

Specification for

Bare fine resistance wire for precision electrical equipment —

Part 2: Metric Units

Confirmed December 2011

Co-operating organizations

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:

- Admiralty*
- Associated Offices' Technical Committee
- Association of Consulting Engineers (Incorporated)
- Association of Mining Electrical and Mechanical Engineers
- Association of Supervising Electrical Engineers
- British Electrical and Allied Manufacturers' Association*
- British Electrical Development Association
- British Railways Board
- Cable Makers' Association
- Crown Agents for Oversea Governments and Administrations
- Electric Lamp Industry Council
- Electric Light Fittings Association
- Electrical Contractors' Associations (Incorporated)
- Electrical Contractors' Association of Scotland
- Electrical Research Association
- Electricity Council, Generating Board and the Area Boards in England and Wales
- Electronic Engineering Association*
- Engineering Equipment Users' Association
- Independent Cable Makers' Association
- Institution of Electrical Engineers
- Ministry of Aviation*
- Ministry of Labour (H.M. Factory Inspectorate)
- Ministry of Power
- Ministry of Public Building and Works
- Municipal Passenger Transport Association (Incorporated)
- National Inspection Council for Electrical Installation Contracting
- National Physical Laboratory (D.S.I.R.)*
- Oil Companies Materials Association
- Post Office*
- Public Transport Association (Incorporated)
- South of Scotland Electricity Board

The Government departments and scientific and 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 standard:

- Covered Conductors Association
- Engineering Industries Association
- Radio and Electronic Component Manufacturers' Federation
- Scientific Instrument Manufacturers' Association
- Telecommunication Engineering and Manufacturing Association
- Telephone Manufacturers' Technical Development Committee
- Manufacturers of metallic resistance materials

This British Standard, having been approved by the Electrical Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 4 May 1964

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Foreword

This standard makes reference to the following British Standards:

BS 115, *Metallic resistance materials for electrical purposes.*

BS 1489, *Reels for covered, solid, round winding wires for electrical purposes.*

BS 1861, *Oxygen-free high conductivity copper.*

BS 1888, *Precision reels for bare and oxidized resistance wires.*

BS 3466, *Methods of test for resistance per unit length of metallic electrical resistance material.*

BS 3467, *Method of test for temperature coefficient of resistance of alloy wire for precision resistors.*

This part of BS 1117 has been published because the increased use of metric units in certain industries has created a demand for a specification using these units. It has the same technical requirements as Part I except that all dimensions are in metric units.

It has been found impracticable to include resistance tables in the body of the specification, but a table is given in an appendix for some of the commonly used alloys. This table has been given purely for guidance, and is not mandatory.

It is recommended that fine wires are ordered by the characteristics in Appendix C, all of which need to be stated to enable the manufacturer to comply with the specification.

NOTE In place of the customary, but incorrect use of the gramme as a unit of force, the unit gramme-force (gf) has been used in this specification. This is the force which, when acting on a body of mass one gramme, gives it an acceleration equal to that of standard gravity.

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.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, 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.

1 Scope

This British Standard specifies the electrical and mechanical properties of bare metallic resistance wire of circular cross section and of nominal diameter from 0.0080 mm to 0.315 mm. It applies to wire in all conditions of temper, and to oxidized and bright-finished wires, but does not include requirements for the properties of oxide or other coatings or coverings.

NOTE 1 For resistance materials for general purposes, reference should be made to BS 115 "*Metallic resistance materials for electrical purposes*".

NOTE 2 To enable wire to be supplied in accordance with the specification, it is necessary for the particulars listed in Appendix C to be given in the enquiry or order.

2 Definitions

For the purposes of this British Standard, the following definitions apply:

bend

a sharp change in direction

bright-finished

not oxidized

curl

a permanent deformation of the wire which causes it to take up a helical form in the unstressed condition

noble metal

a metal of the platinum group, or gold

noble metal alloy

an alloy of which noble metals are the major constituents

nominal diameter

the diameter shown on the label on the reel

oxidized

having a uniform adherent film of oxide

snarl

the permanent deformation produced when a loop of wire, restrained in its own plane, is reduced in size by pulling its ends to such an extent that the elastic limit is exceeded

3 Classification

In this British Standard, fine resistance wire is classified into six types on a basis of composition, as shown in Table 1. These types are further sub-divided into lettered grades based on resistance tolerance (see Clause 5), and the grades have a numerical suffix added, based on uniformity of resistance (see Clause 6). Finally, there is a separation into six groups on a basis of variation of resistance with temperature, each group being identified by a lower-case letter (see Clause 8).

NOTE For example, a wire designated as Type 1, Grade B3, Group *b*, of 0.200 mm nominal diameter, will be made of copper-manganese based alloy; its stated resistance (see Clause 5) will not vary by more than 3 per cent from the value specified by the purchaser; the resistance will not vary along the length by more than 0.5 per cent of the value stated by the supplier; and the variation of resistance over the temperature range + 20 to + 50 °C will not exceed 200 parts per million.

Table 1 — Classification

Type	Composition
1	Copper-manganese based alloys
2	Copper-nickel alloys (40-46 per cent nickel)
3	Nickel-chromium alloys (approx. 80 per cent nickel)
4	Nickel-chromium alloys of especially low temperature coefficient of resistance
5	Noble metals and noble metal alloys
6	Metals and alloys not listed above

4 Resistivity of material

The nominal value of the resistivity of the material in a stated condition, in microhm cm at 20 °C, shall be declared by the supplier. He shall also declare that the actual resistivity of the material (in the same condition) from which the wire is made does not vary from this nominal value by more than 5 per cent.

NOTE The resistivity of some of the materials with which this standard is concerned is affected by the rate at which the alloy is cooled from the annealing temperature and also by cold work. Consequently the resistivity of a finished wire may differ substantially from the value declared for the material.

5 Resistance

The resistance of the wire, in ohms per metre at 20 °C, shall be stated on each reel. It shall not vary from the resistance value specified by the purchaser by more than the appropriate tolerance given in Table 2 (see Note to Clause 4 above).