INTERNATIONAL STANDARD

ISO 4126-2

Second edition
2018-12

Safety devices for protection against excessive pressure —

Part 2: Bursting disc safety devices

Dispositifs de sécurité pour protection contre les pressions excessives —

Partie 2: Dispositifs de sûreté à disque de rupture

Reference number
ISO 4126-2:2018(E)

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Published in Switzerland

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Foreword

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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.

This document was prepared by Technical Committee ISO/TC 185, *Safety devices for protection against excessive pressure*.

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.

This second edition cancels and replaces the first edition (ISO 4126-2:2003), which has been technically revised. The main changes compared to the previous edition are as follows:

— non-applicable references have been removed;

— material references (old Annexes A and B) have been removed;

— new Annex A has been added.

A list of all parts in the ISO 4126 series can be found on the ISO website.

Introduction

A bursting disc safety device is a non-reclosing pressure relief device used to protect pressure equipment such as pressure vessels, piping, gas cylinders or other enclosures from excessive pressure and/or excessive vacuum.

A bursting disc safety device typically comprises an assembly of components including a bursting disc, a bursting disc holder and, where necessary, other components such as back pressure supports, stiffening rings, etc.

The bursting disc is the pressure-sensitive part of the bursting disc safety device and is designed to open by bursting at a specified pressure. There are many different types of bursting disc safety devices manufactured in corrosion resistant materials, both metallic and non-metallic, to cover a wide range of nominal sizes, burst pressures and temperatures.

Safety devices for protection against excessive pressure —

Part 2:
Bursting disc safety devices

1 Scope

This document specifies the requirements for bursting disc safety devices.

It includes the requirements for the design, manufacture, inspection, testing, certification, marking, and packaging.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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
bursting disc safety device
non-reclosing pressure relief device actuated by differential pressure and designed to function by the bursting of the *bursting disc(s)* (3.3), and which is the complete assembly of installed components including, where appropriate, the *bursting disc holder* (3.4)

3.2
bursting disc assembly
complete assembly of components which are installed in the *bursting disc holder* (3.4) to perform the desired function

3.3
bursting disc
pressure-sensitive component(s) of a *bursting disc safety device* (3.1), designed to open by bursting at a *specified bursting pressure* (3.11)

Note 1 to entry: It is not considered a pressure-containing part with respect to 4.2.

3.4
bursting disc holder
part of a *bursting disc safety device* (3.1) which retains the *bursting disc assembly* (3.2) in position

Note 1 to entry: It is considered a pressure-containing part with respect to 4.2.

3.5
conventional domed bursting disc
bursting disc (3.3) which is domed in the direction of the *bursting pressure* (3.10)

Note 1 to entry: I.e. where the bursting pressure is applied to the concave side of the bursting disc, see Figure 1.

Note 2 to entry: Also referred to as forward-acting bursting disc.

3.6
slotted lined bursting disc
bursting disc (3.3) made up of two or more layers, at least one of which is slit or slotted to control the *bursting pressure* (3.10) of the bursting disc

3.7
reverse domed bursting disc
bursting disc (3.3) which is domed against the direction of the *bursting pressure* (3.10)

Note 1 to entry: I.e. where the bursting pressure is applied to the convex side of the bursting disc, see Figure 2.

Note 2 to entry: Also referred to as reverse-acting bursting disc.

3.8
flat bursting disc
bursting disc (3.3) having one or more layers, which is flat when installed and can be made of a ductile or brittle material

3.9
graphite bursting disc
bursting disc (3.3) manufactured from graphite, impregnated graphite, flexible graphite or graphite composite and designed to burst due to bending or shearing forces

Note 1 to entry: The following definitions apply:

a) Graphite: A crystalline form of the element carbon.

b) Impregnated graphite: Graphite in which the open porosity is impregnated with a filler material.

c) Flexible graphite: A graphite structure formed by the compression of thermally exfoliated graphite intercalation compounds.

d) Graphite composite: Made up of two or more distinct materials and having different properties to those of the separate materials and in which the proportion of graphite is over 50 per cent by weight.

3.10
bursting pressure
value of the differential pressure between the upstream side and the downstream side of the *bursting disc* (3.3) when it bursts

3.11
specified bursting pressure
bursting pressure (3.10) quoted with a *coincident temperature* (3.14) when defining the *bursting disc* (3.3) requirements

Note 1 to entry: Used in conjunction with a *performance tolerance* (3.15).

3.12
specified maximum bursting pressure
maximum *bursting pressure* (3.10) quoted with a *coincident temperature* (3.14) when defining the *bursting disc* (3.3) requirements

Note 1 to entry: Used in conjunction with *specified minimum bursting pressure* (3.13).

3.13
specified minimum bursting pressure
minimum *bursting pressure* (3.10) quoted with a *coincident temperature* (3.14) when defining the *bursting disc* (3.3) requirements

Note 1 to entry: Used in conjunction with *specified maximum bursting pressure* (3.12).

3.14
coincident temperature
temperature of the *bursting disc* (3.3) associated with a *bursting pressure* (3.10) and which is the expected temperature of the bursting disc when it is required to burst

3.15
performance tolerance
range of pressure between the *specified minimum bursting pressure* (3.13) and the *specified maximum bursting pressure* (3.12), or the range of pressure in positive and negative percentages or quantities which is related to the *specified bursting pressure* (3.11)

Note 1 to entry: See Figure 9.

3.16
operating pressure
pressure existing at normal operating conditions within the system being protected

3.17
differential back pressure
differential pressure across a *bursting disc* (3.3) in the opposite direction to the direction of the *bursting pressure* (3.10), which is the result of pressure in the discharge system from other sources and/or a result of vacuum on the upstream side of the bursting disc

3.18
vent area
cross-section area available for discharge of fluid as calculated by the manufacturer

3.19
batch
quantity of *bursting discs* (3.3) or *bursting disc safety devices* (3.1) made as a single group of the same type, size, materials and *specified bursting pressure* (3.11) requirements where the *bursting discs* (3.3) are manufactured from the same *lot of material* (3.20)

3.20
lot of material
definite quantity of material produced by a single manufacturer under conditions that are presumed uniform

Note 1 to entry: Lots of the following materials used to manufacture bursting discs are defined as:

a) **Metal**: Material of the same specification coming from the same heat number, heat treatment batch and specified thickness with tolerances to an appropriate standard;

b) **Graphite and flexible graphite**: Material of the same specification grade and quality coming from the same graphite manufacturer and the same manufacturing process;

c) **Impregnated graphite**: Graphite of the same lot impregnated with a specific grade of filler material by the same manufacturing process;

d) **Graphite composite**: Graphite and specific grades of other constituents coming from the same mix of raw materials.

3.21
back pressure support
component of a *bursting disc safety device* (3.1) which prevents damage to the *bursting disc* (3.3) due to *differential back pressure* (3.17)

Note 1 to entry: A back pressure support which is intended to prevent damage to the bursting disc when the system pressure falls below atmospheric pressure is sometimes referred to as a vacuum support.

3.22
stiffening ring
component of a *bursting disc assembly* (3.2) used primarily for reinforcing fragile *bursting discs* (3.3), so as to prevent damage

3.23
coating
layer of metallic or non-metallic material applied to components of a *bursting disc safety device* (3.1) by a coating process

3.24
lining
additional sheet or sheets of metallic or non-metallic material forming part of a *bursting disc assembly* (3.2) or *bursting disc holder* (3.4)

3.25
plating
metal layer applied to a *bursting disc* (3.3) or *bursting disc holder* (3.4) by a plating process

3.26
muffled outlet
component of a *bursting disc safety device* (3.1) which disperses the discharge

3.27
temperature shield
device which protects a *bursting disc* (3.3) from excessive temperature

3.28
pressure-containing part
part, whose failure to function as intended results in a release of contained fluid into the environment

4 Materials

4.1 Selection of materials

The selection of materials used for the components of bursting disc safety devices shall take into account:

a) suitability with regard to manufacture;

b) compatibility with the process fluid, the adjoining components and the chemical and physical conditions to which the bursting disc safety device will be subjected when in service.

NOTE For example, the use of corrosion-resistant materials for the downstream side of the bursting disc device may be selected because corrosion of these parts can cause damage which can impair the performance of the bursting disc safety device.

4.2 Material specifications

4.2.1 The material specifications of the bursting disc assembly component(s) shall be defined by the manufacturer of the bursting disc safety device to provide control of the applicable properties.

4.2.2 Materials used for the pressure-containing part(s) of the bursting disc holder of the bursting disc safety device shall be suitable for pressure-containing functions, taking into account their temperature limitations.

Only materials with defined chemical and physical properties and published in a recognized national or international standard shall be used.

NOTE Some examples of published national or international material standards are ASME, ASTM, JIS, and EN.

4.3 Protection from corrosion

Bursting disc safety devices are frequently required to operate in corrosive environments. Therefore, components manufactured from materials affected by corrosion shall be protected by coating, plating or lining, where appropriate.

Coatings and plating shall be applied to give an even and homogeneous coating to the surfaces to be protected. Linings shall be seamless and supplied with the bursting disc safety device so as to preserve them as a set or integral unit.

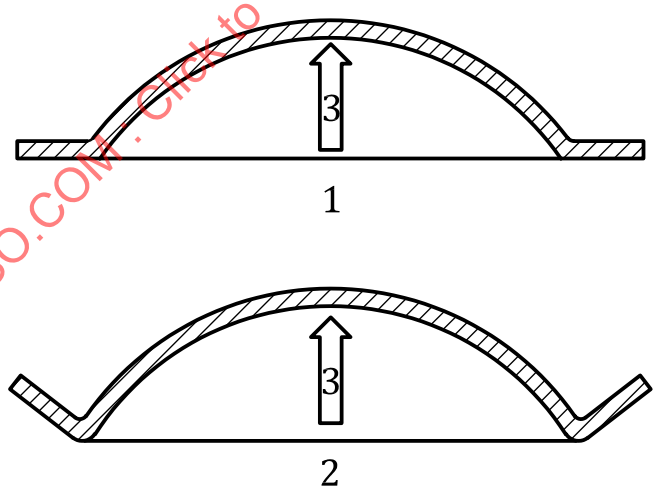
The corrosion protection shall be supplied only by the manufacturer.

The corrosion protection shall not impair the performance of the bursting disc safety device.

5 Types of bursting discs

5.1 Conventional domed bursting discs (Forward acting)

Conventional domed bursting discs shall be designed so that they burst due to tensile stresses when the bursting pressure is applied to the concave side of the bursting disc (see Figure 1).



Key

1 flat seat
2 angle seat
3 flow

Figure 1 — Conventional domed bursting disc (Forward acting)

They shall be domed by a means sufficient to cause a permanent set such that no further plastic flow occurs initially when the bursting disc is subjected to its intended operating condition.

Conventional domed bursting discs include the following types:

a) Conventional simple domed: This type of bursting disc shall have one or more layers, the bursting pressure of which is controlled by the ultimate tensile strength of the material(s).

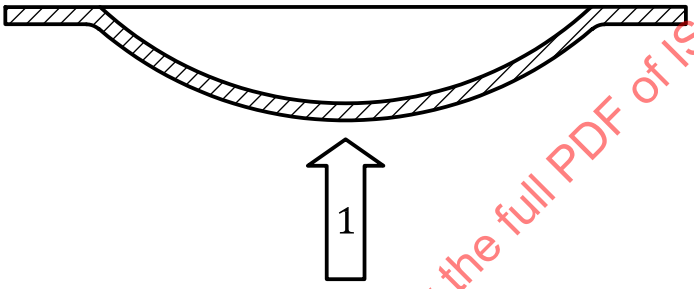
b) Conventional slotted domed: This type of bursting disc shall have two or more layers at least one of which shall have slits or slots so as to reduce its strength and to control the bursting pressure.

c) Conventional scored simple domed: This type of bursting disc shall be scored such that when the bursting pressure is reached, the bursting disc opens along the score.

d) Conventional simple domed with knife blades. This type of bursting disc shall open by being cut by the knife blades when the bursting pressure is reached.

5.2 Reverse domed bursting discs (Reverse acting)

Reverse domed bursting discs shall be designed to function due to buckling, bending or shearing stresses when the bursting pressure is applied to the convex side of the bursting disc (see Figure 2).



Key

1 flow

Figure 2 — Reverse domed bursting disc (Reverse acting)

Reverse domed bursting discs include the following types:

a) Reverse domed scored: This type of bursting disc shall be scored such that, when the dome reverses at the bursting pressure, the bursting disc opens along the score. The bursting disc may also have areas of weakness which determine the pressure at which the bursting disc reverses.

b) Reverse domed having slip or tear-away design: This type of bursting disc shall function by being expelled downstream from the bursting disc holder.

NOTE A catching device can be provided for this type of bursting disc.

c) Reverse domed with knife blades: This type of bursting disc shall open by being cut by knife blades during reversal of the dome.

d) Reverse domed that function by shearing: This type of bursting disc shall have one or more layers which upon reversal opens due to shearing forces.

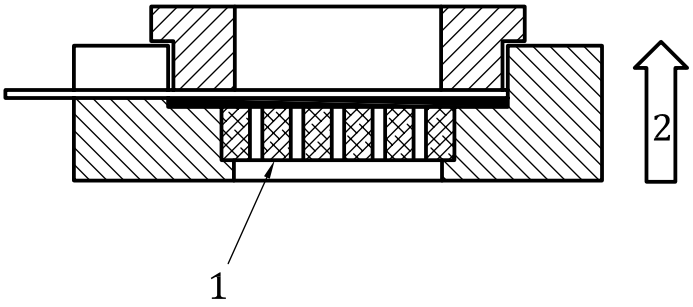
e) Reverse domed composite or multi-layered: This type of bursting disc shall have two or more layers at least one of which shall contain areas of weakness of such a configuration as to determine the pressure at which the bursting disc reverses.

5.3 Flat bursting discs

Flat bursting discs shall have one or more layers. According to the type, they can require a bursting disc holder, or be fitted directly between installation flanges.

Flat bursting discs include the following types:

a) Graphite replaceable element: This type of bursting disc shall be plane or recessed and used in conjunction with a bursting disc holder. They shall be designed to burst due to bending or shearing forces (see Figure 3).



