

Submitted for recognition as an American National Standard

SUPERCHARGER TESTING STANDARD

Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board format.

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1. **Scope**—This test document is applicable to all superchargers not requiring fuel to be added to the inlet air prior to the supercharger. This SAE Standard only applies to bench testing. Any maximum speed, temperature, and pressure ratios supplied by the manufacturer should be for this use only and may not apply to applications of firing engines. This document has been adopted by SAE to specify:

- a. A standard basis for supercharger efficiency rating
- b. Reference inlet air supply test conditions
- c. A method for correcting observed efficiency to reference conditions
- d. A method for presenting these results in an accurate and usable way
- e. A method to compare superchargers without the affects of engine dynamics and intercooling

2. **References**

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

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

SAE J1349—Engine Power Test Code—Spark Ignition and Compression Ignition—Net Power Rating

SAE J1826—Turbocharger Gas Stand Test Code

SAE J1995—Engine Power Test Code—Spark Ignition and Compression Ignition—Gross Power Rating

3. **Definitions**—This section contains the definitions of key terms used to describe the supercharger performance test.

3.1 **Rated Speed**—The speed and pressure determined by the manufacturer at which the supercharger efficiency is the greatest.

3.2 **Fully Equipped Supercharger**—A fully equipped supercharger is a supercharger with all the accessories necessary to perform its basic function. These include balance shafts, integral oil pumps but not auxiliary oil pumps, nor variable pulleys. The purpose is to find the maximum performance of the supercharger excluding all external accessories. The effect of the accessories should be noted in the presentation of the results.

3.3 **Reference Test Conditions**—The standard or reference supercharger inlet air supply (atmospheric) to which all performance corrections are made.

- 3.4 **Supercharger Speed**—The revolutions per minute of the supercharger read from the pulley or input shaft of the supercharger.
- 3.5 **Positive Displacement Supercharger**—A positive displacement supercharger is one that for every revolution a set volume of air is displaced.
- 3.6 **Restrictor**—The system used to control pressure ratio (i.e., globe valve, V-ball) that does not interact with the performance of the supercharger.
- 3.7 **Surge**—Surge is severe air flow reversal characterized by the sharp increase in supercharger inlet air temperature (per 6.3.3) and rapid pressure fluctuations. This does not apply to positive displacement superchargers.
- 3.8 **Pressure Ratio**—Pressure differential across the supercharger.
- 4. **Reference Test Conditions and Corrections**—This section contains reference air supply test conditions and specifications, recommended test ranges, and applicability of the correction procedures.
 - 4.1 **Reference Atmospheric Conditions**—Table 1 consists of the reference atmospheric conditions and test ranges for which the correction procedures are valid:

TABLE 1—REFERENCE ATMOSPHERIC CONDITIONS

| | Standard Condition | Recommended Test Range Limits |
|--------------------------------------|--------------------|-------------------------------|
| Inlet Air Supply Pressure (absolute) | 100 kPa | — |
| Dry Air Pressure (absolute) | 99 kPa | 90 to 105 kPa |
| Inlet Air Supply Temperature | 25 °C | 15 to 35 °C |

- 4.2 **Performance Corrections**—Nonpositive displacement superchargers are affected by the density of the inlet air. Therefore, in order to provide a common basis of comparison, it may be necessary to apply correction factors to the observed flow to account for differences between reference air conditions and those at which the test data were acquired.
 - 4.2.1 All flow correction procedures for atmospheric air are based on the conditions of the supercharger inlet air supply immediately prior to the entrance into the supercharger inlet system. This may be ambient (atmospheric) air or a laboratory air plenum that maintains air supply conditions within the range limits defined per 4.1.
 - 4.2.2 The magnitude of the air flow correction should not exceed 5% for the inlet air. If the correction factor exceeds these values, it shall be noted in accordance with 8.1.
- 5. **Laboratory and Supercharger Equipment**—This section contains a list of laboratory equipment used in the supercharger performance test.
 - 5.1 **Laboratory Equipment**—The following standard laboratory test equipment is required for the supercharger performance test.
 - 5.1.1 **INLET SYSTEM**—The inlet system begins at the point where air enters from the supply source (atmosphere) and ends at the entrance to the supercharger. The inlet system should be designed to provide the least amount of restriction possible. For part throttle testing, a throttle may be added to the inlet system and it must be noted in the data. The diameter of this pipe should meet the specifications in Table 2: