

INTERNATIONAL  
RECOMMENDATION

**OIML R 23**

Edition 1975 (E)

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Tyre pressure gauges for motor vehicles

Manomètres pour pneumatiques de véhicules automobiles

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OIML R 23 Edition 1975 (E)



ORGANISATION INTERNATIONALE  
DE MÉTROLOGIE LÉGALE

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INTERNATIONAL ORGANIZATION  
OF LEGAL METROLOGY

## Foreword

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This publication – reference OIML R 23 (E), edition 1975 – which is under the responsibility of OIML TC 10 *Instruments for measuring pressure, force and associated quantities*, was sanctioned by the International Conference of Legal Metrology in 1972.

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# TYRE PRESSURE GAUGES FOR MOTOR VEHICLES

## 1 Scope

This Recommendation lays down the principal metrological characteristics to which pressure gauges intended for the measurement of the inflation pressures in motor-vehicle tyres must conform.

It applies to instruments in which a mechanical measuring sequence transmits the elastic deformation of a sensing element directly to an indicating device comprising a pointer and a scale graduated in authorized pressure units.

The types of instruments covered are :

- pressure gauges used in “fixed” or mobile installations in service stations and intended for checking pressure while the tyres are being inflated,
- hand-held pressure gauges from vehicle tool-kits and intended for periodic checks of tyre pressure ; these pressure gauges are hereinafter called briefly “hand-held pressure gauges”,
- pressure gauges fixed on vehicle dashboards and intended for the continuous checking of vehicle-tyre pressure while the vehicle is moving.

The metrological characteristics of instruments in service station installations and of dashboard instruments must meet the requirements of OIML International Recommendation N° 17, “Indicating Pressure Gauges, Vacuum Gauges and Pressure Vacuum Gauges with Elastic Sensing Elements and Direct Indications by Pointer and Graduated Scale”, as well as the requirements of this Recommendation.

## 2 Pressure measurement units

2.1. The SI unit of pressure is the pascal (Pa).

2.2. For the graduation of scales of tyre pressure gauges, the following units are admitted : (\*)

the meganewton per square metre ( $\text{MN/m}^2$ ),

the bar =  $10^5 \text{ N/m}^2 = 0.1 \text{ MN/m}^2$ .

## 3 Load limits

3.1. Pressure gauges must not be used regularly beyond a working limit equal to 3/4 of their upper limit of measurement.

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(\*) The following units are also admitted for a limited period :  
the kilogram – force per square centimetre ( $\text{kgf/cm}^2$ )  
the kilopond per square centimetre ( $\text{kp/cm}^2$ )  
 $1 \text{ kgf/cm}^2 = 1 \text{ kp/cm}^2 = 0.980665 \text{ bar} = 98066.5 \text{ N/m}^2$  ;  
the pound-force per square inch ( $\text{lbf/in}^2$ )  
 $1 \text{ lbf/in}^2 = 0.070307 \text{ kgf/cm}^2 = 0.070307 \text{ kp/cm}^2 = 0.0689476 \text{ bar} = 6894.76 \text{ Pa}$ .

## 4 Reading device

- 4.1. The reading device should make it possible to read directly the indications of the value of the pressure measured (without applying a multiplication factor) without any risk of error exceeding 2 tenths of the scale division.
- 4.2. The scale intervals, as a function of the upper limits of the scales, for pressure gauges used in service stations and for hand-held pressure gauges, are given in Table I, this scale interval being constant over the whole length of the scale (see 4.4.1).

**TABLE I**

<b>Upper measurement limits Mpa<sup>(*)</sup></b>	<b>Scale intervals of pressure gauges Mpa<sup>(*)</sup></b>	
	<b>used in service stations</b>	<b>hand-held</b>
<b>up to and including 0.4</b>	0.01	0.01
<b>from 0.4 to 1.0</b>	0.01	0.02 or 0.025

### 4.3. Pointer

- 4.3.1. The tip of the pointer must be of the form of an isosceles triangle of apex angle less than 60°; the tip of the pointer may also take the form of a knife edge perpendicular to the plane of the dial. That part of the knife edge overlapping the scale marks must not be thicker than these marks.
- 4.3.2. The tip of the pointer must cover the shortest scale marks by 1/3 to 2/3 of their length.
- 4.3.3. The separation between the pointer and the dial must not exceed the value  $0.02 l + 1$  mm, (l being the distance, in mm, between the axis of rotation of the pointer and its tip).

### 4.4. Scale

- 4.4.1. Pressure gauge scales must be regular over their whole length.
- 4.4.2. The length of the scale divisions must not be less than 1.5 mm.
- 4.4.2.1. The lengths of the different scale divisions of the same scale must not differ from one another by more than 1/5 of the greatest of these lengths.

