BRITISH STANDARD

BS 2950:1958

Incorporating Amendment No. 1

CONFIRMED
DECEMBER 2007

Specification for

Cartridge fuse-links for telecommunication and light electrical apparatus

[UDC 621.316.923]

Co-operating organizations

The Telecommunication 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*
British Broadcasting Corporation*
British Electrical & Allied Industries Research Association*
British Electrical & Allied Manufacturers' Association*
British Radio Equipment Manufacturers' Association*
British Radio Valve Manufacturers' Association
British Transport Commission
Cable & Wireless Ltd.
Central Electricity Authority and Area Boards
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Radio & Electronic Component Manufacturers' Federation*
Radio Industry Council
Relay Services Association of Great Britain
Telecommunication Engineering & Manufacturing Association*

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 the standard.

British Institution of Radio Engineers
Crown Agents for Oversea Governments and Administrations
Inter-Services Radio Components Standardization Committee
Radio Society of Great Britain

This British Standard, having been approved by the Telecommunication Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 31 January 1958

The following BSI references relate to the work on this standard:—
Committee references
TLE4, TLE/4/1
Draft for comment
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Amendments issued since publication

Amd. No.	Date of issue	Comments
6690	January 1991	Indicated by a sideline in the margin

Contents

Foreword

This standard makes reference to the following British Standards:

BS 381C, *Colours for ready mixed paints.*

BS 646, *Cartridge fuse-links (rated at up to 5 amperes) for a.c. and d.c. service.*

This standard has been prepared under the authority of the Telecommunication Industry Standards Committee and supersedes the Type B fuse-link requirements in BS 646:1935, "*Ordinary duty 250 volt cartridge fuses (rated up to 5 amperes) for a.c. and d.c. service*".

The present standard is based on cartridge fuse-links of the same dimensions, but differs from the old standard in two important respects. Firstly, the rated voltage is now related to the rated current, and is raised to 1 000 volts for the smaller currents; secondly, since under the conditions in which these fuse-links are intended to be used the prospective fault current is restricted, the breaking-capacity test is made at a prospective current that does not exceed ten times the rated current of the fuse-link.

The primary object of the standard is to specify cartridge fuse-links that experience has shown to be adequate for this class of service, without adding to their cost by requiring expensive proving tests. Moreover, since the cost of producing fuse-links giving a close degree of protection increases with the smaller currents, and critical protection is not always required within this range, two classes of fuse-link, Grades A and B, are specified, for rated currents of 250 ma and below, which will blow at two or three times their rated currents respectively.

Fuses within the scope of this standard are not sensitive to normal electromagnetic disturbances, and therefore no immunity tests are required.

Significant electromagnetic disturbance generated by a fuse is limited to the instant of its operation. Provided that the maximum arc voltages during operation in the type test comply with the requirements of the clause in this standard specifying maximum arc voltage, the requirements for electromagnetic compatibility are deemed to be satisfied.

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 10, 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 British Standard relates to non-rewirable cartridge fuse-links for use in conjunction with telecommunication or light electrical equipment where the prospective fault current of the circuit will not exceed ten times the rated current of the fuse-link.

Fuse-links of two grades, A and B, which will blow at two or three times their rated currents respectively, are specified for rated currents of 250 ma and below.

The standard does not specify surge resisting characteristics, but for the guidance of those who wish to make tests of these characteristics, information on a suitable test is given in Appendix A.

2 Definitions

For the purpose of this British Standard the following definitions apply:

cartridge fuse-link

a cartridge containing a fuse-element

cartridge

a totally-enclosing fuse-element container consisting of insulating material tubular in form and having its ends enclosed by metallic caps

fuse-element

that part of a cartridge fuse-link which is designed to melt and thus open a circuit

prospective current (of a circuit)

the direct current or the r.m.s. value of the alternating current that would flow in a circuit containing a cartridge fuse-link if the latter were replaced by a link of negligible impedance

prospective fault current

the maximum value of the prospective current that could occur under fault conditions

rated current

the current, stated by the manufacturer, that the cartridge fuse-link will carry in accordance with Clause **10** a)

rated voltage

the voltage specified in this standard is the highest voltage that may be associated with a cartridge fuse-link of a given rated current

breaking capacity

the capacity of a cartridge fuse-link to open an electrical circuit under prescribed conditions

Section 2. Requirements

3 Dimensions

The dimensions of fuse-links shall be as shown in Figure 1.

4 End-caps

Fuse-links shall have at each end a metallic cap with a cylindrical surface, the outer ends being substantially flat and at right angles to the axis of the cylinder. The caps shall be of non-corroding metal or of metal suitably protected against corrosion and shall be effectively free from fluxes or other non-conducting substances on the contacting surfaces.

The axial deviation of either end-cap to the body of the fuse-link shall be checked by means of the gauge shown in Figure 2. The entire length of the fuse-link shall pass by its own weight through the gauge when the latter is held with its axis vertical.

5 Preferred rated currents and voltages

The rated currents and voltages of the preferred range of fuse-links are specified in Table 1. A fuse-link having an intermediate value of rated current shall be rated at the voltage of the fuse-link having the next higher rated current in the preferred range.

6 Minimum life

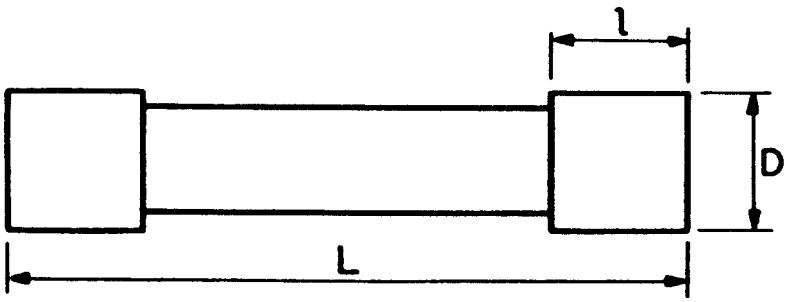
Fuse-links shall be capable of passing the minimum life test specified in Clause **10** a).

7 Blowing current

Fuse-links shall be capable of passing the blowing-current test specified in Clause **10** b).

8 Breaking-capacity

Fuse-links shall be capable of passing the breaking-capacity test specified in Clause **10** c).

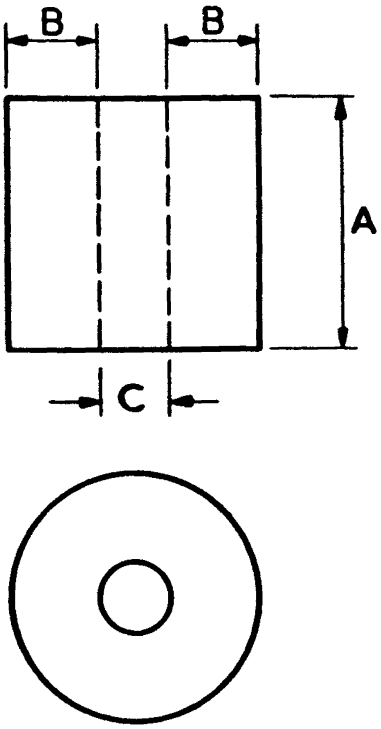


l. 7/32 in. ± 1/32
5·55 mm ± 0·8

D. 0·25 in. ± 0·005
6·35 mm ± 0·13

L. 1¼ in. + 1/32 − 1/64
31·8 mm + 0·8 − 0·4

Figure 1 — Dimensions of fuse-links



A. min.	1·5 in. 38·1 mm
B. min.	0·5 in. 12·7 mm
C. min.	0·258 in. $+0{\cdot}003$ -0 6·553 mm $+0{\cdot}076$ -0

Figure 2 — Gauge for fuse-links

Table 1 — Rated currents and voltages of the preferred range of cartridge fuse-links

Rated current Amp	Blowing current Amp [See Clause 10 b)]		Rated voltage		Optional Colour Code	
	Grade A	Grade B	a.c.	d.c.	Colour	BS 381C[a] Colour No.
0.05	0.10	0.15	1 000	1 000	Salmon Pink	443
0.06	0.12	0.18	1 000	1 000	Black	—
0.10	0.20	0.30	1 000	1 000	Dark Admiralty Grey	632
0.15	0.30	0.45	1 000	1 000	Post Office Red	538
0.25	0.50	0.75	1 000	750	Dark Brown	412
	Grade A					
0.50	1.0		750	350	Golden Yellow	356
0.75	1.5		500	300	Mid Brunswick Green	226
1.0	2.0		350	250	Azure Blue	104
1.5	3.0		250	250	Sky Blue	101
2	4.0		250	250	Dark violet	796
3	6.0		250	32	White	—
5	10		250	32	Black and White	—
7	14		150	32	Light Orange	557
10	20		100	32	Light Orange and Black	557 —
12	24		100	32	Light Orange and Dark Admiralty Grey	557 632
15	30		50	32	Light Orange and Mid Brunswick Green	557 226
20	40		32	32	Light Orange and Dark Violet	557 796
25	50		32	32	Light Orange and White	557 —

NOTE These fuse-links are not intended for use in circuits where the prospective fault current will exceed 10 times the rated current of the fuse-links.

