BRITISH STANDARD

BS 3214:1974

Incorporating Amendment Nos. 1, 2 and 3

Specification for

Locking connectors for battery operated vehicles, excluding industrial trucks, (320 ampere rating)

Confirmed December 2009

UDC 629.113.65:621.316.541

Co-operating organizations

The Electrical Industry Standards Committee under whose supervision this British Standard was prepared consists of representatives from the following Government department and scientific and industrial organizations:

Associated Offices Technical Committee
Association of Consulting Engineers
Association of Manufacturers of Domestic Electrical Appliances
Association of Mining Electrical and Mechanical Engineers
Association of Supervisory and Executive Engineers
British Electrical and Allied Manufacturers' Association
British Electrotechnical Approvals Board for Household Equipment
British Radio Equipment Manufacturers' Association
British Railway Board
British Steel Corporation
Crown Agents for Oversea Governments and Administrations
Department of Employment (HM Factory Inspectorate)
Department of the Environment
Department of Trade and Industry, Electricity
Department of Trade and Industry (Standards, Weights and Measures Division)
Electric Cable Makers' Confederation
Electrical Contractors' Association
Electrical Contractors' Association of Scotland
Electrical Research Association
Electricity Supply Industry in England and Wales*
Electronic Engineering Association
Engineering Equipment Users' Association
Institution of Electrical Engineers
Institution of Electrical and Electronics Technician Engineers
Lighting Industry Federation Limited
Ministry of Defence
National Inspection Council for Electrical Installation Contracting
Oil Companies Materials Association
Post Office
South of Scotland Electricity Board

The organization marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation on this British Standard:

Accumulator Makers' Association
British Industrial Truck Association
Electrical Installation Equipment Manufacturers' Association
Electric Vehicle Association of Great Britain Ltd.
Society of Motor Manufacturers and Traders Ltd.

This British Standard, having been approved by the Electrical Industry Standards Committee, was published under the authority of the Executive Board on 18 June 1974

First published February 1960
First revision June 1974

The following BSI references relate to the work on this standard:
Committee references ELE/56 and ELE/56/6
Draft for comment 71/25227

ISBN 0 580 08374 8

Amendments issued since publication

Amd. No.	Date of issue	Comments
3640	October 1981	
4873	July 1985	
6125	July 1989	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the authority of the Electrical Industry Standards Committee. It is based on proposals submitted by the Electric Vehicle Association of Great Britain Ltd. and is a revision in metric terms of a standard originally published in 1960 .

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

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 12, 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 specifies locking connectors designed for use in battery electric vehicles (excluding industrial trucks) with a nominal battery voltage not exceeding 96 V. The connectors are intended for operation at ambient temperatures between – 10 °C and 40 °C.

NOTE The titles of the British Standards referred to in this standard are listed on the inside back cover.

2 Definitions

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

2.1
connector section

one of the three interconnecting sections of a locking connector

2.2
locking section

the portion of the locking connector fitted with the locking handle

2.3
fixed section

the portion of the locking connector fitted with a mounting bracket

2.4
free section

the portion of the locking connector not fitted with either a mounting bracket or a locking handle

Section 2. General requirements

3 Rating

The rating for continuous operation of the main contacts shall be 320 A at a maximum direct voltage of 125 V. Pilot contacts shall be rated at 20 A at a maximum direct voltage of 125 V.

4 Construction

Each connector section shall have four contacts, namely, two main current-carrying contacts and two pilot contacts. The pilot contacts make before and break after the main contacts. The locking section shall include a device for maintaining full contact pressure and preventing accidental removal of the plug. The design shall comply with that shown in Figure 1, Figure 2 and Figure 3. Provision shall be made on all connector sections to prevent the polarity on the output side being reversed relative to the input.

A cable sleeve conforming to the design shown in Figure 10 shall be fitted to each free connector section and to each locking section not intended to be fixed into position. The fitting of a cable sleeve to the fixed section and to the locking section when in the fixed condition is optional.

NOTE It is recommended that the insulation of the cables fitted to the main contacts should be removed only to the extent that any gap between the ends of the contact and the cable insulation does not exceed 5 mm when the cable is fitted to the contact.

5 Materials

1) The materials used for the manufacture of current carrying parts shall be as follows:

Main contacts. High conductivity copper rod, condition H, complying with the requirements of BS 1433-C101, BS 1433-C102 or BS 1433-C103, or other material of at least equal conductivity.

Pilot contacts. Brass rod, condition M, complying with the requirements of BS 2874-CZ121 or other material of at least equal conductivity.

2) The insulating material used in the construction of the locking connector shall be a tough, moulding material that will not support combustion and that gives a plastic yield not exceeding 6 mm when tested at a temperature of 100 °C by Method 102 A of Part 1 of BS 2782:1970.

3) Parts made of ferrous metal shall be protected against rusting. Special attention should be given to springs which should be protected with zinc in accordance with the requirements of BS 1706:1960 Zn3.

4) The insulating material used in the construction of the cable sleeve shall be a tough flexible material, resistant to battery electrolyte, hydraulic fluids, lubricating oils and weather. The material shall not support combustion.

Suitable materials include polychloroprene which should be based on polychloroprene complying with the requirements for RS 2 sheath given in Table 3 of BS 6899:1984.

6 Marking

All connector sections shall be clearly and indelibly marked with the following information:

1) The number of this British Standard, i.e. BS 3214.

2) The name or trade mark of the manufacturer.

3) The signs + and – to indicate polarity.

The locking section shall, in addition, be clearly and indelibly marked with the current rating and the voltage of the main contacts, i.e. 320 A, 125 V d.c.

Section 3. Design of connector sections

7 Case

The case shall be of mild steel or other suitable robust material. The essential dimensions are shown in Figure 1, Figure 2 and Figure 3.

8 Contacts

The main and pilot contacts shall be cylindrical, spring-loaded and shall be manufactured from a suitable material in accordance with clause **5** 1). Main contacts may if necessary be faced with a suitable material to enable them to meet the requirements of **11.2**.

The dimensions of the main contacts shall be as shown in Figure 5 and Figure 6 and the dimensions of the pilot contacts shall be as shown in Figure 8 and Figure 9.

The contacts shall be so fixed in the body of the plug as to prevent them from working loose, but shall be self-adjusting with regard to pitch and contact making.

Each contact shall be formed in one piece and shall comply with the dimensions in Figure 5 and Figure 8.

The size of the cable holes in the pilot and main contacts shall provide nominal allowance for the soldering of conductors with maximum cross-sectional areas of 2.5 mm^2 and 70 mm^2 respectively. Where conductors are required to be compression jointed into pilot or main contacts this shall be specified by the purchaser and the diameter of the cable hole and dimensions of the cable barrel shall be subject to agreement between purchaser and supplier.

9 Interior

The interiors shall be of insulating material and shall either fully comply with the dimensions shown in Figure 4 and Figure 7 or shall be interchangeable with the interiors dimensioned in Figure 4 and Figure 7 in which case there shall be no protrusion outside the peripheral dimensions of Figure 4 and Figure 7.

Section 4. Tests

10 Routine test

10.1 High voltage test. Each connector section shall withstand an alternating voltage of 2 000 V r.m.s. of approximately sine wave form and having a frequency between 25 Hz and 100 Hz applied between:

1) line terminals,
2) line terminals and pilot terminals,
3) line terminals and casing,
4) pilot terminals,
5) pilot terminals and casing.

11 Type test

11.1 General. Type tests shall be performed on representative samples of connector section having pilot cables of 2.5 mm^2 and main cables of 50 mm^2 cross-sectional area and 1 m length, connected into their respective contacts.

The mechanical operation of the contacts shall be checked by fully inserting the free section or fixed section, as appropriate, into the locking section and then withdrawing it. This shall be repeated five times after which each contact shall be inspected to ensure that it moves freely within its housing.

Records of type tests shall be accepted as evidence of compliance with the requirements of this standard.

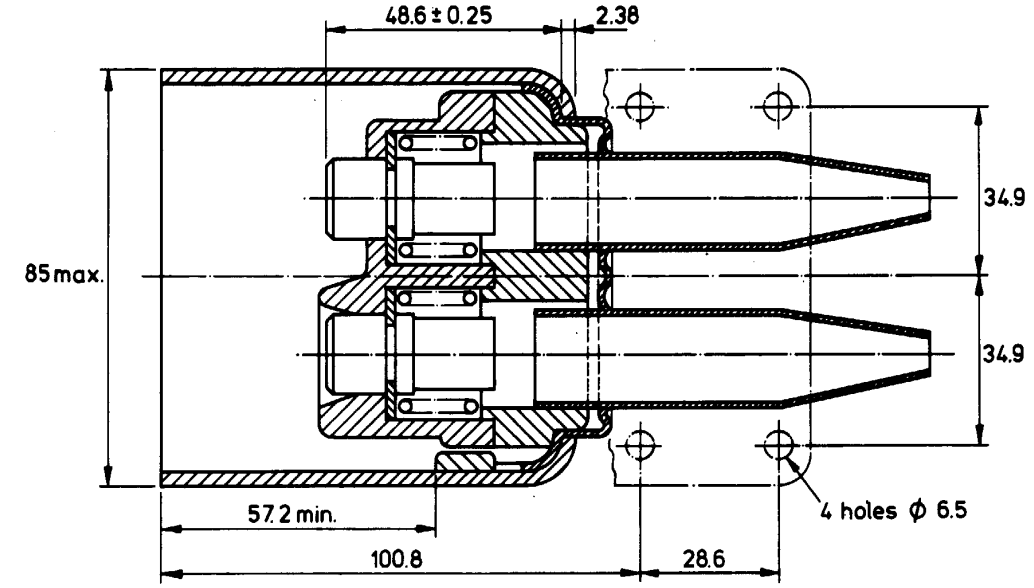
11.2 Temperature rise test. The locking connector shall first be subjected to overload by passing currents of 450 A through the main contacts and 30 A through the pilot contacts for a period of 1 h in an ambient temperature of 40 °C.

