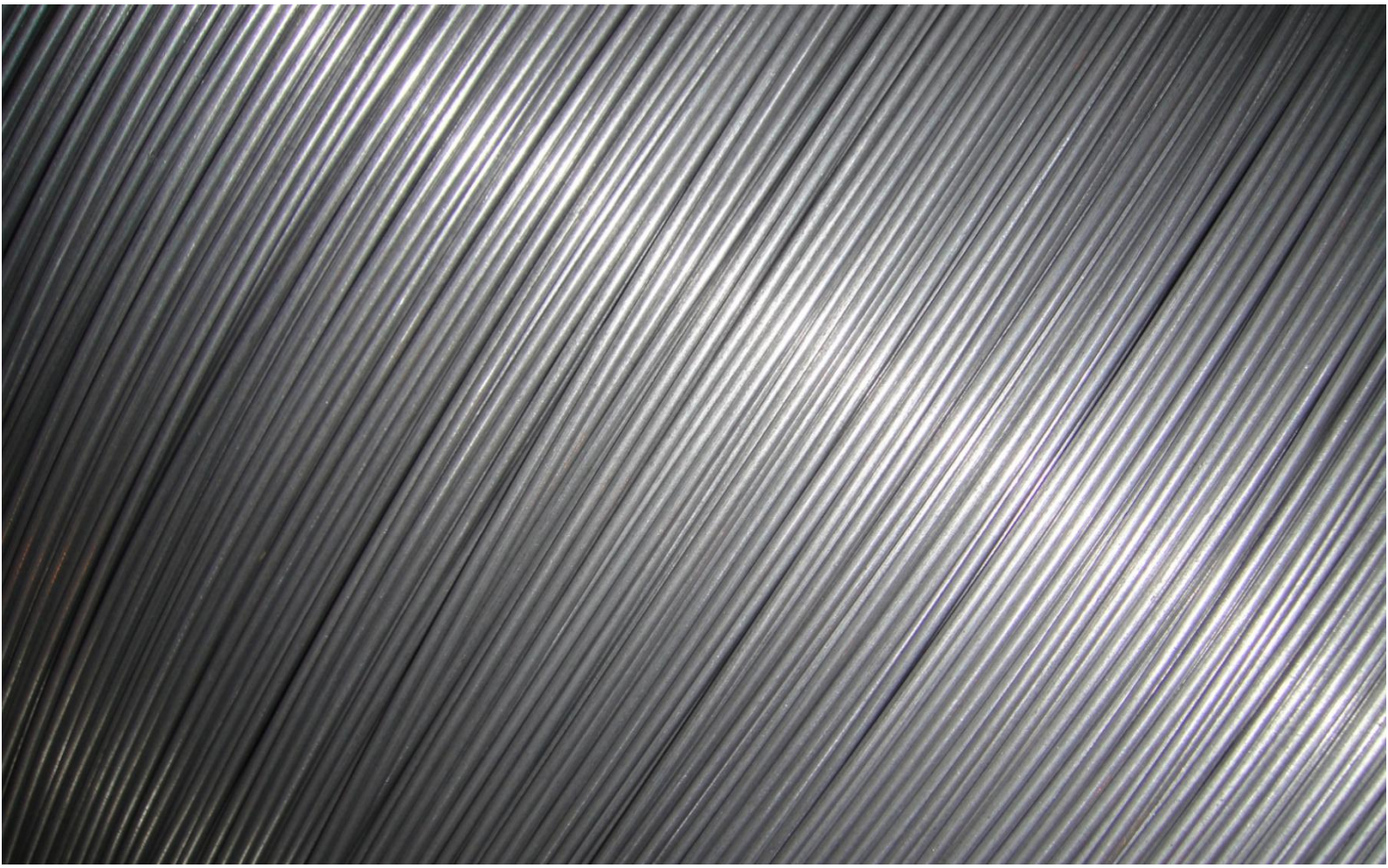
# Aluminum Clad Steel Wire



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# Wire Solution for rust-proof, high tensile strength, and high conductivity applications

*By Combination of Aluminum & Steel*

With more than 21 years' experience, We offer you quality aluminum clad steel wires (ACS wires) for power transmission and agriculture.

