

Cable datasheet

TitleBESS XKDAIT 800Al/50RCu mm2 60/36kV (#20923)

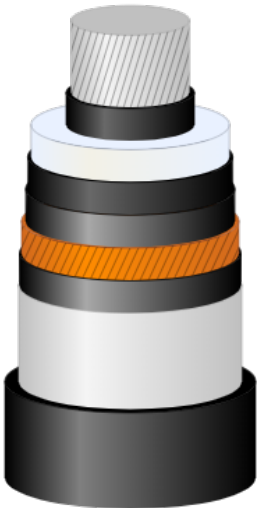
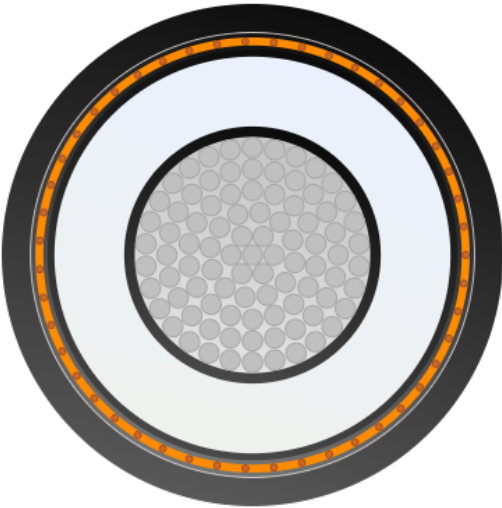
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Cigre TB 880, optional guidance points (see preferences)

None

General Data

Rated line-to-line voltage	U_n	60 kV
Base voltage for tests	U_0	36 kV
Highest voltage for equipment	U_m	72.5 kV
Nominal system frequency	f	50 Hz
Number of conductors cable	n_c	1
Number of phases in a cable	n_{ph}	1



conductor

conductor shield

insulation

insulation screen

screen bedding

screen

serving

sheath

jacket

created by Cableizer

Cable elements

Conductor

Cross-sectional area conductor	A_c	1 x 800 mm ²
Conductor material	M_c	Aluminium, round stranded
External diameter conductor	d_c	33.8 mm
Radius conductor	r_c	16.9 mm
$\frac{d_c}{2}$		

Insulation

Insulation material	M_i	Crosslinked polyethylene (XLPE)
Thickness conductor shield	t_{cs}	1.5 mm
Thickness insulation	t_{ins}	10 mm
Thickness insulation screen	t_{is}	1 mm
Thickness insulation	t_i	12.5 mm
$t_{ct} + t_{cs} + t_{ins} + t_{is}$		

Screen bedding

Screen bedding material		Water-blocking tapes, semi-conducting
Thickness screen bedding	t_{scb}	0.6 mm

Screen

Type		round wires
Screen material	M_{sc}	Copper
diameter wires	t_{sc}	1.151 mm
Standard copper wire size	CUW_{sc}	AWG 17
Number of wires screen	n_{sw}	47
Elongation screen	v_{sc}	3 %

Screen serving

Screen serving material		Water-blocking tapes
Thickness screen serving	t_{scs}	0.6 mm

Sheath

Sheath material	M_{sh}	Aluminium
Thickness sheath corrugated	t_{sh}	0.2 mm No

Jacket

Jacket material	M_j	Polyethylene (LD/MDPE, ST3)
Thickness jacket	t_j	4 mm

Overall

External diameter object	D_e	71.9 mm
Absorption coefficient solar radiation	σ_{sun}	0.4
Emissivity cable	ϵ_e	0.9
Reflectivity cable	η_e	0.1
$1 - \epsilon_e$		
Mass cable	m_{tot}	5.279 kg/m
$m_{hollow} + m_{metal}$		

Electrical**Conductor**

Electrical resistance DC conductor 20°C	R_{c20}	3.6700e-5 Ω /m
Standard DC resistance of conductor	R_{co}	0.0367 Ω /km
Skin effect coefficient	k_s	1
Proximity effect coefficient	k_p	0.8
Geometric mean radius conductor	GMR_c	0.01305 m
$K_{GMR} r_{z1}$		
Factor geometric mean radius	K_{GMR}	0.772
Constant relating to conductor formation	K_{BICC}	0.0514
Number of wires conductor	n_{cw}	61
Diameter of wires conductor (average)	d_{cw}	3.35 mm

Insulation

Capacitance insulation $\frac{2\pi\epsilon_0\epsilon_i}{\ln\left(\frac{r_{osc}}{r_{isc}}\right)}$	C_b	3.204e-10 F/m
Capacitance to earth C_b	C_E	3.204e-10 F/m
Vacuum permittivity	ϵ_0	8.854187817620389e-12 F/m
Radius above the inner semi-conducting layer $\frac{d_c}{2} + t_{ct} + t_{cs}$	r_{isc}	18.4 mm
Radius over capacitive insulation layers $\frac{D_{ins}}{2}$	r_{osc}	28.4 mm
Velocity of propagation $\frac{1}{1000\sqrt{\mu_0\epsilon_0\epsilon_i}}$	v_{prop}	189605.4 km/s

Screen + Sheath

Electrical resistance screen $10^6 \frac{\rho_{sc}}{A_{sc}}$	R_{sc}	3.4228e-4 Ω /m
Geometric mean radius screen $\left(0.7788 \frac{t_{sc}}{2} n_{sw} \left(\frac{t_{sc}}{2}\right)^{n_{sw}-1}\right)^{\frac{1}{n_{sw}}} \frac{1}{1000}$	GMR_{sc}	0.00062 m
Electrical resistance sheath $10^6 \frac{\rho_{sh}}{A_{sh}}$	R_{sh}	7.0955e-4 Ω /m
Electrical resistance screen/sheath 20°C $\frac{R_{sc}R_{sh}}{R_{sc} + R_{sh}}$	R_{so}	2.309e-1 Ω /km

Radius

Radius conductor	r_{z1}	0.0169 m
Radius shield (inner)	r_{z2}	0.02942 m
Radius shield (outer)	r_{z3}	0.03165 m
Radius screen (inner)	$r_{z2,sc}$	0.02942 m
Radius screen (outer)	$r_{z3,sc}$	0.03173 m
Radius sheath (inner)	$r_{z2,sh}$	0.03165 m
Radius sheath (outer)	$r_{z3,sh}$	0.03205 m
Radius armour (inner)	r_{z4}	0.03195 m
Radius armour (outer)	r_{z5}	0.03195 m
Radius outersheath	r_{z6}	0.03595 m

Material parameters**Conductor**

Electrical resistivity conductor material	ρ_c	2.826e-8 Ω .m
Temperature coefficient conductor material	α_c	4.03e-3 1/K
Reciprocal of temperature coefficient conductor material	β_c	2.281e2 K
Volumetric heat capacity conductor material	σ_c	2.50e6 J/(K.m ³)

Thermal conductivity conductor material	k_c	204.08 W/(m.K)
Density conductor material	ζ_c	2.712 g/cm ³

Insulation

Relative permittivity insulation material	ϵ_i	2.5
Loss factor insulation material	$\tan\delta_i$	0.001
Thermal resistivity insulation material	ρ_i	3.5 K.m/W
Volumetric heat capacity insulation material	σ_i	2.40e6 J/(K.m ³)
Density insulation material	ζ_i	0.923 g/cm ³
Max. temperature conductor	θ_{cmax}	90 °C
Max. temperature conductor, emergency overload	θ_{cmaxeo}	105 °C
Max. temperature conductor, short-circuit	θ_{cmaxsc}	250 °C

Conductor shield

Thermal resistivity conductor shield	ρ_{cs}	3.5 K.m/W
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Insulation screen

Thermal resistivity insulation screen	ρ_{is}	3.5 K.m/W
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Screen bedding

Thermal resistivity screen bedding	ρ_{scb}	3.5 K.m/W
Volumetric heat capacity screen bedding	σ_{scb}	2.00e6 J/(K.m ³)
Density tape material	ζ_{tape}	0.34 g/cm ³

