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Engineering Standards for Clutches and Brakes

I. SAE STANDARDS

Fifteen of these standards for the year 2003 that pertain to brake or clutch components are briefly described in the remainder of this chapter. Other standards apply to brake line hoses, fluids for hydraulically activated brakes, brake cables, clutch flywheels, and so on.

Descriptions of these standards are arranged in the numerical order of the standards. This order differs from the coded order found in the *SAE Handbook*, wherein the first digits are listed in numerical order, followed by the second digits, and so on. In that system the order would be SAE J1079, SAE J1087, SAE J160, SAE 286, SAE J866.

Society of Automotive Engineers (SAE) standards may be purchased from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA, 15096-0001. All of them are collected in the *SAE Handbook*, which is also available for sale from the society. They are frequently updated to reflect current engineering practice and some, such as SAE J659, have been cancelled.

A. SAE J160

This seven-page standard, entitled *Dimensional Stability of Friction Materials When Exposed to Elevated Temperatures*, is to "establish a common laboratory method for determining the dimensional stability of friction materials when exposed to elevated thermal conditions." Dimensional changes in a

lining material may cause unintended contact in either clutches or brakes between mating surfaces, with the obvious possibility of serious consequences. This standard is to provide a specific measure of dimensional changes under well-defined conditions.

B. SAE J286

This five-page standard, entitled *SAE No. 2 Clutch Friction Test Machine Guidelines*, is to specify the requirements for a friction test machine to evaluate friction characteristics of wet friction clutch systems using automatic transmission fluids. It also outlines testing procedures to be employed.

C. SAE J373

This two-page standard, entitled *Housing Internal Dimensions for Single- and Two-Plate Spring-Loaded Clutches*, gives the minimum internal dimensions to provide recommended clearance for these clutches relative to SAE clutch numbers and to SAE flywheel housing numbers.

D. SAE J379

This four-page standard, entitled *Gogan Hardness of Brake Lining*, requires use of a commercially available Gogan Model 911 direct-reading hardness-testing machine or an equivalent to perform testing in which a shallow surface deformation induced by a penetrator of specified geometry serves as a quality check of a brake lining. It is to be a quality and processing check by a lining manufacturer for each thickness, configuration, and formulation. Loads for the scale symbols shown are given, along with the associated recommended ranges of Gogan numbers.

E. SAE J380

This three-page standard, entitled *Specific Gravity of Friction Material*, is also to serve as a quality check by providing another indicator of the consistency of the formulation and processing of friction materials. It describes the equipment to be used and the procedures to be followed. Acceptable range for each product is to be established by the manufacturer. See ASTM B 376 for a corresponding test for sintered metal powder friction materials.

F. SAE J621

This four-page standard, entitled *Industrial Power Take-Offs with Driving Ring-Type Overcenter Clutches*, includes a drawing of a driving ring-type overcenter clutch, along with a table of recommended dimensions for industrial power takeoffs. See SAE 1079 for related speed testing of these clutches.

G. SAE J661

This seven-page standard, entitled *Brake Lining Quality Test Procedure*, defines a uniform laboratory procedure for obtaining and recording friction and wear properties of brake lining material using a typical, commercially available, friction materials test machine as illustrated in the first two figures in the standard. Its intended uses are for quality control by a manufacturer and for lining evaluation by buyers of brake lining material. Grids for plotting the friction coefficient as a function of temperature for first fade, first recovery, second fade, second recovery, and wear are shown in the master form plot sheet on page 7.

H. SAE J662

This two-page standard, entitled *Brake Block Chamfer*, shows the chamfering in two figures, with appropriate instructions.

I. SAE J663

This two-page standard, entitled *Rivets for Brake Linings and Bolts for Brake Blocks*, is presented in three tables and three figures for rivet and bolt configurations and dimensions.

J. SAE J840

This ten-page standard, entitled *Test Procedures for Brake Shoe and Lining Bonds*, "covers equipment and procedures for qualification of bonded or integrally molded drum and disc shoe and lining assemblies." It includes bonded and molded shear test procedures and related equipment, complete with drawings.

K. SAE J866

This two-page standard, entitled *Friction Coefficient Identification System for Brake Linings*, gives the code letters for friction coefficient ranges from below 0.15 to over 0.55. It scheduled to be withdrawn immediately upon adoption of standards SAE 1802 and SAE 2430.

