

International Standard



5171

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Pressure gauges used in welding, cutting and related processes

Manomètres utilisés pour le soudage, le coupage et les techniques connexes

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5171 was developed by Technical Committee ISO/TC 44, *Welding and allied processes*, and was circulated to the member bodies in July 1978.

It has been approved by the member bodies of the following countries:

Belgium	India	Norway
Brazil	Ireland	Poland
Czechoslovakia	Israel	Romania
Egypt, Arab Rep. of	Italy	Spain
Finland	Japan	Sweden
France	Korea, Rep. of	Switzerland
Germany, F. R.	Mexico	USA

The member bodies of the following countries expressed disapproval of the document on technical grounds:

Australia
New Zealand
United Kingdom
USSR



INTERNATIONAL STANDARD ISO 5171-1980 (E)/ERRATUM

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ERRATUM

Page 4

Figure 2 : definition of S, delete : "according to ISO 272".

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Pressure gauges used in welding, cutting and related processes

1 Scope and field of application

This International Standard specifies requirements for Bourdon-tube pressure gauges normally used with compressed gases at pressures up to 200 bar¹⁾ in welding, cutting and related processes. It also covers use for dissolved acetylene and for liquefied gases under pressure.

2 References

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

ISO 228/1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Designation, dimensions and tolerances.*

ISO 272, *Fasteners — Hexagon products — Widths across flats.*

3 Definition

Bourdon-tube pressure gauge: A device incorporating elastic tubes with direct indication by pointer and graduated scale of the pressure being measured.

4 Pressure

4.1 Unit of pressure

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

4.2 Maximum scale reading

The maximum scale reading for a particular gas and pressure level shall be selected from the values given in table 1.

Table 1 — Maximum scale reading

Pressure level	Values in bars		
	Acetylene	Oxygen	Other gases
Low-pressure (LP)	2,5	6,3	3,15
		12,5	6,3
High-pressure (HP)	40	16	12,5
		(250)*	16
		315	(250)*
			315

* 250 bar pressure gauges are intended only for use with compressed gas cylinders filled to a maximum pressure of 160 bar.

NOTE — If other graduations are required, they shall be selected from the R 10 series of preferred numbers. The maximum operating pressure (which shall be indicated by a symbol or coloured mark) shall not exceed 2/3 of the maximum scale reading in the case of variable pressure, and shall not exceed 3/4 of the maximum scale reading in the case of constant pressure.

1) 1 bar = 10⁵ Pa = 10⁵ N/m²

5 Manufacturing requirements

5.1 Materials

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.

5.1.1 Acetylene pressure gauges

The Bourdon tubes, filler metals and component parts of the pressure gauge in contact with the gas shall not contribute to the formation of acetylides to a dangerous level.¹⁾

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.

For all oxygen pressure gauges, all components shall be thoroughly cleaned and degreased before assembly.

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 error within the tolerance $\pm 2,5$ % under service conditions and within $\pm 2,0$ % when new or re-adjusted.

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 1,5 times the maximum scale reading (see 8.6).

5.2.1.3 Torsion

After the application of the torque of 10 N.m according to 8.3.1 for a period of not less than 30 s, the pressure gauge shall satisfy the conditions of accuracy according to 5.2.1.1.

After the application of the torque of 25 N.m 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.

5.2.1.4 Bending

After the 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.

5.2.2 Dimensions

The nominal size is based on the diameter of the casing (dimension *A* in figure 1). The values 50 and 63 are standardized.

The dimensions shall be in accordance with figure 1 and table 2.

The thread connection may be of the parallel type or taper type, complying respectively with ISO 228/1 class B or ISO 7/1 (see figure 2).

Widths across flats (*S*) for wrenching shall conform to the dimensions shown in figure 2.

The maximum turning radius shall be as given in figure 3 and table 3.

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 shall be white. The markings and pointer shall 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.

