BRITISH STANDARD

BS EN
12560-6:2003

Flanges and their joints — Gaskets for class-designated flanges —

Part 6: Covered serrated metal gaskets for use with steel flanges

The European Standard EN 12560-6:2003 has the status of a British Standard

ICS 23.040.80

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 12560-6:2003.

The UK participation in its preparation was entrusted to Technical Committee PSE/2, Jointing materials and compounds, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 22 December 2003

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 43133 9

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12560-6

December 2003

ICS 23.040.80

English version

Flanges and their joints - Gaskets for Class-designated flanges - Part 6: Covered serrated metal gaskets for use with steel flanges

Brides et leurs assemblages - Joints pour les brides désignées Class - Partie 6: Joints métalliques striés revêtus pour utilisation avec des brides en acier

Flansche und ihre Verbindungen - Dichtungen für Flansche mit Class-Bezeichnung - Teil 6: Kammprofildichtungen für Stahlflansche

This European Standard was approved by CEN on 3 November 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 12560-6:2003 E

Contents

page

Foreword

This document (EN 12560-6:2003) has been prepared by Technical Committee CEN/TC 74 "Flanges and their joints", the secretariat of which is held by DIN.

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 June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

The annex A is informative and contains "Information to be supplied by the purchaser".

The annex B is informative and contains "The use of metric bolting with class designated covered serrated metal gaskets".

This document includes a Bibliography.

EN 12560 consists of 7 parts:

Part 1: Non-metallic flat gaskets with or without inserts
Part 2: Spiral wound gaskets for use with steel flanges
Part 3: Non-metallic PTFE envelope gaskets
Part 4: Corrugated, flat or grooved metallic and filled metallic gaskets for use with steel flanges
Part 5: Metallic ring joint gaskets for use with steel flanges
Part 6: Covered serrated metal gaskets for use with steel flanges
Part 7: Covered metal jacketed gaskets for use with steel flanges

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the construction, dimensions and marking of covered serrated metal gaskets for use with flanges complying with prEN 1759-1 for Class 150, Class 300, Class 600, Class 900, Class 1500 and Class 2500 up to and including NPS 24.

This document does not extend to serrated covered metal based heat exchanger gaskets with pass bars or large vessel gaskets but, in the lack of a dedicated document for such gaskets, the principles set down can be applied to them.

NOTE 1 Dimensions of other types of gaskets for use with flanges to prEN 1759-1, EN 1759-3 and EN 1759-4 are given in EN 12560-1, EN 12560-2, EN 12560-3, EN 12560-4, EN 12560- 5 and prEN 12560-7.

NOTE 2 Annex A lists information that should be supplied by the purchaser when ordering gaskets in circumstances where the choice of the gasket materials appropriate to the service is left to the supplier.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

prEN 1759-1, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, Class-designated - Part 1: Steel flanges, NPS 1/2 to 24.*

EN 1759-3:2003, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, Class designated — Part 3: Copper alloy flanges.*

EN ISO 6708:1995, *Pipework components — Definition and selection of DN (nominal size) (ISO 6708:1995).*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1759-3:2003, EN ISO 6708:1995 and the following apply.

3.1
covered serrated metal gasket
consists of a sealing element with or without a location ring which may or may not be rigidly fixed to the sealing element. The sealing element consists of a metal core with serrated top and lower surfaces and a conformable sealing material adhered to each serrated surface. The serrations into metal core have the function of creating regions of high surface pressure on the conformable sealing material to ensure the required level of tightness in service. The density of the sealing material in the serrations during service should also be high enough to ensure that secondary sealing is provided by the impermeable nature of the material between the tips of the serrations. In service the thickness of the sealing material over the serrations is minimal, often about 0,1 mm. The widths of the tips of the serrations should also be of the order of 0,1 mm

3.2
DN
see EN ISO 6708

3.3
NPS
see EN 1759-3

3.4
class
see EN 1759-3

4

4 Designations

4.1 Range of class designations

Gaskets shall be designated as suitable for use with one or more of the following class designations of flange:

Class 150, Class 300, Class 400, Class 600, Class 900, Class 1500 and Class 2500

4.2 Range of gasket sizes

Gasket nominal sizes shall also be designated in accordance with the ranges specified in Table 1.

The general principles described in this standard shall also be applied to gaskets outside of the range specified in Table 1 by agreement between supplier and customer.

4.3 Gasket types

Gasket types, as illustrated in Figure 1, shall be designated as:

Type NR: Sealing element without any location ring.

