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## Tools for pressing — Vocabulary

*Outillage de presse — Vocabulaire*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

This document was developed on basis of ISO 8695 and Chinese National Standard GB/T 8845-2017.

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# Tools for pressing — Vocabulary

## 1 Scope

This document establishes the terms and definitions of the main types of tools for pressing, their features and dimensional characteristics. Some of these terms refer to components whose functions are shown in [Figure 1](#), [Figure 2](#) and [Annex A](#).

This document is intended to serve as a reference for users and manufacturers of tools for pressing.

This document is used for understanding of technical terms and applicable for communication and trade of tools for pressing.

NOTE The figures are given only as examples to illustrate the terms and definitions.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1 Classification

#### 3.1.1

##### **stamping die** **stamping tool**

tool to get product under pressure through separating, shaping or joining metallic, non-metallic flat sheet or section by deforming it with a die, including *blanking die* ([3.1.2](#)), *drawing die* ([3.1.5](#)), *bending die* ([3.1.3](#)), *forming die* ([3.1.6](#)), *progressive die* ([3.1.8](#)) and *compound die* ([3.1.7](#)), etc.

#### 3.1.2

##### **blanking die**

die to separate sheet material along a closed or open profile line

##### 3.1.2.1

##### **punching die**

*blanking die* ([3.1.2](#)) to separate material and get product with closed outer profile, consisting of *blanking punch* ([3.2.6.1](#)) and *punching die plate* ([3.2.5](#))

Note 1 to entry: See [Figure A.1](#).

##### 3.1.2.2

##### **perforating die**

*blanking die* ([3.1.2](#)) to separate material and get product with closed inner profile

##### 3.1.2.3

##### **fine blanking die**

*blanking die* ([3.1.2](#)) with the sheet deformation zone punched under three-dimensional pressure stress to form high smoothness surface and high precision dimension product

**3.1.2.4**

**cutting-off die**

*blanking die* (3.1.2) to separate sheet material along non-closed profile

**3.1.2.5**

**trimming die**

*blanking die* (3.1.2) to cut off excess material at the edge of processed part

**3.1.2.6**

**shaving die**

*blanking die* (3.1.2) to trim off a small amount of material along the blanked edges or holes to improve the product dimension precision and reduce the blanked section roughness value

**3.1.3**

**bending die**

*stamping die* (3.1.1) to bend blank or workpiece to certain angle and shape

Note 1 to entry: See [Figure A.2](#).

**3.1.4**

**curling die**

*stamping die* (3.1.1) to curl workpiece edge to certain shape, or to create a hollow ring

**3.1.5**

**drawing die**

*stamping die* (3.1.1) to draw blank to hollow body product or workpiece or to further change the hollow body workpiece shape and dimension

Note 1 to entry: See [Figure A.3](#).

**3.1.5.1**

**obverse drawing die**

*drawing die* (3.1.5) to redraw workpiece in the same direction of former drawing process

**3.1.5.2**

**reverse drawing die**

*drawing die* (3.1.5) to flange hollow body workpiece inwall

**3.1.5.3**

**hydrodrawing die**

*drawing die* (3.1.5) using fluid to draw a part

**3.1.6**

**forming die**

*stamping die* (3.1.1) to produce plastic deformation without a blank holder in sheet or blank material to form a product

**3.1.6.1**

**bulging die**

*forming die* (3.1.6) to produce tensile plastic deformation inside hollow blank to get product with convex drum shape

**3.1.6.2**

**flanging die**

*forming die* (3.1.6) to erect workpiece edge or to form certain angle of straight flange

**3.1.6.3**

**burring die**

*forming die* (3.1.6) to erect workpiece hole edge or to form certain angle of straight flange

**3.1.6.4****necking die**

*forming die* (3.1.6) to reduce the radial dimension of hollow or tubular workpiece end

**3.1.6.5****flaring die**

*forming die* (3.1.6) to enlarge the radial dimension of hollow or tubular workpiece end

**3.1.6.6****hydroforming die**

*forming die* (3.1.6) using fluid as a force transmission medium to work with a *punch* (3.2.6.1) or *die plate* (3.2.5) to form product

**3.1.6.7****micro forming die**

*forming die* (3.1.6) with which at least two-dimensional submillimeter level dimensions in the plastic forming part of product are achieved

**3.1.6.8****calibration die**

*forming die* (3.1.6) used to rework a product to achieve the required shape, dimension and precision

**3.1.6.9****embossing die**

*forming die* (3.1.6) used to press a convex-concave imprint on the product surface, while changing the material thickness between the two surfaces

**3.1.7****compound die**

*single-station stamping die* (3.1.1) which can simultaneously complete two or more stamping processes in one-stroke of press machine

Note 1 to entry: See [Figure A.4](#).

**3.1.7.1****obverse compound die**

*compound die* (3.1.7) with the *cutting punch in combination punching* (3.2.6.3) in the *upper die* (3.2.3) and with the *punching die button* (3.2.6.4) and *perforating punch* (3.2.6.1) mounted in the *lower die* (3.2.4)

**3.1.7.2****inverse compound die**

*compound die* (3.1.7) with the *cutting punch in combination punching* (3.2.6.3) in the *lower die* (3.2.4) and with the *punching die button* (3.2.6.4) and *perforating punch* (3.2.6.1) mounted in the *upper die* (3.2.3)

**3.1.8****progressive die**

*stamping die* (3.1.1) which in one-stroke of press machine can the strip material be fed in successively at fixed pitch and simultaneously complete multi-process stamping in multi-station arranged in the direction of material-feeding

Note 1 to entry: See [Figure A.5](#).

**3.1.9****single-operation die**

*stamping die* (3.1.1) which completes one stamping process in one-stroke of press machine

**3.1.10****combined die**

*stamping die* (3.1.1) which completes different stamping processes or produces various products through disassembling and assembling combination of die components

### 3.1.11

#### **transfer die**

*stamping die* (3.1.1) to simultaneously complete multi-process stamping at two or more stations arranged in the feeding direction in one stroke of press machine, in which the delivery of workpiece is realized by means of automatic transmission device

### 3.1.12

#### **flexible die**

*stamping die* (3.1.1) which respectively produces various specification of products through controlling states of different working stations

### 3.1.13

#### **hot stamping die**

*stamping die* (3.1.1) to shape heated metal sheet and then harden it by cooling

### 3.1.14

#### **multi-function stamping die**

*stamping die* (3.1.1) with multiple functions such as automatic punching, stacking, counting, grouping, skewing and safety protection, etc.

### 3.1.15

#### **low-cost die**

*stamping die* (3.1.1) with simple structure, short manufacturing cycle and low cost, suitable for small-lot or pilot production

#### 3.1.15.1

##### **rubber die**

*low-cost die* (3.1.15) in which the *working components* (3.2.6) are made of rubber

#### 3.1.15.2

##### **resin die**

*low-cost die* (3.1.15) in which the *working components* (3.2.6) are made of high polymer material

#### 3.1.15.3

##### **low-melting-point alloy die**

*low-cost die* (3.1.15) in which the *working components* (3.2.6) are made of low melting-point alloy

### 3.1.16

#### **planishing die**

*stamping die* (3.1.1) to flatten product to achieve the required plane precision

## 3.2 Parts and components

### 3.2.1

#### **die set**

sub-assembly of a die usually consisting of a bottom plate (*matrix* (3.2.6.2) *retainer* (3.2.23.4)) and an top plate (*punch* (3.2.6.1) *retainer* (3.2.23.4)), with *guide pillars* (3.2.23.1) built into one of the plates and the corresponding *guide bushes* (3.2.23.2) built into the other plate

#### 3.2.1.1

##### **standardized die set**

*die set* (3.2.1) combined by assembly of components which have standardized, serialized structural types and dimensions, and certain interchangeability

#### 3.2.1.2

##### **quick change die set**

*die set* (3.2.1) into which several different die *inserts* (3.2.8) can be fitted

**3.2.1.3****die set, rear pillars**

*die set* (3.2.1) with *guide pillars* (3.2.23.1) mounted on the rear side of the top and bottom plates

Note 1 to entry: *Die set* (3.2.1) with rear pillars, which is particularly suited to single-process dies and is used for inserting large work pieces.

**3.2.1.4****die set, diagonal pillars**

*die set* (3.2.1) with *guide pillars* (3.2.23.1) mounted diagonal to each other at the corners of the top and bottom plates

Note 1 to entry: *Die set* (3.2.1) with diagonally positioned pillars, which is particularly suited to *progressive dies* (3.1.8) with multiple working steps, but only for suitably narrow work pieces.

**3.2.1.5****die set, center pillars**

*die set* (3.2.1) with *guide pillars* (3.2.23.1) mounted in bilateral symmetry at the centre of the edges of the top and bottom plates

Note 1 to entry: *Die set* (3.2.1) with center pillars, which is primarily used for single-process dies, e.g. *blanking dies* (3.1.2).

