BELDEN
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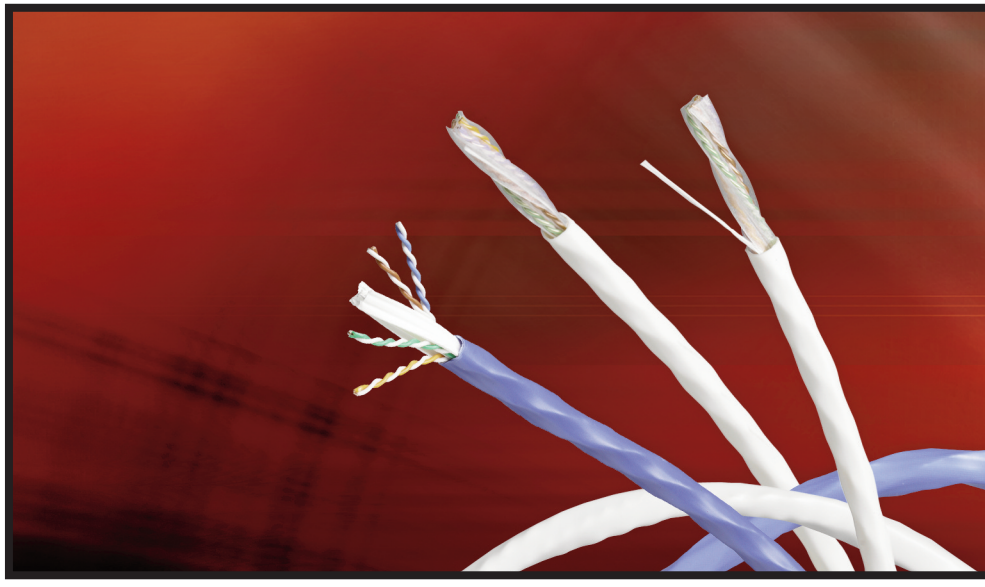
Product Bulletin

PB 297

Belden® 10GX® Cables

10GX UTP Cables incorporate patent-pending RoundFleX Technology, opening the door to higher density due to their reduced diameter, while at the same time offering a high level of Alien Crosstalk reduction. Both advantages are essential to 10 Gb/s cabling systems.



Belden's 10GX Cables Offer the Smallest Diameter and Outstanding Mechanical and Electrical Characteristics

10GX Cable

Belden's line of 10GX Cables are designed to address the needs of demanding networking arenas that require both high density connections and superb mechanical and electrical performance.

This series is intended for use in horizontal cable installations in data centers, high speed Local Area Networks (LANs), server farms, storage area networks (SANs), network access nodes (NANs), campus backbones, metropolitan area networks (MANs) and short distance back-bone connections — anywhere there is a high concentration of data traffic.

Belden's engineers have attained a smaller diameter cable (only .295 in.) than could previously be made. The use of our RoundFleX Technology means higher density connections in the rack. What's more, the smaller diameter and greater flexibility provides for easier handling during installation. And, depending on your application requirements, 10GX Cables can be specified in either a Nonbonded-Pair design or in Belden's exclusive Bonded-Pair construction.

Alien Crosstalk

Still another major bonus of the RoundFlex Technology is that it keeps Alien Crosstalk – crosstalk between neighboring cables – impressively low. To allow for the data rates of 10 Gb/s that are typical in data centers and the like, signals must be transmitted at frequencies up to a minimum of 500 MHz, in contrast to Category 6 transmissions that only run to 200 MHz.

However, achieving satisfactory communication at these high frequencies over UTP copper requires significant changes in the way the channel components are designed – the cable being no exception. Overcoming Alien Crosstalk has been one of the most difficult demands of the Category 6A standard.

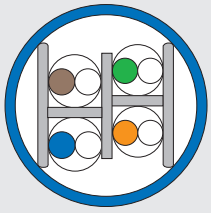
Patent-pending RoundFleX Technology successfully attacks the problem by improving control of the electrical performance with improved positioning of the pairs. The resulting level of Alien Crosstalk suppression is fully compatible with Belden's guaranteed performance specifications for its 10GX systems.

