

Specification for

Bursting discs and bursting disc devices

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Pressure Vessel Standards Policy Committee (PVE/-) to Technical Committee PVE/12, upon which the following bodies were represented:

- Associated Offices Technical Committee
- British Compressed Air Society
- British Compressed Gases Association
- British Valve and Actuator Manufacturers' Association
- Combustion Engineering Association
- Electricity Supply Industry in England and Wales
- Energy Industries Council
- Engineering Equipment and Materials Users' Association
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Institution of Mechanical Engineers
- Lloyd's Register of Shipping
- Power Generation Contractors' Association (BEAMA Ltd.)
- Spring Research and Manufacturers' Association
- Transmission and Distribution Association (BEAMA Ltd.)

This British Standard, having been prepared under the direction of the Pressure Vessel Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 30 September 1990

© BSI 07-1999

First published December 1957
Second edition December 1974
Third edition July 1984
Fourth edition September 1990

The following BSI references relate to the work on this standard:
Committee reference PVE/12
Draft for comment 88/77745 DC

ISBN 0 580 18833 7

Amendments issued since publication

Amd. No.	Date	Comments
6781	July 1991	Indicated by a sideline in the margin

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Definitions	1
3 Bursting discs	2
4 Holders	3
5 Reverse pressure supports	4
6 Temperature shields	5
7 Stiffening rings	5
8 Gaskets	5
9 Protection from corrosion	5
10 Inspection by the manufacturer	6
11 Burst testing	8
12 Certificate	9
13 Marking	10
14 Packaging	10
Appendix A Information to be supplied by the user	12
Appendix B Guide to the use of bursting discs	13
Appendix C Application	13
Appendix D Installation	15
Appendix E Discharge capacity of a discharge system	16
Appendix F Derivation of F	20
Appendix G Derivation of compressibility factor Z	20
Figure 1 — Conventional domed bursting disc: simple domed with angle seat	4
Figure 2 — Conventional domed bursting disc: simple domed with flat seat	4
Figure 3 — Reverse domed bursting disc	5
Figure 4 — Conventional domed bursting disc: slotted lined	5
Figure 5 — Flat bursting disc	6
Figure 6 — Monobloc bursting disc recessed on the outlet side	6
Figure 7 — Monobloc bursting disc recessed on the inlet side	7
Figure 8 — Monobloc bursting disc recessed on both sides	7
Figure 9 — Capsule/insert holder	7
Figure 10 — Full diameter holder	8
Figure 11 — Typical union holder	9
Figure 12 — Typical plug/screw holder	9
Figure 13 — Discharge coefficients	22
Figure 14 — Compressibility factor Z as a function of reduced pressure $p_r = p/p_c$ and reduced temperature $T_r = T/T_c$	23
Figure 15 — Isentropic exponent for steam	25
Figure 16 — Correction factors for liquid dynamic viscosity	26
Table 1 — Number of bursting discs to be tested	8
Table 2 — Values of	21
Table 3 — Properties of gases	24
Publication(s) referred to	Inside back cover

Foreword

This revision of this BS 2915 which has been prepared under the direction of the Pressure Vessel Standards Policy Committee supersedes BS 2915:1984, which is withdrawn.

In revising the standard, cognizance has been taken of discussions currently being held within the International Organization for Standardization (ISO) towards the preparation of the second edition of ISO 6718 “Bursting discs and bursting disc devices”.

In particular, clause 11, which gives the requirements for burst testing, and Appendix E, which gives guidance for determining the mass flow rate through a discharge system containing a bursting disc device, have been significantly extended.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier’s quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

This British Standard is listed in the Health and Safety Executive publication “Standards significant to health and safety at work”¹⁾ and is also referred to in Health and Safety Executive Guidance Notes.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

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 and ii, pages 1 to 26, 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⁾ Available from HMSO, Holborn Bookshop, 49 High Holborn, London WC1.

1 Scope

This British Standard specifies requirements for bursting discs and bursting disc devices designed to protect pressure vessels, piping systems or other closed systems from excessive pressure or vacuum. It includes requirements for inspection, testing, certification, marking and packaging.

Information to be supplied by the user, selection, application, installation and discharge capacity are given in Appendix A, Appendix B, Appendix C, Appendix D and Appendix E respectively.

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

2 Definitions

For the purposes of this British Standard, the following definitions apply.

2.1

back pressure

the static pressure existing at the outlet of a bursting disc device at the time the device bursts or vents

2.2

baffle plate

a plate attached to the vent side of a bursting disc device or system to redirect discharge and/or reduce recoil

2.3

batch

a quantity of bursting discs made as a single group of the same type, size, maximum and minimum specified limits of pressure (see 2.18 and 2.19) and coincident temperature, manufactured from the same lot of material (see 2.17)

2.4

bursting disc

the pressure containing and pressure sensitive component of a bursting disc device

2.5

bursting disc assembly

the complete assembly of components which are installed into the holder to perform the desired function

2.6

bursting disc device

a non-reclosing pressure relief device actuated by differential pressure and designed to function by the bursting or venting of the bursting disc(s). It is the complete assembly of installed components, including where appropriate, the bursting disc holder

2.7

bursting disc device discharge area

the area which is the minimum cross-sectional flow area of the bursting disc device taking into consideration the possible reduction of the cross section, for example, by reverse pressure supports, catching devices and parts of the bursting disc which remain after bursting or venting

2.8

bursting disc device discharge capacity

the rate at which a bursting disc device discharges a fluid after bursting or venting of the bursting disc assembly

2.9

bursting pressure

the value of the pressure differential across the bursting disc at which a bursting disc device functions

2.10

coating

a layer of metallic or non-metallic material applied by brush, spray, dipping, fluidized bed or other similar method, to components of a bursting disc device

2.11

coincident temperature

the temperature used in conjunction with a bursting pressure

2.12

conventional domed bursting disc

a bursting disc which is domed in the direction of the bursting pressure (i.e. where the bursting pressure is applied to the concave side of the bursting disc) and is designed to fail in tension

NOTE See Figure 1 and Figure 2.

2.13

excess flow valve

a device which permits limited flow. When this flow is exceeded the valve closes

2.14

foil

the sheet or strip used for the manufacture of metallic bursting discs

2.15

holder

that part of a bursting disc device which retains the bursting disc assembly in position

2.16

lining

an additional sheet or sheets of material forming part of the bursting disc assembly or holder

2.17**lot of material**

- 1) For metal. All material issuing from the same heat number, heat treatment batch, and specified thickness with tolerances to an appropriate standard.
- 2) For graphite. All material of a specific grade and impregnant, where used.

2.18**maximum specified bursting pressure**

the maximum pressure quoted by the user or the manufacturer with a coincident temperature when specifying the bursting disc performance

2.19**minimum specified bursting pressure**

the minimum pressure quoted by the user or the manufacturer with a coincident temperature when specifying the bursting disc performance

2.20**muffled outlet**

a component of a bursting disc device which disperses the discharge

2.21**operating pressure**

the pressure to which the bursting disc is exposed during normal operation

2.22**performance tolerance**

the difference between the maximum and minimum specified bursting pressures at a coincident temperature

2.23**plating**

a metal layer applied by a plating process to components of a bursting disc device

2.24**relieving pressure**

the maximum pressure under discharge conditions in the pressurized system

NOTE It may differ from the bursting pressure of the bursting disc device.

2.25**relieving temperature**

the maximum temperature under discharge conditions in the pressurized system

NOTE It may differ from the coincident temperature specified for the bursting disc device.

2.26**reverse domed bursting disc**

a bursting disc which is domed against the direction of the bursting pressure (i.e. where the bursting pressure is applied to the convex side of the bursting disc) and designed to fail by buckling, bending or shearing forces

NOTE See Figure 3.

2.27**reverse pressure support**

that component of a bursting disc device which prevents the failure of the bursting disc due to pressure differential in a reverse direction

NOTE A reverse pressure support which is intended to prevent the failure of the bursting disc when the system pressure falls below atmospheric pressure is sometimes referred to as a vacuum support.

2.28**service life**

the time period beginning at the installation of a bursting disc assembly and ending at either replacement or burst

2.29**slotted lined bursting disc**

a conventional domed bursting disc made up of two or more layers, one of which is slit or slotted so as to reduce its strength and to control the bursting pressure of the bursting disc

NOTE 1 See Figure 4.

NOTE 2 This type of bursting disc may also be referred to as a composite slotted bursting disc.

2.30**stiffening ring**

an integral component of the bursting disc assembly used primarily for the stiffening of fragile discs

2.31**temperature shield**

a device which protects a bursting disc from excessive temperature

3 Bursting discs**3.1 Materials**

All materials including linings, coatings and platings used for the manufacture of bursting discs shall have uniform properties suitable for the working environment in which the bursting discs are to be used. The material in the final form shall be free from defects which would cause the bursting disc to function incorrectly.

Requirements for the application of bursting disc devices shall be as given in Appendix C.

3.2 Conventional domed bursting discs

Conventional domed bursting discs shall be designed so that they burst or vent in tension when the bursting pressure is applied to the concave side of the bursting disc. These include the following types:

- a) plain simple domed or pre-scored simple domed (see Figure 1 and Figure 2);
- b) slotted lined (see Figure 4).

3.3 Reverse domed bursting discs

Reverse domed bursting discs shall be designed to fail by buckling, bending or shearing when the bursting pressure is applied to the convex side of the bursting disc (see Figure 3). These include the following types.

- a) Reverse domed bursting discs with knife blades. This type of bursting disc opens by being cut by knife blades during reversal of the dome.
- b) Reverse domed bursting discs having lines of weakness (without knife blades). This type of bursting disc opens by having lines of weakness such that, when the dome reverses at the bursting pressure, the bursting disc opens along the lines of weakness.
- c) Reverse domed bursting discs having slip or tear-away design (without knife blades). This type of bursting disc vents by being expelled downstream from the holder.

NOTE A catching device may be provided.

- d) Reverse domed bursting discs that fail by shearing during reversal.

3.4 Flat bursting discs

Flat bursting discs shall be plane (see Figure 5) or recessed.

NOTE Plane and recessed bursting discs used in conjunction with a separate holder are known as replacement element bursting discs.

Recessed bursting discs which have an integral holder are known as monobloc bursting discs (see 3.5).

3.5 Monobloc bursting discs

Monobloc bursting discs shall be designed such that the bursting pressure is applied in one of the following ways:

- a) to the flat face of the monobloc bursting disc which is recessed on the outlet side (see Figure 6);
- b) to the recess of the monobloc bursting disc which is recessed on the inlet side (see Figure 7);

NOTE For this monobloc bursting disc the bore of the vent local to the bursting disc should follow the manufacturer's instructions. Normally this bore will be greater than the inside diameter of the recess.

- c) to the smaller diameter recess of the monobloc bursting disc which is recessed on both sides (see Figure 8).

3.6 Discharge capacity

The manufacturer shall, when requested by the user, provide the following information relating to the bursting disc device:

- a) bursting disc device discharge area;
- b) pressure loss (resistance coefficient).

This information shall be based on:

- 1) tests on actual bursting disc devices;
- 2) established scientific data;
- 3) conservative values.

NOTE Guidance for determining the mass flow rate, for single phase flow, through a discharge system containing a bursting disc device is given in Appendix E.

4 Holders

4.1 Materials

The material(s) of construction of the holder shall be compatible with the process fluid, adjoining components and the environment in which it is to be used.

4.2 Design

4.2.1 The holder shall be designed so as to ensure the accurate location and the correct functioning of the bursting disc assembly and shall not be modified without the approval of the manufacturer.

Holders include the following types.

- a) *Capsule/insert holder* (see Figure 9). Capsule/insert holders shall be of the correct dimensions to fit within the ring of bolts of the appropriate standard flange.
- b) *Full diameter holder* (see Figure 10). Full diameter holders shall have an outside diameter equal to the outside diameter of the mating flanges and shall have holes to suit the flange bolting.
- c) *Union holder* (see Figure 11). Union holders shall consist of an inlet and outlet member connected by a union nut.
- d) *Plug/screw holder* (see Figure 12). Plug/screw holders shall consist of an inlet and outlet member screwed together.

4.2.2 The design of a holder shall be such that, for practical purposes, the bursting disc assembly is effectively sealed when correctly installed.

NOTE It is recommended that the holder is so designed as to protect the bursting disc assembly during installation. With domed bursting discs this may be achieved by having the relevant side of the holder thicker than the height of the dome.

4.2.3 Where bursting disc devices are intended to fit between flanges, e.g. capsule/insert and full diameter, the holder shall have a facing and surface finish compatible with the installation flanges.

5 Reverse pressure supports

5.1 General

Where a bursting disc is to be subjected in service to a pressure differential in the reverse direction, it shall be supported by a reverse pressure support unless the bursting disc itself is strong enough to withstand the pressure differential.

The reverse pressure support shall be supplied by the bursting disc manufacturer either permanently attached to the bursting disc or it shall form part of a bursting disc device that ensures the reverse pressure support can only be assembled to the correct side of the bursting disc.

The reverse pressure support shall be free from all burrs or similar imperfections which would cause a bursting disc to function incorrectly. The inclusion of a reverse pressure support can reduce the discharge capacity and shall be taken into account when selecting the bursting disc.

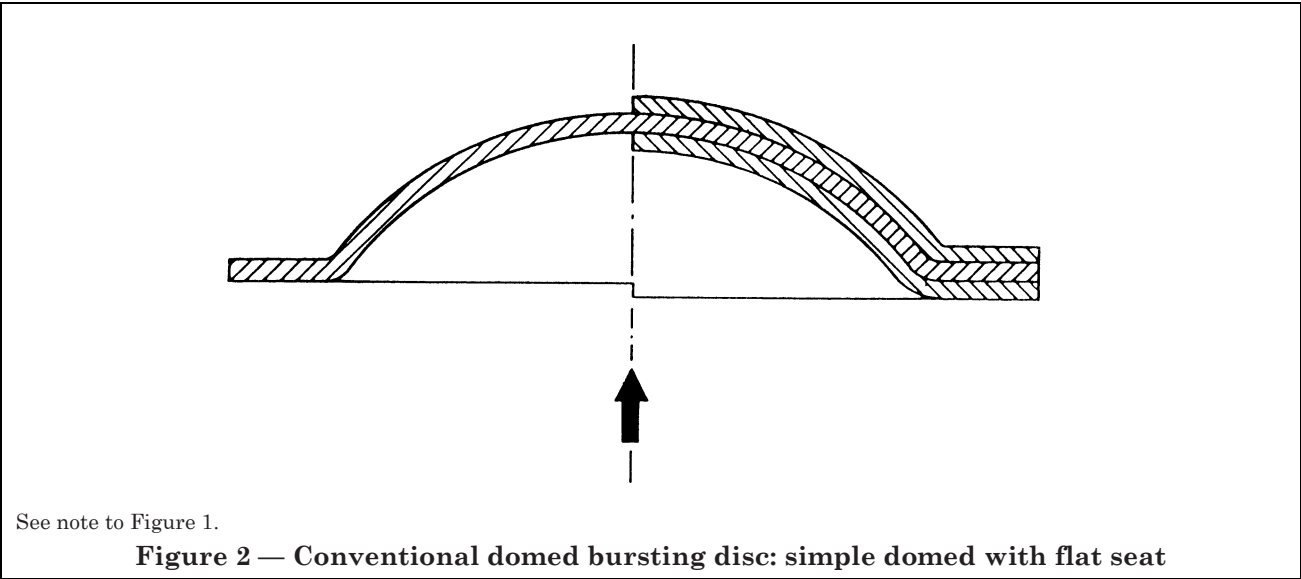
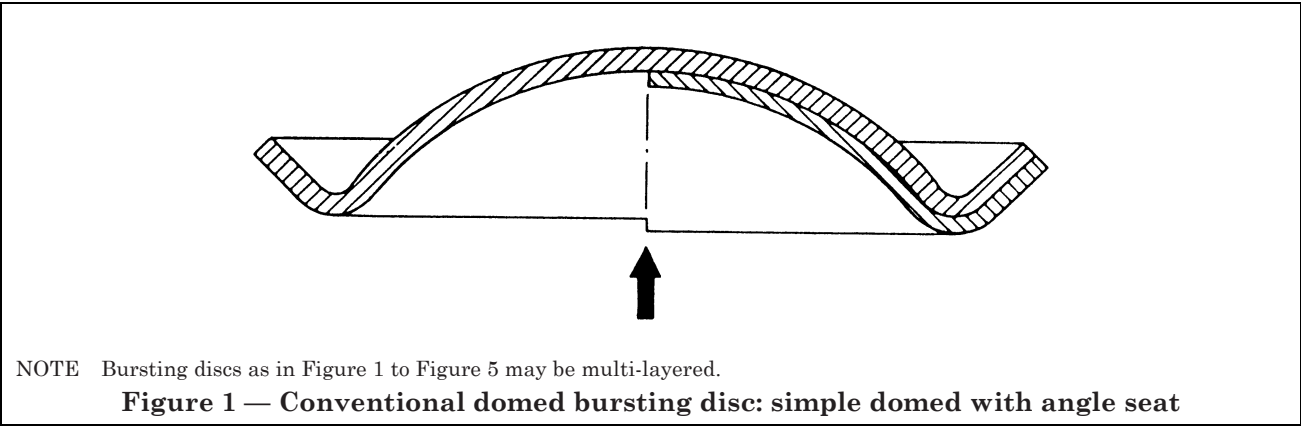
5.2 Opening reverse pressure supports

The opening reverse pressure support shall fit closely against the bursting disc so as to give support to part of its area. The support shall be slit or perforated to transmit the pressure in the system to the bursting disc.

The opening reverse pressure support shall open when submitted to a pressure not exceeding the minimum specified bursting pressure (see 2.19) at the coincident temperature of the associated bursting disc.

5.3 Non-opening reverse pressure supports

The non-opening reverse pressure support shall fit closely against the bursting disc so as to give support to part of its area.



6 Temperature shields

Temperature shields shall be designed so that they protect the bursting disc from excessive temperature and do not interfere with the bursting disc operation.

7 Stiffening rings

Stiffening rings, when fitted to bursting discs, shall not interfere with the bursting disc operation.

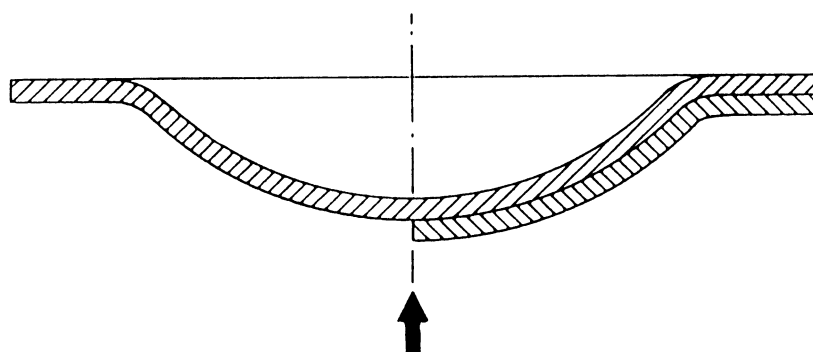
8 Gaskets

Gaskets forming part of the bursting disc device shall be compatible with the chemical, thermal and mechanical demands of the application.

9 Protection from corrosion

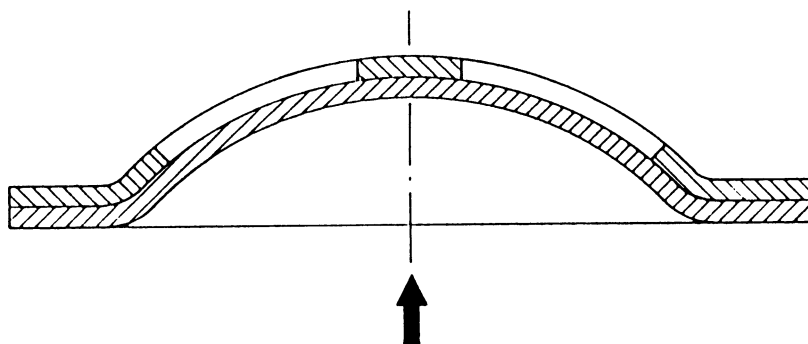
9.1 General

Bursting disc devices are frequently required to work in corrosive environments and, therefore, bursting disc devices manufactured from materials affected by corrosion shall be protected by coating, plating, lining or other suitable means. The protection shall only be supplied by the bursting disc device manufacturer. Corrosion protection shall not impair the performance of the bursting disc.



See note to Figure 1.

Figure 3 — Reverse domed bursting disc



See note to Figure 1.

Figure 4 — Conventional domed bursting disc: slotted lined

9.2 Coatings

Coating shall be applied to give an even and homogeneous coating to the surfaces to be protected.

9.3 Plating

Plating shall be applied to give an even and homogeneous plating to the surfaces to be protected.

9.4 Bursting disc linings

Bursting disc linings shall be continuous and supplied with the bursting disc so as to preserve them as a set or integral unit.

10 Inspection by the manufacturer

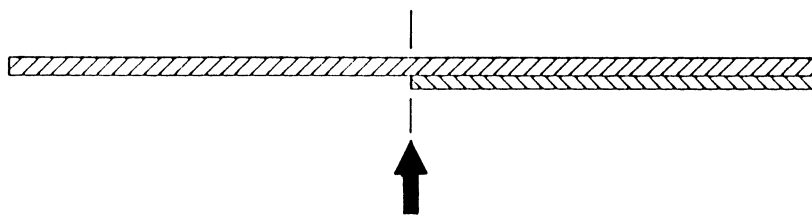
After manufacture all components of a bursting disc device shall be visually inspected. Those exhibiting defects which would cause incorrect functioning shall be discarded or rectified.

Bursting discs made from foil less than 0.2 mm thick shall be examined, for example, over a suitable light box using an intensity of light not less than 5 000 lm/m², and discarded if they appear porous.

Coatings, plating and linings shall be checked for continuity and those exhibiting defects that will affect the integrity of the bursting disc device shall be discarded.

NOTE In the case of plastics coatings a suitable method of checking continuity of the coating is electrostatic testing.

Any additional inspection requirements for bursting discs and bursting disc devices e.g. permeability tests, leakage tests and the acceptance levels, shall be as specified by the user and agreed by the manufacturer.



See note to Figure 1.

Figure 5 — Flat bursting disc

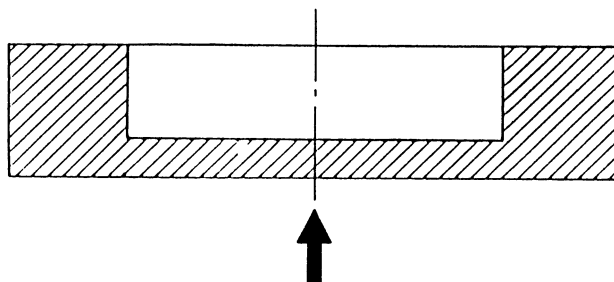


Figure 6 — Monobloc bursting disc recessed on the outlet side