

Please be aware that this PDF has been created from the original hardcopy document, which might not be in good condition and so the PDF might reflect this.

S/S 1972

Issue

NO 11/75

BRITISH STANDARD 861: Part 2: 1966

ISSN 0013-0642/11

SPECIFICATION FOR

AIR-BREAK SWITCHES AND ISOLATORS

Part 2 Switches and isolators for
voltages not exceeding 660 volts and
currents up to 800 amperes a.c.

BRITISH STANDARDS INSTITUTION

Currently in preview, click buy full version

SPECIFICATION FOR
AIR-BREAK SWITCHES
AND ISOLATORS

Part 2. Switches and isolators for
voltages not exceeding 660 volts and
currents up to 800 amperes a.c.

B.S. 861 : Part 2 : 1966

Price 10/- net

BRITISH STANDARDS INSTITUTION

INCORPORATED BY ROYAL CHARTER

BRITISH STANDARDS HOUSE, 2 PARK ST., LONDON, W.1

TELEGRAMS: STANDARDS LOND VI TELEPHONE: MAYFAIR 9000

THIS BRITISH STANDARD, having been approved by the Electrical and Safety Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 18th March, 1966.

- | | | |
|----------|---|-------------------------------|
| B.S. 109 | { | First published, July 1921 |
| | | First revision, February 1923 |
| | | Second revision, January 1933 |
| B.S. 124 | { | Third revision, March 1934 |
| | | First published, May 1923 |
| | | First revision, January 1933 |
| B.S. 126 | { | Second revision, March 1934 |
| | | First published, May 1923 |
| | | First revision, June 1930 |
- First published as B.S. 861, December 1939
First published as B.S. 861, Part 2, March 1966

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 4000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, price 15s. The B.S. Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

- B.S. 91. Electrical cable soldering sockets.
- B.S. 116. Oil circuit-breakers for alternating current systems.
- B.S. 229. Flameproof enclosure of electrical apparatus.
- B.S. 587. Motor starters and controllers.
- B.S. 738. Definitions for non-ignitable and self-extinguishing properties of solid electrical insulating materials (including classification and methods of test).

- B.S. 861. Air-break switches and isolators.
Part 1. Switches and isolators for voltages not exceeding 660 volts and for currents not exceeding 200 amperes.
- B.S. 862. Air-break circuit-breakers (including totally-enclosed and flameproof types) for voltages not exceeding 660 volts.
- B.S. 936. Oil circuit-breakers for medium-voltage alternating-current systems.
- B.S. 2817. Types of enclosure of electrical apparatus.
- B.S. 3078. Isolators (including selectors) for alternating-current systems.
- B.S. 3185. Heavy-duty composite units of air-break switches and fuses for voltages not exceeding 660 V.
- B.S. 3807. Method for the type testing of enclosures for electrical apparatus for use in onerous dust conditions.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

CONTENTS

Co-operating organizations	Page	6
Foreword		7
SECTION ONE: INTRODUCTION		
1. Scope	8	
2. Conditions of service	9	
3. Definitions	9	
4. Classification of types of enclosure	11	
SECTION TWO: RATINGS		
5. Ratings	12	
6. Making and breaking capacity under overload conditions	12	
7. Making capacity of Class 2 switches under fault conditions	12	
8. Short-time current rating of Class 2 switches and isolators (one-second through-fault capacity)	12	
9. Selection of switches and isolators	12	
10. Switches for motor isolation	15	
SECTION THREE: CONSTRUCTION		
11. Enclosures	15	
12. Provision for earthing	16	
13. Operating handle	16	
14. Indication of position of switch or isolator	16	
15. Attachment of covers to enclosures	16	
16. Flashover distances	17	
17. Creepage distances	17	
18. Shielding and prevention of danger	17	
19. Terminals	18	
20. Mounting	18	
21. Switch or isolator contacts	18	
22. Positive action of switches and isolators	19	
23. Double-break knife switches and isolators	19	
24. Cable entries	19	

CONTENTS (continued)