[a] BS 381C, *Colours for ready-mixed paints*. These numbers are added for guidance only and are not mandatory.

9 Marking

Each fuse-link shall be clearly and indelibly marked with the following information:

a) The number of this standard, viz. BS 2950 followed by the letter A or B according to the grade.

b) The rated current. Fuse-links may in addition be colour-coded and, if they are, the code shall be in accordance with Table 1. Ratings which are not included in the preferred range shall not be colour coded.

c) The manufacturer's name or identifying mark.

Section 3. Tests

10 Performance tests

All tests of fuse-links specified in the following clauses shall be type-tests.

The fuse-links used for the type-tests shall be identical in all details likely to affect the performance with those to be used in service. Certificates of type-tests shall be deemed evidence of compliance of fuse-links with the requirements of the relevant clauses of the standard and the manufacturer shall hold available such certificates, together with detail drawings of the fuse-links and a record of any alterations that have been made in the fuse-links subsequent to the type-tests. The manufacturer shall, if required by the purchaser, certify that the fuse-links are identical in material and performance with those covered by a certificate of stated date. Type-tests may be made by the manufacturer, provided that he shall arrange for a recognized authority to make any type-tests for which he himself is not equipped.

Six new fuse-link shall be used for each test.

Fuse-links shall be deemed to comply with this specification only if all that are tested pass the tests.

The cartridge fuse-links shall be mounted for test vertically in a metal testing enclosure as shown in Figure 3, and shall be tested at an ambient temperature of 15 – 25 °C. Connections shall be made with electric cable soldering tags of appropriate size to each terminal by not less than 2 ft of vulcanized rubber or P.V.C. covered cable of the following standard sizes:

Not exceeding 5 amperes	3/.029
Exceeding 5 amperes but not exceeding 20 amperes	7/.029
Exceeding 20 amperes	7/.036

a) *Minimum life test*. Each fuse-link shall be capable of carrying its rated current for 1 000 hours. The test shall be made with not more than ten interruptions, and the current shall be held within the limits of $^{+2}_{-0}$ per cent.

This test may be carried out at any convenient voltage.

b) *Blowing-current test*. The cartridge fuse-links shall blow within 10 seconds at their rated voltage and at twice their rated current for Grade A fuse-links, or at three times their rated current for Grade B fuse-links, immediately after having carried their rated current for not less than one minute and not more than ten minutes.

The doubling or trebling of the current shall take place within one second.

c) *Test of breaking capacity*. Cartridge fuse-links of up to and including 2 amp rated current shall be tested for breaking capacity by testing each fuse-link, in the enclosure shown in Figure 3, in a d.c. circuit, at the rated voltage of the fuse-link with a tolerance of ± 5 per cent.

Cartridge fuse-links of more than 2 amp rated current shall be tested in an a.c. circuit having a power factor of any convenient value between 0.8 lagging and 1.0 at the rated alternating voltage of the fuse-link, with a tolerance of ± 5 per cent, and also in a d.c. circuit having a time constant not exceeding 0.002 sec at the rated d.c. voltage of the fuse-link with a tolerance of ± 5 per cent.

The test circuit connections shall be as shown in Figure 4. The prospective current shall be ten times the rated current of the fuse-link.

For fuse-links of up to and including 2 amp rated current six fuse-links shall be tested at their rated d.c. voltage. For fuse-links of more than 2 amp rated current six shall be tested at their rated d.c. voltage and six at their rated a.c. voltage.

11 Criteria of failure

A fuse-link shall be deemed not to comply with this British Standard, if in any of the above tests one or more of the following are found to have occurred:

a) The fuse-link has burst violently.

b) The end-caps are externally damaged.

c) The fuse-link "x" has blown, indicating arcing to the metal enclosure. (See Figure 4.)

