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Procedures of characterization and
calibration for pressure gauges —
Part 1: General

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## Foreword

This Japanese Industrial Standard has been established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by Japan Measuring Instruments Federation (JMIF)/National Institute of Advanced Industrial Science and Technology (AIST)/Japanese Standards Association (JSA) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act. This Standard partially replaces **JIS B 7547 : 2008**, which has been withdrawn.

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**JIS B 7547** series consists of the following 2 parts under the general title *Procedures of characterization and calibration for pressure gauges*:

JIS B 7547-1 *Part 1 : General*

JIS B 7547-2 *Part 2 : High-pressure gases*

# Procedures of characterization and calibration for pressure gauges — Part 1 : General

## 1 Scope

This Japanese Industrial Standard specifies the procedures of characterization and calibration for pressure gauges used as a standard in the calibration, test, inspection, etc. of pressure gauges. However, the procedures of characterization and calibration for pressure gauges for high-pressure gas by the standard calibrated with liquid pressure are excepted. It does not apply to pressure balances.

## 2 Normative references

The following standard contains provisions which, through reference in this text, constitute provisions of this Standard. The most recent edition of the standard (including amendments) indicated below shall be applied.

JIS Z 8103 *Glossary of terms used in measurement*

## 3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS Z 8103**, and the following apply.

### 3.1

#### **characteristic test**

test to be carried out for evaluating the metrological performance of pressure gauge  
The input-output characteristics test and the environment sensitivity test are included.

### 3.2

#### **range**

pressure range to be measured by a pressure gauge

### 3.3

#### **span**

absolute value of the difference between the upper limit value and lower limit value of a given range, which represents the width of the range

### 3.4

#### **standard**

measuring instrument to generate or measure the pressure to be the standard for application on the tested device or calibrated device

### 3.5

**tested device**

pressure gauge to be tested

**3.6****calibrated device**

pressure gauge to be calibrated

**3.7****control precision**

precision to be set as a control target by users

It is determined by referring to the precision indicated in the product specification, product standard and so on prepared by the manufacturer.

**3.8****absolute pressure**

pressure where the perfect vacuum is taken as a standard

**3.9****gauge pressure**

pressure where the atmospheric pressure is taken as a standard

The positive gauge pressure and negative gauge pressure are included.

**3.10****differential pressure**

pressure where an arbitrary pressure is taken as a standard

**3.11****line pressure**

pressure to be the standard in differential pressure

It is also referred to as base pressure or reference pressure.

**3.12****zero point**

output of a tested device or calibrated device when pressure is not applied

It refers to output when the pressure gauge connection port is open to the atmosphere for the measurement of pressure gauges, output when the connection port is used for exhaustion to vacuum for the measurement of absolute pressure and output when only the line pressure is applied to two connection ports for the measurement of differential pressure.

**3.13****pressure reference level**

height position which becomes a reference at which the pressure value of a standard, tested device or calibrated device is obtained

### 3.14

#### **head difference**

difference in the pressure reference level between a standard and a tested device or calibrated device

### 3.15

#### **USE NO OIL**

prohibition of use of petroleum, oils, fats and other combustible materials

### 3.16

#### **USE NO WATER**

prohibition of use of water and those containing moisture

## **4 Equipment and measuring instrument**

### **4.1 Requirements for equipment and measuring instrument**

The equipment and measuring instrument to be used shall have been confirmed to be safe and shall have the sufficient pressure resistance to the maximum test pressure or to the maximum calibration pressure. The connection elements which may come into contact with the atmosphere and any part of the measuring instrument shall not contain dust or impurities which may cause corrosion.

**4.1.1 Piping** The piping to be used shall be clean and free from crack, deformation, etc. For the connection between the machineries used for flowing pressure medium, the piping which is as short as possible and has a large sectional area shall be used. The piping which withstands the maximum test pressure or maximum calibration pressure without being largely deformed shall be used.

The piping used for vacuum exhaust of which the piping resistance is small and in which dirt such as oils is not adhered to the internal wall shall be used.

**4.1.2 Joint** For the connection to machineries, the joint corresponding with pressure ranges, pressure media and piping shall be used. The joint with the escape hole for pressure media prepared for in case the connection is loosened should be used.

**4.1.3 Valve** The valve of which the volume change is small when opening or closing, and the closing capacity exceeds the maximum test pressure or maximum calibration pressure shall be used.

**4.1.4 Pressure regulator** The pressure regulator used shall be capable of stably applying and reducing pressure from the minimum pressure to the maximum pressure in a test or calibration and shall be that which has been confirmed that there is no leakage.

**4.1.5 Vacuum pump** When the zero point is measured by performing vacuum ex-

haust for the measurement of absolute pressure, the vacuum pump capable of exhausting air inside the piping at not more than the readout resolution of a tested device or calibrated device shall be used.

**4.1.6 Vacuum gauge** When the zero point is measured by performing vacuum exhaust for the measurement of absolute pressure, the vacuum gauge capable of measuring the pressure of the connection port of a tested device or calibrated device shall be installed at the place close to the connection port.

**4.1.7 Environmental measuring instrument** The measuring instrument which satisfies the following requirements shall be installed at an appropriate indoor place. In any cases, a measuring instrument which has been calibrated or inspected shall be appropriately selected according to the target uncertainty of calibration.

- a) Thermometer capable of measuring the temperature range of a test atmosphere or calibration atmosphere
- b) Hygrometer capable of measuring the relative humidity range of a test atmosphere or calibration atmosphere
- c) Barometer capable of measuring the pressure range of a test atmosphere or calibration atmosphere

**4.1.8 Height measuring instrument** When the head difference is measured, an appropriate height measuring instrument shall be used according to the target uncertainty of calibration. Examples are a vernier calliper, height gauge and cathetometer.

**4.1.9 Level** The measuring instrument capable of checking the level line of the installation location of an apparatus shall be used. An example is a bubble level.

**4.1.10 Measuring instrument of angle** The measuring instrument of angle is used when evaluating the posture difference in the environment sensitivity test and that capable of measuring the inclination angle shall be used. Examples are an inclinometer and angle meter.

**4.1.11 Pressure medium** The pressure medium to be used shall satisfy the requirements in **a)** or **b)** below. The medium of which the use is forbidden by the manufacturer shall not be used.

The same pressure medium as that used when a standard is calibrated by the higher standard should be used. When using the pressure medium which is different from that used when calibration is performed by the higher standard, the influence quantity on the calibration value shall be evaluated. When the influence quantity is large, correction shall be performed.

**a) Gas**

- It shall be clean and dry.
- It shall be stable without being corrosive to the apparatus to be used.
- The gas temperature shall be almost equal to ambient temperature.

**b) Liquid**

- It shall not be corrosive to the apparatus to be used and shall not affect the apparatus.
- The liquid and its vapour shall not affect a calibration worker, ambient environment, etc.
- When there is a product marking or the USE NO OIL indication requested by the client, oils (machine oil, etc.) shall not be used as a pressure medium irrespective of the removal method after the test or calibration.
- When there is a product marking or the USE NO WATER indication requested by the client, water shall not be used as a pressure medium irrespective of the removal method after the test or calibration.
- When the medium at the time of use of a tested device or calibrated device is different from the liquid used for the test or calibration in classification, it shall be as agreed between the interested parties.

#### 4.2 Installation environment of equipment and measuring instrument

The equipment and measuring instrument to be used shall be installed in the environment which satisfies a) to f) below.

- a) There shall not be such a vibration that affects the performance.
- b) The installation posture shall not change during the work.
- c) There shall be no transformer, high-voltage line, etc. in the vicinity, which emit such a magnetic field that affects the performance.
- d) There shall not be such an electromagnetic interference that has an adverse effect on the performance.
- e) When a power source is needed, the supply power source voltage variation shall not have an influence on use. When the power requirement is defined by the manufacturer or the user, it shall be followed.
- f) The aerial environment shall have no adverse effect on the health of workers and its safety shall be taken into consideration.

### 5 Procedure of characterization

#### 5.1 General

The method for obtaining the input-output characteristics of a pressure gauge shall be as specified in 5.3. The environment sensitivity test shall be as specified in 5.4.

#### 5.2 Test atmosphere

The test atmosphere shall be as follows.

- Ambient temperature : 15 °C to 35 °C
- Relative humidity : 30 % to 80 %

#### 5.3 Input-output characteristic test