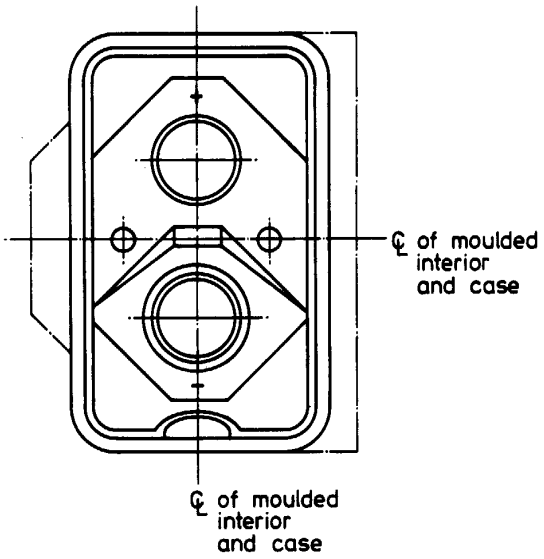
After allowing the assembly to cool to a temperature of 20 °C, currents of 320 A and 20 A shall be passed through the main and pilot contacts respectively for a further period of 1 h in an ambient temperature of 40 °C. 40 °C.

The temperature rise measured immediately after the conclusion of this second period of current heating shall not exceed 65 °C. The temperature rise shall be measured by thermocouples attached by a low melting point alloy or by some equally effective means of attachment.

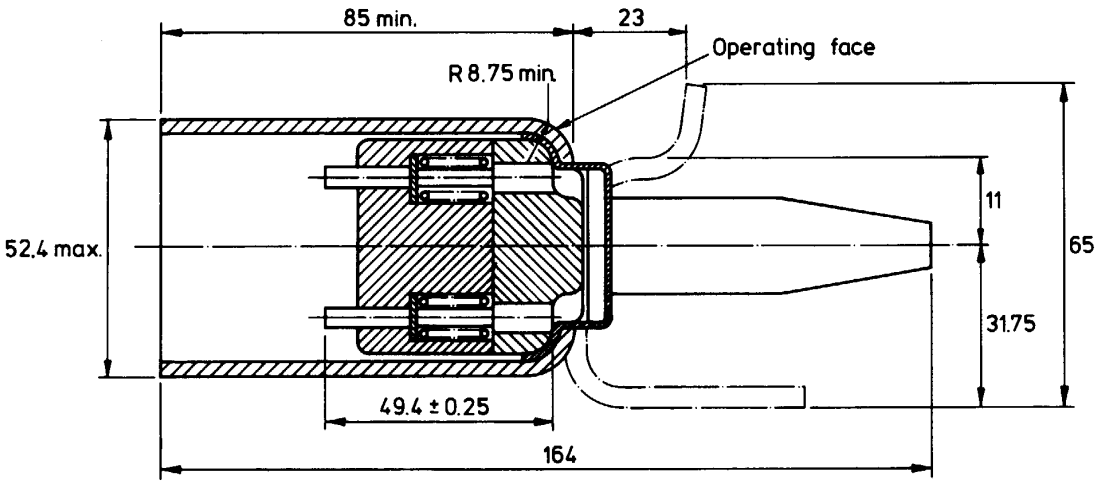
11.3 Mechanical drop test. An assembled unit consisting of a free section fully inserted in a locking section shall be dropped from a height of 1 m on to a concrete floor, such that the locking lever is uppermost and does not make contact with the concrete floor. This test shall be repeated six times after which the locking lever shall not have moved from the closed position.

The above test shall be repeated with an individual free section and an individual locking section socket after which the samples shall show no serious damage and in particular, no part shall have become cracked, detached or loosened. Small chips or dents in the enclosure shall be neglected if they do not affect the insertion of the free section into the locking section or its withdrawal.





The + and − marking is shown to indicate the polarity of the contacts in relation to the operating face and does not necessarily indicate the actual position of the marking on the fixed section.