RoundFleX, MatriX IDC, X-Bar, FleXPoint and Bonded-Pair technologies are the pillars that support Belden's complete 10GX system.

10GX Enabling Technologies

The 4-pair, 23 AWG UTP copper 10GX Cables represent the latest advance in Belden's evolving IBDN 10GX family of cabling products.

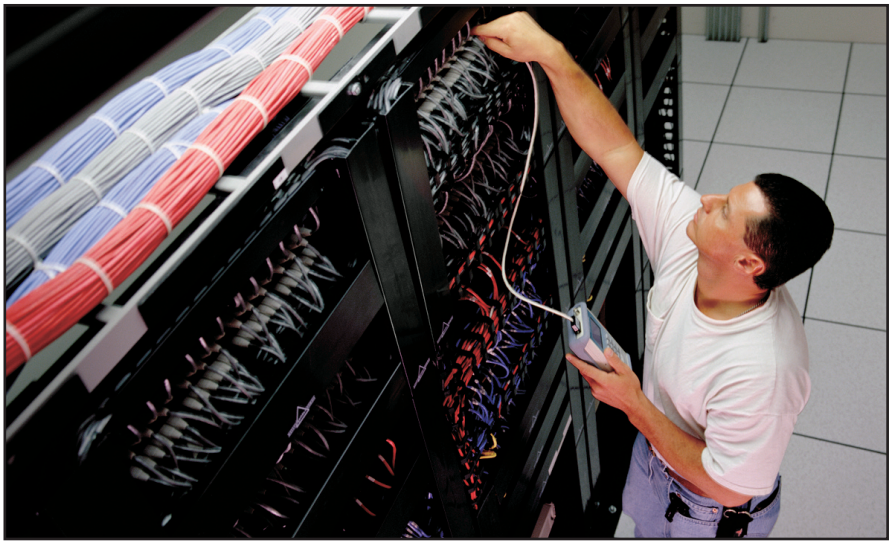
The company's RoundFleX, MatriX IDC, X-Bar, FleXPoint and Bonded-Pair technologies, taken together, comprise five strong pillars of enabling technology that support a complete 10GX system from Belden. They permit the building of a channel that goes well beyond expectations for leading edge 10 Gb/s system performance, exceeding all parameters specified in the Category 6A standard. All performance characteristics have extended bandwidth to support future growth. Alien Crosstalk (ANEXT), NEXT, FEXT, Insertion Loss and Return Loss have guaranteed channel transmission performance up to 625 MHz.



Belden's small OD 10GX Cable features RoundFleX Technology, an internal H-web construction that keeps Alien Crosstalk at an exceptionally low level.

Applications

- 10GBASE-T Full Power Implementation (IEEE 802.3an)
- 10GBASE-T Low Power Implementation (Short Reach Mode) (IEEE 802.3an)
- 1000BASE-T Applications (IEEE 802.3ab)
- Power Over Ethernet Plus – 2 pairs, up to 30 Watts or 4 pairs, up to 60 Watts (IEEE 802.3at)
- Power Over Ethernet – 2 pairs, up to 12.95 Watts (IEEE 802.3af)
- Broadband Video (CATV) & High Speed Internet (DOCSIS) over UTP up to 860 MHz
- High Temperature performance up to 50°C without length de-rating for 1000BASE-T and 100BASE-TX
- High Noise Immunity with a Noise Reduction Factor of 0.3 (TIA 569B)
- VoIP Applications with stringent Bit Error Rate (BER) / Quality of Service (QoS) objectives