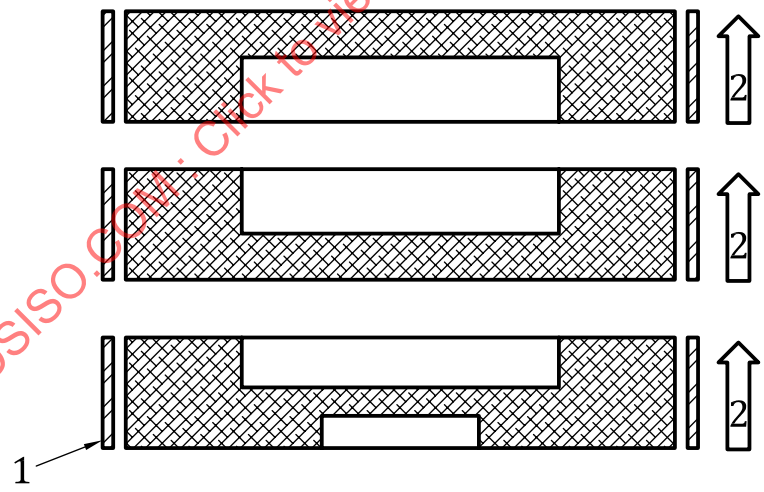
Key

1 back pressure support (where required)

2 flow

Figure 3 — Typical replaceable element graphite bursting disc and holder

b) Graphite monobloc: This type of bursting disc shall be designed so as to fit directly between the installation flanges. They may be recessed on one or both sides according to the bursting pressure and the direction in which it is to be applied (see Figure 4). Graphite monobloc bursting discs may be reinforced with an external armour ring. This design may be provided with a lining on the pressure side.



Key

1 armour ring (optional)

2 flow

Figure 4 — Graphite monobloc bursting discs — Different configurations

The pressure-containing capability of graphite monobloc bursting discs, after bursting, shall be determined by one of the methods given in 6.1.1.

NOTE For this design of graphite monobloc bursting disc, the diameter of the downstream piping adjacent to the bursting disc usually follows the manufacturer's instructions. Normally, this diameter is greater than the inside diameter of the recess.

c) Flat slotted lined: This type of bursting disc shall have two or more layers. At least one of the layers shall have for example, slits or slots so as to reduce its strength and to control the bursting pressure. According to the design, it can be necessary for the bursting disc to be used in conjunction with a bursting disc holder.

5.4 Other types and designs

Other types and other designs of bursting discs are permitted provided that they meet the requirements of this document.

6 Bursting disc holders

6.1 Design

6.1.1 Pressure-containing capability

The pressure-containing capability of bursting disc holders shall be determined by either:

a) calculation generally according to design rules for flanged connections or other established design methods of the manufacturer; or

b) experimental design procedure(s) developed by the manufacturer, carried out on prototypes, or on representative production samples in accordance with 14.1.

6.1.2 Other design requirements

The design of the bursting disc holder shall ensure:

a) the accurate positioning of the bursting disc assembly;

b) that the bursting disc assembly, where applicable, can only be fitted the correct way round;

c) the ability to apply or transmit a clamping load appropriate to the particular bursting disc assembly;

d) where appropriate, the correct fitting of a back pressure support (see Clause 7);

e) that, when installed in accordance with the manufacturer's installation instructions, it provides adequate pressure containment under the specified service conditions;

f) the position of any holes for pre-assembly screws is compatible with the specified gaskets used between the bursting disc holder and the installation flanges;

g) the accurate positioning within the pressure system connection including direction of flow;

h) its suitability for the specified service conditions;

i) correct functioning of the bursting disc assembly.

It is recommended that the bursting disc holder is designed so as to protect the bursting disc assembly during installation and removal. For domed bursting discs, this can be achieved by ensuring that the dome does not protrude beyond the bursting disc holder. Other methods may be used subject to agreement between the purchaser and the manufacturer.

6.2 Types

The type of bursting disc holder shall be appropriate to the particular type of bursting disc and suitable for its intended use.

Bursting disc holders include the following types:

a) Insert/capsule: Insert/capsule bursting disc holders shall have an inlet and outlet member, with or without fasteners and shall fit within the installation flange bolting (see Figure 5).

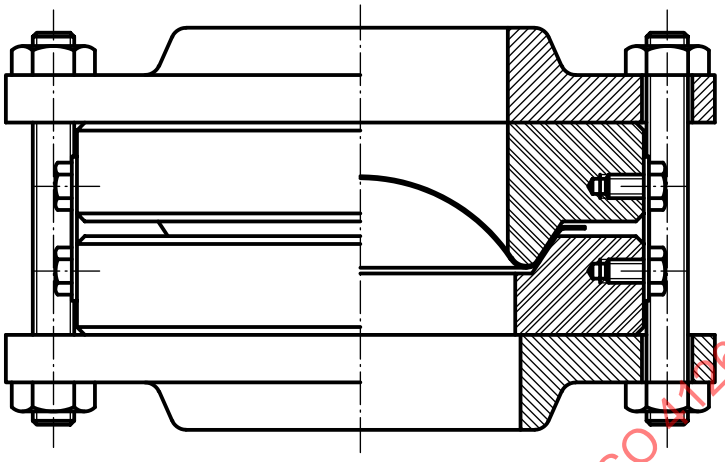


Figure 5 — Typical insert/capsule bursting disc holder

b) Full face flange: Full face flange bursting disc holders shall have an inlet and outlet member, with or without fasteners and shall have holes/slots to suit the installation flange bolting (see Figure 6).

NOTE The outside diameter is normally the same as the outside diameter of the installation flanges.