All dimensions in millimetres

Figure 1 — Fixed section

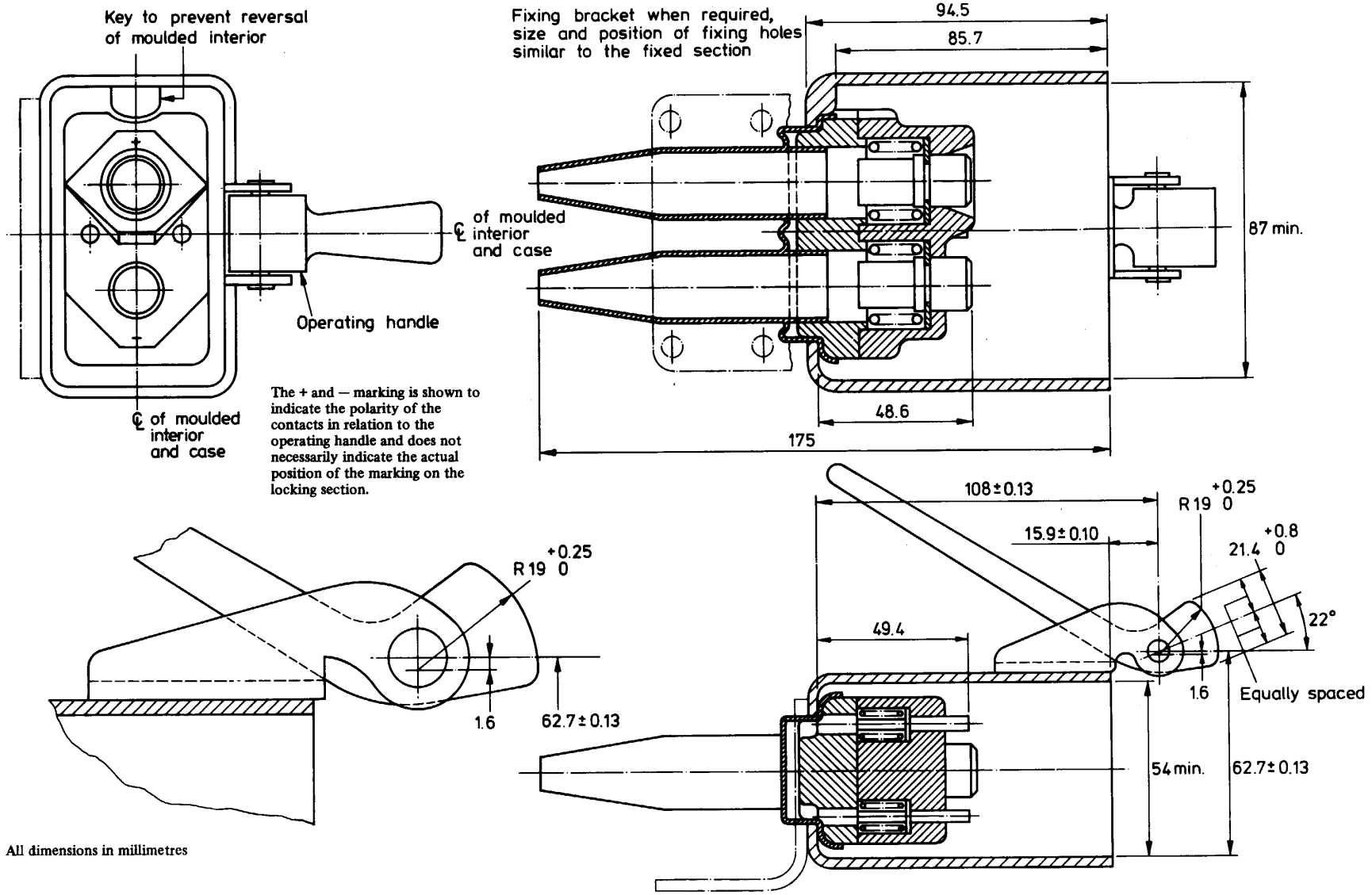
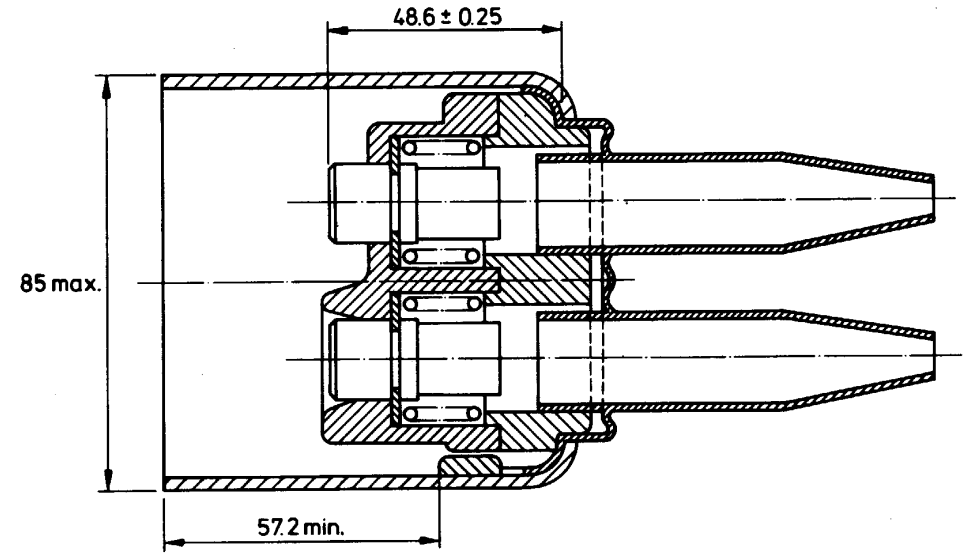
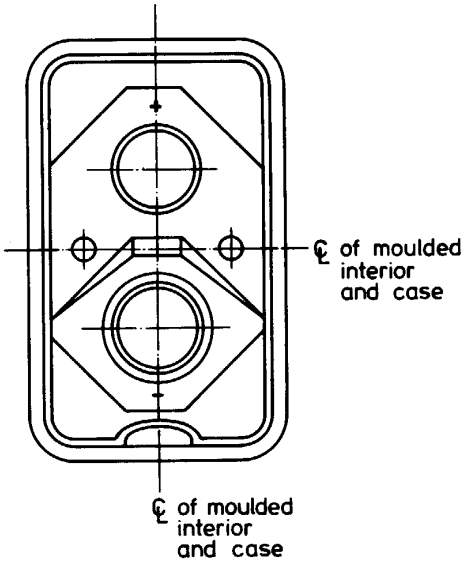
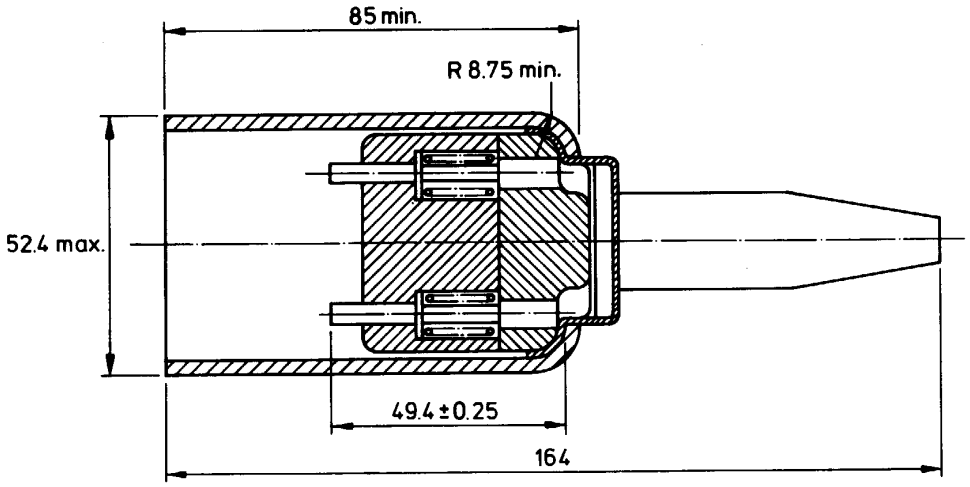