Features and Benefits of 10GX Cables

- Unique, patent pending, RoundFleX H-web design separates pairs and maintains stability in pair position, thus improving ANEXT, NEXT and impedance performance
- Small cable diameter (.295 in.)
- Guaranteed electrical performance that goes well beyond Category 6A
- Strong signal strength due to improved noise attenuation
- Maximized bandwidth and signal-to-noise margin for mission-critical applications
- Reduced Alien Crosstalk and less susceptibility to noise due to improved balance/symmetry on Bonded-Pair products
- Truly backward compatible with Category 6 and Category 5e components to protect users' cabling investment
- Easy to install, due to a more round cross-section
- Matching tip and ring color code for ease of installation
- Available in Bonded-Pair and Nonbonded-Pair design
- Available in CMR, CMP and LSZH

Technical Specifications*

Physical Characteristics

- Conductors: 23 AWG solid copper
- Insulation:
  - Plenum: 100% FEP
  - Riser: Polyolefin
  - Color coding as per ANSI/TIA/EIA-568-B
- Cable Core:
  - Unique H-web design
  - Four twisted pairs construction
- Jacket with Rip Cord:
  - Plenum: LSPVC
  - Riser: PVC
  - LSZH: Low Smoke Zero Halogen Polymer Alloy
  - Jacket printed at intervals indicating cable code, AWG, listings (NEC Code), verification, date, manufacturing traceability code
  - Descending length markings start at highest number and end at 0

Mechanical Characteristics

- Minimum Recommended Installation Temperature: 5°C (40°F)
- Temperature Rating: 60°C (140°F)

Transmission Characteristics

- Values up to 625 MHz are minimum guaranteed values
- Values above 625 MHz are for engineering purposes only
- DC Resistance @ 20°C, max.: 7.4 ohms/100 m
- DC Resistance Unbalance, max.: 3%
- Mutual Capacitance, nom.: 5.7nF/100 m
- Capacitance Unbalance Pair to Ground, max.: 50pF/100 m
- Input Impedance:

Input Impedance	Bonded-Pair	Nonbonded-Pair
100±12	1-20 MHz	—
100±15	20-250 MHz	1-100 MHz
100±20	250-350 MHz	—
100±22	350-625 MHz	100-200 MHz
100±32	—	200-625 MHz

- Nominal Velocity of Propagation (NVP):
  - Plenum: 68% @ 10 MHz
  - Riser: 64% @ 10 MHz
- Propagation Delay (Skew), max.: 35ns/100 m

Qualifications

- Category 6A requirements as per TIA/EIA-568-B.2-10-2008, and ISO/IEC 11801 Ed.2 Draft Amd 2 Class EA
- Exceeds Category 6 requirements per ANSI/TIA/EIA-568-B
- Exceeds the Category 5e requirements per ANSI/TIA/EIA-568-A.5 or ANSI/TIA/EIA-568-B
- Riser: ITS/ETL Certified as CMR, and listed as NEC Type CMR per UL Standard 444
- Plenum: ITS/ETL Certified as CMP, and listed as NEC Type CMP per UL Standard 444
- LSZH: ISO/IEC 332-1, 754-2 and 1034-2

Visit **www.belden.com** to obtain more information on Belden 10GX System and its performance cabling technologies.

* Values are the same for Bonded-Pair and Nonbonded-Pair Cables, unless specifically noted.

Key Physical Attributes – 10GX Bonded-Pair Cable

4-pair, 23 AWG Bonded-Pair	Nominal O.D.	Min. Bend Radius	Weight (Cable Only)
CMR (10GX32)	7.49mm (0.295 in.)	31.75mm (1.25 in.)	59.38 kg/km (40.0 lb/kft)
CMP (10GX33)	7.49mm (0.295 in.)	31.75mm (1.25 in.)	56.41 kg/km (38.0 lb/kft)

10GX44 LSZH version is available upon request

Key Physical Attributes – 10GX Nonbonded-Pair Cable

4-pair, 23 AWG Nonbonded-Pair	Nominal O.D.	Min. Bend Radius	Weight (Cable Only)
CMR (10GX12)	7.49mm (0.295 in.)	31.75mm (1.25 in.)	59.38 kg/km (40.0 lb/kft)
CMP (10GX13)	7.49mm (0.295 in.)	31.75mm (1.25 in.)	56.41 kg/km (38.0 lb/kft)

