

Pressure regulators and associated safety devices for gas appliances —

Part 2: Pressure regulators for inlet pressures above 500 mbar up to and including 5 bar

The European Standard EN 88-2:2007 has the status of a
British Standard

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National foreword

This British Standard is the UK implementation of EN 88-2:2007.

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

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

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pour pression amont supérieure à 500 mbar et inférieure ou
égale à 5 bar

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Contents

Page

Foreword	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
3.1 Pressure regulator	7
3.2 Components	7
3.3 Safety shut-off devices	9
3.4 Control variables	10
3.4.1 Reference values	10
3.4.2 Variables in the controlling process	11
3.4.3 Possible values of all variables	11
3.4.4 Terms pertinent to the controlled variable	12
3.5 Operating features in stable conditions	12
3.6 Features pertinent to accuracy	14
3.7 Features pertinent to lock-up behaviour	15
3.8 Further functional terminology	16
3.8.1 Pressures pertinent to design of gas pressure regulator	16
3.8.2 nominal pressure	17
3.8.3 operating temperature range temperature range at which the pressure regulator components and fixtures are capable of operating continuously	17
4 Classification	17
5 Units of measurement and test conditions	17
5.1 Units of measurement	17
5.2 Test conditions	17
6 Construction requirements	18
6.1 General	18
6.2 Construction	18
6.2.1 General	18
6.2.2 Breather holes	18
6.2.3 External visual Indication of the position of the closure member	18
6.2.4 Parts transmitting actuating forces	19
6.2.5 Pressure adjustment	19
6.3 Materials	19
6.3.1 General	19
6.3.2 Springs	19
6.3.3 Requirements for elastomers (including vulcanized rubbers)	19
6.4 Gas connections	19
6.4.1 General	19
6.4.2 Connection sizes	19
6.4.3 Threads	20
6.4.4 Pressure test nipples (applicable only for outlet connections operating at $\leq$ 500 mbar)	20
7 Performance requirements	20
7.1 General	20
7.2 Strength of housings	20
7.2.1 Requirement	20
7.2.2 Performance test	21
7.3 External and internal leak tightness	21
2	

7.4	Torsion and bending.....	21
7.5	Control classification.....	21
7.5.1	General.....	21
7.5.2	Control classifications for pressure regulators.....	21
7.5.3	Safety shut-off device accuracy group for over-pressure.....	22
7.6	Safety devices	22
7.6.1	Over-pressure safety shut-off device	22
7.6.2	Under-pressure safety shut-off devices	23
7.6.3	Bypass.....	23
7.6.4	Response time.....	23
7.7	Durability of performance	23
7.7.1	Pressure regulator	23
7.7.2	Safety slam-shut device	23
8	Marking, installation and operating instructions.....	24
8.1	Marking	24
8.2	Installation, operating and servicing instructions.....	24
8.3	Warning notice	25
Annex A	(informative) Main components for direct acting and pilot controlled pressure regulators.....	26
A.1	Main components of a pressure regulator	26
A.2	Main components of a gas safety shut-off device.....	27
Annex B	(informative) Use of ISO 7-1 and EN ISO 228-1 threads for gas connections (see 6.4.3).....	29
Annex C	(normative) Performance test methods	30
C.1	General.....	30
C.2	Apparatus and test rig.....	30
C.3	Performance tests under stable conditions	32
C.3.1	General.....	32
C.3.2	Determination of a performance curve.....	34
C.3.3	Determination of the lock-up pressure.....	35
C.3.4	Regulator accuracy class.....	36
C.4	Safety shut-off device accuracy group.....	37
C.4.1	General conditions and apparatus.....	37
C.4.2	Test at ambient temperature	39
C.4.3	Test at the limit temperatures between 0 °C and 60 °C.....	39
C.4.4	Verification of the upper limit of the highest set range	40
C.4.5	Response time.....	40
C.5	Durability of performance	41
C.5.1	General.....	41
C.5.2	Pressure regulator	41
C.5.3	Safety shut-off devices.....	42
Annex ZA	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 90/396/EEC	43
Bibliography		45

Foreword

This document (EN 88-2:2007) has been prepared by Technical Committee CEN/TC 58 "Safety and control devices for gas-burners and gas-burning appliances", the secretariat of which is held by BSI.