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**Typical wire products applications:**

Power line crossing water
Power line in industrial, semi-industrial or coastal area
Airport fence, farm electrical fence
Vineyard wires and similar applications.

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## *Advantages*

1. **Superior corrosion resistance** compared with galvanized steel wires, aluminized steel wires and galfan wires. Best for coast area and industrial zone.
2. **Better conductivity** than galvanized steel wire (14~40% VS 9%).
3. **Flexibility for design** because of wider range of combinations of tensile strength and conductivity.
4. **Lighter weight,** 15~40% lighter than galvanized wire, but tensile strength can be same.
5. **Excellent thermal stability**, good as ACSS core.
6. **Wider variety of products**, with broad range of properties, quality, and size of steel wire and aluminum cladding.

## *Applications*

**OPGW** (optical fiber ground wire, good lightening protection)
**ACS strand**, as conductor core, ground wires, guy wires or messenger wires
**Preformed wires** (fitting for power transmission line)
**Electrical fence,** because of good conductivity and corrosion proof characteristics
**Antenna,** as construction and anchoring material
**Vineyard**



## *Packing*

All wires can be delivered in wooden spools, plywood spools, corrugated steel spools or coils.

Spool size: 630mm (~24.8inch), 800mm (~31.5inch) and 1000mm (~39.4inch).

Arbor hole size: 80mm (3.15inch) or specified by the customer.

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**ASTM B 415**
**Hard Drawn Aluminum Clad Steel Wire**

| Nominal Diameter, in./mm | | Size, AWG | 20.3% | | 27% | | 30% | | 40% | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | psi | MPa | psi | MPa | psi | MPa | psi | MPa |
| 0.2043 | 5.19 | 4 | 155000 | 1070 | 125000 | 862 | 102000 | 703 | 80000 | 552 |
| 0.1880 | 4.78 | | 160000 | 1100 | 129000 | 889 | 106000 | 731 | 84000 | 579 |
| 0.1819 | 4.62 | 5 | 165000 | 1140 | 133000 | 917 | 110000 | 758 | 88000 | 607 |
| 0.1729 | 4.39 | | 170000 | 1170 | 137000 | 945 | 114000 | 786 | 92000 | 634 |
| 0.1620 | 4.11 | 6 | 175000 | 1210 | 141000 | 972 | 114000 | 786 | 96000 | 662 |
| 0.1549 | 3.93 | | 180000 | 1240 | 145000 | 1000 | 118000 | 814 | 96000 | 662 |
| 0.1443 | 3.67 | 7 | 185000 | 1280 | 150000 | 1034 | 122000 | 841 | 98000 | 676 |
| 0.1369 | 3.48 | | 190000 | 1310 | 154000 | 1062 | 126000 | 869 | 98000 | 676 |
| 0.1285 | 3.26 | 8 | 195000 | 1340 | 156000 | 1076 | 128000 | 883 | 99500 | 686 |
| 0.1144 | 2.91 | 9 | 195000 | 1340 | 156000 | 1076 | 128000 | 883 | 99500 | 686 |
| 0.1019 | 2.59 | 10 | 195000 | 1340 | 156000 | 1076 | 128000 | 883 | 99500 | 686 |
| 0.0907 | 2.30 | 11 | 195000 | 1340 | 156000 | 1076 | 128000 | 883 | 99500 | 686 |
| 0.0808 | 2.05 | 12 | 195000 | 1340 | 156000 | 1076 | 128000 | 883 | 99500 | 686 |

Minimum elongation 1.5% at break or 1.0% after break, gauge length 250mm
Min. torsion 20 turns

**IEC 61232-1993 & GB/T 17937-2009**
**Aluminum Clad Steel Wire**

| IEC 61232 | GB/T 17937 | Nominal diameter, mm | | Minimum Tensile (MPa) | Load @1% extension Mini.（MPa） | Elongation |
|---|---|---|---|---|---|---|
| | | Over | Up to and including | | | |
| - | LB14 | 2.25 | 3.00 | 1590 | 1410 | Minimum elongation 1.5% at break or 1.0% after break, gauge length 250mm. |
| | | 3.00 | 3.50 | 1550 | 1380 | |
| | | 3.50 | 4.75 | 1520 | 1340 | |
| | | 4.75 | 5.50 | 1500 | 1270 | |
| 20SA-A | LB20A | 1.50 | 3.25 | 1340 | 1200 | |
| | | 3.25 | 3.45 | 1310 | 1180 | |
| | | 3.45 | 3.65 | 1270 | 1140 | |
| | | 3.65 | 3.95 | 1250 | 1100 | |
| | | 3.95 | 4.10 | 1210 | 1100 | |
| | | 4.10 | 4.40 | 1180 | 1070 | |
| | | 4.40 | 4.60 | 1140 | 1030 | |
| | | 4.60 | 4.75 | 1100 | 1000 | |
| | | 4.75 | 5.50 | 1070 | 1000 | |
| 20SA-B | LB20B | 1.50 | 5.50 | 1320 | 1100 | |
| - | LB23 | 2.50 | 5.00 | 1220 | 980 | |
| 27SA | LB27 | 2.50 | 5.00 | 1080 | 800 | |
| 30SA | LB30 | 2.50 | 5.00 | 880 | 650 | |
| - | LB35 | 2.50 | 5.00 | 810 | 590 | |
| 40SA | LB40 | 2.80 | 5.00 | 680 | 500 | |

Min. torsion 20 turns

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## Wire Diameter Variations

| Specified Diameter | | Permissible Variations in Specified Diameter, plus and minus |
|---|---|---|
| ASTM | ⩾0.2043 to 0.1000,incl (2.51-5.19mm)<br>0.1000 to 0.0800,incl (2.03-2.50mm) | 1.5%<br>0.0015 in. (0.038mm) |
| IEC/GB | ⩾2.67mm<br><2.67mm | 1.5%<br>0.04mm |

## Aluminum coating & DC resistance

| GB/T 17937 -2009 | IEC 61232 -1993 | ASTM B415 | Al Area/ Total Area % | Average Aluminum thickness (concentric) % r | Min. Al thickness（eccentricity） % r | DC Resistance Max. |
|---|---|---|---|---|---|---|
| LB14 | - | - | 13% | 6.7 | 5 | 123.15nΩ.m |
| LB20 | 20SA | 20.3% | 25% | 13.4 | 8（d<1.80mm）<br>10（d≥1.80mm） | 84.80nΩ.m<br>51.01 Ω·cmil/ft |
| LB23 | - | - | 30% | 16.3 | 11 | 74.96nΩ.m |
| LB27 | 27SA | 27% | 37% | 20.5 | 14 | 63.86nΩ.m<br>38.41 Ω·cmil/ft |
| LB30 | 30SA | 30% | 43% | 24.5 | 15 | 57.47nΩ.m<br>34.57 Ω·cmil/ft |
| LB35 | - | - | 52% | 30.7 | 20 | 49.26nΩ.m |
| LB40 | 40SA | 40% | 62% | 38.4 | 25 | 43.10nΩ.m<br>25.93 Ω·cmil/ft |

