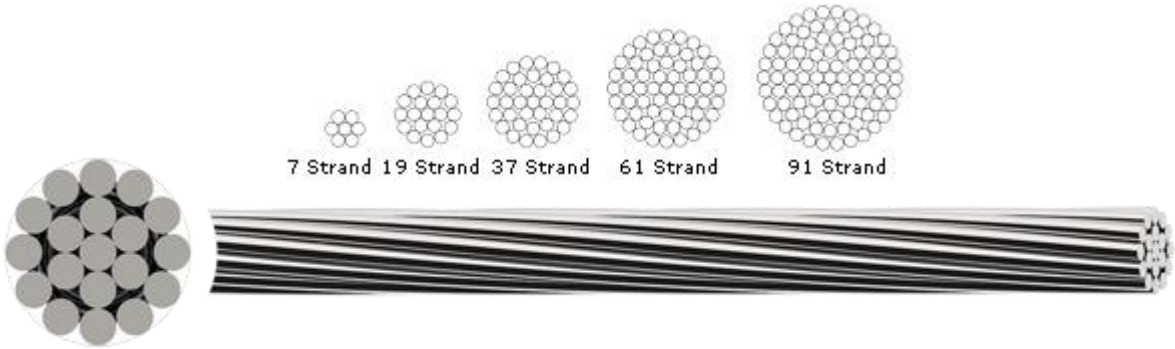
BARE ALUMINUM CONDUCTORS

The range of bare cables for airlines is divided, depending on their use, in:
- **Phase Conductors**
- **Ground Cables**

These are mainly made of Aluminum, Aluminum Alloy and Aluminum-Steel cables, these are replacing hard copper line cables since the last century.

ALL ALUMINUM CONDUCTOR CABLES (AAC)

These cables are formed by several aluminum wires in concentric layers wired in opposite directions.

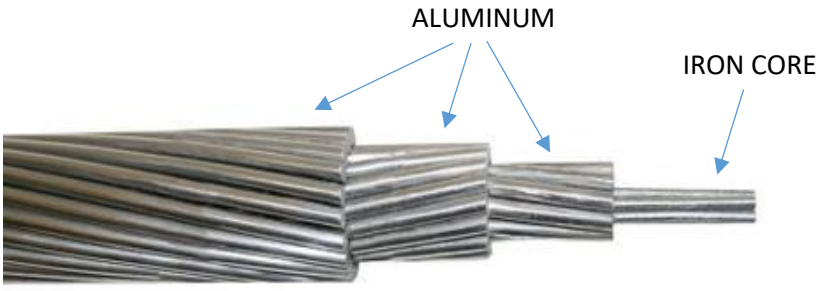


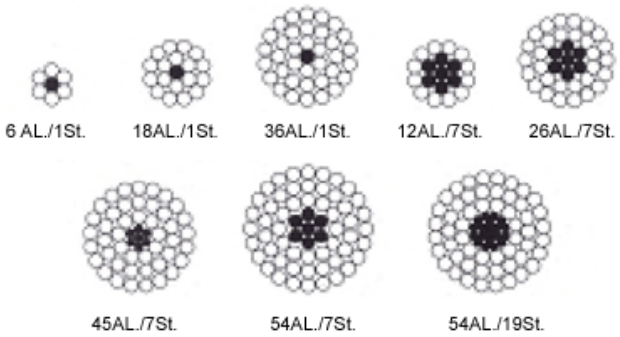
The aluminum used to produce these cables is from first fusion, with a minimum of 99.5% aluminum ensuring with this purity a high resistance to corrosion. These cables are suitable in areas with high humidity and in places with high air pollution.
These cables can be supplied greased, using a chemically stable grease and neutral against aluminum.

