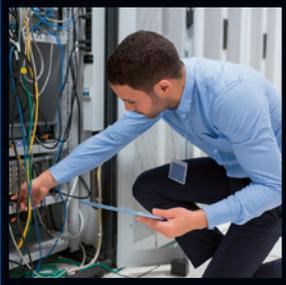# BELDEN
SENDING ALL THE RIGHT SIGNALS

DataTuff® Industrial Ethernet Solutions

Be certain.
Belden.

The Best Fit for Your Industrial Ethernet Application – from the Cabinet to the Machine

Be Certain. Belden Understands Industrial Ethernet.

Optimize your costs by guiding you to the best and most suitable technology for your needs.

The Belden product portfolio covers all areas of the industrial environment, from the cabinet, through the telecommunications room to the factory floor, and ending on the actual machine. The comprehensive DataTuff® Industrial Ethernet cable and connectivity range ensures the highest level of reliability, quality and performance. Specifiers can choose from products suitable for indoor and outdoor applications, for use underground, and for other harsh conditions. Cordsets come with RJ45 and M12 connectors, and IP20, IP67 and IP68 protection.

The cabling meets all data rate requirements, ranging from 100 Mb/s, through 1 Gb/s, to 10 Gb/s.

How to Select the Right Industrial Ethernet Cable
DataTuff® Industrial Ethernet Cable Selector

Step1: Type of Application

First step is to identify the application of the cable, by understanding where are the cables needed, as of the picture below:
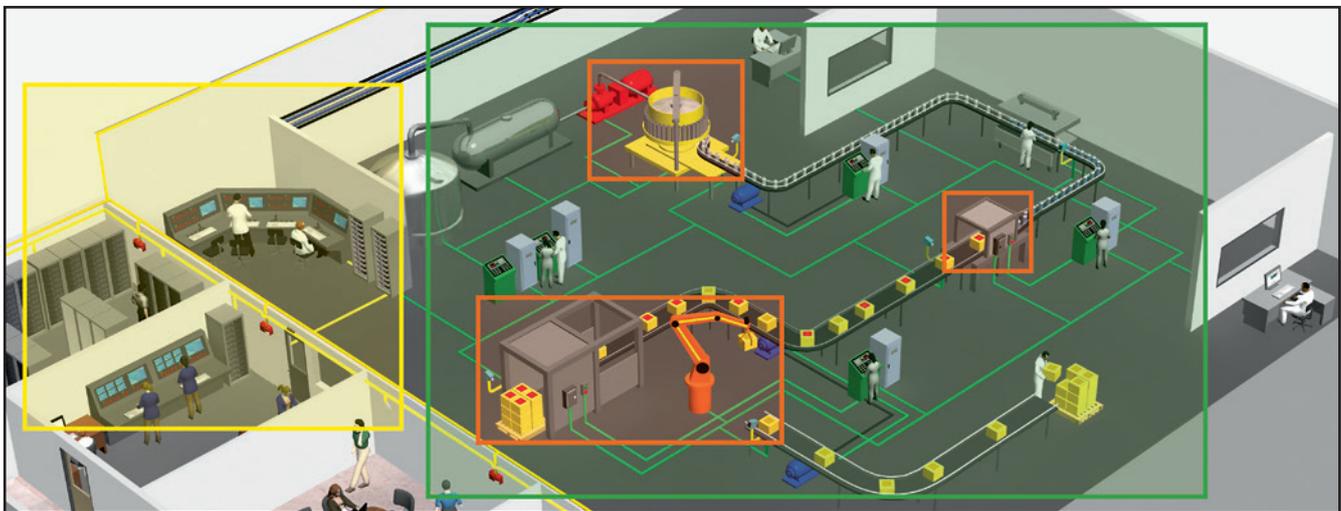
Cabinet/Control Room and Permanent Installation	Factory Floor and Moderate Flexing	On-Machine and Continuous Flexing

Permanent Installation range is suitable for cabinets, control rooms and telecommunication rooms: enclosed environments, where vibration is limited. In these applications, a solid conductor is the right choice, future-proofed with high bandwidth capability.

Moderate Flexing range is aimed at the factory floor and work areas where there are raised levels of vibration, and cables are likely to be exposed to oil, chemicals, rough handling, abrasion, UV radiation, temperature variations, and electronic noise (EMI and RFI).

Continuous Flexing range is for use on the machine itself, where vibration and temperatures are high to very high, and the need is for highly flexible cabling resistant to trailing and torsion, as well as a high level of connectivity protection against liquids (M12 with IP67 protection).

