17.3	47.3	44.3	536.3	<0.25	35.5	32.5
300	34.2	65.2	62.2	17.3	45.8	42.8	536.1	<0.25	31.1	28.1
350	37.2	64.2	61.2	17.3	44.4	42.4	535.9	<0.25	27.1	24.1
400	40.0	63.4	60.4	17.3	43.3	40.3	535.8	<0.25	23.4	20.4
550	47.7	61.3	58.3	17.3	40.5	37.5	535.5	<0.25	13.6	10.6
600	50.1	60.7	57.7	17.3	39.7	36.7	535.5	<0.25	10.6	7.6
650 *	52.4	60.2	57.2	17.3	39.0	36.0	535.4	<0.25	7.8	5.8
750 *	56.8	59.3	56.3	17.3	37.8	34.8	535.3	<0.25	2.5	-0.5
850 *	61.0	58.5	55.5	17.3	36.7	33.7	535.2	<0.25	-2.5	-5.5
900 *	63.0	58.1	55.1	17.3	36.2	33.2	535.2	<0.25	-4.9	-7.9
1000 *	66.9	57.4	54.4	17.3	35.3	32.3	535.1	<0.25	-9.5	-12.5

Cat6a IEC61156-5-2009

Frequency (MHz)	Attenuation (dB/100m)	NEXT (dB)	PSNEXT (dB/100m)	Return Loss (dB)	ELFEXT (dB/100m)	PSELFEXT (dB/100m)	Propagation Delay(ns)	Delay Skew (μs)	ACR (dB/100m)	PS-ACR (dB/100m)
1	2.1	75.3	72.3	20.0	68.0	65.0	570.0	<0.045	73.2	70.2
4	3.8	66.3	63.3	23.0	56.0	53.0	552.0	<0.045	62.5	59.5
10	5.9	60.3	57.3	25.0	48.0	45.0	545.4	<0.045	54.4	51.4
16	7.5	57.2	54.2	25.0	43.9	40.9	543.0	<0.045	49.8	46.8
31. 25	10.5	52.9	49.9	23.6	38.1	35.1	540.4	<0.045	42.4	39.4
62. 5	15.0	48.4	45.4	21.5	32.1	29.1	538.6	<0.045	33.4	30.4
100	19.1	45.3	42.3	20.1	28.0	25.0	537.6	<0.045	26.2	23.2
250	31.1	39.3	36.3	17.3	20.0	17.0	536.3	<0.045	8.3	5.3
300	34.3	38.1	35.1	17.3	18.5	15.5	536.1	<0.045	3.9	0.9
350	37.2	37.1	34.1	17.3	17.1	14.1	535.9	<0.045	-0.1	-3.1
400	40.1	36.3	33.3	17.3	16.0	13.0	535.8	<0.045	-3.8	-6.8
500	45.3	34.8	31.8	17.3	14.0	11.0	535.6	<0.045	-10.4	-13.4
600 *	50.1	33.6	30.6	17.3	12.4	9.4	535.5	<0.045	-16.4	-19.4
650 *	52.3	33.1	30.1	17.3	11.7	8.7	535.4	<0.045	-19.2	-22.2

Cat6 IEC61156-5-2009

Frequency (MHz)	Attenuation (dB/100m)	NEXT (dB)	Psnext (dB/100m)	Return Loss (dB)	Elfext (dB/100m)	Pselfext (dB/100m)	Propagation Delay(ns)	Delay Skew (μs)	ACR (dB/100m)	PS-ACR (dB/100m)
1	2.1	75.3	72.3	20.0	68.0	65.0	570.0	<0.045	73.2	70.2
4	3.8	66.3	63.3	23.0	56.0	53.0	552.0	<0.045	62.4	59.4
10	6.0	60.3	57.3	25.0	48.0	45.0	545.4	<0.045	54.3	51.3
16	7.6	57.2	54.2	25.0	43.9	40.9	543.0	<0.045	49.6	46.6
20	8.5	55.8	52.8	25.0	42.0	39.0	542.0	<0.045	47.3	44.3
31. 25	10.7	52.9	49.9	23.6	38.1	35.1	540.4	<0.045	42.1	39.1
62. 5	15.5	48.4	45.4	21.5	32.1	29.1	538.6	<0.045	32.9	29.9
100	19.9	45.3	42.3	20.1	28.0	25.0	537.6	<0.045	25.4	22.4
155.5	25.3	42.4	39.4	18.8	24.2	21.2	536.9	<0.045	17.1	14.1
175	27.1	41.7	38.7	18.4	23.1	20.1	536.7	<0.045	14.6	11.6
200	29.1	40.8	37.8	18.0	22.0	19.0	536.5	<0.045	11.6	8.6
250	33.0	39.3	36.3	17.3	20.0	17.0	536.3	<0.045	6.3	3.3
300 *	36.6	38.1	35.1	17.3	18.5	15.5	536.1	<0.045	1.5	-1.5
350 *	40.0	37.1	34.1	17.3	17.1	14.1	535.9	<0.045	-2.8	-5.8
450 *	46.2	35.5	32.5	17.3	14.9	11.9	535.7	<0.045	-10.7	-13.7