Type IR: Sealing element with integral location ring.

Type LR: Sealing element with loose location ring.

Type NR is used only with spigot faced or tongue & groove faced flanges.

4.4 Information to be supplied by the purchaser

The selection of gasket materials and type should take into account the fluid, the operating conditions and the properties of the gasket materials as well as the type of flange. It is recommended that selection of a gasket for any particular application is made in consultation with the gasket supplier who will advise on the materials required for a particular service (see annex A).

5 Constructional details

5.1 General details

Figure 1 gives illustrations of the cores and, where used, the location rings of the three types of covered serrated metal gasket listed in 4.3.

Figure 2 shows a typical covered serrated metal gasket for use with type A and type B flanges, the Type A and B flange facings are specified in prEN 1759-1.

5.2 Core

5.2.1 Core materials

The material of the core shall be selected to be compatible with the intended service. The core thickness measured over the tips of the serrations shall be a minimum of three times the depth of the serrations.

5.2.2 Core welding

If the core is of a welded construction then the method of welding shall be such as to ensure that the weld is throughout the full thickness of the core. The number of welds shall not be more than two.

5.2.3 Dressing of core welds

The welds shall be dressed to preserve the number and depth of the serrations of the rest of the core.

5.2.4 Core flatness

The out of flatness of the serrated core shall not be more than 3 mm for every 300 mm of outside diameter.

5.3 Serrations

The serration depth shall be a minimum of 0,4 mm. The pitch of the serration and the width of the serration shall be arranged so that the width of the tips is 0,1 mm. The first and last tips of the serrated core should be as near as possible to the respective edges of the core.

Proprietary forms of serrations and core profiles may be used by agreement between the purchaser and manufacturer.

To reduce the possibility of vibration induced cracking of the core, the radius at the bottom of the grooves shall be as large as possible.

5.4 Location rings

5.4.1 Integral ring

The thickness of the integral ring shall be a minimum of twice the serration depth. The location ring shall be undercut on at least one side to protect the sealing element in the event of thermal expansion induced interference between the location ring and the bolts of the flange.

5.4.2 Loose ring

The thickness of the location ring shall be a minimum of 0,5 mm. When installed the ring shall be sufficiently loose in the location slot in the core so that thermal expansion effects never cause the ring to become tight in the location slot. The location ring may be made in sections and assembled around the core. The sections of the assembled ring shall be either welded together or otherwise securely held together. The material of the loose location ring may be carbon steel.

5.5 Facing materials

The facing material shall be selected to be suitable for the intended service and the material of the flanges. Suitable materials range from very soft, rubber bound, sheet material to metal foils.

The facing material may be cut from sheet to the appropriate size, applied in the form of texturised tape or by any other means that meets the other requirements of this standard.

5.6 Facing weight per unit area

The weight per unit area of facing in order to create the required level of tightness in service is a function of the thickness and density of the facing material, the depth, width and pitch of the serrations, the required in service density of the facing material and the thickness of facing required above the core in service. The weight per unit area shall be such that metal to metal contact between the tips of the serrations and the flange surface is avoided.

For guidance, a satisfactory level of sealing is routinely achieved with graphite of 0,5 mm thickness and a density of 1,0 gm/cm^3 as received when used with a core where the serrations are 0,4 mm in depth and the serration tip width is 0,1 mm.

Ignoring the effects of the thickness of any adhesive and the grooving of the flange surfaces, the target weight per unit area of facing can be estimated from the following:

Weight per unit area = ρ_s [t + (A_G / P)]

Where $\tilde{n}_s$ is the required density of the facing in service

t is the required thickness in service of facing above the core

A_G is the cross sectional area, perpendicular to the plane of the core, of the serrations

P is the pitch of the serrations

5.7 Attachment of facing

5.7.1 Methods of attachment

The facing may be attached to the core by any means that satisfies the requirement of 5.8 provided that the attachment method does not result in the introduction of any component that is likely to initiate corrosion.

5.7.2 De-greasing of core

Where an adhesive is used the area of the core to which the facings are to be glued shall be de-greased before use of the adhesive and the amount of the adhesive used shall be minimised.

5.7.3 Number of joins

The number of joins in the facing material shall be minimised and shall never exceed two. At joins the facing material shall be overlapped or the two parts chamfered or, where a butt joint is used, the join may be overlapped with a thin layer of the tape.

5.7.4 Excessive facing

Once the sealing faces have been applied any excess material shall be removed paying particular attention that none protrudes inside of the inner diameter of the gasket.

