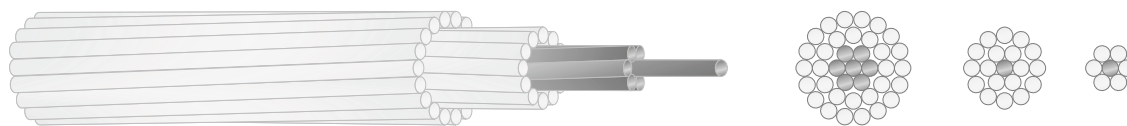


ACSR- ROPES

Aluminium wire steel reinforced (ACSR conductor)



CONSTRUCTION

The steel reinforced aluminium conductor consists of seven or more aluminium wires applied in concentric layers over a steel core made of one or more steel wires applied in concentric layers twisted together.

CONSTRUCTION DETAILS

Cross-sectional area					Construction	
Nominal		Calculated			No x diameter Al	No. of layers
Al/Fe mm ²	Cross-sectional ratio	Al mm ²	Fe mm ²	Total mm ²		
16/2,5	6	15,3	2,5	17,8	6 x 1,80	1
25/4	6	23,8	4,0	27,8	6 x 2,25	1
35/6	6	34,3	5,7	40,0	6 x 2,70	1
44/32	1,4	44,0	31,7	75,7	14 x 2,00	1
50/8	6	48,3	8,0	56,3	6 x 3,20	1
50/30	1,7	51,2	29,8	81,0	12 x 2,33	1
70/12	6	69,9	11,4	81,3	26 x 1,85	2
95/15	6	94,4	15,3	109,7	26 x 2,15	2
95/55	1,7	96,5	56,3	152,8	12 x 3,20	1
105/75	1,4	105,7	75,5	181,5	14 x 3,10	1
120/20	6	121,6	19,8	141,4	26 x 2,44	2
120/70	1,7	122,0	71,3	193,3	12 x 3,60	1
125/30	4,3	127,9	29,8	157,7	30 x 2,33	2
150/25	6	148,9	24,2	173,1	26 x 2,70	2
170/40	4,3	171,8	40,1	211,9	30 x 2,70	2
185/30	6	183,8	29,8	213,6	26 x 3,0	2
210/35	6	209,1	34,1	243,2	26 x 3,20	2
210/50	4,3	212,1	49,5	261,6	30 x 3,00	2
230/30	7,7	230,9	29,8	260,7	24 x 3,50	2
240/40	6	243,0	39,5	282,5	26 x 3,45	2
265/35	7,7	263,7	34,1	297,8	24 x 3,74	2
300/50	6	304,3	49,5	353,7	26 x 3,86	2
305/40	7,7	304,6	39,5	344,1	54 x 2,68	3
340/30	11,3	339,3	29,8	369,1	48 x 3,00	3
360/57	6	360,2	56,3	416,5	26 x 4,20	2
360/57*	6	360,2	57,3	417,5	26 x 4,20	2
380/50	7,7	382,0	49,5	431,5	54 x 3,00	3
385/35	11,3	386,0	34,1	420,1	48 x 3,20	3
435/55	7,7	434,3	56,3	490,6	54 x 3,20	3
450/40	11,3	448,7	39,5	488,2	48 x 3,45	3
490/65	7,7	490,3	63,6	553,9	54 x 3,40	3
495/35	15,3	494,1	34,1	528,2	45 x 3,74	3
510/45	11,3	510,2	45,3	555,5	48 x 3,68	3
550/70	7,7	550,0	71,3	621,3	54 x 3,60	3
560/50	11,3	561,7	49,5	611,2	48 x 3,86	3
570/40	14,5	565,5	39,5	610,3	45 x 4,02	3
650/45	14,5	653,2	45,26	698,5	45 x 4,30	3
680/85	7,7	678,8	86,0	764,8	54 x 4,00	3

