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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

## Metallic flanges —

### Part 3: Copper alloy and composite flanges

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*Brides métalliques —*

*Partie 3: Brides en alliages de cuivre et brides composites*

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7005-3 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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# Metallic flanges —

## Part 3: Copper alloy and composite flanges

### 0 Introduction

Various flange systems based on differing design criteria have been in use throughout the world for many years. Given the increasing difficulties arising from such a situation, this International Standard has been based on a single series of metallic flanges. ISO 7005 will be published in four parts as follows:

Part 1: Steel flanges

Part 2: Cast iron flanges

Part 3: Copper alloy and composite flanges

Part 4: Aluminium and aluminium alloy flanges

This part of ISO 7005 is based on the American and European copper alloy flange systems which have been combined to produce one International Standard with some changes to the dimensions specified in the two systems.

The flanges specified in this part of ISO 7005 are intended, in general, for use with copper or copper alloy tubes and pipework system components. Integral flanges are also intended for use with steel and cast iron pipework system components.

In the American system, flanges are designated by a Class rating but in this part of ISO 7005 the relevant Class ratings are designated by nominal pressure (PN) ratings.

The equivalent designations are as follows:

Class 150: ISO PN20

Class 300: ISO PN50

The ratings for ISO PN20 and ISO PN50 flanges are those based on American standards, established for use in copper alloy pipework systems. The ratings used in the European system remain as ISO PN6, ISO PN10, ISO PN16, ISO PN25 and ISO PN40.

In this part of ISO 7005, ISO copper alloys, in wrought and cast forms, have been specified where they are comparable with the American and European materials. In addition, an American specification has been retained for a ferrous backing flange

material and work is proceeding within ISO to prepare steel material specifications suitable for flange applications.

Flange details in all four parts of ISO 7005 are such that flanges having the same PN and nominal size (DN) values and compatible flange facings will mate together.

Users of this part of ISO 7005 should satisfy themselves that the flanges comply with any statutory requirements.

### 1 Scope and field of application

This part of ISO 7005 for a single system of flanges specifies requirements for circular copper alloy and composite flanges in the following nominal pressure ratings:

Series 1*	Series 2*
ISO PN10	ISO PN6
ISO PN16	ISO PN25
ISO PN20	ISO PN40
ISO PN50	

Attention is drawn to the need to refer to the pressure/temperature ( $p/T$ ) ratings in tables 10, 10a), 10b) and 10c) for the maximum permissible working pressures and temperatures, particularly for ISO PN20 and ISO PN50 flanges and for ISO PN6, ISO PN10, ISO PN16 and ISO PN25 flanges attached by soft solder or silver brazing.

This part of ISO 7005 specifies the types of flanges and their facings, dimensions, tolerances, bolt sizes (including copper alloy), flange face surface finish, marking, testing, inspection and materials.

#### NOTES

1 Dimensions of gaskets will be the subject of a future International Standard.

2 For guidance, information on the application and installation of flanges is given in the annex, which does not form an integral part of this part of ISO 7005.

\* Series 1 ratings are the basic ratings; series 2 ratings have limited application.

## 2 Definitions and designation

### 2.1 Definitions

**2.1.1 nominal size (DN):** A numerical designation of size which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

#### NOTES

- 1 Nominal size is designated by "DN" followed by the appropriate number.
- 2 This definition is in accordance with that given in ISO 6708.

**2.1.2 nominal pressure (PN):** A numerical designation which is a convenient rounded number for reference purposes.

All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions.

#### NOTES

- 1 The maximum allowable working pressure depends on materials, design and working temperatures and should be selected from the tables of pressure/temperature ratings given in this part of ISO 7005.
- 2 In this part of ISO 7005, nominal pressure is designated by the letters "ISO PN" followed by the appropriate reference number.
- 3 This definition of nominal pressure is in accordance with that given in ISO 7268.

### 2.2 Designation of types and facings

Figure 1 shows the basic commonly used flanges identified according to type.

- 01 — Plate flange in copper alloy for brazing or welding.
- 02 — Loose flange in ferrous material with a plate collar in copper alloy for brazing or welding.
- 04 — Loose flange in ferrous material with a welding neck collar in copper alloy for welding.
- 05 — Blank flange in copper alloy or in ferrous material clad with the jointing face in copper alloy.
- 07 — Loose flange in ferrous material with a slip-on collar in copper alloy for soft soldering, brazing or welding.
- 11 — Welding neck flange in copper alloy.
- 12 — Hubbed slip-on flange in copper alloy for soft soldering, brazing or welding.
- 14 — Hubbed slip-on flange in copper alloy for soft soldering, brazing or welding and supplied with tube-stops, the dimensions and locations of which shall be at the discretion of the manufacturer or as specified by the purchaser. In addition, integral grooves for preplaced soft-solder or brazing alloy rings may be machined in the sockets, the dimensions and locations of which shall be at the discretion of the manufacturer or as specified by the purchaser.
- 21 — Integral flange in copper alloy as part of some other equipment or component.

## 3 Pressure/temperature ( $p/T$ ) ratings

### 3.1 General

The pressure/temperature ratings of the materials specified in 4.1 shall be the maximum allowable non-shock working pressures at the temperatures given in tables 10, 10a), 10b) and 10c), as appropriate. Linear interpolation is permitted for intermediate temperatures.

### 3.2 Rating of flanged joints

Where two flanges in a flanged joint do not have the same pressure/temperature rating, the rating of the joint at any temperature shall not exceed the lower of the two flange ratings at that temperature.

### 3.3 Temperature

NOTE — The temperature shown for a corresponding pressure rating is considered to be the same as that of the contained fluid. Use of a pressure rating corresponding to a temperature other than that of the contained fluid is the responsibility of the user, subject to the requirements of any applicable code or regulation.

## 4 Materials

### 4.1 Range of materials

Flanges shall be manufactured from the materials specified in tables 11 and 11a) as appropriate.

#### NOTES

- 1 Each national standards organization has the responsibility of determining the national materials comparable with the materials specified in this part of ISO 7005.
- 2 Where there is an appropriate application standard, it is the responsibility of the purchaser to ensure compliance with the requirements of that standard.

### 4.2 Gaskets

The various types, dimensions and materials used for gaskets are not within the scope of this part of ISO 7005.

### 4.3 Bolting

The materials of the bolting shall be chosen by the user according to the pressure, flange material and the selected gasket so that the flanged joint remains tight under the expected operating conditions.

#### NOTES

- 1 For the purposes of this part of ISO 7005, either metric or inch bolting may be used for ISO PN20 and ISO PN50 flanges in conjunction with gaskets manufactured from sheet materials.
- 2 For flange types 01, 05 (when it is copper alloy only), 11, 12, 14 and 21, where copper alloy bolting is used, the recommended bolting materials are ISO 428 1/28A or 1/28B for temperatures up to and including 120 °C. (See table 11 for an explanation of the abbreviated alloy designations.)
- 3 For flange types 02, 04, 05 (when it is ferrous with copper alloy cladding) and 07, ferrous bolting should be used and reference should be made to ISO 7005-1.

## 5 Dimensions

### 5.1 Range of nominal sizes

The range of nominal sizes applicable to each flange type and to each pressure rating shall be as specified in table 2.

NOTE — The sizes of copper and copper alloy tubes are designated by reference to the outside diameter in millimetres.

### 5.2 Dimensional details

Dimensions of flanges shall be in accordance with the following tables, as appropriate:

- table 3 for ISO PN6 flanges
- table 4 for ISO PN10 flanges
- table 5 for ISO PN16 flanges
- table 6 for ISO PN20 flanges
- table 7 for ISO PN25 flanges
- table 8 for ISO PN40 flanges
- table 9 for ISO PN50 flanges

#### NOTES

- 1 The bore sizes of type 21 flanges are usually equal to the nominal size of the pipe, valve or fitting of which they form a part and the actual bore sizes are usually given in the appropriate product standard.
- 2 Where type 07, 12 and 14 flanges are for use with soft soldering techniques only, then reference should be made to ISO 2016 for socket depths.
- 3 For type 04 and 11 flanges the recommended weld preparation angle is  $37,5^\circ \pm 2,5^\circ$  when butt welding to pipe with thicknesses of 3 mm and greater.

## 6 Joint facings and surface finish

**6.1** Types 01, 11, 12, 14 and 21 flanges shall be supplied with flat faces for use with full-face gaskets.

#### NOTES

- 1 Notes at the foot of table 3 (ISO PN6), table 4 (ISO PN10), table 5 (ISO PN16) and table 7 (ISO PN25) indicate which sizes may be used in conjunction with inside bolt circle gaskets and type 02, 04, 05 and 07 flanges.
- 2 Where type 21 flanges in table 3 (ISO PN6), table 4 (ISO PN10), table 5 (ISO PN16) and table 7 (ISO PN25) in sizes up to and including DN 100 are required for bolting to flanges with raised faces, then the appropriate flange thickness ( $C_1^*$ ) given in table 8 (ISO PN40) applies.

**6.2** Where type 01, 11, 12 and 14 flanges in sizes above DN 50, and type 21 flanges in sizes above DN 100 are required to be bolted to existing raised face type steel or cast iron flanges, then the raised faces shall be removed.