5.8 Integrity of facing attachment

The facing material and the method of attachment shall be selected so that the facing is held securely in place and will withstand reasonable handling during transport and location of the gasket in the flange.

The sealing face shall also be free of surface blemishes, defects and damage that would impair the sealing performance of the gasket.

5.9 Typical construction details

Commonly used details for Figure 2 are:

a Core thickness 4,0 mm

b Groove depth 0,4 mm

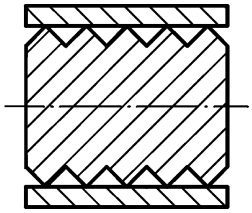
c Location ring thickness 0,5 mm

d Facing material thickness 0,5 mm

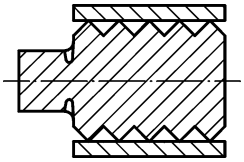
e Tip width 0,1 mm

Facing density 1,0 gm/cm^3

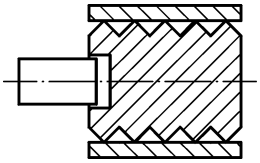
NOTE The selection of gasket type should take into account the fluid, the operating conditions and the properties of the gasket materials. It is recommended that selection of gasket type of any particular application is in consultation with the gasket supplier (see annex A).



a) Type NR: Sealing element with no locating ring



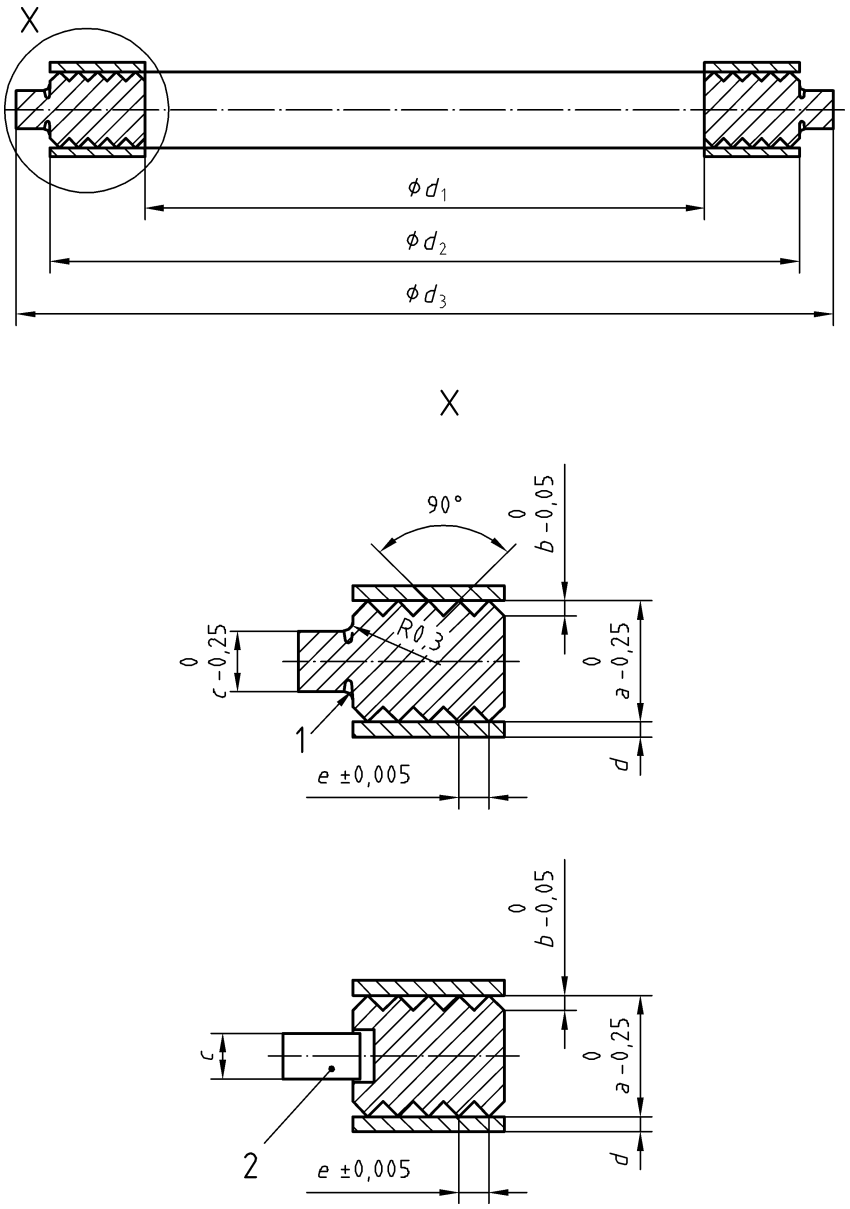
b) Type IR: Sealing element with integral locating ring



c) Type LR: Sealing element with loose locating ring

Figure 1 — Covered serrated metal gasket types with sealing facings

Dimensions in millimetres



Key
1 Integral locating ring
2 Loose locating ring

Figure 2 — Typical covered serrated metal gasket with sealing layer

6 Dimensions

The diameters of covered serrated gaskets, for use with types A and B flange facings, shall be as given in Table 1.

Table 1 — Dimensions of covered serrated metal gaskets for type A and type B flanges

Dimensions in millimetres

Sealing element outer diameter			150	300	400	600	900	1 500	2 500
NPS in	I/D	O/D	Location ring outer diameter						
½	23,0	33,3	44,4	50,8	50,8	50,8	60,3	60,3	66,7
¾	28,6	39,7	53,9	63,5	63,5	63,5	66,7	66,7	73,0
1	36,5	47,6	63,5	69,8	69,8	69,8	76,2	76,2	82,5
1¼	44,4	60,3	73,0	79,4	79,4	79,4	85,7	85,7	101,6
1½	52,4	69,8	82,5	92,1	92,1	92,1	95,2	95,2	114,3
2	69,8	88,9	101,6	108,0	108,0	108,0	139,7	139,7	142,8
2½	82,5	101,6	120,6	127,0	127,0	127,0	161,9	161,9	165,1
3	98,4	123,8	133,4	146,1	146,1	146,1	165,1	171,5	193,7
3½	111,1	136,5	158,8	161,9	158,7	158,7	—	—	—
4	123,8	154,0	171,5	177,8	174,6	190,5	203,2	206,4	231,7
5	150,8	182,6	193,7	212,7	209,5	238,1	244,5	250,8	276,2
6	177,8	212,7	219,1	247,7	244,5	263,5	285,8	279,4	314,3
8	228,6	266,7	276,2	304,8	301,6	317,5	355,6	349,3	384,1
10	282,6	320,7	336,5	358,8	355,6	396,9	431,8	431,8	473,0
12	339,7	377,8	406,4	419,1	415,9	454,0	495,3	517,5	546,1
14	371,5	409,6	447,7	482,6	479,4	488,9	517,5	574,7	—
16	422,3	466,7	511,2	536,6	533,4	561,9	571,5	638,1	—
18	479,4	530,2	546,1	593,7	590,5	609,6	635,0	701,7	—
20	530,2	581,0	603,2	650,9	644,5	679,5	695,3	752,4	—
22	581,0	631,8	657,2	701,7	698,5	730,3	—	—	—
24	631,8	682,6	714,4	771,5	765,2	787,4	835,0	898,5	—

Diameter tolerances for Table 1:

Up to 1 000 mm OD + 0/- 0,4 mm
ID + 0,4 mm/- 0

Above 1 000 mm OD + 0/- 1,0 mm
ID + 1,0 mm/- 0

7 Marking

The gasket location ring shall be marked with the following information:

a) manufacturer's name or trademark

b) nominal size (see Table 1)

c) Class designation (see Table 1)

d) abbreviations given in Table 2 for the metallic sealing element core, the soft gasket covering layers and where applicable, the loose location ring.

EXAMPLE AAA/BBB — NPS 4 — Class 150 — XXX

The gasket shall be identified either individually or on the packaging containing the gasket(s) with the number of the European Standard i. e. EN 12560-6.

8 Colour coding

Covered serrated metal gaskets shall be marked with a colour code that identifies the metallic sealing element core and the soft gasket covering layers. The relevant colours that shall be used are shown in Table 2.

Where the thickness of the location ring is sufficient a continuous colour around the outer location ring shall identify the metallic sealing element core. Intermittent strips around the outer location ring shall identify the soft gasket covering layers.

For sizes below NPS 1.5, gaskets will have a minimum of 2 strips-180° apart.

For sizes above NPS 1.5, gaskets will have a minimum of 4 strips-90° apart.

Where the thicknesses do not allow the clear marking of the edge of the ring or the core then the marking shall be on the upper and lower surfaces of the location ring.