**3.2.1.6****die set, four pillars**

*die set* (3.2.1) with *guide pillars* (3.2.23.1) mounted at all four corners of the top and bottom plates

**3.2.1.7****fine blanking die set**

*die set* (3.2.1) with high rigidity and guide precision and suitable for fine blanking

**3.2.1.8****sliding guide die set**

*die set* (3.2.1) in which sliding guides are used to guide the *upper* and *lower dies* (3.2.3 and 3.2.4)

**3.2.1.9****die set with roller bearing**

*die set* (3.2.1) in which roller bearings are used to guide the *upper* and *lower dies* (3.2.3 and 3.2.4), preferably using ball or roller guides

**3.2.1.10****die set with spring-loaded plate**

*die set* (3.2.1) in which a third plate, the spring-loaded *guide plate* (3.2.23.5), is placed between the *upper* and *lower dies* (3.2.3 and 3.2.4)

**3.2.2****die shoe**

part of *die set* (3.2.1) that is fixed to the press ram or bed, on which the *working components* (3.2.6), *guide elements* (3.2.23) and locating parts are positioned

**3.2.3****upper die****upper half of die**

die part mounted on the press ram

**3.2.4****lower die****lower half of die**

die part mounted on the press bed (anvil)

### 3.2.5

#### **die plate**

plate part that forms *stamping die* ([3.1.1](#))

Note 1 to entry: *Die plates* ([3.2.5](#)) include the openings for the *punches* ([3.2.6.1](#)) used in the various work stages.

### 3.2.6

#### **working component**

component which directly forms the shapes and dimensions of the product

#### 3.2.6.1

##### **punch**

*working component* ([3.2.6](#)) which is counterpart to the *matrix* ([3.2.6.2](#)) and used for cutting or punching in shear cutting processes

##### 3.2.6.1.1

###### **round punch**

*punch* ([3.2.6.1](#)) with cylindrical section body

Note 1 to entry: See [Figure 1](#).

##### 3.2.6.1.2

###### **punch with ejector**

*punch* ([3.2.6.1](#)) with mounting holes for *ejector pins* ([3.2.25.6](#))

##### 3.2.6.1.3

###### **quick change punch**

*punch* ([3.2.6.1](#)) which can be rapidly demounted and replaced

##### 3.2.6.1.3.1

###### **ball-lock punch**

*quick change punch* ([3.2.6.1.3](#)) which is mounted and held by a ball-lock

#### 3.2.6.2

##### **matrix**

*working component* ([3.2.6](#)) which is used for cutting or punching in shear cutting processes

#### 3.2.6.2.1

##### **round matrix**

cylindrical *matrix* ([3.2.6.2](#))

Note 1 to entry: See [Figure 2](#).

#### 3.2.6.2.2

##### **quick change matrix**

*matrix* ([3.2.6.2](#)) which can be rapidly demounted and replaced

#### 3.2.6.3

##### **cutting punch in combination punching**

*working component* ([3.2.6](#)) which serves both as the cutting *punch* ([3.2.6.1](#)) and cutting *die button* ([3.2.6.4](#))

#### 3.2.6.4

##### **die button**

plate part that works as the *matrix* ([3.2.6.2](#))

### 3.2.7

#### **shrinking ring**

circular bushing component embracing *die button* ([3.2.6.4](#)), which has interference fit with the *matrix* ([3.2.6.2](#)) to increase its strength

**3.2.8****insert**

working part built into the *punch* (3.2.6.1) or the *die button* (3.2.6.4)

**3.2.9****section**

*working component* (3.2.6) joined together as main body of forming component

**3.2.10****side cutter**

*working component* (3.2.6) used to make notches at the side edge of sheet material for limiting the feeding pitch

**3.2.11****feed limiter**

fixed stop to limit the feed of sheet material

**3.2.11.1****locating pin**

component that serves to correctly position sheet material or workpiece

**3.2.11.2****locating plate**

plate component that serves to correctly position sheet material or workpiece

Note 1 to entry: To ensure that the sheet/strip is correctly fed into the tool and to prevent buckling.

**3.2.12****stop pin**

component to determine the feeding pitch of sheet material

**3.2.13****finger stop pin**

component to determine the initial feeding position of sheet material

**3.2.14****pilot punch**

*punch* (3.2.6.1) with a radiused nose point end, which enters previously made holes of various shapes to pick up and accurately locate the stock within the die

**3.2.15****strip lifter pin**

component for lifting the material being worked on and sometimes also for guiding the feeding of sheet material

**3.2.16****stock guide rail**

component that guides sheet material

**3.2.17****backing plate**

plate component to bear and disperse the forming pressure and to adjust the height

Note 1 to entry: See 10 of [Figure A.4](#).

