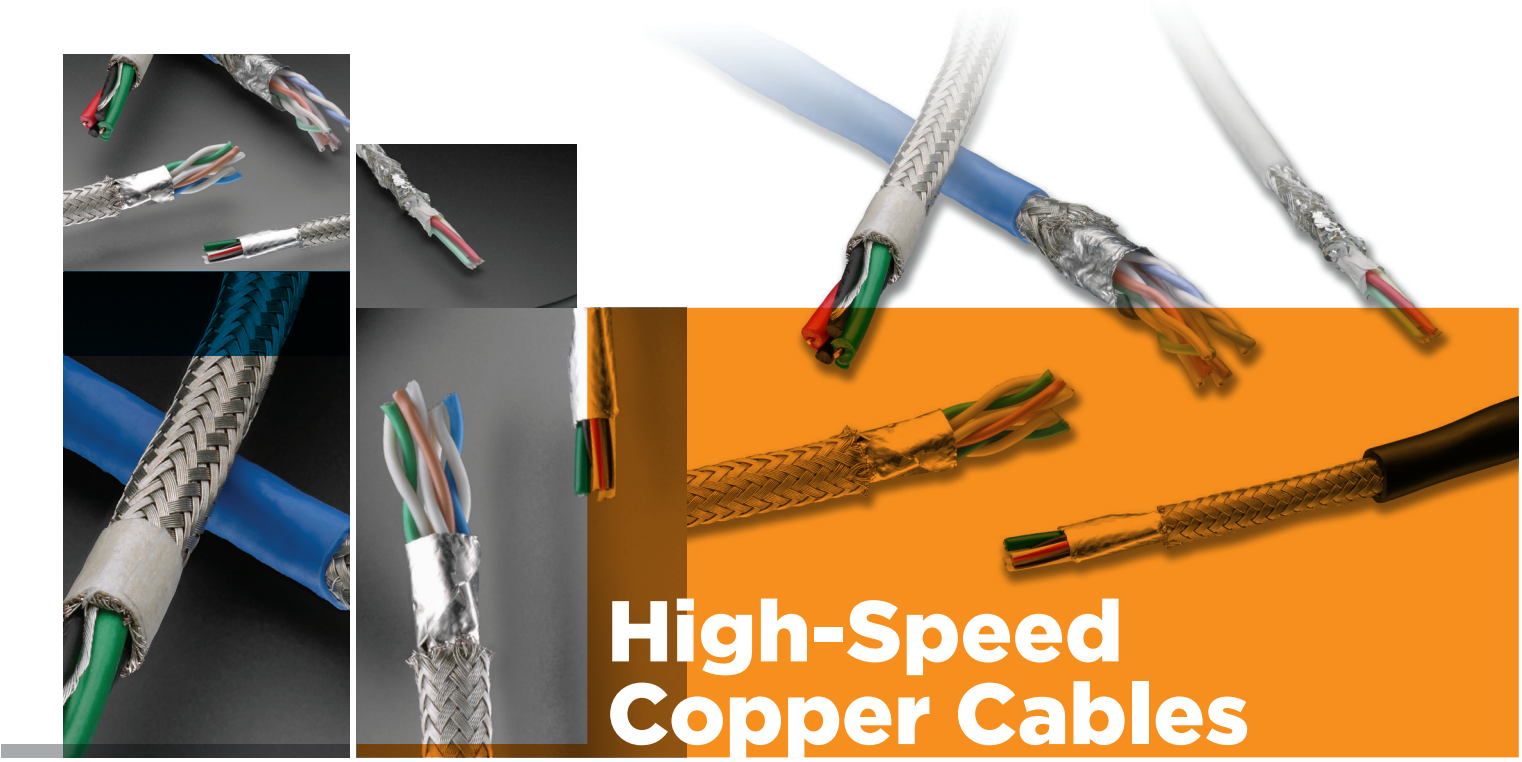


High-Speed Copper Cables

Signal Integrity for High-Speed Protocols in Cables Designed to Withstand Harsh Environments

High-Speed Copper Cables

HIGH PERFORMANCE
- Increased bandwidth
- EMI protection
- Lightning protection

COMPACT AND RUGGED
- Ruggedized to survive in harsh environments
- Reduced size and weight

LOWER TOTAL INSTALLED COSTS
- Integrated solution
- Reduced engineering time
- Complexity reduction for straightforward installation
- Compatibility with numerous TE contacts and TE termination devices

VERSATILE
- Configurations for a wide range of protocols
- Custom solutions available

TE Connectivity (TE) offers a large and growing range of high-speed copper cables for high-speed protocols, such as Ethernet, IEEE 1394, Fibre Channel, and USB in commercial and military aerospace, ground systems, and marine applications.

TE's high-speed copper cable combine with TE's matched-impedance contacts and connectors can provide a total solution for higher performance and the signal integrity while maintaining robustness in today's Aerospace, Defense and Marine applications.

