BRITISH STANDARD

BS 5266-3: 1981

Emergency lighting —

Part 3: Specification for small power relays (electromagnetic) for emergency lighting applications up to and including 32 A

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Contents

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Foreword

This Part of this British Standard has been prepared under the direction of the General Electrotechnical Engineering Standards Committee.

BS 764 (confirmed 1974) is an established specification for automatic changeover contactors, which are generally used for the centralized control of emergency lighting systems. The practice has developed over the years of employing small power relays which may be used to control small systems and individual luminaires.

These small power relays are sufficiently different from the contactors specified in BS 764 to make it necessary for them to be specified in a separate standard.

The purpose of this standard is to provide a specification for small power relays which, as well as transferring small systems to an emergency supply, are also used to control a small number of lamps, including a single unit, and which may be compact enough to be housed within a luminaire.

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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.

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1 Scope

1.1 This standard specifies the performance characteristics of relays capable of transferring an emergency lighting load from a normal source of supply to an emergency supply when the normal source of supply fails; or connecting an emergency lighting load when de-energized, and disconnecting an emergency lighting load when energized.

NOTE The use of relays satisfying the performance requirements of this specification does not necessarily ensure the maintenance of adequate lighting under emergency conditions and it may be necessary to fit ancillary equipment.

1.2 The object of this standard is:

a) to draw attention to the need for the relay to be able to make a reliable and positive transfer of the emergency lighting load to the emergency supply after being in the normally energized position for an extended period of time, e.g. 12 months;

b) to specify tests to confirm that these conditions have been fulfilled and to describe the methods to be adopted for these tests.

2 References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3 Standard conditions for construction

3.1 Mechanical design

3.1.1 *General*. The relay shall always "fail safe" by automatically taking up the emergency supply position.

3.1.1.1 The following shall *not* be used.

a) Any latch arrangement to retain the transfer switch in any position.

b) Any electrical energy to cause the transfer switch to change to the emergency position.

3.1.1.2 Insulating materials shall be classified in accordance with BS 2757.

3.1.1.3 All plastics materials used shall be tested for the rate of burning in accordance with method 508A of BS 2782:1970. Three specimens of each material shall not burn to the first mark and any flame or after-glow, after removal of the burner, shall not endure for more than five seconds.

3.1.2 *Terminals.* Where screw terminals are used, they shall be such that they cannot turn or be displaced when the connecting screws are tightened, and such that the connectors cannot become displaced and the necessary pressure on the conductor is maintained permanently.

No contact pressure shall be transmitted through insulating materials, and the gripping of the conductor shall take place between metal surfaces. Where snap-on connectors are used, they shall be suitably protected against corrosion.

Terminal screw sizes shall be in accordance with Tables 15, 16 and 17 of BS 3456-101:1978. Appropriate extracts from these tables are shown in Table 4, Table 5 and Table 6 respectively.

The maximum torques to be applied to screw fixings shall be as shown in Table 1.

Table 1 — Maximum screw fixing torques

Nominal thread diameter	Screws without heads not protruding from the hole when tightened	Others
mm	N m	N m
3.0	0.25	0.5
3.5	0.4	0.8
4.0	0.7	1.2

3.1.3 *Contact contamination.* The construction shall be such that deterioration greater than that specified in **7.6** does not occur.

3.1.4 *Mounting.* Provision for secure mounting shall be made as well as means to prevent movement in any plane when fixed. Plug-in relays shall be equipped with a retaining device.

3.1.5 *Ambient temperature*. The ambient temperature range shall be from – 10 °C to + 55 °C.

3.2 Electrical design

3.2.1 *Clearance and creepage distances.* Clearance and creepage distances shall be not less than the values given in Table 2.

3.2.2 ***Coils***

3.2.2.1 All coils shall be capable of withstanding the continuous application of 110 % of rated voltage over the ambient temperature range.

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Table 2 — Clearance and creepage distances

NOTE See also explanation of terms on page 3.