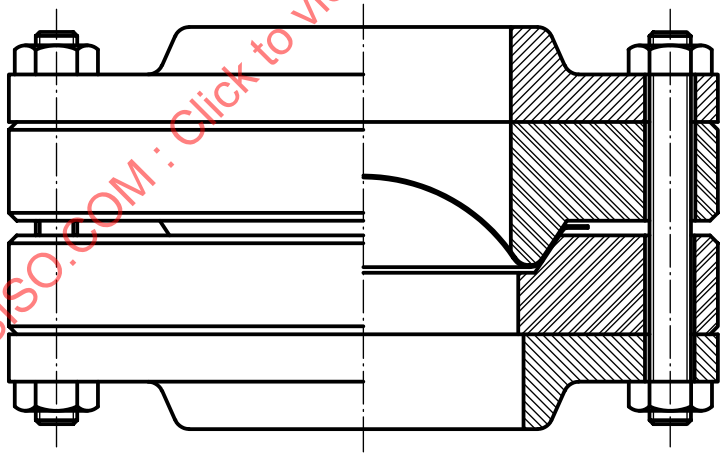
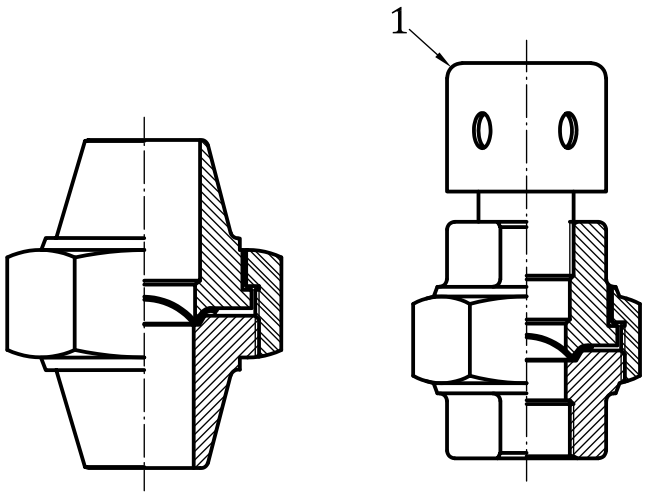


Figure 6 — Typical full face flange bursting disc holder

c) Union: Union bursting disc holders shall have an inlet and outlet member connected by a union nut (see Figure 7).



Key

1 muffled outlet (optional)

Figure 7 — Typical union bursting disc holders

d) Plug/screw: Plug/screw bursting disc holders shall have an inlet and outlet member which are screwed together. The outlet member may be a muffled outlet design (see Figure 8).

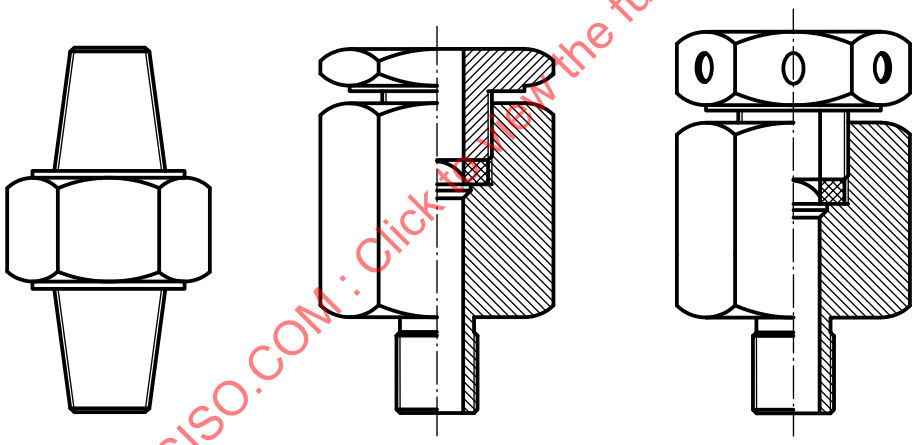


Figure 8 — Typical plug/screw bursting disc holders

e) Other: Other types of bursting disc holders are permitted provided that they meet the requirements of this document.

6.3 Connections

Where bursting disc holders fit between installation flanges, for example, insert/capsule and full face flange types, the facing and surface finish of the bursting disc holder shall be compatible with that of the purchaser's piping specifications.

For other types [see 6.2 e)], the connections to the installation may be threaded, welded, proprietary, etc., according to the purchaser's requirements.

7 Back pressure supports

7.1 General

Where a bursting disc is to be subjected in service to a differential back pressure, it shall be supported by a back pressure support unless the bursting disc is capable of withstanding the back pressure.

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

The back pressure support shall be free from all burrs or similar imperfections which would cause a bursting disc to function incorrectly.

7.2 Opening back pressure supports

The opening back pressure support shall fit closely against and give adequate support to the bursting disc. The support shall be designed such that the pressure in the system is transmitted to the bursting disc.

When the bursting disc has burst, the back pressure support shall open when subjected to a pressure not exceeding the specified minimum bursting pressure or the specified bursting pressure minus the negative tolerance at the coincident temperature of the associated bursting disc.

7.3 Non-opening back pressure supports

The non-opening back pressure support shall fit closely against and give adequate support to the bursting disc. The support shall have openings to allow the discharge of fluid.

8 Temperature shields

The temperature shields shall be designed and manufactured so as to reduce the temperature at the bursting disc in order to avoid incorrect functioning of the bursting disc. They shall be used when specified, and shall be supplied by the manufacturer.

9 Stiffening rings

Stiffening rings shall provide reinforcement to, and protection of, the seating area of the bursting disc without interfering with the correct functioning of the bursting disc. They shall be permanently attached to the bursting disc.

10 Gaskets/seals

Gaskets/seals forming part of the bursting disc safety device shall be compatible with the chemical, thermal and mechanical demands of the application (see 4.1).

The use, type, material (see 4.2) and dimensions shall be as specified by the manufacturer.

11 Assembly of bursting disc safety devices

11.1 General

Instructions for the assembly, installation, use and maintenance of the bursting disc safety device shall be provided by the manufacturer.

The requirements for the assembly of bursting disc safety devices are dependent on whether:

a) the bursting disc assembly is retained in the bursting disc holder in such a way that the bursting disc assembly can readily be replaced (see 11.2); or

b) the bursting disc assembly is permanently retained in the bursting disc holder as an integral assembly (see 11.3).

11.2 Bursting disc safety devices with replaceable bursting disc assemblies

The bursting disc safety device shall be such that following initial assembly of the bursting disc assembly in the bursting disc holder, it can readily be dis-assembled, a replacement bursting disc assembly fitted and then re-assembled.

The components of the bursting disc safety device may be assembled either by the manufacturer or the purchaser. The bursting disc holder's and the bursting disc assemblie's pressure integrity shall be verified in accordance with 6.1.1.

Prior to assembly, the manufacturer's model/type reference for the bursting disc holder, marked on the bursting disc assembly, shall be checked to ensure that it coincides with that marked on the bursting disc holder (see Clause 17).

The performance of the bursting disc safety device is determined by the interaction of its components and shall be assembled in accordance with the manufacturer's instructions.

11.3 Bursting disc safety devices with non-replaceable bursting disc assemblies

The components of the bursting disc safety devices shall be assembled by the manufacturer.

They shall be permanently joined together using welding, crimping, adhesion or other permanent joining process. Joining materials such as welding materials, brazing materials, solders, adhesives and cements shall be compatible with the materials of the components being joined and be suitable for the duty. The joining shall be carried out by suitably experienced/qualified personnel using approved written procedures. The completed joint shall form an effective seal and pressure containment when installed.

Bursting disc safety devices with non-replaceable bursting disc assemblies shall be manufactured as a batch with the bursting discs being manufactured from the same lot of material.

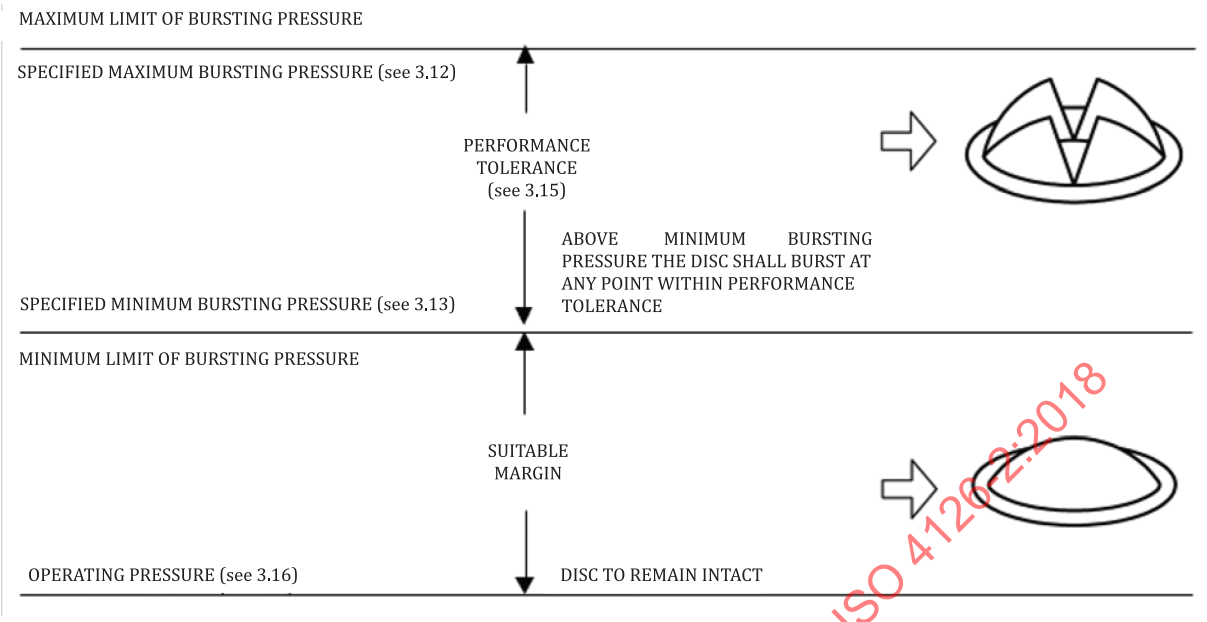
The testing and marking shall comply with Clauses 14 and 17.

12 Specified bursting pressure requirements

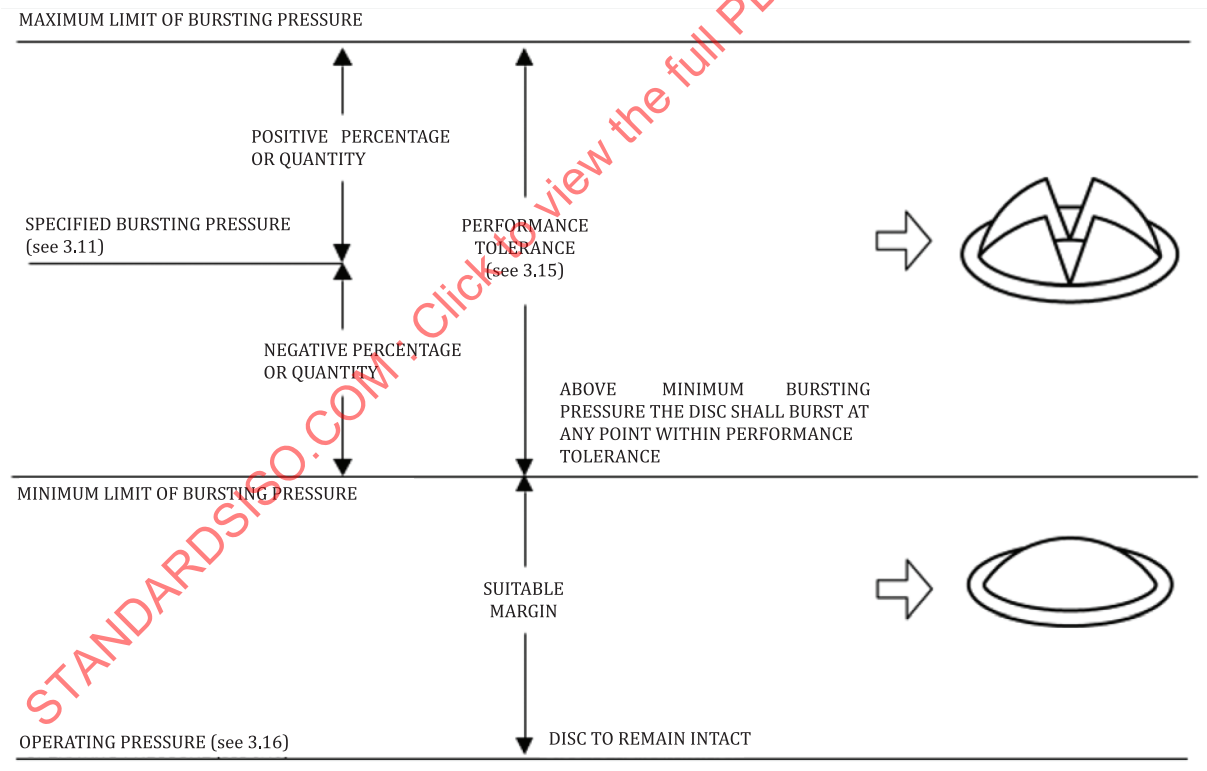
The specified bursting pressure shall be expressed as follows, (see Figure 9):

a) by using specified maximum bursting pressure and specified minimum bursting pressure with a coincident temperature [see Figure 9 a)]; or

b) by using specified bursting pressure and performance tolerance with a coincident temperature [see Figure 9 b)].



a) Specified maximum bursting pressure and specified minimum bursting pressure with coincident temperature



b) Specified bursting pressure and performance tolerance with coincident temperature

Figure 9 — Methods for specifying bursting pressure

13 Inspection by the manufacturer

Inspection of components during manufacture shall be carried out in accordance with the manufacturer's requirements.

On completion of manufacture, all components shall be visually inspected for defects. Any components having defects, which would cause incorrect functioning, shall be discarded or rectified.

14 Test procedures

14.1 General

For instances where verification of the pressure integrity for bursting disc holders is required per 6.1.1 b), the requirements as described in 14.2 are to be met.

The verification of the specified bursting pressure requirements of bursting disc or bursting disc safety devices with non-replaceable bursting disc assemblies shall be carried out in accordance with 14.3.

Additional testing requirements necessitated by a particular application may, where required, be specified by the purchaser (see 14.4 and 14.5).

14.2 Pressure testing

When required, the manufacturer shall subject the bursting disc holder to a hydrostatic pressure test.

The test fluid should be water. However, other fluids may be used. Appropriate safety precautions shall be observed.

Testing shall be conducted on the bursting disc holder/assemblies either at the component level or fully assembled

When pressure testing fully assembled bursting disc holders, the bursting disc holder shall be assembled using an appropriate sealing device in place of a bursting disc.

For bursting disc safety devices with non-replaceable bursting disc assemblies, the test pressure shall be applied without creating pressure differential across the bursting disc to help avoid damage.

