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

*Matériels de soudage au gaz — Manomètres utilisés pour le soudage,
le coupage et les techniques connexes*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 44, *Welding and allied processes*, Subcommittee SC 8, *Equipment for gas welding, cutting and allied processes*.

This fourth edition cancels and replaces the third edition (ISO 5171:2009) which has been technically revised.

The main changes compared to the previous edition are as follows:

- [Clause 7](#) has been revised;
- [Clause 8](#) has been clarified regarding the amount of test samples to be used;
- editorial changes have been made;
- test B has been added in [5.2.1.2.3](#) for supplementary leakage rate under the testing conditions of 8.7.2.

Any feedback, question or request for official interpretation related to any aspect of this document should be directed to the Secretariat of ISO/TC 44/SC 8 via your national standards body. A complete listing of these bodies can be found at www.iso.org/members.html. Official interpretations, where they exist, are available from this page: <https://committee.iso.org/sites/tc44/home/interpretation.html>.

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

1 Scope

This document specifies requirements for Bourdon-tube pressure gauges normally used with compressed gas systems at pressures up to 30 MPa (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

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

ISO 228-1, *Pipe threads where pressure-tight joints are not 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 4589-2:2017, *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test*

ISO 9539, *Gas welding equipment — Materials for equipment used in gas welding, cutting and allied processes*

ISO 10102, *Assembly tools for screws and nuts — Double-headed open-ended engineers' wrenches — Outside dimensions*

ISO 14114, *Gas welding equipment — Acetylene manifold systems for welding, cutting and allied processes — General requirements*

ISO 15296, *Gas welding equipment — Vocabulary*

ANSI/ASME B1.20.1¹⁾, *Pipe threads, general purpose (inch)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15296 and the following 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/>

1) Published by and available from the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036.

- 3.1 Bourdon tube pressure gauge**
device incorporating elastic tube with direct indication by *pointer* (3.5) and graduated *scale* (3.7) of the pressure being measured
- 3.2 case**
outer housing that contains the Bourdon tube and the movement (if existing)
- 3.3 dial**
plate or area on which the *scale* (3.7) is marked
- 3.4 flange**
circular extension of the *case* (3.2) used for mounting
- 3.5 pointer**
indicator whose position in relation to the *scale* (3.7) indicates the value of the measured pressure
- 3.6 pointer stop**
projection that stops the travel of the *pointer* (3.5)
- 3.7 scale**
array of marks, together with any associated figuring, in relation to which the position of the *pointer* (3.5) is observed
- 3.8 vent**
blowout safety device or venting area incorporated in the gauge to permit the rapid safe dissipation of internal pressure in the event of a leakage or burst in the Bourdon tube
- 3.9 window**
transparent front through which the *dial* (3.3) is observed

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4 Pressure

4.1 Unit of pressure

All pressures given are gauge (effective) pressures in megapascals (MPa) (and 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 not practical, the maximum scale reading shall be selected from the R10 series of preferred numbers or the more rounded values given in ISO 497.

4.3 Maximum pressure mark

The maximum operating pressure shall be indicated on the dial by a symbol or coloured mark and shall not exceed 3/4 of the maximum scale reading.

NOTE For pressure gauges used with regulators conforming to ISO 2503, the maximum pressure mark is normally p_2 for low-pressure gauges and p_1 for high-pressure gauges, as defined in ISO 2503.

Table 1 — Maximum scale reading

Pressure level	Acetylene MPa (bar)	Oxygen and other gases MPa (bar)
Low-pressure (LP) ^a	0,1 (1) 0,16 (1,6) 0,25 (2,5) ^b	0,25 (2,5)
		0,4 (4)
		0,6 (6)
		1,0 (10)
		1,6 (16)
		2,5 (25)
High-pressure (HP) ^{c,d,e,f}	4 (40)	4,0 (40)
		25 (250)
		31,5 (315)
		40 (400)

^a For acetylene, the low-pressure level shall be $\leq 0,15$ MPa (1,5 bar) according to ISO 14114.

^b 0,25 MPa (2,5 bar) only apply for acetylene systems up to maximum working pressure up to 1,5 bar.

^c 25 MPa (250 bar) pressure gauge for use with CO₂ and compressed gas cylinders filled to a maximum settled filling pressure of 18,5 MPa (185 bar) at 15 °C.

^d 31,5 MPa (315 bar) pressure gauge for use with compressed gas cylinders filled to a maximum settled filling pressure of 23 MPa (230 bar) at 15 °C.

^e 40 MPa (400 bar) pressure gauge for use with compressed gas cylinders filled to a maximum settled filling pressure of 30 MPa (300 bar) at 15 °C.

^f For acetylene, the high-pressure level shall be $>0,15$ MPa (1,5 bar) up to 2,5 MPa (25 bar) according to ISO 14114.

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5 Manufacturing requirements

5.1 Materials

5.1.1 General

The materials of the pressure gauge components in 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 ISO 9539.

5.1.2 Oxygen pressure gauges

Bourdon tubes and other parts in contact with the gas shall be resistant to the action of the oxygen and shall not be flammable under operating conditions (e.g. working pressures and temperatures).

Thread sealants or sealing rings shall also be resistant to the action of the oxygen and shall not be flammable under operating conditions (e.g. working pressures and temperatures).

Components in contact with oxygen gas shall conform to ISO 9539.

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 equipment

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 Overpressure and leakage test requirements

5.2.1.2.1 General

Test A of [5.2.1.2.2](#) and Test B of [5.2.1.2.3](#) apply to all gauges except for acetylene gauges located in the high-pressure part of manifold systems or high-pressure pipe systems, which shall fulfil the requirements defined in ISO 14114.

5.2.1.2.2 Test A

Those parts of the pressure gauge that are in contact with the gas shall not burst or leak when tested under the conditions given in [8.6.1](#) for a period of not less than 24 h at 60 °C. The leakage rate shall not exceed 0,306 mbar l/min (18 cm³/h).

5.2.1.2.3 Test B

When tested in accordance with [8.6.2](#), the leakage rate shall not exceed 0,0612 mbar l/min (3,6 cm³/h).

5.2.1.3 Torsion

After application of the torque of 10 Nm according to [8.3.1](#) 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 application of the torque of 25 Nm according to [8.3.2](#) 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.

The tests above apply to gauges with connecting threads of a nominal size of 1/4. Connecting threads of nominal size 1/8 shall only be used when equivalent safety can be demonstrated.

5.2.1.4 Bending

After application of the load of 1 kN according to [8.4](#), the pressure gauge shall be leak-tight to atmosphere at a pressure corresponding to the maximum scale reading.

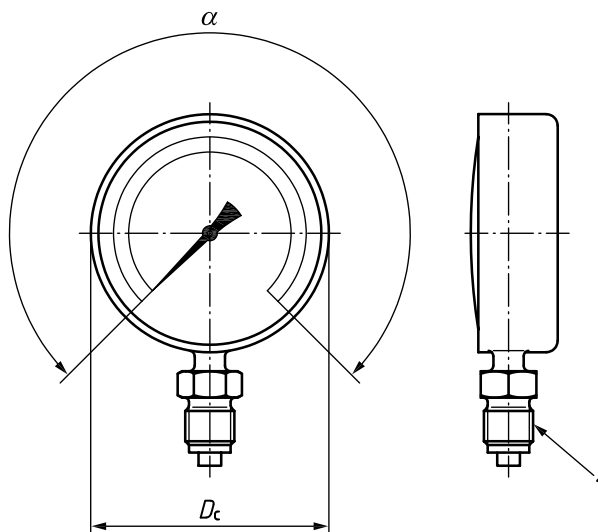
5.2.1.5 Case vent test

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 safely and in any case not in the direction perpendicular to the front of the pressure gauge (see [8.5](#)). Furthermore, the face of the gauge shall not burst, and no parts shall be thrown from the gauge in any direction.

5.2.2 Dimensions

The nominal size is based on the diameter of the casing (dimension *A* in [Figures 1](#) and [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](#).



Key

- 1 thread
- α scale angle
- D_c diameter of the casing

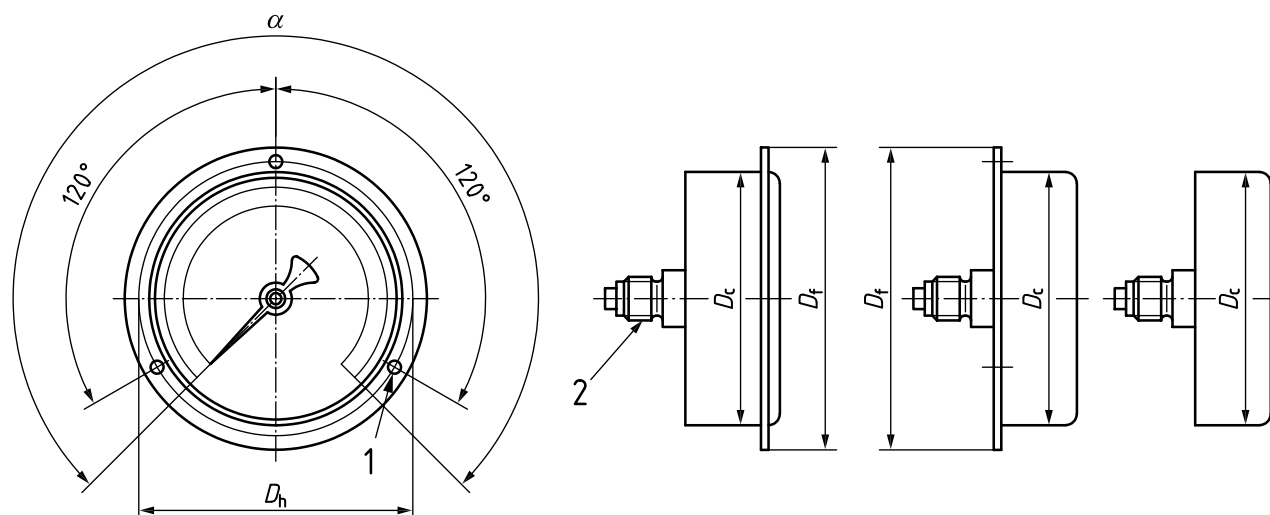
Figure 1 — Pressure gauge with bottom entry
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Table 2 — Dimensions of pressure gauge with bottom radial entry