NAME	EQUIVALENCE IN COPPER mm²	COMPOSITION n	DIAMETER mm	SECTION mm²	EXTERNAL DIAMETER mm	BRAKE CHARGE Kgf	MAXIMUM ELECTRICAL RESISTANCE	WEIGHT kg/km
L 28	17,5	7	2,25	27,83	6,75	512	1,0286	76,1
L 40	27	7	2,80	43,10	8,40	741	0,6642	117,9
L 56	34	7	3,15	54,55	9,45	922	0,5248	149,2
L 80	48	19	2,25	75,55	11,25	1.390	0,3808	207,6
L 110	74	19	2,80	116,99	14,00	2.012	0,2459	321,5
L 145	93	19	3,15	148,07	15,75	2.502	0,1943	406,9
L 180	118	19	3,55	188,06	17,75	3.103	0,1530	516,9
L 280	177	37	3,10	279,26	21,70	4.720	0,1032	769,1
L 400	240	61	2,82	380,99	25,38	6.553	0,0758	1.051,4
L 450	286	61	3,08	454,49	27,72	7.681	0,0636	1.254,3
L 550	344	61	3,38	547,33	30,42	9.140	0,0528	1.510,5
L 630	400	61	3,65	638,27	32,85	10.531	0,0453	1.761,5

ALUMINUM CONDUCTOR STEEL REINFORCED CABLES (ACSR)

(ACSR)Aluminum-Steel cables arose from the need to reinforce the aluminum cables by increasing the mechanical characteristics of the same, improving the coefficient of thermal expansion and ensuring a longer life of the driver. Since that time these drivers are the most universally employed in airlines.
ACSR cables (Aluminum Conductor Steel Reinforced) are formed by wires of high purity hard temper aluminum, placed in concentric layers over a wire core or galvanized steel wire.





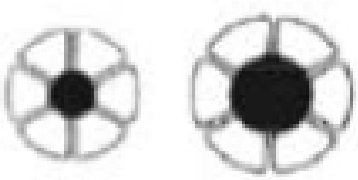
NAME	EQUI-VALENCE IN COPPER mm²	COMPOSITION ALUMINUM n	DIAM. (mm)	IRON n	DIAM. (mm)	SECTION AL mm²	TOTAL mm²	EXT. DIAMETER TOTAL (mm)	IRON (mm)	BRAKE CHARGE Kgf	MAX. ELEC. RESIST. Ω/Km	WEIGHT TOTAL	AL kg/km	IRON
LA 30	16,9	6	2,38	1	2,38	26,69	31,14	7,14	2,38	1.010	1,0750	107,9	73,2	34,7
LA 56	29,7	6	3,15	1	3,15	46,76	54,55	9,45	3,15	1.670	0,6137	189,0	128,2	60,8
LA 78	42,7	6	3,78	1	3,78	67,33	78,55	11,34	3,78	2.360	0,4261	272,1	184,6	87,5
LA 110	59,4	30	2,00	7	2,00	94,25	116,24	14,00	6,00	4.400	0,3066	432,5	260,2	172,3
LA 145	75,1	30	2,25	7	2,25	119,28	147,11	15,75	6,75	5.520	0,2423	547,3	329,2	218,1
LA 180	92,7	30	2,50	7	2,50	147,26	181,62	17,50	7,50	6.520	0,1962	675,7	406,5	269,2
LA 280	151,9	26	3,44	7	2,68	241,65	281,13	21,80	8,04	8.620	0,1198	975,9	666,5	309,4
LA 380	212,3	54	2,82	7	2,82	337,27	380,99	25,38	8,46	10.870	0,0857	1.274,0	931,4	342,6
LA 455	253,3	54	3,08	7	3,08	402,33	454,49	27,72	9,24	12.650	0,0718	1.519,7	111,0	408,7
LA 545	305,1	54	3,38	7	3,38	484,53	547,33	30,42	10,14	15.150	0,0597	1.830,2	1.338,0	492,2
LA 635	355,7	54	3,65	10	2,19	565,03	636,60	32,85	10,95	17.850	0,0512	2.128,6	1.560,4	568,2

COMPACTED ALUMINUM WIRE REINFORCED with steel core (AWG-MCM)

This cable is a classic seven-wire formed by Circular section Aluminum-Steel, in which manufacturing process is given him a sectoral shape to the wires of the outer layer. eliminating the existing gaps. Its main job is in medium and low voltage lines providing the following advantages:

-Decrease in total diameter for the same effective section with consequent advantages in terms of wind action, ice sleeves, protection against humidity, etc.

- Advantage to the connection, due to a larger contact surface.