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(\*) For other units, viz :  
the bar, the kilogram-force per square centimetre and the kilopond per square centimetre, numerical values ten times greater are used.

4.4.3. Every fifth mark must be distinguished from the others by a greater length, every fifth or tenth mark must be numbered (the scale should include at least 4 numbered marks).

4.4.4. The thickness of the marks in that part of the scale over which the tip of the pointer passes must not exceed 1/5 of the length of the scale division ;

this thickness must be the same for all the marks :

however, a difference not exceeding 10% of the thickness of the thickest mark is admissible.

Increase of thickness to facilitate reading is only admissible beyond the part over which the pointer passes.

4.4.5. The working range of the scale may be made conspicuous by marks or by any other effective method.

4.4.6. The scale must be visible and easily readable at a distance of 0.6 m without any optical magnifying system.

*Note* : Other types of reading device conforming to the requirements stated in the introduction to Section 4 are admissible.

## **5 Additional devices**

5.1. To facilitate their use, hand-held pressure gauges may include a locking device, enabling their indications to be read after disconnection from the tyre valve.

5.2. The pressure gauges mentioned in 5.1 must include provision for returning the pointer to its initial position (corresponding to atmospheric pressure).

5.3. The connecting ports from the pressure gauge to the tyre valve must be such as to provide an air-tight seal, so as to exclude any error from leakage of air during the pressure measurement.

## **6 Marking**

The pressure gauges must carry the following marks :

6.1. On the dial :

- a) the symbol of the unit of measurement,
- b) the words : “Tyre pressure gauge” (\*),
- c) if necessary, a mark indicating the working position of the instrument.

6.2. On the dial or on the casing :

- a) the manufacturer’s name and address,
- b) the manufacturer’s mark,
- c) the serial number of manufacture,
- d) the date of manufacture.

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(\*) The marking appears on the dials of pressure gauges on vehicle dashboards.

6.3. Pressure gauges on vehicle dashboard must also be marked with the following information :

- the type of tyres on the vehicle,
- the values of pressure appropriate to this type.

6.4. The inscriptions on the dial must not make it difficult to read the scale marks.

## 7 Accuracy

7.1. Maximum permissible errors

7.1.1. Maximum permissible intrinsic errors for pressure gauges used in service stations and for hand-held pressure gauges are specified as absolute values depending on the upper limit of the scale. They are given in Table II.

**TABLE II**

Upper measurement limit Mpa (*)	Maximum permissible intrinsic error Mpa (*)	
	instruments in service (and at periodic verifications)	new or repaired instruments (and at initial verification)
up to and including 0.4	± 0.01	± 0.008
from 0.4 to 1.0	± 0.02	± 0.016

The maximum permissible intrinsic errors are the same throughout the scale range.

7.1.2. The maximum permissible errors for pressure gauges on vehicle dashboards, expressed in % of the upper measurement limits, are as follows :

for instruments in service (and at periodic verifications) ..... ± 2.5 %

for new or re-adjusted instruments (and at initial verification) ..... ± 2.0 %

7.2. Hysteresis band (\*\*)<sup>1</sup>

The hysteresis band of pressure gauges (when their construction permits it to be defined), both for new or re-adjusted instruments and for instruments in service, must not exceed the absolute value of the maximum permissible error.

7.3. Conformity of pressure gauges with the requirements of 7.1.1, 7.1.2, and 7.2 is determined by the method given in paragraph 1 of the Appendix.

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(\*) For other “admitted units”, the provisions of the footnote to paragraph 4 apply.

(\*\*) See Vocabulary of Legal Metrology, paragraph 9.7.1.

<sup>1</sup> *Translator’s Notes:*

In the English translation of the Vocabulary of Legal Metrology presented in BSI publication PD6461, the translation of paragraph 9.7.1 (French term “Erreur de réversibilité”) was rendered as “Hysteresis error”. It has subsequently been decided that this term is inappropriate and should be replaced by “Hysteresis band”.

- 7.4. At atmospheric pressure, the tip of the pointer of a pressure gauge must stop opposite the zero mark on the scale within limits of deviation which do not exceed the maximum permissible error.
- 7.5. For pressure gauges in which the scale has no zero mark, the pointer, at atmospheric pressure, must stop below the mark corresponding to the lower measurement limit, in the zero direction, at a distance corresponding, on the scale, to more than three times the absolute value of the maximum permissible intrinsic error.
- 7.6. The variation of the indications of pressure gauges for temperatures outside the range  $20 \pm 5^\circ \text{C}$  must not exceed  $\pm 0.4 \%$  of the upper measurement limit for each  $10^\circ \text{C}$ .

