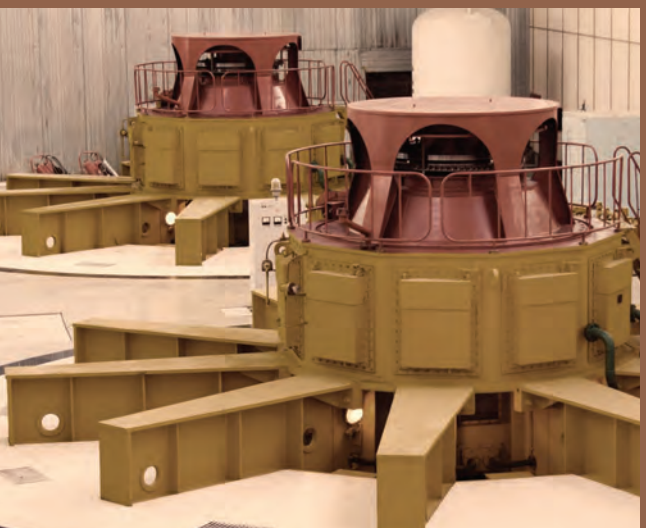
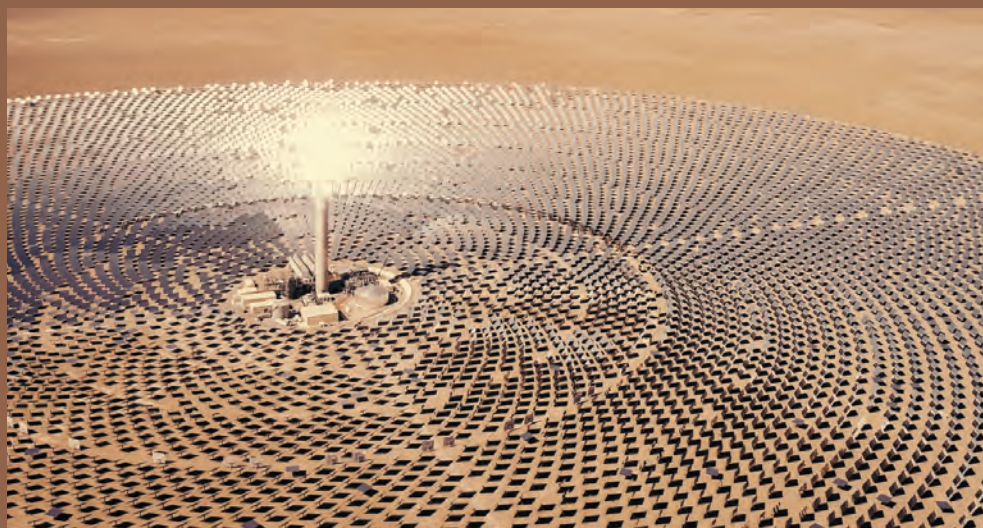
Exel International

CATALOG

ABSOLUTE SYNERGY





Exel International

MISSION STATEMENT

Exel is committed to making a difference in the global energy industry by constantly improving its product line and services and maintaining high quality standards, with the ultimate goal of exceeding customer expectations.

VISION

Exel strongly believes that the synergy of all aspects of our business is vital for worldwide success. The company aims to achieve excellence through teamwork, with the goal of becoming a world leader in its field and a business recognized by peers.

VALUES

COMMITMENT • RESPECT • INTEGRITY • CREATIVITY

Version 4.0 / Updated October 2020

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IMPORTANT INFORMATION

The Imperial system is used for all dimensions in this catalogue. Metric sizes are also available.

FLEXIBLE BRAIDED CONNECTORS

Exel International

FLEXIBLE BRAIDED CONNECTORS

For large or small quantities, Exel is equipped to meet the various requirements of its customers. Manufactured from top-quality materials using proven processes and exclusive, advanced numerically controlled equipment designed in house, Exel's flexible braided connectors offer the highest quality and performance.

UL LISTED RoHS COMPLIANT

*UL is a leading provider of product testing and certification services responsible for defining industry specific national and international standards, as well as for the testing required to prove product compliance to those standards. If such standards currently exist at purchase time for a specific connector, certification will be provided by Exel for said model. However, if standards are non-existent on the market for a model of connector, the client will have the responsibility to provide its own standards to Exel for testing and certification issuance upon request and additional costs and conditions will apply.

APPLICATIONS

For low and medium-voltage applications, flexible braided connectors are used mainly in the energy industry for wind turbines, generators, substations, transformers, switchgears, hydro turbines, circuit breakers and rectifiers. They are also used in the automotive, aerospace, information technology and military industries.

Flexible braided connectors are mainly used in the following situations:

- Heavy mechanical vibrations
- Thermal contraction and/or expansion of attached units
- Space constraints

STANDARD SPECIFICATIONS

FERRULES

- Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

FERRULE PLATING OPTIONS

- Electrolytic tin plating as per ASTM B545
- Electrolytic silver plating as per ASTM B700
- Electroless nickel plating as per ASTM B733
- Lead-free hot tin dip plating

The standard ferrule plating thickness is 0.0003", but can be made up to 0.003" upon request.

FLAT, ROUND OR TUBULAR BRAIDS

- Tin-plated C11000 ETP copper as per ASTM B33
- Silver-plated C11000 ETP copper as per ASTM B298
- Nickel-plated C11000 ETP copper as per ASTM B335
- Bare C11000 ETP copper as per ASTM B3

The most commonly used wire gauges in the industry are 30 AWG (0.010") to 44 AWG (0.002").

DIMENSIONS

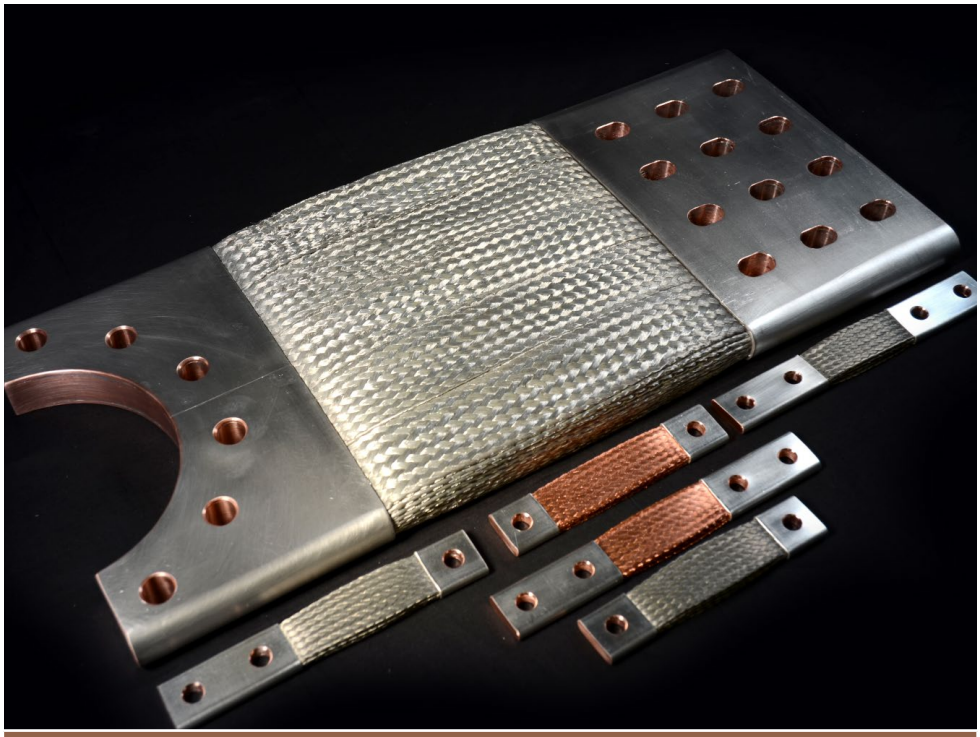
- Ferrule widths up to 10"
- Ferrule thicknesses up to 3"
- Total connector length up to 1200"
- Mounting holes as per NEMA standards

CURRENT CAPACITY

- 100 amperes to 7,500 amperes

OPTIONS

- Insulation: Heat shrink PVC and polyolefin, ceramic heat shield material and other types of insulation materials are available.



FC001

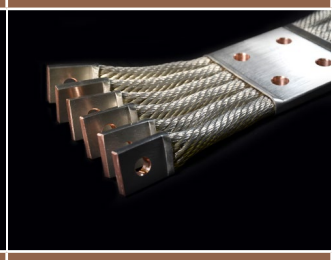
FC002

FC003

FC004

FC005

FC006



FC007

Custom sizes, alloys and plating types are also available upon request. We are specialized in customized solutions. Exel International offers UL listed and flexible braided connectors.

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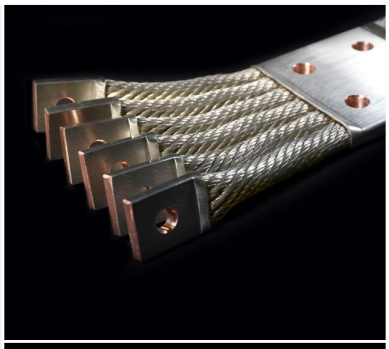
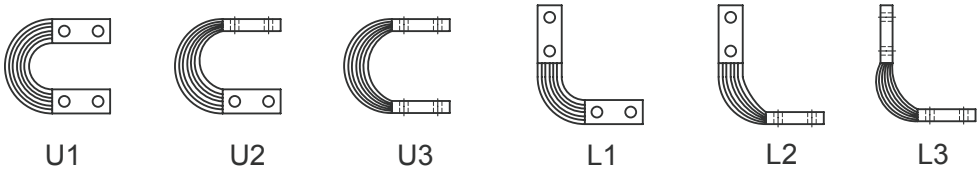
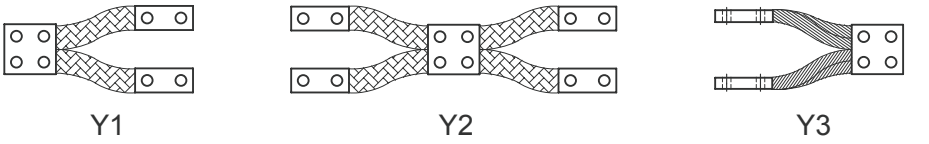
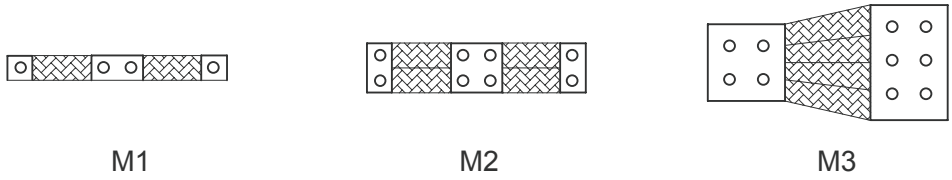


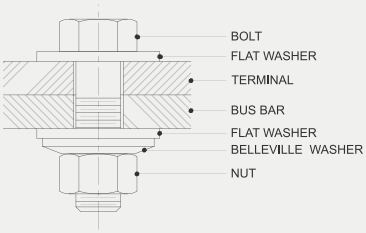
SPECIAL SHAPES AND CONFIGURATIONS







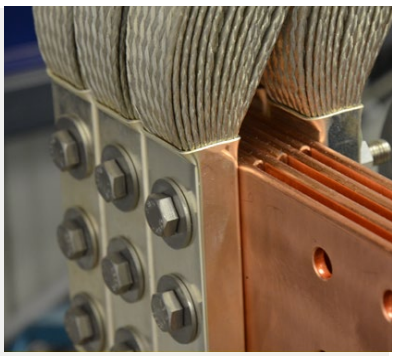
CUSTOM SHAPES ARE ALSO AVAILABLE



SUGGESTED MOUNTING METHOD

COPPER AND ALUMINIUM BUS BAR BOLTING TORQUES

BOLT SIZE (UNC)	TERMINAL HOLE SIZE (IN)	FLAT WASHER 18-8 & 316 STAINLESS STEEL		RECOMMENDED BOLTING TORQUES BASED ON NEMA STANDARD			
				18-8 STAINLESS STEEL OR SILICON BRONZE		2024-T4 ALUMINIUM (LUBRICATED)	
		OUTSIDE DIAMETER (IN)	NOMINAL THICKNESS (IN)	LBS/FT	LBS/INCH	LBS/FT	LBS/INCH
5/16-18	3/8	0.750	0.050	15	180	10	120
3/8-16	7/16	0.875	0.050	20	240	14	168
1/2-13	9/16	1.250	0.062	40	480	25	300
5/8-11	11/16	1.500	0.078	55	660	40	480
3/4-10	13/16	1.875	0.109	87	1044	54	648

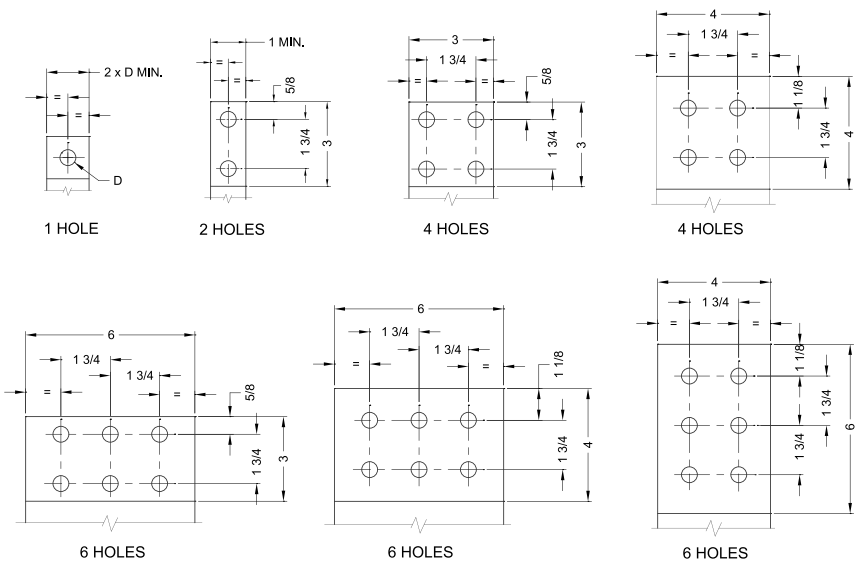


WARNING

When copper and aluminium are exposed to air before the conductor is joined and bolted, the oxide film must be carefully removed and a thin layer of electrical contact compound must quickly be applied to the contact area.

Special care must be taken when joining dissimilar materials due to galvanic corrosion and differential thermal expansion. See the galvanic corrosion table.