10GX24 LSZH version is available upon request

10GX Cables

Key Electrical Attributes – 10GX Bonded-Pair Cable

Frequency (MHz)	Max. Insertion Loss (dB/100 m)		Min. PSNEXT (dB)		Min. PSACR (dB)		Min. PSACRF (dB)		THE BONDED-PAIR ADVANTAGE						Min. PSANEXT (dB)		Min. PSAACRF (dB)	
									Min. Return Loss (dB)*		Min. Balance TCL (dB)*		Min. Balance ELTCTL (dB)*					
	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden
1	2.1	2.1	72.3	73.3	70.2	71.2	64.8	68.8	20.0	20.0	40.0	48.0	35.0	43.0	67.0	67.0	67.0	67.0
4	3.8	3.8	63.3	64.3	59.5	60.5	52.8	56.8	23.0	23.0	40.0	48.0	23.0	31.0	67.0	67.0	66.2	67.2
8	5.3	5.3	58.8	59.8	53.4	54.4	46.7	50.7	24.5	24.5	40.0	48.0	16.9	24.9	67.0	67.0	60.1	61.1
10	5.9	5.9	57.3	58.3	51.4	52.4	44.8	48.8	25.0	25.0	40.0	48.0	15.0	23.0	67.0	67.0	58.2	59.2
16	7.5	7.5	54.2	55.2	46.8	47.8	40.7	44.7	25.0	25.0	38.0	46.0	10.9	18.9	67.0	67.0	54.1	55.1
20	8.4	8.4	52.8	53.8	44.4	45.4	38.8	42.8	25.0	25.0	37.0	45.0	9.0	17.0	67.0	67.0	52.2	53.2
25	9.4	9.4	51.3	52.3	42.0	43.0	36.8	40.8	24.3	25.0	36.0	44.0	7.0	15.0	67.0	67.0	50.2	51.2
31.25	10.5	10.5	49.9	50.9	39.4	40.4	34.9	38.9	23.6	25.0	35.1	43.1	5.1	13.1	67.0	67.0	48.3	49.3
62.5	15.0	15.0	45.4	46.4	30.4	31.4	28.9	32.9	21.5	25.0	32.0	40.0	-	-	65.6	66.6	42.3	43.3
100	19.1	19.1	42.3	43.3	23.2	24.2	24.8	28.8	20.1	25.0	30.0	38.0	-	-	62.5	63.5	38.2	39.2
155	24.1	24.1	39.4	40.4	15.4	16.4	21.0	25.0	18.8	22.8	28.1	36.1	-	-	59.6	60.6	34.4	35.4
200	27.6	27.6	37.8	38.8	10.2	11.2	18.8	22.8	18.0	21.0	27.0	35.0	-	-	58.0	59.0	32.2	33.2
250	31.1	31.1	36.3	37.3	5.3	6.3	16.8	20.8	17.3	20.5	26.0	34.0	-	-	56.5	57.5	30.2	31.2
300	34.3	34.3	35.1	36.1	0.9	1.9	15.3	19.3	16.8	20.1	25.2	33.2	-	-	55.3	56.3	28.7	29.7
350	37.2	37.2	34.1	35.1	-	-	13.9	17.9	16.3	19.8	24.6	32.6	-	-	54.3	55.3	27.3	28.3
400	40.1	40.1	33.3	34.3	-	-	12.8	16.8	15.9	19.5	24.0	32.0	-	-	53.5	54.5	26.2	27.2
450	42.7	42.7	32.5	33.5	-	-	11.7	15.7	15.5	18.9	23.5	31.5	-	-	52.7	53.7	25.1	26.1
500	45.3	45.3	31.8	32.8	-	-	10.8	14.8	15.2	18.4	23.0	31.0	-	-	52.0	53.0	24.2	25.2
550	-	47.7	-	32.2	-	-	-	14.0	-	18.0	-	-	-	-	-	52.4	-	24.4
600	-	50.1	-	31.6	-	-	-	13.2	-	17.6	-	-	-	-	-	51.8	-	23.6
625	-	51.2	-	31.4	-	-	-	12.9	-	17.4	-	-	-	-	-	51.6	-	23.3
750	-	56.7	-	30.2	-	-	-	11.3	-	16.5	-	-	-	-	-	50.4	-	21.7
860	-	61.2	-	29.3	-	-	-	10.1	-	15.8	-	-	-	-	-	49.5	-	20.5

Values above 625 MHz for engineering purposes only.
* Belden's Bonded-Pair Cables provide improved return loss and balance performance.

