

Safety devices for gas pressure regulating stations and installations — Gas safety shut-off devices for inlet pressures up to 100 bar

ICS 23.060.40

National foreword

This British Standard is the UK implementation of EN 14382:2005+A1:2009, incorporating corrigendum June 2009. It supersedes BS EN 14382:2005 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment 1 is indicated by **A1** **A1**.

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The UK participation in its preparation was entrusted to Technical Committee GSE/32, Gas governors.

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

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English Version

**Safety devices for gas pressure regulating stations and
installations - Gas safety shut-off devices for inlet pressures up
to 100 bar**

Dispositifs de sécurité pour postes et installations de
détente-régulation de pression de gaz - Clapets de sécurité
pour pressions amont jusqu'à 100 bar

Sicherheitseinrichtungen für Gas-Druckregelanlagen und -
einrichtungen - Gas-Sicherheitsabsperreinrichtungen für
Eingangsdrücke bis 100 bar

This European Standard was approved by CEN on 30 December 2004 and includes Amendment 1 approved by CEN on 12 January 2009.

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Foreword

This document (EN 14382:2005+A1:2009) has been prepared by Technical Committee CEN/TC 235 "Gas pressure regulators and associated safety devices for use in gas transmission and distribution", the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by September 2009.

This document includes Amendment 1, approved by CEN on 2009-01-12.

This document supersedes A1 EN 14382:2005 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 97/23/EC.

For relationship with EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

Safety shut-off devices dealt with in this document are standard safety shut-off devices and, when used in pressure regulating stations complying with EN 12186 or EN 12279, they are considered as standard pressure equipment in accordance with Clause 3.1 of Art. 1 of Pressure Equipment Directive (PED).

For standard safety shut-off devices used in pressure regulating stations complying with EN 12186 or EN 12279, Table ZA.1 given in Annex ZA includes all applicable Essential Requirements given in Annex I of PED A1 except the external corrosion resistance in case of environmental conditions where corrosion is likely to occur A1.

The normative Annex J of this document lists some suitable materials for pressure containing parts, inner metallic partition walls, fasteners and connectors. Other materials may be used when complying with the restrictions given in Table 5.

A1 *deleted text* A1

A1 Continued A1 integrity of safety shut-off devices is assured by periodic functional checks. For periodic functional checks it is common to refer to national regulations/standards where existing or users/manufacturers practices.

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

1 Scope

[A1] This document specifies constructional, functional, testing and marking requirements, sizing and documentation of gas safety shut-off devices used in the pressure regulating stations in accordance with EN 12186 or EN 12279: **[A1]**

- for inlet pressures up to 100 bar and nominal diameters up to DN 400;
- for an operating temperature range from $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$,

which operate with fuel gases of the 1st and 2nd family in accordance with EN 437 in transmission and distribution networks and also in commercial and industrial installations.

"Gas safety shut-off devices" will hereafter be called "SSDs" except in titles.

[A1] For standard safety shut-off devices when used in pressure regulating stations complying with EN 12186 or EN 12279, Annex ZA lists all applicable Essential Requirements except the external corrosion resistance in case of environmental conditions where corrosion is likely to occur. **[A1]**

[A1] This document considers the following classes/types of SSDs: **[A1]**

temperature classes:

- class 1: operating temperature range from $-10\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$;
- class 2: operating temperature range from $-20\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$;

functional classes:

- **[A1]** class A: SSDs that close when damage to the pressure detector element occurs (applicable to overpressure SSDs only) or when external power fails and whose re-opening, after an intervention for overpressure, is possible only manually;
- class B: SSDs that do not close when damage to the pressure detector element occurs and whose re-opening, after an intervention for overpressure, is possible only manually;

SSDs types:

- type IS: (integral strength type);
- type DS: (differential strength type). **[A1]**

SSDs complying with the requirements of this document may be declared as "in conformity with EN 14382" and bear the mark "EN 14382".

The material and functional requirements specified in this document may be applied to SSDs which use thermal energy or the effects of electrical energy to trip the operation of the closing member. For these SSDs the operational parameters are not specified in this document.

This document does not apply to:

- SSDs upstream from/on/in domestic gas-consuming appliances which are installed downstream of domestic gas meters;
- **[A1]** SSDs incorporated into pressure-regulating devices used in service lines **[AC1]**¹⁾ **[AC1]** with volumetric flow rate $\leq 200\text{ m}^3/\text{h}$ at normal conditions and inlet pressure $\leq 5\text{ bar}$. **[A1]**

[AC1]¹⁾ The service lines are those defined in EN 12279. **[AC1]**

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including amendments) applies.

 deleted text 

 EN 287-1:1992, *Approval testing of welders – Fusion welding – Part 1: Steel* 

EN 334:2005, *Gas pressure regulators for inlet pressures up to 100 bar*

 EN 473:2000 , *Non destructive testing – Qualification and certification of NDT personnel – General principles*

 deleted text 

 EN 970:1997 , *Non-destructive examination of fusion welds – Visual examination*

 deleted text 

 EN 1092-1:2007, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges*

EN 1092-2:1999, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 2: Cast iron flanges*

EN 1092-3:2005, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 3: Copper alloy flanges*

EN 1092-4:2004, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 4: Aluminium alloy flanges* 

EN 1349, *Industrial process control valves*

 EN 1418:1997 , *Welding personnel – Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials*

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 EN 1759-1, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, Class-designated – Part 1: Steel flanges, NPS ½ to 24*

