

NEWSLETTER

Industrial Ethernet options for continuous flexing applications

INDUSTRIAL ETHERNET FOR MOTION CONTROL

Balanced copper cables are a widely popular option in automation, due the ease of deployment and readily available industrial grade connectors.

This product newsletter introduces the most important options for industrial Ethernet cable suitable for continuously moving motion control applications.



TKFF 390 Cat 7 SF/FTP Ethernet cable for continuous flexing.

INTRODUCTION TO INDUSTRIAL ETHERNET

Industrial Ethernet is a ruggedized version of Ethernet cables for use in industrial applications. Industrial Ethernet cables are typically shielded to protect from unwanted electrical interference in industrial environments.

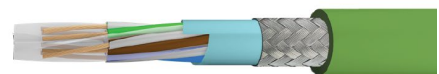
The balanced twisted pair design already helps to minimize crosstalk and interference; the shield adds another protective layer to cope with the electrical noise commonly found in industrial applications. Using Ethernet cables in motion control applications adds another mechanical requirement: The cable must offer reliable network performance during the fast motion of the cable drag chain.

Options with 4 twisted pairs

8-pole Industrial Ethernet cables made with four twisted pairs are available for Cat5e, Cat6A and Cat7 categories and transmission rates of 1000 Mbit/s or 10,000 Mbit/s depending on type. Cables are made with four twisted pairs, a total of eight conductors that can transmit data.

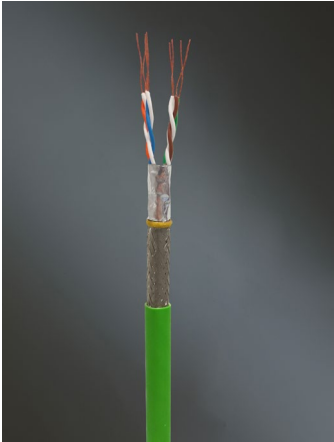
Different shielding options are available depending on the category. The color code for 4-pair cables follows Ethernet standards: Blue - White/Blue, Orange - White/Orange, Green - White/Green, Brown - White/Brown.

SF-UTP Cat6A Cable



Options with 2 twisted pairs and Star-Quad

4-pole Industrial Ethernet cable can be made with 2 twisted pairs, but more common for industrial applications are PROFINET and EtherCAT 4-pole designs. These Ethernet variants are specifically designed for industrial applications. These systems are optimized for reliability in industrial applications with maximum transmission rates of 100 Mbit/s.



Ethernet cable with 4 pairs

Both, PROFINET and EtherCAT differ from other industrial ethernet cables in construction and color code. The biggest difference is in the way the pairs are created. 4-pole PROFINET/EtherCAT cables are made with four conductors cabled around a common axis and two conductors across from each other make a pair. This is referred to as unshielded twisted quad (UTQ). The common gage size for PROFINET/EtherCAT is typically AWG22.

PROFINET SF-UTQ



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TK USA offers a wide range of Industrial Ethernet cables from “SPE” Single Pair Ethernet to PROFINET/EtherCAT to Cat5e, Cat6A and Cat7 for continuous flexing applications. These cables can be manufactured with 300V, 600V and 1000V approvals.

All cables in the TKFF390 series are designed to withstand the mechanical stresses in continuous motion such as drag chain application. The extremely robust PUR jacket is colored green (RAL 6018) in accordance with DESINA standards for data and measurement cables. Other color options are available upon request.

| | PROFINET | Cat5e | Cat5e | Cat6 | Cat6A | Cat7 |
|----------------------|------------------------|------------------------|--------------------------------------|---|---|---|
| Construction | Star Quad | 2-pair | 4-pair | 4-pair | 4-pair | 4-pair |
| Speed | 10/100 Mbit/s | 10/100 Mbit/s | 10/100/1000 Mbit/s | 10/100/1000 Mbit/s | 10/100/1000 Mbit/s | 10/100/1000 Mbit/s |
| LAN Protocol | 10BASE-T 100BASE-TX | 10BASE-T 100BASE-TX | 10BASE-T 100BASE-TX 1000BASE-T | 10BASE-T 100BASE-TX 1000BASE-T 10GBASE-T | 10BASE-T 100BASE-TX 1000BASE-T 10GBASE-T | 10BASE-T 100BASE-TX 1000BASE-T 10GBASE-T |
| Bandwidth | 100 MHz | 100 MHz | 100 MHz | 250 MHz | 500 MHz | 600 MHz |
| ISO/IEC ref. | | 11801 | 11801 | 11801 | 11801 | 11801 |
| ANSI/TIA ref. | | 568-B | 568-C.2 | 568-C.2 | 568-C.2 | |

| PIN | PROFINET/EtherCat | | Industrial Ethernet Twisted Pair | | | |
|-----|------------------------|------------|----------------------------------|-------------------------|---------------------|---------------------|
| | 10BASE-T 100BASE-TX | Color code | 10BASE-T 100BASE-TX | 1000BASE-T 10GBASE-T | Color code T568A | Color code T568B |
| 1 | Transmit+ | Yellow | Transmit+ | BI_DA+ | WH/GN | WH/OG |
| 2 | Transmit- | Orange | Transmit- | BI_DA- | GN | OG |
| 3 | Receive+ | White | Receive+ | BI_DB+ | WH/OG | WH/GN |
| 4 | - | - | - | BI_DC+ | BU | BU |
| 5 | - | - | - | BI_DC- | WH/BU | WH/BU |
| 6 | Receive- | Blue | Receive- | BI_DB- | OG | GN |
| 7 | - | - | - | BI_DD+ | WH/BN | WH/BN |
| 8 | - | - | - | BI_DD- | BN | BN |