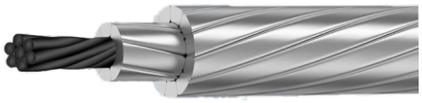
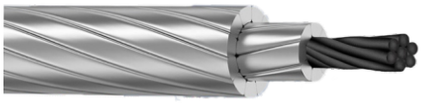


ACMCC®

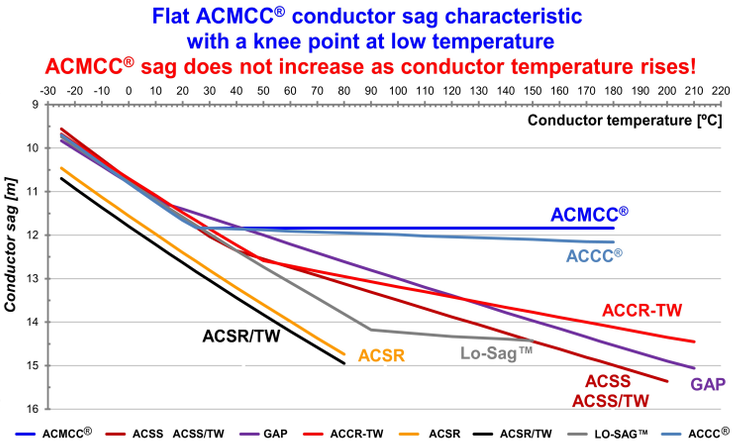


Aluminium Conductor Multistrand Carbon fiber Core

New generation high temperature small sag multi-rod polymer composite core conductors for upgrading of existing and construction of new HV power lines

The state of the art ACMCC® conductors combine two long known technologies: the carbon fibre composite core and the fully annealed trapezoidal 99.7% aluminum wires. Due to their low weight and strong multi-rod composite core construction, the conductors are characterised by a lower mass with the same diameter as of the conductor being replaced, increased bending and tensile strength, and flat sag characteristics at increased temperatures which means that sag increases only slightly as the temperature rises.

The Low-Loss High Temperature small sag ACMCC® conductor is a revolutionary technology meeting the increased demands of the 21st century HV networks. ACMCC® conductors are the low-loss conductors as due to an increased aluminium content (in the annealed condition) their resistance is 25-30% lower than that of ACSR conductors of the same diameter, what assures that losses are lowered by 25-30% with the same load profile as in the case of ACSR conductors.



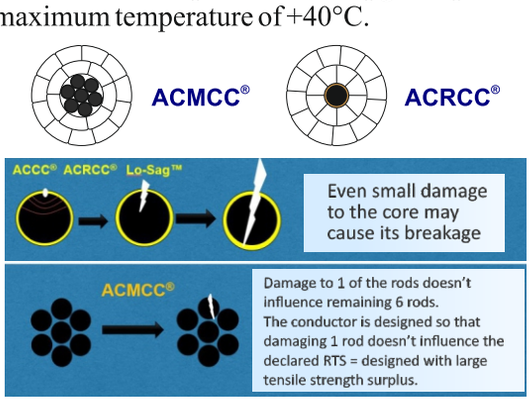
The ACMCC® conductor, being a high temperature conductor, is a low loss conductor since its resistance during operation at the temperature of +180°C is only slightly higher than the resistance of the equivalent ACSR conductor operating at +80°C.

When compared with other low-loss technologies, e.g. AAAC and ACSR/TW, the ACMCC® conductors current carrying capacity is twice as high what ensures a significantly higher flexibility of the power grid operation for example under n-1 and n-2 contingency conditions. If the higher current load capacity is utilised only for a short time e.g. in emergency situations under extreme weather conditions (intensive solar radiation, no wind and high air temperature) or at times of maximum electricity generation by wind farms, then the increase of losses occurring in a particular line due to the line reaching the high temperature operation range will be slight. The application of ACMCC® conductors in the construction of new power lines limits the number of supporting structures by 15-40%, which decreases their environmental footprint and reduces the number of negotiations with land owners while increasing power grid operation flexibility in extreme situations due to a high current load capacity.

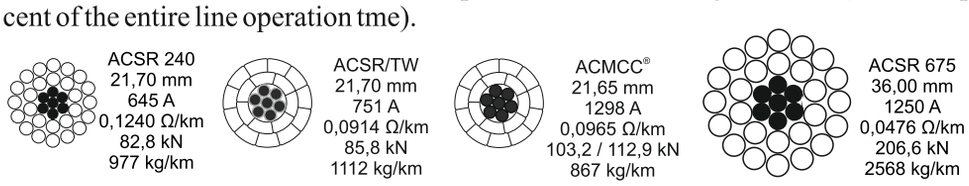
Due to the application of annealed AL wires, the ACMCC® conductors' so called knee point occurs at a low temperature while due to the application of a carbon fibre core, the sag curve remains almost flat as the temperature rises. In the case of conductors with a polymer composite core but with hard drawn aluminium zirconium alloy ALZr wires, the knee point is located at much higher temperatures, whereby their sag is by 1-2 meters larger than that of ACMCC® conductors.