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 May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

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(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

EN 88 consists of the following parts under the general title "Pressure regulators and associated safety devices for gas appliances":

Part 1: Pressure regulators for inlet pressures up to and including 500 mbar;

Part 2: Pressure regulators for inlet pressures above 500 mbar up to and including 5 bar.

This European Standard should be used in conjunction with EN 13611 "Safety and control devices for gas burners and gas burning appliances — General requirements."

SIL classification according to EN 61508 cannot automatically be claimed based upon compliance with this standard. Pressure regulators with SIL classification do not meet automatically the requirements of this standard.

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.

Introduction

This standard is a particular standard for Pressure Regulators for gas-burners and gas-burning appliances which cites EN 13611 "Safety and control devices for gas burners and gas-burning appliances - General requirements" wherever possible. This standard supplements or modifies the corresponding clauses of EN 13611. The construction and performance requirements are as far as applicable in total conformity with EN 13611.

1 Scope

This European Standard specifies the safety, construction and performance requirements for pressure regulators (hereafter referred to as regulators) intended for use with gas burners and gas-burning appliances using fuel gases of the 1st, 2nd and 3rd families. This European Standard covers type testing only. It also provides additional information for the purchaser and user.

This European Standard is applicable to regulators that may be tested independently of gas burners and gas-burning appliances, which have a declared working pressure from above 500 mbar up to and including 5 bar.

This European Standard is also applicable to regulators incorporating safety devices.

NOTE 1 For safety accessories and pressure accessories, the requirements of EN 13611:2007, Annex F also apply.

NOTE 2 Regulators conforming to EN 88-2 fulfil also the requirements of EN 88-1.

Regulators intended to be used on pipe work installations for third family gases are also covered by EN 13785 and EN 13786.

This European Standard is not applicable to:

- a) pressure regulators that are connected directly to mains pipe-work or to a container that maintains a standard distribution pressure;
- b) pressure regulators which use electrical auxiliary energy.

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 any amendments) applies.

EN 88-1:2007, *Pressure regulators and associated safety devices for gas appliances — Part 1: Pressure regulators for inlet pressures up to and including 500 mbar*

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 682, *Elastomeric seals — Materials requirements for seals used in pipes and fittings carrying gas and hydrocarbon fluids*

EN 13611:2007, *Safety and control devices for gas burners and gas burning appliances — General requirements*

EN 13787, *Elastomers for gas pressure regulators and associated safety devices for inlet pressures up to 100 bar*

EN 60534-1:2005, *Industrial-process control valves — Part 1: Control valve terminology and general considerations (IEC 60534-1:2005)*

EN 60534-2-3, *Industrial-process control valves — Part 2-3: Flow capacity — Test procedures (IEC 60534-2-3:1997)*

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

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

ISO 7-1, *Pipe threads where pressure tight joints are made on the threads — Part 1: Designation, dimensions and tolerances*

ISO 3419, *Non-alloy and alloy steel butt-welding fittings*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13611:2007, EN 60534-1:2005 and the following apply.

3.1 Pressure regulator

3.1.1

pressure regulator

device that maintains the outlet pressure constant independent of the variations in inlet pressure and/or flow rate within defined limits

3.1.2

nominal inlet diameter

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

3.1.3

nominal outlet diameter

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

3.2 Components

NOTE The main components of a pressure regulator and a safety shut-off device are shown in Annex A.

3.2.1

control member

movable part of the pressure regulator that is positioned in the flow path to restrict the flow through the pressure regulator

NOTE A control member may be a plug, ball, disk, vane, gate, diaphragm, etc.

3.2.2

body

part of the pressure regulator that is the main pressure containing envelope

3.2.3

valve seat

corresponding sealing surfaces within a pressure regulator, or SSD that make full contact only when the pressure regulator or SSD is in the closed position

3.2.4

seat ring

replaceable component of a regulator valve seat assembly

3.2.5

actuator

device or mechanism which changes the signal from the controller into a corresponding movement controlling the position of the control member

3.2.6

casing of actuator

housing of the actuator

NOTE There may be two chambers under pressure within it. When the pressure in each chamber is different from atmospheric pressure, the chamber at the higher pressure is termed the "motorization chamber"

3.2.7

controller

device that controls the regulator

NOTE It includes:

- setting element, normally a spring, to obtain the set value of the controlled variable;
- detector element, normally a diaphragm, for the controlled variable.

3.2.8

pilot controller

device that controls the regulator

NOTE It includes:

- setting element to obtain the set value of the controlled variable;
- detector element for the controlled variable;
- unit which compares the set value of the controlled variable with its feedback value;
- system which provides the motorization energy for the actuator.

3.2.9

main diaphragm

device that detects the controlled variable feedback pressure and provides the force to position the valve

3.2.10

pressure containing parts

parts where failure would result in release of gas to the atmosphere

NOTE Such parts comprise bodies, control member, bonnets, the casing of the actuator, blind flanges and pipes for process and sensing lines.

3.2.11

inner metallic partition wall

metallic wall that divides internal chambers which have differing operating pressures

3.2.12

process and sensing line

line that connects impulse points to the pressure regulator

NOTE Sensing and process lines may be integrated into the pressure regulator or external to the pressure regulator. Those lines with no internal flow are termed "sensing lines"; those with internal flow are termed "process lines".

3.2.13**breather line**

line between the controller and/or pilot regulator and atmosphere which equalizes the pressure on a detector element when it changes its position

3.2.14**exhaust line**

line to atmosphere between the regulator or fixtures for the safe venting of gas in the event of a component failure

3.2.15**fixtures**

functional devices connected to the main components of the pressure regulator or SSD

3.3 Safety shut-off devices**3.3.1****safety shut-off device****SSD**

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 deviates above or below the pre-set value

3.3.2**closure member**

movable part of the safety shut off device that shuts off the gas flow

3.3.3**trip mechanism**

mechanism that releases the closure member when activated by the controller

3.3.4**actuator**

device that is activated by the trip mechanism which shuts the closure member

3.3.5**relatching device**

device that enables the complete opening of an SSD

3.3.6**safety shut-off device controller**

safety device for the regulator

NOTE It may include:

- setting element to adjust the set value of the trip pressure;
- sensing element for the control of the monitored pressure (e.g. a diaphragm);
- unit which compares the set value of the trip pressure with the monitored pressure;
- system which gives the energy to operate the trip mechanism.

3.4 Control variables

3.4.1 Reference values

3.4.1.1 Pressure

NOTE All pressures specified in this European Standard are static gauge pressures. They are measured in bar¹⁾.

3.4.1.1.1 inlet pressure

p_e
gas pressure at the inlet of the pressure regulator

3.4.1.1.2 outlet pressure

p_a
gas pressure at the outlet of the pressure regulator

3.4.1.1.3 differential pressure

Δp
difference between values of pressure measured at two different points

3.4.1.1.4 motorization pressure,

p_m
gas pressure in the motorization chamber

3.4.1.1.5 motorization chamber

chamber at the higher pressure of two chambers under pressure within the casing of actuator

3.4.1.1.6 pilot feeding pressure

p_{ep}
gas pressure at the inlet of the pilot

3.4.1.2 Flow conditions

3.4.1.2.1 normal conditions

absolute pressure p_n of 1 013,25 mbar and temperature T_n of 0 °C (273,15 K)

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

3.4.1.2.2 gas volume

volume of gas at normal conditions

NOTE It is expressed in m³.

3.4.1.2.3 volumetric flow rate

Q
volume of gas which flows through the pressure regulator in unit time

1) 1 bar = 1000 mbar = 10⁵ N/m² = 10⁵ Pa = 10⁻¹ MPa.

NOTE It is expressed in m^3/h at normal conditions.

3.4.2 Variables in the controlling process

3.4.2.1

controlled variable

X

variable which is monitored by the controlling process

NOTE 1 This controlled variable in pressure regulators may be:

- inlet pressure, p_e ;
- outlet pressure, p_a ;
- differential pressure, Δp .

NOTE 2 In this European Standard, only the outlet pressure " p_a " is considered as the controlled variable.

3.4.2.2

disturbance variable

Z

variables acting from outside on the controlling process

NOTE In the case of pressure regulators with the outlet pressure as the controlled variable, the disturbance variables are essentially:

- fluctuations in the inlet pressure, p_e ;
- changes in the volumetric flow rate, Q.