## **8 Stability of tyre pressure gauges**

- 8.1. The “stability” of the metrological and technical properties of instruments in service during the period between two successive verifications must be ensured by sound construction based on the use of appropriate materials, the correct technology, and adequate “running-in” before being put into operation.
- 8.2. The metrological characteristics of new or repaired pressure gauges must conform with the requirements of 7.1.1, 7.1.2, 7.2, after the instruments (\*) have been subjected to :
- a) an overload pressure exceeding the upper scale limit by 25 % for 15 minutes,
  - b) for pressure gauges used in service stations and for hand-held pressure gauges, 1000 impulses given by a pressure varying from 0 to 90/95 % of the upper scale limit,
  - c) for pressure gauges used in service stations and for hand-held pressure gauges whose locking device is disengaged before the tests, 10 000 cycles of pressure varying slowly from 0 to 75 % of the upper scale limit at a frequency not exceeding 60 cycles per minute,
  - d) for pressure gauges intended to be mounted on vehicle dashboards, 20 000 cycles at a pressure varying slowly from 25 % to 75 % of the upper scale limit at a frequency not exceeding 60 cycles per minute.
  - e) an ambient temperature of  $-20^\circ \text{C}$  for 6 hours (and in special cases of  $-50^\circ \text{C}$ ), and a temperature of  $+50^\circ \text{C}$  for 6 hours,
  - f) for hand-held pressure gauges and for pressure gauges intended to be mounted on vehicle dashboards, vibration at a frequency of 50 cycles per second and an acceleration of  $50 \text{ m/s}^2$  for 2 hours,
  - g) for pressure gauges intended to be mounted on vehicle dashboards, shocks at a frequency of 80-120 shocks per minute and an acceleration of  $50 \text{ m/s}^2$  for 2 hours ;  
for hand-held pressure gauges. the shock acceleration is to be increased to  $70 \text{ m/s}^2$ .

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(\*) Pressure gauges which have undergone the tests given in “a”, “b”, “c” and “d” should satisfy the requirements of 7.1.1, 7.1.2, 7.2 after one hour of non-use ; this non-use is extended to 6 hours in an ambient temperature of  $20^\circ \text{C} \pm 5^\circ \text{C}$  after the test specified in “e”.

## **9 Liability to legal metrological controls**

### 9.1. Metrological controls

When in any country tyre pressure Gauges are subject to State metrological controls, these controls must include, depending upon the internal legislation of that country, the following controls or at least some of them :

#### 9.1.1. Pattern approval

Each pattern of instrument from each maker is to be subject to pattern approval. No modification may be made to an approved pattern without special authorization.

#### 9.1. Initial verification

Instruments must undergo the initial verification tests.

9.1.3. Subsequent or periodic verifications in the course of which it will be established that the instruments have retained their statutory metrological qualities.

9.1.4. The procedures for and the validity of, these tests are laid down in national regulations.

### 9.2. Methods of control

Methods of control, especially for periodic verification, are given below in an Appendix.

### 9.3. Metrological control marks

Instruments subjected to these controls and which have satisfactorily undergone the corresponding tests, will be scaled and stamped with control marks in accordance with the requirements of the national Metrological Services.

**ANNEX**  
**METHODS OF CONTROL**

A.1. The errors of indication of hand-held pressure gauges included in vehicle tool kits, and of pressure gauges used in service stations, are determined at the time of the verification.

A.1.1. At the time of the verification the following conditions must be complied with :

- a) pressure gauge in the normal working position, as indicated on the dial or as selected to suit the arrangements for connection,
- b) ambient temperature  $20 \pm 5$  °C,
- c) a pressurised air supply providing pressure pulses <sup>(\*)</sup>.

A.1.2. The errors of pressure gauges used for control purposes must not exceed 1/4 of those permitted in the instruments under test.

A.1.3. The check of the indications of the pressure gauges being verified is to be made at 5 or more points uniformly distributed along the scale, including the upper and lower measurement limits.

The indications must be read to within 0.2 of the scale interval, with the pressure increasing.

The indications of pressure gauges having a locking device (5.1) must be read after disconnection of the pressure gauge from the source of pressure.

A.2. Verification of pressure gauges installed on vehicle dashboards, and of pressure gauges which can operate in conditions of increasing or decreasing pressure, is to be conducted in conformity with the test methods specified in OIML Recommendation N° 17.

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<sup>(\*)</sup> For instance, a system comprising airtight metal reservoirs, of about 25 litres capacity, incorporating a pressure regulator, a test pressure gauge and a tyre valve to which the instrument being verified is connected.

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