1) To prevent a dangerous level of acetylides, it is recommended that :

- a) the copper content does not exceed 70 % (*m/m*) for components in contact with acetylene;
- b) the silver content in filler metals used in brazing is limited to a maximum of 43 % silver and 21 % copper; the width of the brazed joint should not exceed 0,3 mm;
- c) the Bourdon tubes for high-pressure gauges do not contain any copper alloys.

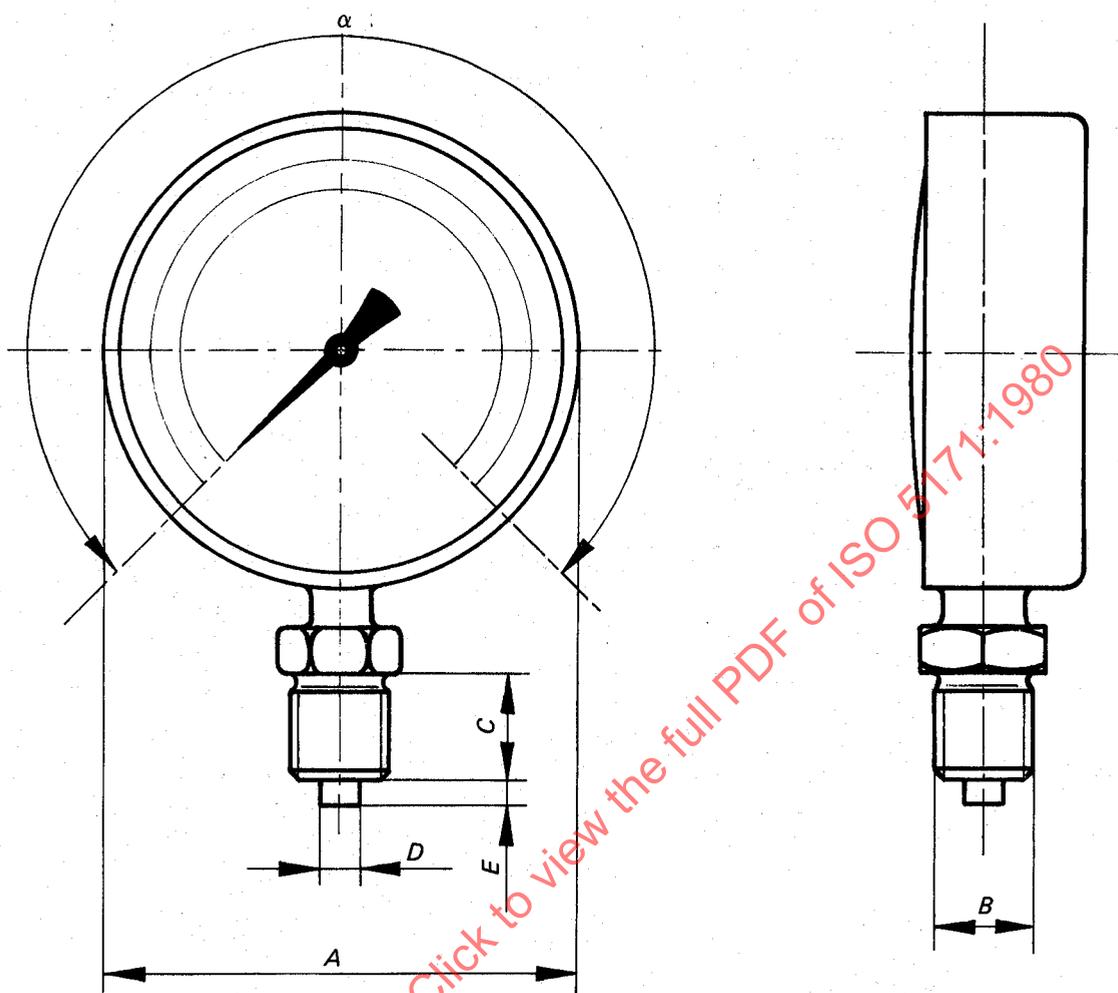
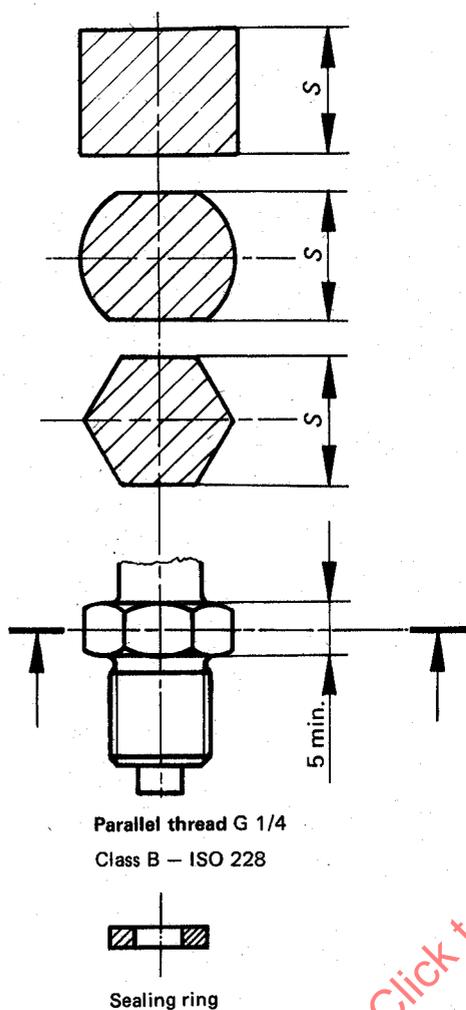