SECTION FOUR: LIMITS OF TEMPERATURE RISE		
25. Temperature rise of current-carrying parts of switches and isolators	Page	20
SECTION FIVE: TESTS		
26. General	20	
27. Temperature rise at rated current	20	
28. Mechanical endurance	22	
29. Tests for making and breaking capacity and short-time current	23	
30. Test for making and breaking capacity under overload conditions	24	
31. Test for making capacity of switches under fault conditions	24	
32. Short-time current test (one-second through-fault capacity)	25	
33. Result of tests	25	
34. High-voltage test	25	
35. Marking	26	
APPENDICES		
A. Temperature measurements	27	
B. Determination of short-time current	27	

ASSOCIATED-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:

- * Associated Offices Technical Committee
- * Association of Consulting Engineers
- * Association of Mining Electrical and Mechanical Engineers
- * Association of Supervising Electrical Engineers
- * British Electrical and Allied Manufacturers' Association
- * British Railways Board
- * Cable Makers' Association
- * Crown Agents for Oversea Governments and Administrations
- * Electric Lamp Industry Council
- * Electric Light Fittings Association
- * Electrical Contractors' Association (Incorporated)
- * Electrical Contractors' Association of Scotland
- * Electrical Research Association
- * Electricity Council, The Generating Board and the Arrangements in England and Wales
- * Electronic Engineering Association
- * Engineering Equipment Users' Association
- * Independent Cable Makers' Association
- * Institution of Electrical Engineers
- * Ministry of Aviation
- * Ministry of Defence, Army Department
- * Ministry of Defence, Navy Department
- * 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 (Ministry of Technology)
- * 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 British Standard:

- Association of Short-circuit Testing Authorities
- Engineer Surveyors' Association
- Lloyd's Register of Shipping
- London Transport Board
- National Coal Board
- North of Scotland Hydro-Electric Board

BRITISH STANDARD SPECIFICATION FOR

AIR-BREAK SWITCHES AND ISOLATORS

Part 2. Switches and isolators for voltages not exceeding 660 volts and currents up to 800 amperes a.c.

FOREWORD

This part of the standard, together with Part 1, supersedes B.S. 861 : 1939. It has been prepared to meet the need for a standard for switches and isolators having current ratings and duties in excess of those specified in B.S. 861, Part 1*. It also provides for a class of isolator not covered by B.S. 3078†.

For isolators with short-time current ratings higher than 16 kA reference should be made to B.S. 3078†.

The range of switches and isolators in this standard falls broadly in the same class as that covered by B.S. 3185‡. The ratings extend up to 800 amperes and a new class of duty is specified for switches and isolators in the range 60 to 800 amperes (Class 2), where conditions are more onerous than those covered by B.S. 861, Part 1*. Provision is also made for switches in the range of 15 to 800 amperes for motor isolation.

This standard describes a range of manually operated load-breaking switches and non-load-breaking isolators.

The scope of the specification has been so framed that the resultant product represents two classes of manufacture in very wide use for mixed distribution systems where experience has shown that a relatively modest performance suffices for the first class but that the second class is necessary for severer duties.

Similar conditions exist, for example, where in one case there is significant impedance between a relatively unlimited supply source and the point where the switch or isolator is located and in the other where there is a lesser impedance.

In order to enable the user to make a suitable choice, tables of performance figures are introduced (in addition to test requirements) for the different classes to permit appropriate selection. These switches and isolators are suitable for very much higher duties where energy-limiting high-breaking capacity fuses exist between the point of supply and the switch or isolator.

* B.S. 861, 'Air-break switches and isolators', Part 1, 'Switches and isolators for voltages not exceeding 660 volts and for currents not exceeding 200 amperes'.

† B.S. 3078, 'Isolators (including selector switches) for alternating-current systems'.

‡ B.S. 3185, 'Heavy-duty composite units of air-break switches and fuses for voltages not exceeding 660 V'.

Where the circuit parameters indicate conditions outside the scope of the performance figures, reference should be made to B.S. 936*, B.S. 862† or B.S. 116‡. Attention is particularly drawn to the figure of making capacity which, in this specification, is given in r.m.s. current as this is considered to be more easily assessed than the peak current given in other specifications.

It should be noted that the number of amperes of the peak current may be double that of the corresponding figure for r.m.s. value.

NOTE. Where metric equivalents are stated the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in B.S. 350, 'Conversion factors and tables'.