SPECIFICATION

Type	Standard
Aluminium Conductors Steel reinforced (ACSR Conductor)	DIN 48204
	EN 50182
	JUS N.C1.351

PHYSICAL AND MECHANICAL CHARACTERISTICS

Cross sectional ratio	Number of wires	Density		Coef. of linear expansion	Elasticity module
		Al/Fe	103 kg/m ³		
1,4	14	7/19	4,91	15,0	110000
1,7	12	7	4,66	15,3	107000
4,3	30	7	3,57	17,8	82000
6	6	1		19,2	81000
6	26	7	3,5	18,9	77000
6	24	7		19,6	74000
7,7,	54	7	3,36	19,3	70000
7,7	54	19	3,36	19,4	68000
11,3	48	7	3,2	20,5	62000
14,5	45	7	3,09	20,9	61000

No x diameter Fe	Overall diameter mm	Weight			Tensile strength N	Max. resistance 20 °C Ohm/km
		Weight Al kg/km	Weight Fe kg/km	Net kg/km		
1 x 1,80	5,4	41,8	19,9	62	5825	18,780
1 x 2,25	6,8	65,4	31,0	97	9400	12,002
1 x 2,70	8,1	94,2	44,7	140	12900	0,8352
7 x 2,40	11,2	121,5	248,3	378	45500	0,6573
1 x 3,20	96,0	132,2	62,7	196	17400	0,5946
7 x 2,33	11,7	141,2	234,0	383	44225	0,5643
7 x 1,44	11,7	192,7	89,4	285	26315	0,4130
7 x 1,67	13,6	260,3	120,2	384	35750	0,3058
7 x 3,20	16,0	266,3	441,4	722	80200	0,2992
19 x 2,25	17,5	291,9	594,1	907	106635	0,2735
7 x 1,90	15,5	335,3	155,6	496	45460	0,2374
7 x 3,60	18,0	337,1	558,6	913	98195	0,2364
7 x 2,33	16,3	353,2	234,0	595	57800	0,2259
7 x 2,10	17,1	410,5	190,1	607	55200	0,1939
7 x 2,70	18,9	474,3	314,2	798	77040	0,1682
7 x 2,33	19,0	506,8	234,0	748	66225	0,1571
7 x 2,49	20,3	576,6	267,2	852	74950	0,1380
7 x 3,00	21,0	585,5	387,9	986	92275	0,1362
7 x 2,33	21,0	636,5	234,0	878	73030	0,1249
7 x 2,68	21,8	670,2	309,6	990	86460	0,1188
7 x 2,49	22,4	726,8	267,2	1003	82955	0,1094
7 x 3,00	24,4	839,0	387,9	1239	105120	0,9487
7 x 2,68	24,1	841,0	309,6	1160	99305	0,9490
7 x 2,33	25,0	936,0	234,0	1177	92505	0,0851
7 x 3,20	26,4	993,3	441,4	1449	125245	0,0801
19 x 1,96	26,6	993,3	450,8	1468	125245	0,0801
7 x 3,00	27,0	1053,9	387,9	1454	120990	0,0757
7 x 2,49	26,7	1064,9	267,2	1341	104315	0,0748
7 x 3,20	28,8	1199,0	441,4	1654	136275	0,0590
7 x 2,68	28,7	1237,8	309,6	1557	120195	0,0643
7 x 3,40	30,6	1353,6	498,3	1868	152915	0,0590
7 x 2,49	29,9	1363,6	267,2	1639	120280	0,0585
7 x 2,87	30,7	1408,4	355,0	1775	134295	0,0566
7 x 3,60	32,4	1517,5	558,6	2094	167530	0,0511
7 x 3,00	32,2	1549,5	387,9	1950	146300	0,0514
7 x 2,68	32,2	1575,4	309,6	1895	138000	0,0510
7 x 2,87	34,4	1802,5	355,0	2169	155550	0,0443
19 x 2,40	36,0	1873,5	676,0	2573	210055	0,0426

Cu- ROPES

Cu – conductors



CONSTRUCTION

The Cu-conductor is made out of seven or more copper strands (hard or soft drawn), stranded in concentric layers.