Key Electrical Attributes – 10GX Nonbonded-Pair Cable

Frequency (MHz)	Max. Insertion Loss (dB/100 m)		Min. PSNEXT (dB)		Min. PSACR (dB)		Min. PSACRF (dB)		Min. Return Loss (dB)		Min. Balance TCL (dB)		Min. Balance ELTCTL (dB)		Min. PSANEXT (dB)		Min. PSAACRF (dB)	
	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden	TIA	Belden
1	2.1	2.1	72.3	73.3	70.2	71.2	64.8	68.8	20.0	20.0	40.0	40.0	35.0	35.0	67.0	67.0	67.0	67.0
4	3.8	3.8	63.3	64.3	59.5	60.5	52.8	56.8	23.0	23.0	40.0	40.0	23.0	23.0	67.0	67.0	66.2	67.2
8	5.3	5.3	58.8	59.8	53.4	54.4	46.7	50.7	24.5	24.5	40.0	40.0	16.9	16.9	67.0	67.0	60.1	61.1
10	5.9	5.9	57.3	58.3	51.4	52.4	44.8	48.8	25.0	25.0	40.0	40.0	15.0	15.0	67.0	67.0	58.2	59.2
16	7.5	7.5	54.2	55.2	46.8	47.8	40.7	44.7	25.0	25.0	38.0	38.0	10.9	10.9	67.0	67.0	54.1	55.1
20	8.4	8.4	52.8	53.8	44.4	45.4	38.8	42.8	25.0	25.0	37.0	37.0	9.0	9.0	67.0	67.0	52.2	53.2
25	9.4	9.4	51.3	52.3	42.0	43.0	36.8	40.8	24.3	24.3	36.0	36.0	7.0	7.0	67.0	67.0	50.2	51.2
31.25	10.5	10.5	49.9	50.9	39.4	40.4	34.9	38.9	23.6	23.6	35.1	35.1	5.1	5.1	67.0	67.0	48.3	49.3
62.5	15.0	15.0	45.4	46.4	30.4	31.4	28.9	32.9	21.5	21.5	32.0	32.0	-	-	65.6	66.6	42.3	43.3
100	19.1	19.1	42.3	43.3	23.2	24.2	24.8	28.8	20.1	20.1	30.0	30.0	-	-	62.5	63.5	38.2	39.2
155	24.1	24.1	39.4	40.4	15.4	16.4	21.0	25.0	18.8	18.8	28.1	28.1	-	-	59.6	60.6	34.4	35.4
200	27.6	27.6	37.8	38.8	10.2	11.2	18.8	22.8	18.0	18.0	27.0	27.0	-	-	58.0	59.0	32.2	33.2
250	31.1	31.1	36.3	37.3	5.3	6.3	16.8	20.8	17.3	17.3	26.0	26.0	-	-	56.5	57.5	30.2	31.2
300	34.3	34.3	35.1	36.1	0.9	1.9	15.3	19.3	16.8	16.8	25.2	25.2	-	-	55.3	56.3	28.7	29.7
350	37.2	37.2	34.1	35.1	-	-	13.9	17.9	16.3	16.3	24.6	24.6	-	-	54.3	55.3	27.3	28.3
400	40.1	40.1	33.3	34.3	-	-	12.8	16.8	15.9	15.9	24.0	24.0	-	-	53.5	54.5	26.2	27.2
450	42.7	42.7	32.5	33.5	-	-	11.7	15.7	15.5	15.5	23.5	23.5	-	-	52.7	53.7	25.1	26.1
500	45.3	45.3	31.8	32.8	-	-	10.8	14.8	15.2	15.2	23.0	23.0	-	-	52.0	53.0	24.2	25.2
550	-	47.7	-	32.2	-	-	-	14.0	-	14.9	-	-	-	-	-	52.4	-	24.4
600	-	50.1	-	31.6	-	-	-	13.2	-	14.7	-	-	-	-	-	51.8	-	23.6
625	-	51.2	-	31.4	-	-	-	12.9	-	14.5	-	-	-	-	-	51.6	-	23.3
750	-	56.7	-	30.2	-	-	-	11.3	-	14.0	-	-	-	-	-	50.4	-	21.7
860	-	61.2	-	29.3	-	-	-	10.1	-	13.6	-	-	-	-	-	49.5	-	20.5

