BRITISH STANDARD

BS EN
562:2003

Gas welding equipment — Pressure gauges used in welding, cutting and allied processes

The European Standard EN 562:2003 has the status of a British Standard

ICS 17.100; 25.160.30

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 562:2003. It supersedes BS EN 562:1995 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/18, Gas welding appliances, which has the responsibility to:

— aid enquirers to understand the text;

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

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

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

Cross-references

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

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

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 3 June 2003

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 14, an inside back cover and a back cover.

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

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 41988 6

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 562

May 2003

ICS 17.100; 25.160.30

Supersedes EN 562:1994

English version

Gas welding equipment - Pressure gauges used in welding, cutting and allied processes

Matériel de soudage aux gaz - Manomètres utilisés pour le soudage, le coupage et les techniques connexes

Gasschweißgeräte - Manometer für Schweißen, Schneiden und verwandte Prozesse

This European Standard was approved by CEN on 17 March 2003.

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

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

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

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

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

Ref. No. EN 562:2003 E

Contents

page

Foreword 3
1 Scope 3
2 Normative references 3
3 Terms and definitions 4
4 Pressure 4
4.1 Unit of pressure 4
4.2 Maximum scale reading 4
4.3 Maximum pressure mark 5
5 Manufacturing requirements 5
5.1 Materials 5
5.2 Design and dimensions 5
6 Safety 9
7 Marking 10
8 Tests 10
8.1 General 10
8.2 Design and manufacturing standard 10
8.3 Accuracy 10
8.4 Torsion test 11
8.5 Bend test 12
8.6 Case vent test 13
8.7 Strength 13
8.8 Flammability test 13
Bibliography 14

Foreword

This document (EN 562:2003) has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS.

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 November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.

This document supersedes EN 562: 1994.

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

1 Scope

This European Standard specifies requirements for Bourdon-tube pressure gauges normally used with compressed gases at pressures up to 300 bar in welding, cutting and allied processes. It also covers use for dissolved acetylene and for liquefied gases under pressure.

It does not cover gauges for acetylene in acetylene manufacturing plants.

2 Normative references

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

EN 472:1994, *Pressure gauges — Vocabulary*.

EN 29539, *Materials for equipment used in gas welding, cutting and allied processes (ISO 9539:1988).*

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 4589-2:1999, *Plastics - Determination of burning behaviour by oxygen index - Part 2: Ambient-temperature test (ISO 4589-2:1996).*

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

ISO 497, *Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers.*

ISO 7000:1989, *Graphical symbols for use on equipment—Index and synopsis.*

ISO 10102, *Assembly tools for screws and nuts—Double headed open-ended engineers' wrenches—Length of wrenches and thickness of the heads.*

ANSI/ASME B1.20.1, *Pipe threads, general purpose (inch)*[1)].

[1)] Standard published and available at: ANSI – American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 472:1994 and the following apply.

3.1
bourdon-tube pressure gauges
device incorporating flexible tubes with direct indication by pointer and graduated scale of the pressure being measured

3.2
dial
plate or area on which the scale is marked

3.3
pointer stop
projection that stops the travel of the pointer

4 Pressure

4.1 Unit of pressure

All pressures given are gauge (effective) pressures in bar.

4.2 Maximum scale reading

Where practical the maximum scale reading for a particular gas and pressure level shall be selected from the values given in Table 1. Where it is not practicable the maximum scale reading shall be selected from the R10 series of preferred numbers or more rounded values given in ISO 497.

Table 1 — Maximum scale reading

Values in bar

Pressure level	Acetylene	Oxygen and other gases
low-pressure (LP)	1 1,6 2,5	2,5 4 6 10 16 25 40
high-pressure (HP) (see NOTES 1, 2 and 3)	40	250 315 400

NOTE 1 250 bar pressure gauge for use with CO_2 and compressed gas cylinders filled to a maximum settled filling pressure of 185 bar at 15 °C.

NOTE 2 315 bar pressure gauge for use with compressed gas cylinders filled to a maximum settled filling pressure of 230 bar at 15 °C.

NOTE 3 400 bar pressure gauge for use with compressed gas cylinders filled to a maximum settled filling pressure of 300 bar at 15 °C.

4.3 Maximum pressure mark

The maximum operating pressure[2)] shall be indicated on the dial by a symbol or coloured mark and shall not exceed ¾ of the maximum scale reading.

5 Manufacturing requirements

5.1 Materials

5.1.1 General

The materials of the pressure gauge components liable to come into contact with the gas shall have adequate resistance to the chemical action of the gas under operating conditions.