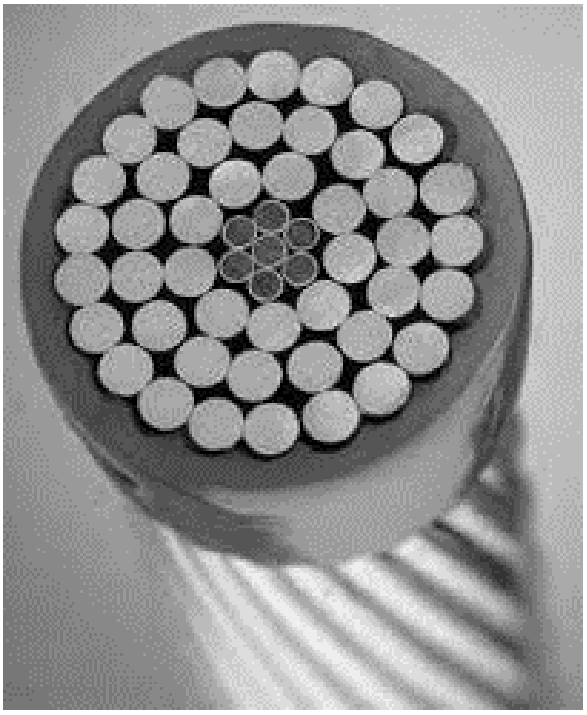


ALUMINUM CONDUCTOR STEEL REINFORCED/AW CORE (ACSR-AW)

Aluminum coated steel (Alumoweld type) is a bimetallic product with a pure aluminum coating on a high strength steel core, metallurgically bonded.

The use of this type of wire is came of the conductivity that is higher than the galvanized steel and guarantees a corrosion resistance similar to the aluminum wire, so they can be used more safely than the ACSR in zones of industrial and maritime environments.

Cable Alumoweld 7 wires



Cable ACSR-AW (LARL)

Vicente Torns
DISTRIBUTION S.L.

NAME	NOMINAL SECTION			ALUMINIUM WIRES		IRON WIRES		Ø NOMINAL		BRAKE CHARGE Kgf	MAX. ELEC. RESIST. Ω/Km	WEIGHT kg/km
	ALU.	IRON	TOTAL	n	ø	n	ø	CORE	TOTAL			
	mm	mm²	mm²		mm		mm	mm	mm			
LARL 30	26,7	4,4	31,1	6	2,38	1	2,38	2,38	7,14	1.020	1.0175	102,5
LARL 56	46,8	7,8	54,6	6	3,15	1	3,15	3,15	9,45	1.720	0.5808	179,7
LARL 78	67,4	11,2	78,6	6	3,78	1	3,78	3,78	11,34	2.300	0.4033	259
LARL 145	119,3	27,8	147,1	30	2,25	7	2,25	6,75	15,75	5.510	0.2244	514
LARL 180	147,3	34,3	181,6	30	2,50	7	2,50	7,50	17,50	6.630	0.1818	634
LARL 280 Hawk	241,7	39,4	281,1	26	3,44	7	2,68	8,04	21,80	8,760	0.1131	929
LARL 380 Gull	337,3	43,7	381	54	2,82	7	2,82	8,46	25,38	10.960	0.0820	1222
LARL 455 Condor	402,3	52,2	454,5	50	3,08	7	3,08	9,24	27,72	12.940	0.0688	1457
LARL 545 Cardinal	484,5	62,8	547,3	54	3,38	7	3,38	10,12	30,42	15.320	0.0571	1755
LARL 635 Finch	565	71,6	636,6	54	3,65	19	2,19	10,96	32,85	17.750	0.0490	2037

ALL ALUMINUM ALLOY CONDUCTOR / ALMELEC (AAAC)

Almelec is an aluminum alloy (Magnesium and Silicon) used in conductors for power lines.
The advantage of these cables against ACSR are:

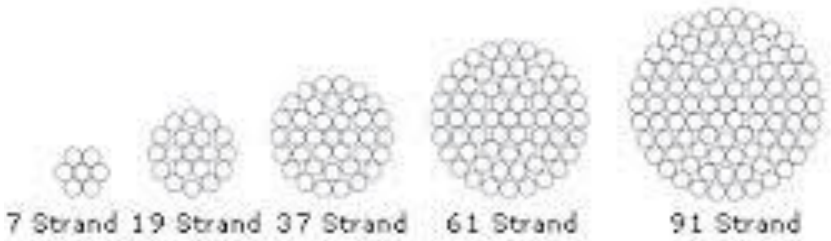
- Cheaper infrastructure due to:

• Longer runs (less supports required) due to lower weight and high breaking load (arrow is less)
• Better reuse of waste because it is a homogeneous cable

- Easy installation

• Greater surface hardness than aluminum (less shock sensitive)
• Better tensile strength
• Less weight, better handling of reels
• Easy attachment of cable ends

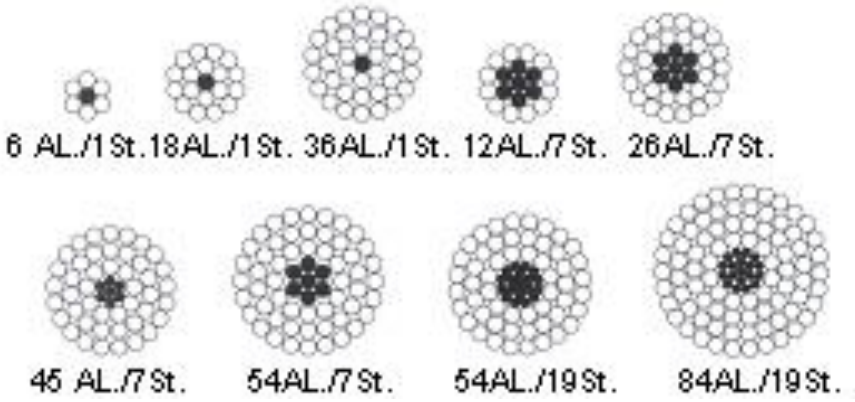
Almelec greased cables, both inside and outside, goes really well in installations near the sea and in areas with high pollution.



NOMINAL SECTION		WIRES		Ø NOMINAL	BRAKE CHARGE Kgf	ELEC. RESIST. Ω/Km	WEIGHT kg/km
	mm^2	N.º	Diámetro mm.	mm	Kgf	Ohm/Km	Kg/km
D28	27,8	7	2,25	6,75	810	1.1827	76,2
D40	43,1	7	2,80	8,40	1.260	0.7637	118
D56	54,6	7	3,15	9,45	1.600	0.6034	149,3
D80	75,5	19	2,25	11,25	2.220	0.4378	208
D110	117	19	2,80	14,00	3.430	0.2827	322
D145	148,1	19	3,15	15,75	4.340	0.2234	407
D180	188,1	19	3,55	17,75	5.520	0.1758	517
D280	279,3	37	3,10	21,70	8.200	0.1187	770
D400	381	61	2,82	25,38	11.180	0.0872	1.053
D450	454,5	61	3,08	27,72	13.350	0.0731	1.256
D550	547,3	61	3,38	30,42	16.080	0.0607	1.512
D630	638,3	61	3,65	32,85	18.700	0.0520	1.763
Conductores compactados de aleación de aluminio							
27,8	29,59	7	2,32	6,90	871	1.100	80
54,6	54,55	7	3,15	9,30	1.750	0.624	149
80	80,32	19	2,32	11,40	2.400	0.426	220

MIXED CABLES ALMELEC-GALVANIZED STEEL (AACSR)

These cables allow the construction of exceptionally long bays, to make installations where a high breaking load is required.



	NOMINAL SECTION			ALUMINUM WIRES		IRON WIRES		ø NOMINAL		BRAKE CHARG Kgf	ELEC. RESIST. Ω/Km	WEIGHT KG/KM
NAME	Alu.	IRON	Conductor	N.°	Ø	N.°	Ø	IRON CORE	Conductor			
	mm	mm^2	mm^2		mm		mm	mm	mm			
DA 30	26,7	4,4	31,1	6	2,38	1	2,38	2,38	7,14	1.350	1.236	107,9
DA 56	46,8	7,8	54,6	6	3,15	1	3,15	3,15	9,45	2.360	0.7056	189,1
DA 78	67,4	11,2	78,6	6	3,78	1	3,78	3,78	11,34	3.400	0.4900	272
DA 110	94,2	22,00	116,2	30	2,00	7	2,00	6,00	14,00	5.500	0.3525	433
DA 145	119,3	27,80	147,1	30	2,25	7	2,25	6,75	15,75	6.960	0.2785	548
DA 180	147,3	34,3	181,6	30	2,50	7	2,50	7,50	17,50	8.600	0.2256	676
DA 280	226,4	52,9	279,3	30	3,10	7	3,10	9,30	21,70	13.250	0.1467	1.040