**6.3** Where type 01, 11, 12, 14 and 21 flanges for ISO PN20 and ISO PN50 are required to be bolted to existing raised face type steel or cast iron flanges, then the raised faces on all sizes shall be removed.

**6.4** All flange jointing faces shall be finished in accordance with table 1. The faces shall be compared by visual or tactile means with reference specimens which conform to the  $R_a$  and  $R_z$  values given in table 1.

#### NOTES

- 1 It is not intended that instrument measurements are taken on the flange faces, and the  $R_a$  and  $R_z$  values as defined in ISO 468 relate to the reference specimens.
- 2 Other finishes may be agreed between the manufacturer and purchaser.

**Table 1 — Surface finish of flanges**

Values in micrometres

Manufacturing process	$R_a$	$R_z$
Turning <sup>1)</sup>	3,2 to 12,5	12,5 to 50
Other <sup>2)</sup>	3,2 to 6,3	12,5 to 25

1) "Turning" covers any method of machine operation producing either serrated concentric or serrated spiral grooves.

2) Processes other than turning are permissible provided that they give a surface finish in compliance with the  $R_a$  and  $R_z$  values specified.

**6.5** Flange rims are permitted to be machined or left unmachined.

**6.6** Composite flanges shall be machine finished, or have a surface equivalent to that obtained by machining on all locating diameters, bores and abutment faces. The abutment faces shall be flat and square to the bore axis.

## 7 Drilling and spot-facing

**7.1** Unless otherwise specified by the purchaser, all bolt holes shall be equally spaced on the pitch circle diameter,  $K$ . In the case of integral flanges, the bolt holes shall be positioned off-centre.

**7.2** Bearing surfaces for the nuts shall be parallel to the flange jointing face within  $1^\circ$  and shall be capable of accepting a normal series washer complying with the requirements of ISO 887.

**7.3** Any back-facing or spot-facing required to accomplish this shall not reduce the flange thickness to less than the minimum specified.

**7.4** When a bossed or integral flange is back-faced, it is permissible for the fillet to be reduced but the fillet shall not be eliminated entirely.

## 8 Tolerances

Flanges shall be manufactured to comply with the tolerances specified in table 12.

## 9 Marking

Flanges other than integral shall be clearly marked as follows:

- a) the nominal size (DN) and the nominal pressure rating (ISO PN);
- b) material designation (for copper alloy and ferrous material designations, see table 11);
- c) manufacturer's name or trademark.

*Examples:*

Copper alloy component:  
**DN 300 ISO PN20 I/29A XXXX**  
(e.g. for CuNi10Fe1Mn)

Ferrous component:  
**DN 300 ISO PN20 A105 XXXX**

Copper alloy flanges shall be clearly and permanently marked by vibro or electrolytic etching or by other suitable means. Stamping with steel stamps shall not be used. The manufacturer's name or trademark together with other relevant marking may be produced during casting or forging operations.

NOTE — Ferrous flanges may be marked round the rim of the flange using round-nosed steel stamps.

## 10 Inspection and test

ISO PN20 and ISO PN50 flanges specified are designed to be interchangeable with, but not identical to, comparable flanges to ANSI B16.24.

## NOTES

- 1 It is recommended that these flanges be accepted by inspectors as complying with the dimensions specified in ANSI B16.24.
- 2 This part of ISO 7005 does not make provision for routine inspection or pressure testing of separate flanges. However, flanges may be required to be pressure tested after attachment to a pipe or other equipment. The test pressure is then dependent on the requirements of the appropriate standard or code of practice in accordance with which the equipment has been manufactured (see the annex).

## 11 Information to be supplied by the purchaser

The following information should be supplied by the purchaser in the enquiry and/or order:

- a) number of this part of ISO 7005, i.e. ISO 7005-3;
- b) nominal size — DN followed by the appropriate number;
- c) nominal pressure — ISO PN followed by the appropriate number;
- d) flange type number (and whether thicker flanges are required; see 6.1);
- e) material designations (for both the copper alloy and the ferrous component, where applicable);
- f) any protective coating (galvanizing, painting) of the ferrous flanges, subject to agreement between the purchaser and manufacturer;
- g) whether flange rims are to be machined or unmachined (see 6.5);
- h) the bore of the flange and/or collar where flanges can be made to suit more than one tube diameter (see tables 3 to 9).

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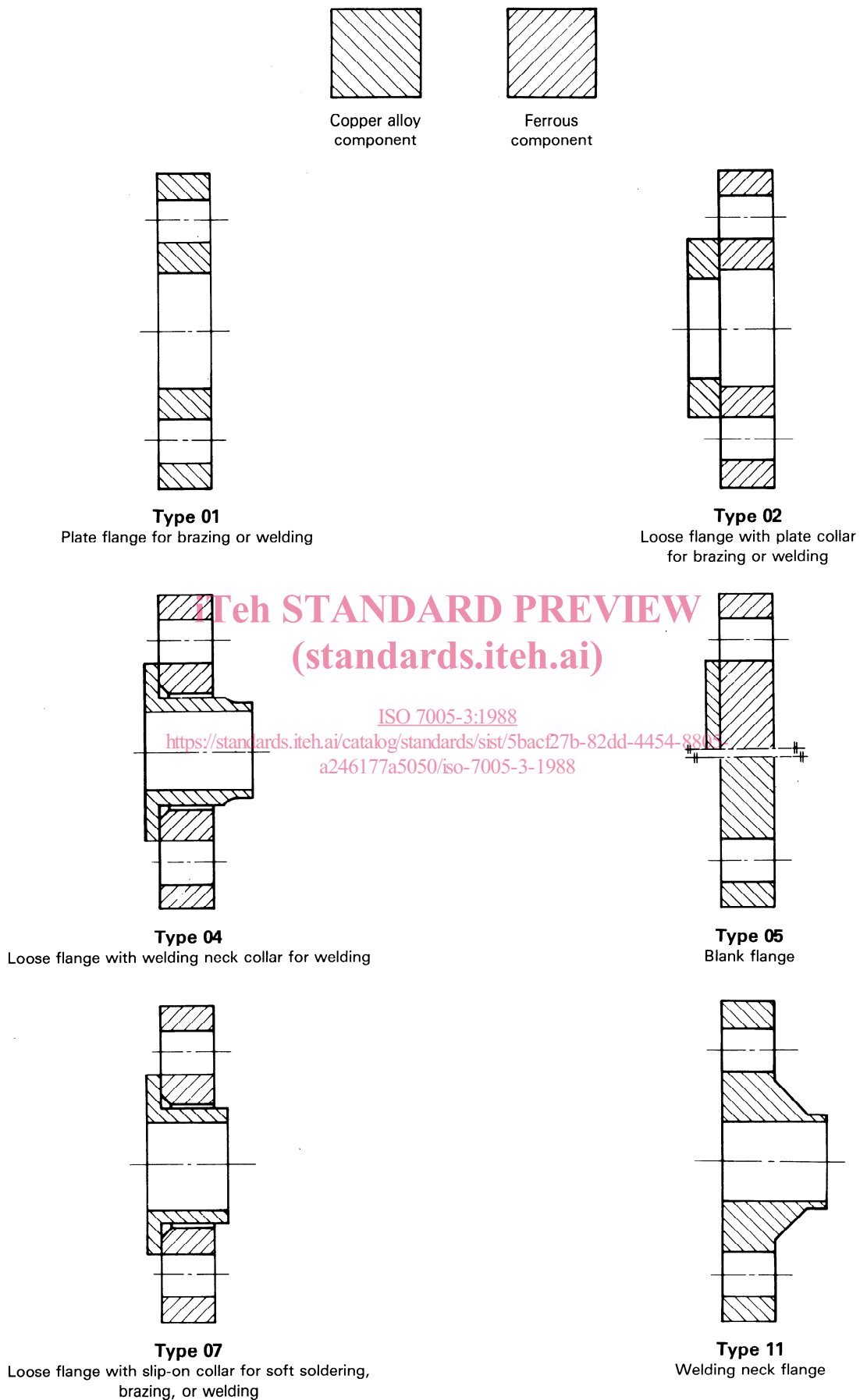
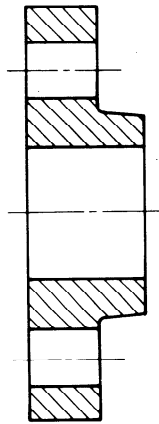
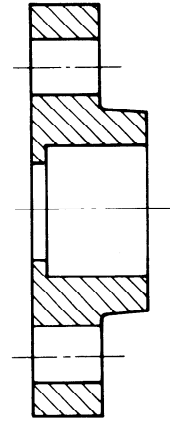


