General

Introduction

The heat produced by the Joule effect when a current flows through the conductor core, is conducted by the various external insulating layers to be finally dissipated by the external cable environment.

This dissipation of heat via the external environment of the cable is done either by:

- convection and radiation if the cable is installed in the open air.
- conduction if the cable is in contact with other elements or materials.

When the thermal losses produced are equal to the thermal losses dissipated in the surrounding medium, a state of balance is achieved, characterised by a constant core temperature (steady state). This temperature must not exceed the maximum supported by the insulation, to ensure the cable has an optimum lifetime.

The maximum permissible current under continuous operation is the current strength value which, for a clearly defined cable environment, provokes the heating of the conductor cores to the maximum permitted value.

Calculations of permissible current as per IEC 60287

Title of IEC 60287

"Calculation of the continuous current rating of cables (100% load factor)"

Field of application of IEC 60287

This standard only concerns the permanent use operation of cables for all alternating and direct voltages up to 5 kV, buried directly underground, installed in liners, gutters or steel tubes, as well as cables installed in the open air. In IEC 60287, "permanent use" is understood to mean the continuous circulation of a sufficient constant current (load factor 100%) to asymptomatically achieve the maximum conductor temperature, assuming that the conditions of the ambient environment remain unchanged.

Basic assumptions for calculating permissible currents under IEC 60287

- Copper or aluminium core(s).
- Insulation class "maximum temperature resistance of insulation"
- Insulated cable in open air resting on supports or flanges.
- Outer cable diameter less than 150 mm.
- Cable protected from direct sunlight.
- AC (F = 50 Hz) or DC ≤ 5000 V.
- Suitable thermal dissipation and ventilation in the immediate vicinity of the cable.
- No external heat sources in the immediate vicinity of the cable.

Observations

The values indicated in the tables, graphs or calculations are indicative and theoretical.
They must only be used as estimations or as a starting point for a more detailed experimentation plan.
Indeed, these values can vary significantly according to core stranding options, the type of insulation, the number of conductors, the environmental conditions, the conditions of installation, etc.
Our technical departments are at your service for further and more detailed analyses.

Complements

Correction factors

The calculations of maximum permissible current strength according to IEC 60287 result in graph curves that can be downloaded directly from our website, www.omerin.com. Today a large majority of OMERIN products have their own maximum permissible current graphs. However, if you are unable to find the right one or access the graphs, please contact us.

These graphs are given for specific cable installation conditions (blue box on upper right of graph: see basic assumptions on previous page). For other conditions of installation, you may apply the correction factors given below.

To select the correct dimensioning of your cables, apply the following formula and select the dimensions according to the correction:

$I_{corrected} = (I_{application} / K) / (\text{number of cables per phase})$

Correction factors for several single-core cables or multicore cables

	Correction factors Number of single or multicore cables										
Layout of sealed cables	2	3	4	5	6	7	8	9	12	16	20
Enclosed	0.8	0.7	0.65	0.6	0.55	0.55	0.5	0.5	0.45	0.4	0.4
Single layer on walls or floors or non-perforated trays	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.7	0.7	0.7	0.7
Single layer on ceiling	0.85	0.76	0.72	0.69	0.67	0.66	0.65	0.64	0.64	0.64	0.64
Single layer on perforated horizontal or vertical trays	0.88	0.82	0.77	0.75	0.73	0.73	0.72	0.72	0.72	0.72	0.72
Single layer on cable raceways, gutters, welded frames, etc.	0.88	0.82	0.8	0.8	0.79	0.79	0.78	0.78	0.78	0.78	0.78

Correction factors for installation in several layers

Number of layers	1	2	3	4	5	6	7	8	>9
Coefficient	1	0.8	0.73	0.7	0.7	0.68	0.68	0.68	0.66