NEMA BOLT HOLE CONFIGURATIONS FOR TERMINAL CONNECTORS



Exel International

XB GROUNDING SERIES

FLEXIBLE BRAIDED CONNECTORS
FOR GROUNDING AND BONDING EQUIPMENT STANDARD.
LISTED TO UL 467 & 468A

UL LISTED RoHS COMPLIANT

STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545

OPTIONAL FERULLE FINISHES
Silver plating 0.0003" as per ASTM B700
Nickel plating 0.0003" as per ASTM B733
Bare copper finishes

LENGTH (G) END TO END TOLERANCES
+0.125"/-0 for 6" to 11"
+0.250"/-0 for 12" to 24"

+0.500"/-0 for 25" to 48"
+1.000"/-0 for 49" to 99"

PART NUMBER EXAMPLE

Length (G)
6" to 99"

XB40A-XX-X

Serial

Plating type
T = Tin
S = Silver
N = Nickel
U = Unplated

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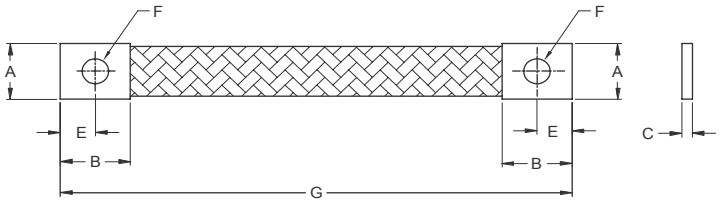
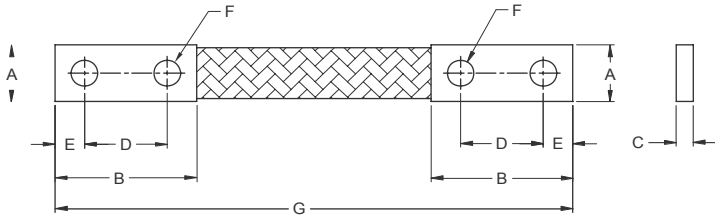
EXEL P/N	TYPE	NUMBER OF BRAIDS IN FERRULES	A FERRULE WIDTH (+/-0.020")	B FERRULE LENGTH (+/-0.060")	C FERRULE THICKNESS (+/-0.020")	D HOLE DISTANCE (+/-0.020")	E HOLE END POSITION (+/-0.060")	F HOLE DIAMETER (+/-0.020")	BRAIDS CROSS-SECTION		SHORT TIME TEST CURRENTS VS TIME				PULLOUT TEST (LBS)
											TEST VALUE		CALCULATION VALUE BY INTERPOLATION METHOD		
									CIRCULAR MILS	mm²	9 sec	6 sec	3 sec	1 sec	
XB6-xx-x	1H	1	0.750	0.750	0.125	N/A	0.375	0.343	38,400	19.5		1,530A	2,175A	3,767A	100
XB4-xx-x	1H	1	1.000	1.250	0.150	N/A	0.625	0.438	48,000	24.3		2,450A	3,466A	6,004A	140
XB2-xx-x	1H	1	1.000	1.250	0.180	N/A	0.625	0.438	76,800	38.9		3,900A	5,494A	9,515A	180
XB2A-xx-x				2.500		1.250	0.625	0.438							
XB2B-xx-x				3.000		1.500	0.750	0.438							
XB2C-xx-x				3.000		1.750	0.625	0.563							
XB10-xx-x	1H	1	1.250	1.500	0.176	N/A	0.750	0.563	105,600	53.5	5,050A		8,748A	15,151A	250
XB10A-xx-x	2H			2.500		1.250	0.625	0.438							
XB10B-xx-x				3.000		1.500	0.750	0.438							
XB10C-xx-x				3.000		1.750	0.625	0.563							
XB20-xx-x	1H	2	1.250	1.500	0.220	N/A	0.750	0.563	153,600	77.8	6,400A		11,020A	19,088A	300
XB20A-xx-x	2H			2.500		1.250	0.625	0.438							
XB20B-xx-x				3.000		1.500	0.750	0.438							
XB20C-xx-x				3.000		1.750	0.625	0.563							
XB30-xx-x	1H	1	1.250	1.500	0.250	N/A	0.750	0.563	168,000	85.1	8,030A		13,898A	24,072A	350
XB30A-xx-x	2H			2.500		1.250	0.625	0.438							
XB30B-xx-x				3.000		1.500	0.750	0.438							
XB30C-xx-x				3.000		1.750	0.625	0.563							
XB40-xx-x	1H	2	1.250	1.500	0.290	N/A	0.750	0.563	211,200	107.0	10,100A		17,495A	30,302A	450
XB40A-xx-x	2H			2.500		1.250	0.625	0.438							
XB40B-xx-x				3.000		1.500	0.750	0.438							
XB40C-xx-x				3.000		1.750	0.625	0.563							
XB300-xx-x	1H	2	1.500	1.500	0.330	N/A	0.750	0.563	336,000	170.3	14,300A		24,854A	43,049A	550
XB300A-xx-x	2H			2.500		1.250	0.625	0.438							
XB300B-xx-x				3.000		1.500	0.750	0.438							
XB300C-xx-x				3.000		1.750	0.625	0.563							
XB350-xx-x	1H	3	1.500	1.500	0.352	N/A	0.750	0.563	374,400	189.7	16,700A		28,997A	50,224A	600
XB350A-xx-x	2H			2.500		1.250	0.625	0.438							
XB350B-xx-x				3.000		1.500	0.750	0.438							
XB350C-xx-x				3.000		1.750	0.625	0.563							
XB400A-xx-x	2H	2	1.500	2.750	0.450	1.250	0.625	0.438	460,800	233.5	19,100A		33,139A	57,399A	650
XB400B-xx-x				3.250		1.500	0.750	0.438							
XB400C-xx-x				3.250		1.750	0.625	0.563							
XB500A-xx-x	2H	3	1.500	2.750	0.480	1.250	0.625	0.438	504,000	255.4	23,900A		41,424A	71,749A	800
XB500B-xx-x				3.250		1.500	0.750	0.438							
XB500C-xx-x				3.250		1.750	0.625	0.563							
XB600A-xx-x	2H	2	1.625	2.750	0.500	1.250	0.625	0.438	614,400	311.3	28,700A		49,709A	86,099A	900
XB600B-xx-x				3.250		1.500	0.750	0.438							
XB600C-xx-x				3.250		1.750	0.625	0.563							
XB700A-xx-x	2H	3	1.625	2.750	0.580	1.250	0.625	0.438	756,000	383.1	33,500A		57,994A	100,448A	1000
XB700B-xx-x				3.250		1.500	0.750	0.438							
XB700C-xx-x				3.250		1.750	0.625	0.563							
XB900A-xx-x	2H	3	1.625	2.750	0.711	1.250	0.625	0.438	921,600	467.0	43,100A		74,563A	129,148A	1000
XB900B-xx-x				3.250		1.500	0.750	0.438							
XB900C-xx-x				3.250		1.750	0.625	0.563							



TYPE 1H



TYPE 2H

Exel International

SHORT CIRCUIT GUIDELINES

COPPER CONDUCTOR SIZE				GROUNDING & BONDING CONDUCTOR SIZE FOR SHORT-CIRCUIT CURRENT (AMPS) vs TIME & TEMPERATURE										MINIMUM SIZE OF COPPER GROUNDING vs EQUIPMENT CIRCUIT CURRENT. BASED ON CEC, TABLE 16, AND NEC, TABLE 250.122		MINIMUM SIZE OF GROUNDING BARE COPPER vs SHORT CIRCUIT CURRENT BASED ON CEC, TABLE 51		
				WITHOUT BREAKING OR MELTING (1,083˚C) AFTER TEST CURRENT					75˚C INSULATION DAMAGE PROTECTION BASED ON INSULATED CABLE ENGINEERS ASSOCIATED (I.C.E.A.) NOTE 1			250˚C MATERIAL ANNEALING PROTECTION BASED ON *GROUNDING ELECTRICAL DISTRIBUTION SYSTEMS FOR SAFETY BY EUSTACE C. SOARES* NOTE 2			MINIMUM COPPER CONDUCTOR SIZE FOR GROUNDING AND BONDING	RATING OR SETTING OF OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT NOT EXCEEDING (AMPS) (NOTE 3)	MIMIMUM SIZE OF BARE COPPER GROUNDING CONDUCTOR	MAXIMUM AVAILABLE SHORT CIRCUIT CURRENT (AMPERES) vs MAXIMUM FAULT DURATION (SEC) WITH WELD, COMPRESSION OR BOLT JOINT BARE GROUNDING CONNECTOR	
				TEST CURRENT vs TIME		CURRENT vs TIME BY EXTRAPOLATED DATA			CURRENT vs TIME BY CALCULATION			CURRENT vs TIME BY CALCULATION						
AWG	CIR.MILL	MM²	IN²	9 SEC	6 SEC	2 SEC	1 SEC	.5 SEC	2 SEC	1 SEC	.5 SEC	2 SEC	1 SEC	.5 SEC	AWG	AMPS	AWG	0.5 SEC	1.0 SEC
6	26,248	13.3	0.0206		1,530	2,663	3,767	5,327	890	1,250	1,780	1,420	2,000	2,823	6	200	6	5KA	
4	41,839	21.2	0.0329		2,450	4,245	6,004	8,491	1,420	2,000	2,840	2,250	3,170	4,491	4	300	4		5KA
3	52,694	26.7	0.0414		3,100	5,347	7,561	10,694	1,780	2,530	3,580	2,830	4,000	5,660	3	400	3	10KA	
2	66,311	33.6	0.0521		3,900	6,728	9,515	13,457	2,250	3,180	4,500	3,550	5,040	7,140	2	500	2		
1	83,679	42.4	0.0657		4,900	8,491	12,008	16,981	2,830	4,000	5,650	4,490	6,350	9,000	1	600	1	15KA	10KA
1/0	105,585	53.5	0.0829	5,050		10,714	15,151	21,427	3,570	5,050	7,150	5,650	8,000	11,350	1/0	800	1/0		15KA
2/0	133,018	67.4	0.1045	6,400		13,497	19,088	26,994	4,500	6,350	9,000	7,150	10,100	14,300	2/0	1,000	2/0	25KA	
3/0	167,752	85	0.1318	8,030		17,021	24,072	34,043	5,700	8,000	11,400	9,000	12,700	18,000	3/0	1,200	3/0	30KA	20KA
4/0	211,170	107	0.1659	10,100		21,427	30,302	42,854	7,150	10,100	14,300	11,300	16,000	22,700	4/0	1,600	4/0	35-40KA	25-30KA
250MCM	250,000	127	0.1969	12,000		25,367	35,874	50,734	8,500	12,000	17,000	13,450	19,000	26,900	250MCM	2,000	250MCM	50KA	35KA
300MCM	300,000	152	0.2357	14,300		30,440	43,049	60,881	10,150	14,300	20,300	16,100	22,700	32,200	300MCM		300MCM	60KA	40KA
350MCM	350,000	177	0.2744	16,700		35,514	50,224	71,028	11,800	16,650	23,550	18,700	26,500	37,500	350MCM	2,500	350MCM	70KA	50KA
400MCM	400,000	203	0.3147	19,100		40,587	57,399	81,174	13,500	19,200	27,000	21,500	30,500	43,000	400MCM	3,000	400MCM	80KA	
500MCM	500,000	253	0.3922	23,900		50,734	71,749	101,468	16,900	23,800	33,700	26,800	37,900	53,700	500MCM	4,000	500MCM	90-100KA	60KA
600MCM	600,000	304	0.4713	28,700		60,881	86,099	121,762	20,300	28,700	40,600	32,200	45,500	64,500	600MCM		600MCM		70-80KA
700MCM	700,000	355	0.5504	33,500		71,028	100,448	142,055	23,600	33,600	47,500	37,500	53,000	75,300	700MCM	5,000	700MCM		90-100KA
750MCM	750,000	380	0.5891	35,900		76,101	107,623	152,202	25,400	36,000	50,800	40,300	57,000	80,600	750MCM		750MCM		
800MCM	800,000	405	0.6279	38,300		81,174	114,798	162,349	27,000	38,400	54,000	43,000	60,500	86,000	800MCM	6,000	800MCM		
900MCM	900,000	456	0.7070	43,100		182,643	129,148	182,643	30,500	43,000	61,000	48,300	68,300	96,800	900MCM		900MCM		
1000MCM	1,000,000	507	0.7860	47,900		101,468	143,498	202,936	34,000	48,000	67,500	53,700	76,000	107,500	1,000MCM		1,000MCM		

Note 1: The maximum allowable short circuit temperature increases, which may cause serious damage to insulation, has been established for various insulation types:
- 200˚C for paper, rubber and varnished cloth
- 150˚C for thermoplastic

Note 2: This is the damage level associated with the conductor temperature rising from 75˚C to 250˚C. This would be the temperature at which the joined or bolted conductor loosens (also known as the annealing point of copper).

Note 3: Overcurrent is either overload or short-circuit current. Overload current is excessive current created when motors start up or transformers are energized and is often one to six times greater than normal current. Short-circuit or fault current is overcurrent that is typically 500 to 1,000 times greater than normal current over a very short period (less than 1 second). The standard short-circuit duration valuse is 1 second, in accordance with IEC 60694, article 4.7.

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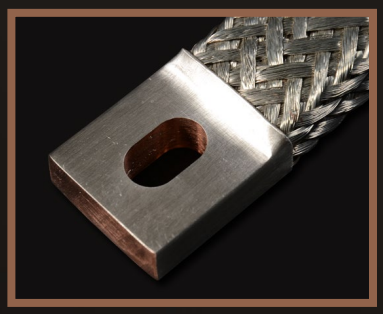

X075-XX075 SERIES

FLEXIBLE & EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

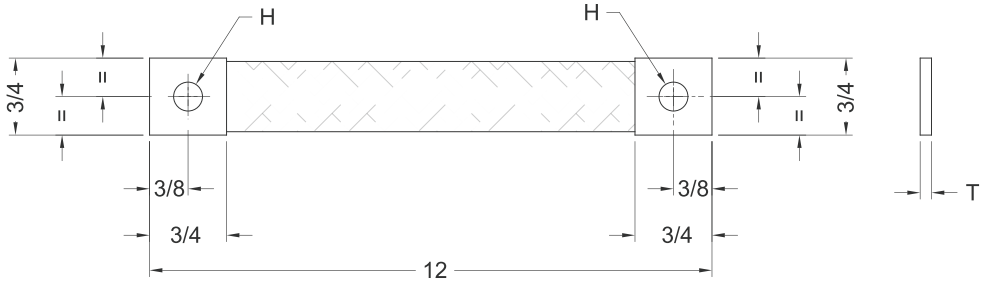
EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

	EXEL P/N	T	H	APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
					CROSS-SECTION mm^2	CROSS-SECTION in^2	CIRCULAR MIL	45° C RISE	65° C RISE
STANDARD FLEXIBLE	X075A12	0.125	0.343	0.15	19.5	0.030	38,400	130	160
	X075B12	0.209	0.343	0.30	38.9	0.060	76,800	190	240
	X075C12	0.250	0.343	0.42	58.4	0.090	115,200	240	290
EXTRA FLEXIBLE	XX075A12	0.125	0.343	0.16	20.4	0.032	40,200	130	160
	XX075B12	0.214	0.343	0.31	40.7	0.063	80,400	200	240
	XX075C12	0.250	0.343	0.44	61.1	0.095	120,600	250	300

CUSTOM SIZES ARE ALSO AVAILABLE.



OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X075A 12

Standard length

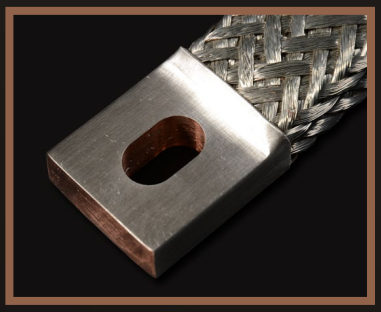
CUSTOM PART NUMBER

X075A 16.50 - S3

Required length Plating type

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determime the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International



X100-XX100 SERIES

FLEXIBLE & EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED RoHS COMPLIANT

*UL is a leading provider of product testing and certification services responsible for defining industry specific national and international standards, as well as for the testing required to prove product compliance to those standards. If such standards currently exist at purchase time for a specific connector, certification will be provided by Exel for said model. However, if standards are non-existent on the market for a model of connector, the client will have the responsibility to provide its own standards to Exel for testing and certification issuance upon request and additional costs and conditions will apply.

STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X100A 12

Standard length

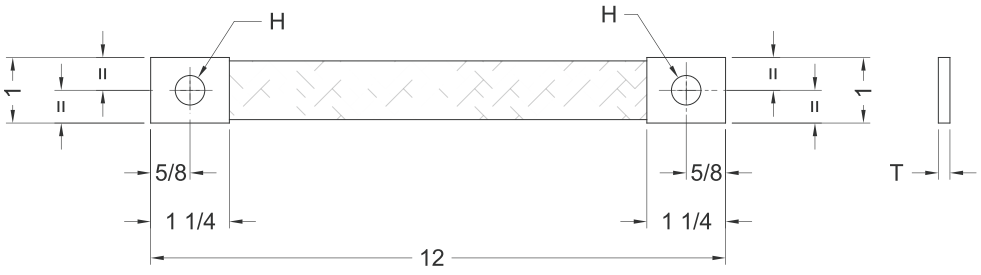
CUSTOM PART NUMBER

X100A 16.50 - S3

Required length Plating type

	EXEL P/N	T	H	APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
					CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
STANDARD FLEXIBLE	X100A12	0.178	0.438	0.34	38.9	0.060	76,800	210	250
	X100B12	0.198	0.438	0.41	48.6	0.075	96,000	230	290
	X100C12	0.232	0.438	0.56	73.0	0.113	144,000	290	360
	X100D12	0.282	0.438	0.72	97.3	0.151	192,000	340	420
	X100E12	0.339	0.438	0.90	121.6	0.188	240,000	390	470
EXTRA FLEXIBLE	XX100A12	0.148	0.438	0.25	24.3	0.038	48,000	160	200
	XX100B12	0.198	0.438	0.41	48.6	0.075	96,000	230	290
	XX100C12	0.232	0.438	0.56	73.0	0.113	144,000	290	360
	XX100D12	0.282	0.438	0.72	97.3	0.151	192,000	340	420
	XX100E12	0.339	0.438	0.90	121.6	0.188	240,000	390	470

CUSTOM SIZES ARE ALSO AVAILABLE.



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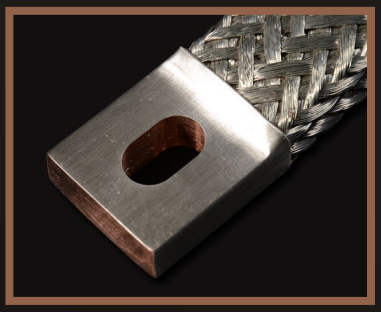
Exel International



X125 SERIES

FLEXIBLE BRAIDED CONNECTORS

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X125A 12

Standard length

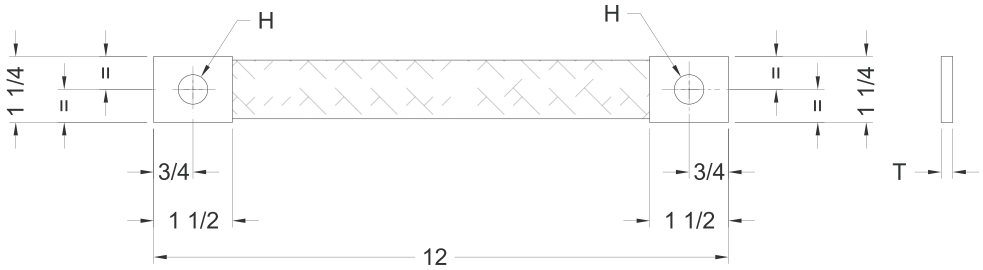
CUSTOM PART NUMBER

X125A 16.50 - S3

Required length Plating type

EXEL P/N	T	H	APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
				CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
X125A12	0.220	0.563	0.51	53.5	0.083	105,600	270	330
X125B12	0.260	0.563	0.68	77.8	0.121	153,600	320	400
X125C12	0.300	0.563	0.93	116.8	0.181	230,400	400	490
X125D12	0.364	0.563	1.19	155.7	0.241	307,200	420	560

CUSTOM SIZES ARE ALSO AVAILABLE.



The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determine the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

X126 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X125A 12

Standard length

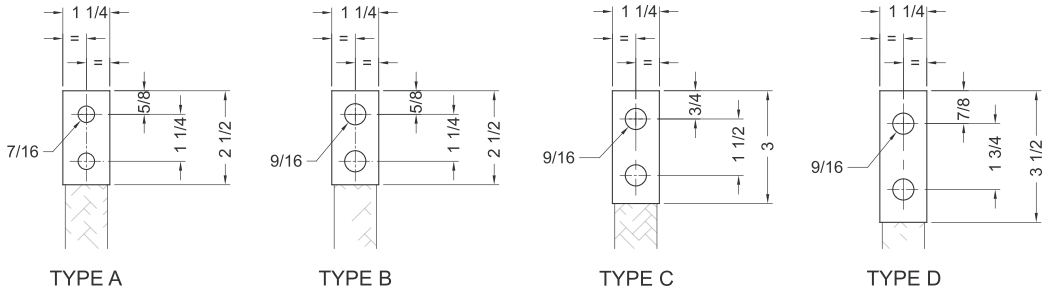
CUSTOM PART NUMBER

X125A 16.50 AB - S3

Required length | Ferrule configuration | Plating type

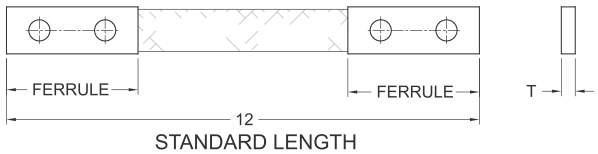
EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
X126A12	0.220	D	D	0.67	53.5	0.083	105,600	290	360
X126B12	0.260	D	D	0.84	77.8	0.121	153,600	360	440
X126C12	0.300	D	D	1.09	116.8	0.181	230,400	440	540
X126D12	0.364	D	D	1.35	155.7	0.241	307,200	520	630
X126E12	0.453	D	D	1.71	194.6	0.302	384,000	590	720
X126F12	0.478	D	D	1.87	233.5	0.362	460,800	650	790
X126G12	0.541	D	D	2.13	272.4	0.422	537,600	720	870
X126H12	0.647	D	D	2.53	311.3	0.483	614,400	780	950

CUSTOM SIZES ARE ALSO AVAILABLE.



TYPE A TYPE B TYPE C TYPE D

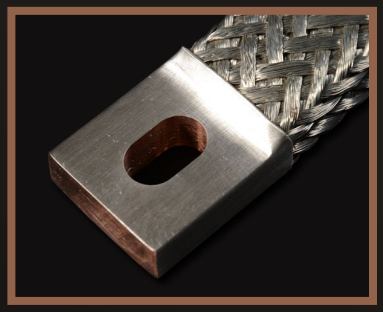
FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determine the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International



X150-XX150 SERIES

FLEXIBLE & EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X150A 12

Standard length

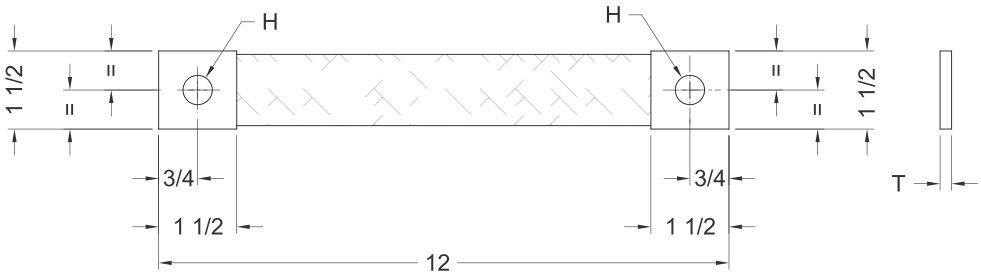
CUSTOM PART NUMBER

X150A 16.50 - S3

Required length Plating type

	EXEL P/N	T	H	APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
					CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
STANDARD FLEXIBLE	X150A12	0.171	0.563	0.52	53.5	0.083	105,600	280	340
	X150B12	0.242	0.563	0.87	107.0	0.166	211,200	400	490
	X150C12	0.313	0.563	1.22	160.5	0.249	316,800	500	610
	X150D12	0.438	0.563	1.65	214.0	0.332	422,400	590	720
	X150E12	0.500	0.563	2.00	267.6	0.415	528,000	670	820
	X150F12	0.563	0.563	2.36	321.1	0.498	633,600	740	910
EXTRA FLEXIBLE	XX150A12	0.168	0.563	0.50	51.1	0.079	100,800	270	330
	XX150B12	0.236	0.563	0.84	102.2	0.158	201,600	390	480
	XX150C12	0.304	0.563	1.18	153.2	0.238	302,400	490	600
	XX150D12	0.375	0.563	1.51	204.3	0.317	403,200	570	700
	XX150E12	0.477	0.563	1.92	255.4	0.396	504,000	650	800
	XX150F12	0.546	0.563	2.26	306.5	0.475	604,800	720	890

CUSTOM SIZES ARE ALSO AVAILABLE.



The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determime the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

X151 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X151A 12

Standard length

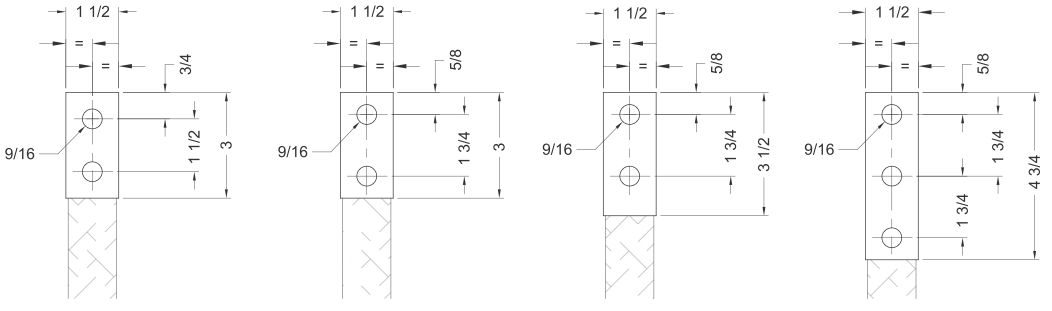
CUSTOM PART NUMBER

X151A 16.50 AB - S3

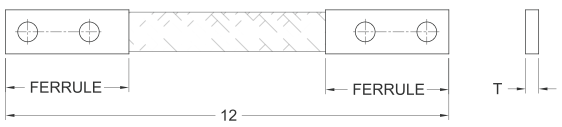
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION			APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
	T	TYPE	TYPE		CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
X151A12	0.171	C	C	0.74	53.5	0.083	105,600	350	420
X151B12	0.242	C	C	1.09	107.0	0.166	211,200	500	610
X151C12	0.313	C	C	1.44	160.5	0.249	316,800	640	750
X151D12	0.438	C	C	1.96	214.0	0.332	422,400	740	890
X151E12	0.500	C	C	2.32	267.6	0.415	528,000	840	1010
X151F12	0.566	C	C	2.67	321.1	0.498	633,600	930	1120
X151G12	0.625	C	C	2.99	374.6	0.581	739,200	1010	1220
X151H12	0.688	C	C	3.35	428.1	0.664	844,800	1100	1320
X151I12	0.785	C	C	3.85	481.6	0.746	950,400	1180	1430
X151J12	0.856	C	C	4.20	535.1	0.829	1,056,000	1260	1520
X151K12	0.929	C	C	4.55	588.6	0.912	1,161,600	1340	1620
X151L12	0.985	C	C	4.91	642.1	0.995	1,267,200	1410	1700
X151M12	1.080	C	C	5.26	695.7	1.078	1,372,800	1490	1800
X151N12	1.150	C	C	5.74	749.2	1.161	1,478,400	1560	1880

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

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Exel International

XX151 SERIES

EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

XX151A 12

Standard length

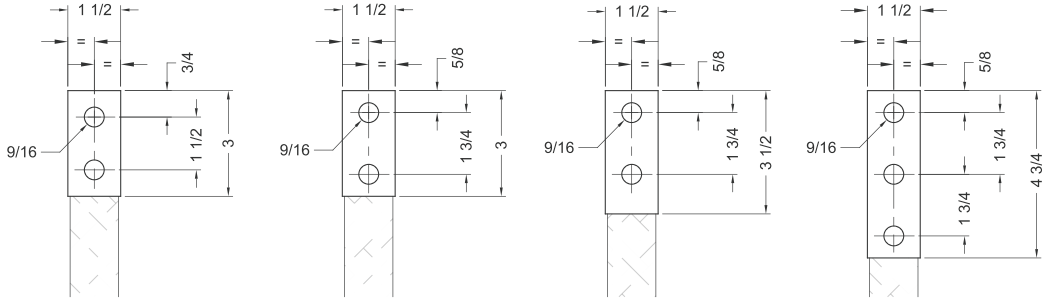
CUSTOM PART NUMBER

XX151A 16.50 AB - S3

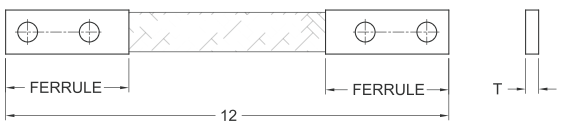
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
XX151A12	0.168	C	C	0.72	51.1	0.079	100,800	340	410
XX151B12	0.236	C	C	1.06	102.2	0.158	201,600	490	590
XX151C12	0.304	C	C	1.39	153.2	0.238	302,400	610	730
XX151D12	0.375	C	C	1.73	204.3	0.317	403,200	710	860
XX151E12	0.477	C	C	2.24	255.4	0.396	504,000	810	980
XX151F12	0.546	C	C	2.57	306.5	0.475	604,800	900	1090
XX151G12	0.590	C	C	2.88	357.6	0.554	705,600	980	1190
XX151H12	0.660	C	C	3.22	408.6	0.633	806,400	1060	1290
XX151I12	0.760	C	C	3.70	459.7	0.713	907,200	1150	1390
XX151J12	0.830	C	C	4.04	510.8	0.792	1,008,000	1230	1480
XX151K12	0.900	C	C	4.38	561.9	0.871	1,108,800	1300	1570
XX151L12	0.950	C	C	4.72	613.0	0.950	1,209,600	1370	1650
XX151M12	1.020	C	C	5.06	664.0	1.029	1,310,400	1440	1740
XX151N12	1.100	C	C	5.50	715.1	1.108	1,411,200	1520	1830

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determine the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

X163 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X163A 12

Standard length

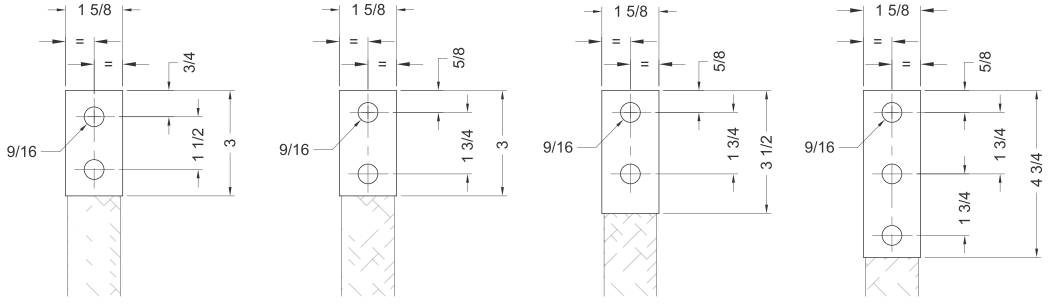
CUSTOM PART NUMBER

X163A 16.50 AB - S3

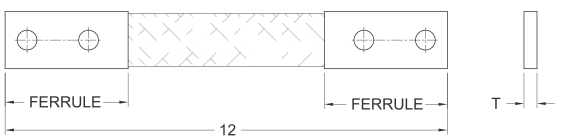
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	TYPE	TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	65° C RISE
X163A12	0.165	C	C	0.74	53.5	0.083	105,600	360	430
X163B12	0.231	C	C	1.09	107.0	0.166	211,200	510	620
X163C12	0.330	C	C	1.44	160.5	0.249	316,800	620	770
X163D12	0.396	C	C	1.96	214.0	0.332	422,400	750	910
X163E12	0.463	C	C	2.32	267.6	0.415	528,000	850	1030
X163F12	0.500	C	C	2.67	321.1	0.498	633,600	940	1130
X163G12	0.570	C	C	2.99	374.6	0.581	739,200	1020	1240
X163H12	0.663	C	C	3.35	428.1	0.664	844,800	1110	1340
X163I12	0.729	C	C	3.85	481.6	0.746	950,400	1200	1440
X163J12	0.796	C	C	4.20	535.1	0.829	1,056,000	1270	1540
X163K12	0.847	C	C	4.55	588.6	0.912	1,161,600	1350	1630
X163L12	0.914	C	C	4.91	642.1	0.995	1,267,200	1420	1720
X163M12	0.980	C	C	5.26	695.7	1.078	1,372,800	1500	1810
X163N12	1.062	C	C	5.74	749.2	1.161	1,478,400	1570	1900

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determine the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

XX163 SERIES

EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

XX163A 12

Standard length

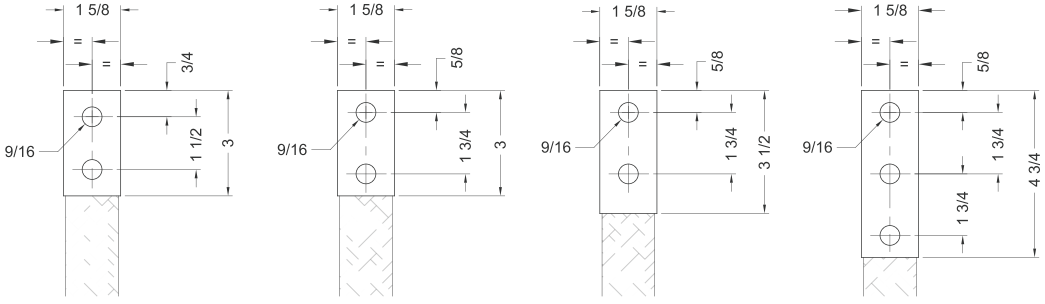
CUSTOM PART NUMBER

XX163A 16.50 AB - S3

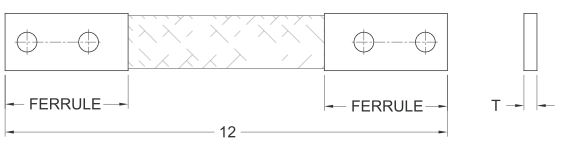
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
XX163A12	0.162	C	C	0.72	51.1	0.079	100,800	350	420
XX163B12	0.225	C	C	1.06	102.2	0.158	201,600	500	600
XX163C12	0.321	C	C	1.56	153.2	0.238	302,400	620	750
XX163D12	0.384	C	C	1.90	204.3	0.317	403,200	730	880
XX163E12	0.448	C	C	2.24	255.4	0.396	504,000	830	1000
XX163F12	0.486	C	C	2.54	306.5	0.475	604,800	910	1100
XX163G12	0.549	C	C	2.88	357.6	0.554	705,600	1000	1210
XX163H12	0.612	C	C	3.22	408.6	0.633	806,400	1080	1300
XX163I12	0.702	C	C	3.70	459.7	0.713	907,200	1160	1400
XX163J12	0.765	C	C	4.04	510.8	0.792	1,008,000	1240	1500
XX163K12	0.829	C	C	4.40	561.9	0.871	1,108,800	1310	1580
XX163L12	0.877	C	C	4.72	613.0	0.950	1,209,600	1380	1670
XX163M12	0.941	C	C	5.06	664.0	1.029	1,310,400	1450	1750
XX163N12	1.020	C	C	5.50	715.1	1.108	1,411,200	1530	1840

