BS EN 3777:2010

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# Aerospace series — Pins, quick release, single and double acting — Technical specification



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The UK participation in its preparation was entrusted to Technical Committee ACE/12, Aerospace fasteners and fastening systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

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**EN 3777**

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# Aerospace series - Pins, quick release, single and double acting - Technical specification

Série aérospatiale - Broches à démontage rapide, simple et double action - Spécification technique

Luft- und Raumfahrt - Kugelsperrbolzen mit Zugauslösung und Zug- Druckauslösung - Technische Lieferbedingungen

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# Contents

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# Foreword

This document (EN 3777:2010) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2011, and conflicting national standards shall be withdrawn at the latest by April 2011.

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## 1 Scope

This standard specifies the characteristics, qualification and acceptance requirements for quick release pins, single and double acting for aerospace applications.

It is applicable whenever referenced.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 2002-001, *Aerospace series — Metallic materials — Test methods — Part 001: Tensile testing at ambient temperature*

EN 2002-7, *Aerospace series — Metallic materials — Test methods — Part 7: Hardness test* [1)]

EN 3238, *Aerospace series — Metallic materials — Test method — Shear test for wires and rivets*

EN 9100, *Quality Management Systems — Requirements for Aviation, Space and Defense Organizations*

EN 9133, *Aerospace series — Quality management systems — Qualification procedure for aerospace standard parts*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

NASM 1312, *Fastener test methods FSC 53GP* [2)]

MIL-PRF-23827C, *Grease, aircraft and instrument, gear and actuator screw, NATO code number G-354* [3)]

MIL-STD-810G, *Environmental engineering considerations and laboratory tests* [3)]

1) Published as ASD-STAN Prestandard at the date of publication of this standard by Aerospace and Defence Industries Association of Europe-Standardization (ASD-STAN) (www.asd-stan.org).

2) Published by: Aerospace Industries Association/ National Aerospace Standards (AIA/NAS) (www.aia.aerospace.org).

3) Published by: Department of Defense (DoD), http://www.defenselink.mil/.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**batch**
**lot**
**inspection batch**
**inspection lot**
quick release pins of the same type, size, material and surface protection manufactured under the same conditions and presented for inspection of the same size

**3.2**
**surface discontinuities**

**3.2.1**
**crack**
break in the material which may extend in all directions and be intercrystalline or transcrystalline in character

**3.2.2**
**pit**
void, hole in the surface as caused, for example, by corrosion

**3.2.3**
**score, scratch**
open surface defect

**3.2.4**
**seam**
unwelded fold which appears as an open defect in the material

## 4 Classification

### 4.1 General

The quick release pins, single or double acting, can be manufactured with handles of different configuration.

### 4.2 Single acting pin

The release is obtained only by an axial push applied to the actuating button.

### 4.3 Double acting pin

The release is obtained only when the spindle has been moved to a release position by an axial push or pull on the actuating button or handle.

## 5 Requirements

See Table 1.

**Table 1**

| Clause | Characteristics | Requirements | Inspection and test method | Q [a] | A [b] |
|---|---|---|---|---|---|
| **5.1** | **Materials** | In accordance with the product standard or definition document. | Chemical analysis or certificate of conformity issued by the manufacturer of the semi-finished product | X | X |
| **5.2** | **Dimensions and tolerances** | In accordance with the product standard or definition document. | Standard gauging | X | X |
| **5.3** | **Masses** | In accordance with the product standard or definition document. | Suitable methods | X | X |
| **5.4** | **Marking** | In accordance with the product standard or definition document. It shall be legible and shall not adversely affect the material or the functioning of the pins. | Visual examination | X | X |
| **5.5** | **Surface appearance** | Pins shall be free of surface discontinuities liable to have an adverse effect on their characteristics and endurance. See 3.2 for definitions. | Suitable measuring instruments | X | X |
| **5.6** | **Surface coating** | | | | |
| **5.6.1** | **Presence** | Applied at the locations specified in the product standard or definition document. | Visual examination | X | X |
| **5.6.2** | **Type** [c] | In accordance with the definition document. | Visual examination or inspection by chemical reagent in case of doubt (method agreed upon between the manufacturer and the user) | X | X |
| **5.6.3** | **Thickness** | In accordance with the definition document. | Device for measuring the thickness of surface coatings. In case of doubt, inspect defective nuts under low magnification after sectioning. | X | X |
| **5.7** | **Heat treatment** | In accordance with the product standard or definition document | Standard gauging | X | X |
| **5.8** | **Hardness** | In accordance with the product standard or definition document. Shank and balls are to be checked, specifically. | Test according to EN 2002-7. | X | |
| **5.9** | **Corrosion** | Pins shall be subjected to the corrosion test.<br>The same pins shall be then tested for conformance to the release actuating force values specified in Table 2. | According to the NASM 1312 test 1 salt-spray.<br>Upon completion of the test, the pins shall be tested as defined in 5.11 and 5.12. | X | |