9 Packaging

The packaging shall be sufficient to protect the sealing faces from damage during shipment and subsequent handling before installation. Large diameter gaskets shall be securely mounted on a carrier board or within a protective framework.

Table 2 — Colour coding and abbreviations for covered serrated metal gasket materials

Material	Abbreviation	Colour code
Metal of		
Carbon steel	CRS	Silver
X4CrNi18-10 (1.4301)	304	Yellow
X2CrNi19-11 (1.4306)	304L	No colour
X15CrNiSi20-12 (1.4828)	309	No colour
X15CrNiSi25-20 (1.4841)	310	No colour
X5CrNiMo17-12-2 (1.4401)	316	Green
X2CrNiMo17-12-2 (1.4404)	316L	Green
X6CrNiNb18-10 (1.4550)	347	Blue
X6CrNiTi18-10 (1.4541)	321	Turquoise
X6Cr17 (1.4016)	430	No colour
NiCu30Fe (2.4360)	MON	Orange
Ni99.2 (2.4066)	Ni	Red
Titanium	TI	Purple
NiMo28 (2.4617)	HAST B	Brown
NiMo16Cr15W (2.4819)	HAST C	Beige
NiCr15Fe (2.4816)	INC 600	Gold
NiCr22Mo9Nb (2.4856)	INC 625	Gold
X10NiCrA*l*Ti32-20 (1.4876)	IN 800	White
NiCr21Mo (2.4858)	IN 825	White
Soft gasket covering layers		
Flexible graphite	F. G.	Grey stripe
PTFE	PTFE	White stripe
Non asbestos	Mfg's designation	Pink stripe
Phyllosilicate	Mfg’s designation	Light blue stripe

NOTE Other materials can be used by agreement between the purchaser and the manufacturer. In this case it is recommended that a colour code be agreed between the two parties.

Annex A
(informative)

Information to be supplied by the purchaser

Before ordering a gasket it is recommended that the selection of the gasket type and materials should be made in consultation with the gasket supplier. This selection should take account of the fluid, the properties of the gasket materials, the service temperature and the flange type and flange materials.

The following information should be supplied by the purchaser when ordering gaskets:

a) number and part of this European standard, i.e. EN 12560-6

b) gasket type

c) nominal size — DN (see Table 1)

d) class designation (see Table 1)

e) required gasket materials or expected operating conditions for applications where the gasket manufacturer is required to select gasket materials

f) type, thickness and density of facing material

g) type of metal for core and, where appropriate, for the locating ring.

Annex B
(informative)

The use of metric bolting with class designated covered serrated metal gaskets

B.1 General

Whilst it is not recommended, if users prefer or require to use metric bolting in lieu of the intended imperial bolting the comparison between the bolt sizes for the two series given in B.2 is the one agreed in the preparation of ISO 7005. If using metric bolts in place of imperial then the guidance notes on gasket assembly in B.3 should be carefully observed. B.4 details the precise differences between the bolts of the two series and is provided for information.

B.2 Comparable imperial & metric bolt sizes

Imperial	½	5/8	¾	7/8	1	1 1/8	1 ¼	1 ½
Metric	M14	M16	M20	M24	M27	M30	M33	M39

B.3 Gasket assembly guidance with metric bolting

WARNING: Users should note that the centring of an inside bolt circle gasket in an assembled Class designated flange joint will be affected when using metric bolting. In bolt sizes up to and including 1½ the metric sizes tend to be larger in diameter whilst above this they tend to be smaller. It is essential therefore that great care be taken to ensure that gaskets are centred properly.

However, with care, and dependent on the tolerances which have been used, it should be possible to fit the normal imperial dimensioned gasket when using metric bolting in existing imperial holes.

B.4 Imperial/metric bolt comparisons

To enable users to ascertain precisely the difference between the two systems the information below is given for reference.

Bolt Diameter [mm]			Bolt hole diameter [mm]	Clearances [mm]
Imperial	Metric	Difference	Imperial	Metric bolt in imperial hole
12,70	14,00	+ 1,30	15,88	1,88
15,88	16,00	+ 0,12	19,05	3,05
19,05	20,00	+ 0,95	22,23	2,23
22,23	24,00	+ 1,77	25,40	1,40
25,40	27,00	+ 1,60	28,58	1,58
28,58	30,00	+ 1,42	31,75	1,75
31,75	33,00	+ 1,25	34,93	1,93
38,10	39,00	+ 0,90	41,28	2,28

Bibliography

EN 1759-4, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, class designated — Part 4: Aluminium alloy flanges.*

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL