Product Overview

Aluminum-Clad Steel Wire (ACS), also known as Aluminum-Clad Steel (AW, AS or AC), is a bimetallic wire consisting of a high-strength steel core continuously and uniformly covered with an outer layer of aluminum.
Manufactured through a metallurgical cladding process, ACS wire combines the mechanical strength of steel with the electrical conductivity and corrosion resistance of aluminum. Compared with conventional galvanized steel wire, it offers improved corrosion protection and higher electrical conductivity, making it suitable for demanding overhead power transmission and grounding applications.

QZ Cable supplies aluminum-clad steel wires for ACSR/AW conductors, OPGW cables, overhead ground wires and other electrical infrastructure applications.

Product Designations and Applicable Standards

Aluminum-Clad Steel (ACS) wire is identified by different designations according to the applicable international standards.

Designation	Product Description	Standard
AW	Aluminum-Clad Steel Wire	ASTM B502
AS	Aluminum-Clad Steel Wire	IEC 61232
AC	Aluminum-Clad Steel Wire	AS 3607
ACS	Aluminum-Clad Steel Wire	International product designation
—	German standard requirements	DIN 48201 (specific part to be confirmed)
—	Aluminum-Clad Steel Core Wire	ASTM B415

Other applicable standards:

- IEC 61232 – Aluminum-clad steel wires for electrical purposes.
- ASTM B415 – Aluminum-clad steel core wire for use in overhead electrical conductors.
- ASTM B502 – Aluminum-clad steel core wire for use in overhead electrical conductors.
- AS 3607 – Conductors – Bare overhead – Aluminium and aluminium alloy-steel reinforced.
- DIN 48201 – German standard series; applicable part and product scope to be confirmed.

Note: The applicable standard depends on the wire construction, intended application and project requirements. Please specify the required standard and edition when requesting a quotation.

Construction

ACS wire features a composite bimetallic construction consisting of:
Steel Core
The inner steel core provides high tensile strength and mechanical support, enabling the wire to withstand mechanical loads in overhead electrical applications.
Aluminum Cladding
The outer aluminum layer forms a continuous and uniform protective covering around the steel core. It provides electrical conductivity and improves resistance to corrosion in outdoor and industrial environments.
Metallurgical Bonding
The aluminum cladding is bonded to the steel core through a controlled manufacturing process, providing an integrated composite structure.
Technical Specifications

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IACS Conductivity %	14	20.3	27	30	40
Min. Thickness of aluminium (% of wire radius)	4.6	10	14	15	25
Density	7.29	6.59	5.91	5.61	4.64
Coefficient of linear expansion	11.9	13	13.4	13.8	15.5
Modulus of elasticity	174	162	140	132	109
Tensile strength grade	UHS,EHS	EHS,REGULAR	REGULAR	REGULAR	REGULAR

Key Features and Advantages

1. Excellent Corrosion Resistance

The aluminum outer layer provides improved protection against corrosion compared with conventional galvanized steel wire. ACS wire is suitable for coastal areas, industrial environments and locations exposed to salt and atmospheric pollutants.

2. Higher Electrical Conductivity

ACS wire offers higher electrical conductivity than conventional galvanized steel wire. Depending on the aluminum layer thickness and product grade, conductivity is available in different IACS levels.

Common conductivity grades include 14%, 20%, 27%, 30% and 40% IACS, subject to the applicable standard and product specification.

3. High Mechanical Strength

The steel core provides mechanical strength, while the aluminum cladding contributes to the wire's electrical and environmental performance. This combination makes ACS suitable for applications requiring both mechanical support and electrical functionality.

4. Compatibility with Aluminum Conductors

When used in ACSR/AW conductors and OPGW cables, aluminum-clad steel wires provide a compatible aluminum surface in contact with aluminum components. This can help reduce galvanic corrosion risks associated with dissimilar exposed metals.