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determime the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

X175 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X175A 12

Standard length

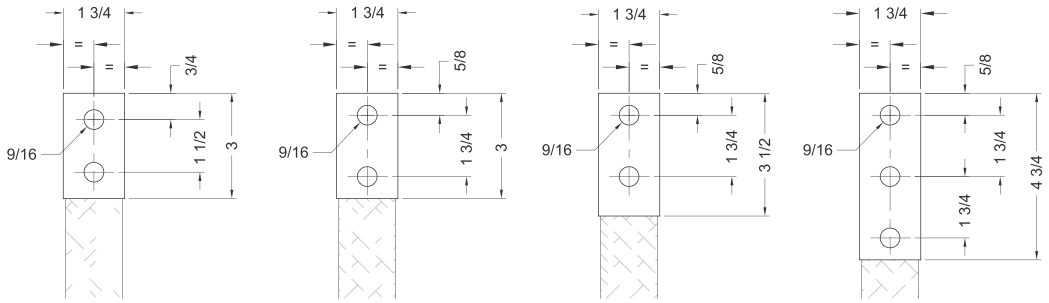
CUSTOM PART NUMBER

X175A 16.50 AB - S3

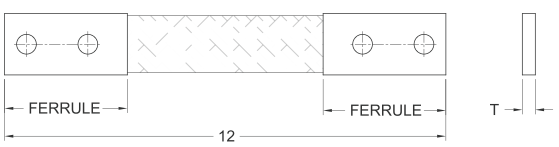
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
X175A12	0.190	C	C	0.90	53.5	0.083	105,600	370	450
X175B12	0.250	C	C	1.25	107.0	0.166	211,200	530	640
X175C12	0.314	C	C	1.61	160.5	0.249	316,800	660	790
X175D12	0.353	C	C	1.93	214.0	0.332	422,400	760	920
X175E12	0.413	C	C	2.28	267.6	0.415	528,000	860	1040
X175F12	0.474	C	C	2.64	321.1	0.498	633,600	950	1150
X175G12	0.560	C	C	3.14	374.6	0.581	739,200	1050	1260
X175H12	0.625	C	C	3.49	428.1	0.664	844,800	1130	1360
X175I12	0.683	C	C	3.85	481.6	0.746	950,400	1210	1460
X175J12	0.731	C	C	4.20	535.1	0.829	1,056,000	1290	1550
X175K12	0.792	C	C	4.56	588.6	0.912	1,161,600	1360	1640
X175L12	0.853	C	C	4.91	642.1	0.995	1,267,200	1440	1730
X175M12	0.929	C	C	5.38	695.7	1.078	1,372,800	1510	1800
X175N12	1.000	C	C	5.73	749.2	1.161	1,478,400	1580	1910

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determine the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

XX175 SERIES

EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

XX175A 12

Standard length

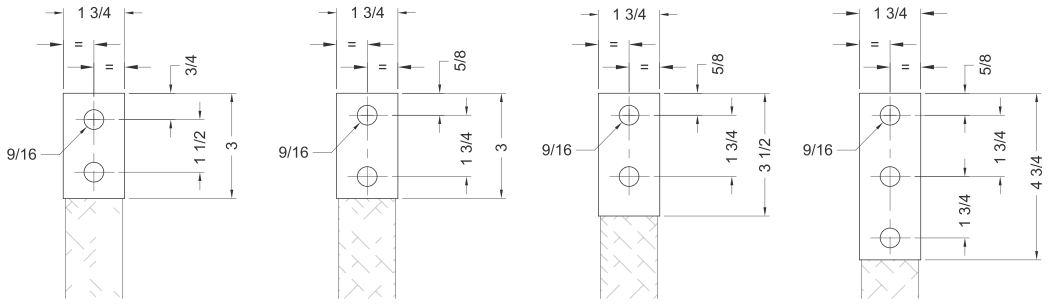
CUSTOM PART NUMBER

XX175A 16.50 AB - S3

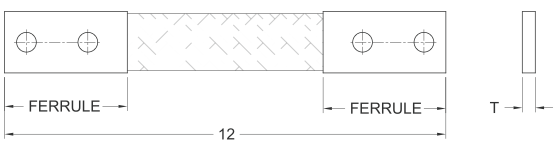
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
XX175A12	0.189	C	C	0.89	51.1	0.079	100,800	360	440
XX175B12	0.247	C	C	1.22	102.2	0.158	201,600	520	620
XX175C12	0.306	C	C	1.56	153.2	0.238	302,400	640	770
XX175D12	0.342	C	C	1.87	204.3	0.317	403,200	740	900
XX175E12	0.400	C	C	2.20	255.4	0.396	504,000	840	1010
XX175F12	0.458	C	C	2.54	306.5	0.475	604,800	930	1120
XX175G12	0.541	C	C	3.03	357.6	0.554	705,600	1020	1230
XX175H12	0.573	C	C	3.27	408.6	0.633	806,400	1100	1320
XX175I12	0.658	C	C	3.70	459.7	0.713	907,200	1180	1420
XX175J12	0.703	C	C	4.04	510.8	0.792	1,008,000	1250	1510
XX175K12	0.761	C	C	4.38	561.9	0.871	1,108,800	1300	1600
XX175L12	0.819	C	C	4.72	613.0	0.950	1,209,600	1400	1690
XX175M12	0.892	C	C	5.17	664.0	1.029	1,310,400	1470	1770
XX175N12	0.951	C	C	5.50	715.1	1.108	1,411,200	1540	1860

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

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Exel International

X200 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X200A 12

Standard length

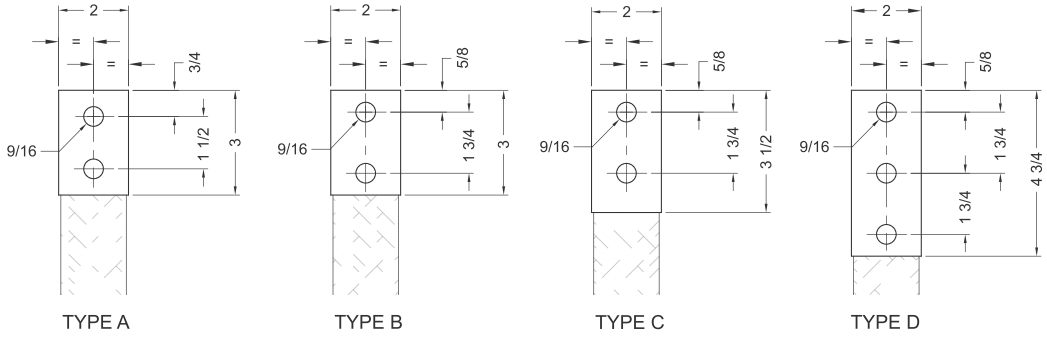
CUSTOM PART NUMBER

X200A 16.50 AB - S3

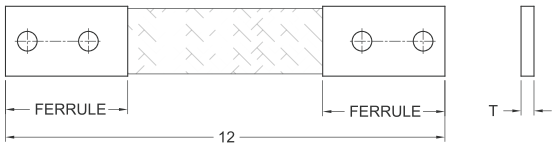
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION			APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
	T	TYPE	TYPE		CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
X200A12	0.187	C	C	0.91	77.8	0.121	153,600	460	560
X200B12	0.235	C	C	1.43	155.7	0.241	307,200	670	800
X200C12	0.362	C	C	2.21	233.5	0.362	460,800	830	1000
X200D12	0.440	C	C	2.72	311.3	0.483	614,400	970	1180
X200E12	0.505	C	C	3.24	389.2	0.603	768,000	1100	1330
X200F12	0.582	C	C	3.75	467.0	0.724	921,600	1220	1470
X200G12	0.672	C	C	4.38	544.8	0.844	1,075,200	1340	1610
X200H12	0.750	C	C	4.89	622.7	0.965	1,228,800	1450	1740
X200I12	0.827	C	C	5.41	700.5	1.086	1,382,400	1550	1870

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determine the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

XX200 SERIES

EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

XX200A 12

Standard length

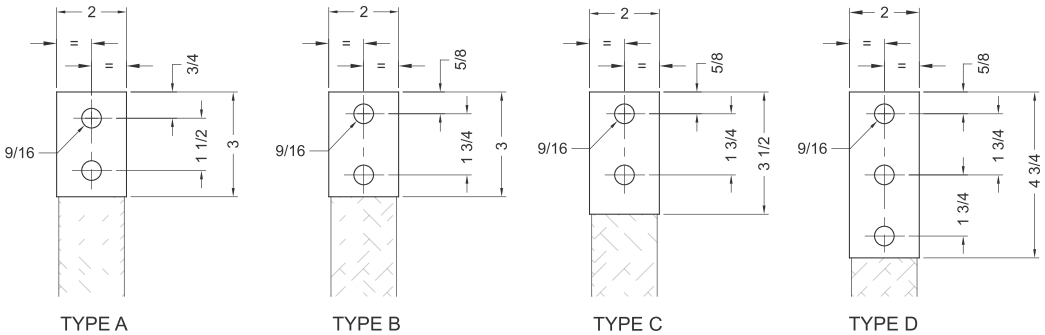
CUSTOM PART NUMBER

XX200A 16.50 AB - S3

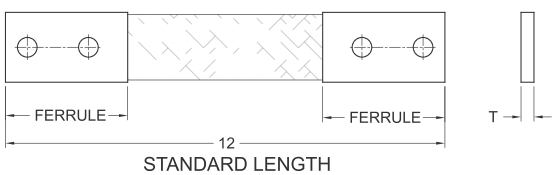
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION			APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
	T	TYPE	TYPE		CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
XX200A12	0.187	C	C	1.07	102.2	0.158	201,600	540	650
XX200B12	0.235	C	C	1.41	153.2	0.238	302,400	660	800
XX200C12	0.335	C	C	2.01	204.3	0.317	403,200	780	940
XX200D12	0.384	C	C	2.35	255.4	0.396	504,000	880	1060
XX200E12	0.437	C	C	2.69	306.5	0.475	604,800	970	1170
XX200F12	0.486	C	C	3.05	357.6	0.554	705,600	1050	1270
XX200G12	0.524	C	C	3.37	408.6	0.633	806,400	1130	1370
XX200H12	0.575	C	C	3.71	459.7	0.713	907,200	1210	1460
XX200I12	0.625	C	C	4.04	510.8	0.792	1,008,000	1290	1550
XX200J12	0.740	C	C	4.83	613.0	0.950	1,209,600	1430	1730
XX200K12	0.790	C	C	5.17	664.0	1.029	1,310,400	1500	1810
XX200L12	0.841	C	C	5.50	715.1	1.108	1,411,200	1570	1890

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

The estimated current rating is based on calculation methods and applicable to 12" and shorter connectors. Due to many different applications and service conditions, it is difficult to determime the current capacity by theoretical calculation. Exact performance may differ and cannot be predicted by Exel. The suggested calculated current rating is approximate. Exel is not liable for any damages due to current variation under any circumstances. To determine actual perfomance, Exel can perform a heat rise test from 400A to 5000A as per IEC 60694 standards or customer specifications upon request.

Exel International

X300 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X300A 12

Standard length

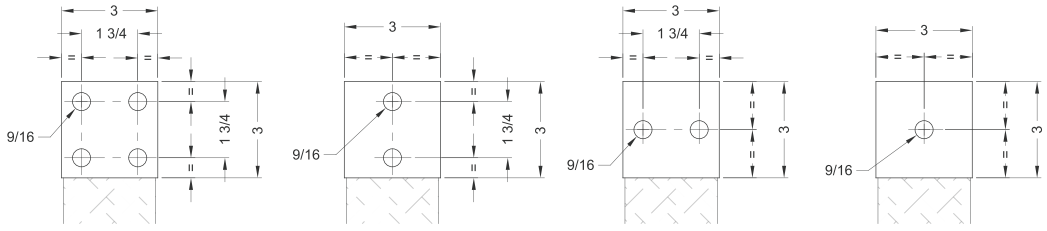
CUSTOM PART NUMBER

X300A 16.50 AB - S3

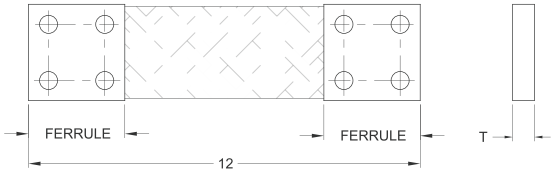
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
X300A12	0.250	A	A	2.14	214.0	0.332	422,400	900	1090
X300B12	0.323	A	A	2.85	321.1	0.498	633,600	1120	1350
X300C-12	0.392	A	A	3.56	428.1	0.664	844,800	1300	1570
X300D-12	0.461	A	A	4.27	535.1	0.829	1,056,000	1470	1770
X300E12	0.530	A	A	4.97	642.1	0.995	1,267,200	1620	1950

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

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Exel International

XX300 SERIES

EXTRA FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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EXTRA FLEXIBLE BRAIDS
36 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

XX300A 12

Standard length

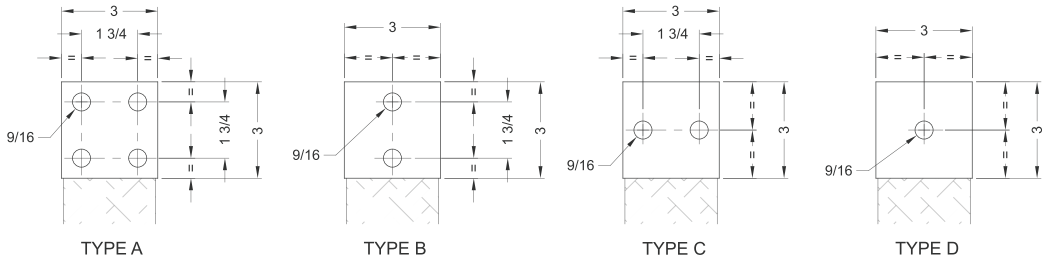
CUSTOM PART NUMBER

XX300A 16.50 AB - S3

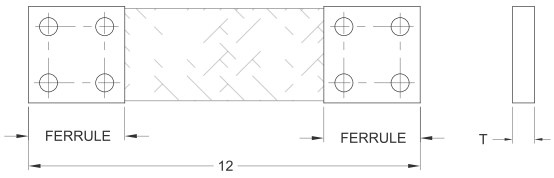
Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION			APPROX. WEIGHT (LBS)	BRAID DATA			CURRENT RATING (A) 60 Hz free-air	
	T	TYPE	TYPE		CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	45° C RISE	65° C RISE
XX300A12	0.250	A	A	2.08	204.3	0.317	403,200	880	1070
XX300B12	0.313	A	A	2.76	306.5	0.475	604,800	1090	1320
XX300C-12	0.375	A	A	3.43	408.6	0.633	806,400	1270	1530
XX300D12	0.445	A	A	4.11	510.8	0.792	1,008,000	1430	1720
XX300E12	0.511	A	A	4.78	613.0	0.950	1,209,600	1580	1900

CUSTOM SIZES ARE ALSO AVAILABLE.



FERRULE CONFIGURATION



STANDARD LENGTH

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Exel International

X400 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X400A 12

Standard length

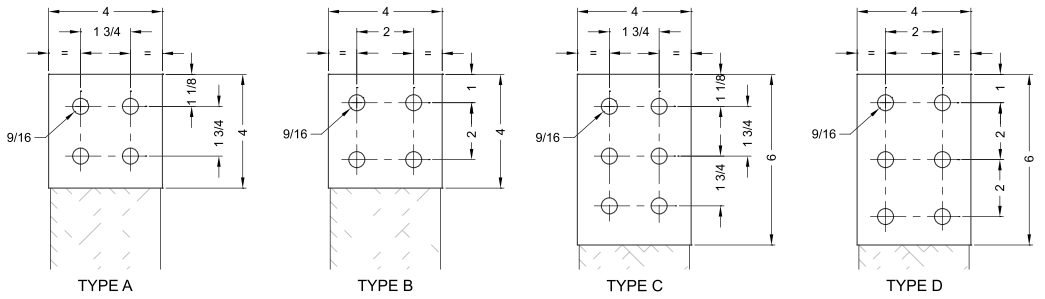
CUSTOM PART NUMBER

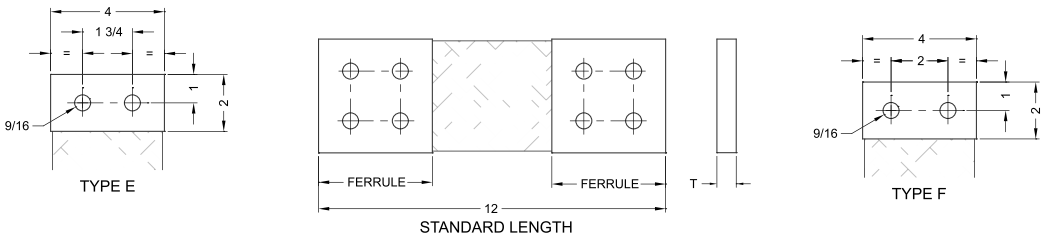
X400A 16.50 AB - S3

Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	TYPE	TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	CROSS-SECTION in²	CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	65° C RISE
X400A12	0.230	A	A	2.77	214.0	0.332	422,400	1000	1210
X400B12	0.250	A	A	3.12	255.4	0.396	504,000	1100	1320
X400C12	0.280	A	A	3.41	311.3	0.483	614,400	1210	1470
X400D12	0.320	A	A	4.04	394.0	0.611	777,600	1370	1650
X400E-12	0.336	A	A	4.18	428.1	0.664	844,800	1430	1730
X400F-12	0.354	A	A	4.52	467.0	0.724	921,600	1500	1810
X400G12	0.375	A	A	4.81	510.8	0.792	1,008,000	1570	1890
X400H12	0.438	A	A	5.68	642.1	0.995	1,267,200	1770	2130
X400I12	0.500	A	A	6.58	778.4	1.206	1,536,000	1960	2360
X400J12	0.763	A	A	10.27	1,284.3	1.991	2,534,400	2570	3100
X400K12	0.841	A	A	11.33	1,444.8	2.239	2,851,200	2740	3310

CUSTOM SIZES ARE ALSO AVAILABLE.