Our expansive research and development programs in material sciences are continually developing unique polymer solutions that will reduce weight and size while increasing robustness of our products.

APPLICATIONS
- **Military Aerospace:** Situational awareness systems (radar); weapons systems (missiles); communications (radio and intercoms)
- **Commercial Aerospace:** In-flight entertainment; glass cockpit; in-flight wireless
- **Military Ground Systems:** Glass dashboard; integrated computer system; remote weapons system; radio and intercom communications; situational awareness (thermal imaging, vision systems)
- **Smart Soldier Systems:** Live health monitoring; Real Time Soldier Movement; Portable computers

MATERIALS
- **Conductor:** Tin, silver, copper, high-strength alloys

ELECTRICAL
- **Impedance:** Matched impedance connectors and cables
  - 90-Ohm USB
  - 100-Ohm Gigabit Ethernet
  - 100-Ohm DVI
  - 110-Ohm IEEE 1394
  - 150-Ohm Fibre Channel
- **EMC:** Electromagnetic interferences protection

MECHANICAL
- Small size
- Lighter weight
- Reduced complexity

DESIGN FLEXIBILITY
- CAD for quick response
- High product performance
- Optimum layout
- Rapid quotations
- Size and weight details

TE Components . . . TE Technology . . . TE Know-how . . .

AMP | AGASTAT | CII | HARTMAN | KILOVAC | MICRODOT | NANONICS | POLAMCO | Raychem | Rochester | DEUTSCH
SEACON Phoenix | LL ROWE | Phoenix Optix | AFP | SEACON

Empower Engineers to Solve Problems, Moving the World Forward.

Materials Innovation for Superior Dielectrics

TE has designed a new process for extruding foamed FEP and other jacket materials with relatively uniform bubbles (void spaces) along the entire length of our cables. Such uniformity helps increase electrical performance and signal integrity while maintaining mechanical robustness.

Jacket Materials

Jacket Materials	Temperature Range (˚C)	Abrasion Resistance	Flexibility	Typical Industry Use
Thermorad K (Modified PVDF)	-65 to +150	Very Good	Fair	Aerospace, Ground and Marine
Thermorad F & S	-55 to +125	Good	Good	Ground Systems
Modified FEP	-65 to +200	Good	Good	Aerospace
UXL-ETFE	-65 to +150	Good	Fair	Aerospace and Ground Systems
Thermorad HT (Modified ETFE)	-65 to +200	Very Good	Fair	Aerospace
Thermorad FL	-55 to +200	Very Good	Good	Aerospace
Zerohal	-30 to +105	Good	Good	Marine
FDR-25	-40 to +125	Fair	Excellent	Ground Systems
Low Fluoride XL-ETFE	-65 to +200	Very Good	Fair	Aerospace
Laser Markable FEP	-65 to +200	Good	Good	Aerospace
Thermorad NTFR	-55 to +110	Good	Excellent	Ground Systems and Marine
Raythane FR	-65 to +90	Excellent	Excellent	Marine
Thermorad O	-55 to +125	Good	Good	Ground Systems and Marine

Compatible Products

A small sampling of TE connectors and contacts that are compatible is shown below. Consult TE for additional information.


CeeLok FAS-T Connector

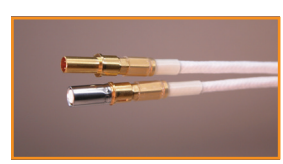

Molded Shapes


Band Straps


SolderSleeve Termination Devices

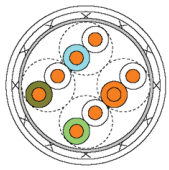

CeeLok FAS-X Connectors


EN4165 Connectors

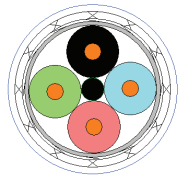

Quadrax Contacts


Twinax Contacts

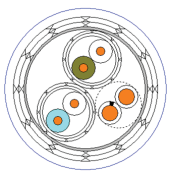
Ethernet Category Cables
Markets: Commercial and Military Aerospace, Marine, Military Ground Systems
Speeds: 10 Mb/s to 10 Gb/s
Common Names: Quadrax, Cat 5e, Cat 6a
Primary Usage: Generalized Data Communications



Fibre Channel
Markets: Aerospace
Speeds: 200 MB/s to 1.6 GB/s
Primary Usage: Storage Technologies and Long Distance Communications

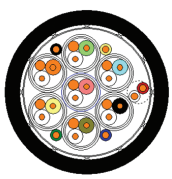


FireWire/IEEE 1394
Markets: Aerospace Commercial and Military
Speeds: 100 Mb/s to 3.2 Gb/s
Primary Usage: High-Data-Rate Communication; Bus Independent



Universal Serial Bus (High-Speed)
Markets: Aerospace, Ground Systems, Marine, Missiles
Speeds: up to 480 Mb/s
Primary Usage: Universal Data Transfer—Requires Computing System to Function