5. Long Service Life

The protective aluminum layer helps improve durability in demanding outdoor environments, potentially reducing corrosion-related maintenance requirements.

Applications of Aluminum-Clad Steel Wire

1. ACSR/AW Conductors

Used as the reinforcing core in aluminum conductor aluminum-clad steel reinforced (ACSR/AW) conductors. ACS wire provides mechanical strength and improved corrosion protection for overhead transmission lines.

2. Overhead Ground Wires

Used as overhead ground or shield wires to protect transmission and distribution systems against lightning strikes and provide grounding paths.

3. OPGW Cables

Used as metallic strength members or components in Optical Ground Wire (OPGW) cables, combining overhead grounding functions with optical fiber communication.

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4. Guy and Stay Wires
Used for supporting utility poles, transmission towers and other overhead structures where tensile strength and corrosion resistance are required.
5. Electrical Grounding Systems
Applied in grounding and bonding systems where electrical conductivity, mechanical strength and corrosion resistance are important.

Specifications

Single Wire As Per ASTM B 415 Standard

Size AWG	Diameter		Tensile Strength		Cross section		D C Resistance at 20°C	Nominal Weight		Minimum Thickness of Aluminum Cladding	
	in.	mm	kcal	N/mm2	in2	mm2	Ω/km	lb/1000 lb	Kg/km	in	mm
(CONDUCTIVITY = 27 % IACS)											
4.0	0.204	5.189	125	862	0.03278	21.149	3.019	84.00	124.99	0.01430	0.363
	0.188	4.775	129	889	0.02776	17.909	3.566	71.13	105.84	0.01316	0.334
5.0	0.182	4.620	133	917	0.02599	16.766	3.809	66.59	99.09	0.01273	0.323
	0.173	4.392	137	945	0.02348	15.148	4.216	60.16	89.52	0.01210	0.307
6.0	0.162	4.115	141	972	0.02061	13.298	4.802	52.82	78.59	0.01134	0.288
	0.155	3.934	145	1000	0.01884	12.158	5.252	48.29	71.85	0.01084	0.275
7.0	0.144	3.665	150	1034	0.01635	10.551	6.052	41.91	62.36	0.01010	0.257
	0.137	3.477	154	1062	0.01472	9.497	6.724	37.72	56.12	0.00958	0.243
8.0	0.129	3.264	156	1076	0.01297	8.367	7.632	33.23	49.45	0.00900	0.228
9.0	0.114	2.906	156	1076	0.01028	6.631	9.629	26.34	39.19	0.00801	0.203
10.0	0.102	2.588	156	1076	0.00816	5.261	12.136	20.90	31.10	0.00713	0.181
11.0	0.091	2.304	156	1076	0.00646	4.168	15.319	16.56	24.64	0.00635	0.161
12.0	0.081	2.052	156	1076	0.00513	3.308	19.303	13.14	19.55	0.00566	0.144
(CONDUCTIVITY = 30 % IACS)											
4.0	0.204	5.189	102	703	0.03278	21.149	2.717	79.74	118.65	0.01532	0.389
	0.188	4.775	106	731	0.02776	17.909	3.209	67.52	100.47	0.01410	0.358
5.0	0.182	4.620	110	758	0.02599	16.766	3.428	63.21	94.06	0.01364	0.347
	0.173	4.392	114	786	0.02348	15.148	3.794	57.11	84.98	0.01297	0.329
6.0	0.162	4.115	114	786	0.02061	13.298	4.322	50.14	74.60	0.01215	0.309
	0.155	3.934	118	814	0.01884	12.158	4.727	45.84	68.21	0.01162	0.295
7.0	0.144	3.665	122	841	0.01635	10.551	5.447	39.78	59.19	0.01082	0.275
	0.137	3.477	126	869	0.01472	9.497	6.052	35.80	53.28	0.01027	0.261
8.0	0.129	3.264	128	883	0.01297	8.367	6.869	31.54	46.94	0.00964	0.245
9.0	0.114	2.906	128	883	0.01028	6.631	8.666	25.00	37.20	0.00858	0.218
10.0	0.102	2.588	128	883	0.00816	5.261	10.923	19.84	29.52	0.00764	0.194
11.0	0.091	2.304	128	883	0.00646	4.168	13.787	15.72	23.38	0.00680	0.173
12.0	0.081	2.052	128	883	0.00513	3.308	17.372	12.47	18.56	0.00606	0.154
(CONDUCTIVITY = 40 % IACS)											
4.0	0.204	5.189	80	552	0.03278	21.149	2.038	65.95	98.13	0.02554	0.649
	0.188	4.775	84	579	0.02776	17.909	2.407	55.85	83.10	0.02350	0.597
5.0	0.182	4.620	88	607	0.02599	16.766	2.571	52.28	77.79	0.02274	0.578
	0.173	4.392	92	634	0.02348	15.148	2.845	47.23	70.29	0.02161	0.549
6.0	0.162	4.115	96	662	0.02061	13.298	3.241	41.47	61.70	0.02025	0.514