Values above 625 MHz for engineering purposes only.

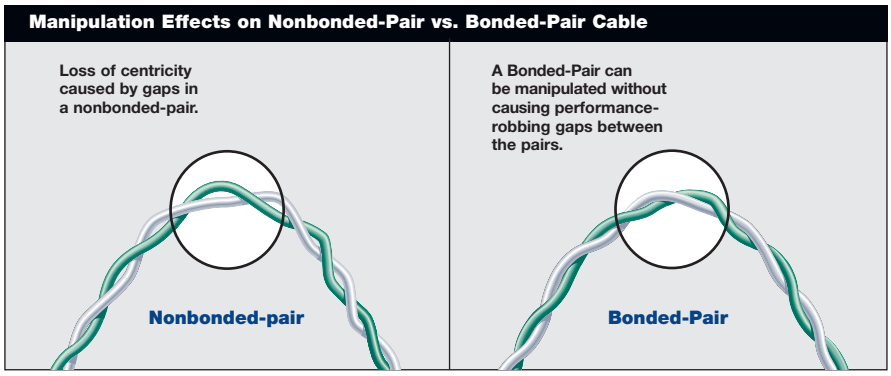
10GX Cables

Select Bonded-Pair or Nonbonded-Pair Construction

Belden provides the option of ordering 10GX Cables in either Bonded-Pair or Nonbonded-Pair constructions. The choice will depend on the type of signals supported, the critical nature of the information transmitted, and the stability of the networking environment.

Belden's Bonded-Pair Cables feature a patented design in which the individual conductors are securely bonded along their longitudinal axis to guarantee uniform spacing within each twisted pair — a key factor in maintaining consistently high electrical performance.

Because Belden's Bonded-Pair Cables avoid potential gaps between each pair's conductors, they provide improved return loss and balance performance. Superior transverse conversion loss (TCL), capacitance unbalance and resistance unbalance results in less modal conversion, which means the cabling infrastructure is less susceptible to electromagnetic and radio frequency interference (EMI/RFI) in noisy environments. Less modal conversion also means that Alien NEXT performance for short channels and Alien FEXT performance for long channels is significantly improved.

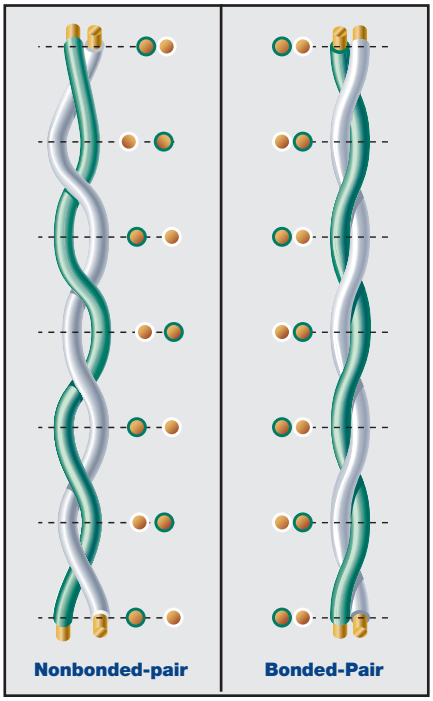


The slightest manipulation of a nonbonded-pair cable (left), can cause gaps between the conductors of the pair and impair electrical performance. Gaps cannot form between the conductors in a Bonded-Pair Cable (right), resulting in consistent electrical performance.

