Low Voltage Power Cable Technical Data

Two installation specifications are implemented for the low voltage power cable, IEC 60364-5-52(2001) and AS3008.1.1(2009).This allows the user to tailor a circuit rating for their given prescribed installation.The base conditions and correction factors to be used up to the intallation specification selected during calculation.

Base Conditions

If installation method IEC60364-5-52 applied,the base conditions for the current ratings in CableApp are as follows:

Parameter	Condition
Ambient Air temperature	30°C
Ambient Ground temperature or in ducts	20°C
Base installation depth (for cables installed in the ground)	0.7m
Base soil resistivity (for cables installed in the ground)	2.5 K.m/W
Thermal resistivity of earthenware ducts, plastic ducts or metallic ducts	2.5 K.m/W

When the calculation with AS3008,the base cable installation conditions for the current ratings in CableApp are as follows：

Parameter	Condition
Ambient Air temperature	40°C
Ambient Ground temperature	25°C
Base installation depth (for cables installed in the ground)	0.5m
Base soil resistivity (for cables installed in the ground)	1.2 °C.m/W

Correction factors

- **Temperature factors**

The temprature correction factors as below when installation method IEC60364-5-52 used:

Table A.52-14 (52-D1) **– Correction factor for ambient air temperatures other than 30 °C to be applied to the current-carrying capacities for cables in the air**

Ambient temperature [a] °C	Insulation			
	PVC	XLPE and EPR	Mineral [a]	
			PVC covered or bare and exposed to touch 70 °C	Bare not exposed to touch 105 °C
10	1,22	1,15	1,26	1,14
15	1,17	1,12	1,20	1,11
20	1,12	1,08	1,14	1,07
25	1,06	1,04	1,07	1,04
35	0,94	0,96	0,93	0,96
40	0,87	0,91	0,85	0,92
45	0,79	0,87	0,87	0,88
50	0,71	0,82	0,67	0,84
55	0,61	0,76	0,57	0,80
60	0,50	0,71	0,45	0,75
65	–	0,65	–	0,70
70	–	0,58	–	0,65
75	–	0,50	–	0,60
80	–	0,41	–	0,54
85	–	–	–	0,47
90	–	–	–	0,40
95	–	–	–	0,32

[a] For higher ambient temperatures, consult manufacturer.

Table A.52-15 (52-D2) **– Correction factors for ambient ground temperatures other than 20 °C to be applied to the current-carrying capacities for cables in ducts in the ground**

Ground temperature °C	Insulation	
	PVC	XLPE and EPR
10	1,10	1,07
15	1,05	1,04
25	0,95	0,96
30	0,89	0,93
35	0,84	0,89
40	0,77	0,85
45	0,71	0,80
50	0,63	0,76
55	0,55	0,71
60	0,45	0,65
65	–	0,60
70	–	0,53
75	–	0,46
80	–	0,38

If installlation method AS3008.1.1 applied,the temperature factors given as follows:

VARIANCE: AIR AND CONCRETE SLAB AMBIENT TEMPERATURES

INSTALLATION CONDITIONS: CABLES IN AIR OR HEATED CONCRETE SLABS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Conductor temperature °C	Rating factor																				
	Air and concrete slab ambient temperature (See Notes 1, 2 & 3), °C																				
	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	100	110	120	130	140
150	1.11	1.09	1.07	1.04	1.02	1.0	0.98	0.95	0.93	0.90	0.88	0.85	0.83	0.80	0.77	0.74	0.69	0.60	0.52	0.43	0.30
110	1.16	1.13	1.10	1.07	1.04	1.0	0.96	0.93	0.89	0.85	0.80	0.76	0.71	0.65	0.60	0.53	0.38	—	—	—	—
90	1.26	1.20	1.15	1.10	1.05	1.0	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34	0.19	—	—	—	—	—	—
80	1.31	1.25	1.19	1.12	1.06	1.0	0.92	0.84	0.76	0.66	0.56	0.45	0.27	—	—	—	—	—	—	—	—
75	1.35	1.28	1.21	1.14	1.07	1.0	0.91	0.82	0.72	0.60	0.49	0.37	—	—	—	—	—	—	—	—	—

VARIANCE: SOIL AMBIENT TEMPERATURE

INSTALLATION CONDITIONS: CABLES BURIED DIRECT IN GROUND OR IN UNDERGROUND WIRING ENCLOSURES

1	2	3	4	5	6	7	8
Conductor temperature °C	Rating factor						
	Soil ambient temperature, °C						
	10	15	20	25	30	35	40
110	1.08	1.06	1.03	1.0	0.97	0.94	0.91
90	1.11	1.07	1.03	1.0	0.97	0.93	0.89
80	1.13	1.09	1.04	1.0	0.96	0.91	0.85
75	1.14	1.10	1.05	1.0	0.95	0.89	0.83

- **Group factors**

The correction factors for installation conditions and grouping defined in the tables A.52-17 to A.52-21 of IEC60364-5-52

Correction Factor Type	**Reduction factors Table Reference in IEC60364-5-52(2001)**
Reduction factors for groups of more than one circuit or more than one multi-core cable	Table A.52-17
Reduction factors for more than one circuit cables laid directly in the ground	Table A.52-18
Reduction factors for more than one circuit cables laid in ducts in the ground	Table A.52-19
Reduction factors for group of more than one multicore cables in free air	Table A.52-20
Reduction factors for group of more than one circuit of single core cables in free air	Table A.52-21

The correction factors for installation conditions and grouping defined in the tables 22 to 26 of AS/NZS3008.1.1

Correction Factor Type	Correction Table Reference in AS/NZS3008.1.1(2009)
Derating factors for bunched circuits of single core and multicore cables in air or in wiring enclosures	Table 22
Derating factors for circuits of single core in trays,racks,cleats or other supports in air	Table 23
Derating factors for circuits of multicore in trays,racks,cleats or other supports in air	Table 24
Derating factors for groups of circuits of single core and multicore buried direct in ground	Table 25
Derating factors for groups of circuits of single core or multicore cables enclosed separately or more than one single-core cable per wiring enclosure.	Table 26

Energy Conscious Solution

The following information provides guidance in energy efficiency, and the calculation method used to provide the **Energy Conscious Solution** in the CableApp.

The calculation requires the end user to define some of the parameters used in the calculation, within the "**settings**" menu of the CableApp.

The potential savings should be considered as guidance only.

According to Joules Law, whenever a conductor carry’s current, it will generate heat (thermal energy).

It can be demonstrated that the thermal energy of a cable corresponds to the following general expression:

$E_P = n \cdot R \cdot I^2 \cdot L \cdot t / 1000$

Where:

E_P: line energy lost [kWh]

n: number of loaded conductors

R: conductor resistance [Ω/km]

L: line length [km]

I: line current [A]

t: time [h]

If the cable cross section is increased, its conductor resistance will be decreased accordingly. When carrying the same current I (A), there will be a reduction in the energy lost (E_P). Both cost saving in electricity bills and reduction in CO_2 emissions can be benefit from the energy saving.

The cable itself cost will be higher due to the larger size, however the advantages will be:

- Lower running costs, reduced energy bills.

- Reduced CO_2 emissions, therefore an environmentally better proposition.

- Extended design life for the cable because it is operating at a lower temperature.
  Standard design life is based on the cable being at its maximum load (maximum operating temperature) for every hour of that defined life in years

- Improved short circuit capability - larger cross-sectional areas will carry higher currents in a fault condition.

- Potential to uprate the cable to carry higher loads in the future.

As a rule, cables do not carry the same current (I) continuously. For this reason, it is advisable to consider the mean square value of the current over time or at least to make an estimate.

The CableApp will offer by default the **average usage of load** (I ') equal to **75%** of I, but other values can be selected or defined by the user in the "**Settings**" of the CableApp

100% I
40% I (residential)
60% I (public place)
75% I (industrial)
Other %

Thus, the energy saved (EA) by installing conductors of lower resistance (R2) than (R1) will be:

$EA = n \cdot (R1-R2) \cdot L \cdot I'^2 \cdot t / 1000 \; (S2 > S1)$

Having calculated the saved energy, the economic savings can be calculated and the savings in CO_2 emissions since we have defined the electricity tariffs (Energy Price) in **CNY/kWh** (in the "**settings**") and the approximate values of CO_2 emissions (A_{CO2}) **kg per kWh** generated taking account of the country's energy mix is defined by the CableApp (note, this value cannot be modified by the user)