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Size AWG	Diameter		Tensile Strength		Cross section		D C Resistance at 20°C	Nominal Weight		Minimum Thickness of Aluminum Cladding	
	in.	mm	kcal	N/mm2	in2	mm2	Ω/km	lb/1000 lb	Kg/km	in	mm
	0.155	3.934	96	662	0.01884	12.158	3.545	37.91	56.41	0.01936	0.492
7.0	0.144	3.665	98	676	0.01635	10.551	4.085	32.90	48.96	0.01804	0.458
	0.137	3.477	98	676	0.01472	9.497	4.539	29.61	44.06	0.01711	0.435
8.0	0.129	3.264	99.5	686	0.01297	8.367	5.152	26.09	38.82	0.01606	0.408
9.0	0.114	2.906	99.5	686	0.01028	6.631	6.500	20.68	30.77	0.01430	0.363
10.0	0.102	2.588	99.5	686	0.00816	5.261	8.192	16.41	24.41	0.01274	0.324
11.0	0.091	2.304	99.5	686	0.00646	4.168	10.340	13.00	19.34	0.01134	0.288
12.0	0.081	2.052	99.5	686	0.00513	3.308	13.029	10.32	15.35	0.01010	0.257

Single Wire As Per ASTM B 502 Standard

Diameter		Tensile Strength		Stress at 1% Extension		Resistivity		Density	
in.	mm	ksi	N/mm²	ksi	N/mm²	Ω.Cmil/ft	n.Ωm	lb/in³	g/cm³
0.0770 ~ 0.1289	1.956 ~ 3.274	195	1344	175	1206	51.01	84.8	0.2381	6.59
0.1290 ~ 0.1369	3.275 ~ 3.477	190	1310	170	1172				
0.1370 ~ 0.1443	3.478 ~ 3.665	185	1275	165	1137				
0.1444 ~ 0.1549	3.666 ~ 3.934	180	1241	160	1103				
0.1550 ~ 0.1620	3.935 ~ 4.115	175	1206	160	1103				
0.1621 ~ 0.1729	4.116 ~ 4.392	170	1172	155	1068				
0.1730 ~ 0.1819	4.393 ~ 4.620	165	1137	150	1034				
0.1820 ~ 0.1880	4.621 ~ 4.775	160	1103	145	1000				
Coefficient of linear expansion : 12.6 x 10-6/°C Modulus of Elasticity : 23500 Ksi (162000 MPa)				Temperature coefficient of Resistance:0.0036/°C Minimum Aluminum Thickness : 10% of nominal wire radius					