SPECIFICATION

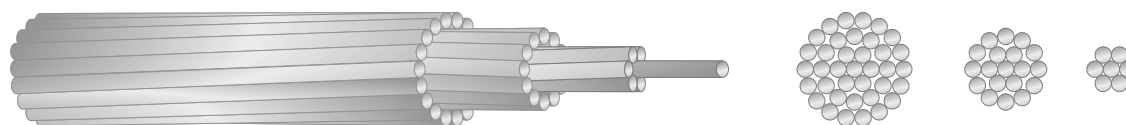
Type	Standard
Cu - conductors	DIN 48 201 Teil 1

TECHNICAL DATA

Nominal cross sectional area	Calculated cross-sectional area	Design of Cu-ropes	Overall diameter	Net weight (approx)	Tensile strength	Packing
mm ²	mm ²	n x d	mm	kg/km	kN	No/m
10	10,02	7 x 1,35	4,1	91	4,02	8/4500
16	15,89	7 x 1,70	5,1	145	6,37	8/4500
25	24,25	7 x 2,10	6,3	221	9,72	8/2900
35	34,36	7 x 2,50	7,5	313	13,77	8/2000
50	49,48	7 x 3,00	9,0	450	19,84	8/2200
50	48,35	19 x 1,80	9,0	440	19,38	10/2200
70	65,81	19 x 2,10	10,5	599	26,38	8/1000
95	93,27	19 x 2,50	12,5	849	37,39	10/1500
120	116,99	19 x 2,80	14,0	1065	46,90	10/1250
150	147,11	37 x 2,25	15,8	1339	58,98	12/1750
185	181,52	37 x 2,50	17,5	1653	72,81	12/1300
240	242,54	61 x 2,25	20,3	2207	97,23	14/1600
300	299,43	61 x 2,50	22,5	2725	120,04	18/2300
400	400,14	61 x 2,89	26,0	3640	160,42	20/2300
500	499,83	61 x 3,23	29,1	4545	200,38	20/1800

AI- ROPES

Al – conductors for overhead lines



CONSTRUCTION

The Al-conductor is made out of seven or more individual strands twisted in concentric layers. All strands in the conductor are of the same diameter. One to four layers of strand are applied around the centre strand, each layer having opposite lay direction and the outer layer always having a right hand lay.

Conductors are made out of hard drawn Al wires in accordance with HRN N.C1. 301 specification.

SPECIFICATION

Type	Standard
Al – conductors for overhead lines	DIN EN 50182
	JUS N.C1. 302/301

TECHNICAL DATA

Electrical and physical characteristics

Characteristics	Unit	Value
Specific electrical resistance at 20 °C	$Wm \times 10^{-6}$	0.02801
Coefficient of linear elongation	$m/m \text{ } ^\circ C$	2.3×10^{-5}
Coefficient of thermal resistance	$W/W \times \text{ } ^\circ C$	0.00403
Tensile strength	N/mm^2	105-120
Density at 20 °C	kg/m^3	2703

Electrical and physical characteristics

Construction	Elasticity module	Coefficient of linear elongation
No. of wires	N/mm^2	$1/ \text{ } ^\circ C$
7	60000	23×10^{-6}
19	57000	23×10^{-6}
37	57000	23×10^{-6}
61	55000	23×10^{-6}

Lay factor

No. of wires in the conductor	Factor step nesting			
	6. wire layer	12. wire layer	18. wire layer	24. wire layer
7	10 – 14			
19	10 – 16	10 – 14		
37	10 – 17	10 – 16	10 – 14	
61	10 – 17	10 – 16	10 – 15	10 – 14

Construction details

Nominal cross sectional area	Calculated cross sectional area	Design of Al-ropes	Overall diameter	Net weight (approx)	Electrical resistance	Tensile strength	Packing
mm^2	mm^2	$n \times d$	mm	kg/km	Ω/km	kN	No/m
16	15,89	$7 \times 1,70$	5,1	44	1,80	2,90	8/4400
25	24,25	$7 \times 2,10$	6,3	67	1,18	4,25	9/4000

Nominal cross sectional area	Calculated cross sectional area	Design of Al-ropes	Overall diameter	Net weight (approx)	Electrical resistance	Tensile strength	Packing
mm ²	mm ²	n x d	mm	kg/km	Ω/km	kN	No/m
35	34,36	7 x 2,50	7,5	94	0,84	5,85	9/3000
50	49,48	7 x 3,00	9,0	135	0,58	8,10	10/2800
50	48,35	19 x 1,80	9,0	133	0,59	8,60	10/2800
70	65,81	19 x 2,10	10,5	181	0,44	11,5	10/2100
95	93,27	19 x 2,50	12,5	256	0,31	15,95	12/2600
120	116,99	19 x 2,80	14,0	322	0,25	19,10	12/2000
150	147,11	37 x 2,25	15,8	406	0,20	25,70	12/2600
185	181,52	37 x 2,50	17,5	501	0,16	31,05	14/2000
240	242,54	61 x 2,25	20,3	670	0,12	40,15	16/2500
300	299,43	61 x 2,50	22,5	827	0,09	48,50	18/2300
400	400,14	61 x 2,89	26,0	1105	0,07	61,90	20/2400
500	499,83	61 x 3,23	29,1	1381	0,05	76,00	22/2300

Fe- ROPES

Steel ropes for overhead lines



CONSTRUCTION

These steel ropes are used as lightning protection for overhead lines. They are made in accordance with HRN N.C1. 702 (JUS N.C1.702). The layers are twisted in concentric manner and in opposite direction from each other with the outside layer in right hand direction.

SPECIFICATION

Type	Standard
Galvanised steel ropes	HRN N.C1. 702 (JUS N.C1.702)
	JUS N.C1. 302/301

TECHNICAL DATA

Hard drawn galvanised steel wires – characteristics

Diameter	Tolerance	Stress at 1% elongation Re 1.0	Tensile strength		min. weight of zinc	min. number of dipping for 60 sec.
			Mpa	Mpa		
mm	mm	Mpa	Mpa	Mpa	g/cm ²	
1,6 - 1,75	+/- 0,035	1180	1310-1520	1250	200	2
1,76 - 2,24	+/- 0,040	1180	1310-1520	1250	210	2,5
2,25 - 2,74	+/- 0,040	1180	1310-1520	1250	230	3
2,75 - 3,05	+/- 0,050	1140	1310-1520	1250	240	3

Construction details

Nominal cross sectional area	Calculated cross sectional area	Design of Fe-ropes	Overall diameter (approx)	Net weight (approx)	Tensile strength	Packing
mm ²	mm ²	n x d	mm	kg/km	kN	No/m
16	15,89	7 x 1,70	5,1	126	18,75	8/4400
25	24,25	7 x 2,10	6,3	192	30,80	9/4000
35	34,36	7 x 2,50	7,5	272	43,75	9/3000
50	49,48	7 x 3,00	9,0	391	63,00	10/2800
50	48,36	19 x 1,80	9,0	384	61,55	12/4000
58	58,10	7 x 3,25	9,8	460	66,80	12/3500
70	65,81	19 x 2,10	10,5	523	83,80	10/2100
95	93,27	19 x 2,50	12,5	741	118,75	12/2600
120	117,0	19 x 2,80	14,0	929	148,95	12/2000
150	147,11	37 x 2,25	15,8	1170	187,30	12/2600
185	181,60	37 x 2,50	17,5	1445	231,20	14/2000