Type of insulation	Dimensions in mm required for working volts[b]																			
	Up to 50[a]					Over 50 and up to 130					Over 130 and up to 250					Over 250				
	Clearance	Creepage with CTI[h]				Clearance	Creepage with CTI				Clearance	Creepage with CTI				Clearance	Creepage with CTI			
		120 — 174	175 — 249	250 — 699	over 700		120 — 174	175 — 249	250 — 699	over 700		120 — 174	175 — 249	250 — 699	over — 700		120 — 174	175 — 249	250 — 699	over 700
Operational insulation[f,g]																				
Sealed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Encapsulated	0.3	0.5	0.4	0.3	0.3	0.5	0.8	0.7	0.6	0.5	0.9	1.4	1.2	1.0	0.9	1.3	2.1	1.8	1.5	1.3
Clean	0.4	0.6	0.5	0.4	0.4	0.6	1.0	0.8	0.7	0.6	1.0	1.7	1.4	1.2	1.0	1.5	2.4	2.1	1.8	1.5
Normal	0.5	0.8	0.7	0.6	0.5	0.8	1.4	1.2	1.0	0.8	1.4	2.3	2.0	1.7	1.4	2.1	3.4	2.8	2.4	2.1
Dirty	0.8	1.4	1.1	0.8	0.8	1.2	2.0	1.7	1.4	1.2	2.0	3.4	2.8	2.3	2.0	2.8	4.8	4.0	3.4	2.8
Wet-dirty	1.1	2.1	1.7	1.4	1.1	1.7	3.0	2.5	2.0	1.7	2.8	4.8	4.9	3.4	2.8	4.0	6.8	5.7	4.8	4.0
Basic insulation[e,f]																				
Clean	0.4	0.8	0.6	0.5	0.4	0.7	1.2	1.0	0.8	0.7	1.2	2.0	1.7	1.4	1.2	1.8	2.8	2.4	2.1	1.8
Normal	0.6	1.1	0.9	0.8	0.6	1.0	1.7	1.4	1.2	1.0	1.7	2.8	2.3	2.0	1.7	2.4	4.0	3.4	2.8	2.4
Dirty	0.8	1.7	1.4	1.1	0.8	1.4	2.5	2.0	1.7	1.4	2.3	4.0	3.4	2.8	2.3	3.4	5.7	4.8	4.0	3.4
Wet-dirty	1.4	2.6	2.1	1.7	1.4	2.0	3.6	3.0	2.5	2.0	3.4	5.7	4.8	4.0	3.4	4.8	8.0	6.8	5.7	4.8
Across full disconnection	As for basic protective insulation, but see footnote[c]																			
Across microdisconnection	As for operational insulation, but see footnotes[c] and[d]																			
Across microinterruption	There are no requirements other than between terminals and terminations.																			
	Between terminals and terminations the requirements are as for operational insulation.																			

[a] The values specified apply to circuits operating at safety extra-low voltage. The values specified for operational insulation apply to all classes of insulation.

[b] If the working voltage across creepage distances and clearances for other than operational insulation is less than the rated voltage of the control, the working voltage is assumed to be equal to the rated voltage.

[c] If the contact member is of the same material and design as the actual contact, the contact member is considered to be part of the contact.

In double-break controls the creepage distances and clearances between parts separated by the action of the control are considered to be the sum of the distances for each part of the double break. For full disconnection, each part of a double break should be at least one-third of the prescribed distance.

[d] The clearances specified apply neither to the separation between contacts, nor between those current-carrying parts where the clearance varies with the movement of the contacts; for such clearances no value is specified. For clearances between parts, other than for terminals and terminations, the values specified may be reduced to a value not less than that of the contact separation, provided the design is such that these clearances cannot be reduced by displacement of the parts concerned, and are at least:

0.5 mm for working voltages up to and including 250 V;
1.0 mm for working voltages over 250 V up to and including 380 V;

2.0 mm for working voltages over 380 V.

[e] For double insulation, if either of the two insulations satisfies the requirements for reinforced insulation, the requirements for the other insulation do not apply.

[f] If the live part is a wire and is coated by a layer of lacquer or enamel that satisfies the requirements of 5.8 for grade 2 of BS 4520:1969, the distance may be reduced by 50 % for operational insulation and for basic insulation.

[g] For operational insulation, any clearance, and any creepage distance over insulating material with a CTI of 175 or greater, may be smaller than specified, provided that the control does not show any defect within the meaning of this specification, or does not reduce the safety of any appliances with which it is integrated or incorporated, if these clearances and creepage distances are short-circuited consecutively.

[h] Comparative tracking index; see, for example, BS 5901.

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Explanation of the terms used in Table 2

a) *Operational insulation:* the insulation between live parts that have a potential difference between them, and which is necessary for the correct operation of the equipment during its required life.