3.4.2.3

monitored pressure

pressure monitored and safeguarded by the SSD

3.4.2.4

trip pressure

pressure value at which the closing member starts to move

3.4.2.5

upper trip pressure

p_o

upper limit of the monitored pressure (over-pressure)

3.4.2.6

lower trip pressure

p_u

lower limit of the monitored pressure (under pressure)

3.4.3 Possible values of all variables

3.4.3.1

actual value

instantaneous value of any variable at any instant

NOTE It is specified by the subscript "i" added to the symbol of the variable

3.4.3.2

maximum value

highest value to which any variable can be adjusted, limited or reached during a series of measurements or during a certain time period

NOTE It is specified by the subscript "max" added to the symbol of the variable.

3.4.3.3

minimum value

lowest value to which any variable can be adjusted, limited or reached during a series of measurements or during a certain time period

NOTE It is specified by the subscript "min" added to the symbol of the variable.

3.4.4 Terms pertinent to the controlled variable

3.4.4.1

set point

p_{as}

nominal value of the controlled variable

NOTE The set point is not directly measurable but determined as shown in Figure 1.

3.4.4.2

set point range

W_h

whole range of set points, which can be obtained from a pressure regulator by adjustment and/or the replacement of some components

NOTE Components might be replacement of the valve seat or adjustment element e.g. spring.

3.4.4.3

specific set point range

W_a

whole range of set points which can be obtained in a pressure regulator by adjustment and with no replacement of its components

3.4.4.4

control deviation

X_w

difference between the actual value of the controlled variable and the set point

3.4.4.5

regulation change

control deviation, X_w expressed as a percentage of the set point

3.5 Operating features in stable conditions

3.5.1

stable conditions

conditions when the controlled variable settles to a stable value after a disturbance has occurred

3.5.2

performance curve

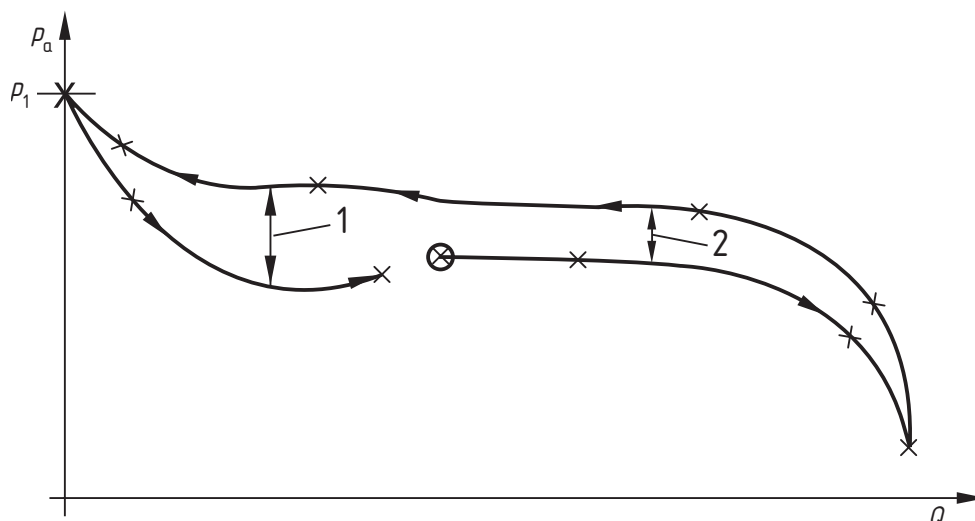
graphic representation of the controlled variable as a function of the volumetric flow rate

NOTE This curve is determined by increasing and then decreasing the volumetric flow rate with constant inlet pressure and set point (see Figure 1).

3.5.3**hysteresis band**

difference between the two values of outlet pressure for a given volumetric flow rate

NOTE See Figure 1.

**Key**

1 Max hysteresis band

2 Hysteresis band

⊗ Start setting

× Measured values

Figure 1 — Performance curve (p_{as} constant, p_e constant)

3.5.4**family of performance curves**

set of the performance curves for each value of inlet pressure determined for a given set point

NOTE See Figure 2.