Bourdon tubes and other parts in contact with acetylene gas shall conform to EN 29539.

5.1.2 Oxygen pressure gauges

Bourdon tubes and other parts in contact with the gas shall be resistant to the chemical action of the oxygen and shall not be flammable under operating conditions.

Thread sealants or sealing rings shall also be resistant to the chemical action of the oxygen and shall not be flammable under operating conditions.

Components in contact with oxygen gas shall conform to EN 29539.

Only lubricants suitable for use in oxygen at the service pressure and temperature shall be used.

5.2 Design and dimensions

5.2.1 Operational requirements

5.2.1.1 Accuracy

The pressure gauge accuracy shall be at least that of class 2,5, i.e. with a maximum deviation within the tolerance $\pm$ 2,5 % (of full scale reading) over the entire scale.

5.2.1.2 Strength

Those parts of the pressure gauge that are in contact with the gas shall not burst or leak when tested to a pressure corresponding to 2,5 times the maximum scale reading (see 8.7).

5.2.1.3 Torsion

After the application of the torque of 10 Nm according to 8.4.1 for a period of not less than 30 s, the pressure gauge shall satisfy the conditions of accuracy specified in 5.2.1.1.

After the application of the torque of 25 Nm according to 8.4.2 for a period of not less than 30 s, the pressure gauge shall be leak-tight at a pressure corresponding to the maximum scale reading.

---

2) For pressure gauges used with regulators to EN ISO 2503 the maximum pressure mark is normally p_2 for low-pressure gauges and p_1 for high-pressure gauges, as defined in EN ISO 2503:1998, Table 4.

5.2.1.4 Bending

After the application of the load of 1 kN according to 8.5, the pressure gauge shall be leak-tight to atmosphere at a pressure corresponding to the maximum scale reading.

5.2.2 Dimensions

The nominal size is based on the diameter of the casing (dimension A in Figure 1 and Figure 2). The values 40, 50 and 63 are standardized.

The dimensions shall be in accordance with Figure 1 and Table 2, or Figure 2 and Table 3 as appropriate. The connecting dimensions are shown in Figure 3 and Table 4.

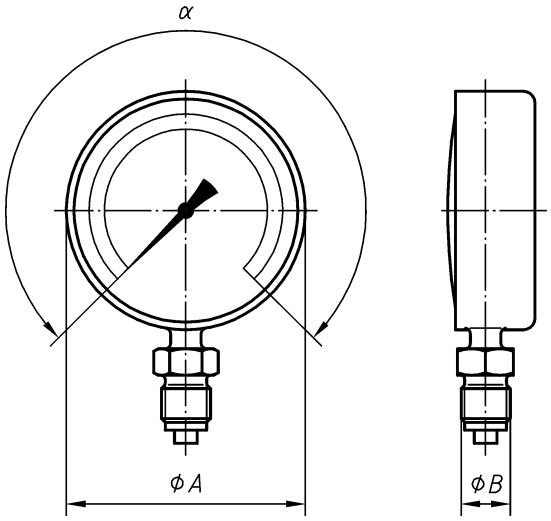


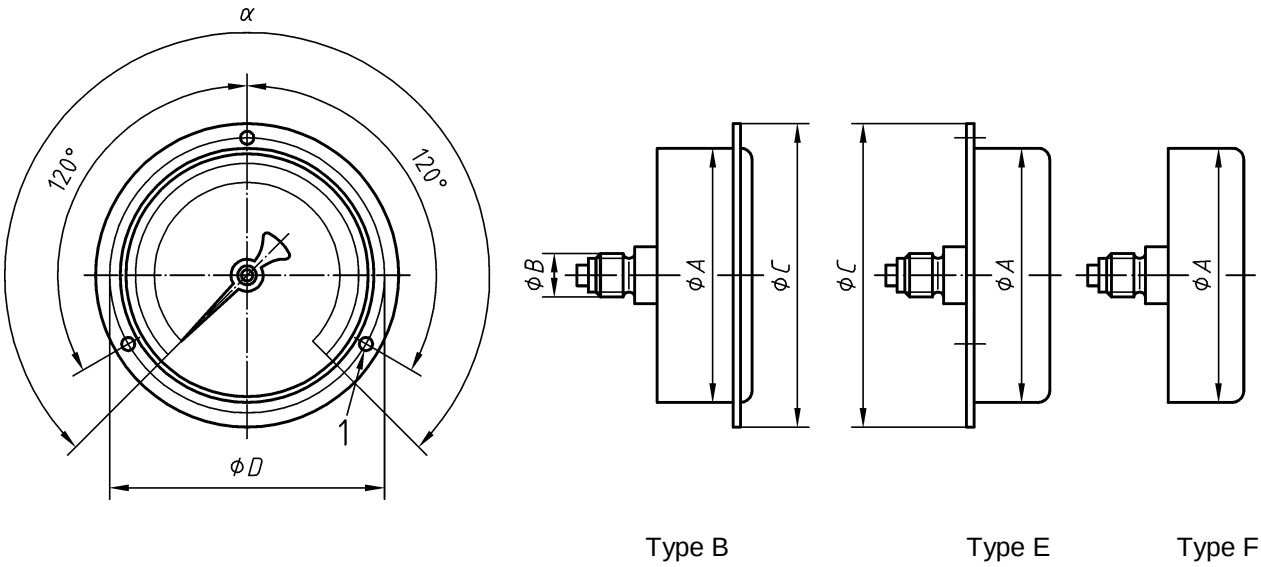
Figure 1 — Pressure gauge with bottom entry