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

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

EN 10045-1, *Metallic materials – Charpy impact test – Part 1: Test method*

 EN 10204:2004 , *Metallic products – Types of inspection documents*

 EN 10226-1, *Pipe threads where pressure tight joints are made on the threads – Part 1: Taper external threads and parallel internal threads – Dimensions, tolerances and designation*

EN 10226-2, *Pipe threads where pressure tight joints are made on the threads – Part 2: Taper external threads and taper internal threads – Dimensions, tolerances and designation* 

EN 12186, *Gas supply systems – Gas pressure regulating stations for transmission and distribution – Functional requirements*

EN 12279, *Gas supply systems – Gas pressure regulating installations on service lines – Functional requirements*

[A1] EN 12516-1:2005, *Industrial valves – Shell design strength – Part 1: Tabulation method for steel valve shells*

EN 12516-2:2004, *Industrial valves – Shell design strength – Part 2: Calculation method for steel valve shells*

EN 12516-4:2008, *Industrial valves – Shell design strength – Part 4: Calculation method for valve shells in metallic materials other than steel* **[A1]**

[A1] *deleted text* **[A1]**

EN 12627, *Industrial valves – Butt welding ends for steel valves*

EN 13445-4, *Unfired pressure vessels – Part 4: Fabrication*

EN 13906-1, *Cylindrical helical springs made from round wire and bar – Calculation and design – Part 1: Compression springs*

EN 13906-2, *Cylindrical helical springs made from round wire and bar – Calculation and design – Part 2: Extension springs*

EN 60534-1:1993, *Industrial-process control valves – Part 1: Control valve terminology and general considerations (IEC 60534-1:1987)*

EN ISO 175:2000, *Plastics – Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175:1999)*

[A1] EN ISO 9606-2:2004, *Qualification test of welders – Fusion welding – Part 2: Aluminium and aluminium alloys (ISO 9606-2:2004)*

EN ISO 9606-3:1999, *Qualification test of welders – Fusion welding – Part 3: Copper and copper alloys (ISO 9606-3:1999)*

EN ISO 9606-4:1999, *Qualification test of welders – Fusion welding – Part 4: Nickel and nickel alloys (ISO 9606-4:1999)*

EN ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials – General rules (ISO 15607:2003)*

EN ISO 15609-1:2004, *Specification and qualification of welding procedures for metallic materials – Welding procedure specification – Part 1: Arc welding (ISO 15609-1:2004)*

EN ISO 15610:2003, *Specification and qualification of welding procedures for metallic materials – Qualification based on tested welding consumables (ISO 15610:2003)*

EN ISO 15611:2003, *Specification and qualification of welding procedures for metallic materials – Qualification based on previous welding experience (ISO 15611:2003)*

EN ISO 15612:2004, *Specification and qualification of welding procedures for metallic materials – Qualification by adoption of a standard welding procedure (ISO 15612:2004)*

EN ISO 15613:2004, *Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test (ISO 15613:2004)*

EN ISO 15614-1:2004, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*

EN ISO 15614-2:2005, *Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 2: Arc welding of aluminium and its alloys (ISO 15614-2:2005)* ^{A1}

EN ISO/IEC 17025:2000, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:1999)*

ISO 7-1, *Pipe threads where pressure tight joints are made on threads – Part 1: Dimensions, tolerances and designation*

ISO 1817, *Rubber, vulcanized – Determination of the effect of liquids*

ISO 7005 (all parts), *Metallic flanges*

ANSI/ASME B1.20.1:1983, *Pipe threads, general purpose (inch)*

^{A1} ~~deleted text~~ ^{A1}

MSS SP 55:1985, *Quality standard for steel castings for valves, flanges and fittings and other piping components (Visual method)*

3 Terms, definitions and symbols

^{A1} For the purposes of this document, the following terms, definitions and symbols apply.

NOTE Annex L list all definitions and terms in alphabetic order for English language, the relevant translation in French and German language and the relevant sub clause of this clause. ^{A1}

3.1 ^{A1} General terms and definition of type of safety devices ^{A1}

^{A1} ~~deleted text~~ ^{A1}

3.1.1 safety shut-off device

device whose function is to stay in the open position under normal operating conditions and to shut-off the gas flow automatically and completely when the monitored pressure exceeds the pre-set values ^{A1} (over-pressure monitoring and/or under-pressure monitoring) ^{A1}

3.1.2 direct acting shut-off device

^{A1} SSD in which the pressure detector element is directly connected to the trip mechanism (see Figure 1) ^{A1}

3.1.3 indirect acting shut-off device

SSD in which the energy required to move the closing member or to operate the controller is supplied by an internal or external power supply (see Figures 2 and 3)

3.1.4 cut-off device

SSD designed to shut-off the gas flow, which responds slower dynamically than a slam shut device when the monitored pressure exceeds the pre-set values

EXAMPLE SSD using actuator driven by pipeline gas or external power

3.1.5

slam shut device

SSD designed to quickly shut-off the gas flow when the monitored pressure exceeds the pre-set values

EXAMPLE Spring or weight loaded SSD

3.1.6

sensing point

point from which the monitored variable is fed to the SSD

3.1.7

SSD size

 deleted text 

nominal size DN of the inlet connection in accordance with EN ISO 6708

3.1.8

series of safety shut-off devices

SSDs with the same design concept but differing only in size 

3.2 Terms and definition of components of safety devices

3.2.1

main components

parts including normally: a controller, a trip mechanism, an actuator, a closing member and a relatching device permitting the manual opening of the SSD. All these parts are functionally connected (see Figures 1, 2 and 3)

3.2.1.1

closing member

part which shuts off the gas flow completely

3.2.1.2

trip mechanism

mechanism which releases the closing member when activated by the controller

3.2.1.3

actuator

device activated by the trip mechanism which shuts the closing member

3.2.1.4

relatching device

device which enables the complete opening of the SSD

3.2.1.5

body

main pressure containing envelope which provides the fluid flow passageway and the pipe end connections

3.2.1.6

valve seat

corresponding sealing surfaces within an SSD which make full contact only when the closing member is in the closed position

3.2.1.7

seat ring

part assembled in a component of the SSD to provide a removable seat

3.2.1.8

controller

 device which includes:

- a setting element to adjust the set value of the trip pressure;
- a pressure detector element which has the function to detect the feedback of the monitored pressure (e.g. a diaphragm);
- a unit which compares the set value of the trip pressure with the monitored pressure;
- a system which gives the energy to operate the trip mechanism 

3.2.1.9

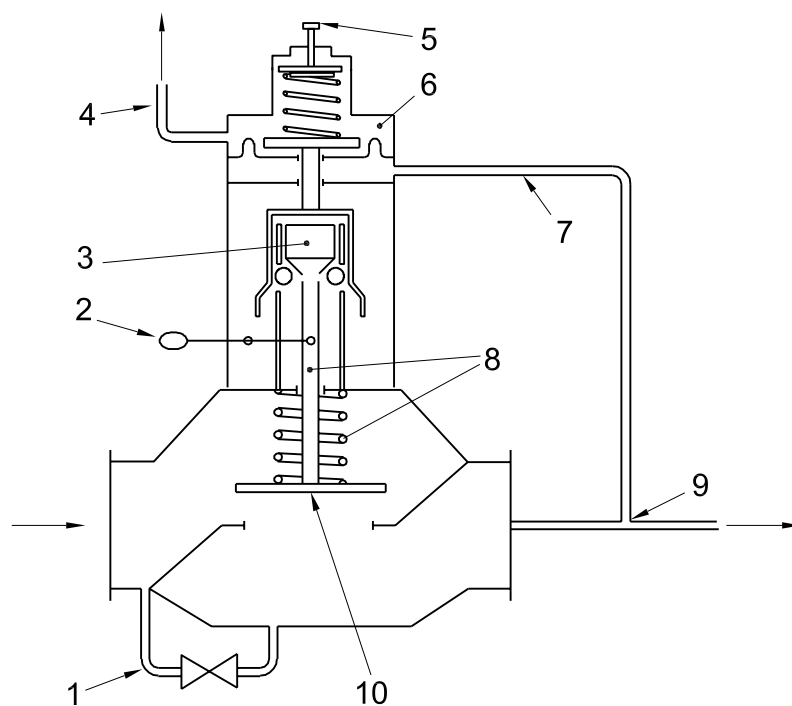
bypass

device permitting manual equalization of pressure across a closed SSD

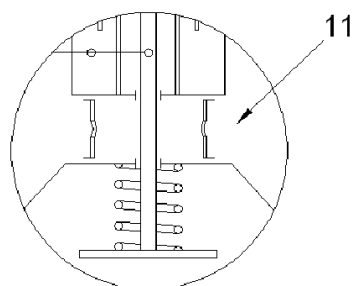
3.2.2

fixtures

devices functionally connected to the main components of the SSD



A₁



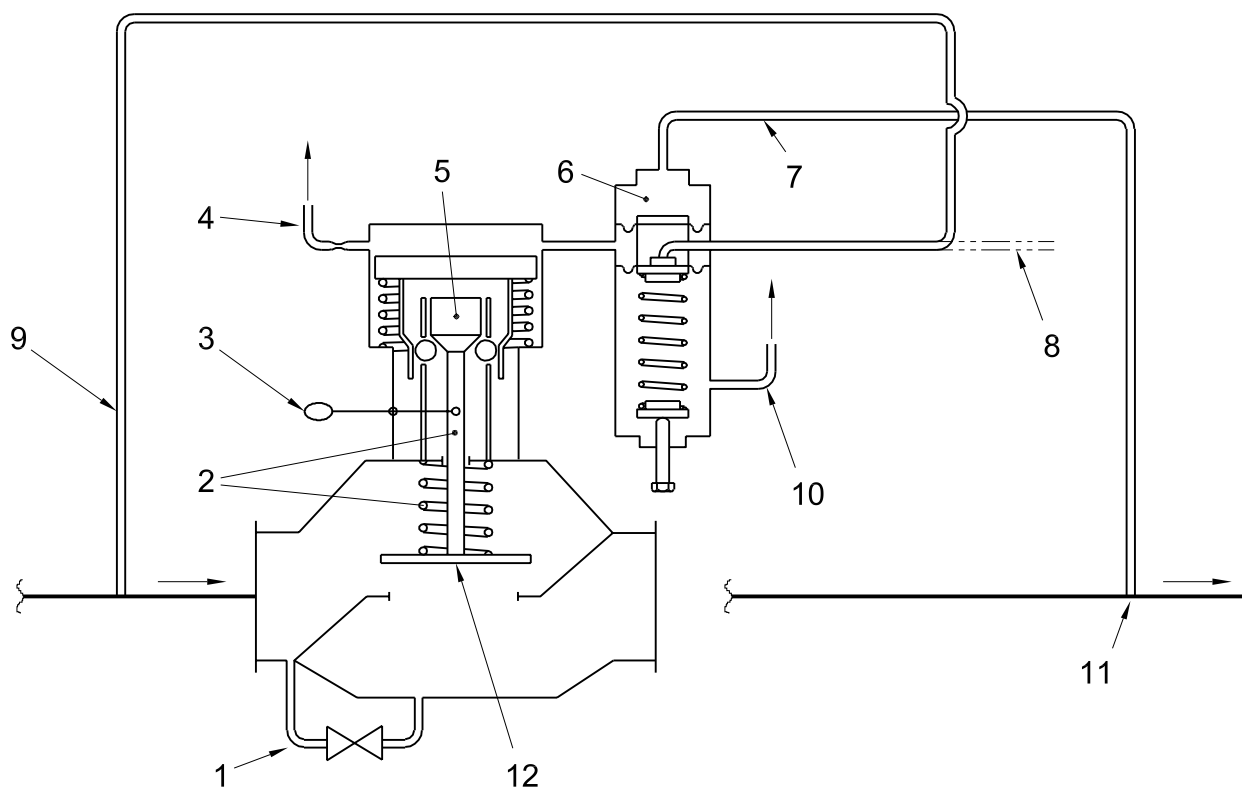
scheme 1a

A₁

Key

- | | |
|---------------------|--|
| 1 Bypass | 6 Controller |
| 2 Relatching device | 7 Sensing line |
| 3 Trip mechanism | 8 Actuator |
| 4 Breather line | 9 Sensing point |
| 5 Setting element | 10 Closing member |
| | A ₁ 11 Scheme 1a A ₁ |

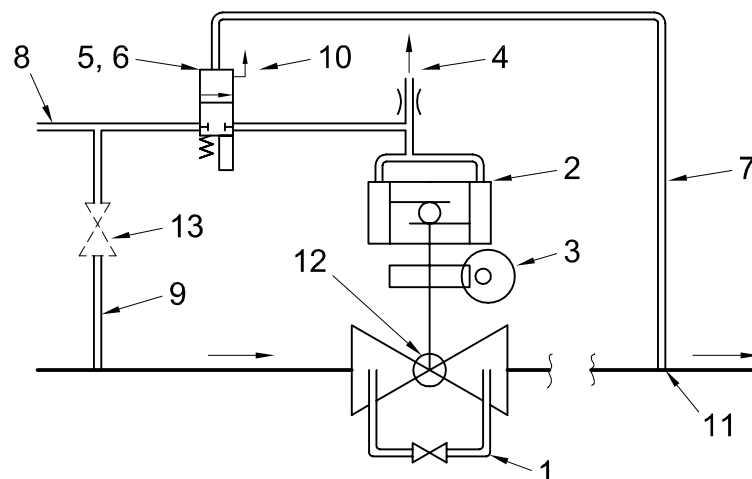
Figure 1 — Example of a direct acting safety shut-off device



Key

- | | |
|---------------------|----------------------------------|
| 1 Bypass | 7 Sensing line |
| 2 Actuator | 8 External loading pressure line |
| 3 Relatching device | 9 Internal loading pressure line |
| 4 Exhaust line | 10 Breather/exhaust line |
| 5 Trip mechanism | 11 Sensing point |
| 6 Controller | 12 Closing member |

Figure 2 — Example of an indirect acting shut-off device



Key

- | | |
|---------------------|-------------------------------------|
| 1 Bypass | 7 Sensing line |
| 2 Actuator | 8 External loading pressure line |
| 3 Relatching device | 9 Internal loading pressure line |
| 4 Exhaust line | 10 Breather/exhaust line |
| 5 Trip mechanism | 11 Sensing point |
| 6 Controller | 12 Closing member |
| | 13 Pressure reducer (is applicable) |

Figure 3 — Example of an indirect acting shut-off device

A1 deleted text A1

3.2.3

loading pressure line

line connecting the controller and/or actuator to the internal or external power source

3.2.4

pressure containing parts

parts whose failure to function would result in a release of the retained fuel gas to the atmosphere

NOTE These include bodies, closing member, controllers, bonnets, blind flanges and pipes for process and sensing lines but exclude compression fittings, diaphragms, bolts and other fasteners.

3.2.5

inner metallic partition wall

metallic wall that separates a chamber into two individual pressure-containing chambers at different pressures under normal operating conditions

3.2.6

sensing line

line connecting the sensing point and the controller

3.2.7

exhaust line

A1 line connecting the controller and/or actuator of the SSD to atmosphere for the safe exhausting of fuel gas in the event of failure of any part A1

3.2.8

breather line

A1 line connecting the atmospheric side of the pressure detector element to atmosphere

NOTE In the event of a fault in the pressure detector element this line can become an exhaust line. **A1**

A1 *deleted text* **A1**

3.3 **A1** Terms, symbols and definitions related to the functional performance **A1**

3.3.1

pressure

all pressures specified in this standard are static gauge pressures

NOTE Pressure is expressed in bar **AC1** ²⁾ **AC1** .

3.3.1.1

differential pressure

Δp

difference between two values of pressure at two different points

3.3.1.2

loading pressure

pressure of the gas from the upstream pipeline or of the gas from an external source used as an energy source for the controller and/or actuator

A1 *deleted text* **A1**

3.3.2.1

monitored pressure

pressure monitored and safeguarded by the SSD, normally the outlet pressure of the pressure regulating station/installation

3.3.2.2

disturbance variables

variables affecting the functioning of the SSD

EXAMPLES

- **A1** changes in flow rate; **A1**
- temperature changes;
- mechanical impacts;
- influence of moisture;
- influence of gas conditioning agents;
- dust, condensation or other foreign material;
- dynamic force on closing member created by gas flow

AC1 ²⁾ **AC1** 1 bar = 10^5 Pascal = 1 000 mbar = 10^{-1} MPa = 10^5 N/m².

3.3.2.3

trip pressure

p_{do} (for over-pressure monitoring)

p_{du} (for under-pressure monitoring)

pressure value at which the closing member moves to closed position

deleted text

3.3.3 Possible values of all variables

3.3.3.1

actual value of the trip pressure

p_{dio} (for over-pressure monitoring)

p_{diu} (for under-pressure monitoring)

pressure value at which the closing member of an SSD starts to move

3.3.3.2

maximum value

highest value, which is specified by the index “max” added to the symbol of the variable:

- to which any variable can be adjusted or to which it is limited;
- any variable may reach during a series of measurements, or during a certain time period

3.3.3.3

minimum value

lowest value, which is specified by the index “min” added to the symbol of the variable:

- to which any variable can be adjusted or to which it is limited;
- any variable may reach during a series of measurements or during a certain time period

3.3.4 Terms, symbols and definitions related to the set value of the trip pressure

3.3.4.1

set point

p_{dso} (for over-pressure monitoring)

p_{dsu} (for under-pressure monitoring)

nominal trip pressure value under specified conditions

3.3.4.2

set range

W_{do} (for over-pressure monitoring)

W_{du} (for under-pressure monitoring)

whole range of set points which can be obtained with a SSD by adjustment and/or the replacement of some components (e.g. replacement of the setting mean, or pressure detector element)

3.3.4.3

specific set range

W_{dso} (for over-pressure monitoring)

W_{dsu} (for under-pressure monitoring)

whole range of set points which can be obtained with a SSD by adjustment and without replacement of any component

3.3.5 Terms, symbols and definitions related to the flow

3.3.5.1

normal conditions

absolute pressure of 1,013 bar and temperature of 0 °C (273,15 K).

NOTE For calculation purposes a value of 273 K is used in this document.

3.3.5.2

gas volume

volume of gas at normal conditions

NOTE Gas volume is expressed in m^3 .

3.3.5.3

volumetric flow rate

Q

volume of gas which flows through the SSD per unit time, at normal conditions

NOTE Volumetric flow rate is expressed in m^3/h .

deleted text

3.3.6 Terms, symbols and definitions related to accuracy and some other performances

3.3.6.1

trip pressure deviation

difference between the actual value of the trip pressure and the set point as a percentage of the set value (see Figure 4)

3.3.6.2

accuracy group

AG

maximum permissible absolute value of trip pressure deviation (see Figure 4)

3.3.6.3

inlet operating pressure range

b_{pu}

range of inlet operating pressure for which the SSD ensures a given accuracy group

3.3.6.4

response time

t_a

time interval between attaining the permissible limit value of the trip pressure at the sensing point and complete closure of the closing member

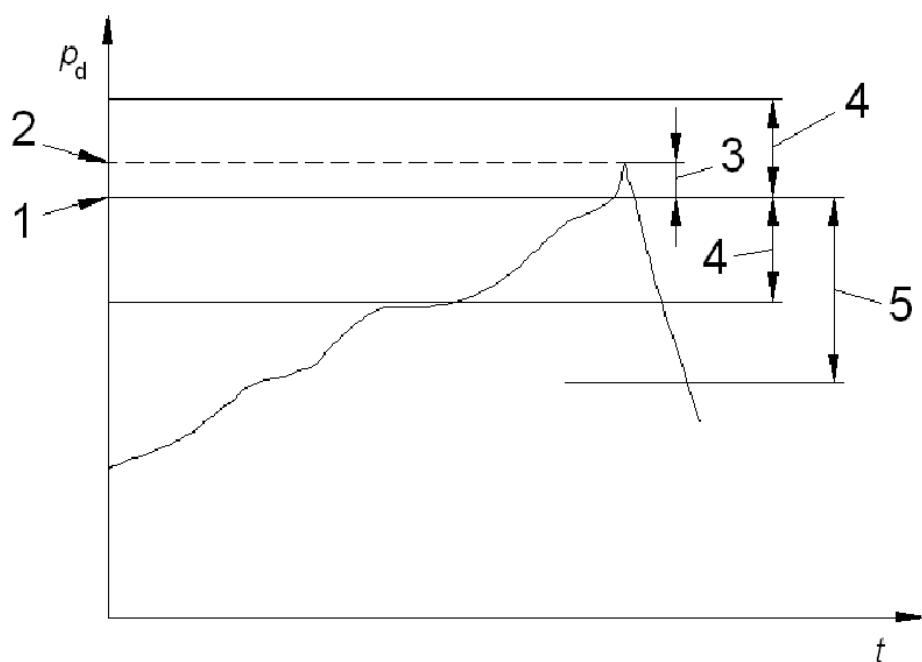
3.3.6.5

relatching difference

Δp_w

$\square A_1$ minimum difference $\langle A_1 \rangle$ between the set value of the trip pressure and the monitored pressure which is required for the correct resetting of the SSD

$\square A_1$



$\square A_1$

Key

- 1 Set value of trip pressure (p_{dso})
- 2 Actual value of trip pressure (p_{dio})
- 3 Trip pressure deviation
- 4 Accuracy group (AG)
- 5 Relatching difference (Δp_w)