**3.2.18****retainer plate**

plate component to fix the *working components* (3.2.6)

**3.2.19**

**spring-loaded guide rail**

plate component used to eliminate the side clearance between the sheet or strip material and the *stock guide rail* ([3.2.16](#))

**3.2.20**

**stop block**

plate or block component to bear lateral force

**3.2.21**

**limit block**

component to limit the stamping stroke or position

**3.2.22**

**automatic feeder**

**automatic feeding mechanism**

device used to set the feeding of sheet or strip

**3.2.23**

**guide element**

component to ensure the guide for movement and to determine the relative position precision of *upper* and *lower dies* ([3.2.3](#) and [3.2.4](#)) during operation

**3.2.23.1**

**guide pillar**

pillar component which is matched with *guide bush* ([3.2.23.2](#)) (or guide hole) to guide the movement and to determine the relative position precision of *upper* and *lower dies* ([3.2.3](#) and [3.2.4](#))

**3.2.23.2**

**guide bush**

component which is matched with *guide pillar* ([3.2.23.1](#)) to guide the movement and to determine the relative position precision of *upper* and *lower dies* ([3.2.3](#) and [3.2.4](#))

**3.2.23.3**

**ball cage**

circular bushing

Note 1 to entry: Ball cages are mounted pre-tensioned so that there is no play in the guiding. Ball cages are manufactured with very precise rolling elements, which are fixed in the ball cage in such a manner that the rolling movement is not hindered and the rolling elements do not fall out of the ball cage.

**3.2.23.4**

**retainer**

limit component to confine the *ball cage* ([3.2.23.3](#)) on the *guide pillar* ([3.2.23.1](#)) or in the *guide bush* ([3.2.23.2](#))

**3.2.23.5**

**guide plate**

plate component to guide the die assembly

**3.2.23.6**

**sliding plate**

plate component which has high hardness or with lubricating properties to correctly guide the relative position of different parts in *upper die* ([3.2.3](#)) and *lower die* ([3.2.4](#))

**3.2.24**

**clamping component**

component to clamp sheet material

**3.2.24.1****stock-supporting plate**

plate component to support the sheet material which is entering die

**3.2.24.2****pressure plate**

plate or block component used to press sheet material on the *punch* (3.2.6.1) or *matrix* (3.2.6.2)

**3.2.24.3****blank holder**

component in a cutting die or *forming die* (3.1.6), which is used to hold down the sheet material edge in order to adjust the material flow resistance and to prevent wrinkling

**3.2.24.4****vee-ring plate**

toothed ring component in *fine blanking die* (3.1.2.3), which is used to form strong three-dimensional compressive stress and to prevent the sliding of sheet material from the surface of the punching layer and tearing on the blanking surface

**3.2.25****stripping component**

component to demould or eject the product and scraps

**3.2.25.1****ejector pressure plate**

plate component for transferring the ejection force of press machine to the component

**3.2.25.2****slide feed plate**

plate component to push workpiece to next working station

**3.2.25.3****stripper plate**

plate component for stripping the product from the die

**3.2.25.3.1****fixed stripper plate**

*stripper plate* (3.2.25.3) fixed in the moving half and which also acts as guide for the *punch* (3.2.6.1)

**3.2.25.3.2****elastic stripper plate**

*stripper plate* (3.2.25.3) that effects the stripping and blank holding via an elastic element, which also serves to protect and guide the *punch* (3.2.6.1)

**3.2.25.4****shoulder screw**

rod component which connects the *stripper plate* (3.2.25.3) and adjusts the stripping distance of the plate

Note 1 to entry: See 2 of [Figure A.1](#).

**3.2.25.5****pressure pad**

block component to eject the product or scraps from the *matrix* (3.2.6.2)

Note 1 to entry: See 12 of [Figure A.1](#).

**3.2.25.6****ejector pin**

rod component to push out the products, slugs and scraps or congealed material

**3.2.25.7**

**pressure pin**

rod component to connect the *ejector pressure plate* ([3.2.25.1](#)) and *pressure pad* ([3.2.25.5](#)) and to transfer ejector force of the press machine

**3.2.25.8**

**ejector bolt**

rod component which passes through the *clamping pin* ([3.2.27](#)) hole and transfers the force of press ram to the *ejector pressure plate* ([3.2.25.1](#))

**3.2.25.9**

**tie rod**

rod component which is fixed in the top plate and transfers the *stripping force* ([3.3.38](#)) to the *cushion plate* ([3.2.25.10](#))

**3.2.25.10**

**cushion plate**

component which is mounted in bottom plate and transfers the force of the *cushion* ([3.2.25.12](#)) to the *ejector pin* ([3.2.25.6](#))

Note 1 to entry: See 10 of [Figure A.1](#).

**3.2.25.11**

**cushion pin**

rod component which connects the *cushion plate* ([3.2.25.10](#)) and transfers the force to the *pressure plate* ([3.2.24.2](#)), *blank holder* ([3.2.24.3](#)) or *stripper plate* ([3.2.25.3](#))

**3.2.25.12**

**cushion**

device to transfer the *ejecting force* ([3.3.39](#)) to the *blank holder* ([3.2.24.3](#)) or the *pressure pad* ([3.2.25.5](#))

**3.2.25.13**

**scrap cutter**

component used to cut off scraps during stamping process

**3.2.26**

**punch-protecting bushing**

bushing component to improve the integral rigidity of slender *punch* ([3.2.6.1](#))

**3.2.27**

**clamping pin**

**centering tool**

connecting component to make the center line of die and press machine overlapped and to fix the *upper die* ([3.2.3](#)) on press ram

**3.2.27.1**

**self-centering clamping pin**

*clamping pin* ([3.2.27](#)) with self-centering effect

**3.2.28**

**cam driver**

mechanism which can transfer vertical movement to horizontal or slanted movement through cooperative use of driving block and *slider* ([3.2.29](#))

**3.2.28.1**

**rotating cam driver**

*cam driver* ([3.2.28](#)) to make working *slider* ([3.2.29](#)) (shaft) which is cylindrical in overall do rotation movement

**3.2.28.2****swinging cam driver**

*cam driver* (3.2.28) to make working *slider* (3.2.29) do pendulum movement around axis

**3.2.29****slider**

component which reciprocates along the changed direction with a wedge effect, for cutting or forming processes

**3.2.30****wear plate**

plate component mounted on sliding surface and has high hardness or with lubricating properties

**3.2.31****scrap-removing mechanism**

mechanism for collecting chips/scrap and removing them/it from the die or press machine

**3.2.32****feed safety detection mechanism**

device to detect the incorrect feeding situation of *automatic feeding mechanism* (3.2.22) and then to exit from die working zone and stop in due time

**3.2.33****strip delivery detection device**

device to detect the situation of incorrect delivery of strip material to position in automatic high-speed stamping process and then to stop in due time

**3.2.34****bottom dead center detection device**

device to detect the situation of the die's incorrect reaching the bottom dead center in automatic high-speed stamping process and then to stop in due time

**3.2.35****scrap-bouncing prevention device**

auxiliary device which is set on the die to prevent the bouncing of scraps in stamping process

**3.2.36****safety shield**

thin sheet which is mounted on the die as a protective device

**3.2.37****temperature control system**

temperature control device which is used to control the die temperature through heating or cooling

**3.3 Design elements****3.3.1****cutting point**

*punch* (3.2.6.1) active section which directly stamps or pierces sheet material to get the required shapes and dimensions

Note 1 to entry: See 6 in [Figure 1](#).

**3.3.2****point diameter**

dimension, equal to the *hole diameter* (3.3.10) in the component

Note 1 to entry: See 5 in [Figure 1](#) and ISO 8695:2010, Figure 11.

### 3.3.3

#### **point length**

length of cutting diameter

### 3.3.4

#### **punch shank**

*punch* (3.2.6.1) section which is fitted in a relative hole in the *punch* (3.2.6.1) *retainer* (3.2.23.4)

Note 1 to entry: See 10 in [Figure 1](#).

### 3.3.5

#### **punch shank diameter**

nominal diameter of *punch shank* (3.3.4)

Note 1 to entry: See 9 in [Figure 1](#) and ISO 8695:2010, Figure 12.

### 3.3.6

#### **reduced punch diameter**

diameter of the reduced shank section which is set at the *punch* (3.2.6.1) press-in end for its correct pressing into the *punch* (3.2.6.1) *retainer* (3.2.23.4)

Note 1 to entry: See 8 in [Figure 1](#).

### 3.3.7

#### **radius blend**

connecting radius of the shank or lead to the *cutting point* (3.3.1)

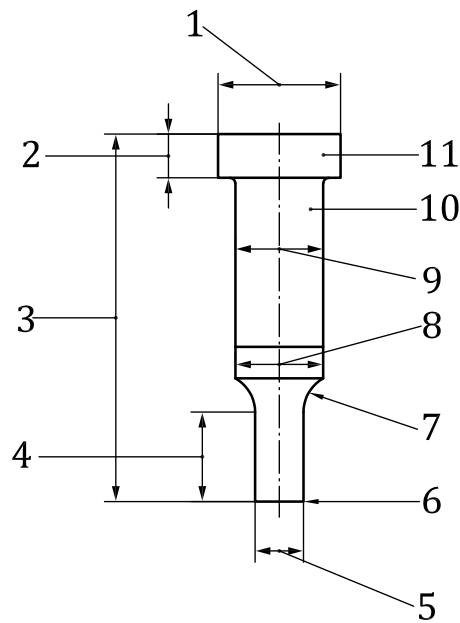
Note 1 to entry: See 7 in [Figure 1](#) and ISO 8695:2010, Figure 11.