Single Wire As Per AS-3607 Standard

Diameter (mm)			Tensile Strength		Cross section	D C Resistance at 20°C	Nominal Weight	Minimum Thickness of Aluminum Cladding	
Std	Max	Min	N/mm²	KN	mm²	Ω/km	Kg/km	in	mm
1.600	1.640	1.560	1340	2.69	2.011	42.28	13.25	0.080	
1.750	1.790	1.710	1340	3.22	2.405	35.34	15.85	0.088	
2.250	2.290	2.210	1340	5.33	3.976	21.38	26.20	0.113	
2.500	2.540	2.460	1340	6.58	4.909	17.32	32.35	0.125	
2.750	2.791	2.709	1340	7.96	5.940	14.31	39.14	0.138	
3.000	3.045	2.955	1340	9.47	7.069	12.03	46.58	0.150	
3.250	3.299	3.201	1340	11.12	8.296	10.25	54.67	0.163	
3.500	3.553	3.448	1310	12.60	9.621	8.83	63.40	0.175	
3.750	3.806	3.694	1270	14.03	11.045	7.70	72.78	0.188	
Coefficient of linear expansion : 12.9 x 10-6/°C Modulus of Elasticity : 23500 Ksi (162000 MPa)					Temperature coefficient of Resistance:0.0036/°C Minimum Aluminum Thickness : 10% of nominal wire radius				

Standard: ASTM B416

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Code Number	Area	No.of Wires	Diameter		Weight	Rated Strength	Max.D.C. Resistance at 20°C
			Wire	Cond.			
	mm2		mm	mm	kg/km	kN	Ω/km
3 x 5AWG	50.32	3	4.62	9.96	334.1	54.42	1.6990
3 x 6AWG	39.00	3	4.11	8.87	265.0	45.74	2.1420
3x7AWG	31.65	3	3.67	7.90	210.1	38.36	2.7010
3 x 8AWG	25.10	3	3.26	7.03	166.7	32.06	3.4060
3 x 9AWG	19.90	3	2.91	6.26	132.2	25.43	4.2940
3x10AWG	15.78	3	2.59	5.58	104.8	20.16	5.4150
7 x 5AWG	117.40	7	4.62	13.90	781.1	120.27	0.7426
7 x 6AWG	93.10	7	4.11	12.40	619.5	101.14	0.9198
7x7AWG	73.87	7	3.67	11.00	491.1	84.81	1.1600
7x8AWG	58.56	7	3.26	9.78	389.6	70.88	1.4630
7 x 9AWG	46.44	7	2.91	8.71	308.9	56.20	1.8440
7x10AWG	36.83	7	2.59	7.76	245.1	44.58	2.3250
7x11AWG	29.21	7	2.30	6.91	194.4	35.35	2.9320
7x12AWG	23.16	7	2.05	6.16	154.2	28.03	3.6970
19x5AWG	318.70	19	4.62	23.10	2129.0	326.39	0.2698
19x6AWG	252.70	19	4.11	20.60	1688.0	274.55	0.3402
19x7AWG	200.40	19	3.67	18.30	1339.0	230.18	0.4290
19x8AWG	158.90	19	3.26	16.30	1062.0	192.41	0.5409
19x9AWG	126.10	19	2.91	14.50	842.0	152.58	0.6821
19x10AWG	99.96	19	2.59	12.90	667.7	121.00	0.8601
37 x 5AWG	620.60	37	4.62	32.30	4170.0	635.43	0.1394
37 x 6AWG	492.20	37	4.11	28.80	3307.0	534.85	0.1757
37 x 7AWG	390.30	37	3.67	25.70	2623.0	448.09	0.2216
37 x 8AWG	309.50	37	3.26	22.90	2080.0	374.67	0.2794
37 x 9AWG	245.50	37	2.91	20.30	1649.0	279.11	0.3523
37x10AWG	194.70	37	2.59	17.90	1308.0	235.61	0.4443

ACS Conductor IEC 61232 Standard

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Class		20SA		27SA	30SA	40SA
Type		A	B	–	–	–
Tolerance on diameter	Ø ≥ 2,67 mm	± 1,5%	± 1,5%	± 1,5%	± 1,5%	± 1,5%
	Ø < 2,67 mm	± 0,04 mm	± 0,04 mm	± 0,04 mm	± 0,04 mm	± 0,04 mm
Minimum thickness of aluminium clad (% of radius)		8% if Ø < 1,80 mm		14%	15%	25%
		10% if Ø ≥ 1,80 mm				
Nominal density at 20°C (g/cm³)		6,59	6,53	5,91	5,61	4,64
Resistivity at 20°C max. (nΩ x m)		84,80	84,80	63,86	57,47	43,10
Conductivity (IACS)		20,3%	20,3%	27%	30%	40%
Final modulus of elasticity (GPa)		162	155	140	132	109
Coefficient of linear expansion (K-1)		13,0 x 10-6	12,6 x 10-6	13,4 x 10-6	13,8 x 10-6	15,5 x 10-6
Constant-mass temperature coefficient of resistance (K-1)		0,0036	0,0036	0,0036	0,0038	0,0040

MECHANICAL PROPERTIES

class	type	nominal diameter (mm)		min. tensile strength (N/mm²)	min. stress at 1% extension	elongation	torsion test (min. twists)
20SA	A	1,24	3,25	1340	1200	1,5%	20
		3,26	3,45	1310	1180		
		3,46	3,65	1270	1140		
		3,66	3,95	1250	1100		
		3,96	4,10	1210	1100		
		4,11	4,40	1180	1070		
		4,41	4,60	1140	1030		

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Class			20SA		27SA	30SA	40SA
Type			A	B	–	–	–
Tolerance on diameter	Ø ≥ 2,67 mm		± 1,5%	± 1,5%	± 1,5%	± 1,5%	± 1,5%
	Ø < 2,67 mm		± 0,04 mm	± 0,04 mm	± 0,04 mm	± 0,04 mm	± 0,04 mm
Minimum thickness of aluminium clad (% of radius)			8% if Ø < 1,80 mm		14%	15%	25%
			10% if Ø ≥ 1,80 mm				
Nominal density at 20°C (g/cm³)			6,59	6,53	5,91	5,61	4,64
Resistivity at 20°C max. (nΩ x m)			84,80	84,80	63,86	57,47	43,10
Conductivity (IACS)			20,3%	20,3%	27%	30%	40%
Final modulus of elasticity (GPa)			162	155	140	132	109
Coefficient of linear expansion (K-1)			13,0 x 10-6	12,6 x 10-6	13,4 x 10-6	13,8 x 10-6	15,5 x 10-6
Constant-mass temperature coefficient of resistance (K-1)			0,0036	0,0036	0,0036	0,0038	0,0040
		4,61	4,75	1100	1000		
		4,76	5,50	1070	1000		
	B	1,24	5,50	1320	1100		
27SA	–	2,50	5,00	1080	800		
30SA	–	2,50	5,00	880	650		
40SA	–	2,50	5,00	680	500		

ACS Conductor DIN 48201 Standard

Code Number	Area	No. of wires	Diameters(mm)		Weight	Rated Strength	DC Resistance
mm2	mm2		wire	conductor	kg/km	kN	ohm/km

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Code Number	Area	No. of wires	Diameters(mm)		Weight	Rated Strength	DC Resistance
mm2	mm2		wire	conductor	kg/km	kN	ohm/km
25	24.25	7	2.1	6.3	162	31.56	3.546
35	34.36	7	2.5	7.5	229	44.72	2.499
50	49.48	7	3	9	330	64.4	1.736
70	65.81	19	2.1	10.5	441	85.65	1.313
95	93.27	19	2.5	12.5	626	121.39	0.925
120	116.99	19	2.8	14	785	152.26	0.737
150	147.11	37	2.25	15.7	990	191.46	0.587
185	181.62	37	2.5	17.5	1221	236.38	0.476
240	242.54	61	2.25	20.2	1635	299.05	0.357
300	299.43	61	2.5	22.5	2017	369.2	0.289

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