Table 2 — Dimensions of threads pressure gauge with bottom radial entry

Nominal size	*α*	*A*	*B*	
	[degree]	[mm]	**Parallel thread**	**Tapered thread**
40	270	40^{+5}_{-2}	G1/8 B or G1/4 B	R1/8 or 1/8-27 NPT EXT or R1/4 or 1/4-18 NPT EXT
50	270	50^{+7}_{-2}	G1/8 B or G1/4 B	R1/8 or 1/8-27 NPT EXT or R1/4 or 1/4-18 NPT EXT
63	270	63^{+7}_{-2}	G1/4 B	R1/4 or 1/4-18 NPT EXT

The thread connection (see Figure 3) according to the type shall conform to the following standards:

Parallel thread – EN ISO 228-1; Tapered thread (Symbol R) – ISO 7-1; Tapered thread (Symbol NPT) – ANSI/ASME B1.20.1.



Key

1 Fixing holes F

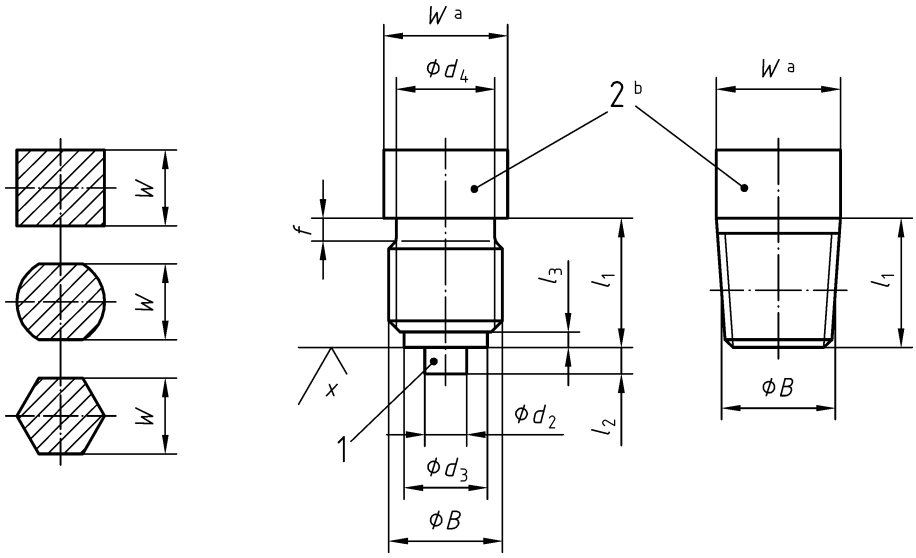
Figure 2 — Pressure gauge with rear entry

Table 3 — Dimensions of threads pressure gauge with rear entry

Nominal size	α	A_{max}	B		C_{max}	D	F_{min}
	[degree]	[mm]	Parallel thread	Tapered thread	[mm]	[mm]	[mm]
40	270	42	G1/8 B or G1/4 B	R1/8 or 1/8-27 NPT EXT or R1/4 or 1/4-18 NPT EXT	61	51	3,6
50	270	52	G1/8 B or G1/4 B	R1/8 or 1/8-27 NPT EXT or R1/4 or 1/4-18 NPT EXT	68	60	3,6
63	270	67	G1/4 B	R1/4 or 1/4-18 NPT EXT	81	75	3,6

The thread connection (see Figure 3) according to the type shall conform to the following standards:

Parallel thread – EN ISO 228-1; Tapered thread (Symbol R) – ISO 7-1; Tapered thread (Symbol NPT) – ANSI/ASME B1.20.1.



Key

W Width of wrenches

1 spigot

2 Square, hexagon or flat of wrench

x $\sqrt{R_z = 16}$ 3)

a) Minimum height of flats shall be compatible with the use of standard spanner according to ISO 10102

Figure 3 — Thread connection

Table 4 — Dimensions of parallel threads

Dimensions in millimetres

Thread size Ø B	***Ø d2***	***Ø d3***	***Ø d4*** $_{min}$	***l1***	***l2***	***l3***	***f***	***W*** $_{min}$
G1/8 B	4	8	8	$10^{+0,5}_{0}$	2	$2^{+0,5}_{0}$	1,6	8 a)
G1/4 B	5	9,5	9,5	$13^{+0,5}_{0}$	2	$2^{+0,5}_{0}$	2	10 a)
R1/8	-	-	-	min. 10	-	-	-	8 a)
R1/4	-	-	-	min. 13	-	-	-	10 a)
1/8-27 NPT EX	-	-	-	min. 10	-	-	-	8 a)
1/4-18 NPT EX	-	-	-	min. 13	-	-	-	10 a)

NOTE 1 G1/8 B may be made without spigot.

NOTE 2 G1/8 B may be made without groove *f*. In this case, the length of threading shall be equal to l_1 .

a) Preferably 14 mm

The maximum values for the turning radius, *R*, shall be as given in Figure 4 and Table 5.

3) According to EN ISO 1302.

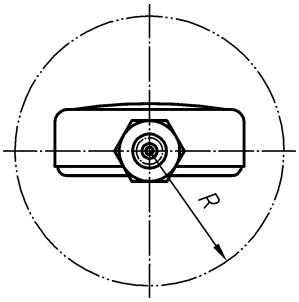


Figure 4 — Turning radius

Table 5 — Maximum values of turning radius, *R*

Pressure gauge size [mm]	$R_{max.}$ [mm]
40	30
50	37
63	45

5.2.3 Dial and pointer

The graduations and markings shall be clear and legible, and it shall be possible to read the indicated pressure easily.

The dial ground colour should be white. The markings and pointer should be black.

The scale shall be numbered on at least every tenth mark but with a minimum of four numbered marks over the scale range.

The tip of the pointer shall be as near as practical to the dial but in any case the distance shall not exceed 2 mm.

6 Safety

All pressure gauges shall be degreased.

Substances that may react violently with oxygen, e.g. hydro-carbon based solvents and oils shall not be used for pressure testing of gauges irrespective of gas service.

The inlet orifice to the Bourdon tube of pressure gauges whose maximum scale reading is less than 40 bar shall be limited to a maximum of 0,2 mm^2. Pressure gauges whose maximum scale is equal to or greater than 40 bar, the orifice shall be limited to 0,1 mm^2.

In case of rupture of the Bourdon tube, e.g. due to overpressure or fatigue, the vent on the pressure gauge shall allow the escape of gas in a direction away from the face of the gauge (see 8.6). Furthermore, the face of the gauge shall not burst and no parts shall be thrown from the gauge in any direction.

All non-metallic external materials shall be self-extinguishing (see 8.8).

Under normal operating conditions, the vent shall be closed with a membrane, disk or a similar closure which shall withstand normal handling.

7 Marking

The dial shall be marked with the following:

— the number of this standard: EN 562;

— the symbol for the unit of pressure;

— the name or trademark of the manufacturer and/or suppliers;

— for an acetylene pressure gauge, the word "acetylene"[4] or the letter "A";

— for an oxygen pressure gauge, the word "oxygen"[5] or the letter "O" and the symbol (0248 according to ISO 7000:1989, however crossed out) as shown in Figure 5.

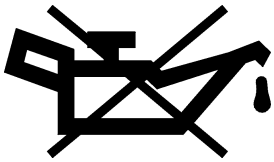


Figure 5 — Engine oil (crossed out)

8 Tests

8.1 General

The following tests are not intended as a production inspection procedure but are to be applied to sample gauges submitted for approval regarding compliance with this standard.