Normal size	α degrees	D_c mm	Thread	
			Parallel thread	Tapered thread
40	270	40^{+5}_{-2}	G1/8 B	R1/8 or 1/8-27 NPT EXT
			or G1/4 B	or R1/4 or 1/4-18 NPT EXT
50	270	50^{+7}_{-2}	G1/8 B	R1/8 or 1/8-27 NPT EXT
			or G1/4 B	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:

- for parallel thread, ISO 228-1;
- for tapered thread (Symbol R), ISO 7-1;
- for tapered thread (Symbol NPT), ANSI/ASME B1.20.1.



Key

- 1 fixing holes, *F*
- 2 thread
- α scale angle
- D_c diameter of the casing
- D_f flange diameter
- D_h diameter of the fixing hole circle

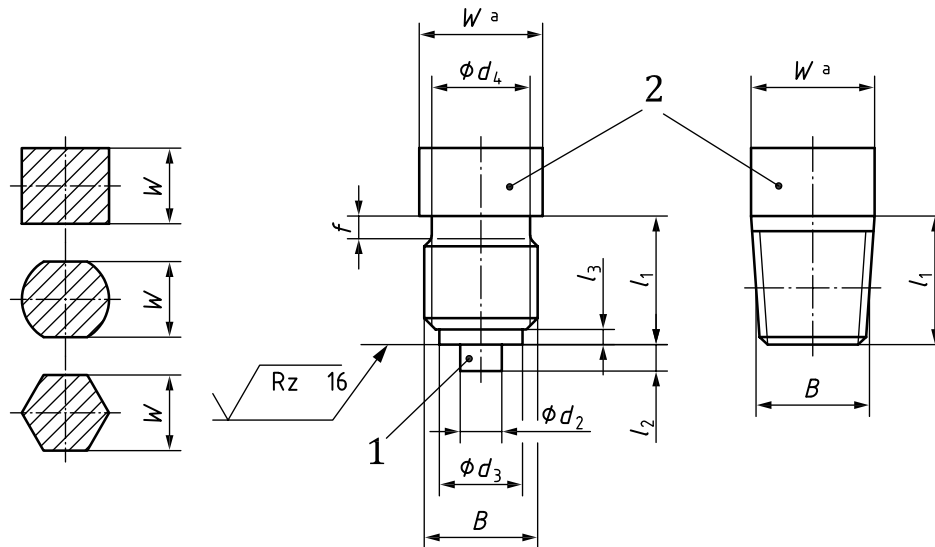
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Figure 2 — Pressure gauge with rear entry

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Table 3 — Dimensions of pressure gauge with rear entry

Normal size	α degrees	$D_{c, \max}$ mm	Thread		$D_{f, \max}$ mm	D_h mm	F_{\min} mm
			Parallel thread	Tapered thread			
40	270	42	G1/8 B	R1/8 or 1/8-27 NPT EXT	61	51	3,6
			or G1/4 B	or R1/4 or 1/4-18 NPT EXT			
50	270	52	G1/8 B	R1/8 or 1/8-27 NPT EXT	68	60	3,6
			or G1/4 B	or R1/4 or 1/4-18 NPT EXT			
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:

- for parallel thread, ISO 228-1;
- for tapered thread (symbol R), ISO 7-1;
- for tapered thread (Symbol NPT), ANSI/ASME B1.20.1.



Key

- 1 spigot
- 2 wrench flats (square, hexagon or other form)
- W width of wrench flats
- a The minimum height of flats shall be compatible with the use of standard spanners according to ISO 10102.

Figure 3 — Thread connection
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Table 4 — Dimensions of threads

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Thread size	ϕd_2	ϕd_3	ϕd_{4min}	l_1	l_2	l_3	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 EXT	—	—	—	min. 10	—	—	—	8 ^a
1/4-18 NPT EXT	—	—	—	min. 13	—	—	—	10 ^a
G1/8 B may be made without spigot.								
G1/8 B may be made without groove f . In that 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](#).