

SURFACE VEHICLE INFORMATION REPORT

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(R) GUIDE TO MANIFOLD ABSOLUTE PRESSURE TRANSDUCER REPRESENTATIVE SPECIFICATION

Foreword—This document has been made to comply with the SAE Technical Standards Board format. This includes the renumbering of some sections, i.e., Section 2 is the Reference Section and Section 3 is Definitions. All other sections have been renumbered.

This document is intended as a guide for technical personnel of both using and supplier firms whose duties include specifying, calibrating, testing, developing, or demonstrating the performance characteristics of Manifold Absolute Pressure (MAP) transducers. By basing users' specifications as well as suppliers' technical advertising and reference literature on this document, or by referencing portions thereof, as applicable, a clear understanding of the users' needs and of the transducers' performance capabilities will be provided. Adhering to the specification outline, terminology, and procedures shown will result in simple, complete specifications; it will also reduce design time, procurement lead time, and labor, as well as material costs.

This guide is also intended for use as a general example for specifying other types of transducers.

The MAP Transducer Representative Specification is referenced to and dependent upon SAE J1346.

1. Scope—This guide is intended to cover specifications applicable to MAP transducers. It is also applicable to transducers such as Barometric (Ambient) Absolute Pressure transducers, Manifold Vacuum transducers, and similar pressure transducers used in automotive systems. Although this guide is oriented towards active devices (those using internal signal conditioning), it can be applied to passive devices with minor modifications.

1.1 Values—The guide is intended to be general in nature. Specific values for performance data are not included in order to maintain generality. Exemplary values are contained in the Appendix in an attempt to clarify the text. The SAE does not imply any recommendations regarding these values.

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2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1346—Guide to Manifold Absolute Pressure Transducer Representative Test Method
 SAE J1113-1—Electromagnetic Compatibility Measurement Procedures and Limits for Vehicle Components (Except Aircraft) (60 Hz to 18 GHz)
 SAE J1113-4—Immunity to Radiated Electric Fields—Bulk Current Injection (BCI) Method
 SAE J1113-11—Immunity to Conducted Transients on Power Leads
 SAE J1113-12—Electrical Interference by Conduction and Coupling—Coupling Clamp
 SAE J1113-13—Electromagnetic Compatibility Measurement Procedure for Vehicle Components—Part 13—Immunity to Electrostatic Discharge
 SAE J1113-21—Road Vehicles—Electrical Disturbances by Narrowband Radiated Electromagnetic Energy—Component Test Methods Part 21—Absorber-Lined Chamber
 SAE J1113-22—Electromagnetic Compatibility Measurement Procedure for Vehicle Components—Part 22—Immunity to Radiated Magnetic Fields from Power Lines
 SAE J1113-23—Electromagnetic Compatibility Measurement Procedure for Vehicle Components—Immunity to Radiated Electromagnetic Fields, 10 kHz to 200 MHz, Strip Line Method
 SAE J1113-25—Electromagnetic Compatibility Measurement Procedure for Vehicle Components—Immunity to Radiated Electromagnetic Fields, 10 kHz to 500 MHz—Tri-Plate Line Method
 SAE J1113-27—Electromagnetic Compatibility Measurements Procedure for Vehicle Components—Part 27—Immunity to Radiated Electromagnetic Fields (Reverberation Method)
 SAE J1113-41—Limits and Methods of Measurement of Radio Disturbance Characteristics of Components and Modules for the Protection of Receivers used on Board Vehicles
 SAE J1113-42—Electromagnetic Compatibility—Component Test Procedure—Part 42—Conducted Transient Emissions

3. Definitions

3.1 Failure—Failure of the Manifold Absolute Pressure sensor is the inability of the part to provide the specified function within the specified tolerances when properly installed in the specified environment, including all interfaces, for a continuous period of time equal to or greater than 10 s.

4. Specification Manifold Absolute Pressure Transducer

4.1 Operating Pressure Range—The operating pressure range is from $a - b$ kPa exclusive of abnormal pressure excursions. (All pressures in this document are given an absolute pressure.)

4.2 Electrical

4.2.1 POWER SUPPLY VOLTAGE—The normal operating supply voltage is $c \pm d$ VDC.

4.2.2 REFERENCE VOLTAGE—The nominal reference voltage is $e \pm f$ VDC.

4.2.3 OVERVOLTAGE PROTECTION

- a. EITHER—The supplied voltage is free from transients and voltage reversals.
- b. OR—Devices must survive the following without degradation of performance.
- c. LIST—(The list shall contain a short description, the name and number of times it may be encountered with reference to a figure showing voltage versus time. A recommended test circuit should be included if available.)

4.2.4 CURRENT DRAW

4.2.4.1 *Power Supply Current*—Maximum allowable current draw shall be h mA.

4.2.5 TRANSDUCER INPUT/OUTPUT FUNCTIONAL RELATIONSHIP

NOTE—Y may be in units of volts, ohms, henries, farads, hertz, seconds, etc.

- a. EITHER—The output parameter, Y_o , shall correspond to Equation 1:

$$Y_o = AP + B \quad (\text{Eq. 1})$$

where:

P is the pressure in kilopascals

A is i Y units/kPa

B is j Y units

- b. OR—The output parameter, Y_o , shall correspond to Equation 2:

$$Y_o = V_r(AP + B) \quad (\text{Eq. 2})$$

where:

P is the pressure in kilopascals

V_r is either the power supply voltage, or the reference voltage

A is k Y/volt-kPa

B is $/Y/volt$

4.2.5.1 Sensors which exhibit a nonlinear input-output relationship shall be specified in a similar manner as determined by the purchaser. Where possible, a power series expression is preferred.

4.2.6 OUTPUT LOAD—The transducer must meet the accuracy requirements while driving a load of $m\Omega$ returned to the n supply, or as otherwise specified.

4.2.7 OUTPUT PARAMETER RANGE—The maximum and minimum output parameter range over the full required pressure range (and supply voltage range) are from o X– p X units (see 4.2.5 –Y units).

4.2.8 OUTPUT ERROR—The allowable output error will be expressed as an equivalent change in the measurand and will be within the limits shown in Figures 2 and 3. The error limits shown in the figures include all sources of error. (The figures shall show error in kPa versus applied pressure.)

4.2.9 WARM-UP TIME—The transducer shall be operating within the allowable error band no more than q s after the application of power.

4.2.10 OUTPUT NOISE AND RIPPLE—The output ripple shall not exceed that shown in Figure 3. (The figure shall show allowable output peak-to-peak ripple versus frequency.) The output noise shall be as specified by the purchaser.