

Circular flanges for pipes, valves and fittings (Class designated) —

**Part 3: Steel, cast iron and copper alloy
flanges —**

**Section 3.3 Specification for copper
alloy and composite flanges**

UDC 621.643.4 – 034.14:621.643.411.412.8:669.35:620.168:001.4:006.3/.8

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This British Standard, having been prepared under the direction of the Piping Systems Components Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 30 June 1989

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First published as BS 1560-2 November 1970
First revision as BS 1560-3.3 June 1989

The following BSI references relate to the work on this standard:
Committee reference PSE/15
Draft for comment 87/72072 DC

ISBN 0 580 17047 0

Amendments issued since publication

Amd. No.	Date of issue	Comments

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Foreword

This Section of BS 1560 has been prepared under the direction of the Piping Systems Components Standards Policy Committee and constitutes a new Section of BS 1560 for Class designated copper alloy and composite flanges. For PN designated copper alloy and composite flanges reference should be made to BS 4504-3.3.

This Section of BS 1560 is related to ISO 7005-3 published by the International Organization for Standardization (ISO) in respect of flanges having nominal pressures PN 20 and PN 50 covered by the International Standard. The types of flanges and their size ranges are limited when compared to those flanges of the equivalent nominal pressure given in ISO 7005-3.

The PN 6, PN 10, PN 16, PN 25 and PN 40 flanges given in ISO 7005-3 are related to PN designated flanges specified in BS 4504-3.3.

To align with the format of ISO 7005, BS 1560-3 is published in three Sections.

- *Section 3.1: Specification for steel flanges;*
- *Section 3.2: Specification for cast iron flanges¹⁾;*
- *Section 3.3: Specification for copper alloy and composite flanges;*

This Section of BS 1560 specifies copper alloy and composite flanges which have compatible mating dimensions with steel flanges complying with BS 1560-3.1. In addition ANSI B16.24 published by the American National Standards Institute has been taken into account together with ISO 7005-3. Until such time as all three parts of ISO 7005 are published and this Section of BS 1560 is revised, this Section of BS 1560 specifies flanges having inch bolt sizes and bolt holes as specified in BS 1560-3.1.

The flanges specified, with the exception of integral (code 321) flanges, are for attachment to copper or copper alloy tubes complying with BS 2871.

The principles adopted in the preparation of this Section of BS 1560 are in accordance with the following.

- a) Dimensions, other than mating dimensions, are based on ISO 7005-3 for PN 20 (Class 150) and PN 50 (Class 300) flanges.
- b) Mating dimensions, including outside diameters, pitch circle diameters, bolt holes and bolt sizes, comply with BS 1560-3.1.
- c) Tolerances are generally in accordance with ISO 7005-3.
- d) Pressure/temperature ratings are in accordance with ISO 7005-3.
- e) Surface finish and spot facing or back facing are in accordance with ISO 7005-3.
- f) Flanges have been additionally designated by code numbers to maintain harmonization with BS 4504-3.3 and BS 1560-3.1 which are based on the principles agreed internationally for designating flanges by type numbers.

It should be noted that the thicknesses of code 305 blank flanges have nominal thicknesses different to those specified in the related specification ANSI B16.24; the thicknesses specified in ANSI B16.24 are minimum values.

Guidance notes and recommendations have been included in Appendix B. Appendix B is not intended to be exhaustive.

The various gasket types, dimensions, design characteristics and materials are outside the scope of this Section of BS 1560. For dimensions of gaskets reference should be made to BS 3381 for spiral wound gaskets and to BS 7076-1, BS 7076-3 and BS 7076-4 for other types of gaskets.

¹⁾ In preparation.

This standard specifies inch bolting only and the use of metric bolting is outside the scope of this Section of BS 1560. However, for information Appendix C gives the proposed metric bolt sizes to be used in lieu of the inch sizes specified. Users of metric bolting should note that bolt hole clearances may be reduced or increased.

Assessed capability. Users of this Section of BS 1560 are advised to consider the desirability of assessment and registration of a supplier's quality systems against the appropriate Part of BS 5750 by a third party certification body.

NOTE For the purposes of this Section of BS 1560 no difference is intended in the meaning between pipe and tube although idiomatic use prefers sometimes the one and sometimes the other.

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 to iv, pages 1 to 16, 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 Section of BS 1560 specifies requirements for Class designated circular copper alloy and composite flanges in Class 150 and Class 300 ratings and in nominal sizes up to 36 in of the type given in Table 1.

Table 1 — Types of copper alloy and composite flanges

Code no. ^a	Description
301	Plate flange in copper alloy (for brazing or welding)
304	Loose flange in steel with a weld-neck collar in copper alloy (for welding)
305	Blank flange in copper alloy or in steel clad with the jointing face in copper alloy
307	Loose flange in steel with a slip-on collar in copper alloy (for brazing or welding)
311	Weld-neck flange in copper alloy (for welding)
312	Hubbed slip-on flange in copper alloy (for brazing or welding)
314	Hubbed slip-on flange in copper alloy supplied with tube stops (for brazing or welding)
321	Integral flange in copper alloy as part of some other equipment or component
NOTE 1 Figure 1 illustrates flanges according to description and code numbers.	
NOTE 2 Flanges may be designated by description or code numbers.	
^a Code numbers have been made non-consecutive to permit possible future additions.	

