

Specification for

Electric traction equipment

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The Electrical Industry Standards Committee under whose supervision this British Standard was prepared consists of representatives from the following Government departments and scientific and industrial organizations:

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- Association of Consulting Engineers*
- Association of Manufacturers of Domestic Electrical Appliances
- Association of Mining Electrical and Mechanical Engineers
- Association of Supervisory and Executive Engineers
- British Electrical and Allied Manufacturers' Association
- British Electrotechnical Approvals Board for Household Equipment
- British Radio Equipment Manufacturers' Association
- British Railways Board*
- British Steel Corporation
- Crown Agents for Oversea Governments and Administrations
- Department of Employment (HM Factory Inspectorate)
- Department of the Environment
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- Department of Trade and Industry — Standards, Weights and Measures
- Electric Cable Makers' Confederation*
- Electrical Contractors' Association
- Electrical Contractors' Association of Scotland
- Electrical Research Association
- Electricity Supply Industry in England and Wales
- Electronic Engineering Association
- Engineering Equipment Users' Association
- Institution of Electrical Engineers
- Institution of Electrical and Electronics Technician Engineers
- Lighting Industry Federation Limited
- Ministry of Defence
- National Inspection Council for Electrical Installation Contracting
- Oil Companies Materials Association
- Post Office
- South of Scotland Electricity Board

The industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- London Transport Executive
- Railway Industry Association of Great Britain

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Foreword

This British Standard has been prepared under the authority of the Electrical Industry Standards Committee. It is based upon IEC Publication 77 *“Rules for electric traction equipment”* and is technically identical to it.

This revision of BS 2618 has been extended to cover not only d.c. control equipment for electric traction, but also all the components in the various vehicle circuits with the exception of rotating machines, main transformers, reactors and static convertors for which there are other separate British Standards.

The various circuits each have a specific function. They are so arranged that the motive power unit exhibits the characteristics and qualities required for its operation, having regard to the kind of current used and the characteristics of the supply network in the case of electric vehicles, or the characteristics of the power source in the case of vehicles without external supply.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This specification applies to equipment installed on motive power units in the following categories:

- vehicles supplied with so-called high-voltage d.c., i.e. with a voltage between 600 V and 3 000 V;
- vehicles supplied with high-voltage a.c. at industrial frequency or at special frequency;
- multi-system vehicles capable of being supplied from a number of the systems described above;
- vehicles with independent power source (i.e. accumulators, or heat engines with electrical or other transmission) but excluding road vehicles.

It also applies to equipment installed on control trailers, or distributed among trailer coaches of multiple unit trains.

NOTE 1 Parts of this specification, after agreement between user and manufacturer, are suitable for use for electrical equipment installed on other vehicles such as d.c. electric rolling stock supplied at voltages below 600 V, mine locomotives, trolley-buses and so on.

NOTE 2 The title of the British Standard referred to in this standard is given on the inside back cover.

2 Limitations of the specification

Equipment meeting the requirement of this specification may be used in:

- the main circuits: apparatus for circuit isolation, protection, current breaking, control, regulating and vehicle interconnection;
- high and low-voltage auxiliary circuits (circuits for motors driving vehicle auxiliaries, lighting circuits and circuits for heating or air conditioning of the vehicle or train); apparatus for isolating, protection, interruption, control, regulating and adjustment;
- control and indication circuits apparatus for control, checking, indication and vehicle interconnection.

Control of the various components forming the equipment may be of the mechanical, pneumatic, electrical, hydraulic, electro-magnetic or electro-pneumatic type, or consist of a combination of several types. These equipments may include individual or group controls.

This specification does not apply to the following components or equipment:

- cables (these shall form the subject of special agreement including the methods of installation),
- resistors for use in main circuits,
- lightning arresters,

current collector gear (which depends mainly on the general design of the contact system and the speed of the rolling stock),

fuses for voltages below 600 V,

fuses for high-voltage a.c.,

lamps for lighting,

heating couplers,

roof bushing insulators,

measuring instruments,

equipment for repeating track signals on the rolling stock,

electronic or automatic control equipment,

control couplers,

and, generally, all equipment covered by other British Standards.

However, provided that there has been previous agreement between user and manufacturer, the specification may be applied to certain equipments, such as:

heating, air-conditioning and lighting equipment,

apparatus for the remote control of doors,

electro-pneumatic or electro-magnetic braking equipment.

3 Service conditions

3.1 The specification applies to equipment used in the following conditions:

3.1.1 *Altitude*. In the absence of information on the height above sea level at which the equipment is normally to function, it is to be assumed that this height shall not exceed 1 200 m.

3.1.2 *Temperature*. In the absence of information on the ambient temperatures in which the equipment is normally to function, it is to be assumed that these lie between -25°C and $+40^{\circ}\text{C}$, with an annual average temperature not exceeding $+25^{\circ}\text{C}$.

3.1.3 *Shocks and mechanical vibration*. In the absence of information concerning the degree of vibration and shock to which the equipment is likely to be subjected in service, it is to be assumed:

that the vibration is of sine-wave form, that the frequency f of vibration is between 1 Hz and 50 Hz, and that the amplitude a , expressed in millimetres, is given as a function of f , by the equations:

$$a = \frac{25}{f} \text{ for values of } f \text{ from 1 Hz up to 10 Hz}$$

$$a = \frac{250}{f^2} \text{ for values of } f \text{ exceeding 10 Hz and up to 50 Hz}$$

that the stresses due to sudden variations in vehicle speed correspond to maximum accelerations of $\pm 3g$ (g being the value of acceleration due to gravity).

Where shock absorbers are fitted for a piece of apparatus or for a complete equipment, they shall be considered as part of the assembly.

3.1.4 Installation. With due regard to its location and method of installation on the vehicle, the equipment shall be capable of operating correctly in spite of dust, dirt, mist, rain and snow (especially powdered snow) to which rolling stock is normally exposed in service.

3.1.5 Surface creepage and electrical clearance. For equipment operating at the nominal line voltage between live parts and ground, or between positive and negative poles in systems where both conductors are insulated, surface creepage and clearance values shall be those given in Table 1.

The following meanings have been assigned to the terms used in the headings of Table 1:

- 1) *Clean conditions.* Applies to equipment mounted in vehicle compartments, switch-group (control-group) cases cupboards and all enclosed apparatus.
- 2) *Dirty conditions.* Applies in particular to resistors mounted in a resistor compartment, beneath the underframe or on the roof of the vehicle.
- 3) *Roof mounted.* Applies in particular to ceramic insulators for pantographs and for bare conductors. It does not apply to rubber piping for pantograph air supply or to roof cabling, to which larger values shall be applied.
- 4) *Inside mounted.* Applies to equipment mounted either in an enclosure which is dust-proof or in a chamber where clean conditions apply.

5) *Outside mounted.* Applies to equipment which does not fulfil the conditions for inside mounting.

6) *Electrical clearance.* The values given in the table do not apply to situations influenced by electrical arcs.

Equipment for trolleybuses on systems having nominal voltages up to 600 volts shall conform to the 600 volt values given in Table 1, except that for roof or chassis mounted resistors that are not totally enclosed the minimum surface creepage to the chassis shall be 45 mm.

NOTE 1 Equipment which is operating on any of the nominal line voltages shown in the table, but which is at a potential less than the nominal line voltage, may have proportionally less creepage and electrical clearance values with a minimum of the 600 volt values given in the table.

NOTE 2 Special conditions may demand that the creepage clearances in Table 1 be increased.

NOTE 3 Creepage and clearance values at voltages below 250 V are excluded from Table 1. Other criteria assume greater importance at low voltages and it is not possible to give specific figures without taking this into account. Each application needs to be judged on its own merits and, where appropriate, figures agreed between the user and the manufacturer.

3.2 Special arrangements shall be agreed between user and manufacturer to cover the case of service conditions of greater severity than those mentioned in 3.1, e.g.

- altitude above 1 200 m;
- ambient temperature exceeding 40 °C;
- minimum temperature below – 25 °C, in this case it shall be for the user to change the quality of the lubricant;
- high average temperature combined with high relative air humidity;
- equipment mounted directly on non-suspended components (e.g. bogies, axles and on prime movers);
- heavy rain, sandstorms, etc.

Checks on the effectiveness of such arrangements may form the subject of investigation tests (see Clause 8).

Table 1 — Surface creepage and electrical clearance values for equipment in circuits operating at voltages exceeding 250 volts and not exceeding 3 000 volts

Nominal line voltage volts	Minimum surface creepage values			Minimum electrical clearance values	
	Clean conditions mm	Dirty conditions mm	Roof mounted mm	Inside mounted mm	Outside mounted mm
250 to 600	12	30	60	12	25
750	20	50	65	12	35
1 200	30	60	80	15	45
1 500	40	70	90	20	50
2 400	60	90	115	25	65
3 000	75	100	140	30	75