GALVANIZED STEEL GROUND CABLES (GSW)

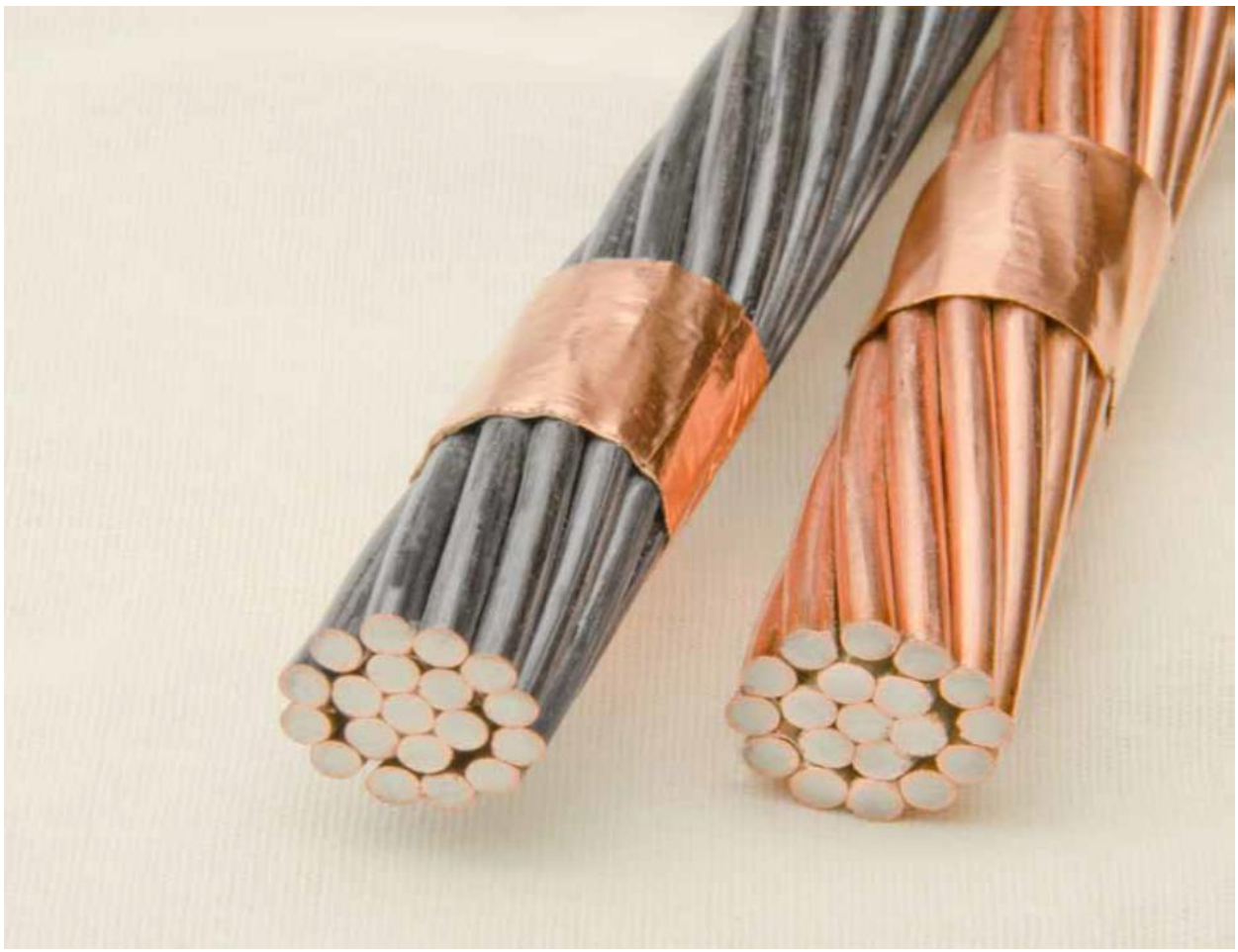
Airlines that carry large amounts of energy must have permanent protection against lightning. For this purpose, it's used cables that go above the conductors and are called Earth Cables.