Figure 2 — Locking section





The + and – marking is shown to indicate the polarity of the contacts in relation to the operating face and does not necessarily indicate the actual position of the marking on the free section.



All dimensions in millimetres

Figure 3 — Free section

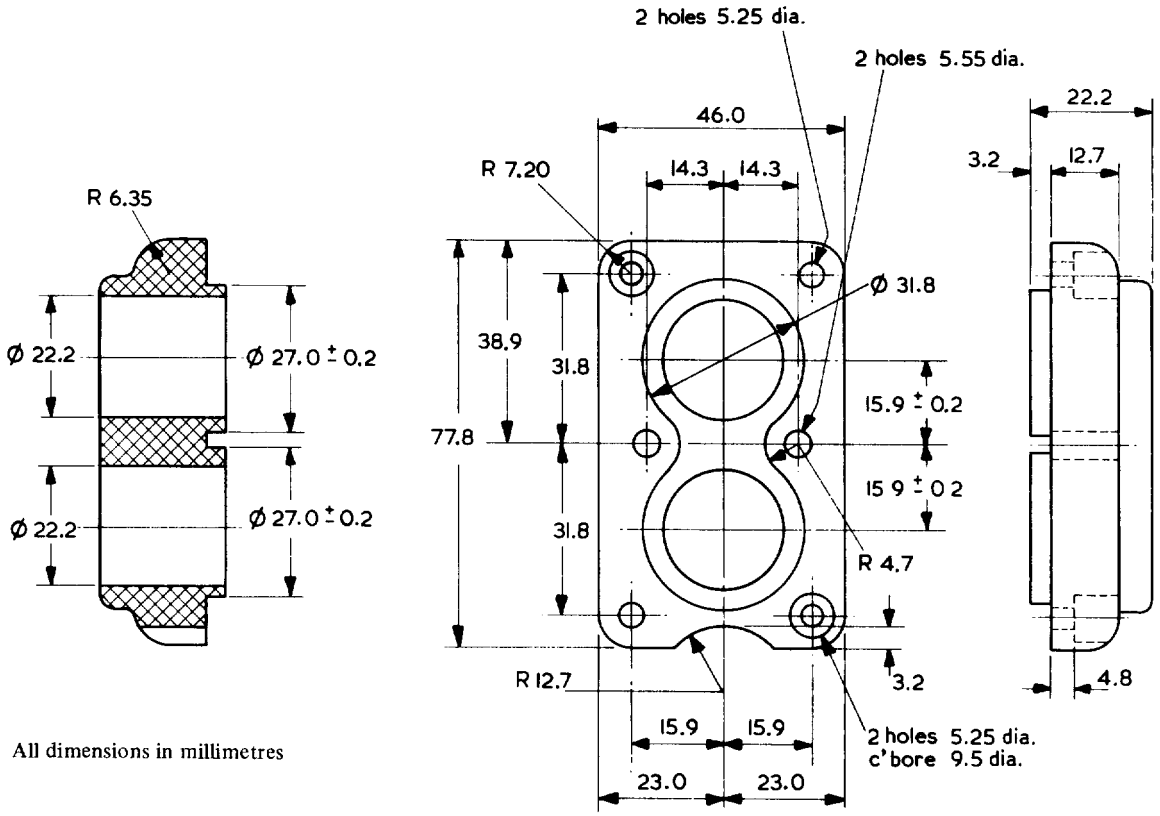


Figure 4 — Interior moulded (back half)