This used to be referred to as part of that insulation known as "functional insulation".

b) *Basic insulation:* the insulation applied to live parts to provide basic protection against electric shock. It includes insulation between live parts and:

1) intermediate conductive parts or metal foil over intermediate insulating surfaces;

2) accessible conductive parts;

3) conductive parts connected to accessible conductive parts;

4) metal foil over accessible insulating surfaces.

This used to be referred to as part of that insulation known as "functional insulation".

See also BS 2754:1976.

c) *Sealed situation:* that when the distance, i.e. creepage or clearance distance, under consideration is within an evacuated or inert gas-filled enclosure that is permanently sealed.

d) *Encapsulated situation:* that when the distance under consideration is effectively protected against the ingress of moisture or dust by means of a seal, or cemented joint of cross-linked polymer or other similar material, or by the use of an encapsulated or moulded enclosure.

e) *Clean situation:* that when the distance under consideration is not exposed to the deposition of dirt, e.g. in the case of a close fitting cover, it is not necessary that this cover should be provided with a gasket or seal.

f) *Normal pollution situation:* when the distance under consideration is exposed to the atmosphere prevailing in normal household premises, and when any dust is only a loose deposit of non-conductive substance.

g) *Dirty situation:* when the distance under consideration is exposed to a deposition of dust greater than in a normal pollution situation, particularly when the dust is partially conductive.

h) *Wet-dry situation:* when the distance under consideration is either exposed to excessive condensation, or when moisture, together with conductive dust, is present.

3.2.2.2 *Voltage ratings*. The preferred voltage ratings are as follows:

a.c. 2, 6, 12, 24

48/50 115, 200, 220, 240

Unless otherwise declared, these shall be at a frequency of 50 Hz.

d.c. 2, 6, 12, 24

48/50 110, 200, 220, 250

3.2.2.3 *Voltage proof*. Coils shall withstand a voltage proof test carried out with the voltages given in Table 3, without breakdown.

The test shall be carried out in the manner described in **6.3**.

3.2.2.4 *Insulation resistance*. Coil circuits shall comply with the following requirement subsequent to the relay being subjected to the electrical endurance test of **7.3**.

The insulation resistance of coil circuits shall be not less than 100 MΩ when tested in accordance with **7.4**.

3.2.3 *Relay contacts*. All normally closed relay contact units shall break before normally open contact units make. Auxiliary contacts may be excluded from this requirement.

Table 3 — Voltage proof: test voltages

Rated voltage	Test voltage	
	a.c. r.m.s. 50/60 Hz	d.c.
	V	V
Up to and including 100 V	500	700
Over 100 V up to and including 250 V	1 500	2 000

3.2.3.1 The manufacturer's literature shall state the following:

a) number of poles and contact form;

b) changeover or normally closed for light or medium duty;

c) normally closed only for heavy duty.

3.2.3.2 Contact rating(s) shall be related to type of load, e.g. tungsten lamp load.

3.2.3.3 The declared contact rating shall be selected from the following categories:

Light duty	100 mA to 6 A	
Medium duty	1 A to 16 A	
Heavy duty	1 A to 32 A	(normally closed operations only)

A relay may have the characteristics of more than one duty category.

3.2.3.4 *Preferred voltage rating*. The relays shall be rated with contacts suitable for either or both of the following categories:

Category 1:	250 V to 24 V d.c. 240 V to 20 V a.c.
Category 2:	28 V to 2 V d.c. 24 V to 2 V a.c.

3.2.3.5 *Parallel paths*. If parallel contacts are used, each contact shall be capable of satisfying all the requirements of the specification for contact life.

3.3 Coil circuits. The manufacturer's literature shall state the coil wattage at its rated voltage.

NOTE Any components that the manufacturer fixes to the relay to enable it to meet the requirements of this specification constitute integral parts of the relay and as such are tested with it.

4 Marking

4.1 Each relay shall be clearly and indelibly marked with the following information:

a) the number of this standard, i.e. BS 5266-3[1)];

b) the date code (year and week), numbering of weeks in accordance with BS 4760;

c) a unique product code, including manufacturer's identification;

d) additional marking, as required.

4.2 Each package containing one or more of these relays shall be marked with the information c) and d) above.

5 Ordering information

The following information shall be provided.