Conductors with a carbon fibre composite core and fully annealed aluminium wires are the only technology which in order to reach their maximum load capacity does not require increasing (reinforcing) of towers and/or their replacement to upgrade power lines originally designed for operation at maximum temperature of +40°C.

The ACMCC® conductor's has similar technical parameters to ACRCC® (ACCC®) conductors, but with multirod polymer core ACMCC® conductor is less susceptible to breaking as only 1 out of 7 rods will be subject to possible breakage while the remaining 6 rods will support the conductor hanging on line. ACMCC® conductors are ideally suited for upgrading/ construction of lines receiving power from wind farms. Due to the application of annealed AL wires, the ACMCC® conductors' so called knee point occurs at a low temperature while due to the application of a carbon fibre core, the sag curve remains almost flat as the temperature rises. In the case of conductors with a polymer composite core but with hard drawn aluminium zirconium alloy ALZr wires, the knee point is located at much higher temperatures, whereby their sag is by 1-2 meters larger than that of ACMCC® conductors.



the line in relation to the actual transmission generated on the line by a wind farm, a more economical design is possible without the need for line oversizing or constructing a double circuit line in order to serve the periods of maximum generation (a several per cent of the entire line operation tme).



ACMCC® conductors with a diameter of 21.7 mm are able to transmit twice as much power as ACSR 240 conductors of similar diameter, so in a single circuit power line designed for an ACSR 240 conductor ACMCC® ensures transmission capacity of a single circuit line with an ACSR 675 conductor of 36.0 mm in diameter or of a double circuit line with an ACSR 240 conductor, which would require far stronger supporting structures and in the case of a double circuit line a wider rights of way for the line construction. The ACMCC® conductors are also used when crossing rivers and environment protection areas as well as for fast line upgrades without the necessity of long lasting power line conversion works. ACMCC® is an improved Japanese technology which has been present on the world market for about 15 years, proven in thousands of kilometres of installations. The increased current carrying capacity obtained by the replacement of ACSR conductors with ACMCC® postpones the necessity of constructing a new line by 20-25 years.

Examples of the ACMCC® constructions

Conductor designation	Outer diameter	Total mass	RTS for 2 types of carbon fiber		Total cross-section	AL cross-section	D.C. resistance at 20°C	Current carrying capacity [A] at the given conductor temperature			
			JF1A/JF1B	JF2A/JF2B				80°C		180°C	
	[mm]	[kg/km]	[kN]		[mm^2]	[mm^2]	[Ohm/km]	Summer	Winter	Summer	Winter
ACMCC® 120/25	14,47	374	62,3	68,5	145,7	120	0,2334	394	438	649	670
ACMCC® 140/30	15,58	434	70,8	77,9	169,1	140	0,2000	435	484	716	740
ACMCC® 150/30	16,02	462	71,4	78,4	179,1	150	0,1865	470	526	782	808
ACMCC® 177/40	17,67	555	96,7	106,4	217,5	177	0,1578	523	587	875	904
ACMCC® 210/35	18,67	636	86,3	94,6	244,4	210	0,1332	577	648	967	1000
ACMCC® 240/30	19,52	711	76,6	83,6	269,1	240	0,1166	623	700	1047	1082
ACMCC® 240/40	19,98	728	100,3	110,0	280,1	240	0,1166	627	704	1054	1089
ACMCC® 240/55	20,59	752	132,3	145,5	294,9	240	0,1167	631	710	1063	1099
ACMCC® 290/40	21,65	867	103,2	112,9	330,1	290	0,0965	703	791	1187	1227
ACMCC® 300/35	21,75	884	91,5	99,8	334,4	300	0,0932	716	805	1209	1249
ACMCC® 300/40	21,96	894	103,8	113,5	340,1	300	0,0933	718	807	1212	1252
ACMCC® 300/50	22,32	909	124,1	136,0	349,5	300	0,0932	721	811	1218	1259
ACMCC® 320/40	22,59	950	104,9	114,6	360,1	320	0,0875	746	839	1262	1304
ACMCC® 450/55	26,73	1333	144,3	157,6	504,9	450	0,0622	922	1040	1573	1627
ACMCC® 500/55	28,00	1471	147,2	160,5	554,9	500	0,0560	983	1110	1681	1738
ACMCC® 630/65	31,37	1845	168,3	183,1	695,8	630	0,0444	1137	1285	1956	2023
ACMCC® 710/55	32,78	2050	159,3	172,6	764,9	710	0,0394	1220	1379	2104	2176

We suggest usage of the JF1A/JF1B fiber ACMCC® core due to the lower price.
Calculations made according to CIGRE Brochure 207.
Conditions for calculating current carrying capacity:

- ambient temperature: summer +30°C, winter +20°C
- sun radiation: summer 1000 W/m^2, winter 770 W/m^2
- emissivity: 0,5
- absorptivity: 0,5
- wind speed: 0,5 m/s perpendicular to conductor

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The sole distributor of ACMCC® conductors and cores in Europe.

18.03.2021