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Exel International

X600 SERIES

FLEXIBLE BRAIDED CONNECTORS

UL LISTED

RoHS COMPLIANT

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STANDARD FLEXIBLE BRAIDS
30 AWG individual wire - tin-plated C11000 copper as per ASTM B33.

STANDARD FERRULE
Seamless pure copper tube as per ASTM B75, ASTM B88 or ASTM B188

STANDARD FERRULE PLATING
Electro-tin 0.0003" as per ASTM B545, RoHS compliant.

OPTIONAL ORDERING INFORMATION

LENGTH
Change the standard length in the part number to the required length in inches.

FERRULE PLATING
Add the required plating material and thickness codes at the end of the part number.

FERRULE PLATING CODES

PLATING MATERIAL
S = Silver **N =** Nickel **T =** Tin

PLATING THICKNESS
1 = 0.0003" **2 =** 0.0005" **3 =** 0.001"
4 = 0.002" **5 =** 0.003"

EXAMPLE

STANDARD PART NUMBER

X600A 12

Standard length

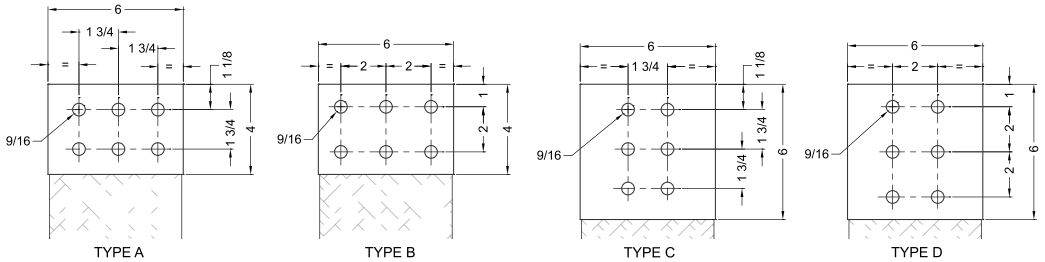
CUSTOM PART NUMBER

X600A 16.50 AB - S3

Required length | Ferrule configuration | Plating type

EXEL P/N	FERRULE CONFIGURATION T	FERRULE CONFIGURATION TYPE	FERRULE CONFIGURATION TYPE	APPROX. WEIGHT (LBS)	BRAID DATA CROSS-SECTION mm²	BRAID DATA CROSS-SECTION in²	BRAID DATA CIRCULAR MIL	CURRENT RATING (A) 60 Hz free-air 45° C RISE	CURRENT RATING (A) 60 Hz free-air 65° C RISE
X600A12	0.246	A	A	4.94	389.2	0.603	633,600	1420	1720
X600B12	0.292	A	A	5.46	467.0	0.724	921,600	1720	2080
X600C-12	0.348	A	A	6.61	642.1	0.995	1,267,200	2030	2450
X600D12	0.366	A	A	7.00	700.5	1.086	1,382,400	2130	2570
X600E12	0.416	A	A	8.03	856.2	1.327	1,689,600	2360	2850
X600F12	0.441	A	A	8.54	934.0	1.448	1,843,200	2470	2980
X600G12	0.484	A	A	9.44	1,070.2	1.659	2,112,000	2650	3190
X600H12	0.515	A	A	10.08	1,167.5	1.810	2,304,000	2770	3340
X600I12	0.552	A	A	10.86	1,284.3	1.991	2,534,400	2910	3510
X600J12	0.589	A	A	11.63	1,401.0	2.171	2,764,800	3050	3680
X600K12	0.663	A	A	13.17	1,634.5	2.533	3,225,600	3310	4000
X600L12	0.737	A	A	14.71	1,868.0	2.895	3,686,400	3550	4280
X600M12	0.756	A	A	15.10	1,926.4	2.986	3,801,600	3610	4360
X600N12	0.812	A	A	16.26	2,101.6	3.257	4,147,200	3780	4560

CUSTOM SIZES ARE ALSO AVAILABLE.



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BRAIDED COPPER CABLES

THE BRAIDED COPPER CABLES SHOWN ON THIS PAGE ARE THE MOST COMMONLY USED IN THE INDUSTRY. THEY ARE EITHER TIN-PLATED OR BARE COPPER. SILVER AND NICKEL PLATING ARE ALSO AVAILABLE.

Wires are made of C11000 soft-annealed copper.

TIN-PLATED COPPER BRAID
Raw material meets ASTM B33.

BARE COPPER BRAID
Raw material meets ASTM B3.

NICKEL-PLATED COPPER BRAID
Raw material meets ASTM B355.

SILVER-PLATED COPPER BRAID
Raw material meets ASTM B298.

If bare copper is required, add (B) at the end of the part number.

When nickel-plated copper is required, add (N) at the end of the part number.

When silver-plated copper is required, add (S) at the end of the part number.

All dimensions are approximate and for reference only.

	EXEL PART NUMBER	NOMINAL FLAT WIDTH (IN)	NOMINAL THICKNESS (IN)	INDIVIDUAL AWG	CONSTRUCTION	TOTAL CIRCULAR MIL	APPROX. AWG EQUIVALENT	APPROX. WEIGHT (LBS/1000 FT)
EXTRA FLEXIBLE FLAT BRAID	**FBC40-48-86**	1.000	0.060	40	48 X 86	40,700	4	140.0
	FBC36-24-7	0.250	0.030	36	24 X 7	4,200	14	14.0
	FBC36-24-16	0.375	0.063	36	24 X 16	9,600	11	32.0
	FBC36-48-15	0.625	0.040	36	48 X 15	18,000	8	61.2
	FBC36-24-40	0.500	0.094	36	24 X 40	24,000	7	75.2
	FBC36-26-67	0.750	0.094	36	26 X 67	40,200	4	142.7
	FBC36-48-40	1.000	0.094	36	48 X 40	48,000	4	163.0
	FBC36-48-84	1.625	0.080	36	48 X 84	100,800	1	359.0
STANDARD FLEXIBLE FLAT BRAID	**FBC30-24-10**	0.500	0.094	30	24 X 10	24,120	6	85.0
	FBC30-24-16	0.625	0.094	30	24 X 16	38,400	4	125.0
	FBC30-24-20	0.750	0.110	30	24 X 20	48,000	4	170.0
	FBC30-24-27	0.937	0.130	30	24 X 27	64,800	2	225.0
	FBC30-24-32	1.000	0.140	30	24 X 32	76,800	1	270.0
	FBC30-24-44	1.250	0.125	30	24 X 44	105,600	1/0	362.0
	FBC30-48-22	1.375	0.125	30	48 X 22	105,600	1/0	362.0
	FBC30-48-32	2.000	0.140	30	48 X 32	153,600	3/0	530.0
	FBC30-48-52	2.500	0.190	30	48 X 52	249,600	250 MCM	900.0
MULTI-LAYER FLAT BRAID	**FBC30-2-24-32**	1.250	0.290	30	2 X 24 X 32	153,600	3/0	560.0
	FBC30-2-24-35	1.250	0.300	30	2 X 24 X 35	168,000	3/0	600.0
	FBC30-3-24-32	1.250	0.400	30	3 X 24 X 32	230,400	4/0	825.0
	FBC30-4-24-32	1.375	0.510	30	4 X 24 X 32	307,200	300 MCM	1,110.0

OTHER SIZES ARE ALSO AVAILABLE.

	EXEL PART NUMBER	NOMINAL DIAMETER (IN)	INDIVIDUAL AWG	CONSTRUCTION	TOTAL CIRCULAR MIL	APPROX. AWG EQUIVALENT	APPROX. WEIGHT (LBS/1000 FT)
ROPE-LAY ROUND BRAID	**RLC36-7-7-43**	0.339	36	7 x 7 x 43	52,675	3	169.0
	RLC30-7-7-34	0.605	30	7 x 7 x 34	167,601	3/0	538.0
	RLC36-19-7-64	0.690	36	19 x 7 x 64	212,800	4/0	689.0
	RLC30-7-7-43	0.681	30	7 x 7 x 43	211,966	4/0	680.0

OTHER SIZES ARE ALSO AVAILABLE.

STANDARD WIRE GAUGES

STANDARD NOMINAL DIAMETERS AND CROSS-SECTIONAL AREAS OF SOLID ROUND WIRES AT 20° C AS PER ASTM B258			
AWG N°	WIRE DIAMETER		CIRCULAR MILS
	INCH	MM	
4/0	0.4600	11.684	211,600
3/0	0.4096	10.404	167,800
2/0	0.3648	9.266	133,100
1/0	0.3248	8.250	105,600
1	0.2893	7.348	83,690
2	0.2576	6.543	66,360
3	0.2294	5.827	52,620
4	0.2043	5.189	41,740
5	0.1819	4.620	33,090
6	0.1620	4.115	26,240
7	0.1443	3.665	20,820
8	0.1285	3.264	16,510
9	0.1144	2.906	13,090
10	0.1019	2.588	10,380
11	0.0907	2.304	8,230
12	0.0808	2.052	6,530
13	0.0720	1.829	5,180
14	0.0641	1.628	4,110
15	0.0571	1.450	3,260
16	0.0508	1.290	2,580
17	0.0453	1.150	2,050
18	0.0403	1.024	1,620
19	0.0359	0.912	1,290
20	0.0320	0.812	1,020
21	0.0285	0.723	812
22	0.0253	0.643	640
23	0.0226	0.573	511
24	0.0201	0.511	404
25	0.0179	0.455	320
26	0.0159	0.405	253
27	0.0142	0.361	202
28	0.0126	0.321	159
29	0.0113	0.286	128
30	0.0100	0.255	100
31	0.0089	0.226	79.2
32	0.0080	0.203	64.0
33	0.0071	0.180	50.4
34	0.0063	0.160	39.7
35	0.0056	0.142	31.4
36	0.0050	0.127	25.0
37	0.0045	0.114	20.2
38	0.0040	0.102	16.0
39	0.0035	0.0889	12.2
40	0.0031	0.0787	9.61
41	0.0028	0.0711	7.84
42	0.0025	0.0635	6.25
43	0.0020	0.0508	4.84
44	0.0020	0.0508	4.00

ELECTRICAL COMPONENTS

Exel International

LAMINATED COPPER AND ALUMINIUM CONNECTORS

If flexible braided connectors don't meet customer needs, flexible laminated copper and aluminium connectors can provide an alternative. Manufactured according to unsurpassed internal procedures, they offer a solution that meets the highest quality standards. Designed so they can be tailored to customer's specifications, the laminated connectors are then manufactured by a team of keen experts.

APPLICATIONS

Frequently used for electrical connections in extreme conditions and environments, laminated connectors are mainly used in the following circumstances:

- Low mechanical vibrations
- Minor thermal contraction and/or expansion of attached units
- Low movements
- Space constraints

If vibration is a critical factor, we suggest using flexible braided connectors.

SPECIFICATIONS

LAMINATES

- Tin-plated C11000 ETP copper as per ASTM B33
- Silver-plated C11000 ETP copper as per ASTM B298
- Nickel-plated C11000 copper as per ASTM B355
- Bare C11000 ETP copper as per ASTM B152
- Aluminium alloy 1350 as per ASTM B209

Standard laminates vary in thickness from 0.005" to 0.04" and in width from 0.5" to 10".

PLATING OPTIONS FOR CONTACT PADS

- Electrolytic tin plating as per ASTM B545
- Electrolytic silver plating as per ASTM B700
- Electroless nickel plating as per ASTM B733
- Lead-free hot-dip tin plating

The standard plating thickness on a contact pad is 0.0003" although it can reach 0.004", upon customer's request.

OVERALL DIMENSIONS

- Contact pad widths up to 10"
- Contact pad thicknesses up to 3"
- Total connector lengths up to 72"
- Mounting holes in accordance with NEMA standards

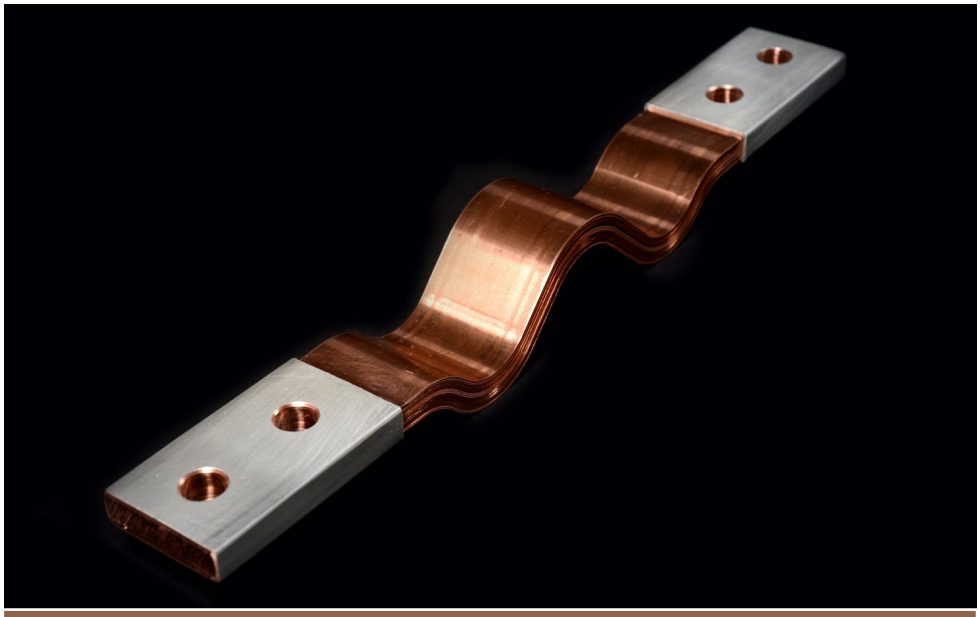
Custom sizes are also available.

CURRENT CAPACITY

- 100 amperes to 7,500 amperes, according to design specifications

OPTIONS

- Insulation: Heat shrink PVC and polyolefin, ceramic heat shield and several other types of insulation materials are available.