continued

**Table 1** *(continued)*

| Clause | Characteristics | Requirements | Inspection and test method | Q [a] | A [b] |
|---|---|---|---|---|---|
| **5.10** | **Sand and dust** | Pins shall be subjected to the sand and dust test.<br>The same pins shall then be tested for conformance to the release actuating force values specified in Table 2. | According to the MIL-STD-810 method 510.1.<br>Upon completion of the test, the pins shall be tested as defined in 5.11 and 5.12. | X | |
| **5.11** | **Release mechanism** | The release mechanism shall automatically return and remain in the locked position. | Mount the pin in a fixture conforming to the Figure 3. The release mechanism actuating force values shall be within the range specified in Table 2.<br>Upon completion of the test, the pins shall be tested as defined in 5.12. | X | X |
| **5.12** | **Locking element** | When the pin release button is depressed to a release position, the pin shall be capable of being pulled out from the bushing of fixture with a force that is twice the maximum release mechanism force in Table 2.<br>The locking device of double acting quick release pins shall withstand the minimum tensile values specified in Table 2 without failure. | Mount the pin in a fixture conforming to the Figure 2. When the pin release button is depressed to the release position, the pin shall be capable of being pulled from the bushing. | X | X |
| **5.13** | **Attaching link, ring, handle** | The complete attachment shall remain intact when subjected to the tensile strength test. Deformation of the link, ring or flag attachment shall not constitute failure.<br>The release mechanism actuating force shall again be measured for conformance to the requirements of Table 2 (see 5.11). | Mount the pin in accordance with the Figure 3. Apply a force of 44 N between the link or ring on the handle and the release mechanism. When a flag is attached the same force shall be applied between the flag and the release link or ring.<br>All parts shall show no evidence of failure. | X | |
| **5.14** | **Ball retention** | Ball shall be retained in the shank when subjected to the minimum push out values specified in Table 2. | The spindle and one ball shall be removed from the test sample. The sample shall be placed on a "V" block with the remaining ball in the staked hole placed downwards in a position not allowing contact with any portions of the "V" block. A mandrel connected to a direct-reading load indicator shall be inserted through the empty top hole and the load specified in Table 2 applied against the ball in the bottom staked hole. | X | |

continued

**Table 1** *(continued)*

| Clause | Characteristics | Requirements | Inspection and test method | Q [a] | A [b] |
|---|---|---|---|---|---|
| **5.15** | **Operability** | The release mechanism shall be operable while the pin is shear loaded to the following percentages of the minimum strengths specified in Table 2.<br>050 pin diameter code = 35 %<br>060 to 200 pin diameter codes = 50 %<br>220 to 270 pin diameter codes = 40 % | Mount the pin in a fixture conforming to Figure 1. The requirements shall be in accordance with values requested for the respective dimensions. | X | |
| **5.16** | **Endurance** | The pin shall function satisfactorily after the release mechanism is subjected to 5 000 cycles of operation. | Mount the pin in a fixture conforming to Figure 3. The actuating force shall be within the values in Table 2.<br>One cycle of operation shall be as follows:<br>For single acting pins, from locked position, push to unlocked position, release to locked position.<br>For double acting pins, from the locked position, push to the unlocked position, release to locked position, then from locked position, pull to unlocked position and release to locked position.<br>Upon completion of the test, the pins shall be tested as defined in 5.11 and 5.12. | | |
| **5.17** | **Straightness** | The maximum permissible measured deviation from straightness of the shank shall be in accordance with Table 3. | An acceptable method of determining shank straightness is by rolling the pin, with the locking balls retracted, on a surface plate and measuring the point of greatest deviation with a feeler gauge. | X | |
| **5.18** | **Pin shear strength** | The minimum double shear strength shall conform to the values of Table 2. | Test according to EN 3238.<br>Use fixture conforming to Figure 1. | X | |
| **5.19** | **Pin tension strength** | The minimum tensile strength shall conform to the values of Table 2. | Test according to EN 3238.<br>Use fixture conforming to Figure 2. | X | |
| **5.20** | **Handle tensile strength** | The handle when subjected to 2,2 kN tensile load, shall show no evidence of failure or distortion. | Test according to EN 2002-001.<br>Use fixture conforming to Figure 4. | X | |