Cat5e IEC61156-5-2009

Frequency (MHz)	Attenuation (dB/100m)	NEXT (dB)	Psnext (dB/100m)	Return Loss (dB)	Elfext (dB/100m)	Pselfext (dB/100m)	Propagation Delay(ns)	Delay Skew (μs)	ACR (dB/100m)	PS-ACR (dB/100m)
1	2.1	65.3	62.3	20.0	64.0	61.0	570.0	<0.045	63.2	60.2
4	4.1	56.3	53.3	23.0	52.0	49.0	552.0	<0.045	52.2	49.2
10	6.5	50.3	47.3	25.0	44.0	41.0	545.4	<0.045	43.8	40.8
16	8.3	47.2	44.2	25.0	39.9	36.9	543.0	<0.045	39.0	36.0
31.25	11.7	42.9	39.9	23.6	34.1	31.1	540.4	<0.045	31.1	28.1
62.5	17.0	38.4	35.4	21.5	28.1	25.1	538.6	<0.045	21.4	18.4
100	22.0	35.3	32.3	20.1	24.0	21.0	537.6	<0.045	13.3	10.3
150 *	27.5	32.7	29.7	18.9	20.5	17.5	536.9	<0.045	5.1	2.1
200 *	32.4	30.8	27.8	18.0	18.0	15.0	536.5	<0.045	-1.6	-4.6

* : The value is for reference only

Type of Cable	Construction
U-UTP or UTP **Unshielded Twisted Pair**	
F-UTP or FTP **Foiled Twisted Pair**	
SF-UTP **Shielded and Foiled Twisted Pair**	
U-FTP **Shielded and Individually Foiled Twisted Pair**	
F-FTP **Foiled and Individually Foiled Twisted pair**	
S-FTP **Shielded and Individually Foiled Twisted Pair**	

TIA and ISO STANDARDS

TIA and ISO Equivalent Classifications

Frequency Bandwidth	TIA (Cabling)	ISO (Cabling)
1 - 100 MHz	Category 5e	Class D
1 - 250 MHz	Category 6	Class E
1 - 500 MHz	Category 6a	Class E_A
1 - 600 MHz	n/s	Class F
1 - 1000 MHz	n/s	Class F_A

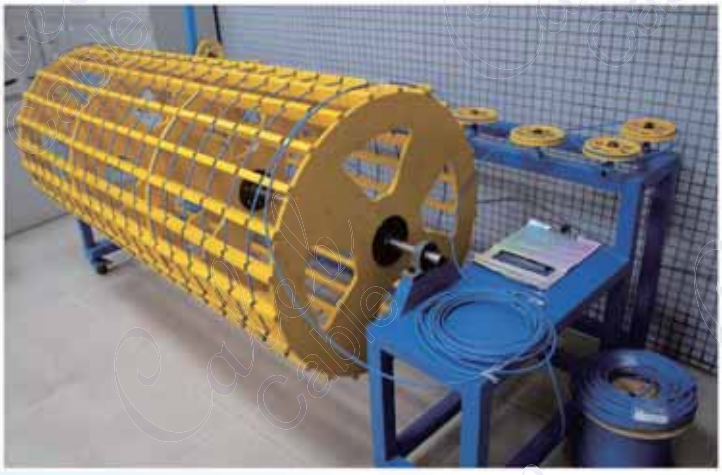
TIA Cabling Standards

Category 5e	ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, 2009
Category 6	ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, 2009
Category 6a	ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, 2009

ISO Cabling Standards

Class D	ISO/IEC 11801, 2nd Ed., Information technology - Generic Cabling for Customer Premises, 2002
Class E	ISO/IEC 11801, 2nd Ed., Information technology - Generic Cabling for Customer Premises, 2002
Class EA	Amendment 1 to ISO/IEC 11801, 2nd Ed., Information technology - Generic Cabling for Customer Premises, 2008
Class F	ISO/IEC 11801, 2nd Ed., Information technology - Generic Cabling for Customer Premises, 2002
Class FA	Amendment 1 to ISO/IEC 11801, 2nd Ed., Information technology - Generic Cabling for Customer Premises, 2008

Cable Installation Tests



Installation cables are essential parts of structured cabling systems. All installation cables have to pass a highly advanced evaluation process designed to reflect practical operational requirements. We simulate the installation procedure in our laboratory with our cable puller.