Belden's ultra-robust Bonded-Pair Cables can provide additional peace of mind, especially when deployed in:

- Mission-critical data centers
- Frequently changing networking environments where constant moves, adds and changes are routine
- Environments where electromagnetic and radio frequency interference (EMI/RFI) create noise and signal transmission problems
- High frequency applications in which return loss can affect signal integrity

In stable networking environments, Belden's standard 10GX Cables will perform reliably to exceed TIA/EIA Category 6A standards. When the application calls for a more robust solution, Belden Bonded-Pair 10GX Cables will provide superior integrity and electrical performance from the reel to real life — through all the stresses of installation and post-installation maintenance. Belden calls this unique capability Installable Performance®.



The distance between the conductors, or the conductor-to-conductor centricity, should remain fixed and stable along the length of the twisted pair.

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10GX Cables are available in both Bonded-Pair and Nonbonded-Pair configurations, as well as plenum, riser and LSZH versions.

Ordering Information

10GX Bonded-Pair, 4-pair, 23 AWG, CMR, Category 6A

Belden Part Number	Color	Length	Packaging	No. of Packages Per Pallet	Total Length Per Pallet
10GX32 0041000	Yellow	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX32 0061000	Blue	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX32 0081000	Gray	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX32 0091000	White	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)

10GX Bonded-Pair, 4-pair, 23 AWG, CMP, Category 6A

Belden Part Number	Color	Length	Packaging	No. of Packages Per Pallet	Total Length Per Pallet
10GX33 0041000	Yellow	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX33 D151000	Blue	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX33 0081000	Gray	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX33 0091000	White	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)

10GX44 LSZH version is available upon request

10GX Nonbonded-Pair, 4-pair, 23 AWG, CMR, Category 6A

Belden Part Number	Color	Length	Packaging	No. of Packages Per Pallet	Total Length Per Pallet
10GX12 0021000	Red	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0031000	Orange	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0041000	Yellow	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0051000	Green	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0061000	Blue	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0071000	Purple	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0081000	Gray	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0091000	White	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0101000	Black	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX12 0041500	Yellow	458 m (1500 ft)	Spool	15 spools/pallet	6870 m (22500 ft)
10GX12 0091500	White	458 m (1500 ft)	Spool	15 spools/pallet	6870 m (22500 ft)
10GX12 0101500	Black	458 m (1500 ft)	Spool	15 spools/pallet	6870 m (22500 ft)
10GX12 0062500	Blue	762 m (2500 ft)	Spool	8 spools/pallet	6096 m (20000 ft)

10GX Nonbonded-Pair, 4-pair, 23 AWG, CMP, Category 6A

Belden Part Number	Color	Length	Packaging	No. of Packages Per Pallet	Total Length Per Pallet
10GX13 0041000	Yellow	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 0051000	Green	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 D151000	Blue	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 0071000	Purple	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 0081000	Gray	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 0091000	White	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 0101000	Black	305 m (1000 ft)	Spool	27 spools/pallet	8235 m (27000 ft)
10GX13 0101500	Black	458 m (1500 ft)	Spool	15 spools/pallet	6870 m (22500 ft)
10GX13 0042500	Yellow	762 m (2500 ft)	Spool	8 spools/pallet	6096 m (20000 ft)
10GX13 D152500	Blue	762 m (2500 ft)	Spool	8 spools/pallet	6096 m (20000 ft)

10GX24 LSZH version is available upon request

To learn more about Belden IBDN System 10GX or any Belden IBDN copper-based structured cabling systems, call **1.800.BELDEN.1** or visit our Website at **www.belden.com**.

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Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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Данный компонент на территории Российской Федерации

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Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

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