Contact rating	Light, medium and heavy duty
Voltage rating	Category 1 Category 2
Coil voltage	
Mounting arrangement required.	

6 Routine tests

6.1 General. Routine tests should be carried out at the manufacturer's works.

In order to achieve conformity of production, manufacturers shall ensure that all individual relays comply with the requirements of **6.2** to **6.4**, for which the reference temperature is 20 °C.

6.2 Performance characteristics. Pull-in voltage shall be less than 85 % of rated volts on a.c. and 80 % of rated volts on d.c.

Drop-out voltage shall be greater than 10 % of rated voltage for d.c. relays and 60 % for a.c. relays.

NOTE In order to achieve the drop-out it may be necessary to fit ancillary equipment.

6.3 Voltage proof

6.3.1 *Procedure*. The voltage shall be applied between:

a) terminations of each contact circuit. Break contacts shall be opened for this test;

b) all terminations connected together and any exposed metal part not intended to be electrically connected;

c) terminations of separate windings;

d) all coil terminations connected together and all contact unit terminations connected together;

e) terminations of separate contact units;

f) terminations of bifilar windings.

The test shall be made with alternating voltage having an effectively sinusoidal waveform and at the rated frequency (50 Hz or 60 Hz), or at the manufacturer's discretion with direct current for a duration of 1 min.

For the purpose of routine tests and at the manufacturer's discretion, the time can be decreased to 1 s and the applied voltage can be increased by 10 %.

[1)] Marking BS 5266-3 on or in relation to a product is a claim by the manufacturer that the product has been manufactured in accordance with the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, British Standards Institution, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ in the case of certification marks administered by BSI or to the appropriate authority for other certification marks.

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Grouping of circuits shall be according to the values of their rated voltages as follows.

1) Each group shall be tested at the prescribed test voltage in relation to all the other groups connected together.

2) Each circuit shall be tested at the prescribed test voltage in relation to all the other groups connected together.

6.3.2 *Test requirement*. There shall be no breakdown.

6.4 Contact circuit resistance

6.4.1 *Procedure*. The resistance shall be measured using a 4-terminal bridge or by the voltmeter-ammeter method.

The measurement shall be made on all contacts in their closed position. The coil shall be energized with rated voltage (or current), if necessary to effect contact closure.

There shall be no conditioning operation prior to the measurement.

Three test operations shall be made with one measurement per operation. The voltage shall be applied after the contacts are closed, and removed before the contacts are opened.

The contact current shall be

1 A at 20 V d.c. for medium and heavy duty

0.1 A at 2 V for light duty

6.4.2 *Test requirement*. The contact circuit resistance shall not exceed 200 mΩ.

7 Type and qualification tests

7.1 General. The tests shall be carried out by the manufacturer at his works, or at any suitable laboratory of his choice. The tests shall be repeated at intervals of two years. All five samples, which shall be taken from current production, shall comply with the requirements specified at the end of each test.

7.2 Mechanical endurance

7.2.1 *Procedure*. With rated coil voltage and no load applied to the contacts, 10 000 operations shall be performed.

7.2.2 *Post test requirement*. Performance characteristics shall be in accordance with **6.2**.

7.3 Electrical endurance

7.3.1 *Procedure*. With rated coil voltage applied, the contact shall make and break the d.c. rated load consisting of tungsten lamps for 250 operations, and for loads above 1 A each lamp shall contribute no more than 10 % of the total load. All contacts shall be loaded. Maximum speed of operation shall be 120 operations per hour and the duty cycle shall be 50 %.

7.3.2 *Test requirements*

a) *During test*. Throughout the test there shall be no permanent arcing, no flashover between contact sets and no welding of the contacts.

b) *Post test*. The requirements of the following tests shall be satisfied:

1) voltage proof as in **6.3**;

2) insulation resistance as in **7.4**;

3) contact circuit resistance as in **6.4**.

7.4 Insulation resistance

7.4.1 *Procedure*. The insulation test voltage of 500 V d.c. shall be applied between:

a) terminations of each contact circuit; break contacts shall be opened for this test;

b) all terminations connected together and any exposed metal part not intended to be electrically connected;

c) terminations of separate windings;

d) all coil terminations connected together and all contact unit terminations connected together;

e) terminations of separate contact units.

The voltage shall be applied for 1 min, or for such time as is necessary to obtain a stable reading, the insulation resistance being read at the end of that period.

