

Specification for

Industrial duct heaters using metal-sheathed elements

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Committees responsible for this British Standard

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- Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
- British Glass Manufacturers' Confederation
- British Industrial Furnace Constructors Association
- British Lighting Association for the Preparation of Standards (BRITLAPS)
- British National Committee for Electroheat
- British Steel plc
- Committee for Electrical Equipment for Use in Flammable Atmosphere (BEAMA Ltd.)
- Electric Trace Heating Industry Council (ETHIC)
- Electricity Association
- Energy Industries Council
- Engineering Equipment and Materials Users' Association
- Engineering Industries Association
- Health and Safety Executive
- Induction and Dielectric Heating Manufacturers' Association
- Institution of Electrical Engineers
- Lighting Industry Federation Ltd.

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Foreword

This British Standard has been prepared by Technical Committee PEL/27.

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 14, an inside back cover and a back cover.

Specification

1 Scope

This British Standard specifies requirements for industrial electric heaters with a rated voltage of up to 440 V, using metal-sheathed elements and installed in a duct run, for heating in forced air systems or for heating of non-flammable gases.

The heaters may have fixed, replaceable or removable elements.

2 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies: any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

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

3.1 (metal-sheathed heating) element

A heating assembly comprising a resistance alloy within, and insulated from, a tubular metal sheath.

3.2 duct heater

An assembly of metal-sheathed heating element(s), associated controls and wiring, installed in a duct run.

3.3 terminal enclosure

The enclosure in which the elements are terminated.

NOTE. Other electrical equipment can be contained within the enclosure; for example, thermostats, pressure switches, contactors, transformers, fuses.

3.4 fixed element

An element which is permanently attached to its supporting body by adhesive bonding, soldering, brazing or welding.

3.5 replaceable element

An element which can only be removed with the aid of a tool, normally after removal of the element bundle from its containment ducting.

3.6 removable element

An element which can be removed without the need for removing the element bundle from its containment ducting.

3.7 ducting

The sheet-metal fabrication through which the air or non-flammable gases pass, and into which the element bundle is inserted.

3.8 mounting plate

The plate to which the element bundle or containment pocket is attached.

3.9 rated voltage

The voltage assigned to the heater by the manufacturer.

3.10 rated power

The wattage, at rated voltage, assigned to the heater by the manufacturer.

3.11 thermal insulation

A material or system that has the property of resisting the transfer of heat.

3.12 thermostat

A temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which, during normal operation, keeps the temperature of the air or gases between certain limits by opening or closing a heater circuit.

3.13 temperature limiter

A temperature-sensing device, the operating temperature of which may be either fixed or adjustable and which, during normal operation, operates by opening or closing a heater circuit when the temperature reaches a predetermined value.

NOTE. A temperature limiter does not make the reverse operation during the normal duty cycle of the heater. It may or may not require manual resetting.

3.14 thermal cut-out

A device which, during abnormal operation, limits the temperature of a heater, or of parts of it, by opening the circuit or by reducing the current, and which is so constructed that its setting cannot be altered by the user.

3.15 basic insulation

Insulation applied to live parts to provide basic protection against electric shock.

NOTE. Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.16 supplementary insulation

Independent insulation applied in addition to basic insulation, for protection against electric shock in the event of a failure of the basic insulation.

3.17 double insulation

Insulation comprising both basic insulation and supplementary insulation.

3.18 reinforced insulation

A single insulation system applied to live parts that provides a degree of protection against electric shock equivalent to double insulation.

NOTE. The term 'insulation system' does not imply that the insulation is one homogeneous piece. It may comprise several layers that cannot be tested singly.



3.19 stud terminal

Screw-type terminal in which the conductor is clamped under one or two nuts. The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, clamping plate or anti-spread device.

3.20 pillar terminal

Screw-type terminal in which the conductor is inserted into a hole or cavity, where it is clamped under the shank of a screw or screws. The clamping pressure may be applied directly by the shank of the screw or through an intermediate part to which pressure is applied by the shank of the screw.

3.21 screw terminal

Screw-type terminal in which the conductor is clamped under a bolt and washer, the bolt passing through a fixed nut or threaded bush.

3.22 creepage distance

The path between two conductive parts, or between a conductive part and the bounding surface of the element, measured across the surface of the insulating material.

3.23 clearance

The distance between two conductive parts, or between a conductive part and the bounding surface of the element, measured through air.

4 Heating elements

All the heating elements shall conform to BS 7351 : 1990.

5 Rating

5.1 Rated voltage

Heaters shall be rated for a line voltage not greater than 440 V.

NOTE. The requirements of this standard are based on the assumption that, in normal use, the voltage between the supply lines and neutral does not exceed 254 V.

5.2 Rated power

The actual power output from the heater at the operating temperature, on application of the rated voltage, shall not vary from the rated power output by more than the tolerances given in table 1, when verified in accordance with A.1.

Table 1. Power output	
Rated power kW	Tolerance %
0 to 50	± 7.5
≥ 51	± 5.5

6 Degree of protection

The minimum degree of protection provided by heater enclosures shall be in accordance with IP 20 of BS EN 60529 : 1992.

7 Electrical insulation

7.1 The mounting of electrically insulating parts shall be designed so as to prevent breakage or damage due to expansion and contraction.

7.2 Electrically insulating washers, bushings and the like, which are integral parts of the heater, and bases or supports of the mounting of current-carrying parts shall be of a moisture-resistant material which will not be damaged by the temperatures to which they will be subjected under conditions of actual use.

7.3 The insulation between any parts operating at extra-low voltage and other live parts, and between the core of the isolating transformer and other metal parts, shall be as specified in BS 3535 : Part 1 and Part 2.

7.4 Parts which serve as supplementary insulation or reinforced insulation shall either:

- a) be fixed in such a way that they cannot be removed without being seriously damaged; or
- b) be designed so that they cannot be replaced in an incorrect position, and so that, if they are omitted, the appliance is rendered inoperable or manifestly incomplete.

NOTE 1. Sleeving may be used as supplementary insulation on internal wiring, if it can only be removed by breaking or cutting, or if it is clamped at both ends.

NOTE 2. Lining metal enclosures with a coating of lacquer, or with other material in the form of a coating which can be easily removed by scraping, is not deemed to meet this requirement.

7.5 Inside the terminal enclosure, the sheath of a flexible cable or cord shall only be used as supplementary insulation where it is not subject to undue mechanical or thermal stresses and if its insulating properties are not less than those specified for the sheaths of flexible cables and cords in BS 6004, BS 6007, or BS 6500.

8 Thermal insulation

8.1 Thermal insulation materials shall not make contact with the heating element.

8.2 Where terminal enclosures are stood off from the mounting plate to give cooling via natural convection, the stand-off areas shall not be thermally insulated.