



National Institute for Occupational Safety and Health  
National Personal Protective Technology Laboratory  
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Procedure No. RCT-ASRS-STP-0128

Revision: 1.1

Date: 20 September 2005

## DETERMINATION OF ACCURACY OF GAUGE, SELF-CONTAINED BREATHING APPARATUS STANDARD TESTING PROCEDURE (STP)

### 1. PURPOSE

This test establishes the procedures for ensuring that the level of protection by the accuracy of gauge requirements on Self-Contained Breathing Apparatus (SCBA) submitted for Approval, Extension of Approval, or examined during Certified Product Audits, meet the minimum certification standards set forth in 42 CFR, Part 84, Subpart H, Section 84.82(a)(b)(c)(d)(h)(i), Volume 60, Number 110, June 8, 1995.

### 2. GENERAL

This STP describes the Determination of Accuracy of Gauge, Self-Contained Breathing Apparatus test in sufficient detail that a person knowledgeable in the appropriate technical field can select equipment with the necessary resolution, conduct the test, and determine whether or not the product passes the test.

### 3. EQUIPMENT/MATERIALS

3.1. The list of necessary test equipment and materials follows:



3.1.1. Helicoid calibrated test gauges, traceable to NIST.

3.1.2. Source of high pressure air/oxygen and relief valve, or 3.1.3 below.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level



### 3.1.3. Dead weight tester air/oxygen.

(a) Mansfield and Green Model T2 Deadweight Pressure Tester Solon, Ohio 44139 or equivalent, or (b) below.

(b) Ashcroft Portable Test Pump Dresser Industrial Valve and Instrument Division Stratford, Connecticut 06497 or equivalent.

## 4. TESTING REQUIREMENTS AND CONDITIONS

- 4.1. Prior to beginning any testing, all measuring equipment to be used must have been calibrated in accordance with the manufacturer's calibration procedure and schedule. At a minimum, all measuring equipment utilized for this testing must have been calibrated within the preceding 12 months using a method traceable to the National Institute of Standards and Technology (NIST).
- 4.2. The compressed gas cylinder must meet all applicable Department of Transportation requirements for cylinder approval as well as for retesting/requalification.
- 4.3. Normal laboratory safety practices must be observed. This includes all safety precautions described in the current ALOSH Facility Laboratory Safety Manual.
  - 4.3.1. Safety glasses, lab coats, and hard-toe shoes must be worn at all times.
  - 4.3.2. Work benches must be maintained free of clutter and non-essential test equipment.
  - 4.3.3. When handling any glass laboratory equipment, lab technicians and personnel must wear special gloves which protect against lacerations or punctures.

## 5. PROCEDURE

Note: Reference Section 3 for equipment, model numbers and manufacturers. For calibration purposes use those described in the manufacturer's operation and maintenance manuals.

- 5.1. Set up test apparatus according to manufacturer's directions.
- 5.2. Choose test gauge of appropriate range.

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- 5.3. Mount test gauge and gauge to be tested on test apparatus, using teflon tape on threads to assure water tight seal.
- 5.4. Pump up pressure and check gauge at various intervals.
- 5.5. Record results on test data sheet.
- 5.6. Repeat with two other gauges.
- 5.7. As an alternate procedure a dead weight tester may be substituted for air gauges.
- 5.8. Data Analysis

5.8.1. The dial-indicating gauges shall be reliable within  $\pm 5$  percent of full scale when tested at 5 equal intervals.

Note: This test should be done on a minimum of three gauges or more if additional testing is required (42 CFR, Part 84, Sections: 84.12, 84.30, and 84.60.)

#### 6. PASS\FAIL CRITERIA

6.1. The criterion for passing this test is set forth in 42 CFR, Part 84, Subpart G, Section 84.63(a)(c)(d) and Subpart H, Section 84.82(a)(b)(c)(d)(h)(i), Volume 60, Number 110, June 8, 1995.

6.2. This test establishes the standard procedure for ensuring that:

84.63 Test requirements; general.

(a) Each respirator and respirator component shall when tested by the applicant and by the Institute, meet the applicable requirements set forth in subparts H through L of this part.

(c) In addition to the minimum requirements set forth in subparts H through L of this part, the Institute reserves the right to require, as a further condition of approval, any additional requirements deemed necessary to establish the quality, effectiveness, and safety of any respirator used as protection against hazardous atmospheres.

(d) Where it is determined after receipt of an application that additional requirements will be required for approval, the Institute will notify the applicant in writing of these additional requirements, and necessary examinations, inspections, or tests, stating generally the reasons for such requirements, examinations, inspections, or tests.

84.82. Gas pressure gauges; minimum requirements.

(a) Gas pressure gauges employed on compressed breathing gas containers shall be calibrated in pounds per square inch.

(b) Liquid-level gauges shall be calibrated in fractions of total container capacity, or in units of liquid volume.

(c) Gas pressure gauges other than those specified in paragraphs (a) and (b) of this section shall be calibrated in:

(1) Pounds per square inch, or

(2) In fractions of total container capacity, or

(3) Both in pounds per square inch and fractions of total container capacity.

(d) (1) Dial-indicating gauges shall be reliable to within  $\pm 5$  percent of full scale when tested both up and down the scale at each of 5 equal intervals.

(2) The full scale graduation of dial-indicating gauges shall not exceed 150 percent of the maximum rated cylinder pressures specified for the container in applicable Department of Transportation specifications or permits.

(h) Oxygen pressure gages shall have the words "Oxygen" and "Use No Oil" marked prominently on the gage.

(i) (1) Apparatus using compressed breathing gas, except apparatus classified for escape only, shall be equipped with gages visible to the wearer which indicate the remaining gas content in the container.

(2) Apparatus using liquefied breathing gas, except apparatus classified for escape only, shall be equipped with gages visible to the wearer which indicate the remaining liquid content in the container; however, where the liquid content cannot be rapidly vented, and the service time of the device begins immediately after filling, a timer shall be provided in place of a visible gage.

## 7. RECORDS\TEST SHEETS

7.1. All test data will be recorded on the ACCURACY OF GAUGE, SELF-CONTAINED BREATHING APPARATUS test data sheet.

7.2. All videotapes and photographs of the actual test being performed, or of the test equipment shall be maintained in the task file as part of the permanent record.

7.3. All equipment failing any portion of this test will be handled as follows;

7.3.1. If the failure occurs on a new certification application, or extension of approval application, send a test report to the RCT Leader and prepare the hardware for return to the manufacturer.

7.3.2. If the failure occurs on hardware examined under an Off-the-Shelf Audit the

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hardware will be examined by a technician and the RCT Leader for cause. All equipment failing any portion of this test may be sent to the manufacturer for examination and then returned to NIOSH. However, the hardware tested shall be held at the testing laboratory until authorized for release by the RCT Leader, or his designee, following the standard operating procedures outlined in Procedure for Scheduling, and Processing Post-Certification Product Audits, RB-SOP-0005-00.

## ACCURACY OF GAUGE, SELF-CONTAINED BREATHING APPARATUS

Project No. : \_\_\_\_\_ Date: \_\_\_\_\_

Company : \_\_\_\_\_

Respirator Type: \_\_\_\_\_

Reference: 42 CFR, Part 84, Subpart H, Section 84.82(a)(b)(c)(d)(h)(i) Requirements

**Requirement:** Gauges shall be reliable to within  $\pm 5\%$  of full scale when tested both up and down the scale of 5 equal intervals.

Procedure: A deadweight test is used.

GAGE TYPE: \_\_\_\_\_ GAGE NUMBER: \_\_\_\_\_

Results:

[illegible][illegible]

Gauge #3:	<u>Gauge Reading</u>	<u>Test Gauge Reading</u>	<u>Difference</u>

Comments:

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Test Engineer: \_\_\_\_\_ PASS \_\_\_\_\_ FAIL \_\_\_\_\_







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### Revision History

Revision	Date	Reason for Revision
1.0	11 February 2000	Historic document
1.1	20 September 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method