SPECIFICATION

SECTION ONE: GENERAL

SCOPE

1. This British Standard specifies open and enclosed type air-break switches, and air-break isolators, hereafter referred to as switches and isolators, for use on a.c. systems having a frequency, unless otherwise indicated, of 50 cycles per second.

The rated voltages covered are 240, 415 and 660 volts, with current ratings of from 300 to 800 amperes for Class 1 switches and isolators, from 60 to 800 amperes for Class 2 switches and isolators, and from 15 to 800 amperes for switches intended for motor isolation, the neutral or mid-point being substantially at earth potential in each case.

For switches and isolators mounted in flameproof enclosures, this standard should be read in conjunction with B.S. 229§.

Switches and isolators to this standard are classified as:

Class 1 switches. Switches intended for use where the power factor is relatively high and the necessity for interrupting more than full load does not normally occur and where the switch is associated with suitable back-up protection.

Class 2 switches. Those required to interrupt overcurrents of low power factor in emergency. Class 2 switches are also assigned a limited fault-making capacity and a short-time rating for emergency conditions only.

NOTE 1. In certain circumstances, back up protection may be necessary for Class 2 switches. See Clause 9.

NOTE 2. Provision is also made for switches intended for motor isolation and having a making and breaking capacity in the range of 6 to 8 times that of the motor normal full load current.

* B.S. 936, 'Oil circuit-breakers for medium-voltage alternating-current systems'.

† B.S. 862, 'Air-break circuit-breakers (including totally-enclosed and flameproof types) for voltages not exceeding 660 volts'.

‡ B.S. 116, 'Oil circuit-breakers for alternating current systems'.

§ B.S. 229, 'Flameproof enclosure of electrical apparatus'.

Class 1 isolators. Isolators intended for use where negligible current is to be interrupted and where quick-acting current-limiting back-up protection exists.

Class 2 isolators. Isolators intended for use where negligible current is to be interrupted and where the back-up protection permits the passage of a limited through (fault) current.

CONDITIONS OF SERVICE

2. Switches and isolators complying with this standard are suitable for use under the following conditions of service:

a. *Ambient temperature.* Ambient temperature having a peak value not exceeding 40°C with an average value not exceeding 35°C over 24-hour periods.

NOTE. Switches and isolators are not suitable for exposure to direct radiation from the sun or other source of heat likely to raise the temperature above the specified ambient temperature.

Under normal conditions of service the available cooling air is subjected to natural atmospheric variations of temperature and hence the peak temperature occurs only occasionally during the hot season, and on those days when it does occur it does not persist for long periods. Meteorological records in the United Kingdom indicate that a temperature of at least 10 degC below the peak temperature will occur within the 24-hour period, and that the average temperature over any 24-hour period that includes the peak temperature will be at least 5 degC below the peak value.

b. *Altitude.* An altitude not exceeding 3300 feet (1000 m) above sea level.

c. *Atmosphere.* An atmosphere not subject to excessive pollution by smoke, chemical fumes, salt-laden spray, textile flyings, etc.

NOTE. Where installation conditions differ appreciably from those specified above, the manufacturer should be consulted in selecting apparatus with appropriate ratings.

DEFINITIONS

3. For the purposes of this British Standard the following definitions apply:

1. *Air-break switch.* A non-automatic device capable of making, carrying and breaking currents in air under normal circuit conditions, including specified overcurrent conditions. It may also be capable of making and carrying for a specified time but not breaking, currents under specified abnormal conditions such as those of short-circuit.

NOTE. Where a switch is used for isolating a circuit under load conditions it is sometimes referred to as an isolating switch.

2. *Air-break isolator.* A non-automatic device capable of opening and closing a circuit in air when negligible current is broken or made, or when no significant change in the voltage across the terminals of each pole of the isolator occurs. It may be capable of carrying, for a specified time, current under abnormal circuit conditions such as those of short-circuit.

NOTE 1. An isolator has no rated making or breaking capacity.

NOTE 2. 'Negligible current' implies current such as the capacitance current of busbars, connections and very short lengths of cable. 'No significant change in the voltage' refers to such applications as the by-passing of circuit breakers.