### 3.3.8

#### **punch overall length**

total length between the two ends of *punch* (3.2.6.1)

Note 1 to entry: See 3 in [Figure 1](#) and ISO 8695:2010, Figure 11.

**Key**

|   |                      |    |                        |
|---|----------------------|----|------------------------|
| 1 | head diameter        | 7  | radius blend           |
| 2 | head thickness       | 8  | reduced punch diameter |
| 3 | punch overall length | 9  | punch shank diameter   |
| 4 | point length         | 10 | punch shank            |
| 5 | point diameter       | 11 | punch head             |
| 6 | cutting point        |    |                        |

**Figure 1 — Round punch****3.3.9****matrix point**

*matrix* (3.2.6.2) active section which is matched with the *punch* (3.2.6.1) active section for stamping sheet material to get the required shapes and dimensions

Note 1 to entry: See 4 in Figure 2.

**3.3.10****hole diameter**

*cutting hole diameter* (3.3.11) of the *matrix* (3.2.6.2)

Note 1 to entry: See 3 in Figure 2.

**3.3.11****cutting hole length**

active section length of the *matrix* (3.2.6.2)

Note 1 to entry: See 12 in Figure 2.

**3.3.12****cutting edge angle of conical matrix**

point angle value of the conical *matrix* (3.2.6.2)

**3.3.13****matrix body**

*matrix* (3.2.6.2) section which is fitted with a relative hole in the *matrix* (3.2.6.2) *retainer plate* (3.2.18)

Note 1 to entry: See 5 in Figure 2.

**3.3.14**

**outside diameter of matrix**

*matrix* (3.2.6.2) body outer diameter

Note 1 to entry: See 1 in [Figure 2](#).

**3.3.15**

**reduced matrix diameter**

diameter of reduced *matrix* (3.2.6.2) section which is set at the *matrix* (3.2.6.2) body press-in end for its correct pressing into the *matrix* (3.2.6.2) *retainer* (3.2.23.5)

Note 1 to entry: See 2 of [Figure 2](#).

**3.3.16**

**matrix radius**

connecting radius of *matrix* (3.2.6.2) working surface to the *cutting point* (3.3.1)

**3.3.17**

**matrix overall length**

total length between the two ends of the *matrix* (3.2.6.2)

Note 1 to entry: See 11 in [Figure 2](#).

**3.3.18**

**back hole**

hole which is in the *matrix* (3.2.6.2) and its conterminous die component for eliminating scraps

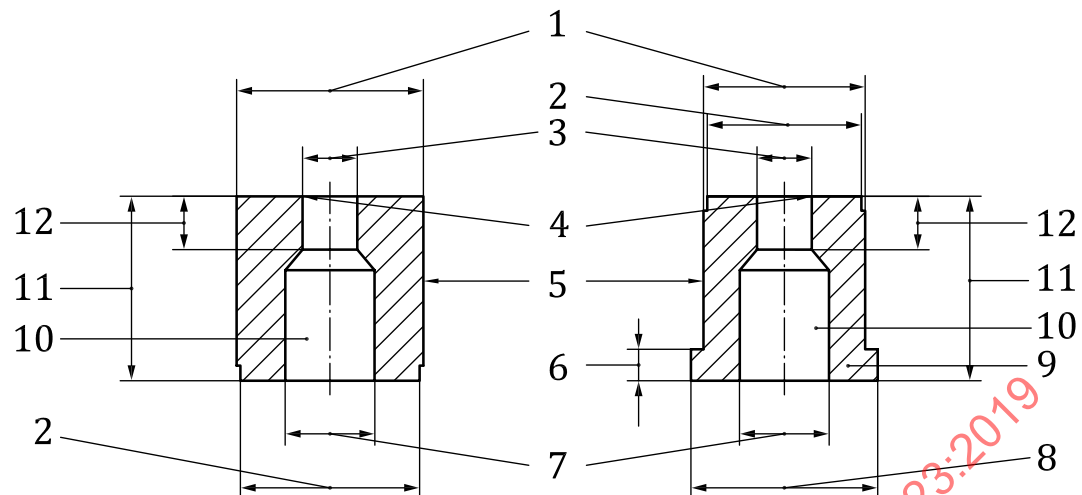
Note 1 to entry: See 10 in [Figure 2](#).

**3.3.19**

**back hole diameter**

diameter of the straight *back hole* (3.3.18) or the maximum diameter of the tapered *back hole* (3.3.18)

Note 1 to entry: See 7 in [Figure 2](#).

