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**Tools for pressing — Ball-lock  
punches —**

Part 1:  
**Ball-lock punches for light duty**

*Outillage de presse — Poinçons à bille —*

*Partie 1: Poinçons à bille pour tôles minces*



Reference number  
ISO 10071-1:2008(E)

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Case postale 56 • CH-1211 Geneva 20  
Tel: + 41 22 749 01 11  
Fax: + 41 22 749 09 47  
E-mail: [copyright@iso.org](mailto:copyright@iso.org)  
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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10071-1 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 8, *Tools for pressing and moulding*.

This second edition cancels and replaces the first edition (ISO 10071-1:2001), of which it constitutes a minor revision. In particular, the normative references given in Clause 2 have been updated, and the indication of surface textures has been made in accordance with ISO 1302:2002.

ISO 10071 consists of the following parts, under the general title *Tools for pressing — Ball-lock punches*:

- *Part 1: Ball-lock punches for light duty*
- *Part 2: Ball-lock punches for heavy duty*

# Tools for pressing — Ball-lock punches —

## Part 1: Ball-lock punches for light duty

### 1 Scope

This part of ISO 10071 specifies interchangeability dimensions and tolerances, in millimetres, for ball-lock punches for light duty.

It is applicable to ball-lock punches with shank diameter sizes from 6 mm up to and including 32 mm, in round, square, rectangular and oblong shapes, for punching holes in steel sheets or other materials, the thickness of which is less than 3 mm.

This part of ISO 10071 also gives examples related to materials and hardness, and specifies the designation of ball-lock punches for light duty.

### 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.

ISO 2768-1:1989, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 8695, *Tools for pressing — Punches — Nomenclature and terminology*

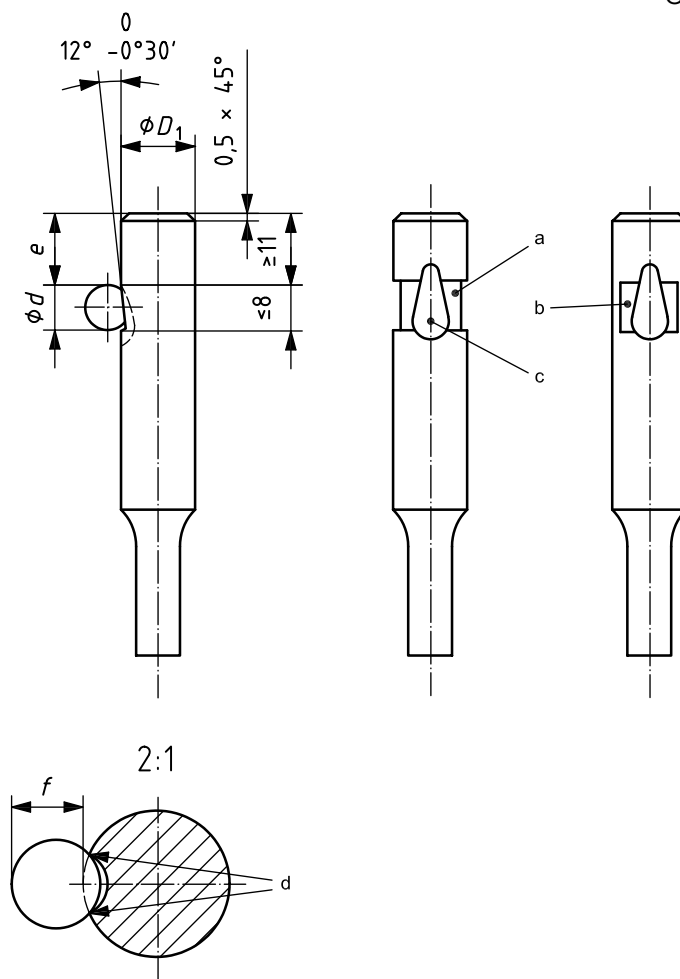
### 3 Terms and definitions

For the purposes of this part of ISO 10071, the terms and definitions given in ISO 8695 apply.

### 4 Dimensions

#### 4.1 Basic dimensions — Ball in locking position

The dimension of the ball and the dimensions and tolerances of the ball seat of ball-lock punches for light duty shall conform to the indications given in Figure 1 and Table 1.



- a Ball seat relief: type and dimensions at manufacturer's direction.
- b Alternative ball seat relief types (band type, swipe type).
- c Ball seat.
- d Two-point contact.