Figure 4 — Monitored pressure and trip pressure

$\square A_1$ 3.3.6.6

pressure drop

drop in pressure, at specified operating conditions, of gas passing through the SSD body $\langle A_1 \rangle$

3.4 $\square A_1$ Terms, symbols and definitions related to the design and tests $\langle A_1 \rangle$

$\square A_1$ deleted text $\langle A_1 \rangle$

$\square A_1$ 3.4.1

component operating pressure

p

gas pressure occurring in any part of a SSD during operation $\langle A_1 \rangle$

3.4.1.1

maximum component operating pressure

$p_{\max}$

highest operating pressure at which a component of an SSD will continuously operate within specified conditions

3.4.2

inlet pressure

p_U

inlet pressure at which the SSD can continuously operate within specified conditions 

 *deleted text* 

3.4.2.1

maximum inlet pressure

p_{umax}

highest inlet pressure at which the SSD can continuously operate within specified conditions

3.4.3

maximum allowable pressure

PS

 maximum pressure for which the body, its inner metallic partition walls and some other pressure containing parts are designed in accordance with the strength requirements in this document 

3.4.4

specific maximum allowable pressure

PSD

pressure for which some pressure containing parts of differential strength SSDs are designed where $\text{PSD} < \text{PS}$ 

 *deleted text* 

 *deleted text* 

3.4.5

nominal pressure

numerical designation relating to pressure, which is a convenient round number for reference purposes in accordance with the relevant parts of ISO 7005 (some parts of these documents can be replaced by the equivalent documents when they are available. At the time of writing, this subject is dealt with in EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4)

NOTE For the specific purpose of this document this term applies to flanges.

EXAMPLE PN 16

3.4.6

test pressure

 pressure applied to a section of the SSD for a limited period of time in order to prove certain characteristics 

3.4.7

limit pressure

p_l

pressure at which yielding becomes apparent in any component of the SSD or its fixtures

 *deleted text* 

3.4.8

safety factor

$\langle A_1 \rangle$ ratio of the limit pressure p_l to the maximum allowable pressure PS or to specific maximum allowable pressure PSD applied to:

- SSD body: S_b (only PS);
- other pressure containing part of the SSD: S (PS or PSD) $\langle A_1 \rangle$

3.4.9

operating temperature range

temperature range at which the SSD components and fixtures are capable of operating continuously

$\langle A_1 \rangle$ deleted text $\langle A_1 \rangle$

$\langle A_1 \rangle$ deleted text $\langle A_1 \rangle$

3.4.10

closing force

F_S

force created by a spring, by a weight-piece or by pressure to operate the closing member

$\langle A_1 \rangle$ deleted text $\langle A_1 \rangle$

4 Construction requirements

4.1 Basic requirements

4.1.1 General

SSDs shall not have any continuous discharge of gas into the atmosphere, however, temporary discharges from fixtures may occur.

$\langle A_1 \rangle$ SSDs shall be so designed that external tightness and internal sealing meet the requirements of 5.2. If in the event of failure (e.g. of a diaphragm) leakage to atmosphere is possible, the breather shall be provided with, a threaded connection of at least DN 10 to enable an exhaust line to be connected $\langle AC_1 \rangle^3 \langle AC_1 \rangle$. $\langle A_1 \rangle$

$\langle A_1 \rangle$ Where there is the possibility of damage to external protrusions or other parts during transport and handling, the manual shall describe precautions to be taken to prevent the risk. $\langle A_1 \rangle$

The force required to operate the relatching device shall be:

- ≤ 250 N;
- ≤ 150 N when the relatching device needs more than 10 operations (e.g. for a cut-off device).

For cut-off devices the operating and maintenance manual shall specify whether a by-pass shall be provided and how this will be accomplished.

$\langle A_1 \rangle$ deleted text $\langle A_1 \rangle$

$\langle AC_1 \rangle^3 \langle AC_1 \rangle$ $\langle A_1 \rangle$ For proper operation of the SSD any exhaust line should be designed in a such way to prevent the ingress of foreign materials. $\langle A_1 \rangle$

SSDs may be stand-alone devices or may be built into gas pressure regulators.

After relatching, all functional units shall have returned to their starting position without impeding the closing function and the SSD shall be ready for operation. The handle of the relatching device may be detachable. Devices to lock the relatching device in the open position are not permitted.

Where pipeline gas is utilized as a source of energy for indirect acting SSDs, the location on the pipeline of the loading pressure connection shall not affect the safety performance of the SSD. If applicable, this information shall be given in the operating manual.

Pressure containing parts not intended to be dismantled during servicing, adjustment or conversion shall be sealed by means which will show evidence of interference (e.g. lacquer).

A1 Pressure containing parts, including measuring and test points, which may be dismantled for servicing, adjustment or conversion, shall be made pressure tight by mechanical means (e.g. metal to metal joints, o-rings, gaskets). Jointing compounds, such as liquids and pastes, shall not be used. **A1**

Jointing compounds, however, may be used for permanent assemblies and shall remain effective under normal operating conditions.

4.1.2 Types of shut-off devices

4.1.2.1 Stand-alone shut-off devices

SSDs may be designed as independent units for separate installation. A stand-alone SSD comprises all the main components **A1** (see 3.2.1) **A1**.

4.1.2.2 Shut-off devices integrated into a gas pressure regulator

SSDs shall be functionally independent from the components of the regulator and from other safety devices.

A1 This requirement is met if the function of the SSD is not affected in the event of the failure and/or loss of functionality of one or more of the following components of the regulator or other safety devices: **A1**

- control/closing/relieving member;
- seat ring;
- actuator;
- actuator casing;
- controller;
- sensing and process lines.

4.1.2.3 **A1** Safety shut-off device with in-line gas pressure regulator

The system includes a regulator with the function of active regulator and an in-line SSD (in series).

The SSD shall be installed directly upstream of the regulator and both devices shall control the pressure at the same location.

The associated in-line regulator shall be functionally independent from the SSD.

This requirement is met if:

- a) the function of the regulator is not affected in the event of the failure and/or loss of functionality of one or more of the following SSD components:

- controller;
- sensing and process lines;

and if:

- b) the function of the SSD is not affected in the event of the failure and/or loss of functionality and/or functionality of one or more of the following regulator components:

- pilot (in case of pilot-controlled regulator);
- sensing and process lines.

The motorization energy for regulator in case of pilot-controlled type, shall be taken downstream from the SSD. $\triangle A_1$

4.1.3 End connections

End connections may be one of the following:

- flanged connections according to the applicable parts of ISO 7005 (some parts of these documents can be replaced by the equivalent documents when they are available. At the time of writing, this subject is dealt with in EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4);
- flangeless type (e.g. wafer body);
- $\triangle A_1$ threaded connections in accordance with EN 10226-1 or EN 10226-2 for:
 - $DN \leq 50$;
 - $DN \leq 80$ and $PS \leq 16$ bar; $\triangle A_1$
- compression fittings for $DN \leq 50$;
- butt-weld connections in accordance with EN 12627.

4.1.4 Flange ratings

The PN ratings for flanges shall be selected from the following designations:

6 - 10 - 16 - 20 - 25 - 40 - 50 - 110 $\triangle AC_1$ ⁴⁾ $\triangle AC_1$

$\triangle A_1$ according to the relevant parts of ISO 7005 (some parts of these documents can be replaced by the equivalent documents when they are available). Flange ratings shall be in accordance with EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4 $\triangle A_1$.

The underlined designations are preferred.

$\triangle AC_1$ ⁴⁾ $\triangle AC_1$ The nominal pressure designations PN 20, PN 50 and PN 110 are equivalent to class ratings 150, 300 and 600 respectively.

4.1.5 Nominal sizes and face-to-face dimensions

SSDs with flange connections should have the same nominal size at the inlet and outlet.

The nominal sizes and face-to-face dimensions given in Table 1 are recommended.

Alternatively, the nominal sizes and face-to-face dimensions may be taken from Table 2.

Flangeless SSDs (SSDs that have no line flanges but are intended to be installed by clamping between pipe flanges) are permitted as an alternative. In this case SSDs should have the same nominal size at the inlet and outlet and face-to-face dimensions should be taken from Tables 3 or 4.

The following SSDs are permitted:

- flanged with different nominal inlet and outlet sizes;
- those with face-to-face dimensions differing from those given in Tables 1 and 2.

Table 1 — Recommended face-to-face dimensions for flanged SSDs

Nominal size	Nominal pressure			Limit deviations for face-to-face dimensions in mm
	PN 10/16/20 ^a	PN 25/40/50	PN 110	
	Face-to-face dimensions in mm			
25	184	197	210	± 2
40	222	235	251	
50	254	267	286	
65	276 ^b	292 ^b	311 ^b	
80	298	317	337	
100	352	368	394	
150	451	473	508	
200	543	568	610	
250	673	708	752	
300	737	775	819	± 3
350	889	927	972	
400	1 016	1 057	1 108	

Source: Tables 1 and 2 of EN 60534-3-1:2000 (nominal pressure in accordance with the relevant parts of ISO 7005 – some parts of these documents can be replaced by the equivalent documents when they are available. At the time of writing, this subject is dealt with in EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4).

^a In some countries the group PN 10/16/20 also includes PN 6.

^b Face-to-face dimensions according to Table 1 of IEC 60534-3.

Table 2 — Alternative face-to-face dimensions for flanged SSDs

Nominal size	Nominal pressure		Limit deviations for face-to-face dimensions in mm
	PN 10/16/25/40/50 ^a	PN 110	
	Face-to-face dimensions in mm		
25	160	230	± 2
40	200	260	
50	230	300	
65	290 ^b	340 ^b	
80	310	380	
100	350	430	
150	480	550	
200	600	650	
250	730	775	
300	850	900	± 3
400	1 100	1 150	

Source: Table 2 of EN 60534-3-1:2000 with addition of PN 50 and replacement of PN 100 by PN 110 (nominal pressure in accordance with the relevant parts of ISO 7005 – some parts of these document can be replaced by the equivalent documents when they are available. At the time of writing, this subject is dealt with in EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4).

^a In some countries the group PN 10/16/25/40/50 also includes PN 6.

^b Face-to-face dimensions according to Table 2 of IEC 60534-3.

Table 3 — Face-to-face dimensions for flangeless SSDs

Nominal size	Face-to-face dimensions in mm	Limit deviation for face-to-face dimensions in mm
25	102	$\pm 1,5$
40	114	$\pm 1,5$
50	124	$\pm 1,5$
80	165	$\pm 1,5$
100	194	$\pm 1,5$
150	229	$\pm 1,5$
200	243	$\pm 1,5$
250	297	$\pm 2,5$
300	338	$\pm 2,5$
400	400	$\pm 2,5$

Source: EN 60534-3-2 (nominal pressure according to the relevant parts of ISO 7005 – some parts of these documents can be replaced by the equivalent documents when they are available. At the time of writing, this subject is dealt with in EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4).

NOTE 1 Nominal pressures: PN 10/16/20/25/40/50/110. In some countries this group also includes PN 6.

NOTE 2 Face-to-face dimensions do not include any allowances for gaskets to seal the joints between the SSD ends and the pipeline flanges.

Table 4 — Face-to-face dimensions for flangeless SSDs

Nominal size	Face-to-face dimensions in mm for		Limit deviations for face-to-face dimensions in mm
	PN 10/16/20/25/40/50 ^a	PN 110	
25	77	86,5	$\pm 1,5$
40	77	86,5	$\pm 1,5$
50	77	86,5	$\pm 1,5$
80	94	104	$\pm 1,5$
100	114	133	$\pm 1,5$
150	140	175	$\pm 1,5$
200	171	205	$\pm 1,5$
250	203	240	$\pm 2,5$
300	240	280	$\pm 2,5$
400	320	350	$\pm 2,5$

NOTE 1 Face-to-face dimensions do not include any allowances for gaskets to seal the joints between the SSD end and the pipeline flanges.

NOTE 2 Nominal pressure according to the relevant parts of ISO 7005 (some parts of these documents can be replaced by the equivalent documents when they are available. At the time of writing, this subject is dealt with in EN 1092-1, EN 1092-2, EN 1092-3, EN 1092-4, EN 1759-1, EN 1759-3 and EN 1759-4).

^a In some countries the group PN 10/16/20/25/40/50 also includes PN 6.

4.1.6 Sealing of the adjusting device

A means for sealing the adjusting device shall be provided. If requested in the order specification the adjusting device shall be sealed.

4.1.7 Set range

Components may be replaced to cover the whole set range. In this case, the manufacturer shall specify the necessary procedure in the operating manual.

4.1.8 External visual Indication of the position of the closing member

[A1] SSDs shall be fitted with an external visual device which clearly indicates whether the closing member is in the open or closed position. **[A1]**

4.1.9 Springs

Springs shall not be overstressed under any operating conditions and there shall be sufficient free movement of the spring to allow satisfactory operation.

The spring shall be designed such that buckling does not occur, in accordance to EN 13906-1 and EN 13906-2.

4.1.10 Parts transmitting actuating forces

Parts transmitting actuating forces should be metallic and designed with a safety factor of ≥ 3 against permanent deformation.

4.1.11 **[A1]** Replaceable parts that can be affected by erosion or abrasion

The seat ring shall be replaceable where erosion or abrasion can occur. **[A1]**

4.2 Materials

4.2.1 Requirements for metallic materials

4.2.1.1 Pressure containing parts and inner metallic partition walls

The pressure containing parts, including those that becomes pressure containing parts in the event of diaphragm or differential pressure seal failure and the inner metallic partition walls can be constructed of:

- materials complying with the restrictions given in Table 5 and an established national or an international standard;
- or materials given in Annex J.

The internal components of an SSD not subjected to differential pressure, may be constructed of either the materials given in Annex J or materials complying with the requirements given in Table 5, without taking into account the restrictions for pressures and nominal sizes, or of different materials provided they comply with the requirements of this document.

4.2.1.2 **[A1]** Material inspection documents **[A1]** of pressure containing parts and inner metallic partition walls

[A1] This sub-clause specifies the different types of inspection documents supplied to the purchaser, in accordance with the requirements of the order, for the delivery of components used for SSDs. **[A1]**

Pressure containing parts and inner metallic partition walls:

- bodies used in the SSDs category II, III and IV according to Annex II of PED, shall be accompanied by a material $\boxed{A_1}$ inspection certificate $\boxed{A_1}$ type 3.2 in accordance with EN 10204.
For these bodies when the material manufacturer has an appropriate quality-assurance system, certified by a competent body established within the EC and having undergone a specific assessment for materials, an $\boxed{A_1}$ inspection certificate $\boxed{A_1}$ type 3.1 in accordance with EN 10204 may be used;
- bodies used in the SSDs category I according to Annex II of PED, shall be accompanied by an inspection document type 2.2 in accordance with EN 10204.

Pressure containing parts and inner metallic partition walls of other components used for SSDs with:

- $\boxed{A_1}$ PS $\leq$ 25 bar can be accompanied by a material test report at least type 2.2 in accordance with EN 10204;
- PS $>$ 25 bar shall be accompanied by a material inspection certificate at least type 3.1 in accordance with EN 10204. $\boxed{A_1}$

4.2.1.3 Fasteners, integral process and sensing lines and connectors

Fasteners, integral process and sensing lines and connectors can be made of:

- materials complying with the restrictions given in Table 5 and with a national or an international established standard;
- or materials given in Annex J.

4.2.1.4 $\boxed{A_1}$ Material inspection documents $\boxed{A_1}$ of fasteners and compression fittings

$\boxed{A_1}$ This sub-clause specifies the different types of inspection documents supplied to the purchaser, in accordance with the requirements of the order, for the delivery of components used for SSDs. $\boxed{A_1}$

Bolts, screws, studs, nuts and compression fittings used in the pressure containing parts of the SSDs shall bear the marking in accordance with the relevant standard and they shall be accompanied by $\boxed{A_1}$ a material test report $\boxed{A_1}$ type 2.2 in accordance with EN 10204.