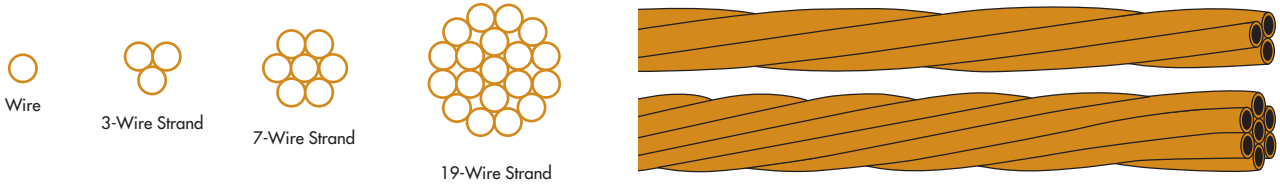


COPPERWELD® WIRE AND STRAND HARD DRAWN



Consisting of a copper cladding metallurgically bonded to a steel core, Copperweld® CCS wire effectively combines the strength of steel with the conductivity and corrosion resistance of copper. Standard copper cladding thicknesses result in a composite conductivity of 30% or 40% IACS. Copperweld wire is available with two types of steel: a strong, high carbon, steel for the high-strength (HS) and extra-high-strength (EHS) grades and a low carbon (LC) steel for special applications.

Copperweld strand is concentrically stranded cable of one or more layers with left-hand lay in the outer layer unless otherwise specified. In any strand, the individual wires are of the same size.

Copperweld hard-drawn wire and strand offers tensile strengths from 80000 - 270000 psi [5625 - 18983 kgf/cm²]. For applications requiring greater flexibility, Copperweld wire and strand are also available in an annealed state.

NOTE: Properties noted in these data sheets are typical values for standard applications. If your application requires performance values beyond those noted, please contact Copperweld's Engineering Support Center at engineering@copperweld.com or **+1.615.377.4200**. Material selection, varying composition and processing conditions all provide flexibility in how Copperweld can deliver exactly the product you need. Bimetallic conductors from Copperweld offer many distinct advantages, and our engineering team works in concert with our clients to determine the proper components for the stringent requirements of their products.

Specifications:

ASTM B-227 Hard Drawn Copper-Clad Steel Wire **ASTM B-228** Concentric-Lay-Stranded Copper-Clad Steel Conductors

BARE SOLID COPPERWELD® WIRES, HIGH STRENGTH AND EXTRA HIGH STRENGTH PHYSICAL AND ELECTRICAL CHARACTERISTICS

(METRIC UNITS)

CONDUCTOR SIZE AWG	DIAMETER		MIN BREAKING LOADS (kgf)			WEIGHT (kg/km)		NOMINAL DC RESISTANCE at 20°C (Ω/km)		CROSS SECTION AREA	
			HIGH STRENGTH		EXTRA HIGH STRENGTH	40% COND	30% COND	40% COND	30% COND	(cmil)	(mm ²)
	40% COND	30% COND	30% COND	(inch)	(mm)						
0	0.3249	8.25	3065	3174	4561	440.5	435.9	0.8058	1.0744	105560	53.49
1	0.2893	7.35	2633	2835	4021	349.2	345.6	1.0164	1.3551	83694	42.41
2	0.2576	6.54	2225	2408	3326	276.9	274.0	1.2819	1.7092	66358	33.62
3	0.2294	5.83	1855	2001	2747	219.6	217.3	1.6164	2.1552	52624	26.67
4	0.2043	5.19	1558	1731	2056	174.2	172.3	2.0380	2.7174	41738	21.15
5	0.1819	4.62	1292	1430	1721	138.1	136.6	2.5709	3.4278	33088	16.77
6	0.1620	4.11	1070	1179	1429	109.5	108.4	3.2413	4.3217	26244	13.30
7	0.1443	3.67	885	972	1180	86.89	85.98	4.0852	5.4469	20822	10.55
8	0.1285	3.26	731	799	970	68.90	68.18	5.1516	6.8687	16512	8.37
9	0.1144	2.91	601	656	787	54.61	54.04	6.4997	8.6663	13087	6.63
10	0.1019	2.59	498	542	642	43.33	42.88	8.1921	10.923	10384	5.26
12	0.0808	2.05	273	274	408	27.24	26.96	13.029	17.373	6529	3.31

NOTE:
 Coefficient of Linear Expansion: 1.3 x 10⁻⁵/°C
 Temperature Coefficient of Resistance: 4.05 x 10⁻³/°C
 Modulus of Elasticity: Wire, 165.5 GPa

BARE SOLID COPPERWELD® WIRES, HIGH STRENGTH AND EXTRA HIGH STRENGTH PHYSICAL AND ELECTRICAL CHARACTERISTICS

(METRIC UNITS)

CONDUCTOR SIZE AWG	DIAMETER		MIN BREAKING LOADS (kgf)			WEIGHT (kg/km)		NOMINAL DC RESISTANCE at 20°C (Ω/km)		CROSS SECTION AREA	
			HIGH STRENGTH		EXTRA HIGH STRENGTH	40% COND	30% COND				
	(inch)	(mm)	40% COND	30% COND	30% COND			40% COND	30% COND	(cmil)	(mm²)
13	0.0720	1.83	225	230	324	21.63	21.41	16.41	21.88	5184	2.63
14	0.0641	1.63	186	182	257	17.15	16.97	20.70	27.60	4109	2.08
15	0.0571	1.45	136	145	204	13.60	13.46	26.09	34.79	3260	1.65
16	0.0508	1.29	112	114	161	10.77	10.66	32.96	43.95	2581	1.31
17	0.0453	1.15	93	91	128	8.563	8.473	41.45	55.27	2052	1.04
18	0.0403	1.02	77	74	102	6.777	6.706	52.38	69.84	1624	0.82
19	0.0359	0.91	60	59	81	5.378	5.322	66.00	88.00	1289	0.65
20	0.0320	0.81	50	48	64	4.273	4.228	83.09	110.8	1024	0.52
21	0.0285	0.72	40	36	70	3.389	3.354	104.7	139.6	812	0.41
22	0.0253	0.64	31	29	55	2.671	2.643	132.9	177.2	640	0.32
23	0.0226	0.57	25	23	45	2.131	2.109	166.5	222.1	511	0.26

BARE COPPERWELD® STRANDED CABLE, HIGH STRENGTH AND EXTRA HIGH STRENGTH PHYSICAL AND ELECTRICAL CHARACTERISTICS

(METRIC UNITS)

CONDUCTOR SIZE AWG	DIAMETER		MIN BREAKING LOADS (kgf)			WEIGHT (kg/km)		NOMINAL DC RESISTANCE at 20°C (Ω/km)		CROSS SECTION AREA	
			HIGH STRENGTH		EXTRA HIGH STRENGTH	40% COND	30% COND				
	(inch)	(mm)	40% COND	30% COND	30% COND			40% COND	30% COND	(cmil)	(mm²)
19-Wire Strand											
19 No. 5	0.910	23.10	22098	24448	29436	2660	2632	0.1372	0.1829	628665	318.55
19 No. 6	0.810	20.57	18305	20167	24433	2110	2088	0.1730	0.2306	498636	252.66
19 No. 7	0.722	18.33	15141	16614	20182	1674	1656	0.2180	0.2907	395627	200.47
19 No. 8	0.643	16.32	12496	13667	16591	1327	1314	0.2749	0.3666	313733	158.97
19 No. 9	0.572	14.53	10285	11216	13465	1052	1041	0.3469	0.4625	248660	126.00
19 No. 10	0.510	12.94	8509	9269	10983	834.8	826.0	0.4372	0.5829	197289	99.97
7-Wire Strand											
7 No. 4	0.613	15.57	9816	10908	12951	1231	1218	0.2941	0.3921	292169	148.04
7 No. 5	0.546	13.86	8141	9007	10845	976.1	965.9	0.3709	0.4946	231613	117.36
7 No. 6	0.486	12.34	6744	7430	9002	774.2	766.1	0.4677	0.6236	183708	93.09
7 No. 7	0.433	11.00	5578	6121	7436	614.3	607.9	0.5894	0.7859	145757	73.86
7 No. 8	0.386	9.79	4604	5035	6112	487.1	482.0	0.7433	0.9911	115586	58.57
7 No. 9	0.343	8.72	3789	4132	4961	386.1	382.1	0.9378	1.2504	91612	46.42
7 No. 10	0.306	7.76	3135	3415	4046	306.3	303.1	1.1820	1.5760	72685	36.83
7 No. 12	0.242	6.16	1717	1723	2572	192.6	190.6	1.8799	2.5066	45700	23.16
3-Wire Strand											
3 No. 4	0.440	11.18	4441	4934	5859	526.7	521.2	0.6848	0.9130	125215	63.45
3 No. 5	0.392	9.96	3683	4075	4906	417.5	413.2	0.8638	1.1517	99263	50.30
3 No. 6	0.349	8.87	3051	3361	4072	331.2	327.7	1.0891	1.4521	78732	39.89
3 No. 7	0.311	7.90	2523	2769	3364	262.7	260.0	1.3726	1.8302	62467	31.65
3 No. 8	0.277	7.03	2083	2278	2765	208.4	206.2	1.7309	2.3079	49537	25.10
3 No. 9	0.247	6.26	1714	1869	2244	165.1	163.4	2.1839	2.9119	39262	19.89
3 No. 10	0.220	5.58	1418	1545	1831	131.0	129.7	2.7526	3.6701	31151	15.78
3 No. 12	0.174	4.42	777	780	1163	82.38	81.52	4.3779	5.8371	19586	9.92

Breaking load of 7-wire and 19-wire Copperweld strands are taken as 90% of the sum of the breaking loads of the individual wires; breaking load of 3-wire Copperweld strand is taken as 95% of the sum of the breaking loads of the individual wires used in the manufacturing of the strand.

NOTE:
 Modulus of Elasticity: Strand, 158.6 GPa
 Coefficient of Linear Expansion: $1.3 \times 10^{-5}/^{\circ}\text{C}$
 Temperature Coefficient of Resistance: $4.05 \times 10^{-3}/^{\circ}\text{C}$

**BARE SOLID COPPERWELD® WIRES, HIGH STRENGTH AND
EXTRA HIGH STRENGTH PHYSICAL AND ELECTRICAL CHARACTERISTICS**

(US/IMPERIAL UNITS)

CONDUCTOR SIZE AWG	DIAMETER	MIN BREAKING LOADS (lbf)			WEIGHT (lbs/kft)		NOMINAL DC RESISTANCE at 68°F (Ω/kft)		CROSS SECTION AREA	
		HIGH STRENGTH		EXTRA HIGH STRENGTH	40% COND	30% COND	40% COND	30% COND	(cmil)	(in ²)
	40% COND	30% COND	30% COND							
	(inch)									
0	0.3249	6757	6998	10055	296.0	292.9	0.2456	0.3275	105560	0.08291
1	0.2893	5804	6250	8865	234.7	232.2	0.3098	0.4130	83694	0.06573
2	0.2576	4905	5309	7332	186.1	184.1	0.3907	0.5210	66358	0.05212
3	0.2294	4090	4411	6055	147.6	146.0	0.4927	0.6569	52624	0.04133
4	0.2043	3435	3817	4532	117.0	115.8	0.6212	0.8283	41738	0.03278
5	0.1819	2849	3152	3795	92.77	91.81	0.7836	1.0448	33088	0.02599
6	0.1620	2360	2600	3150	73.58	72.82	0.9879	1.3173	26244	0.02061
7	0.1443	1952	2142	2602	58.38	57.78	1.2452	1.6602	20822	0.01635
8	0.1285	1611	1762	2139	46.30	45.82	1.5702	2.0936	16512	0.01297
9	0.1144	1326	1446	1736	36.70	36.31	1.9811	2.6415	13087	0.01028
10	0.1019	1097	1195	1416	29.11	28.81	2.4970	3.3293	10384	0.00816
12	0.0808	601	603	900	18.31	18.11	3.9713	5.2951	6529	0.00513
13	0.0720	497	507	714	14.54	14.38	5.0014	6.6686	5184	0.00407
14	0.0641	410	402	566	11.52	11.40	6.3102	8.4136	4109	0.00323
15	0.0571	300	319	449	9.142	9.047	7.9522	10.603	3260	0.00256
16	0.0508	247	252	356	7.236	7.160	10.047	13.396	2581	0.00203
17	0.0453	205	201	283	5.754	5.694	12.635	16.846	2052	0.00161
18	0.0403	169	163	224	4.554	4.506	15.964	21.286	1624	0.00128
19	0.0359	133	129	178	3.614	3.576	20.117	26.823	1289	0.00101
20	0.0320	110	106	141	2.871	2.841	25.320	33.760	1024	0.00080
21	0.0285	88	79	154	2.277	2.254	31.921	42.561	812	0.00064
22	0.0253	69	63	121	1.795	1.776	40.506	54.008	640	0.00050
23	0.0226	55	50	99	1.432	1.417	50.763	67.684	511	0.00040
24	0.0201	46	40	79	1.133	1.121	64.175	85.567	404	0.00032