This Section of BS 1560 specifies the types of flanges and their facings, dimensions, tolerances, bolt sizes, flange face surface finish, marking, materials for bolting and flange materials together with their associated pressure/temperature ratings.

NOTE 1 Details of the tube stops used in conjunction with code 314 flanges are outside the scope of this Section of BS 1560.

NOTE 2 To assist purchasers Appendix A lists information which should be supplied when ordering flanges.

NOTE 3 The routine inspection and pressure testing are outside the scope of this Section of BS 1560 but some guidance is given in Appendix B.

NOTE 4 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Ranges of nominal sizes

The ranges of nominal sizes from ½ in to 36 in applicable to each flange code and for each Class designation shall be as given in Table 2, Table 6 and Table 7.

3 Class designations and pressure/temperature ratings

3.1 Class designations

The Class designation of flanges shall be either:

- Class 150, or
- Class 300.

3.2 Pressure/temperature ratings

The pressure/temperature ratings of flanges manufactured from the materials specified in Table 3 shall be as given in Table 9, Table 10 and Table 11 for the applicable materials and shall be the maximum allowable non-shock working gauge pressure at the temperatures shown.

NOTE 1 Linear interpolation is permitted for intermediate temperatures. The relevant pressures and temperatures are those of the fluid in the pipe or fitting.

NOTE 2 The rating of flanges is not necessarily the rating of the whole pipework system. Gasket materials can also impose limitations on the pressure/temperature rating of a flanged joint and the gasket manufacturer should be consulted when selecting the material of the gasket.

3.3 Rating of flanged joints

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

4 Materials

4.1 Flange materials

Copper alloy components of flanges shall be manufactured from the materials given in Table 3 and steel components of flanges shall be manufactured from the materials given in Table 4.

NOTE 1 Where there is an appropriate application standard it is the responsibility of the purchaser to ensure that the requirements of that standard are met.

NOTE 2 If a protective coating such as zinc coating or painting on steel components is required, the purchaser should state the requirements on the enquiry and/or order (see Appendix A).

4.2 Bolting materials

Materials for bolting shall be as follows:

- a) materials specified in BS 1768, BS 1769 and BS 4882 (inch);
- b) materials specified in ASTM A193 and ASTM A194;
- c) BS 2872 and BS 2874, grades CA 104 and CA 105;
- d) proprietary high strength cupro-nickel alloys.

5 Bolting

5.1 Bolt sizes shall be as given in Table 6 and Table 7, as appropriate.

5.2 Studbolts shall comply with BS 4882 except that form shown in Figure 3(b) of BS 4882:1978 shall apply only to studbolts of material other than alloy steel.

5.3 The mating surfaces of all bolt heads and nuts shall be full faced.

6 Dimensions

6.1 Flange dimensions

Flanges shall have the dimensions appropriate to their nominal sizes, types and Class designations as given in Table 6 and Table 7 and clause 9, if appropriate.

NOTE A summary of the various types of flanges specified showing the nominal sizes applicable to each type and to each Class is given in Table 2.

6.2 Tube sizes

Dimensions of flanges shall be compatible with the tube sizes given in Table 6 and Table 7.

NOTE Alternative values are specified for tube outside diameters for 10 in (DN 250) and it is therefore essential that the purchaser should specify the tube size for which the flange is required (see Appendix A).

6.3 Hubs

The hub of hubbed slip-on copper alloy flanges (code 312) and hubbed slip-on copper alloy flanges with tube stops (code 314) shall be either:

- a) parallel; or
- b) have a draft angle of not more than 4° on the outside surface for forging or casting purposes.

6.4 Bolt holes

Bolt holes shall be equally spaced on the pitch circle diameter, and in the case of integral flanges, shall be positioned off-centre.

7 Flange facings

Plate flanges (code 301), copper alloy (unclad) flanges (code 305), copper alloy weld-neck flanges (code 311), hubbed slip-on flanges (code 312), hubbed slip-on flanges supplied with tube stops (code 314) and integral flanges (code 321) shall be supplied with flat faces for use with full face gaskets.

NOTE When codes 301, 305 (unclad), 311, 312, 314 and 321 flanges are required to be bolted to existing raised face type steel or cast iron flanges, then the raised face on the steel or iron flange should be removed.

8 Facing finishes

8.1 All flange jointing faces shall be machine finished and when compared by visual or tactile means with reference specimens, the surface finish shall comply with the values given in Table 5.

NOTE 1 It is not intended that instrument measurements be taken on the faces themselves and the R_a and R_z values as defined in BS 1134 relate to the reference specimens.

NOTE 2 Requirements for special coatings or finishes should be stated in the enquiry and/or order so that an appropriate allowance may be incorporated in the machining of any relevant mating dimensions (see Appendix A).

8.2 Composite flanges shall be machined on all locating diameters, bores and abutment faces in accordance with Table 5.

9 Spot facing or back facing of flanges

Any spot facing or back facing shall not reduce the flange thickness to less than the thickness specified. When spot facing is used the diameter shall be large enough to accommodate the outside diameter of the equivalent normal series of washer complying with BS 3410 for the inch bolt size being fitted. The bearing surfaces for the bolting shall be parallel to the flange face within the limits given in Table 8.

10 Tolerances

Flanges shall comply with the tolerances specified in Table 8.