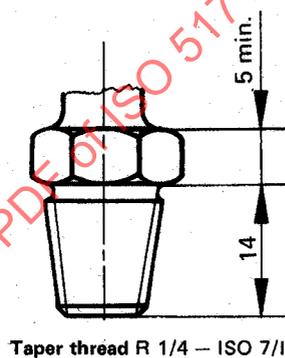
Figure 1 — Pressure gauge

Table 2 — Dimensions of pressure gauge

Nominal size	α	A mm	B	C mm	D mm	E mm
50	270°	50 $\begin{smallmatrix} +7 \\ -2 \end{smallmatrix}$	R 1/4 or G 1/4 B	12	5	3
63	270°	63 $\begin{smallmatrix} +7 \\ -2 \end{smallmatrix}$	R 1/4 or G 1/4 B	12	5	3



S = width of wrenches; according to ISO 272, preferably 14 or 17 mm



Joint made on the threads; if necessary, using a jointing medium.

Figure 2 – Thread connection

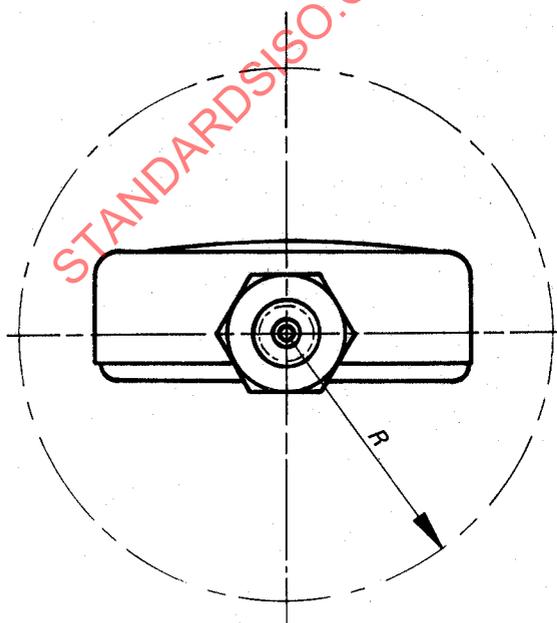


Figure 3 – Turning radius

Table 3 – Values of R

Pressure gauge size	R max. mm
50	37
63	45

6 Safety

Pressure gauges intended for use with oxygen shall be thoroughly degreased.

The inlet orifice to the Bourdon tube of all gauges shall be limited to a maximum of 0,1 mm².

In case of rupture of the Bourdon tube, for example due to overpressure or fatigue, the vent on the back of the pressure gauge shall allow the escape of gas in a direction away from the face of the gauge (see 8.5). Furthermore, the face of the gauge shall not burst.

All materials for the pressure gauges shall be self-extinguishing under normal ambient working conditions.

Under normal 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 :

- a) the symbol for the unit of pressure;
- b) the name or trademark of the manufacturer and/or distributor;
- c) for an acetylene pressure gauge, the word "acetylene";
- d) for an oxygen pressure gauge, the word "oxygen" and the symbol as shown below.



8 Tests

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 International Standard.

Fluids free of combustible constituents shall be used for all manufacturing tests and calibration of pressure gauges for use with oxygen.

8.1 Design and manufacturing standard

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

8.2 Accuracy

The test shall be carried out using a test gauge of class at least 0,6 (i.e. accuracy $\pm 0,5\%$ when new and $\pm 0,6\%$ in service) and at approximately 23 °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 4); the pressure shall then be increased to the maximum scale reading and held for 15 min, after which it shall be decreased in at least five steps. The accuracy shall be compared only over the operating pressure range (see 5.2.1.1).

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

NOTE — The pressure gauge may be lightly tapped during testing.

8.3 Torsion test

8.3.1 With the gauge mounted by its thread, a torque of 10 N.m 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 figure 5).

8.3.2 A torque of 25 N.m shall be applied in the same manner as in 8.3.1.

8.4 Bend test

A force of 1 kN shall be applied in an appropriate device successively on the face, back and one side of the gauge (see figure 6).

NOTE — This test is intended to check the strength of the gauge. The face of the gauge is permitted to fail under this test.

8.5 Energy release test

The pressure gauge shall be connected to a high-pressure gas source and the energy $E = pV$ (where $p = 1,5$ times the maximum scale reading but not less than 40 bar, and $V \approx$ volume of the Bourdon tube) shall be suddenly released into the gauge casing.

NOTE — If the Bourdon tube is simulated by a pressure chamber upstream of the gauge, the entry passage into the gauge casing shall not be less than 5 mm diameter.

8.6 Strength

The pressure gauge shall be submitted to a pressure of 1,5 times the maximum scale reading for a period of not less than 1 min.

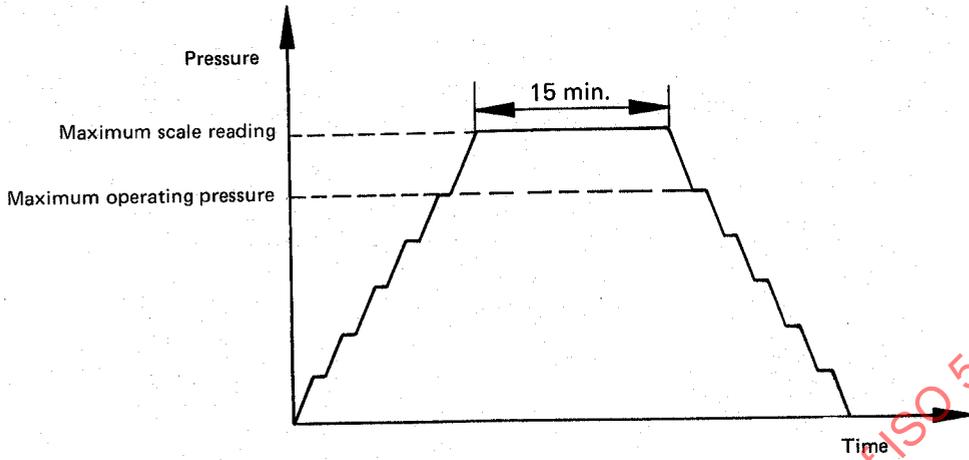


Figure 4 – Accuracy test

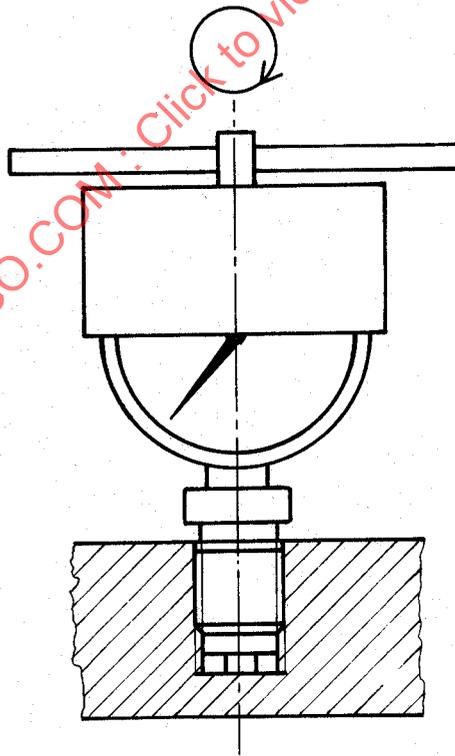


Figure 5 – Torsion test

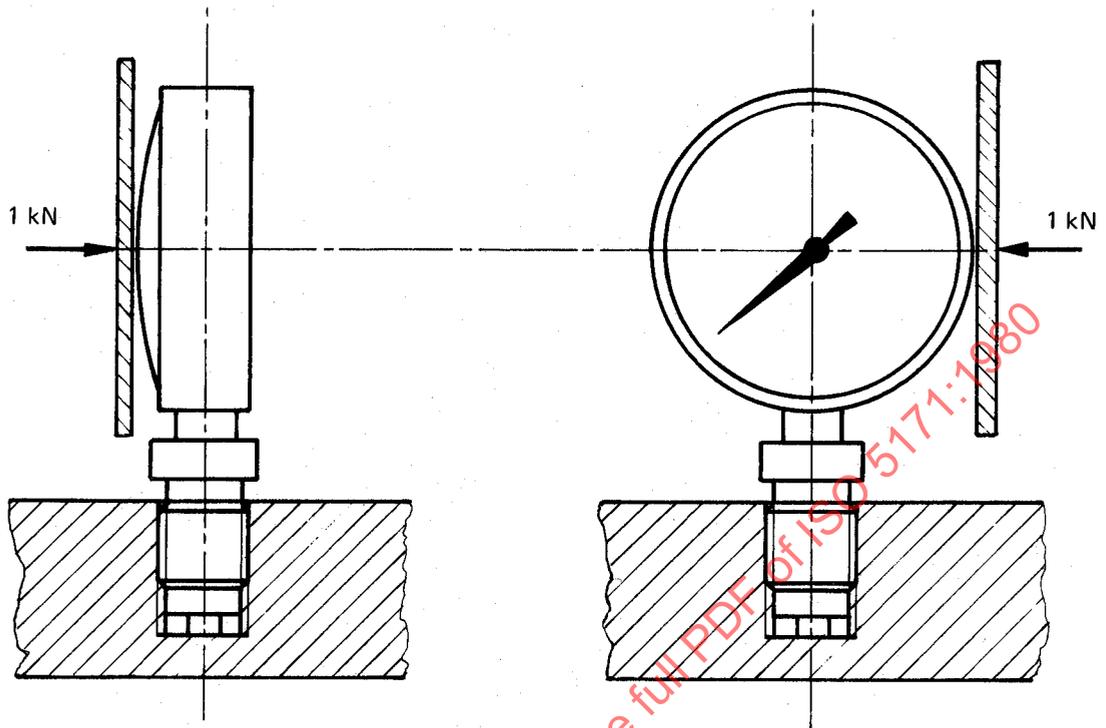


Figure 6 — Bend test

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