Screen

Specific electrical resistivity screen material	ρ_{sc}	1.724e-8 Ω .m
Temperature coefficient screen material	α_{sc}	3.93e-3 1/K
Reciprocal of temperature coefficient screen material	β_{sc}	2.345e2 K
Volumetric heat capacity screen material	σ_{sc}	3.45e6 J/(K.m ³)
Thermal conductivity screen material	k_{sc}	370.4 W/(m.K)
Density metallic screen material	ζ_{sc}	8.94 g/cm ³

Screen serving

Thermal resistivity screen serving	ρ_{scs}	3.5 K.m/W
Volumetric heat capacity screen serving	σ_{scs}	2.00e6 J/(K.m ³)
Density tape material	ζ_{tape}	0.34 g/cm ³

Sheath

Specific electrical resistivity sheath material	ρ_{sh}	2.840e-8 Ω .m
Temperature coefficient sheath material	α_{sh}	4.03e-3 1/K
Reciprocal of temperature coefficient sheath material	β_{sh}	2.281e2 K
Volumetric heat capacity sheath material	σ_{sh}	2.50e6 J/(K.m ³)
Thermal conductivity sheath material	k_{sh}	208.3 W/(m.K)
Density sheath material	ζ_{sh}	2.712 g/cm ³

Jacket

Thermal resistivity jacket material	ρ_j	3.5 K.m/W
Volumetric heat capacity jacket material	σ_j	2.40e6 J/(K.m ³)
Electrical conductivity jacket material	κ_j	1.00e-16 S/m
Density jacket material	ζ_j	0.93 g/cm ³

Thermal resistance

Internal thermal resistances for rating calculation

Thermal resistance conductor—sheath $\frac{\rho_i}{2\pi} \ln \left(1 + \frac{2t_1}{d_c} \right)$	T_1	0.3307 K.m/W
Thermal resistance armour bedding $\frac{\rho_j}{2\pi} \ln \left(\frac{D_j}{D_j - 2t_3} \right)$	T_2	0 K.m/W
Thermal resistance jacket $\frac{\rho_j}{2\pi} \ln \left(\frac{D_j}{D_j - 2t_3} \right)$	T_3	0.0657 K.m/W
Thickness conductor—sheath $t_i + t_{scb} + t_{scs} + \frac{\Delta d_{sh}}{2}$	t_1	13.7 mm
Thickness sheath—armour $\frac{\Delta d_{sh}}{2} + t_{ab}$	t_2	0 mm
Thickness armour—surface $t_j + t_{jj}$	t_3	4 mm

Cable elements

Thermal resistance, transient $T_1 + T_2 + T_3$	T_{tot}	0.3964 K.m/W
Thermal resistance insulation $\frac{\rho_i}{2\pi} \ln \left(\frac{D_i}{d_c} \right)$	T_i	0.3084 K.m/W
Thermal resistance conductor shield $\frac{\rho_{cs}}{2\pi} \ln \left(\frac{D_{cs}}{D_{cs} - 2t_{cs}} \right)$	T_{cs}	0.0474 K.m/W
Thermal resistance insulation $\frac{\rho_i}{2\pi} \ln \left(\frac{D_{ins}}{D_{ins} - 2t_{ins}} \right)$	T_{ins}	0.2418 K.m/W
Thermal resistance insulation screen $\frac{\rho_{is}}{2\pi} \ln \left(\frac{D_{ins} + 2t_{is}}{D_{ins}} \right)$	T_{is}	0.0193 K.m/W
Thermal resistance screen bedding $\frac{\rho_{scb}}{2\pi} \ln \left(\frac{D_{scb}}{D_i} \right)$	T_{scb}	0.0113 K.m/W
Thermal resistance screen serving $\frac{\rho_{scs}}{2\pi} \ln \left(\frac{D_{scs}}{D_{sc}} \right)$	T_{scs}	0.0106 K.m/W
Thermal resistance jacket $\frac{\rho_j}{2\pi} \ln \left(\frac{D_j}{D_j - 2(t_j + t_{jj})} \right)$	T_j	0.0657 K.m/W