## Physical constant (Informative)

| Conductivity %IACS | Density at 20°C | Modulus of Elasticity | Coef. of Linear Expansion | Temperature Coef. of Resistance |
|---|---|---|---|---|
| 14 | 0.2580 lb/in$^3$<br>7.14 g/cm$^3$ | 24.7×10$^6$ psi<br>170 GPa | 0.0000068/°F<br>0.0000120/℃ | 0.0019/°F<br>0.0034/℃ |
| 20.3 | 0.2381 lb/in$^3$<br>6.59 g/cm$^3$ | 23.5×10$^6$ psi<br>162 GPa | 0.0000072/°F<br>0.0000130/℃ | 0.0020/°F<br>0.0036/℃ |
| 23 | 6.27 g/cm$^3$ | 149GPa | 0.0000129/℃ | 0.0036/℃ |
| 27 | 0.2135 lb/in$^3$<br>5.91 g/cm$^3$ | 20.3×10$^6$ psi<br>140 GPa | 0.0000077/°F<br>0.0000134/℃ | 0.0020/°F<br>0.0036/℃ |
| 30 | 0.2027 lb/in$^3$<br>5.61 g/cm$^3$ | 19.1×10$^6$ psi<br>132 GPa | 0.0000079/°F<br>0.0000138/℃ | 0.0021/°F<br>0.0038/℃ |
| 35 | 5.15 g/cm$^3$ | 122GPa | 0.0000145/℃ | 0.0040/℃ |
| 40 | 0.1676 lb/in$^3$<br>4.64 g/cm$^3$ | 15.8×10$^6$ psi<br>109 GPa | 0.0000089/°F<br>0.0000155/℃ | 0.0022/°F<br>0.0040/℃ |

**EN 50540-2010**
**Extra high strength aluminum clad steel wires**

Table 1 Characteristics of 20EHSA（before stranding）

| Diameter mm | | Tolerance mm | Stress@1%ext MPa | Tensile MPa | Elongation @250mm % | Torsion $N^0$ |
|---|---|---|---|---|---|---|
| over | up to | - | min | min | min | min |
| 1.28 | 2.28 | ±0.04 | 1390 | 1620 | 1.5 | 20 |
| 2.29 | 3.04 | ±0.05 | 1360 | 1580 | 1.5 | 20 |
| 3.05 | 3.55 | ±0.05 | 1330 | 1545 | 1.5 | 20 |
| 3.56 | 4.82 | ±0.06 | 1300 | 1515 | 1.5 | 20 |

Table 2 Characteristics of 14EHSA（before stranding）

| Diameter mm | | Tolerance mm | Stress@1%ext MPa | Tensile MPa | Elongation @250mm % | Torsion $N^0$ |
|---|---|---|---|---|---|---|
| over | up to | - | min | min | min | min |
| 1.75 | 2.25 | ±0.04 | 1550 | 1825 | 1.5 | 20 |
| 2.26 | 3.00 | ±0.05 | 1500 | 1790 | 1.5 | 20 |
| 3.01 | 3.50 | ±0.05 | 1470 | 1760 | 1.5 | 20 |
| 3.51 | 4.75 | ±0.06 | 1430 | 1725 | 1.5 | 20 |

**ACS Wire, mild steel**

| Diameter | TS, MPa | | Torsion | Wrapping | Al thickness, | Unit Mass, kg/km | |
|---|---|---|---|---|---|---|---|
| mm | SWMA-A | SWMA-C | Min. | | mm | SWMA-A | SWMA-C |
| 2.00 | 290-590 | 590-880 | 44 | 4d | 0.10 | 23.7 | 20.7 |
| 2.30 | | | 38 | | 0.12 | 31.4 | 27.4 |
| 2.60 | | | 33 | | 0.13 | 40.1 | 35.0 |
| 2.90 | | 540-830 | 28 | | 0.15 | 49.9 | 43.6 |
| 3.20 | | | 26 | | 0.16 | 60.7 | 53.0 |
| 3.50 | | 490-780 | 24 | | 0.18 | 72.6 | 63.5 |
| 4.00 | | 390-780 | 21 | 5d | 0.20 | 94.9 | 82.9 |
| 4.50 | | | 19 | | 0.23 | 120 | 105 |
| 5.00 | | | 17 | | 0.25 | 148 | 130 |
| 5.50 | | | 15 | | 0.28 | 179 | 157 |
| 6.00 | | | 13 | | 0.30 | 213 | 186 |

For fence & agriculture application.

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