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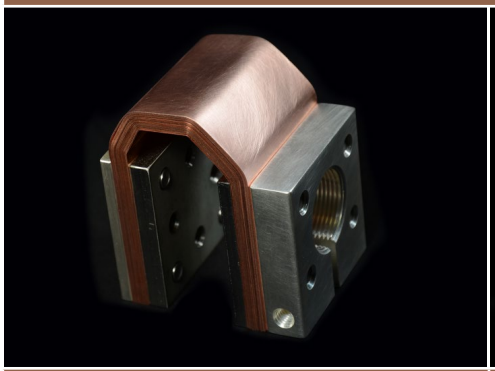

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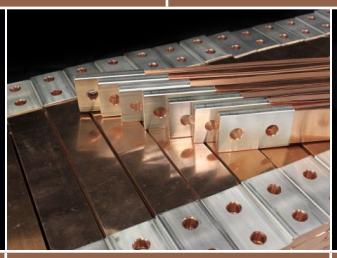

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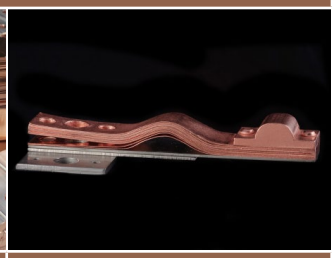

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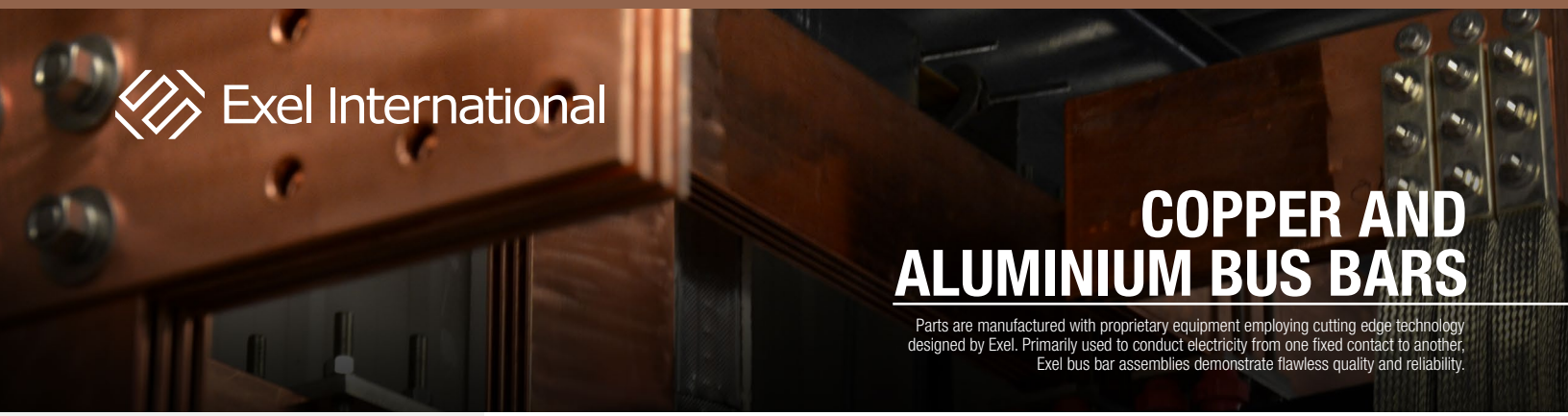


COPPER AND ALUMINIUM BUS BARS

Parts are manufactured with proprietary equipment employing cutting edge technology designed by Exel. Primarily used to conduct electricity from one fixed contact to another, Exel bus bar assemblies demonstrate flawless quality and reliability.

MATERIALS

Materials known for their conductivity properties are C11000 ETP copper and aluminium alloys 1350 and 6061. Other alloys can be used upon request.

PLATING OPTIONS

- Electrolytic tin plating as per ASTM B545
- Electrolytic silver plating as per ASTM B700
- Electroless nickel plating as per ASTM B733

FABRICATION CAPABILITIES

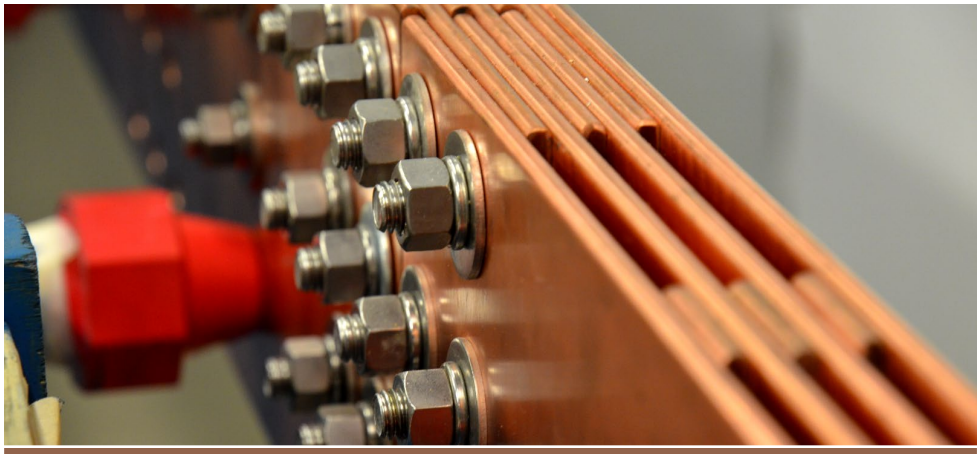
- Widths up to 60"
- Thicknesses up to 3"
- Lengths up to 240"
- Mounting holes as per NEMA standards or customer specifications

CURRENT CAPACITY

Current capacity is determined according to assembly configuration and bus dimension. In some cases, current capacity can reach over 50,000 A.

OPTIONS

- Insulation: Heat shrink PVC and polyolefin, ceramic heat shield material and other types of insulation materials are available.
- Epoxy powder-coated bus bar insulation available



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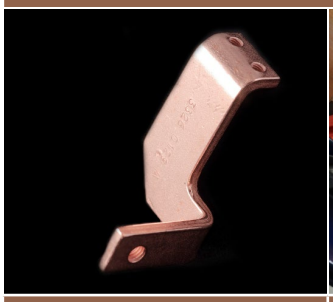

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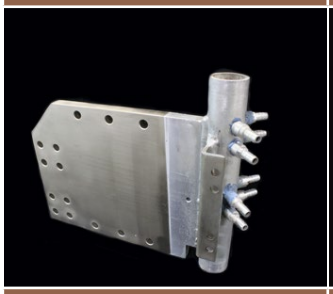

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COPPER VS ALUMINIUM RATIOS		
FEATURE	**COPPER**	**ALUMINIUM**
WEIGHT AT SAME CONDUCTIVITY	1	0.50
SECTION AT SAME CONDUCTIVITY	1	1.30
CONDUCTIVITY AT SAME SECTION	1	0.61
TRACTION RESISTANCE	1	0.40
HARDNESS	1	0.44
MODULUS OF ELASTICITY	1	0.55
COEFFICIENT OF THERMAL EXPANSION	1	1.39
MELTING POINT	1	0.61
COST AT SAME WEIGHT	1	0.60

CURRENT RATINGS

RECTANGULAR BAR COPPER C11000		AREA			WEIGHT	60-Hz CURRENT RATING (Amp) INDOOR SERVICE, 40° C AMBIENT, SINGLE BAR HORIZONTAL RUN ON EDGE, FREE OF EXTERNAL MAGNETIC INFLUENCES, SKIN EFFECT RATIO OF 1.00 TO 1.70			
THICK	WIDTH	SQ. IN	SQ. MM	MCM	LBS/FT	30° C RISE*	40° C RISE	50° C RISE	65° C RISE
0.125	0.500	0.063	40.3	80	0.242	153	176	203	237
0.125	0.750	0.094	60.5	119	0.363	215	247	285	333
0.125	1.000	0.125	80.6	159	0.485	270	311	358	419
0.125	1.500	0.188	121.0	239	0.727	385	443	510	597
0.125	2.000	0.250	161.3	318	0.969	495	569	656	767
0.125	2.500	0.313	201.6	398	1.211	600	690	795	930
0.125	3.000	0.375	241.9	477	1.454	710	817	941	1,101
0.125	3.500	0.438	282.3	557	1.696	810	932	1,073	1,256
0.125	4.000	0.500	322.6	637	1.938	910	1,047	1,206	1,411
0.250	0.500	0.125	80.6	159	0.485	240	276	318	372
0.250	0.750	0.188	121.0	239	0.727	320	368	424	496
0.250	1.000	0.250	161.3	318	0.969	400	460	530	620
0.250	1.500	0.375	241.9	477	1.454	560	644	742	868
0.250	2.000	0.500	322.6	637	1.938	710	817	941	1,101
0.250	2.500	0.625	403.2	796	2.423	850	978	1,126	1,318
0.250	3.000	0.750	483.9	955	2.907	990	1,139	1,312	1,535
0.250	3.500	0.875	564.5	1,114	3.392	1,150	1,323	1,524	1,783
0.250	4.000	1.000	645.2	1,273	3.876	1,250	1,438	1,656	1,938
0.250	5.000	1.250	806.5	1,592	4.845	1,500	1,725	1,988	2,325
0.250	6.000	1.500	967.7	1,910	5.814	1,750	2,013	2,319	2,713
0.375	0.750	0.281	181.5	358	1.090	415	477	550	643
0.375	1.000	0.375	241.9	477	1.454	510	587	676	791
0.375	1.500	0.563	362.9	716	2.180	710	817	941	1,101
0.375	2.000	0.750	483.9	955	2.907	880	1,012	1,166	1,364
0.375	2.500	0.938	604.8	1,194	3.634	1,050	1,208	1,391	1,628
0.375	3.000	1.125	725.8	1,432	4.361	1,200	1,380	1,590	1,860
0.375	3.500	1.313	846.8	1,671	5.087	1,350	1,553	1,789	2,093
0.375	4.000	1.500	967.7	1,910	5.814	1,500	1,725	1,988	2,325
0.375	5.000	1.875	1,209.7	2,387	7.268	1,800	2,070	2,385	2,790
0.375	6.000	2.250	1,451.6	2,865	8.721	2,100	2,415	2,783	3,255
0.375	8.000	3.000	1,935.5	3,820	11.628	2,650	3,048	3,511	4,108
0.500	1.000	0.500	322.6	637	1.938	620	713	822	961
0.500	1.500	0.750	483.9	955	2.907	830	955	1,100	1,287
0.500	2.000	1.000	645.2	1,273	3.876	1,000	1,150	1,325	1,550
0.500	2.500	1.250	806.5	1,592	4.845	1,200	1,380	1,590	1,860
0.500	3.000	1.500	967.7	1,910	5.814	1,400	1,610	1,855	2,170
0.500	3.500	1.750	1,129.0	2,228	6.783	1,550	1,783	2,054	2,403
0.500	4.000	2.000	1,290.3	2,546	7.752	1,700	1,955	2,253	2,635
0.500	5.000	2.500	1,612.9	3,183	9.690	2,050	2,358	2,716	3,178
0.500	6.000	3.000	1,935.5	3,820	11.628	2,400	2,760	3,180	3,720
0.500	8.000	4.000	2,580.6	5,093	15.504	3,000	3,450	3,975	4,650
0.750	4.000	3.000	1,935.5	3,820	11.628	2,050	2,358	2,716	3,178
0.750	5.000	3.750	2,419.4	4,775	14.535	2,400	2,760	3,180	3,720
0.750	6.000	4.500	2,903.2	5,730	17.442	2,800	3,220	3,710	4,340
0.750	8.000	6.000	3,871.0	7,639	23.256	3,500	4,025	4,638	5,425
0.750	10.000	7.500	4,838.7	9,549	29.070	4,200	4,830	5,565	6,510
0.750	12.000	9.000	5,806.4	11,459	34.884	4,900	5,635	6,493	7,595

*Rating of 30°C rise is based on CDA publication.

Notes:

1- Approximate AC current rating for multiple bars, spaced ¼ apart shall be:

No. of bars	Multiply single bar rating by:
2 (II)	1.58
3 (III)	2.00
4 (IIII)	2.30

2- Horizontal capacity is 10% lower than vertical capacity (horizontal run on edge).

3- For aluminium bar capacity, please contact our sales departement.

Exel International

CUSTOM-DESIGNED BUS DUCT SYSTEMS AND ENCLOSURES

Exel International designs and manufactures customized hybrid bus duct systems. Exel offers a wide array of custom-engineered bus duct systems and enclosures solutions for the power generation, distribution, petro-chemical, municipal, transit and industrial markets.

APPLICATIONS

Bus duct systems are usually designed for interconnecting power transformers and other related equipment, such as switchgears and inverters.

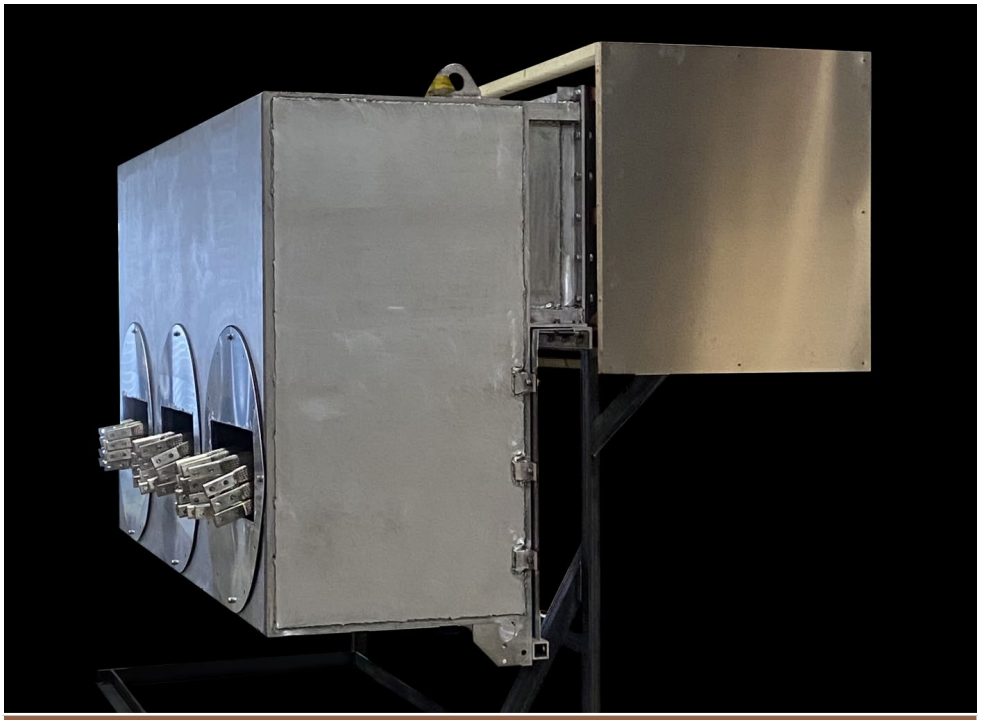
SPECIFICATIONS

- Bus duct and enclosure systems can be designed to meet the requirements of industry standards.
- Ratings from 400 A to 8000 A, 3 phases
- Ventilated or completely enclosed steel enclosure with powder-coating paint for indoor or outdoor service with 1000 hours salt-spray resistance.
- Tin or silver-plated copper and aluminium conductors will be used as intermediate bus.
- Flexible braided connectors are used for end-to-end connections, thermal expansion bonding and grounding.
- The systems can include gaskets, connection flanges, wall entrance seals, equipment terminations, tap boxes, offsets, wall supports and structural steel supports as per the specified design.

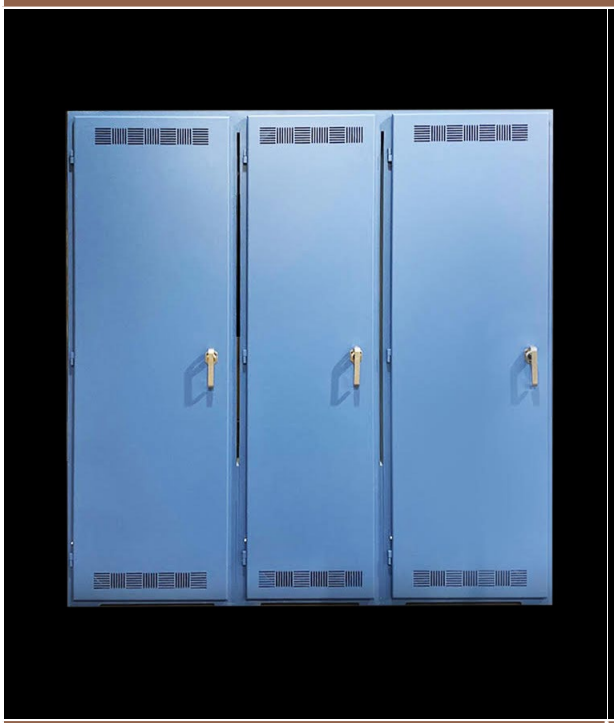
AVAILABLE SYSTEM TESTING

- Testing to UL 857 standards or other requirements.
- Heat rise testing.
- Short-circuit resistance strength testing at rated voltage.
- Verification of insulation resistance and dielectric resistance after exposure to rain.
- Verification of dielectric voltage resistance.
- Verification of impact strength.
- Maximum resistance between exposed metal and busway.

Required tests can be performed by a third-party organization.



XBD001- ENCLOSURE FOR 14KV-8000A



XBD002

XBD003

Exel International

BRAZED ELECTRICAL CONTACTS

A brazed electrical contact is a machined part onto which a silver plate is welded. Exel can design entirely new contacts, repair damaged parts, or even visit your site to determine the solution that best meets your needs.

MATERIALS USED

- C11000 copper
- C1300 aluminium
- C1350 aluminium
- C6061 aluminium
- C260 brass
- C360 brass

Other materials can be used upon request.