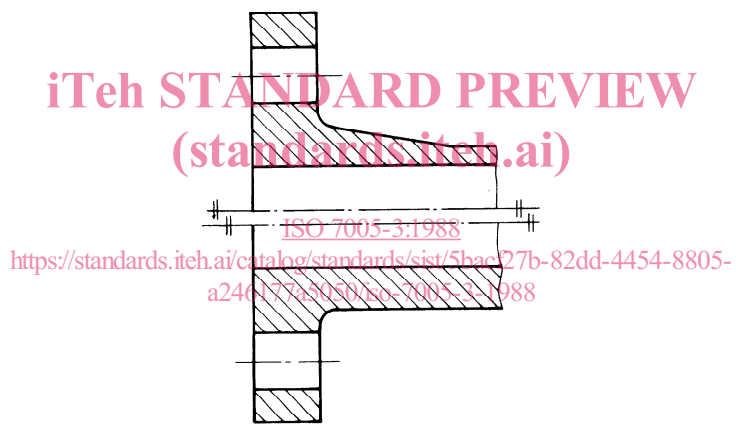
Figure 1 — Types of flanges



**Type 12**  
Hubbed slip-on flange for soft soldering,  
brazing or welding



**Type 14**  
Hubbed slip-on flange for soft soldering,  
brazing or welding with tube-stops



**Type 21**  
Integral flange

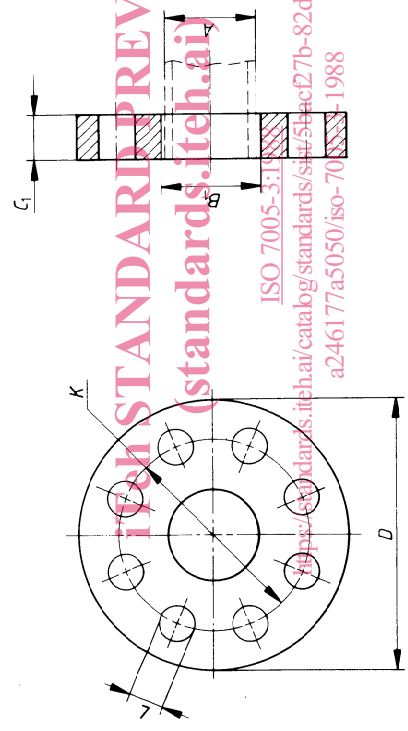
**Figure 1 — Types of flanges (concluded)**



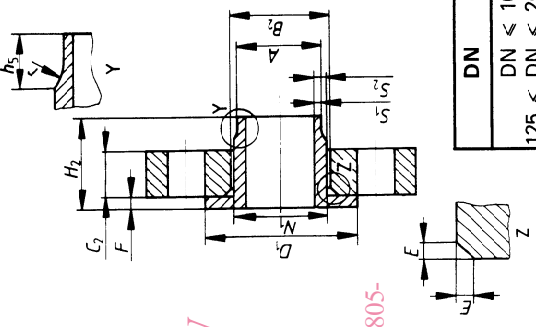
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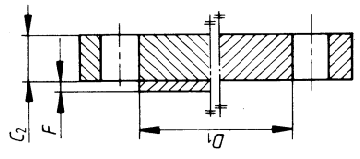
Type 01



Type 04



Type 05

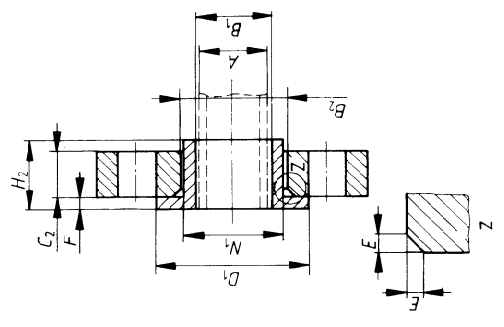


DN	h <sub>5</sub>	r
DN < 100	15	3
125 < DN < 250	15	5
300 < DN < 350	16	5
400 < DN < 450	16	7
500 < DN < 600	20	7
700 < DN < 800	24	7

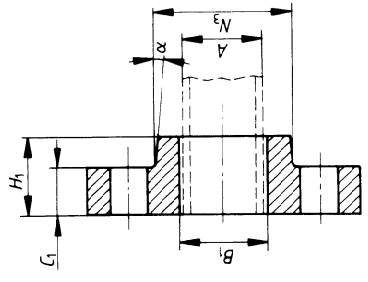
This diagram illustrates the arrangement but not necessarily the correct number of bolt holes.

Refer to the column "number of bolts" in table 3 for the actual number.

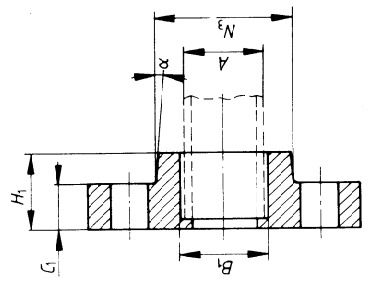
Type 07



Type 12



Type 14



Type 21

