

CGA C-1—2016

**METHODS FOR PRESSURE TESTING
COMPRESSED GAS CYLINDERS**

ELEVENTH EDITION



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Work Item 14-033
Cylinder Specifications Committee

NOTE—Technical changes from the previous edition are underlined.

NOTE—Appendices A, C, D, E, and F (Informative) are for information only.

NOTE—Appendix B (Normative) is a requirement.

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1 Introduction

Pressure testing of compressed gas cylinders is required for many newly manufactured cylinders and is also an accepted test method for the requalification of cylinders. The referenced edition of the applicable documents, as specified by the U.S. Department of Transportation (DOT) in Title 49 of the U.S. *Code of Federal Regulations* (49 CFR), in Canada by Transport Canada (TC) in CSA B339, *Cylinders, spheres, and tubes for the transportation of dangerous goods*, and CSA B341, *UN pressure receptacles and multiple-element gas containers for the transport of dangerous goods* as referenced by the *Transportation of Dangerous Goods Regulations*, or the authority having jurisdiction shall be available at each facility conducting pressure testing/requalification [1, 2, 3, 4].

For the testing/requalification of cylinders manufactured under a special permit or equivalency certificate, a current copy of that special permit or equivalency certificate shall also be available. See Appendix A for addresses of agencies and organizations that produce these documents.

2 Scope

This standard contains operating and equipment requirements necessary to properly perform pressure testing of compressed gas cylinders.

3 Definitions

For the purpose of this standard, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall

Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should

Indicates that a procedure is recommended.

3.1.3 May

Indicates that the procedure is optional.

3.1.4 Will

Is used only to indicate the future, not a degree of requirement.

3.1.5 Can

Indicates a possibility or ability.

3.2 Technical definitions

3.2.1 Accuracy

Degree of conformity of a measured or calculated quantity to its actual (true) value.

3.2.2 Accuracy grade

Inherent quality of the device.

NOTE—Accuracy grade expresses the maximum error allowed for the device at any reading and is expressed as a percentage of the full scale of the device.

3.2.3 Actual test pressure

True, recorded pressure applied to a cylinder during a test.

3.2.4 Bar

Metric measurement used for marking service pressure (1 bar = 14.5 psi).

3.2.5 Calibration

Process of adjusting a device to match a known standard so that it indicates to within specified accuracy limits.

NOTE—See Appendix B for information on calibration devices.

3.2.6 Calibration verification

Checking of an individual device or test apparatus by comparison with a given standard to determine the indication error at specified points of the scale.

3.2.7 Calibrated cylinder

Cylinder that has certified calibration points of pressure with corresponding expansion values.

NOTE—It is a secondary, derived standard used for the verification and demonstration of test system accuracy and integrity.

3.2.8 Condemn

Determination that a cylinder is unserviceable for continued transportation of dangerous goods and that the cylinder may not be restored by repair, rebuild, requalification, or other procedures.

3.2.9 Cylinder

Any type of pressure vessel designed for a minimum internal pressure of 276 kPa, abs (2.8 bar, abs, 40 psia) and used for transportation of compressed gases that is required by the regulatory authority to be pressure tested.¹

3.2.10 Defect

Imperfection requiring a cylinder to be rejected or condemned.

3.2.11 Elastic expansion

Temporary increase in cylinder's volume due to application of pressure that is lost when pressure is released.

NOTE—The calculation for elastic expansion is total expansion minus permanent expansion.

3.2.12 Error

Difference between the indicated value and the true value of the variable being measured.

3.2.13 Expansion indicating device (EID)

Device used to directly or indirectly measure the expansion of a cylinder during the test.

3.2.14 Hydrostatic test

Method of pressure testing a cylinder using liquid as the pressurization media.

3.2.15 Independent Inspection Agency (IIA)

Inspection firm approved by DOT as outlined in 49 CFR 107.803 [1].

3.2.16 Master gauge

Pressure indicating device (PID) used as a calibration standard that has an accuracy grade equal to or better than the requirement for the PID in the test apparatus.

3.2.17 Percent permanent expansion

Ratio of permanent expansion to total expansion, expressed as a percentage.

NOTE—The calculation for percent permanent expansion is permanent expansion divided by total expansion times 100.

3.2.18 Permanent expansion

Increase in cylinder volume due to application of pressure that is not recovered when pressure is released.

3.2.19 Pressure indicating device (PID)

Device used to measure the pressure applied to a cylinder during the test.

¹ kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per [CGA P-11](#), *Metric Practice Guide for the Compressed Gas Industry* [5].