8.2 Design and manufacturing standard

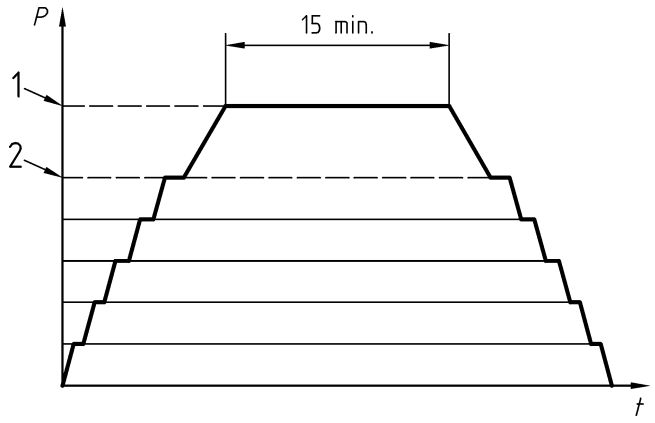
The pressure gauges shall be checked for compliance with the manufacturing drawings and with this standard.

8.3 Accuracy

The test shall be carried out using a test pressure gauge of class at least 0,6 and at (23 ± 2) °C. Each sample gauge shall be tested over its entire scale, the pressure being increased in at least five steps to the maximum operating pressure (see Figure 6). The pressure shall then be increased to the maximum scale reading after which it shall be decreased in at least five steps. The accuracy shall be compared only over operation pressure range (see 5.2.1.1). The pressure gauge may be lightly tapped during this test.

4) The word "acetylene" is not to be translated into any other language.

5) The word "oxygen" is not to be translated into any other language.



Key

1 Maximum scale reading

2 Maximum operating pressure

p= Pressure

t= Time

Figure 6 — Accuracy test

If a pointer stop is incorporated, the accuracy shall meet the conditions of class 2,5 at the bottom of the scale.

8.4 Torsion test

8.4.1 With the gauge mounted by its thread, a torque of 10 Nm shall be applied in the tightening direction to the gauge casing for a period of not less than 30 s, using a device that does not support the casing (see Figures 7 and 8). Immediately after this loading check the pressure gauge for accuracy in accordance with 5.2.1.1.

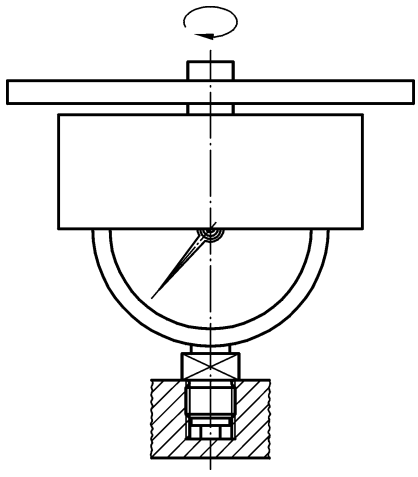


Figure 7 — Torsion test - Pressure gauge with bottom entry

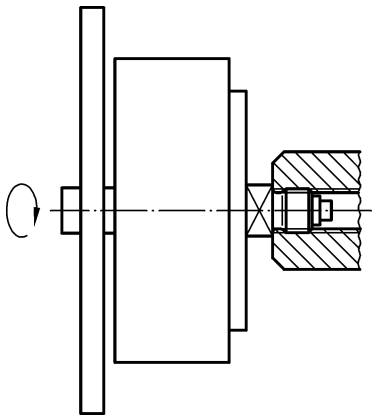


Figure 8 — Torsion test - Pressure gauge with rear entry

8.4.2 A torque of 25 Nm shall be applied in the same manner as in 8.4.1. Immediately after this loading check the pressure gauge for gas tightness at a pressure corresponding to its maximum scale reading.

8.5 Bend test

With the gauge mounted by its thread, a force of 1 kN shall be applied in an appropriate device successively on the face, back and on one side of the case (see Figures 9 and 10). Immediately after this loading check the pressure gauge for gas tightness at a pressure corresponding to its maximum scale reading. The failure of the gauge window shall be permitted.

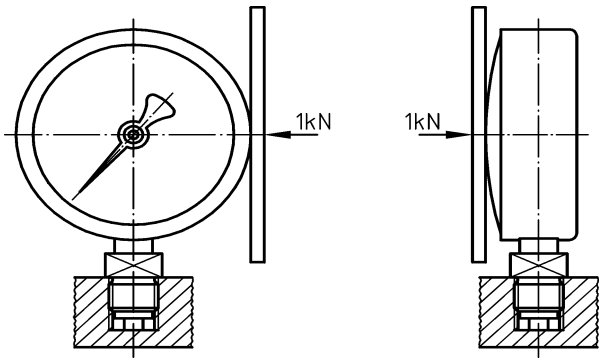


Figure 9 — Bend test - Pressure gauge with bottom entry

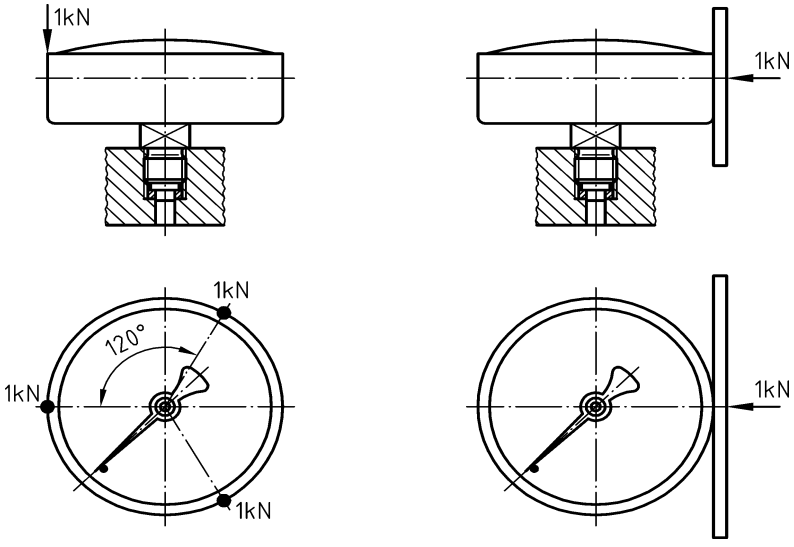


Figure 10 — Bend test - Pressure gauge with rear entry

8.6 Case vent test

8.6.1 The complete pressure gauge shall be connected to a gas source of a pressure equal to its maximum scale reading or 200 bar whichever is the greater. Release the pressure suddenly into the pressure gauge inlet connection.

If gas is vented during this test note direction of gas vented and note if any parts are thrown from the gauge. The test is discontinued.

If no gas is vented or no parts are thrown from the gauge during this test proceed to test in accordance with 8.6.2.

8.6.2 Prepare the pressure gauge to allow a gas energy $E = p \times V$ to be suddenly released into the gauge casing (where p is pressure equal to its maximum scale reading and V is internal gas volume of Bourdon tube and stem). However, the product of $p \times V$ shall regard to the highest energy content of the pressure measuring system. Release energy E suddenly into the gauge case.

If for this test the energy E is introduced from outside the case, the entry passage into the gauge case shall not be less than 5 mm diameter and the energy source as close as practical to the gauge case under test.

If gas is vented during this test, note the direction of gas vented and note if any parts are thrown from the pressure gauge. The test is discontinued.

If no gas is vented or no parts are thrown from the pressure gauge during this test, proceed to test in accordance with 8.6.3.

8.6.3 Prepare the gauge case to allow direct internal pressurization by a high pressure gas source. Internally pressurize the gauge case and increase the pressure until gas is vented. Note the direction of the gas vented and note if any parts are thrown from the pressure gauge.

8.7 Strength

The pressure gauge shall be submitted to a pressure of 2,5 times the maximum scale reading for a period of not less than 24 h at 60 °C. Immediately after this pressurization check the pressure gauge (maximum leak rate $\leq 5 \times 10^{-3}$ mbar $\times L \times s^{-1}$) for gas tightness at a pressure corresponding to its maximum scale reading.

8.8 Flammability test

A sample of the material under test shall be prepared conforming to type I according to EN ISO 4589-2:1999, Table 2.

The sample shall be ignited according to procedure "A" given in EN ISO 4589-2:1999, in 8.2.2, in a nitrogen/oxygen mixture containing 25 % oxygen by volume.

Assessment if fire behaviour and self extinguishing capability shall be made in accordance with EN ISO 4589-2:1999, in 8.3.

The material shall be classified self extinguishing if an "O" response is recorded (see EN ISO 4589-2:1999, in 8.3.2).

Bibliography

EN ISO 1302, *Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation (ISO 1302:2002).*

EN ISO 2503:1998, *Gas welding equipment—Pressure regulators for gas cylinders used in welding, cutting and allied processes up to 300 bar (ISO 2503:1998).*

blank

BSI — British Standards Institution

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

Revisions

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

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

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

Buying standards

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

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

Information on standards

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

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

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

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

Copyright

BSI
389 Chiswick High Road
London
W4 4AL