The GSW wire is formed by a central core of steel wire on which one or more layers of steel of the same diameter and quality are wound helically.

ALUMINUM COATED STEEL GROUND CABLES (AW, Alumoweld type)

The combination of conductivity, high corrosion resistance and high breaking strength make this cable a widely used solution as a grounding wire.
It must be taken into account that the arrow on this cable is smaller than that on the Steel cable.

CAMO COPPERWELD .



Copper coated steel conductors have been an excellent alternative to copper for grounding applications for almost a century.
Providing a path of low impedance to ground, sufficient current capacity, fault and high tensile strength, are something natural for the connection to ground and pole substations.

For a long time, we have commercialized Copperweld® as an anti-theft device since it operates on three levels:

• Magnetic- Most thieves now test the cable for purity of copper by placing a magnet on it. Copper is not magnetic, steel is.

• Difficult to cut - Intelligent thieves know when the wire is not copper, because it resists its cutter unlike the soft and flexible behavior of copper• Low scrap value - If you ignore the signs and cut them anyway you will realize that the scrap value of Copperweld® is not worth the risk. So it may be that it is cut once, but not again.
The only drawback that the CCS seems to have is that it looks like copper. But with CAMO this will change. Through our patent pending, ingenious process, we have developed a method of permanently changing the color of the shiny outer copper layer to a dull, dark gray, without

affecting conductivity or connectivity. CAMO ™ looks like galvanized steel, and thieves simply will not steal it.

DSA Copperweld® wires – physical and electrical characteristics (TABLE 1)

CONDUCTOR SIZE AWG	DIAMETER		MINI BREAKING LOADS				WEIGHT		CROSS SECTION AREA		APPROXIMATE SHORT-TIME FUSING CURRENT AT 30 CYCLES (KA)	
			40% COND		30% COND		LBS/KFT	KG/KM				
	INCH	MM	LBF	kN	LBF	kN			CMIL	MM²	40% COND	30% COND
19-Wire Strand												
19 No. 5	0.910	23.10	17246	76.7	19402	86.3	1769	2632	628665	318.55	85.07	73.68
19 No. 6	0.810	20.57	13679	60.8	15389	68.5	1403	2088	498636	252.66	67.46	58.43
19 No. 7	0.722	18.33	10853	48.3	12210	54.3	1113	1656	395627	200.47	53.50	46.33
19 No. 8	0.643	16.32	8606	38.3	9682	43.1	883	1314	313733	158.97	42.43	36.75
19 No. 9	0.572	14.53	6821	30.3	7674	34.1	700	1041	248660	126.00	33.65	29.14
4THOUGHT™ 4/0	0.528	13.40	5801	25.8	6526	29.0	595	885	211475	107.16	28.60	24.77
7-Wire Strand												
7 No. 4	0.613	15.57	8015	35.7	9017	40.1	819	1218	292169	148.04	39.52	34.23
7 No. 5	0.546	13.86	6354	28.3	7148	31.8	649	966	231613	117.36	31.34	27.14
7 No. 6	0.486	12.34	5040	22.4	5670	25.2	515	766	183708	93.09	24.85	21.53
7 No. 7	0.433	11.00	3998	17.8	4498	20.0	408	608	145757	73.86	19.71	17.07
7 No. 8	0.386	9.79	3171	14.1	3567	15.9	324	482	115586	58.57	15.63	13.54
7 No. 9	0.343	8.72	2513	11.2	2827	12.6	257	382	91612	46.42	12.40	10.74
7 No. 10	0.306	7.76	1994	8.9	2243	10.0	204	303	72685	36.83	9.83	8.51
2 AWG	0.258	6.55	1435	6.4	1614	7.2	145	216	51772	26.23	7.00	6.06
4 AWG	0.204	5.18	897	4.0	1009	4.5	91	135	32368	16.40	4.38	3.79
Single Wire Strand												
2 AWG	0.258	6.54	2023	9.0	2275	10.1	184	274	66358	33.62	8.98	7.77
4 AWG	0.204	5.19	1272	5.7	1431	6.4	116	172	41738	21.15	5.65	4.89
6 AWG	0.162	4.11	800	3.6	900	4.0	73	108	26244	13.30	3.55	3.08