Turbocharger Nomenclature and Terminology—SAE J922 NOV79

SAE Recommended Practice
Completely Revised November 1979

THIS IS A PREPRINT WHICH IS SUBJECT TO REVISIONS AND CORRECTIONS. THE FINAL VERSION WILL APPEAR IN THE 1981 EDITION OF THE SAE HANDBOOK.

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

LAND SEA AIR SPACE

PREPRINT

TURBOCHARGER NOMENCLATURE AND ϕTERMINOLOGY—SAE J922 NOV79

SAE Recommended Practice

Report of the Engine Committee, approved July 1965, completely revised November 1979.

This SAE Recommended Practice was prepared to standardize terminology, definition of terms, and methods of performance presentation in order to facilitate clearer understanding for engineering discussions, comparisons, and the preparation of technical papers.

1. Scope—This recommended practice applies to nomenclature of turbocharger parts and terminology of performance.

Modifying adjectives are omitted in some cases for the sake of simplicity. However, it is considered good practice to use such adjectives when they add to clarity and understanding.

2. Nomenclature

2.1 **Turbocharger**—A centrifugal air pump driven by engine exhaust gases and used to supply engine charge air at flows and pressures above atmospheric.

2.2 **Compressor**—The component of the turbocharger that pumps air to the engine.

2.3 **Compressor Wheel**—The rotating impeller component of the compressor.

2.4 **Diffuser**—A stationary component of the compressor which converts the velocity energy of the impeller discharge air to potential energy as indicated by the pressure.

2.5 **Compressor Housing**—The housing that encloses the compressor, directs the atmospheric air through the impeller, is a portion of the diffuser, collects the air, and directs it to the engine.

2.6 **Turbine**—The component of the turbocharger that converts exhaust gas flow energy to shaft rotational work.

2.7 **Turbine Wheel**—The rotating component of the turbine.

2.8 **Turbine Nozzle**—An arrangement of stationary or movable blades for directing or increasing velocity of the exhaust gas to the turbine wheel.

2.9 **Clockwise and Counterclockwise Rotation**—Direction of shaft rotation as viewed from the compressor end.

2.10 **Turbine Housing**—The housing (usually volute shaped) that encloses the turbine wheel (and nozzle if used), controls the engine exhaust gas flow through the turbine wheel via the turbine nozzle and/or internal contouring, and discharges the exhaust gas for disposal.

2.11 **Vaneless Turbine Housing**—A volute shaped turbine housing that controls the engine exhaust gas flow through the turbine wheel via internal contouring only (without the use of a turbine nozzle).

3. Performance Terminology

$$\text{Compressor pressure ratio} = \frac{\text{Outlet air total absolute pressure}}{\text{Inlet air total absolute pressure}}$$

$$\text{Compressor air mass flow} = \text{kg/min (lb/min) of air mass flow through the compressor}$$

$$\text{Corrected compressor air mass flow} = \frac{\text{Compressor air mass flow}}{\dfrac{\sqrt{\dfrac{\text{Compressor inlet total absolute temperature}}{\text{Standard absolute temperature}^{1}}}}{\text{(Compressor inlet total absolute pressure/Standard pressure)}^{1}}}$$

$$\text{Corrected compressor speed} = \frac{\text{Compressor wheel rpm}}{\sqrt{\dfrac{\text{Compressor inlet total absolute temperature}}{\text{Standard absolute temperature}^{1}}}}$$

$$\text{Compressor efficiency} = \frac{\text{Isentropic total enthalpy rise across the compressor stage}}{\text{Actual total enthalpy rise across the compressor stage}}$$

4. Compressor Performance Graph—A plot of pressure ratio against mass flow with speed and efficiency as parameters. A typical example is shown in Fig. 1.

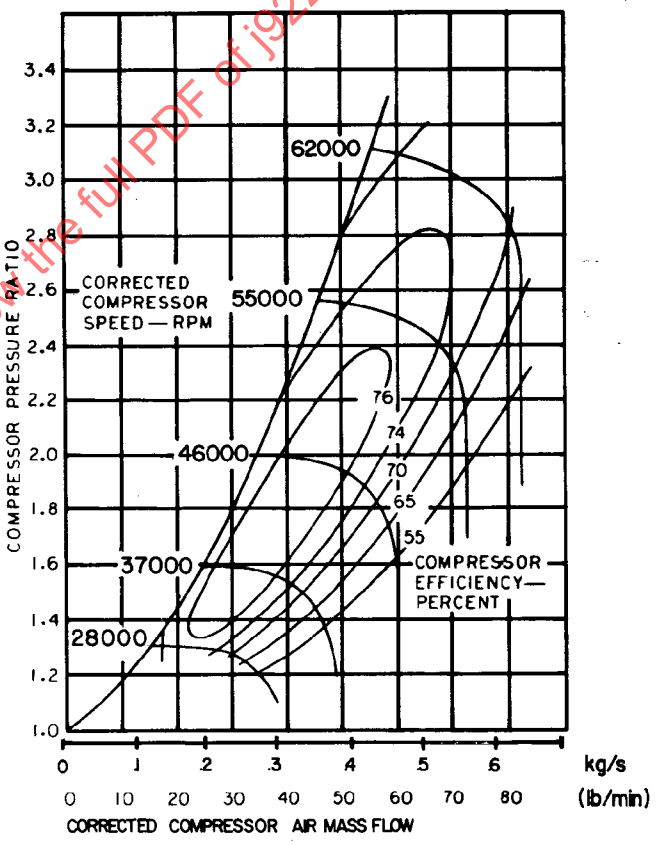

FIG. 1—TYPICAL TURBOCHARGER COMPRESSOR PERFORMANCE GRAPH

[1]Commonly used standards: SAE J816b (March, 1973), 300 K (540 R) and 99.22 kPa (29.38 in Hg); NASA, 288.3 K (519 R) and 101.05 kPa (29.92 in Hg). Some turbocharger manufacturers use 302.8 K (545 R) and 95.84 kPa (28.38 in Hg), which allows for 3.38 kPa (1 in Hg) air filter pressure drop.

The ϕ symbol is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.