The test pressure shall be maintained at the required value for a sufficient period of time to permit an examination to be made. Any bursting disc holder showing signs of leakage or permanent deformation shall be rejected.

14.3 Burst testing

14.3.1 General

A number of bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies shall be selected at random from each batch (see Table 1) and be subjected to burst testing in accordance with 14.3.2 to 14.3.4 in order to verify that the bursting pressure(s) is (are) in accordance with the specified requirements.

Bursting tests carried out during the manufacture of the batch of bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies, i.e. discarded and trial bursts, shall not be considered as part of the batch.

14.3.2 Coincident temperature in the range 15 °C to 30 °C

The number of bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies in accordance with Table 1, shall be tested at any temperature in the range 15 °C to 30 °C.

14.3.3 Coincident temperature above or below the range 15 °C to 30 °C

14.3.3.1 The number of bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies in accordance with Table 1, shall be tested at the coincident temperature.

14.3.3.2 Alternatively, subject to specific agreement, testing may be carried out at a test temperature in the range 15 °C to 30 °C inclusive providing that both the following are satisfied:

a) the relationship between the bursting pressure at the test temperature and the bursting pressure at the coincident temperature is determined from the manufacturer's certified bursting test data; and

b) the relationship (used to establish pressure in the temperature range 15 °C to 30 °C) is specific for the type of bursting disc and the lot of material and is appropriate to the nominal size.

The number to be tested shall be in accordance with Table 1.

The reference of the manufacturer's certified bursting test data used to establish the bursting pressure shall be recorded on the certificate (see Clause 15).

Table 1 — Number of bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies to be tested

Total number in a batch	Number to be tested
Less than 10	2
10 to 15	3
16 to 30	4
31 to 100	6
101 to 250	4 % but not less than 6
251 to 999	3 % but not less than 10
1 000 and more	Minimum 30

14.3.4 Procedure for burst testing

14.3.4.1 Bursting discs shall be tested in a bursting disc holder or test die identical in orifice size and orifice configuration with the bursting disc holder in which the bursting disc is to be installed.

14.3.4.2 In the case of reverse domed bursting discs the test system shall have sufficient capacity to ensure reversal and bursting of the bursting disc (see also 14.3.4.7).

14.3.4.3 A clamping load shall be applied in accordance with the manufacturer's installation instructions for the bursting disc to be tested.

14.3.4.4 The test installation shall be equipped with calibrated measuring and indicating instruments that meet the requirements for the testing and certification specified for the bursting disc or bursting disc safety device with non-replaceable bursting disc.

14.3.4.5 The pressure sensing device shall be located as near as practicable to the bursting disc holder or test die inlet and connected to it in such a way as to minimize pressure drop.

14.3.4.6 In the case of tests to be carried out at specified coincident temperature(s), the bursting disc and bursting disc holder or test die shall be maintained at the coincident temperature for sufficient time to allow the temperature to stabilize before carrying out the test. The coincident temperature shall be maintained throughout the test.

14.3.4.7 With one of the bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies installed, the pressure at the inlet shall be increased to 90 % of the expected minimum bursting pressure in a time not less than 5 seconds. After that, the pressure at the inlet shall be increased

at a linear rate, which allows accurate reading of the smallest graduation of the pressure gauge, but in not more than 120 seconds, until the bursting disc bursts.

The manufacturer, in consultation with the purchaser, may specify testing procedures which deviate from the above when required by the application.

The bursting pressure and any other pertinent characteristics shall be recorded.

14.3.4.8 Where a bursting pressure is not in accordance with the specified bursting pressure requirements (see Clause 12), the batch shall be rejected.

14.3.4.9 The appropriate safety precautions shall be observed when carrying out the tests.

14.4 Leak testing

14.4.1 General

When required, the manufacturer shall subject the bursting disc safety device to a leak test in order to detect any leakage through the bursting disc and/or the leakage through the bursting disc safety device to the surrounding environment.

The method of carrying out the leak test, the number of bursting disc safety devices to be tested and any acceptance criteria shall be specified. Also, testing shall be carried out in accordance with a written procedure.

14.4.2 Selection of acceptable leakage rate

The acceptable leakage rate is dependent on the application. The maximum leakage rate shall be specified by the purchaser and shall not exceed that permitted by the appropriate requirements or standards covering the pressure system.

14.5 Non-destructive examination

Components required to be subject to non-destructive examination shall be tested by the manufacturer in accordance with the specified method, the number of components to be examined and the acceptance criteria.

15 Certification

The manufacturer shall issue a certificate for each batch or part batch of bursting discs or bursting disc safety devices with non-replaceable bursting disc assemblies, stating that they have been manufactured and tested in accordance with the requirements of this document. The certificate shall include the following information:

a) the manufacturer's name or trade mark;

b) the manufacturer's model/type reference;

c) the nominal size designation, as appropriate, for example DN or NPS;

d) the specified maximum bursting pressure and specified minimum bursting pressure with a coincident temperature, stating units; or

   the specified bursting pressure and performance tolerance with a coincident temperature, stating units;

e) when tested in accordance with 14.3.3.2, information as in d) correlated to the conditions of the test;