Figure 1

Table 1

$D_1$	Ball diameter	$e$	$f$
g5	$d$	+0,2 0	0 -0,1
6	6	14	5,2
10	8	12,4	6,7
13	8	12,4	6,7
16	8	12,4	6,7
20	8	12,4	6,7
25	8	12,4	6,7
32	8	12,4	6,7

## 4.2 Perforating punches

### 4.2.1 Punches with straight shank — Type A

The dimensions of type A ball-lock punches with a straight shank shall conform to the indications given in Figure 2 and Table 2.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres

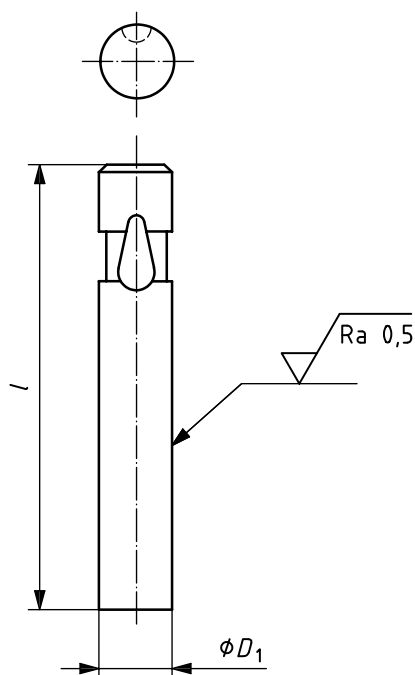


Figure 2

Table 2

$D_1$ g5	$l$ +0,5 0				
	63	71	80	90	100
6	x	x	x	x	x
10	x	x	x	x	x
13	x	x	x	x	x
16		x	x	x	x
20		x	x	x	x
25		x	x	x	x
32		x	x	x	x

NOTE See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

4.2.2 Punches with reduced shank

4.2.2.1 Punches with round shape — Type B

The dimensions of type B ball-lock punches with a round shape shall conform to the indications given in Figure 3 and Table 3.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres

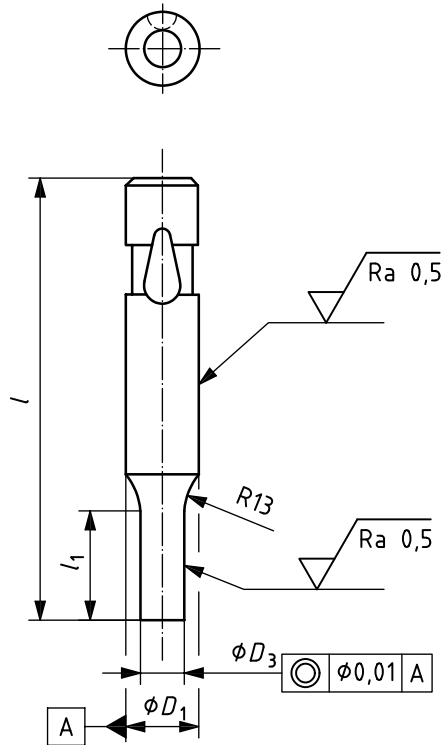


Figure 3

Table 3

$D_1$ g5	$D_3$ $\pm 0,01$	$l$ $\begin{matrix} +0,5 \\ 0 \end{matrix}$				
		63	71	80	90	100
6	$1,6 \leq D_3 \leq 5,9$	x	x	x	x	x
10	$3,5 \leq D_3 \leq 9,9$	x	x	x	x	x
13	$6 \leq D_3 \leq 12,9$	x	x	x	x	x
16	$8,5 \leq D_3 \leq 15,9$		x	x	x	x
20	$12,5 \leq D_3 \leq 19,9$		x	x	x	x
25	$18 \leq D_3 \leq 24,9$		x	x	x	x
32	$20 \leq D_3 \leq 31,9$		x	x	x	x

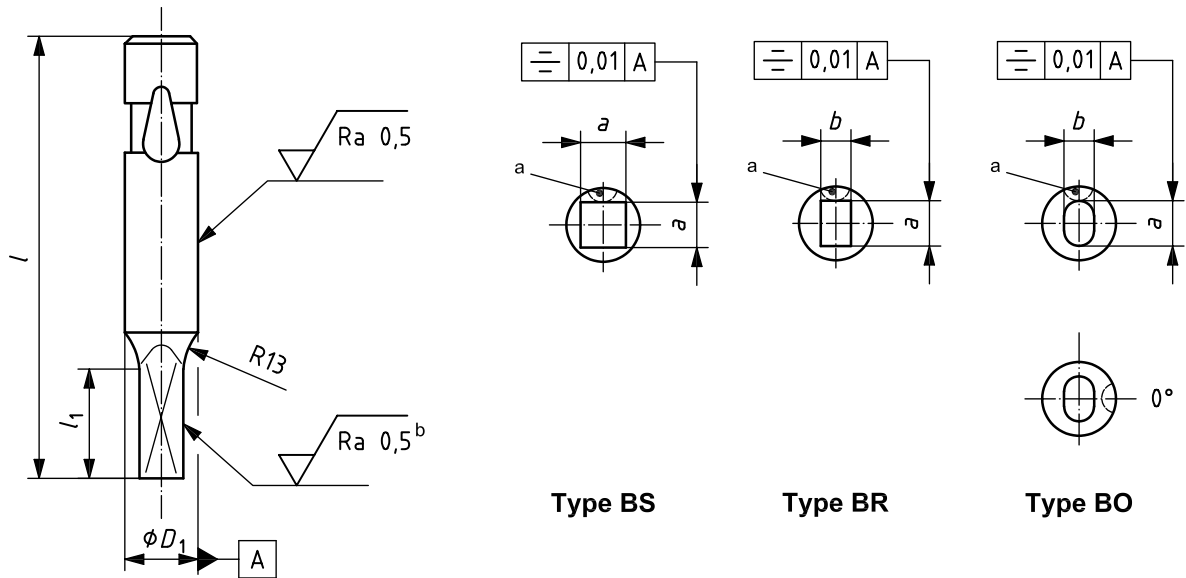
NOTE The point length,  $l_1$ , is left to the manufacturer's direction. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.



4.2.2.2 Punches with square (S), rectangular (R) and oblong (O) shapes — Types BS, BR and BO

The dimensions of types BS, BR and BO ball-lock punches with a square, rectangular and oblong shape shall conform to the indications given in Figure 4 and Table 4.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres



- a Standard at 90°.
- b On all work faces of the point.

Figure 4

Table 4

$D_1$ g5	Type BS	Types BR and BO	$l$				
	$a$ $\pm 0,01$	$a$ and $b$ $\pm 0,01$	$+0,5$	$0$			
6	$1,6 \leq a \leq 4,2$	$1,6 \leq a$ and $b \leq 5,9$	63	71	80	90	100
10	$3,2 \leq a \leq 7$	$3,2 \leq a$ and $b \leq 9,9$	x	x	x	x	x
13	$5 \leq a \leq 9,1$	$5 \leq a$ and $b \leq 12,9$	x	x	x	x	x
16	$6,5 \leq a \leq 11,2$	$6,3 \leq a$ and $b \leq 15,9$	x	x	x	x	x
20	$8,5 \leq a \leq 14,1$	$8 \leq a$ and $b \leq 19,9$		x	x	x	x
25	$11 \leq a \leq 17,6$	$10 \leq a$ and $b \leq 24,9$		x	x	x	x
32	$14 \leq a \leq 22,5$	$12 \leq a$ and $b \leq 31,9$		x	x	x	x

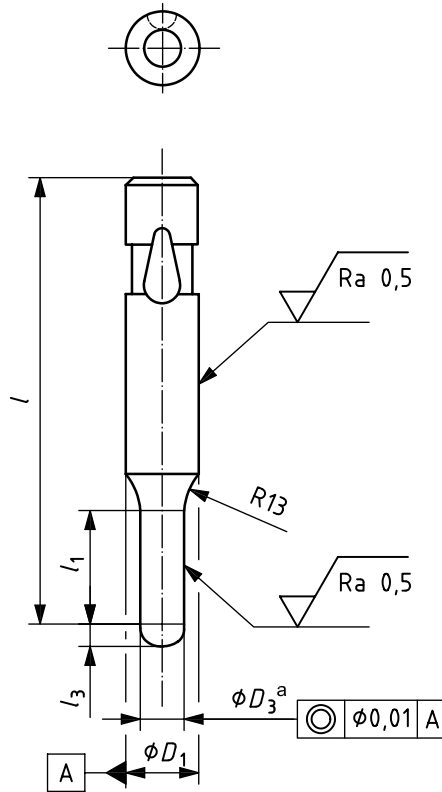
NOTE The point length,  $l_1$ , is left to the manufacturer's discretion. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

4.3 Pilot punches

4.3.1 Pilot punches — Type C

The dimensions of type C ball-lock pilot punches shall conform to the indications given in Figure 5 and Table 5.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres



<sup>a</sup> The diameter  $D_3$  of the pilot shall be smaller than the diameter of the equivalent punch.

Figure 5

Table 5

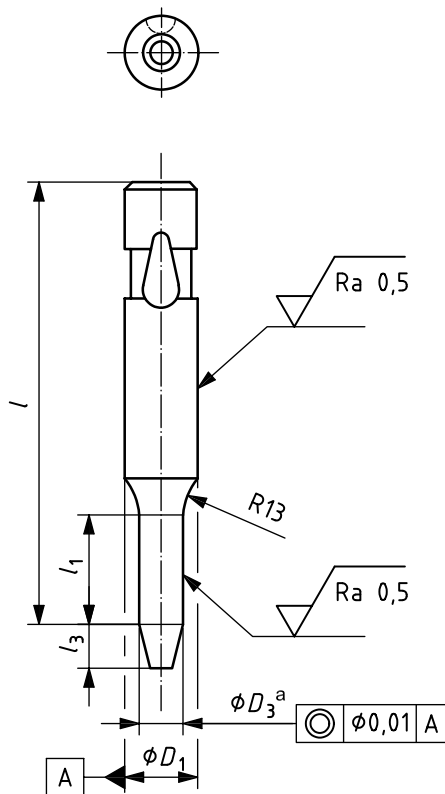
$D_1$ g5	$D_3$ $\pm 0,01$	$l$ $\begin{matrix} +0,5 \\ 0 \end{matrix}$				
		63	71	80	90	100
6	$1,59 \leq D_3 \leq 5,9$	x	x	x	x	x
10	$3,49 \leq D_3 \leq 9,9$	x	x	x	x	x
13	$5,99 \leq D_3 \leq 12,9$	x	x	x	x	x
16	$8,49 \leq D_3 \leq 15,9$		x	x	x	x
20	$12,49 \leq D_3 \leq 19,9$		x	x	x	x
25	$17,99 \leq D_3 \leq 24,9$		x	x	x	x
32	$19,99 \leq D_3 \leq 31,9$		x	x	x	x

NOTE The point lengths,  $l_1$  and  $l_3$ , and the point shape are left to the manufacturer's discretion. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

4.3.2 Positive pilot punches — Type D

The dimensions of type D ball-lock pilot punches shall conform to the indications given in Figure 6 and Table 6.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres



<sup>a</sup> The diameter  $D_3$  of the pilot shall be smaller than the diameter of the equivalent punch.

Figure 6

Table 6

$D_1$ g5	$D_3$ $\pm 0,01$	$l$ $+0,5$ 0				
		63	71	80	90	100
10	$5 \leq D_3 \leq 9,9$	x	x	x	x	x
13	$9 \leq D_3 \leq 12,9$	x	x	x	x	x
16	$12 \leq D_3 \leq 15,9$		x	x	x	x
20	$15 \leq D_3 \leq 19,9$		x	x	x	x
25	$19 \leq D_3 \leq 24,9$		x	x	x	x
32	$24 \leq D_3 \leq 31,9$		x	x	x	x

NOTE The point lengths,  $l_1$  and  $l_3$ , and the point shape are left to the manufacturer's discretion. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

4.4 Punches with ejector

4.4.1 Punches with ejector with straight shank — Type E

The dimensions of type E ball-lock punches that have an ejector with a straight shank shall conform to the indications given in Figure 7 and Table 7.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres

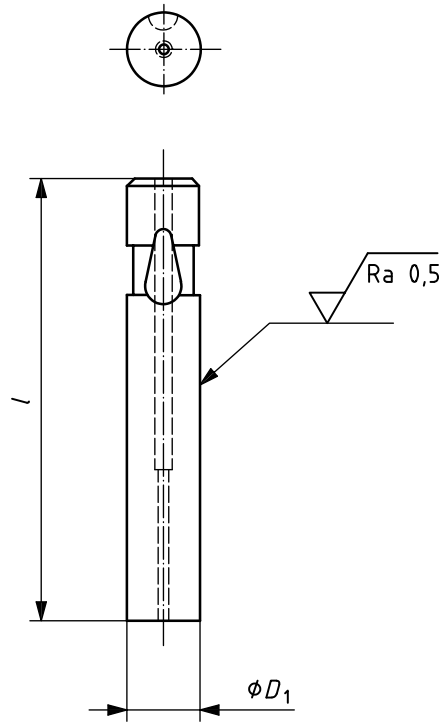


Figure 7

Table 7

$D_1$ g5	$l$ +0,5 0				
	63	71	80	90	100
6	x	x	x	x	x
10	x	x	x	x	x
13	x	x	x	x	x
16		x	x	x	x
20		x	x	x	x
25		x	x	x	x
32		x	x	x	x

NOTE The ejector components and the locking hole are left to the manufacturer's discretion. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

4.4.2 Punches with ejector with reduced shank

4.4.2.1 Punches with ejector with round shape — Type F

The dimensions of type F ball-lock punches that have an ejector with a round shape shall conform to the indications given in Figure 8 and Table 8.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres

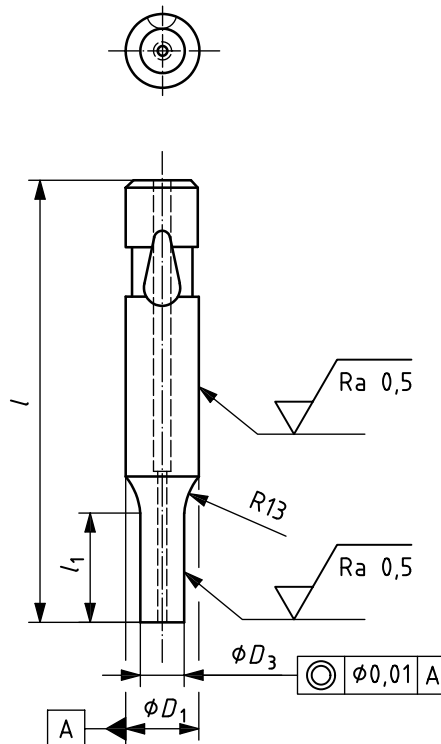


Figure 8

Table 8

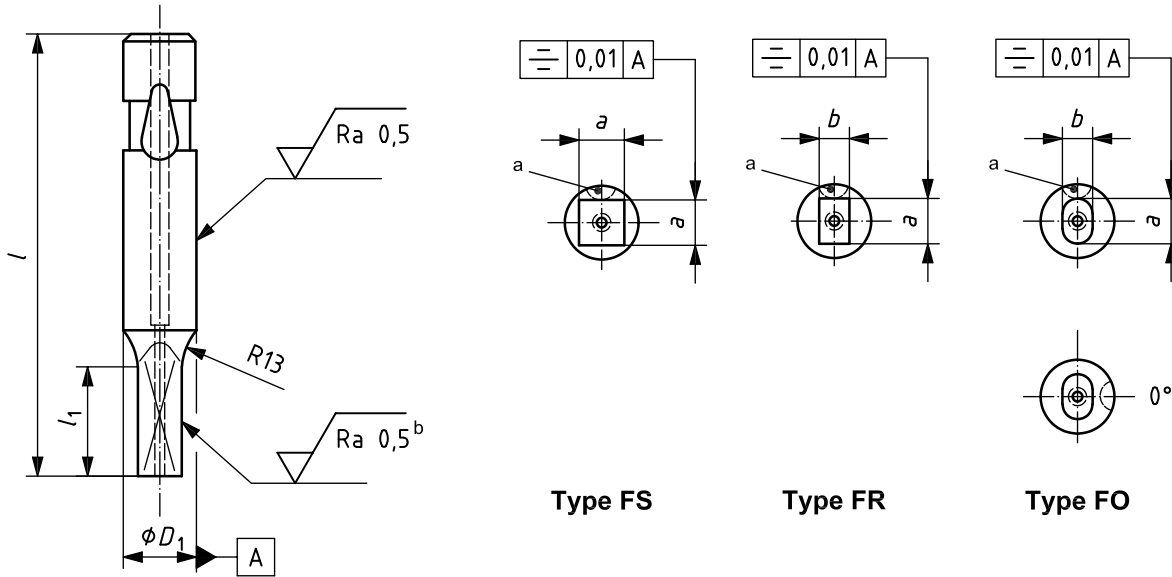
$D_1$ g5	$D_3$ $\pm 0,01$	$l$ $\begin{matrix} +0,5 \\ 0 \end{matrix}$				
		63	71	80	90	100
6	$1,6 \leq D_3 \leq 5,9$	x	x	x	x	x
10	$3,5 \leq D_3 \leq 9,9$	x	x	x	x	x
13	$6 \leq D_3 \leq 12,9$	x	x	x	x	x
16	$8,5 \leq D_3 \leq 15,9$		x	x	x	x
20	$12,5 \leq D_3 \leq 19,9$		x	x	x	x
25	$18 \leq D_3 \leq 24,9$		x	x	x	x
32	$20 \leq D_3 \leq 31,9$		x	x	x	x

NOTE The point length,  $l_1$ , the ejector components and the locking hole are left to the manufacturer's discretion. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

4.4.2.2 Punches with ejector with square (S), rectangular (R) and oblong (O) shapes — Type FS, FR and FO

The dimensions of types FS, FR and FO ball-lock punches with ejector and square, rectangular or oblong shape shall conform to the indications given in Figure 9 and Table 9.

General tolerance: ISO 2768-m  
Surface roughness value in micrometres



- a Standard at 90°.
- b On all work faces of the point.

Figure 9

Table 9

$D_1$ g5	Type FS $a$ $\pm 0,01$	Types FR and FO $a$ and $b$ $\pm 0,01$	$l$ $+0,5$ $0$				
	6	$1,6 \leq a \leq 4,2$	$1,6 \leq a$ and $b \leq 5,9$	63	71	80	90
10	$3,2 \leq a \leq 7$	$3,2 \leq a$ and $b \leq 9,9$	x	x	x	x	x
13	$5 \leq a \leq 9,1$	$5 \leq a$ and $b \leq 12,9$	x	x	x	x	x
16	$6,5 \leq a \leq 11,2$	$6,3 \leq a$ and $b \leq 15,9$	x	x	x	x	x
20	$8,5 \leq a \leq 14,1$	$8 \leq a$ and $b \leq 19,9$		x	x	x	x
25	$11 \leq a \leq 17,6$	$10 \leq a$ and $b \leq 24,9$		x	x	x	x
32	$14 \leq a \leq 22,5$	$12 \leq a$ and $b \leq 31,9$		x	x	x	x

NOTE The point length,  $l_1$ , the ejector components and the locking hole are left to the manufacturer's discretion. See 4.1 for the dimension of the ball and dimensions and tolerances of the ball seat.

## 5 Material and hardness

The material is left to the manufacturer's discretion. The following hardness values are given as examples:

- a) alloyed cold work steel with 5 % to 12 % Cr:  $(60 \pm 2)$  HRC;
- b) high speed steel:  $(62 \pm 2)$  HRC.

## 6 Designation

A ball-lock punch in accordance with this part of ISO 10071 shall be designated by:

- a) "Ball-lock punch";
- b) reference to this part of ISO 10071, i.e. ISO 10071-1;
- c) type of punch (A, B, BS, BR, BO, C, D, E, F, FS, FR or FO);
- d) its shank diameter,  $D_1$ , in millimetres;
- e) for types B, BS, BR, BO, C, D, F, FS, FR and FO, its point dimensions ( $D_3$ ,  $a$  or  $a \times b$ ), in millimetres;
- f) for types BS, BR, BO, FS, FR and FO, the relative position of the shape to the ball seat position ( $0^\circ$  or  $90^\circ$ );
- g) its overall length,  $l$ , in millimetres;
- h) its material (alloyed cold work steel with 5 % to 12 % Cr or high-speed steel).

EXAMPLE 1 A ball-lock punch, round (type B), diameter  $D_1 = 6$  mm, range of point diameter  $D_3 = 2$  mm and overall length  $l = 63$  mm in alloyed cold work steel, is designated as follows:

**Ball-lock punch ISO 10071-1 — B — 6 × 2 × 63 — Alloyed cold work steel**

EXAMPLE 2 A ball-lock punch, rectangular (type BR), diameter  $D_1 = 6$  mm, range of point size  $a \times b = 2$  mm × 3 mm with a ball seat position at  $90^\circ$  and overall length  $l = 63$  mm in high-speed steel, is designated as follows:

**Ball-lock punch ISO 10071-1 — BR — 6 × 2 × 3 × 90° × 63 — High-speed steel**

## Bibliography

- [1] ISO 4957:1999, *Tool steels*
- [2] ISO 6508-1:2005, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*
- [3] ISO 6508-2:2005, *Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines (scales A, B, C, D, E, F, G, H, K, N, T)*
- [4] ISO 6508-3:2005, *Metallic materials — Rockwell hardness test — Part 3: Calibration of reference blocks (scales A, B, C, D, E, F, G, H, K, N, T)*





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