7.4.2 *Test requirement*. The insulation resistance shall be not less than 100 MΩ.

NOTE This test is only performed subsequent to the procedure specified in **7.3.1**.

7.5 Environmental tests

7.5.1 *Cold*. The cold test shall be carried out in accordance with test Aa of BS 2011-2.1A:1977, using the procedure described in **7.3.1** but with the values of the parameters as given below.

Temperature:	– 10 °C
Duration:	250 operations
Speed:	250 operations per hour
Duty cycle:	50 %
Minimum coil volts applied:	90 % of rated voltage

7.5.2 *Dry heat*. The dry heat test shall be carried out in accordance with test Ba of BS 2011-2.1B:1977, using the procedure described in **7.3.1** but with the values of the parameter as given below.

Temperature:	+ 55 °C
Duration:	250 operations
Speed:	250 operations per hour
Duty cycle:	50 %
Maximum coil volts applied:	110 % of rated voltage

7.5.3 *Post test requirement*. The contact circuit resistance requirement given in **6.4** shall be satisfied.

7.6 Contact contamination

7.6.1 *Procedure*. The relay shall be energized at 110 % of maximum rated voltage at maximum ambient temperature with the normally opened contacts, where fitted, carrying the normal rated load for 500 h.

The relay shall be mounted in an enclosure whose volume does not exceed 300 % of the volume of the relay, the latter being computed from the nominal overall dimensions of the relay.

NOTE The result of this test may be affected by contamination from adjacent materials at subsequent mounting.

7.6.2 *Post test requirement*. The contact circuit resistance requirement given in **6.4** shall be satisfied.

Table 4 — Dimensions of pillar terminals[a]

Rated current of the terminal	Minimum nominal thread diameter	Minimum diameter of hole for conductor	Minimum length of thread in pillar	Maximum difference between diameter of hole and nominal thread diameter
A	mm	mm	mm	mm
Up to and including 10	3.0[b]	3.0	2.0	0.6
Over 10 up to and including 16	3.5	3.5	2.5	0.6
Over 16 up to and including 25	4.0	4.0	3.0	0.6
Over 25 up to and including 32	4.0	4.5	3.0	1.0

[a] This table consists of part of Table 15 of BS 3456-101:1978.
[b] For BA threads, this value is reduced to 2.8.

Table 5 — Dimensions of screw terminals[a]

Rated current of the terminal	Nominal thread diameter	Length of thread on screw	Length of thread in screw hole or nut	Nominal difference between diameter of head and shank of screw	Height of head of screw
A	mm	mm	mm	mm	mm
Up to and including 10	3.5	4.0	1.5	3.5	2.0
Over 10 up to and including 16	4.0	5.5	2.5	4.0	2.4
Over 16 up to and including 25	5.0	6.5	3.0	5.0	3.0
Over 25 up to and including 32	5.0	7.5	3.0	5.0	3.5

[a] This table consists of part of Table 16 of BS 3456-101:1978.

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Table 6 — Dimensions of stud terminals[a]

Rated current of the terminal (min.)	**Nominal thread diameter** (minimum)	**Difference between thread diameter and**	
		inner diameter of washers (max.)	**outer diameter of washers** (min.)
A	mm	mm	mm
Up to and including 10	3.0[b]	0.4	4.0
Over 10 up to and including 16	3.5	0.4	4.5
Over 16 up to and including 25	4.0	0.5	5.0
Over 25 up to and including 32	4.0	0.5	5.5

[a] This table corresponds to Table 17 of BS 3456-101:1978.
[b] For BA threads this value is reduced to 2.8.

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Publications referred to

BS 764, *Automatic change-over contactors for emergency lighting systems*[*].

BS 2011, *Basic environmental testing procedures*.

BS 2011-2.1A, *Test A. Cold*.

BS 2011-2.1B, *Test B. Dry heat*.

BS 2754, *Memorandum. Construction of electrical equipment for protection against electric shock*.

BS 2757, *Classification of insulating materials for electrical machinery and apparatus on the basis of thermal stability in service*.

BS 2782, *Methods of testing plastics*.

BS 3456, *Specification for safety of household and similar electrical appliances*.

BS 3456-101, *General requirements*.

BS 4520, *Enamelled copper conductors (polyurethane base with solderable properties)*.

BS 4760, *Numbering of weeks*.

BS 5901, *Method of test for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*.

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