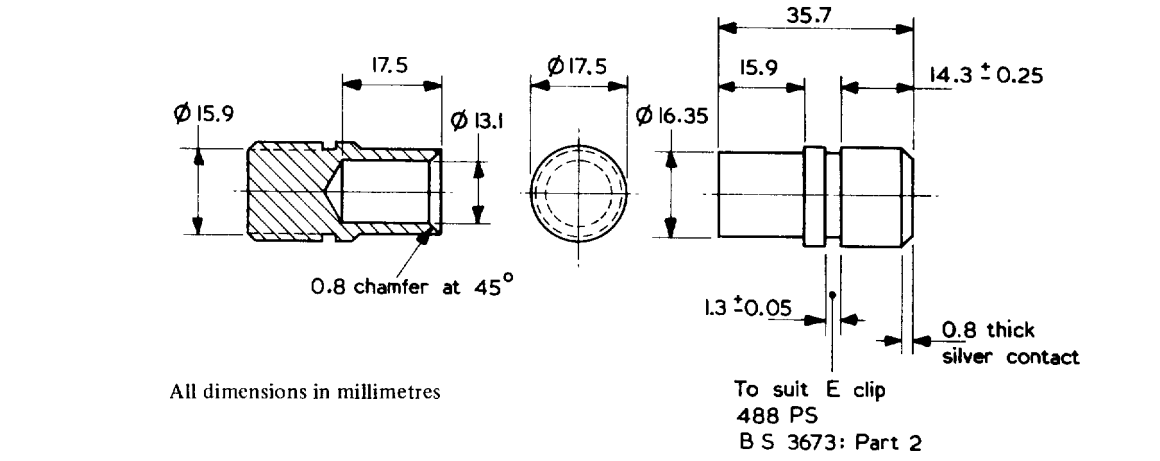
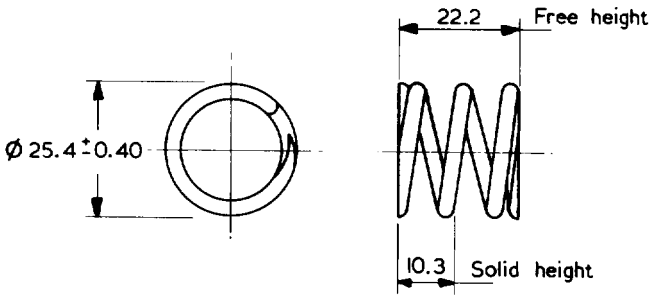