continued

**Table 1** *(concluded)*

| Clause | Characteristics | Requirements | Inspection and test method | Q [a] | A [b] |
|---|---|---|---|---|---|
| **5.21** | **Temperature** | Pins shall function satisfactorily and be hand operable at temperatures from – 54 °C to 93 °C. | Pin shall be held at a temperature of not less than – 54 °C for 1 h, and at a temperature of not less than 93 °C for 1 h.<br>Upon completion of the test, the pins shall be tested as defined in 5.11 and 5.12. | X | |
| **5.22** | **Preservation and packaging** | Pins shall be cleaned so that they are free from dirt and foreign matter. Grease with lubricant MIL-PRF-23827. Pins shall be wrapped with a barrier to ensure adequate protection against damage during handling transportation and storage. | Visual examination | | X |
| **5.23** | **Packing** | Pins shall be delivered in strong, durable and sealed packages, capable of protecting from physical and corrosive deterioration. Additional packaging requirements shall be specified in the order.<br>Each package shall contain quick release pins of only one type, size, material and finish protection. | Visual examination | | X |
| **5.24** | **Identification** (Labelling) | Durable external labels on the package shall contain the following information:<br>— Identity block (conforming to the product standard);<br>— Description;<br>— Quantity;<br>— Manufacture identity (name and address);<br>— Number of lot;<br>— Manufacturer inspection stamp;<br>— Packaging date. | Visual examination | | X |

[a] Q = Qualification test.

[b] A = Acceptance test.

[c] Inspection applicable only to electrolytic platings (cadmium, silver, etc.).

# 6 Quality assurance

## 6.1 Approval of the manufacturer

See EN 9100.

### 6.2 Product qualification

See EN 9133 and Table 4.

No change in the material or design is permitted without prior approval of qualification authorities who guaranteed the initial approval.

## 7 Acceptance conditions

### 7.1 Inspection and tests

The inspection and tests to the performed acceptance of the supplying lot shall be in accordance with Table 4.

Samples shall be selected from each lot (batch) in accordance with the procedures listed in ISO 2859-1.

### 7.2 Rejection and re-test

Batches declared unacceptable shall be resubmitted for reinspection only after all defective units have been removed and/or defects have been corrected.

Twice the normal sample size shall be used for reinspecting or retesting the attribute causing initial rejection. The same acceptance level shall be used.

## 8 Certificate of conformity

All the quick release pins supplied in accordance with this standard shall be accompanied by a certificate of conformity from the manufacturer.

## 9 Filing of documents

For each lot the manufacturer shall keep, for five years minimum, the recording of the tests carried out on each inspection lot.

They shall be despatched to the client, at his request throughout this period.

**Table 2**

| Pin diameter code | Double shear strength kN | | Locking element tensile strength kN | Release mechanism actuating force N | | Locking element push out N |
|---|---|---|---|---|---|---|
| | Steel | Corrosion resisting steel | | | | |
| | min. | min. | min. | max. | min. | min. |
| 050 | 21,88 | 24,62 | 0,44 | 22,60 | 4,40 | 44,50 |
| 060 | 31,69 | 35,65 | 0,92 | | | 66,70 |
| 080 | 56,70 | 63,80 | 2,30 | 31,40 | 8,80 | |
| 100 | 88,97 | 100,10 | 2,84 | 44,20 | 13,40 | |
| 120 | 128,46 | 144,52 | 4,64 | | | 133,50 |
| 140 | 175,18 | 197,08 | 5,68 | | | |
| 160 | 229,14 | 257,78 | 8,28 | | | |
| 180 | 290,33 | 326,62 | 11,80 | 57,90 | 17,90 | |
| 200 | 358,75 | 403,60 | 15,60 | | | |
| 220 | 434,41 | 488,68 | 17,50 | | | |
| 240 | 517,30 | 581,93 | 21,80 | 110,00 | 30,90 | |
| 250 | 561,45 | 631,60 | 24,20 | | | |
| 270 | 656,86 | 746,46 | 25,60 | a | a | |

a Not existing.

**Table 3**

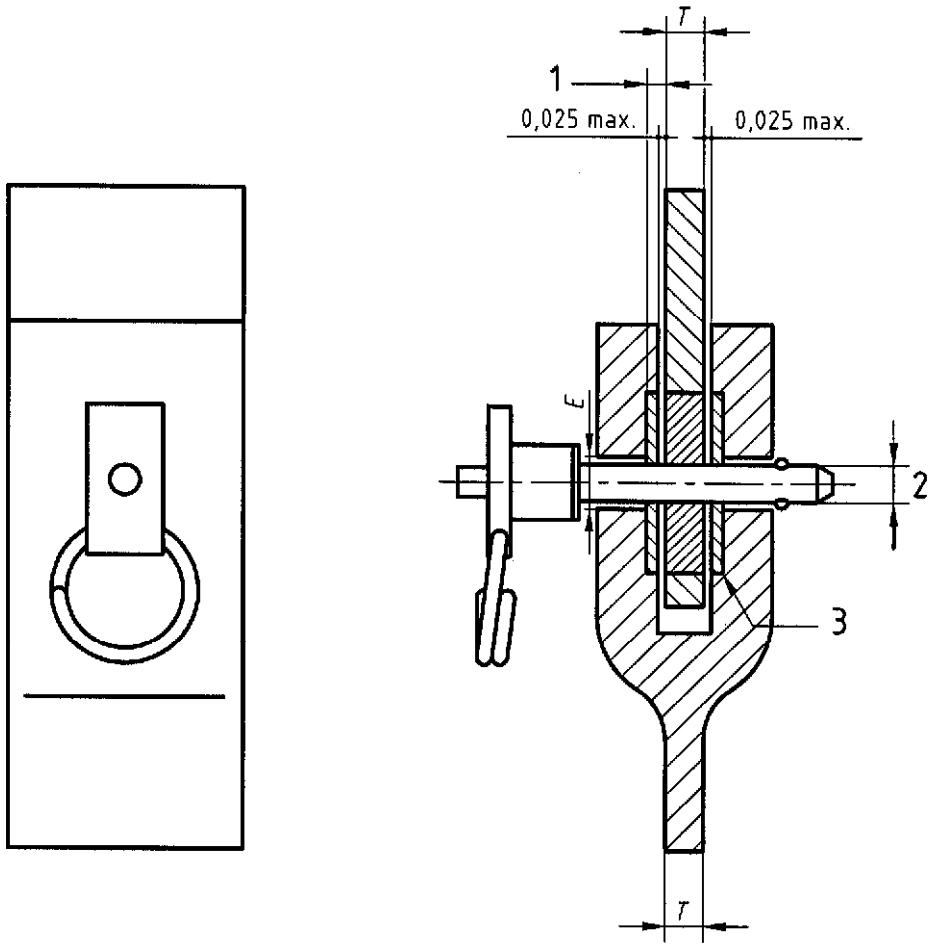
| Pin diameter code | Permissible deviation from straightness millimetre per millimetre of pin grip length max. |
|---|---|
| 050 | 0,004 |
| 060 to 080 | 0,003 |
| 100 to 120 | 0,002 5 |
| ≥ 140 | 0,002 |

**Table 4**

| Inspection or test | Defined in | Qualification (Number of samples) | Acceptance ISO 2859-1 | | |
|---|---|---|---|---|---|
| | | | Control level | Sampling | AQL |
| Non destructive | | | | | |
| Dimensions and tolerances<br>— Shank diameter<br>— Grip length<br>— Locking element projection<br>— Straightness of shank<br>— Freedom of operation<br>— Surface texture | 5.2 | All test samples (5) | II | According to the standard | 2,5 |
| Masses, other dimensions and tolerances<br>— Overall length<br>— Handle dimensions<br>— Flash on handle<br>— Burrs and tool marks | 5.2/5.3 | | | | 4 |
| Marking | 5.4 | | | | 1 |
| Surface appearance | 5.5 | | | | |
| Surface coating | 5.6 | | | | |
| Straightness | 5.17 | | | | 2,5 |
| Preservation and packaging | 5.22 | – | 100 % | – | – |
| Packing | 5.23 | | | | |
| Identification (Labelling) | 5.24 | | | | |
| Destructive | | | | | |
| Heat treatment | 5.7 | [a] | – | – | – |
| Hardness | 5.8 | (2) | II | | 1,5 |
| Corrosion | 5.9 | – | – | – | – |
| Sand and dust | 5.10 | | | | |
| Release mechanism | 5.11 | All test samples (5) | II | | 1,5 |
| Locking element | 5.12 | | | | |
| Attaching link, ring, handle | 5.13 | [a] | – | – | – |
| Ball retention | 5.14 | (2) | II | | 1,5 |
| Operability | 5.15 | – | | | |
| Endurance | 5.16 | (3) | – | – | – |
| Pin shear strength | 5.18 | | | | |
| Pin tension strength | 5.19 | – | II | | 1,5 |
| Handle tensile strength | 5.20 | | | | |

[a] The same samples shall be used.

Dimensions in millimetres




**Key**

1 $U$ typ
2 Hole $D$ in insert
3 Tool steel insert 63 HRC

Jig material: alloy steel.

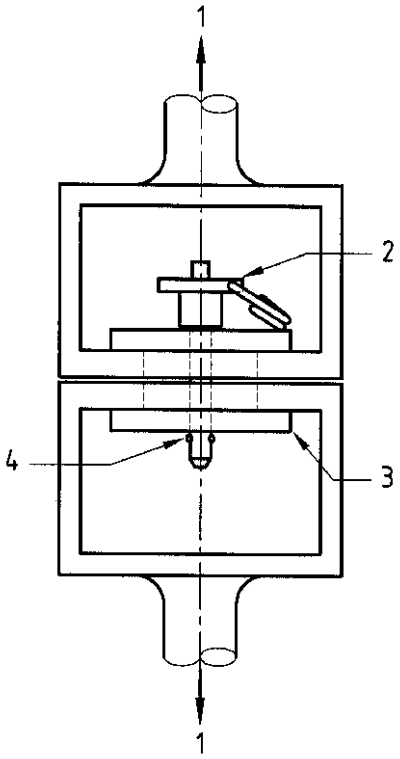
Design ends of the jig to suit test machine.

**Figure 1 — Fixture for shear test**

**Table 5**

Dimensions in millimetres

| **Pin diameter code** | *D* Nom. | Tol. | *E* ± 0,75 | *T* ± 0,025 | *U* ± 0,025 |
|---|---|---|---|---|---|
| 050 | 5 | + 0,1 0 | 8,00 | 5 | 2,500 |
| 060 | 6 | | | 6 | 3,000 |
| 080 | 8 | | 12,70 | 8 | 4,000 |
| 100 | 10 | | 14,30 | 10 | 5,000 |
| 120 | 12 | | 16,00 | 12 | 1,000 |
| 140 | 14 | | 17,50 | 14 | 7,000 |
| 160 | 16 | | 20,00 | 16 | 8,000 |
| 180 | 18 | + 0,15 0 | 22,50 | 18 | 9,000 |
| 200 | 20 | | 25,00 | 20 | 10,000 |
| 220 | 22 | | 27,50 | 22 | 11,000 |
| 240 | 24 | + 0,2 0 | 30,00 | 24 | 12,000 |
| 250 | 25 | | 31,25 | 25 | 12,500 |
| 270 | 27 | | 33,00 | 27 | 13,500 |




**Key**

1 Tension load applied
2 Quick release pin
3 Tool steel bushing 63 HRC
4 Bushing hole diameter (see Table 6)

Jig material: alloy steel.

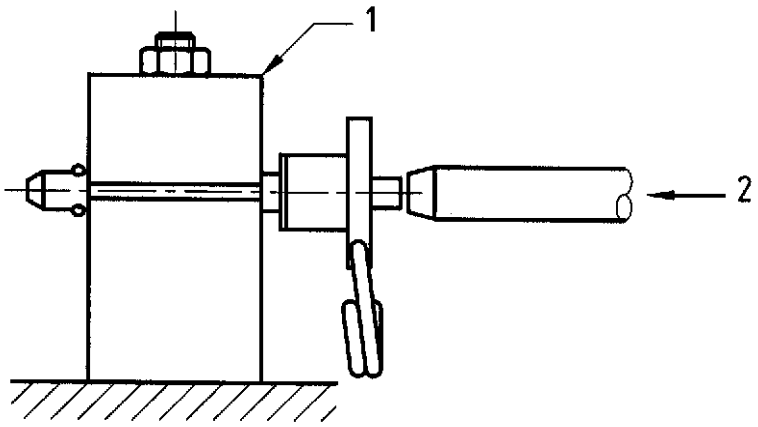
Design ends of the jig to suit test machine.

**Figure 2 — Fixture for tension test**

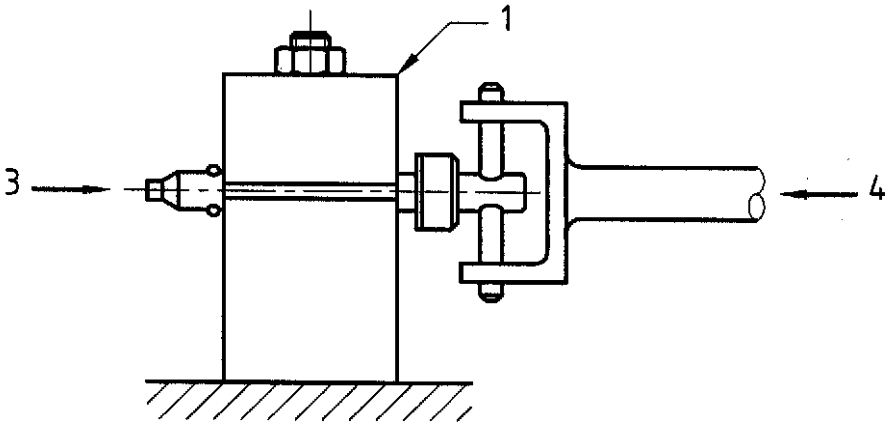
**Table 6**

Dimensions in millimetres

| Pin diameter code | Bushing hole diameter | |
|---|---|---|
| | nom. | Tol. |
| 050 | 5 | + 0,1 0 |
| 060 | 6 | |
| 080 | 8 | |
| 100 | 10 | |
| 120 | 12 | + 0,13 0 |
| 140 | 14 | |
| 160 | 16 | |
| 180 | 18 | + 0,18 0 |
| 200 | 20 | |
| 220 | 22 | |
| 240 | 24 | + 0,25 0 |
| 250 | 25 | |
| 270 | 27 | |




**a) Single acting pin**

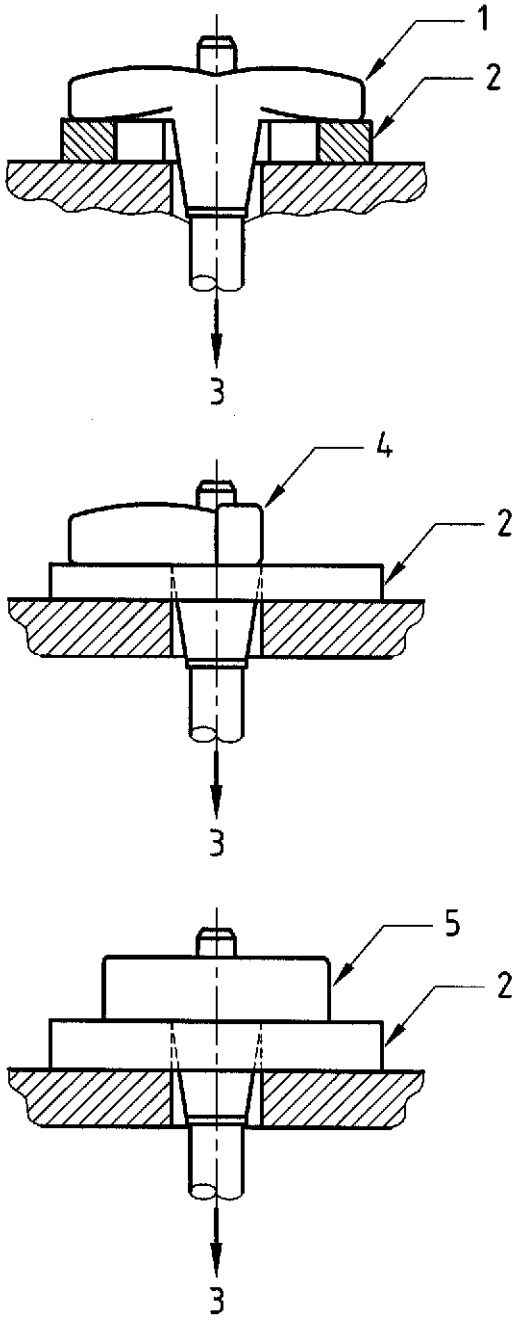



**b) Double acting pin**

**Key**

1 Clamp
2 Stroke as required to fully actuate release mechanism
3 Drive-out feature
4 Stroke as required to fully actuate release mechanism both push and pull

**Figure 3 — Fixture for release mechanism test**




**Key**

1 "T" handle
2 Bushing
3 Load
4 "L" handle
5 Button handle

**Figure 4 — Fixture for handle tensile strength test (single and double acting pin)**

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