Digital Video Interface (DVI)
Markets: Marine and Ground Systems
Primary Usage: Video Displays, Uni-Directional Data Transfer



Shield Types

Shield Type	Standard	Optimized	M24640 or M24643 Optimized
Braid or Spiral			
Braid	1	K	V
Flat braid	2		
Braid + braid	3	L	W
Flat braid + braid	4		
Spiral shield	5		
Foil			
Al/PET	6		
Al/PET + drain wire under wrap	7		
Al/PET + drain wire under braid	G	H	
Other			
Braid + PET wrap + braid	E	P	
Braid + PET wrap + PET wrap + braid	F	Q	
Braid + mumetal + braid		R	

Note: Braid is round unless noted

Shield Type	Standard	Optimized	M24640 or M24643 Optimized
Foil and Braid			
Al/PET under braid	8	M	Y
Al/PET over braid	J		
Al/PET/al under braid	9		
Al/PET/al over braid	A		
Al/polyimide under braid	B		
Foil and Double Braid			
Al/PET + braid + braid	C	N	
Al/PET + braid + PET + braid		T	
Al/polyimide + braid + braid	D		
Unshielded			
No shield or foil wrap	U		

C5E - 26 B 1 2 4 - 7 1 4 *- 9X

VARIATION CODE (3 CHARACTERS)
- **3EA** IEEE1394a
- **3EB** IEEE1394b
- **3EQ** IEEE1394b Quad
- **C5E** CAT5e
- **C6A** CAT6a
- **DVI** DVI
- **FBC** Fibre Channel
- **CBS** CANbus
- **LVD** LVD
- **TGX** 1000BASE-T Quad
- **THX** 100BASE-T Quad
- **UB2** USB 2.0

CONDUCTOR SIZE (AWG) (DATA PAIR)

CONDUCTOR STRANDING (DATA PAIR)
- **A** Solid
- **B** 7 Strand
- **C** 19 Strand

CONDUCTOR MATERIAL (DATA PAIR)
- **1** Tin-coated copper
- **2** Silver-coated copper
- **4** Silver-coated high-strength copper alloy
- **9** Bare copper
- **0** Other
- **A** Silver-coated ultra-high-strength copper alloy
- **E** Silver-coated high-strength copper alloy (80-microinch min, ESA compliant)
- **N** Silver-coated high-strength copper alloy (non-RoHS)

DIELECTRIC MATERIAL (DATA PAIR)
- **1** XL-Foamed HDPE
- **2** Foamed FEP
- **3** XL-Solid HDPE
- **4** Modified Solid FEP
- **5** UXL-ETFE
- **6** XL-ETFE
- **7** Flexible XL-ETFE
- **8** Rayfoam FS
- **0** Other
- **L** Low Fluoride XL-ETFE

NUMBER OF DATA PAIRS
- **1 – 10** (10 pairs = 0)

OUTER JACKET COLOR
For translucent colors, add "X"
- **0** Black
- **1** Brown
- **2** Red
- **3** Orange
- **4** Yellow
- **5** Green
- **6** Blue
- **7** Violet
- **8** Gray
- **9** White
- **0** Clear

*** SEQUENTIAL ALPHA CODE**
A sequential alpha code (A-Z, excluding I and O) shall be used only for Special Construction code "X" to allow for multiple special constructions

JACKET MATERIAL
(each, when more than one jacket)
- **1** Thermorad K
- **3** Thermorad F & S
- **4** Modified FEP
- **5** UXL-ETFE
- **6** Thermorad HT
- **7** Thermorad FL
- **8** Zerohal
- **9** None
- **0** Other
- **F** FDR-25
- **L** Low-fluoride XL-ETFE
- **M** Laser-markable FEP
- **R** Raythane FR
- **T** Thermorad O
- **W** PET wrap

SHIELD MATERIAL
(each, when more than one shield)
- **1** Tin-coated copper
- **2** Silver-coated copper
- **3** Nickel-coated copper
- **4** Silver-coated high-strength copper alloy
- **U** Unshielded

SHIELD TYPE
See Shield Type table

SPECIAL CONSTRUCTION
(P-Line = Power Line)
- **-** Standard
- **A** 28 AWG (P-Line)
- **B** 26 AWG (P-Line)
- **C** 24 AWG (P-Line)
- **D** 22 AWG (P-Line)
- **E** 20 AWG (P-Line)
- **F** 18 AWG (P-Line)
- **G** 16 AWG (P-Line)
- **S** Space rated
- **W** Waterblocked
- **X** *Special construction

LET'S CONNECT

We make it easy to connect with our experts and are ready to provide all the support you need. Just call your local support number or visit www.te.com/industrial to chat with a Product Information Specialist.

Technical Support

te.com/support-center

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North America (Toll)	+1 717 986 7777	Japan	+81 044 844 8180
EMEA/South Africa	+800 0440 5100	Australia	+61 2 9554 2695
EMEA (Toll)	+31 73 624 6999	New Zealand	+64 (0) 9 634 4580
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