**Key**

- |   |                         |    |                       |
|---|-------------------------|----|-----------------------|
| 1 | matrix body diameter    | 7  | back hole diameter    |
| 2 | reduced matrix diameter | 8  | head diameter         |
| 3 | hole diameter           | 9  | round matrix          |
| 4 | matrix point            | 10 | back hole             |
| 5 | matrix body             | 11 | matrix overall length |
| 6 | head thickness          | 12 | cutting hole length   |

**Figure 2 — Round matrix****3.3.20****die clearance**

difference between the nominal mass of the *punch* (3.2.6.1) to the nominal mass of the *matrix* (3.2.6.2)

**3.3.21****die shut height**

die overall height when the die is at the lowest point of working position or in its closing state

**3.3.22****maximum press shut height**

distance between the lower plane of press machine slide and the upper plane of press machine working table when the slide is at the lowest point

**3.3.23****pressure center**

point of action of stamping resultant force

**3.3.24****die center**

*stamping die* (3.1.1) geometric center

**3.3.25****die life**

total number of products being produced in one *stamping die* (3.1.1) from the start to the end regular use

**3.3.26****pressing direction**

direction of stamping force

**3.3.27**

**feed direction**

direction in which sheet material is fed into the die

**3.3.28**

**blank layout**

arrangement and setting of workpiece or blank on sheet material

**3.3.29**

**web**

processing oddment between the products or between the product and the sheet material edge in *blank layout* ([3.3.28](#))

**3.3.30**

**feed pitch**

travel distance of each pitch to feed in sheet material or workpiece in the feeding direction of *progressive die* ([3.1.8](#))

**3.3.31**

**trimming allowance**

width of excess material at the edge of product which should be cut off after drawing or forming

**3.3.32**

**burr**

tip-like stuff produced at the edge of the blanked section of product

**3.3.33**

**roll fillet**

micro fillet produced at the edge of the blanked section of product

**3.3.34**

**smooth cut zone**

bright part of the blanked section of product

**3.3.35**

**blanking force**

force which is needed for blanking

**3.3.36**

**bending force**

force which is needed for bending

**3.3.37**

**drawing force**

force which is needed for drawing

**3.3.38**

**stripping force**

force which is needed for stripping the product or scraps from the *punch* ([3.2.6.1](#)) or the *cutting punch in combination punching* ([3.2.6.3](#))

**3.3.39**

**ejecting force**

force which is needed for ejecting the product or scraps from the *matrix* ([3.2.6.2](#))

**3.3.40**

**pressure plate force**

force of acting on sheet material by *pressure plate* ([3.2.24.2](#))

**3.3.41****blank holder force**

force of acting on the sheet material edge by the *blank holder* ([3.2.24.3](#))

**3.3.42****forming limit diagram**

curve graph constituted by ultimate strain values of sheet material which produces plastic deformation under external force

**3.3.43****neutral zone**

metal layer in which the tangential strain within the bending deformation zone is zero

**3.3.44****neutral zone coefficient**

offset ratio of the *neutral zone* ([3.3.43](#)) to the internal layer in bending deformation

**3.3.45****bending line**

straight line or curve of sheet material outline formed in bending deformation

**3.3.46****bending angle**

angle that product is bent, i.e., supplementary angle of included angle of bent product straight edge

**3.3.47****bending radius**

radius of curvature of bent product inner side

**3.3.48****relative bending radius**

ratio of product *bending radius* ([3.3.47](#)) to sheet material thickness

**3.3.49****minimum bending radius**

*bending radius* ([3.3.47](#)) of the outermost layer fibre of bent sheet material which is on the verge of pulling crack

**3.3.50****unbent length**

length sum of *neutral zone* ([3.3.43](#)) of the linear and bent part of the bent product

**3.3.51****spring back**

elastic recovery phenomenon of the bent or formed product when it is unloaded and stripped from the die

**3.3.52****drawing coefficient**

ratio of drawn product diameter to its blank diameter

**3.3.53****drawing ratio**

reciprocal of *drawing coefficient* ([3.3.52](#))

**3.3.54****drawing operation number**

number that the workpiece needs to be drawn, which is under the restriction of the limit *drawing coefficient* ([3.3.52](#))

**3.3.55**

**necking coefficient**

diameter ratio of product pipe-end after necking to that before necking

**3.3.56**

**flaring coefficient**

ratio of the product maximum pipe-end diameter after flaring to that diameter before flaring

**3.3.57**

**bulge coefficient**

ratio of the cylindrical product maximum diameter after bulging to that diameter before bulging

**3.3.58**

**bulge height**

height of the sheet material partial bulge

**3.3.59**

**hole flanging coefficient**

ratio of the product *hole diameter* ([3.3.10](#)) before hole flanging to that after hole flanging

**3.3.60**

**hole expanding rate**

ratio of the *hole diameter* ([3.3.10](#)) difference between before and after expanding to the *hole diameter* ([3.3.10](#)) before expanding

