BRITISH STANDARD

BS 7660:1993

Incorporating Amendment No. 1

Specification for

Safety pins for general use

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Textiles and Clothing Standards Policy Committee (TCM/-) to Technical Committee TCM/8, upon which the following bodies were represented:

Association of Button Merchants
British Association of Clothing Machinery Manufacturers
British Button Manufacturers' Association
British Clothing Industry Association
British Footwear Manufacturers' Federation
British Narrow Fabrics Association
Camping and Outdoor Leisure Association
Federation of Crafts and Commerce
Made-up Textiles Association
Mail Order Traders' Association
National Building and Allied Hardware Manufacturers' Federation
SATRA Footwear Technology Centre
Zip Fastener Manufacturers' Association

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Consumer Policy Committee of BSI

This British Standard, having been prepared under the direction of the Textiles and Clothing Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 July 1993

The following BSI references relate to the work on this standard:
Committee reference TCM/8
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Amendments issued since publication

Amd. No.	Date	Comments
8011	November 1993	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Textiles and Clothing Standards Policy Committee, following requests from the manufacturing industry for a reference standard.

Its object is to specify requirements for quality and reliability for safety pins for general use, by means of strength and mechanical performance, with a view to giving the user reasonable assurance that safety pins conforming to this standard will satisfactorily fulfil their purpose.

Annex A to Annex D give methods of test for verifying the requirements.

Assessed capability. Users of this British Standard are advised to consider the desirability of quality system assessment and registration against the appropriate Part of BS 5750 by a third party certification body.

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 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.

1 Scope

This British Standard specifies dimensions, material, performance and marking requirements for safety pins for general use made from steel, stainless steel and brass. It does not cover safety pins for specialist applications, e.g. the aerospace industry, or nappy pins.

2 References

2.1 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this British Standard only when incorporated in it by updating or revision.

2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

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

3.1
safety pin

a fastening device consisting of a pointed stem which is held captive by a cap, from which the stem is released to open the device (see Figure 1)

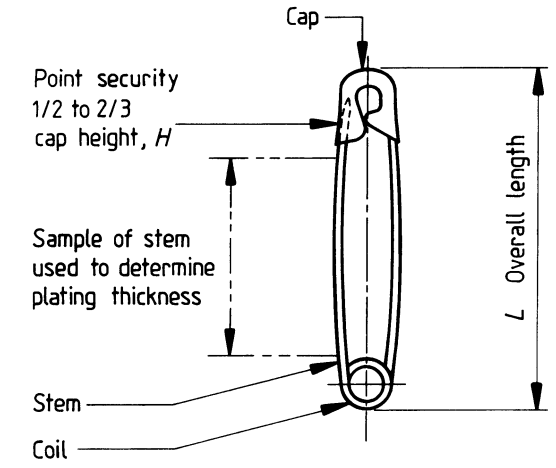


Figure 1 — Safety pin in fully closed position

3.2
stem

the complete wireform from which the safety pin is made (see Figure 1)

3.3
cap

that part which retains the moveable arm in the closed position (see Figure 1)

3.4
movable arm

the pointed arm of the stem which is retained by the cap in the closed position (see Figure 2)

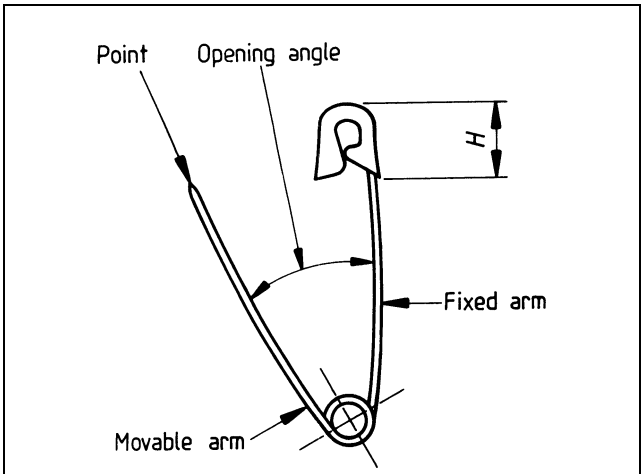


Figure 2 — Safety pin in open position

3.5
fixed arm

that part of the stem lying between the coil and the cap to which it is fixed (see Figure 2)

3.6
coil

the sprung end of the safety pin (see Figure 1)

3.7
overall length

the maximum length of the complete device when closed (see Figure 1)

3.8
opening angle

the angle between the projections of the two arms of the stem when released (see Figure 2)

3.9
point

the free pointed end of the stem (see Figure 2)

3.10
break-open force

the force applied in the centre of, and at right angles to, the stem, away from and in the plane of the safety pin, which will just allow the movable arm to be pulled free from the cap

3.11
opening force

the force applied in the centre of, and at right angles to, the movable arm, towards and in the plane of the safety pin, which will just allow the movable arm to be freed from the cap

4 Manufacture and physical requirements

4.1 Material

Safety pins shall be manufactured from brass, steel or stainless steel.

4.2 Plating

Safety pins of steel shall be nickel plated to a minimum plating thickness of 2 μm on that part of the stem indicated in Figure 1.

NOTE The thickness of nickel plate on individual stems can be determined by the coulometric method only if a special device for measuring metal coating thickness on wires is used. Such devices are available from certain suppliers of instruments for coulometric measurement of the thickness of metal coatings. As an alternative to this specialized coulometric technique, the strip and weigh method described in Appendix F of BS 3382-3:1965 can be used.

The surface appearance of the plating shall conform to clause **3** of BS 1224:1970, and shall be of bright appearance.

4.3 Safety pin

Safety pins shall conform to the appropriate requirements of Table 1 and Table 2.

NOTE Table 1 shows the main sizes available, but other sizes may be available for which the requirements can be obtained by interpolation from the values given in Table 1.

5 Performance

5.1 General

Safety pins shall conform to the appropriate requirements of Table 3.

Table 1 — Dimensions

Nominal size mm	Pin length, L (see note 1 and Figure 1) mm	Pin opening angle (see note 2 and Figure 2) Degrees	Cap height, H (See note 1 and Figure 2) mm
19	19 ± 0.5	30 to 50	5.0 to 5.8
23	23 ± 0.5	30 to 50	5.5 to 6.3
27	27 ± 0.5	30 to 50	7.4 to 8.2
34	34 ± 0.5	30 to 50	7.4 to 8.2
38	38 ± 0.5	30 to 50	8.8 to 9.6
50	50 ± 1.0	30 to 50	11.4 to 12.2
57	57 ± 1.0	30 to 50	11.4 to 12.2

NOTE 1 Determine the length and cap height by means of a calibrated instrument.
NOTE 2 Determine the angle by means of calibrated projection equipment.

5.2 Failure

When carrying out performance tests (see **5.1**), one of the following shall apply:

a) there shall be no more than one failure in any one test;

NOTE Should a safety pin fail a test, another safety pin should be selected from the original quantity, to retain the number in the sample at 50 for successive tests.

b) where there is more than one failure in any one test, two further samples, each of 50 safety pins, shall be tested (see **6.1**) and if there is more than one failure in any one test in either of these samples, the production run shall be rejected.

Table 2 — Physical requirements

Property	Test procedure	Sample	Requirement
Mode of safety pin	Visual examination	A	Safety pin in the fully closed position when sampled (see Figure 1)
Point security	Measurement by calibrated instrument to that point on the stem just covered by the cap in the closed position	A	The point shall be retained by the cap for 1/2 to 2/3 of the cap height (see Figure 1 and Figure 2)
Open/close movement	Determination by hand	A	The movable arm shall enter the cap under its own spring pressure from either side into the fully closed position (see Figure 1)
Hooked point	Determination by touch	A	The point shall be smooth with no hooked points apparent, and the point shall blend smoothly into the stem (see Figure 3)

NOTE Tests on sample A should be carried out in the order in which they are given in Table 2 and Table 3.

6 Sampling and conditioning

6.1 Sampling From a production run, four samples, each consisting of 50 specimens, shall be selected at random.

NOTE The four samples should each be identified, i.e. A, B, C, D.

6.2 Conditioning

Prior to testing, each safety pin shall be conditioned by fully releasing and closing the movable arm by hand five times.

7 Marking

The following information shall be provided on the package or accompanying documents:

a) the name, trademark or other means of identification of the manufacturer or supplier;

b) the number and date of this British Standard, i.e. BS 7660:1993[1)].

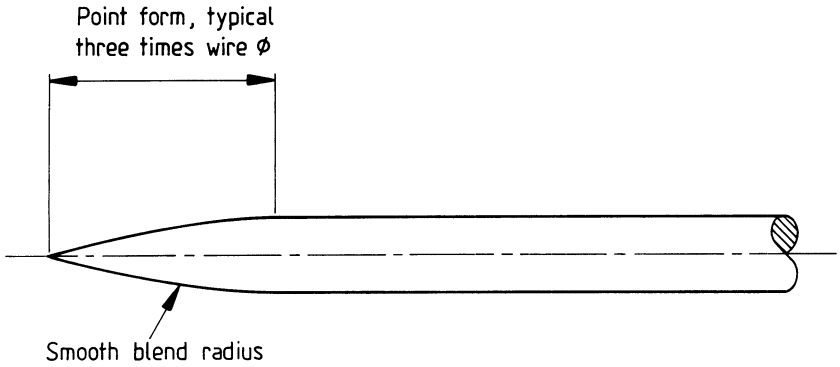


Figure 3 — Safety pin point shape

Table 3 — Performance

Property	Test procedure	Sample	Requirement	
			Steel or stainless steel	Brass
Cap retention force	Annex A	A	≤ 34 mm nominal size: 30 N min. > 34 mm nominal size: 50 N min.	≤ 34 mm nominal size: 10 N min. > 34 mm nominal size: 20 N min.
Point penetration force	Annex B	A	2.5 N to 7.5 N	2.5 N to 7.5 N
Durability of the open/close function	Annex C	B	Retention of function	Retention of function
Break-open force	Annex D	B	18 N min.	≤ 34 mm nominal size: 8 N min. > 34 mm nominal size: 15 N min.
Opening force	Annex E	C	3 N to 12 N	≤ 34 mm nominal size: 1.5 N to 12 N > 34 mm nominal size: 3 N to 12 N

NOTE Tests on sample A should be carried out in the order in which they are given in Table 2 and Table 3.

[1)] Marking BS 7660:1993 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Annex A (normative)
Method for determination of cap retention force

A.1 Principle

The cap of a closed safety pin is pulled away from the stem at a steady rate until the safety pin distorts and thus frees the movable arm, or the required minimum force is reached.

A.2 Apparatus

A.2.1 *Constant rate of extension tensile testing machine*, conforming to grade 0.5 of BS EN 10002-2:1992.

A.2.2 *Holding devices*, which are such that an element of each holding device passes freely through the cap and the coil (see Figure A.1).

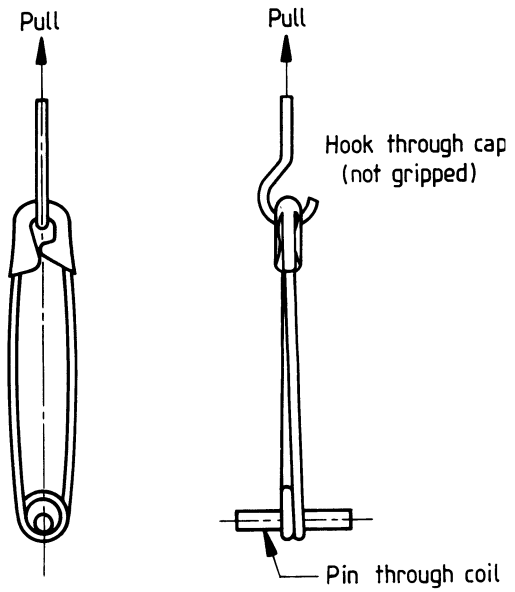


Figure A.1 — Example of apparatus for testing cap retention force

A.3 Specimens

Condition the 50 specimens comprising sample A, as described in **6.2**.

NOTE 1 Pre-treatment may be omitted if this has been done previously.

NOTE 2 Sample A may have been subjected to previous tests (see Table 2).

A.4 Procedure

Locate a specimen freely in the holding devices, which are clamped in the tensile testing machine jaws (see Figure A.1), taking care to ensure that the pull will be exerted through the centre line of the cap. Set the machine in motion at a constant rate of jaw separation of 50 mm/min ± 10 mm/min until the required force is reached (see Table 3) or until the specimen fails, whichever occurs sooner. Record the force, in newtons, at which the point of the safety pin is released from the cap, or the maximum force applied. Record the mode of failure, if any.

Repeat the procedure for the remaining specimens.

A.5 Expression of results

For each specimen, report either:

a) the force, in newtons, at which the point was released from the cap and the mode of failure; or

b) the maximum force applied.

Annex B (normative)
Method for determination of point penetration force

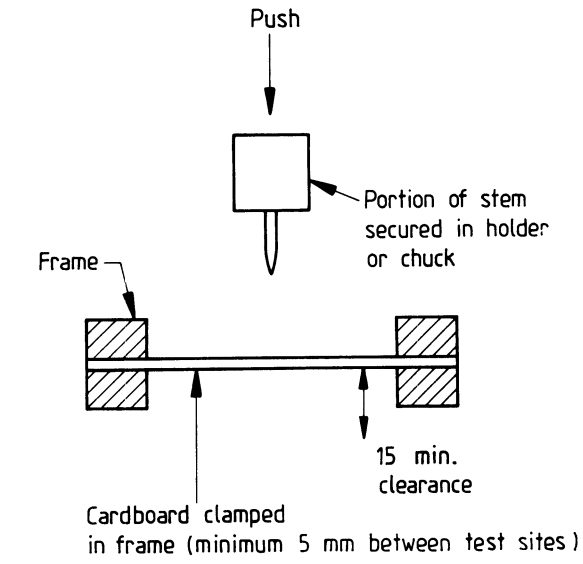
B.1 Principle

The movable arm of a safety pin is pushed into a standard test material and the force required to penetrate the material is measured.

B.2 Apparatus

B.2.1 *Constant rate of extension tensile testing machine*, conforming to grade 0.5 of BS EN 10002-2:1992.

B.2.2 *Penetration jig and holder* (see Figure B.1).



Dimensions in millimetres

Figure B.1 — Example of apparatus for testing point penetration force

B.2.3 *Reference cardboard material*, with the following characteristics: double-coated fully bleached and calendered board, nominal mass/unit area 300 g/m^2, nominal thickness 400 μm, nominal moisture content 8 %, conditioned at 23 °C ± 2 °C and relative humidity 50 % rh ± 5 % rh for 24 h before the test.

B.2.4 *Frame*, in which the cardboard material can be clamped all round with a 15 mm clearance beneath it (see Figure B.1).

B.3 Specimens

Condition the 50 specimens comprising sample A, as described in **6.2**.

NOTE 1 Pre-treatment may be omitted if this has been done previously.

NOTE 2 Sample A may have been subjected to previous tests (see Table 2 and Table 3).

Cut the movable arm of each specimen from the stem near the coil, taking care that damage to the point is not incurred.

B.4 Procedure

B.4.1 Mount the cut movable arm of a specimen in the holder in the tensile testing machine (see Figure B.1).

B.4.2 Cut a piece of conditioned cardboard of sufficient size to allow all 50 specimens in the sample to be tested on the same piece of material (see **B.4.4**), and clamp it securely in the frame (see Figure B.1). Support the frame at the bottom of the tensile testing machine, so that there is a gap of at least 15 mm below the lower cardboard surface, and the test material is at right angles to the direction of penetration of the specimen. Set the tensile testing machine stop so that the specimen can penetrate the test material to approximately 8 mm below the lower surface of the cardboard.

B.4.3 Set the machine in motion at a constant rate of jaw closure of 50 mm/min ± 10 mm/min, continuing until the stop position is reached. Record the maximum force applied, in newtons.

B.4.4 Repeat the procedure for the remaining specimens, moving the material holder laterally by a distance of at least 5 mm to present a fresh area of test material.

B.5 Expression of results

For each specimen, report the maximum force applied, in newtons.

Annex C (normative) Method for determination of durability of the open/close function

C.1 Principle

The movable arm of a safety pin is opened and closed a given number of times to assess the durability of this function.

C.2 Specimens

Condition 10 specimens selected at random from sample B, as described in **6.2**.

C.3 Procedure

Fully release and close the movable arm of a specimen by hand, allowing it to enter the cap under its own spring pressure, from either side. Repeat the procedure for a total of 100 cycles, 50 from each side, recording any functional failure.

Repeat the procedure for the remaining specimens.

C.4 Expression of results

Report any functional failures that occur, and the mode of failure.

Annex D (normative) Method for determination of break-open force

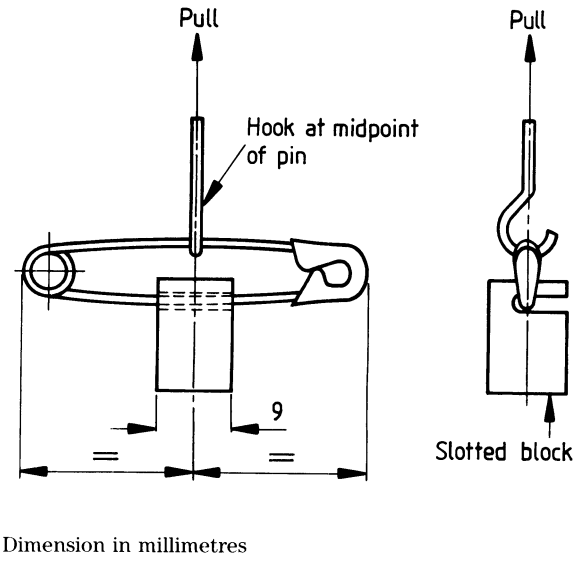
D.1 Principle

The movable arm of a closed safety pin is pulled away from the fixed arm at a steady rate until the safety pin distorts so that the movable arm disengages from the cap, or the required minimum force is reached.

D.2 Apparatus

D.2.1 *A constant rate of extension tensile testing machine*, conforming to grade 0.5 of BS EN 10002-2:1992.

D.2.2 *Suitable non-distorting "hook" shape and slotted block*, for pulling the stem apart by means of the tensile testing machine (see Figure D.1).



Dimension in millimetres

Figure D.1 — Example of apparatus for testing break-open force

D.3 Specimens

Condition the 50 specimens comprising sample B, as described in **6.2**.

NOTE 1 Pre-treatment may be omitted if this has been done previously.

NOTE 2 Some specimens from sample B may have been subjected previously to the test given in Annex C.

D.4 Procedure

D.4.1 Locate a specimen freely in the holding devices, which are clamped in the tensile testing machine jaws (see Figure D.1), ensuring that the specimen is placed in the slot in the block fixture in such a position that the pull of the hook-shaped fixture will be exerted over its centre and in the plane of the safety pin.

D.4.2 Set the machine in motion at a constant rate of jaw separation of 50 mm/min ± 10 mm/min, continuing until the required force is reached (see Table 3) or the specimen fails, whichever occurs sooner. Record the force, in newtons, at which the point of the safety pin is pulled free from the cap, or the maximum force applied. Record the mode of failure, if any.

D.4.3 Repeat the procedure for the remaining specimens.

D.5 Expression of results

For each specimen, report either:

a) the force, in newtons, at which the point was released from the cap and the mode of failure; or

b) the maximum force applied.

Annex E (normative) Method for determination of opening force range

E.1 Principle

The movable arm of a closed safety pin is pushed towards the fixed arm at a steady rate until the movable arm just clears the cap-retaining lugs, or the required maximum force is reached.

E.2 Apparatus

E.2.1 *Constant rate of compression tensile testing machine*, conforming to grade 0.5 of BS EN 10002-2:1992.

E.2.2 *Suitably shaped block fixture*, for supporting and confining the specimen over at least 50 % of the length of the centre section of the fixed arm (see Figure E.1).

E.2.3 *Means of pushing the movable arm inwards* via the tensile testing machine.

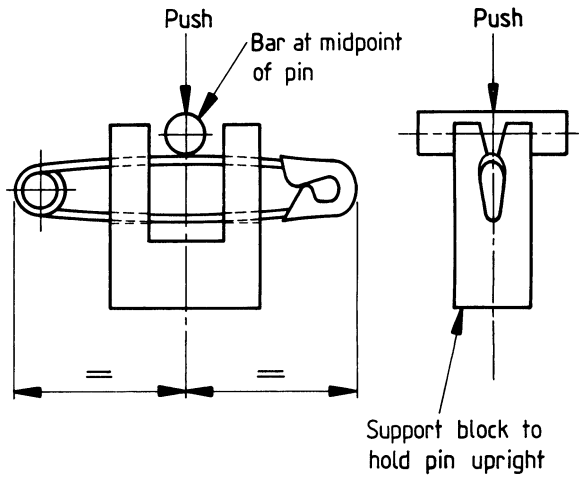


Figure E.1 — Example of apparatus for testing opening force range

E.3 Specimens

Condition the 50 specimens comprising sample C, as described in **6.2**.

E.4 Procedure

E.4.1 Confine a specimen in the support block (see Figure E.1) with the movable arm upwards and place it in the tensile testing machine.

NOTE Any centre tong(s) should be pushed sideways inside the cap to enable the movable arm to be bent downwards by the machine without being caught on the centre tong(s).

E.4.2 Clamp the top fixture in the upper jaws of the tensile testing machine and over the centre of the movable arm (see Figure E.1) and align it so that the force is exerted at the centre and at right angles to the movable arm, towards the safety pin, and in the plane of the safety pin.

E.4.3 Set the stop with the point just clear of the cap. Set the machine in motion at a constant rate of jaw closure of 50 mm/min ± 10 mm/min, until the movable arm just clears the cap-retaining lugs or until the required force is reached (see Table 3), whichever occurs sooner. Record the force, in newtons, at which the movable arm of the specimen is just free from the cap, i.e. the stop is reached, and the arm can therefore be moved sideways away from the cap, or the maximum force applied.

NOTE The movable arm should not catch on the centre tong of the cap as the movable arm is compressed. If this occurs, the test result should be disregarded, and the test repeated.

E.4.4 Repeat the procedure for the remaining specimens.

E.5 Expression of results

For each specimen, report the force, in newtons, at which the movable arm is freed from the cap, or the maximum force applied.

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List of references

Normative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 1224:1970, *Specification for electroplated coatings of nickel and chromium.*
BS EN 10002, *Tensile testing of metallic materials.*
BS EN 10002-2:1992, *Verification of the force measuring system of the tensile testing machine.*

Informative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 3382, *Specification for electroplated coatings on threaded components.*
BS 3382-3 & 4:1965, *Nickel or nickel plus chromium on steel components. Nickel or nickel plus chromium on copper and copper alloy (including brass) components.*
BS 5750, *Quality systems.*

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