Step 2: Data Rates Requirements

Data Rates	Up to 100 Mb/s	Up to 1 Gb/s	Up to 10 Gb/s
Channel Class ISO/IEC 11801	Class D	Class D	Class E
Belden Recommended Cable Category	**Cat 5e (2 pr)**	**Cat 5e (4 pr)**	**Cat 7**
Belden Recommended Patch Cord Category	**Cat 5e (2 pr)**	**Cat 5e (4 pr)**	**Cat 6$_A$**

Step 3: Type of Jacketing

Function	PVC	FRNC	TPE	PUR
Oil Resistance	**	**	***	***
Abrasion Resistance	**	*	***	****
Continuous Flex	**	*	****	****
Specific Attributes	General purpose, good mechanical strength	Flame retardant, low smoke when burned	Excellent for flexing applications and very good resistance to oils and coolants	Outstanding resistance to abrasion, high flex and high tolerance to solvents
Cost of Installation	$	$$	$$$	$$$
Type of Application	**Permanent Installation** / **Moderate Flexing**	**Permanent Installation** / **Moderate Flexing**	**Continuous Flexing**	**Moderate Flexing** / **Continuous Flexing**

Legend: * = Fair, ** = Good, *** = Excellent, **** = Outstanding

Step 4: Unshielded vs Shielded

Function	Unshielded Cables	Shielded Cables
Protection in noisy environment (with high EMI)	Lower	Higher
Ease of Installation	Higher	Lower
Cost of Installation	Lower	Higher

Step 5: Bonded vs Twisted Pair (Nonbonded-Pair)

Belden's Patented Bonded-Pair Technology:

- No gaps between the conductor pairs means that the conductor-to-conductor spacing, or centricity, is always uniform
- With a uniform centricity, the cable offers excellent and consistently reliable electrical performance
- Installable Performance® is achieved – the affixing of the insulation of the cable pairs and the uniform centricity translate to superior electrical performance, even after the cable has been subjected to the bending, pulling and twists inherent in the installation process

Function	Bonded-Pair	Twisted Pair (Nonbonded-Pair)
Performance after bending, pulling and twists inherent in the installation process	Higher	Lower
Electrical Stability	Higher	Lower

Twisted Pair (Nonbonded-Pair)   Bonded-Pair
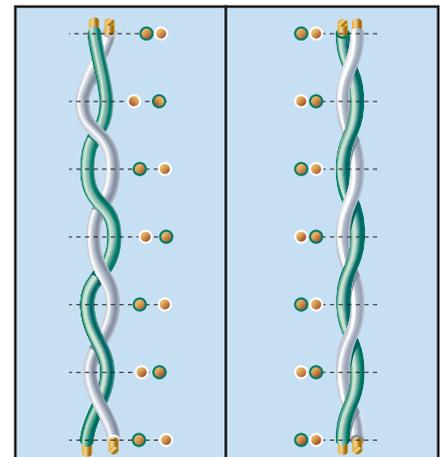
Permanent Installation

Product Image	Data Rates	Cat-egory	Conductor (Stranding)		No. of Pairs	Jacket				Shielding		Design		Part. No.
			Solid	Stranded		PVC	FRNC	TPE	PUR	Shielded	Unshielded	Twisted Pair	Bonded Pair	
INDUSTRIAL ETHERNET														
	100 Mb/s	Cat 5e	AWG 24 (1)	–	2	✔	–	–	–	Foil Braid >80%	–	✔	–	**72001E**
						–	✔	–	–	Foil Braid >80%	–	✔	–	**72001NH**
	100 Mb/s	Cat 5e	AWG 24 (1)	–	2	✔	–	–	–	–	✔	–	✔	**7932A**
	1 Gb/s	Cat 5e	AWG 24 (1)	–	4	✔	–	–	–	Foil Braid >80%	–	✔	–	**74001E**
						–	✔	–	–	Foil Braid >80%	–	✔	–	**74001NH**
	1 Gb/s	Cat 5e	AWG 24 (1)	–	4	✔	–	–	–	–	✔	–	✔	**7923A**
						–	✔	–	–	–	✔	–	✔	**7935A**
	1 Gb/s	Cat 5e	AWG 24 (1)	–	4	✔	–	–	–	✔	–	–	✔	**7929A**
	10 Gb/s	Cat 7	AWG 23 (1)	–	4	✔	–	–	–	Foil Braid >65%	–	✔	–	**74004E**
						–	✔	–	–	Foil Braid >65%	–	✔	–	**74004NH**
PROFINET														
	100 Mb/s	Cat 5e	AWG 22 (1)	–	Quad	✔	–	–	–	Foil Braid >85%	–	✔	–	**70006E**
						–	✔	–	–	Foil Braid >85%	–	✔	–	**70006NH**

Moderate Flexing

Product Image	Data Rates	Cat-egory	Conductor (Stranding)		No. of Pairs	Jacket				Shielding		Design		Part. No.
			Solid	Stranded		PVC	FRNC	TPE	PUR	Shielded	Unshielded	Twisted Pair	Bonded Pair	
INDUSTRIAL ETHERNET														
	100 Mb/s	Cat 5e	–	AWG 26 (7)	2	✔	–	–	–	Foil Braid >80%	–	✔	–	**72002E**
						–	✔	–	–	Foil Braid >80%	–	✔	–	**72002NH**
						–	–	–	✔	Foil Braid >80%	–	✔	–	**72002PU**
	1 Gb/s	Cat 5e	–	AWG 26 (7)	4	✔	–	–	–	Foil Braid >80%	–	✔	–	**74002E**
						–	✔	–	–	Foil Braid >80%	–	✔	–	**74002NH**
						–	–	–	✔	Foil Braid >80%	–	✔	–	**74002PU**
	1 Gb/s	Cat 5e	–	AWG 24 (7)	4	✔	–	–	–	–	✔	–	✔	**7924A**
	10 Gb/s	Cat 7	–	AWG 26 (7)	4	–	–	–	✔	Foil Braid >65%	–	✔	–	**74005PU**
PROFINET														
	100 Mb/s	Cat 5e	–	AWG 22 (7)	Quad	✔	–	–	–	Foil Braid >85%	–	✔	–	**70007E**
						–	✔	–	–	Foil Braid >85%	–	✔	–	**70007NH**
						–	–	–	✔	Foil Braid >85%	–	✔	–	**70007PU**

Continuous Flexing

Product Image	Data Rates	Cat-egory	Conductor (Stranding)		No. of Pairs	Jacket				Shielding		Design		Part. No.
			Solid	Stranded		PVC	FRNC	TPE	PUR	Shielded	Unshielded	Twisted Pair	Bonded Pair	
INDUSTRIAL ETHERNET														
	1 Gb/s	Cat 5e	–	AWG 24 (7) Trailing[1]	4	–	–	✔	–	Foil Braid >85%	–	–	✔	**7938A**
	1 Gb/s	Cat 5e	–	AWG 26 (19) Trailing[2]	4	–	–	–	✔	Foil Braid >80%	–	✔	–	**74003PU**
				AWG 26 (19) Torsion[2]	4	–	–	–	✔	Foil Braid >80%	–	✔	–	**74009PU**
PROFINET														
	100 Mbit/s	Cat 5e	–	AWG 22 (19) Trailing[2]	Quad	–	–	–	✔	Foil Braid >85%	–	✔	–	**70008PU**
				AWG 22 (19) Torsion[2]	Quad	–	–	–	✔	Foil Braid >85%	–	✔	–	**70009PU**

1 = 10 million cycles
2 = > than 2 million cycles

How to Select the Right Industrial Ethernet Connectivity
DataTuff® Industrial Ethernet Connectivity Selector

After specification of the related Ethernet Protocol, the selection of a suitable patch cord is the same as for the Bulk cable (Step 1-5). In additon the type of connector and the type of protection needs to be selected.

Type of Connector

DataTuff® RJ45 and M12 D-coded, M12 X-coded

Type of Protection

For safety, electrical equipment must be protected from any external interference. This is ensured by enclosures which protect the electrical equipment from contact with dangerous parts and prevent ingress of solid foreign objects, dust, humidity and water.

Ingress Protection Class	IP20	IP67	IP68
Solid Protection	Protection against contact with the fingers and solid foreign bodies with Ø>12mm	Total protection against contact, protection against penetration of dust	Total protection against contact, protection against penetration of dust
Liquid Protection	No protection against water	Protection against **temporary** submersion in water	Protection against **permanent** submersion in water

Length Selection Table for CAxxx* Patch Cords

1 m	3 m	5 m	10 m	25 m
.00C01	.00C03	.00C05	.00C10	.00C25

Example: for Belden DataTuff® Industrial Ethernet CA00600 patch cord, 25 m, the part number is: **CA00600.00C25**

Permanent Installation

Data Rates	Patch Cord Category	Conductor (Stranding)		No. of Pairs	Jacket				Shielding		Design		Connectivity				Part. No
		Solid	Stranded		PVC	FRNC	TPE	PUR	Shielded	Unshielded	Twisted Pair	Bonded Pair	Plug End 1	Protection End 1	Plug End 2	Protection End 2	
INDUSTRIAL ETHERNET																	
100 Mb/s	Cat 5e	AWG 24 (1)	–	2	✓	–	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00641
					–	✓	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00642
1 Gb/s	Cat 5e	AWG 24 (1)	–	4	✓	–	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00600
					✓	–	–	–	–	✓	–	✓	RJ45	IP20	RJ45	IP20	E501001
					✓	–	✓	–	–	–	–	✓	RJ45	IP20	RJ45	IP20	E505001
					–	✓	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00643
10 Gb/s	Cat 6A	–	AWG 26 (7)	4	✓	–	–	–	Foil Braid >65%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00664
					–	✓	–	–	Foil Braid >65%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00665
PROFINET																	
100 Mbit/s	Cat 5e	AWG 22 (1)	–	Quad	✓	–	–	–	Foil Braid >85%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00656
					–	✓	–	–	Foil Braid >85%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00658

Moderate Flexing

Data Rates	Patch Cord Category	Conductor (Stranding)		No. of Pairs	Jacket				Shielding		Design		Connectivity				Part. No
		Solid	Stranded		PVC	FRNC	TPE	PUR	Shielded	Unshielded	Twisted Pair	Bonded Pair	Plug End 1	Protection End 1	Plug End 2	Protection End 2	
INDUSTRIAL ETHERNET																	
100 Mb/s	Cat 5e	–	AWG 26 (7)	2	✓	–	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00660
100 Mb/s	Cat 5e	–	AWG 24 (7)	2	✓	–	–	–	–	✓	–	✓	M12MD	IP68	RJ45	IP20	900 001 991
													M12MD	IP68	M12MD	IP68	900 001 973
100 Mb/s	Cat 5e	–	AWG 26 (7)	2	–	✓	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00661
100 Mb/s	Cat 5e	–	AWG 24 (7)	2	–	–	✓	–	Foil Braid >65%	–	–	✓	RJ45	IP20	RJ45	IP20	900 002 882
													M12MD	IP68	M12MD	IP68	900 002 833
1 Gb/s	Cat 5e	–	AWG 26 (7)	4	✓	–	–	–	Foil Braid >80%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00613
1 Gb/s	Cat 5e	–	AWG 24 (7)	4	✓	–	–	–	–	✓	–	✓	RJ45	IP20	RJ45	IP20	900 001 896
1 Gb/s	Cat 5e	–	AWG 24 (7)	4	✓	–	–	–	✓	–	–	✓	RJ45	IP20	RJ45	IP20	E507001
1 Gb/s	Cat 5e	–	AWG 26 (7)	4	–	✓	–	–	Foil Braid >80%	–	–	–	RJ45	IP20	RJ45	IP20	CA00630
10 Gb/s	Cat 6$_A$	–	AWG 26 (7)	4	–	–	–	✓	Foil Braid >65%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00652
													M12MX	IP67	RJ45	IP20	CA00653
													M12MX	IP67	M12MX	IP67	CA00654
PROFINET																	
100 Mbit/s	Cat 5e	–	AWG 22 (7)	Quad	✓	–	–	–	Foil Braid >85%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00730
					–	✓	–	–	Foil Braid >85%	–	✓	–	RJ45	IP20	RJ45	IP20	CA00735

Continuous Flexing

Data Rates	Patch Cord Category	Conductor (Stranding)		No. of Pairs	Jacket				Shielding		Design		Connectivity				Part. No.
		Solid	Stranded		PVC	FRNC	TPE	PUR	Shielded	Unshielded	Twisted Pair	Bonded Pair	Plug End 1	Protection End 1	Plug End 2	Protection End 2	
INDUSTRIAL ETHERNET																	
100 Mb/s	Cat 5e	–	AWG 26 (7)	2	–	–	–	✓	Foil Braid >85%	–	✓	–	M12MD	IP68	M12MD	IP68	0985 S4549 100
10 Gb/s	Cat 6$_A$	–	AWG 26 (7)	4	–	–	–	✓	Foil Braid >65%	–	✓	–	M12MX	IP67	M12MX	IP67	0985 478 601

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GLOBAL LOCATIONS

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