**3.3.61**

**relative height**

ratio of the product height to the product width

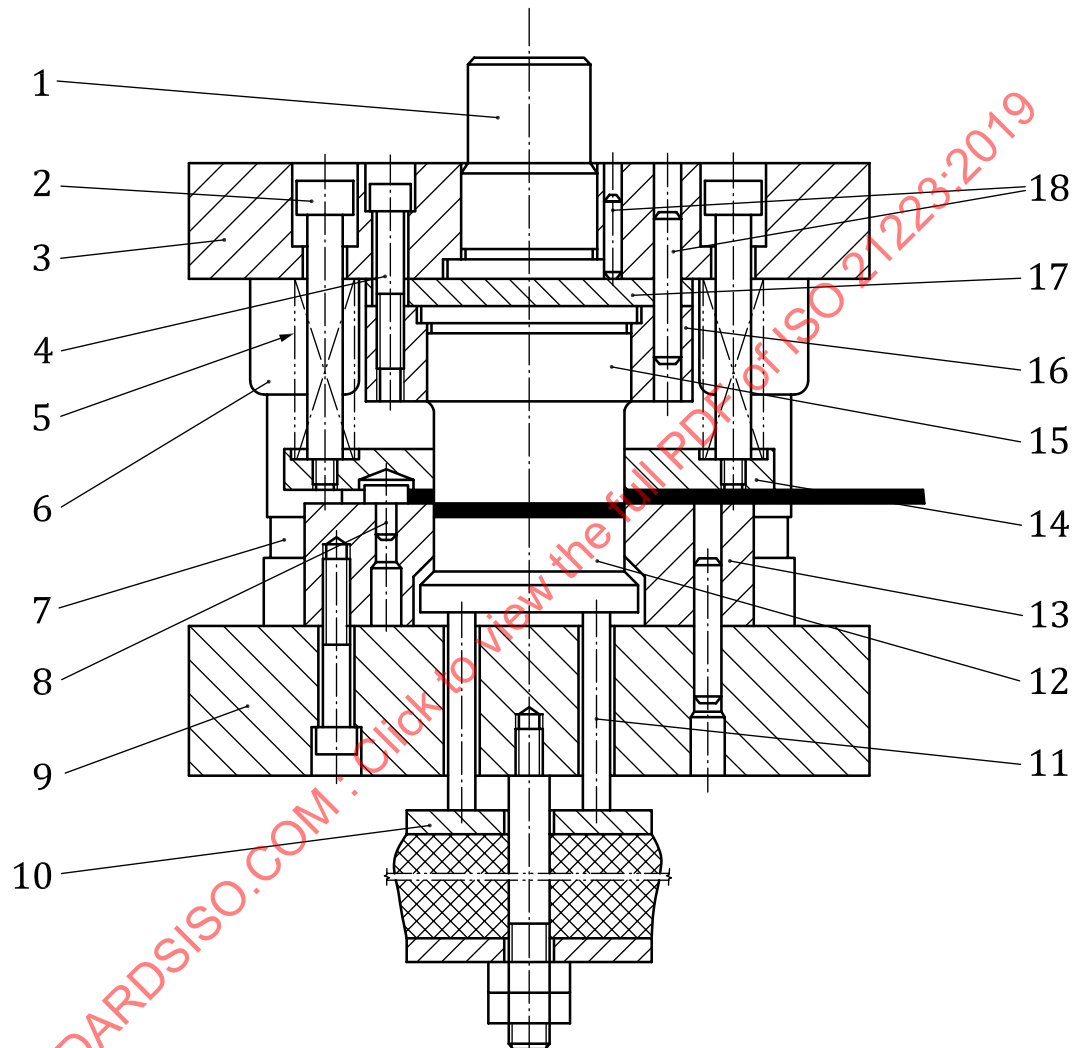
**3.3.62**

**relative thickness**

ratio of the product thickness to the product diameter

## Annex A (informative)

### Structure diagram of stamping dies



#### Key

|   |                               |    |                      |
|---|-------------------------------|----|----------------------|
| 1 | clamping pin/centering tool   | 10 | cushion plate        |
| 2 | shoulder screw                | 11 | ejector pin          |
| 3 | top plate                     | 12 | pressure pad         |
| 4 | hexagon socket head cap screw | 13 | die button           |
| 5 | spring                        | 14 | stripper plate       |
| 6 | guide bush                    | 15 | punch                |
| 7 | guide pillar                  | 16 | punch retainer plate |
| 8 | stop pin                      | 17 | punch pressure plate |
| 9 | bottom plate                  | 18 | dowel pin            |

**Figure A.1 — Punching die**