CONTACT MATERIALS

SILVER AND COPPER

- 90% silver, 10% copper

SILVER AND TUNGSTEN

- 50% tungsten, 50% silver
- 65% tungsten, 35% silver
- 78% tungsten, 22% silver

COPPER AND TUNGSTEN

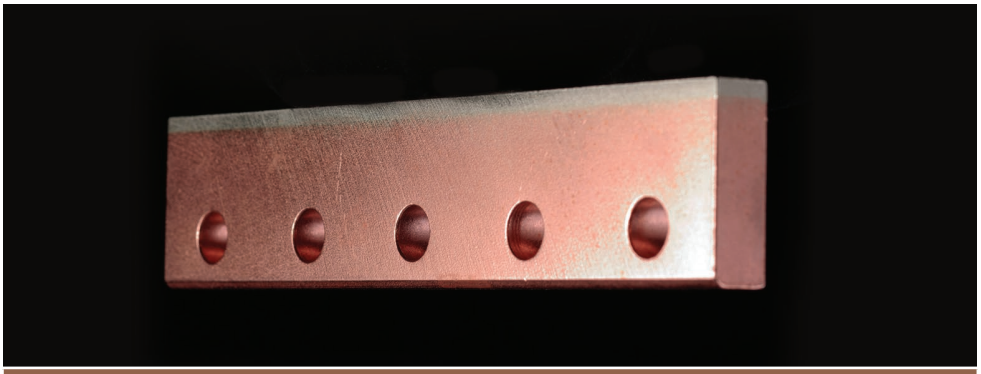
- 56% tungsten, 44% copper
- 68% tungsten, 32% copper
- 70% tungsten, 30% copper
- 75% tungsten, 25% copper
- 80% tungsten, 20% copper

PLATING OPTIONS

- Electrolytic tin plating as per ASTM B545
- Electrolytic silver plating as per ASTM B700
- Electroless nickel plating as per ASTM B733

WELDING METHODS

- Tungsten-electrode inert gas (TIG) welding
- Metal inert gas (MIG) welding
- Metal-arc welding
- Resistance welding
- Brazing (silver)



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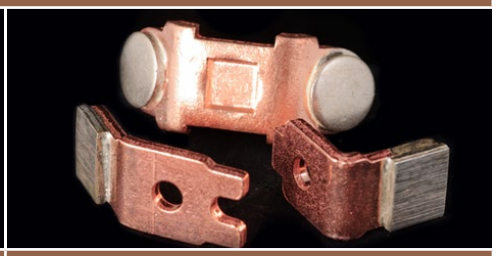

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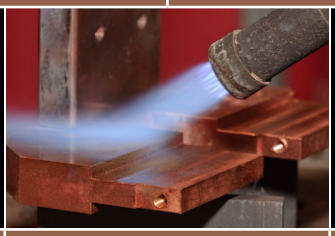

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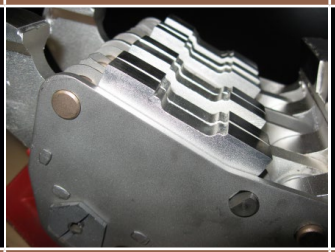

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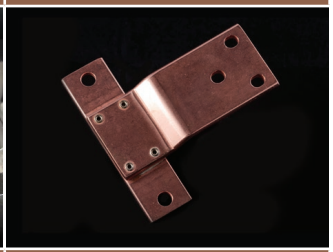

BC009

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COATING / PLATING FOR ELECTRICAL CONDUCTORS

Exel Plating

COATING / PLATING FOR ELECTRICAL CONDUCTORS

From technical expertise and meticulous production to quality assurance via precision technology, we provide high-end finishing and personalized customer service. With more than 50 years of cumulative experience in plating, our team's leadership is supported by a collaborative ensemble of seasoned technicians and chemists. Plating options include tin, silver, nickel, copper, iridium finish (conversion coating), and gold.

Metal coating (plating) is often applied to the surfaces of electrical conductors, connecting parts and bus connection joints to improve solderability, reduce oxidation (corrosion) and improve electrical properties (conductivity, hardness, emissivity, skin effect, etc.). The most common coating (plating) materials used with copper conductors are tin and silver. Copper and nickel coatings are often used as an under layer.

Tin is the most common coating material used with copper conductors for service temperatures of up to 150° C. At higher temperatures, silver and nickel coatings are often used to minimize oxidation.

COATING (PLATING) MATERIAL PROPERTIES	TIN	SILVER	NICKEL
Maximum service temperature	150° C	250° C	450° C
Conductivity (% IACS)	15	105	22
Crimp contact resistance	Good but can deteriorate over time	Excellent	Good but can deteriorate over time
Solderability	Good but can deteriorate over time	Excellent	Requires active flux
Application / Service	Good for non-sliding and non-rotating contacts (i.e. bolted joints). Not good for low temperatures (below -40° C)	Good for sliding and rotating contacts (i.e. switch gears, moving switch blades, primary disconnect assemblies)	Good for wear resistance and as an undercoat for tin plating

PLATING THICKNESS	TYPICAL APPLICATION	SPECIFICATION
TIN		
0.0001" - 0.00025"	Flash for soldering	ASTM B545 MIL-T-10727A
0.0002" - 0.0004"	To prevent galling and seizing	
0.0003" min.	Where corrosion resistance is important (i.e. electrical conductor joints)	
0.0002" - 0.0006"	To prevent case from forming during nitriding	
SILVER		
0.0005" min.	Increasing use in electrical and electronic fields	ASTM B700 QQ-S-365
0.0003" - 0.0005"	To prevent corrosion and improve electrical properties when joining	
0.0005" - 0.0010"	For moving and sliding electrical contacts	
0.0020" - 0.0028"	For high pressure moving and sliding electrical contacts	
ELECTROLESS NICKEL		
0.0010" min.	For steel to prevent corrosion	ASTM B733 MIL-C-26074A
0.0010" min.	For aluminium based alloys	
0.0005" min	For copper, nickel and cobalt based alloys	
COPPER		
0.0010"	Carburizing stop-off protection, shielding for brazing	ASTM B734 MIL-C-145550
0.0005"	As an undercoat for nickel and other plating	
0.0001 - 0.0002"	To prevent base metal migration into tin (prevents poisoning solderability)	
GOLD		
0.00005" min.	Min. gold used over silver underplate to prevent tarnish	ASTM B488 MIL-G-45204
0.00010" min.	Waveguides and contact non-migratory	
0.00020" min.	Standard thickness for engineering use	
0.00030" - 0.00050"	For exceptional corrosion and wear	
0.0015" min.	For cathode emission characteristics	

Exel Plating

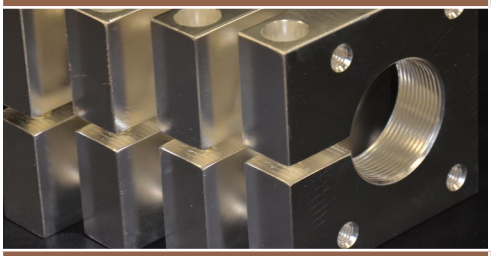
QUALITY CONTROL:

Measurement of coating thickness by X-ray spectrophotometry	ASTM B568
Qualitative adhesion testing of metallic coating	ASTM B571
Solderability of metallic coated products	ASTM B678

COATING (PLATING) IN SERVICE CONDITION	TEMPERATURE LIMITS AS PER IEC 60694	
	TEMPERATURE REACHED ° C (θ max.)	TEMPERATURE RISE AT 40° C AMBIENT °C (ΔT max.)
CONTACTS (BREAKERS, SWITCHGEAR, ETC.)		
BARE COPPER OR BARE-COPPER ALLOY		
- In air	75	35
- In SF6 (oxygen-free gas)	105	65
- In oil	80	40
SILVER COATING ON COPPER OR COPPER ALLOY		
- In air	105	65
- In SF6 (oxygen-free gas)	105	65
- In oil	90	50
TIN COATING ON COPPER OR COPPER ALLOY		
- In air	90	50
- In SF6 (oxygen-free gas)	90	50
- In oil	90	50
BOLTED JOINTS		
BARE COPPER OR BARE-COPPER ALLOY		
- In air	90	50
- In SF6 (oxygen-free gas)	115	75
- In oil	100	60
SILVER COATING ON COPPER OR COPPER ALLOY		
- In air	115	75
- In SF6 (oxygen-free gas)	115	75
- In oil	100	60
TIN COATING ON COPPER OR COPPER ALLOY		
- In air	105	65
- In SF6 (oxygen-free gas)	105	65
- In oil	100	60

PL001

PL002



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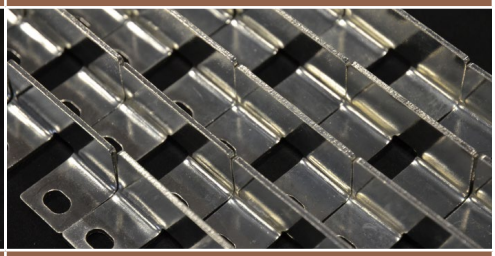


PL004

HEAT RISE TESTING SERVICE

Exel International

HEAT RISE TESTING SERVICE

Exel's heat rise testing services offer expert qualification and certification according to industry standards, with a responsive turnaround for results.

CAPABILITIES

Exel can test electrical components either supplied by our customers or manufactured by Exel in the generation, transmission, and distribution of power from hydroelectric, wind, solar and other sources.

TESTING RATIONALE

To avoid premature component degradation or the triggering of a disastrous chain reaction, it is essential to carry out full-scale tests and measurements within conditions that simulate operating life. Moreover, keep in mind that:

1- COMPUTATION IS NOT SUFFICIENT.

Mathematical computation and software programs can provide a useful baseline for theoretical performance. Overlooked or deliberately neglected parameters will lead to a predicted heat rise that, in fact, may be a few degrees from standard. That discrepancy can put your entire electrical apparatus at risk.

2- THE COMPONENT IS PART OF A CRITICAL APPARATUS.

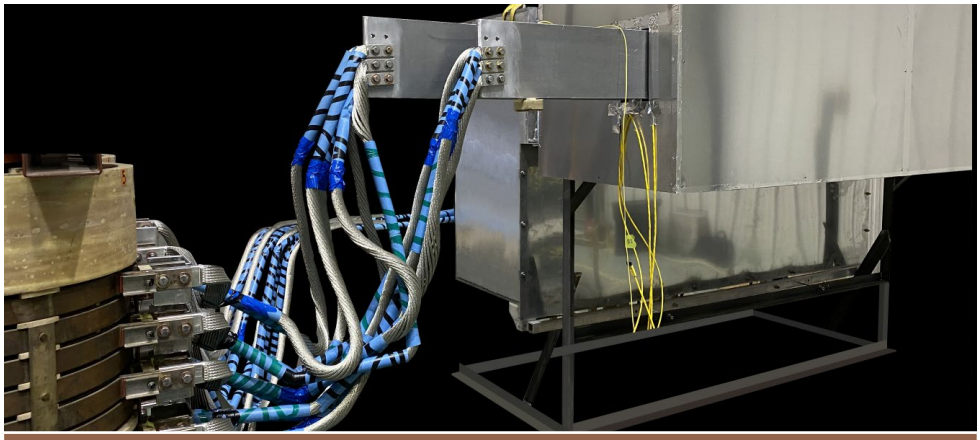
To evaluate the level of criticality, assess the consequences of loss of function, replacement time, and replacement cost.

3- REAL-LIFE OPERATING CONDITIONS ARE HIGHLY VARIABLE.

Environmental factors like temperature and humidity are among the factors that impact component performance.

4- CUSTOM COMPONENTS HAVE NO PERFORMANCE HISTORY.

Testing ensures that a newly designed or modified component is optimized to reduce costs and increase operational life.



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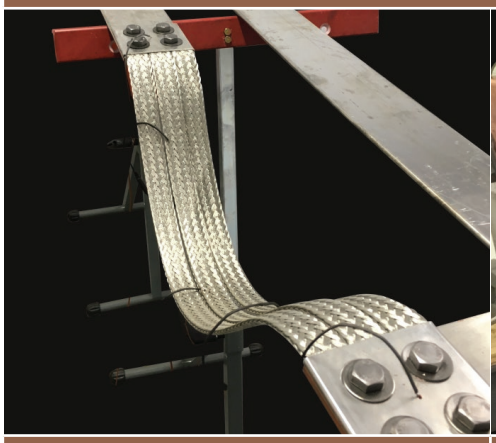

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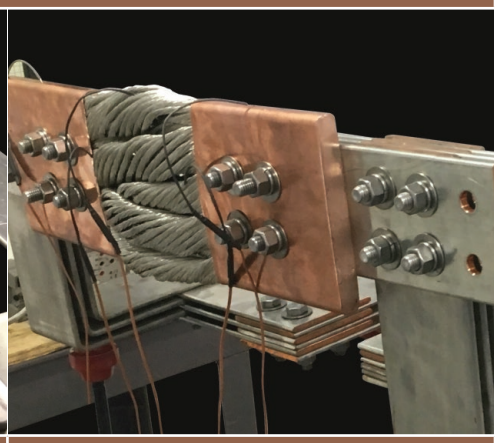

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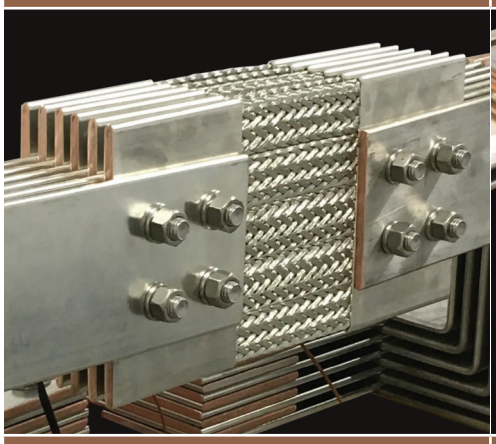

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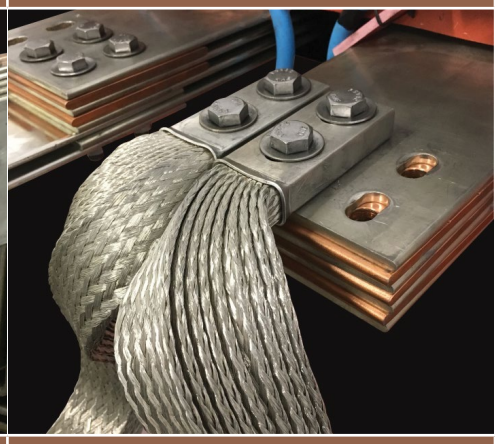


HR005

OBJECTIVES AND TESTS

- Research new materials, configurations, and geometries
- Diagnose components
- Test and certify standard and custom products

NORMS AND STANDARDS

We test to the following standards:

- IEC 60694 and 60129
- Hydro-Quebec SN19.1A (heat rise tests)

CAPACITY

- 400 A to 6000 A (single phase 60 Hz)
- 14 channels of temperature sensors for measurement
- Fully automatic data acquisition system

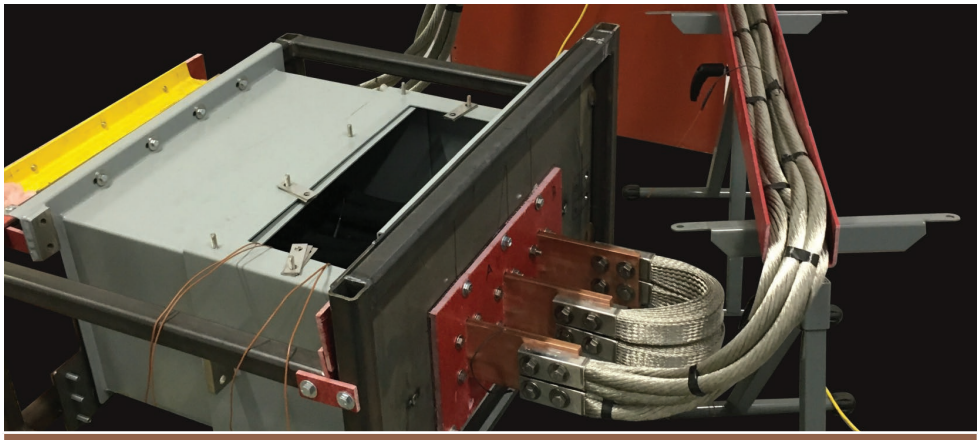
AUTOMATION

To perform tests in automated fashion, our laboratory was designed to:

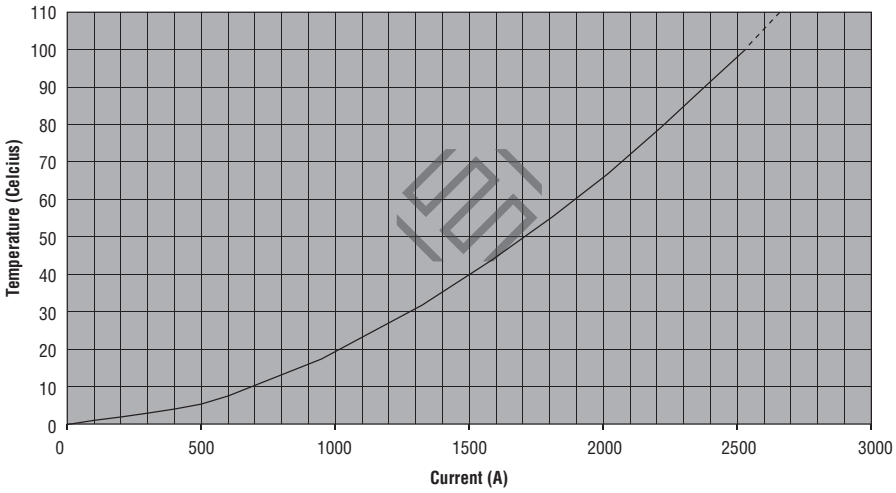
- Permanently control the injection current
- Record the temperatures at set intervals
- Monitor security anomalies and take action in the event of a failure
- Calculate equation parameters for generating reports and issuing certifications

PERFORMANCE CERTIFICATION

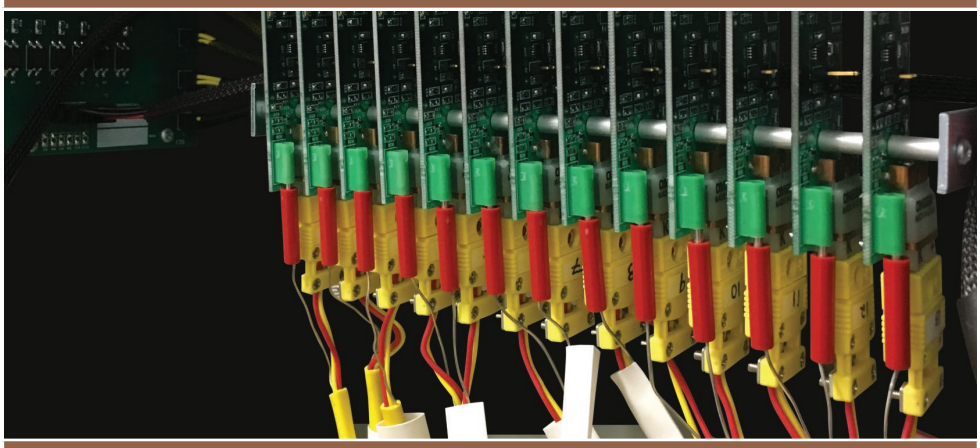
Tested components meeting standards are issued certifications.



HR006



HR007



HR008

TECHNICAL INFORMATION

METAL PROPERTIES

METAL	CHEMICAL SYMBOL	WEIGHT PER CUBIC INCH (LBS)	MELTING POINT (°F)	CONDUCTIVITY % IACS
STEEL, CARBON	—	0.2830	2500	3 to 15
LEAD	Pb	0.4096	621	7
TIN	Sn	0.2633	449	15
IRON	Fe	0.2830	2750	17
NICKEL	Ni	0.3178	2651	22
ZINC	Zn	0.2565	788	27
TUNGSTEN	W	0.6810	6098	31
ALUMINIUM	Al	0.0975	1220	61
GOLD	Au	0.6969	1945	70
COPPER	Cu	0.3230	1981	100
SILVER	Ag	0.3780	1761	105

TEMPERATURE CONVERSION (DEGREES):
Fahrenheit = (1.8 x Celsius) + 32 / Celsius = 0.5555 x (Fahrenheit - 32) / Kelvin = Celsius + 273.2 / Rankine = Fahrenheit + 459.7

COPPER ALLOY		% IACS	TYPICAL USE
C15000	COPPER CLASS 1 - ZIRCONIUM COPPER	93	*RWMA Class 1, Switches, circuit breakers for high temperature applications, stud bases for rectifiers, soldering welding tips
C16200	COPPER CLASS 1 - CADMIUM COPPER	90	*RWMA Class 1, Trolley wires, heating pads, spring contacts, connectors, switch gear components
C18150	COPPER CLASS 2 - CHROMIUM ZIRCONIUM COPPER	80	*RWMA Class 2, Electrode holders, spot welding tips, seam welding wheels, circuit breaker parts, switch contacts, electrical conductors, arcing and bridging parts
C18200	COPPER CLASS 2 - CHROMIUM COPPER	80	
C17500	COPPER CLASS 3 - BERYLLIUM COPPER	45	*RWMA Class 3, Welding Equipment, Fuse Clips, Fasterners, Springs, Switches, Relays, Electrical Conductors
C18000	COPPER CLASS 3 - BERYLLIUM-FREE COPPER	45	*RWMA Class 3, Welding Equipment, Fuse Clips, Fasterners, Springs, Switches, Relays, Electrical Conductors
C17200	COPPER CLASS 4 - BERYLLIUM COPPER	22	*RWMA Class 4, Welding Equipment, Fuse Clips, Fasterners, Springs, Switches, Relays, Electrical Components
C26000	CARTRIDGE BRASS	28	Electrical And mechanical components for general applications
C33000	LOW-LEADED BRASS TUBE	26	Electrical And mechanical components for general applications
C36000	FREE CUTTING BRASS	26	Electrical And mechanical components for general applications
C46400	NAVAL BRASS	26	Electrical And mechanical components for general applications
C51000	PHOSPHOR BRONZE	15	Electrical and mechanical components for general applications, spring contacts for switches and relays

* Resistance Welding Manufacturers Association

ALUMINIUM ALLOY		% IACS	TYPICAL USE
1350	NON-HEAT TREATABLE ALLOY	61	Bus conductor applications
6101-T64	HEAT TREATABLE ALLOY	60	Bus conductor applications
6101-T61	HEAT TREATABLE ALLOY	58	Bus conductor applications
6101-T63	HEAT TREATABLE ALLOY	56	Bus conductor applications
6101-T6	HEAT TREATABLE ALLOY	55	Bus conductor applications
6063-T6	HEAT TREATABLE ALLOY	53	Bus conductor applications
6061-T6	HEAT TREATABLE ALLOY	40	Bus conductor applications

GALVANIC CORROSION OR DISSIMILAR METAL CORROSION

GALVANIC CORROSION IS AN ELECTROCHEMICAL PROCESS OCCURING WHEN TWO OR MORE METALS ARE IN CONTACT.

THERE ARE THREE CONDITIONS THAT MUST EXIST FOR GALVANIC CORROSION TO OCCUR.

1- Electrochemically dissimilar metals must be present.

2- The metals must be in contact with electricity.

3- The metals must be exposed to an electrolyte.

All materials listed within each group in the galvanic chart may be considered similar and not affected by galvanic action when coupled with other metals from the same group in normal environments such as warehouse storage or indoor applications. Typically there should not be more than a 0.25 V difference in the anodic index.

In critical applications (outdoor, high humidity, saline and other environments), the difference in the anodic index between two metals to be coupled should not be more than 0.15 V. In controlled envrionments, differences of up to 0.50 V can be tolerated.

METAL	ANODIC INDEX (V)	COMPATIPLE COUPLE GROUPING
Gold and gold alloys, platinum and platinum alloys	0.00	C
Rhodium (plated on silver plated copper)	0.10	A C
Silver and high silver alloys	0.15	A A C
Nickel, monel and high nickel copper alloys (70-30)	0.30	A A C
Copper, red brass, high copper-nickel alloys (80-20), nickel silver, phosphor bronze, silicon bronze	0.35	A A A C
Brass: Cartridge, naval and commercial brass Commercial bronze	0.40	A A A C
Brass half hard and free cutting yellow, manganese bronze, leaded and non-leaded copper zinc, muntz metal	0.45	A A A C
Stainless steel, 18% chromium	0.50	A A A A C
Stainless steel, 12% chromium, chromium plated	0.60	A A A A C
Tin plate and tin-lead solder	0.65	A A A A C
Lead and high-lead alloys	0.70	A A A A C
Aluminium types 2014, 2024 and 2017	0.75	A A A A C
Iron: gray, malleable, plain carbon Low alloys steel (.13 carbon)	0.85	A A A A C
Aluminium types 1100, 3003, 5052, 6061 and 7075 Aluminium other than aluminium-copper alloys Aluminium casting alloys, silicon type Aluminium casting alloys other than silicon type	0.90	A A A A C
Cadmium plating	0.95	A A A A A C
Galvanized steel, zinc coatings	1.20	A C
Zinc alloys	1.25	A
Magnesium and magnesium alloys	1.75	

c: Indicates the cathodic member.
a: Indicates the anodic member that will corrode.

CONVERSIONS

TEMPERATURE CONVERSION (DEGREES):

Fahrenheit = (1.8 x Celsius) + 32

Celsius = 0.5555 x (Fahrenheit - 32)

Kelvin = Celsius + 273.2

Rankine = Fahrenheit + 459.7

MULTIPLY → TO OBTAIN ←	BY → BY ←	TO OBTAIN DIVIDE

AREA CONVERSIONS

Circular mils	0.0000007854	Square inches
Circular mils	0.0005067	Square millimetres
Square inches	645.16	Square millimetres

LENGTH CONVERSIONS

Feet	0.3048	Metres
Inches	25.4	Millimetres
Inches	25000	Microns
Miles (U.S.)	1.609344	Kilometres
Yards	0.9144	Metres

VOLUME CONVERSIONS

Cubic feet	0.02831685	Cubic metres
Gallons (U.S.)	3.785412	Litres
Cubic inches	16387.06	Cubic millimetres
Cubic yards	0.7645549	Cubic metres

MASS AND DENSITY CONVERSIONS

Ounces (troy)	31.10348	Grams
Pounds	0.4535924	Kilograms
Tons (2,000 lbs)	907.1847	Kilograms
Tons (metric)	1000	Kilograms

MISCELLANEOUS CONVERSIONS

Atmosphere	33.9	Feet of water
Atmosphere	29.92	Inch of mercury
Atmosphere	14.7	PSI (pounds/sq. in)
BTU	778.3	Foot-pounds
BTUs per hour	0.2932	Watts
BTUs per minute	0.02356	Horsepower
Gallons (US)	231	Cubic inches
Horsepower	745.7	Watts
Microns	0.00004	Inches
Ounces	0.0625	Pounds
Quarts	0.25	Gallons
Square feet	144	Square inches

Exel International

ASTM SPECIFICATIONS FOR COPPER AND COPPER ALLOY PRODUCTS

ASTM	DESCRIPTION	ASTM	DESCRIPTION
B1	HARD-DRAWN COPPER WIRE	B173	ROPE-LAY-STRANDED CONDUCTORS WITH CONCENTRIC STRANDED MEMBERS
B2	MEDIUM-HARD DRAWN COPPER WIRE	B174	BUNCH-STRANDED CONDUCTORS
B3	SOFT OR ANNEALED COPPER WIRE	B187	COPPER BUS BAR, ROD AND SHAPES
B8	CONCENTRIC-LAY-STRANDED COPPER CONDUCTORS, HARD, MEDIUM-HARD OR SOFT	B188	SEAMLESS COPPER BUS PIPE AND TUBE
B16	FREE-CUTTING BRASS ROD, BAR AND SHAPES FOR USE IN SCREW MACHINES	B189	LEAD-COATED AND LEAD ALLOY COATED SOFT COPPER WIRE FOR ELECTRICAL PURPOSES
B19	CARTRIDGE BRASS SHEET, STRIP, PLATE, BAR AND DISKS	B194	COPPER BERYLLIUM ALLOY PLATE, SHEET, STRIP, AND ROLLED BAR
B21	NAVAL BRASS ROD, BAR AND SHAPES	B196	COPPER BERYLLIUM ALLOY ROD AND BAR
B22	BRONZE CASTINGS FOR BRIDGES AND TURNTABLES	B197	COPPER BERYLLIUM ALLOY WIRE
B33	TINNED SOFT OR ANNEALED COPPER WIRE FOR ELECTRICAL PURPOSES	B226	CORED, ANNULAR, CONCENTRIC-LAY-STRANDED COPPER CONDUCTORS
B36	BRASS PLATE, SHEET, STRIP AND ROLLED BAR	B229	CONCENTRIC-LAY-STRANDED COPPER AND COPPER-CLAD STEEL COMPOSITE CONDUCTORS
B42	SEAMLESS COPPER PIPE, STANDARD SIZES	B246	TINNED HARD-DRAWN AND MEDIUM HARD-DRAWN COPPER WIRE FOR ELECTRICAL PURPOSES
B43	SEAMLESS RED BRASS PIPE, STANDARD SIZES	B258	NOMINAL DIAMETERS AND CROSS-SECTIONAL AREAS OF AWG SIZES OF SOLID ROUND WIRES USED AS ELECTRICAL CONDUCTORS
B48	SOFT RECTANGULAR AND SQUARE BARE COPPER WIRE FOR ELECTRICAL CONDUCTORS	B280	SEAMLESS COPPER TUBE FOR AIR CONDITIONING AND REFRIGERATION FIELD SERVICE
B49	HOT-ROLLED COPPER ROD REDRAW FOR ELECTRICAL PURPOSES	B286	COPPER CONDUCTORS FOR HOOKUP WIRE IN ELECTRONIC EQUIPMENT
B66	BRONZE CASTINGS IN THE ROUGH FOR LOCOMOTIVE WEARING PARTS	B291	COPPER-ZINC-MANGANESE ALLOY (MANGANESE BRASS) SHEET AND STRIP
B68	SEAMLESS COPPER TUBE, BRIGHT ANNEALED	B298	SILVER-COATED SOFT OR ANNEALED COPPER WIRE
B75	SEAMLESS COPPER TUBE	B301	FREE-CUTTING COPPER ROD AND BAR
B88	SEAMLESS COPPER WATER TUBE	B315	SEAMLESS COPPER ALLOY PIPE AND TUBE
B96	COPPER SILICON ALLOY PLATE, SHEET, STRIP AND ROLLED BAR FOR GENERAL PURPOSES AND PRESSURE VESSELS	B359	COPPER AND COPPER-ALLOY SEAMLESS CONDENSER AND HEAT EXCHANGER TUBES WITH INTEGRAL FINS
B98	COPPER-SILICON ALLOY ROD, BAR AND SHAPES	B360	HARD-DRAWN COPPER CAPILLARY TUBE FOR RESTRICTOR APPLICATIONS
B99	COPPER-SILICON ALLOY WIRE FOR GENERAL PURPOSES	B470	BONDED COPPER CONDUCTORS FOR USE IN HOOKUP WIRE FOR ELECTRONIC EQUIPMENT
B103	PHOSPHOR BRONZE PLATE, SHEET, STRIP AND ROLLED BAR	B496	COMPACT ROUND CONCENTRIC-LAY-STRANDED COPPER CONDUCTORS
B105	HARD-DRAWN COPPER ALLOY WIRES FOR ELECTRICAL CONDUCTORS	B505	COPPER BASE ALLOY CONTINUOUS CASTINGS
B111	COPPER AND COPPER ALLOY SEAMLESS CONDENSER TUBES AND FERRULE STOCK	B584	COPPER ALLOY SAND CASTINGS FOR GENERAL APPLICATIONS
B124	COPPER AND COPPER-ALLOY FORGING ROD, BAR AND SHAPES	B624	HIGH-STRENGTH, HIGH-CONDUCTIVITY COPPER ALLOY WIRE FOR ELECTRONIC APPLICATIONS
B133	COPPER ROD, BAR AND SHAPES	B638	COPPER AND COPPER ALLOY SOLAR HEAT ABSORBER PANELS
B135	SEAMLESS BRASS TUBE	B706	SEAMLESS COPPER ALLOY (UNS NO. C69100) PIPE AND TUBE
B138	MANGANESE BRONZE ROD, BAR AND SHAPES	B716	WELDED COPPER WATER TUBE
B139	PHOSPHOR BRONZE ROD, BAR AND SHAPES	B738	FINE-WIRE BUNCH-STRANDED AND ROPE-LAY BUNCH STRANDED COPPER CONDUCTORS FOR USE AS ELECTRICAL CONDUCTORS
B140	COPPER-ZINC-LEAD (LEADED RED BRASS HARDWARE BRONZE) ROD, BAR AND SHAPES	B743	SEAMLESS COPPER TUBE IN COILS
B150	ALUMINIUM BRONZE ROD, BAR AND SHAPES	B747	COPPER-ZIRCONIUM ALLOY SHEET AND STRIP
B152	COPPER SHEET, STRIP, PLATE AND ROLLED BAR	F9	ROUND WIRE FOR USE AS GRID SIDE RODS IN ELECTRON TUBES
B159	PHOSPHOR BRONZE WIRE	F68	OXYGEN-FREE COPPER IN WROUGHT FORMS FOR ELECTRON DEVICES
B169	ALUMINIUM BRONZE, PLATE, SHEET, STRIP, AND ROLLED BAR	F96	ELECTRONIC GRADE ALLOYS OF COPPER IN WROUGHT FORMS
B171	COPPER ALLOY CONDENSER TUBE PLATES	F467	NONFERROUS NUTS FOR GENERAL USE
B172	ROPE-LAY-STANDARD CONDUCTORS WITH BUNCH STRANDED MEMBERS	F468	NONFERROUS BOLTS, HEX CAP SCREWS, AND STUDS FOR GENERAL USE

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