NOTE:

Coefficient of Linear Expansion: $7.2 \times 10^{-6}/^{\circ}\text{F}$
 Temperature Coefficient of Resistance: $2.1 \times 10^{-3}/^{\circ}\text{F}$
 Modulus of Elasticity: Wire, 24×10^6 psi



BARE COPPERWELD® STRANDED CABLE, HIGH STRENGTH AND EXTRA HIGH STRENGTH PHYSICAL AND ELECTRICAL CHARACTERISTICS

(US/IMPERIAL UNITS)

CONDUCTOR SIZE AWG	DIAMETER	MIN BREAKING LOADS (lbf)			WEIGHT (lbs/kft)		NOMINAL DC RESISTANCE at 68°F (Ω/kft)		CROSS SECTION AREA	
		HIGH STRENGTH		EXTRA HIGH STRENGTH	40% COND	30% COND	40% COND	30% COND	(cmil)	(in ²)
	40% COND	30% COND	30% COND	(inch)						
19-Wire Strand										
19 No. 5	0.910	48718	53899	64895	1787	1769	0.0418	0.0558	628665	0.4938
19 No. 6	0.810	40356	44460	53865	1418	1403	0.0527	0.0703	498636	0.3916
19 No. 7	0.722	33379	36628	44494	1125	1113	0.0665	0.0886	395627	0.3107
19 No. 8	0.643	27548	30130	36577	892.0	882.7	0.0838	0.1117	313733	0.2464
19 No. 9	0.572	22675	24727	29686	707.0	699.6	0.1057	0.1410	248660	0.1953
19 No. 10	0.510	18759	20435	24214	560.9	555.1	0.1333	0.1777	197289	0.1550
7-Wire Strand										
7 No. 4	0.613	21641	24047	28552	827.4	818.8	0.0896	0.1195	292169	0.2295
7 No. 5	0.546	17949	19858	23909	655.9	649.1	0.1131	0.1507	231613	0.1819
7 No. 6	0.486	14868	16380	19845	520.2	514.8	0.1425	0.1901	183708	0.1443
7 No. 7	0.433	12298	13495	16393	412.8	408.5	0.1797	0.2395	145757	0.1145
7 No. 8	0.386	10149	11101	13476	327.3	323.9	0.2266	0.3021	115586	0.0908
7 No. 9	0.343	8354	9110	10937	259.4	256.7	0.2858	0.3811	91612	0.0720
7 No. 10	0.306	6911	7529	8921	205.8	203.7	0.3603	0.4804	72685	0.0571
7 No. 12	0.242	3786	3799	5670	129.4	128.1	0.5730	0.7640	45700	0.0359
3-Wire Strand										
3 No. 4	0.440	9790	10878	12916	353.9	350.2	0.2087	0.2783	125215	0.0983
3 No. 5	0.392	8120	8983	10816	280.5	277.6	0.2633	0.3511	99263	0.0780
3 No. 6	0.349	6726	7410	8978	222.5	220.2	0.3319	0.4426	78732	0.0618
3 No. 7	0.311	5563	6105	7416	176.6	174.7	0.4184	0.5578	62467	0.0491
3 No. 8	0.277	4591	5022	6096	140.0	138.5	0.5276	0.7034	49537	0.0389
3 No. 9	0.247	3779	4121	4948	111.0	109.8	0.6657	0.8875	39262	0.0308
3 No. 10	0.220	3126	3406	4036	88.04	87.12	0.8390	1.1186	31151	0.0245
3 No. 12	0.174	1713	1719	2565	55.36	54.78	1.3344	1.7792	19586	0.0154

Breaking load of 7-wire and 19-wire Copperweld strands are taken as 90% of the sum of the breaking loads of the individual wires; breaking load of 3-wire Copperweld strand is taken as 95% of the sum of the breaking loads of the individual wires used in the manufacturing of the strand.

NOTE:

Modulus of Elasticity: Strand, 23×10^6 psi
Coefficient of Linear Expansion: $7.2 \times 10^{-6}/^{\circ}\text{F}$
Temperature Coefficient of Resistance: $2.1 \times 10^{-3}/^{\circ}\text{F}$



COPPERWELD

the power of two

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