

Electric cables — Calculation of the current rating —

**Part 3-3: Sections on operating
conditions — Cables crossing external
heat sources**

ICS 29.060.20

National foreword

This British Standard was published by BSI. It is the UK implementation of IEC 60287-3-3:2007.

The UK participation in its preparation was entrusted by Technical Committee GEL/20, Electric cables, to Subcommittee GEL/20/16, Medium/high voltage cables.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 June 2007

© BSI 2007

ISBN 978 0 580 55214 4

Amendments issued since publication

Amd. No.	Date	Comments

INTERNATIONAL STANDARD

IEC 60287-3-3

First edition
2007-05

**Electric cables –
Calculation of the current rating –**

**Part 3-3:
Sections on operating conditions –
Cables crossing external heat sources**



Reference number
IEC/CEI 60287-3-3:2007

CONTENTS

INTRODUCTION.....	3
1 Scope	4
2 Normative references	4
3 Symbols	4
4 Description of method	5
4.1 General description	5
4.2 Single source crossing.....	7
4.3 Several crossings	8
4.4 Rating of two crossing cables.....	9
Annex A (informative) Example calculation	10
Annex B (informative) Temperature rise calculation at any point along the route.....	15
Figure 1 – Illustration of a heat source crossing rated cable.....	6
Figure A.1 – Cable configuration	10
Table A.1 – Cable and installation data	11
Table A.2 – Rating factor for the 300 mm ² XLPE 10 kV circuit.....	12
Table A.3 – Rating factor for the 400 mm ² 132 kV cable.....	13
Table A.4 – Rating factors.....	14

INTRODUCTION

In the IEC 60287 series, Part 1 provides general formulae for ratings and power losses of electric cables.

Part 2 presents formulae for thermal resistance, with Part 2-1 providing general calculation methods for thermal resistance.

Part 2-1 provides calculation methods for dealing with groups of buried cables (see 2.2.3). These methods assume that the cables are laid in parallel and hence every cable acts as a parallel line heat source.

This Part 3-3 deals with the crossing of a cable, at right angles or obliquely with another cable, and, more generally, with any linear heat source, such as steam pipes.

When heat sources are installed in the vicinity of a cable, the permissible current-carrying capacity of the cable should be reduced to avoid overheating. But applying formulae that are valid for parallel routes would overestimate the thermal influence of the crossing heat source on the cable.

In this standard a general simplified method is provided to estimate the reduction of the permissible current-carrying capacity of a cable crossed by heat sources.

Every cable and heat source is assumed to be laid horizontally.

ELECTRIC CABLES – CALCULATION OF THE CURRENT RATING –

Part 3-3: Sections on operating conditions – Cables crossing external heat sources

1 Scope

This part of IEC 60287 describes a method for calculating the continuous current rating factor for cables of all voltages where crossings of external heat sources are involved. The method is applicable to any type of cable.

The method assumes that the entire region surrounding a cable, or cables, has uniform thermal characteristics and that the principle of superposition applies. The principle of superposition does not strictly apply to touching cables and hence the calculation method set out in this standard will produce an optimistic result if applied to touching cables.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60287 (all parts), *Electric cables – Calculation of the current rating*

3 Symbols

A	Conductor cross-sectional area	mm ²
DF	Ratio of the permissible current when taking into account the presence of crossing heat sources to the permissible current of the isolated cable (derating factor)	-
I	Maximum permissible current of the rated cable when isolated	A
L	Depth of laying, to cable axis, of the rated cable	m
L_h	Depth of laying of heat source h	m
N	Number of intervals in the spatial discretization for the calculations	
T_1	Thermal resistance per core between conductor and sheath	K×m/W
T_2	Thermal resistance between sheath and armour	K×m/W
T_3	Thermal resistance of external serving	K×m/W
T_4	Thermal resistance of surrounding medium (ratio of cable surface temperature rise above ambient to the losses per unit length)	K×m/W
T_{mh}	Mutual thermal resistance between cable and heat source	K×m/W
T	Equivalent thermal resistance of cable per conductor	K×m/W
T_r	Total thermal resistance of cable per conductor	K×m/W
T_L	Thermal longitudinal resistance of a conductor	K/m/W
W_d	Dielectric losses per unit length per phase	W/m