Data sheet DS-CCS-2026-10
Issue 1 · 2026-10-24
Supersedes: none

Copper-Clad Steel Earthing Conductor – Product Data Sheet

Continuous-cast (CC) and electroplated (EP) copper-clad steel for earthing grids, electrodes and leads. Values marked "calculated" are from the rule of mixtures (copper 100 % IACS, steel core 10 % IACS); measured values are stated in the factory test report for each lot.

1 Product range

Form	Sizes	Copper classes	Temper	Typical use
Round wire	Ø8, 10, 12, 14, 16, 18 mm; 100 m per reel standard (200–1000 m on request)	0.25 (EP) / 0.6 / 0.8 / 1.0 mm (CC)	Annealed, soft (CC)	Horizontal electrode and grid conductor, any soil class
Flat tape	12×6, 15×8, 25×4, 40×4, 50×5 mm	0.25 (EP) / 0.6 / 0.8 mm (CC)	Annealed, soft	Large-section horizontal electrode
Stranded conductor	70, 95, 120, 185, 240 mm²; 30 % / 40 % IACS; copper ≥ 0.25 mm per wire	per wire ≥ 0.25 mm	Hard-drawn	Earthing leads; horizontal runs with moderate corrosion duty
Ground rods	Ø12, 14, 16, 17, 18, 20, 25 mm × 1.5 m (other lengths on request); threaded or pointed	0.25 (EP) / 0.6 / 0.8 / 1.0 mm (CC)	Not annealed, ≥ 550 N/mm²	Vertical electrode driven through hard soil and gravel
Exothermic welding	Graphite moulds, weld powder and accessories matched to the sizes above	—	—	CCS–CCS and CCS–copper joints to DL/T 1342-2014 / IEEE 837

Model code (DL/T 1312-2023 format): CCS [EP | CC] [conductivity grade]-[minimum copper mm]-[size], e.g. CCS CC 25-0.8-Φ16 = continuous-cast, 25 % IACS grade, 0.8 mm minimum copper, Ø16 round wire.

2 Materials and construction

Steel core	Low-carbon steel rod; horizontal conductor annealed after casting (tensile ≥ 300 N/mm²); rods hard (≥ 550 N/mm²)
Copper layer	Copper ≥ 99.9 %; continuous-cast: metallurgical bond, no interface gap; minimum thickness at any point as per class (0.25 / 0.60 / 0.80 / 1.00 mm)
Thickness measurement	DL/T 1312 clause 7: three positions ≥ 50 mm from an end, three points 120° apart at each (9 points), minimum governs; magnetic method ISO 2178 (GB/T 4956) or microscopical ISO 1463 (GB/T 6462)
Bend	Horizontal conductor: 90° × 3 without cracking of the copper layer; rods: 30° × 20 at 40 d
Bond	No separation of copper from steel on the torsion (GB/T 239) / hammer test
Conductivity grades	15 / 20 / 25 / 30 / 40 % IACS (resistivity at 20 °C ≤ 11.50 / 8.62 / 6.90 / 5.75 / 4.31 ×10^{-8} Ω·m); actual value stated per size
Surface	Uniform colour, no pinholes, blisters, peeling, cracks or bare spots

3 Round wire – calculated technical data

Ø mm	Copper mm	Section mm²	Copper mm²	≈ % IACS	DL/T 1312 grade	≈ DC resistance Ω/km (20 °C)	≈ Mass kg/m	of which copper kg/m
8	0.6	50	13.9	35.0	30%	0.981	0.41	0.12
8	0.8	50	18.1	42.4	40%	0.809	0.41	0.16
8	1.0	50	22.0	49.4	40%	0.695	0.42	0.20
10	0.6	79	17.7	30.3	30%	0.724	0.64	0.16
10	0.8	79	23.1	36.5	30%	0.601	0.64	0.21
10	1.0	79	28.3	42.4	40%	0.518	0.65	0.25
12	0.6	113	21.5	27.1	25%	0.563	0.91	0.19
12	0.8	113	28.1	32.4	30%	0.471	0.92	0.25
12	1.0	113	34.6	37.5	30%	0.407	0.93	0.31
14	0.6	154	25.3	24.8	20%	0.452	1.24	0.23
14	0.8	154	33.2	29.4	25%	0.381	1.25	0.30
14	1.0	154	40.8	33.9	30%	0.331	1.25	0.37
16	0.6	201	29.0	23.0	20%	0.373	1.61	0.26
16	0.8	201	38.2	27.1	25%	0.316	1.62	0.34
16	1.0	201	47.1	31.1	30%	0.276	1.63	0.42
18	0.6	254	32.8	21.6	20%	0.314	2.03	0.29
18	0.8	254	43.2	25.3	25%	0.268	2.05	0.39
18	1.0	254	53.4	28.9	25%	0.235	2.06	0.48

Rule of mixtures; densities 8.96 (Cu) and 7.85 (steel) g/cm³; the grade is the highest of the five classes not exceeding the unrounded value. For fault-current sizing use IEEE Std 80-2013 clause 11.3.1 (the simplified K_f form gives kcmil; × 0.5067 for mm²) or the full equation with the material constants of the stated conductivity.

4 Selection of copper thickness

Soil corrosivity	Very low	Low	Medium	High	Extreme*
Average corrosion rate of copper, mm/yr (DL/T 1312-2023 Table 1; allowance per DL/T 2094)	0.001	0.003	0.007	0.012	0.017
Minimum copper per Q/GDW 12015 / DL/T 2094 / DL/T 2650 Table 4	0.25 mm		0.60 mm	0.80 mm	1.0 mm or solid copper*

Minimum copper = corrosion rate × design life + 0.25 mm residual; soil of pH < 4.5 moves up one class (DL/T 1312-2023 cl. 4.6). *Extreme: copper per DL/T 1312-2023 cl. 4.6. DL/T 2650 cl. 5.1.1.5: medium corrosivity – copper-clad steel (or galvanised steel with cathodic protection); high – copper or copper-clad steel.

5 Type tests and routine tests

Type-tested to the full DL/T 1312-2023 programme at a CMA / CNAS dual-accredited laboratory: copper thickness, surface, tensile, bend, bond, resistivity, power-frequency high current (90 % of fusing current × 3, ΔR ≤ 5 %), electrical–corrosion sequence (≥ 25 current–temperature cycles at 350 °C, 10 freeze–thaw cycles, ≥ 500 h neutral salt spray, high current; ΔR ≤ 10 % per stage, ≤ 30 % overall). Sizes reported: Ø12 / 0.25, Ø12 / 0.6, Ø14 / 0.8, Ø16 / 0.25, Ø16 / 0.6, Ø18 / 0.8 (horizontal), Ø20 / 0.8 and Ø25 / 0.8 (rods). Other sizes are type-tested on request for a project. Routine tests per lot (≤ 5,000 m): copper thickness, surface, tensile, bend, resistivity; factory report with each lot.

6 Standards

Product standards: DL/T 1312-2023 (power industry); Q/GDW 10466-2021 (State Grid) – both call for the annealed temper for horizontal conductor. Anti-corrosion: Q/GDW 12015-2020 (State Grid), DL/T 2094-2020 (power industry) – both set 0.25 / 0.6 / 0.8 mm copper for low / medium / high soil corrosivity. Technical supervision: DL/T 2650-2023, *Technical supervision guide for grounding metallic materials in power engineering* – copper-clad steel for medium and high corrosivity, Table 4 minimum copper 0.25 / 0.60 / 0.80 mm. Sizing: IEEE Std 80-2013; GB/T 50065-2011; DL/T 2727-2023. Joints: DL/T 1342-2014; IEEE 837. Related: UL 467 (grounding and bonding equipment), IEC 62561-2 (lightning-protection components), EN 50522 / IEC 61936-1 (HV substations). Quality system: ISO 9001:2015 (certificate RLAC24Q1L1090R0S, valid to 2027-11-18).

7 Packing, marking and ordering

Packing	Round wire 100 m per wooden reel (≈ 160 kg for Ø16 / 0.8); tape and strand on wooden reels; rods bundled or crated; wood packaging heat-treated and marked to ISPM 15
Marking	Each reel: model code, lot number, length, date; lot number traceable to incoming copper and steel certificates
Capacity and lead time	Up to 20,000 m/day of one size; standard sizes 2 weeks ex-works; new sizes 2 weeks after set-up; a 20' container holds ≈ 15 km of Ø16
Minimum order	Standard sizes 300 m (3 reels) / rods 50 pcs; non-standard sizes 1,000 m; samples ≤ 1 m free, freight collect
Terms	FOB Shanghai (Incoterms 2020) by default; CFR / CIF on request; T/T 30 % deposit, 70 % before shipment; L/C at sight for orders ≥ US$ 50,000
Documents	Commercial invoice, packing list, B/L, certificate of origin, factory test report for the lot, type-test report summary; manufacturer's declaration of conformity on request

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