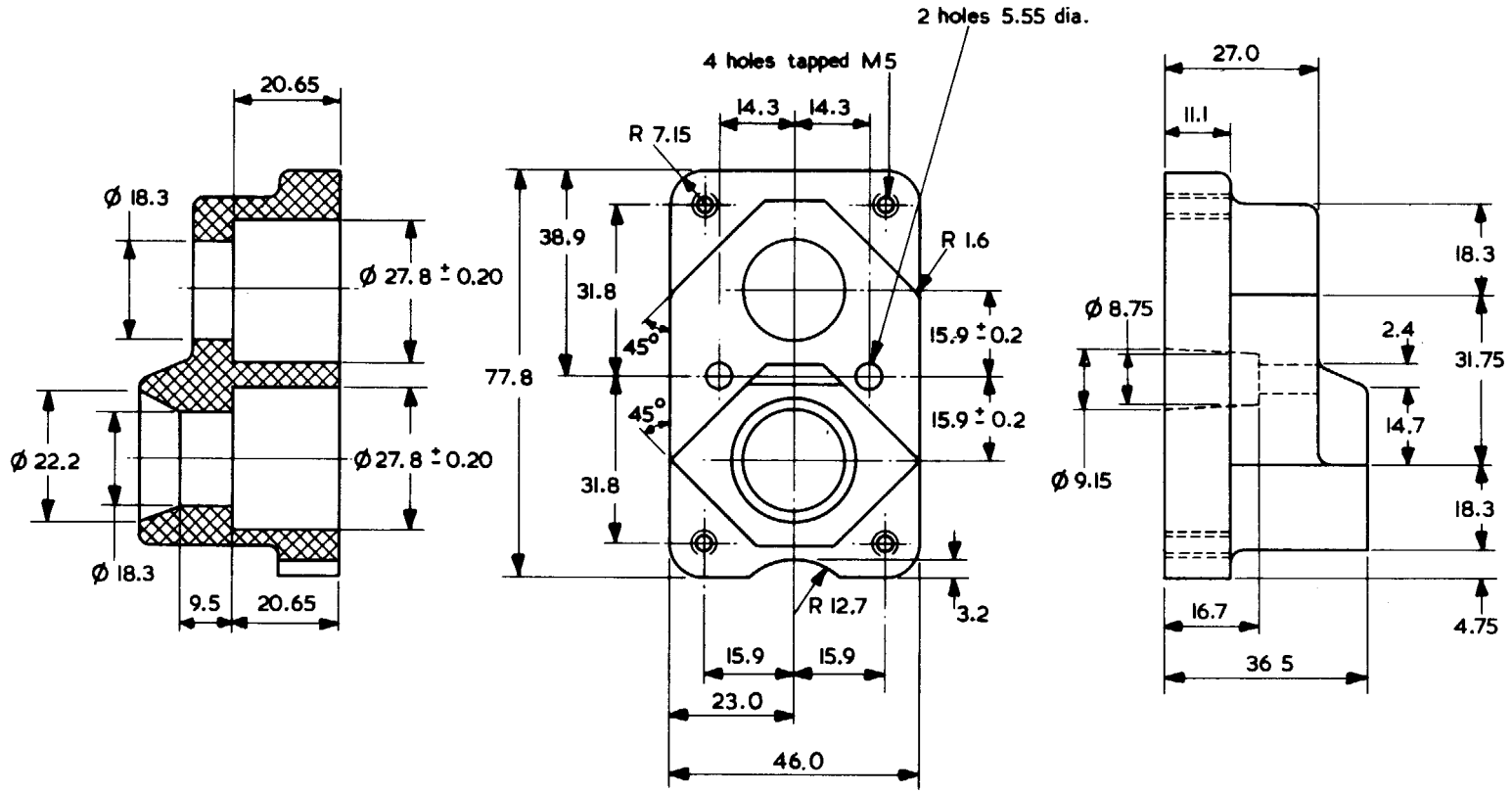
Figure 5 — Main Contact



Diameter of wire 2.65 mm
No. of effective turns 4
Load per mm compression 1.09 kg
Permissible steady load 15.9kg
Wound counter clockwise.

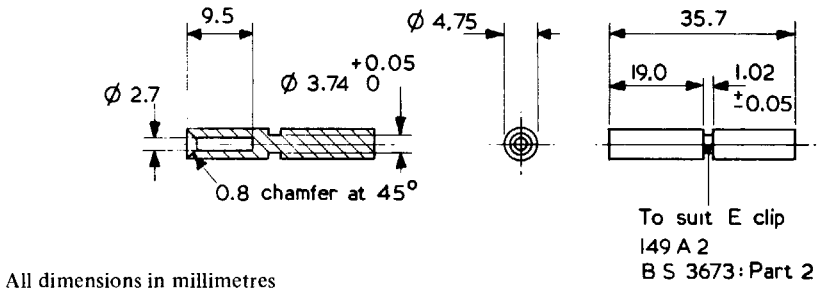
All dimensions in millimetres

Figure 6 — Main Spring



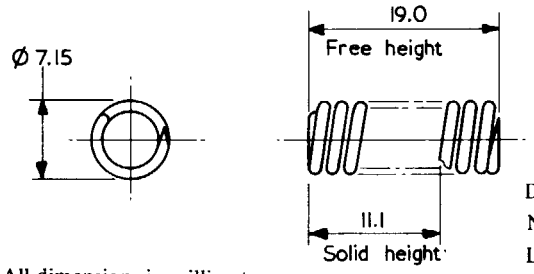
All dimensions in millimetres

Figure 7 — Interior moulded (front half)