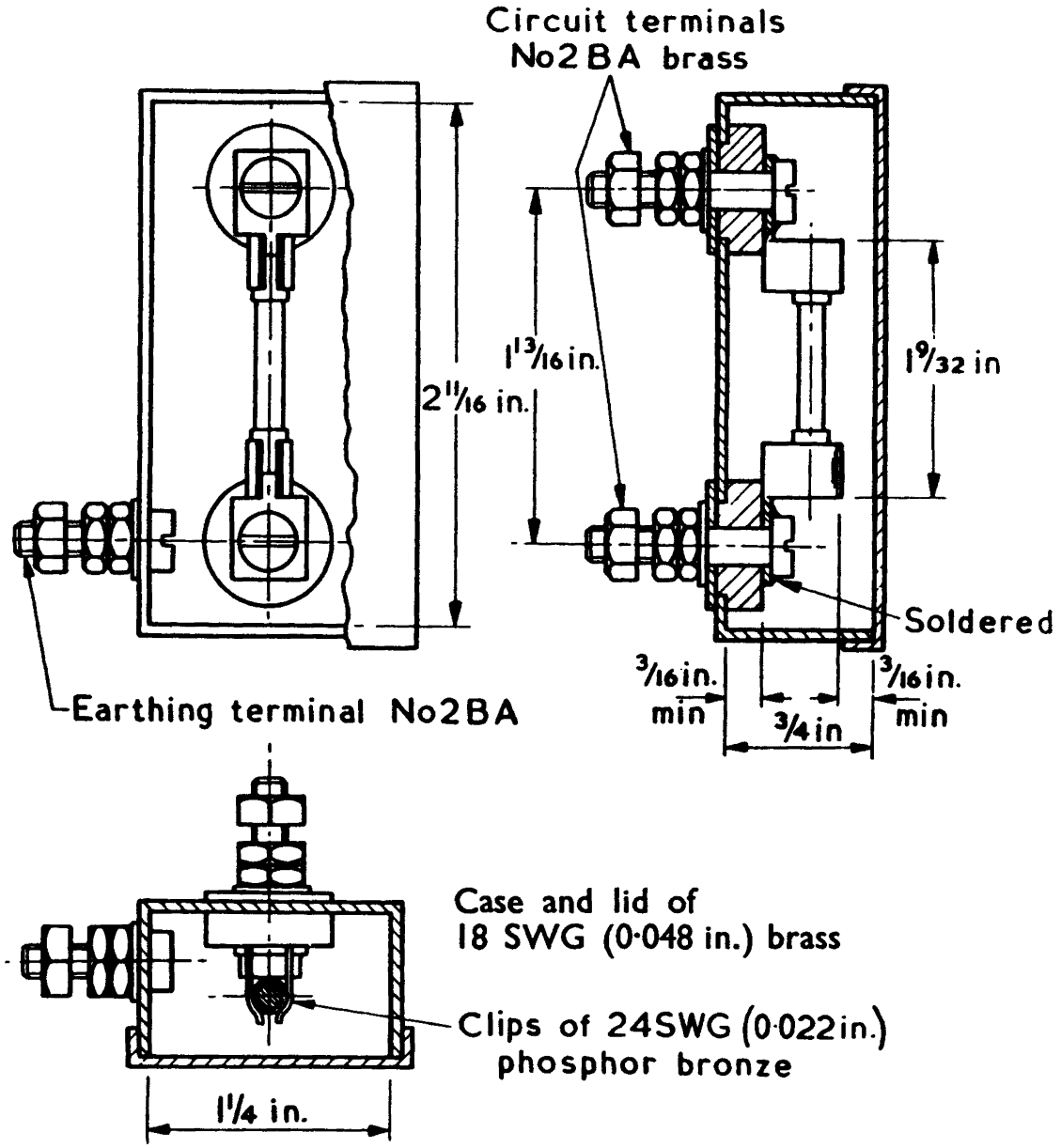
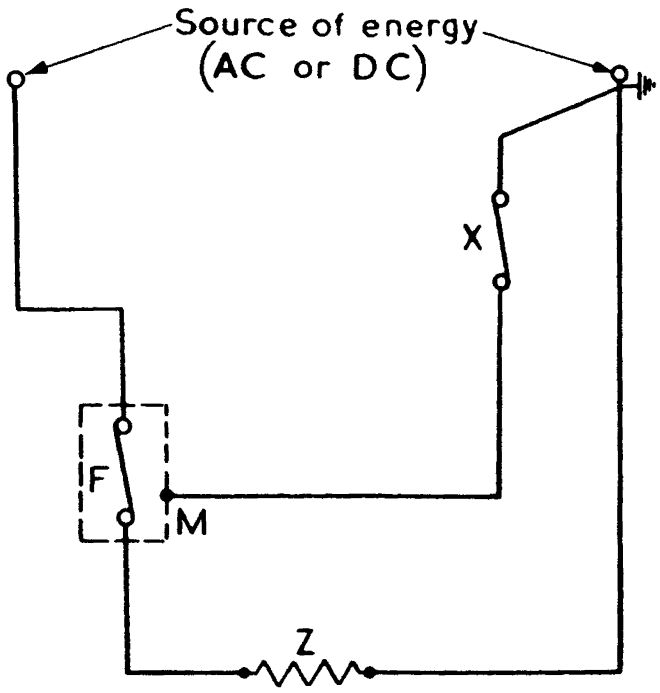


Figure 3 — Testing enclosure



F—Fuse-link on test

M—Testing-enclosure

X—Cartridge fuse-link that will blow within 10 seconds at 200mA at the rated voltage of the fuse-link under test

Z—(If required)—resistor, or reactor, or resistor and reactor in series

Figure 4 — Diagram of connections for tests

Appendix A Recommended method for comparing the surge-resisting characteristics of small telecommunication cartridge fuse-links

Figure 5 gives the circuit diagram of apparatus suitable for comparing the surge-resisting characteristics of small telecommunication cartridge fuse-links having a rated current up to and including 1 amp.

The operation of the apparatus is as follows:

S is a change-over switch arranged to operate at 60 second intervals and so constructed that one set of contacts opens a fraction of a second before the other closes.

When Contact 1 closes, a surge of current whose peak value is controlled by the value of R and whose exponential decay is controlled by CR, flows through the fuse-link. The CR product is maintained at ten milliseconds and the values of C and R are adjusted to produce the required peak current.

The time constant of ten milliseconds is chosen because it represents an average of conditions commonly occurring in practice in domestic radio and television equipment.

C_1, the final smoothing capacitor of the d.c. supply unit, has a value of at least ten times that of C to maintain the supply voltage sensibly constant during the current surge.

After Contact 1 has opened, Contact 2 closes and discharges C ready for the next operation. The discharging surge can conveniently be used to operate a relay and counter system which of course, automatically stops when the fuse-link "blows".

It is recommended that the fuse-link should be subjected to 1 000 operations.

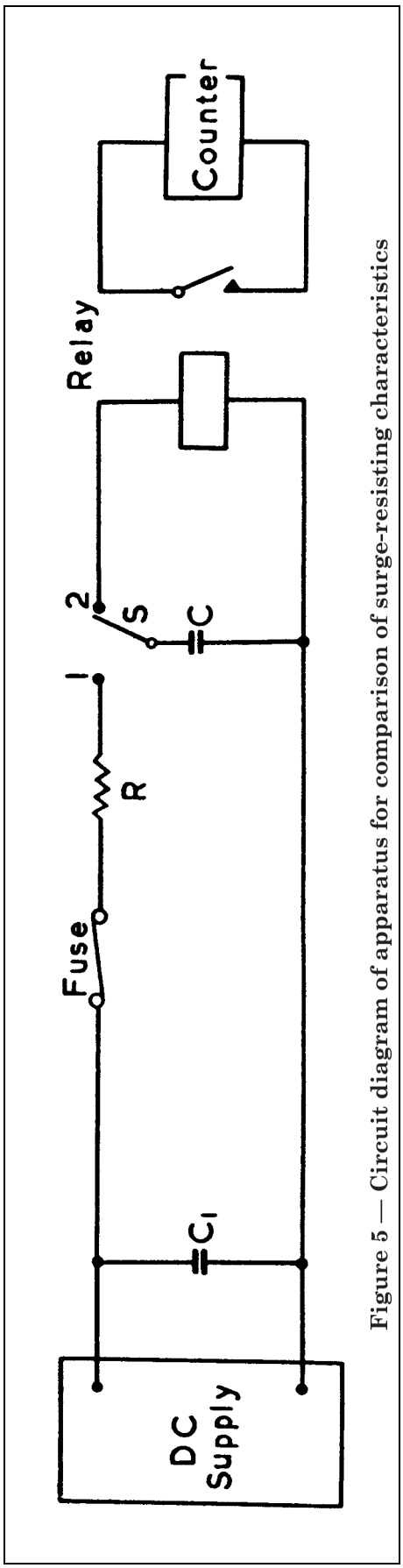


Figure 5 — Circuit diagram of apparatus for comparison of surge-resisting characteristics

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British Standards

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