LAN CABLE APPLICATION CHART

Summary Table

APPLICATIONS	Copper System					
	Unshielded		Shielded			
	CAT 5e	CAT 6	CAT 5e	CAT 6	CAT 6A	CAT 7
IT networks 10 /100 megabits/s	●	●	●	●	●	●
IT networks 1000 megabits/s	●	●	●	●	●	●
IT networks 10 gigabits/s	○	○	○	○	●	●
IT networks 40 gigabits/s	○	○	○	○	◒	◒
IT networks 100 gigabits/s	○	○	○	○	◒	◒
Analog & Digital Phone	●	●	●	●	●	●
IP Phone (VoIP)	●	●	●	●	●	●
IP Phone (VoIP) + PoE	◒	●	◒	●	●	●
XDSL	●	●	●	●	●	●
Wifi Access Point	◒	●	◒	●	●	●
Bluetooth Access Point	◒	●	◒	●	●	●
CCTV with baluns	◒	●	◒	●	●	●
IP Camera	●	●	●	●	●	●
IP Camera + PoE	◒	●	◒	●	●	●
Analog & Digital TV (900 Mhz max)	○	○	○	○	○	●
IPTV	◒	●	◒	●	●	●
IP Alarms & Safety systems	◒	●	◒	●	●	●
PoE system	◒	●	◒	●	●	●
PoEP system	○	◒	○	◒	●	●

● Recommanded ◒ Adapted ○ Non-adapted

Cable Installation Tests

There are wide-ranging differences in the quality of installation cables in actual practice. As laboratory practices show, the transmission characteristics of cable can be altered considerably by installation. This result reflects the situation occurring at the building site after the cable is installed. In our experience, shortcomings of this kind are frequently attributable to processing problems during cable production. This test guarantees that the cable is performed well after installation.

IMPORTANT DEFINITION

Alien Crosstalk

Unwanted signal coupling from one component, channel, or permanent link to another is defined as alien crosstalk. Since alien crosstalk is an indicator of differential (or balanced) signal coupling, alien crosstalk cannot be adversely impacted by common mode noise (e.g. noise from motors or florescent lights) that is present in the environment. Alien crosstalk is only specified by the Standards as a power sum parameter for components and cabling to approximate the energy present when all pairs are energized. Power sum alien crosstalk measured at the near-end is called power sum alien near-end crosstalk loss (PSANEXT loss) and power sum alien crosstalk measured at the far-end is called power sum alien attenuation to crosstalk ratio, far-end (PSAACRF). High power sum alien crosstalk levels can compromise the operation of the 10GBASE-T application.

Attenuation to Crosstalk Ratio, Far-End (ACRF) (previously know as ELFEXT)

Pair-to-pair far-end crosstalk (FEXT) loss quantifies undesired signal coupling between adjacent pairs at the far-end (the opposite end of the transmit-end) of cabling or a component. ACRF is calculated by subtracting the measured insertion loss from the measured far-end crosstalk loss and yields a normalized value that can be used to compare cable and cabling performance independent of length. Poor ACRF levels can result in increased bit error rates and/or undeliverable signal packets. Note that NEXT loss margin alone is not sufficient to ensure proper ACRF performance.

Attenuation to Crosstalk Ratio (ACR)

A critical consideration in determining the capability of a cabling system is the difference between insertion loss and near-end crosstalk (NEXT) loss. This difference is known as the attenuation to crosstalk ratio (ACR). Positive ACR calculations mean that transmitted signal strength is stronger than that of near-end crosstalk. ACR can be used to define a signal bandwidth (i.e. 200 MHz for category 6) where signal to noise ratios are sufficient to support certain applications. It is interesting to note that digital signal processing (DSP) technology can perform crosstalk cancellation allowing some applications to expand useable bandwidth up to and beyond the point at which calculated ACR equals zero. Even so, the maximum frequency for which positive ACR is assured provides a benchmark to assess the useable bandwidth of twisted-pair cabling systems.

Balance

Twisted-pair transmission relies on signal symmetry or "balance" between the two conductors in a pair. Maintaining proper balance ensures that cabling systems and components do not emit unwanted electromagnetic radiation and are not susceptible to electrical noise. Component balance requirements are specified for category 6/class E cabling. Component and cabling balance requirements are specified for category 6A/class EA and higher grades of cabling. Balance may be characterized by longitudinal conversion loss (LCL), longitudinal conversion transfer loss (LCTL), transverse conversion loss (TCL), or equal level transverse converse transfer loss(ELTCTL).