All dimensions in millimetres

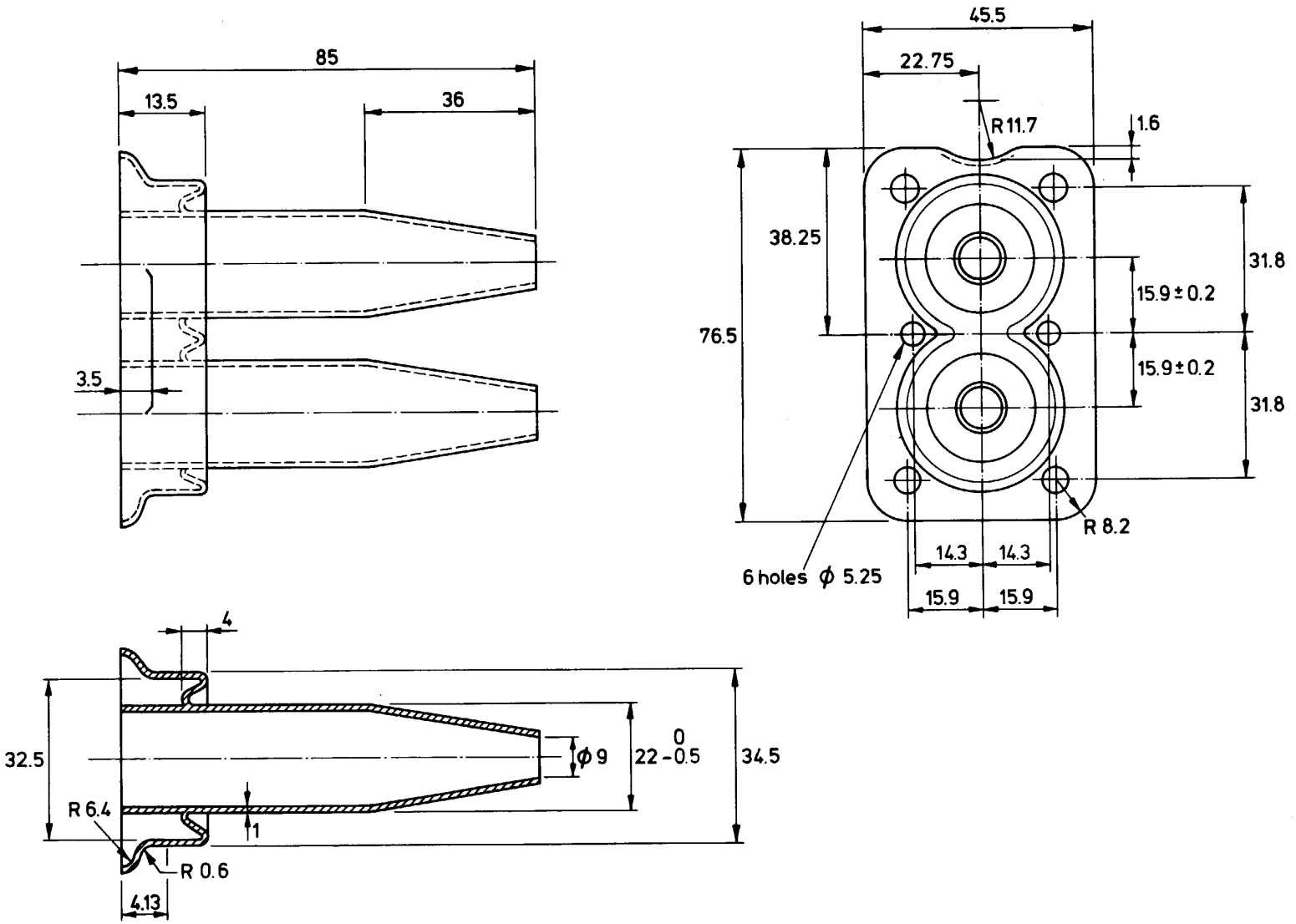
Figure 8 — Pilot contact



All dimensions in millimetres

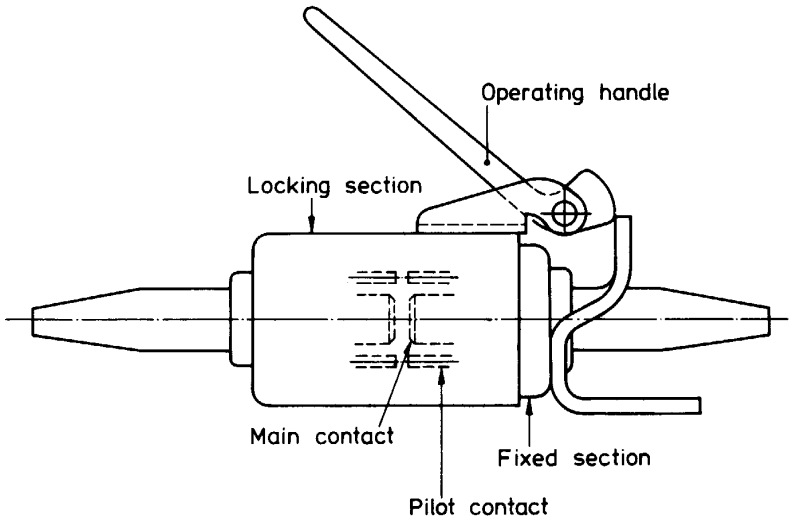
Diameter of wire 0.90
No. of effective turns 12
Load per mm compression 0.243 kg
Permissible steady load 2.05 kg
Wound counter clockwise.

Figure 9 — Pilot spring



All dimensions in millimetres

Figure 10 — Sleeve

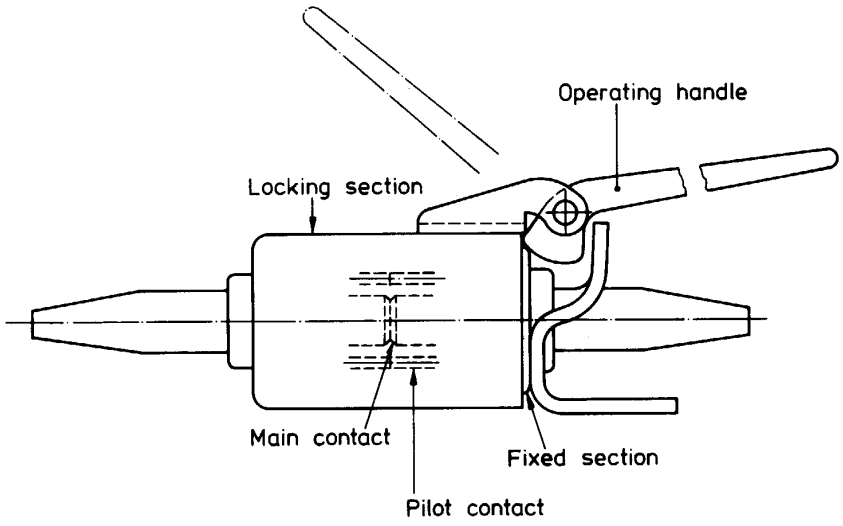


(*a*) Fixed section inserted in locking section with operating handle in open position

Main contacts 4.35 mm apart } with sleeve fitted to both sections
Pilot contacts 2.76 mm apart }

After the initial touching of the faces of the main contacts of the fixed section and the locking section the minimum travel of the fixed section shall be 1.59 mm to the final closed position

Main contacts 5.35 mm apart } with sleeve fitted to locking
Pilot contacts 3.76 mm apart } section only



(*b*) Fixed section fully home with operating handle in closed position

Nominal compression of each main contact 1.19 mm
Nominal compression of each pilot contact 1.98 mm

Figure 11 — Locking section with fixed section (*a*) inserted and (*b*) fully home and locked

Publications referred to

This standard makes reference to the following British Standards:

BS 1433, *Copper for electrical purposes. Rod and bar.*

BS 2782, *Methods of testing plastics.*

BS 2874, *Copper and copper alloys. Rods and sections (other than forging stock).*

BS 3673, *Spring retaining rings.*

BS 3673-2, *Carbon steel E clips.*

BS 6899, *Specification for rubber insulation and sheath of electric cables.*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL