



# AEROSPACE RECOMMENDED PRACTICE

ARP7446™

REV. A

Issued 2019-03  
Revised 2024-05

Superseding ARP7446

## Vacuum Gauge Calibration

### RATIONALE

ARP7446A is the result of a Five-Year Review and update of this specification with corrections made to Place References of Chamber with a Tee or a Cross (see 5.1) and to Pump Down and Warm Up (see 5.2).

#### 1. SCOPE

##### 1.1 Purpose

This SAE Aerospace Recommended Practice (ARP) addresses the general procedure for the best practices for minimizing uncertainty when calibrating thermal conductivity and cold cathode vacuum gauges, which includes the vacuum sensor(s) and accompanying electronics necessary for a pressure measurement to be made. It also includes the best practices for an in-process verification where limitations make it impossible to follow the best practices for minimizing uncertainty.

Verifying the accuracy and operation of vacuum gauges is critical to ensure the maintenance of processes while under vacuum.

##### 1.2 Disclaimer

This document attempts to present the best possible practices for minimizing uncertainty while only utilizing the most basic equipment. This document does not seek to provide a definition for uncertainty, nor an uncertainty assessment for field verification.

This document does not address systems where explosive or condensing gases are used.

#### 2. REFERENCES

##### 2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

AS7766 Terms Used in Aerospace Metals Specifications

## 2.1.2 Other Publications

Joint Committee for Guides in Metrology. (2012). *International vocabulary of metrology - Basic and general concepts and associated terms (VIM)* (3rd ed.). (JCGM 200). Joint Committee for Guides in Metrology. <https://www.bipm.org/>.

## 2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report. They are for further reading on vacuum gauges, calibration, and general definition of terms.

O'Hanlon, J.F. (2003). *A user's guide to vacuum technology* (3rd ed.). John Wiley & Sons.

Joint Committee for Guides in Metrology. (2008). *Evaluation of measurement data - Guide to the expression of uncertainty in measurement*. (JCGM 100). Joint Committee for Guides in Metrology. <https://www.bipm.org/>.

Ellefson, R.E. and Miller, A.P. (2000). Recommended practice for calibrating vacuum gauges of the thermal conductivity type. *Journal of Vacuum Science & Technology A: Vacuum, Surfaces, and Films*, 18(5), 2568-2177.

Tilford, C.R. (1992). Pressure and vacuum measurements. In B.W. Rossiter and R.C. Baetzold (Eds.), *Physical Methods of Chemistry* (2nd ed., Vol. 6). John Wiley & Sons.

## 2.3 Definitions

Terms used in AMS are defined in AS7766 and as follows.

2.3.1 Definitions from JCGM 200 *International Vocabulary of Metrology - Basic and General Concepts and Associated Terms (VIM)* (see 2.1.2).

### 2.3.1.1 REFERENCE STANDARD

Measurement standard designated for the calibration of other measurement standards for quantities of a given kind in a given organization or at a given location.

### 2.3.1.2 VERIFICATION

Provision of objective evidence that a given item fulfills specified requirements. This does not require traceability to national standards and does not require a certificate of calibration.

### 2.3.1.3 CALIBRATION

Operation that, under specified conditions:

2.3.1.3.1 Establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties.

2.3.1.3.2 Uses this information to establish a relation for obtaining a measurement result from an indication.

2.3.1.3.3 Requires traceability to national standards and may require a certificate of calibration.