Equal Level Far-End Crosstalk (ELFEXT)

See definition for Attenuation to Crosstalk Ratio, Far-End.

Insertion Loss (Attenuation)

Insertion loss is a measure of the decrease in signal strength along the length of a transmission line. Ensuring minimal signal attenuation is critical because digital signal processing (DSP) technology can not compensate for excessive signal loss.

Near-End Crosstalk (NEXT) Loss

Pair-to-pair near-end crosstalk (NEXT) loss quantifies undesired signal coupling between adjacent pairs at the near-end (the same end as the transmit-end) of cabling or a component. Excessive NEXT loss can be detrimental to applications that do not employ crosstalk cancellation digital signal processing (DSP) technology.

Power Sum

All pair-to-pair crosstalk parameters can be expressed as a power summation, which approximates the level of undesired internal signal coupling present when all pairs are energized. Power sum NEXT loss, ACRF, ANEXT loss, and AACRF characterization confirms that the cabling is significantly robust to minimize crosstalk from multiple disturbers. This type of characterization is necessary to ensure cabling compatibility with applications that utilize all four pairs for transmitting and receiving signals simultaneously such as 1000BASE-T and applications that are sensitive to alien crosstalk such as 10GBASE-T.

Propagation Delay & Delay Skew

Propagation delay is the amount of time that passes between when a signal is transmitted and when it is received at the opposite end of a cabling channel. The effect is akin to the delay in time between when lightning strikes and thunder is heard - except that electrical signals travel much faster than sound. Delay skew is the difference between the arrival times of the pair with the least delay and the pair with the most delay. Transmission errors that are associated with excessive delay and delay skew include increased jitter and bit error rates.

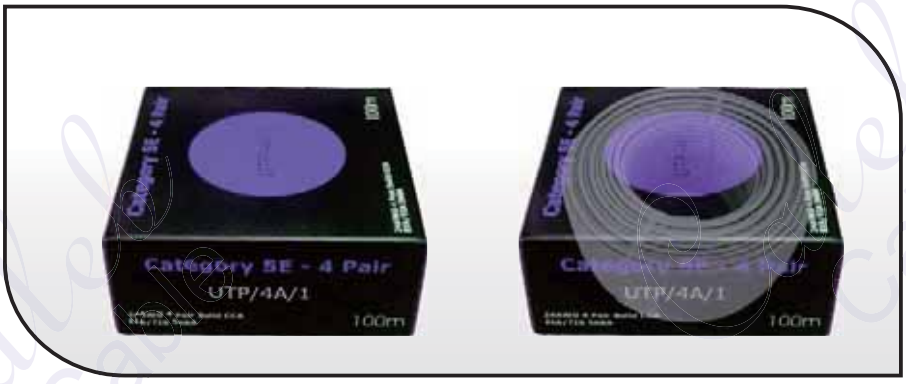
Return Loss

Return loss is a measure of the signal reflections occurring along a transmission line and is related to impedance mismatches that are present throughout a cabling channel. Because emerging applications such as 1000BASE-T and 10GBASE-T rely on full duplex transmission encoding schemes (transmit and receive signals are superimposed over the same conductor pair), they are sensitive to errors that may result from marginal return loss performance.

Source: *De-Mystifying Cabling Specifications From 5e to 7A* by Valerie Maguire

PACKAGING

Carton

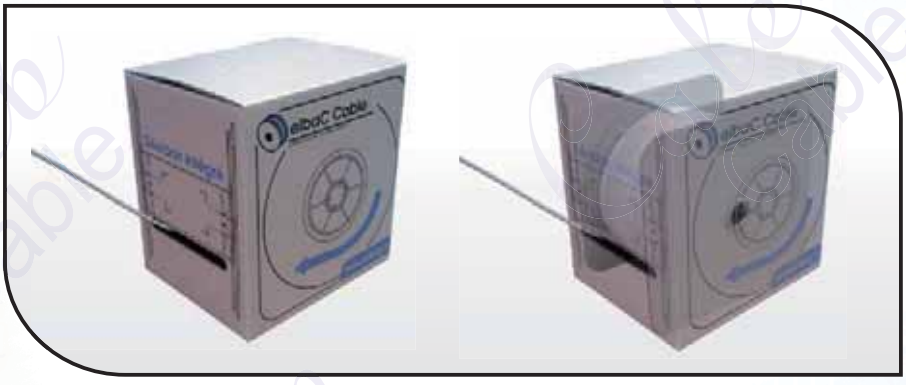


Length
300ft

Easy Box

Length
1000ft

Easy Reel



Length
1000ft

Wooden Drums

Length
1500ft
3000ft

Caleb Cable

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