L. SAE J1087

This seven-page standard, entitled *One-Way Clutches—Nomenclature and Terminology*, with eight figures, is "intended to establish common nomenclature and terminology for automotive transmission one-way clutches." This terminology also applies to one-way clutches for other applications, such as jet engine and turbine starters.

M. SAE J1079

This two-page standard, entitled *Overcenter Clutch Spin Test Procedure*, sets forth a test procedure either to find the rotational velocity at which a driving ring type of overcenter clutch will burst or to verify that it will not burst at a specified speed. The required test equipment is described in SAE J1240. See SAE J621 for a description and figure of a driving ring-type overcenter clutch.

N. SAE J1499

This four-page standard, entitled *Band Friction Test Machine (SAE) Test Procedure*, refers to a SAE band friction test machine and gives the test procedure to be followed. The band friction test machine involved is neither shown nor described in this standard.

O. SAE J1646

This 18-page standard, entitled *Glossary of Terms—Lubricated Friction Systems*, contains graphs, definitions, and equations related to these terms as used in the testing automatic transmission clutch plates, band brakes, and other friction systems that operate in a fluid environment. Terms and graphs used to present test results are also described and defined.

II. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

The American National Standards Institute, whose acronym is ANSI, collects and compiles standards from between 60 and 70 professional societies (The number depends upon whether different committees within an organization are counted separately) in the United States and also cooperates with international standards organizations. Many of these standards include the acronym of the authoring organization, and many, but not all, of these standards are sold to users through its subsidiary organization, the National Standards System Network, whose Web address is www.nssn.org.

ANSI itself appears to have authored some of these standards, such as ANSI B11.3—2002, Machine Tools—Safety Requirements for Power Press Brakes.

III. OTHER STANDARDS ORGANIZATIONS

Notice that some of the acronyms for the following organizations may not represent the initials of that organization. For example, the ISO standards

from the International Organization for Standardization are published in three languages: French, English, and Russian. The order of the majuscules ISO in its acronym does not correspond to the order of the leading characters in any of these three languages.

Australia: Standards Australia (SAA).
Canada: Standards Council of Canada (SCC).
Europe: European Committee for Standardization (CEN)
Finland: Finnish Standards Association (SFS).
France: Association Francaise de Normalisation (AFNOR).
Germany: Deutsches Institut für Normung (DIN).
Italy: Eute Nazionale Italiano di Unificazione (UNI).
Japan: Japanese Industrial Standards (JIS).
Korea: Korean Standards Association (KSA).
Malaysia: Standards and Industrial Research of Malaysia (SIRIM).
Netherlands: Nederlands Normalisatie-Instituut (NEN).
Norway: Norwegian Standards Association (—)
Slovenia: Standards and Metrology Institute (SMIS).
Taiwan: Bureau of Standards and Metrology Institute (BSMI).
United States: Department of Defense (DoD—STD—), (MIL—).

A. Selected Standards from these Other Organizations

The titles of the following standards were copied from the NSSN Web site as a partial indication of the topics and applications considered. At this time of this writing, the standards listed by NSSN may be found by going to www.ossn.org, where a left-click of a computer mouse on the words *Search for Standards*, which are directly under the words www.NSSN.ORG at the top left of the screen, will call a search form to the screen. Entering the word *clutch* in the *Find By Title Word* block and leaving all other blocks blank will produce the name of all of the standards available to NSSN that have the word *clutch* in the title. A left click on the document number of a particular standard will then yield a screen with instructions for obtaining a copy of that standard.

JIS D 4421:1996: Method of Hardness Test for Brake Linings, Pads and Clutch Facings for Automobiles.
JIS D 0152:1997: Clutches and Brakes—Vocabulary.
ASME B5.55M: Specification and Performance Standard, Power Press Brakes R(2002).
BSMI B2004400: Hand Brakes for Bicycles.
BSMI B4003700: Axles with Brakes of Trailer for Power Tiller.

BSMI B7005800: Method of Test for the Rear Brakes of Bicycles.
BSMI D3010900: Method of Test for Air Brakes of Automobiles.
CEN EN12622: Safety of Machine Tools—Hydraulic Press Brakes.
CEN PREN 12622: Hydraulic Press Brakes—Safety.
CEN PREN 1292-2: Safety Requirements for Passenger Transportation by Rope—General Provisions—Part 2: Additional Requirements for Reversible Bicable Aerial Ropeways Without Carrier Truck Brakes.
DIN 11742: Agricultural Machinery: Internal Expanding Brakes for Trailers, Dimensions.
DIN 154332-2: Power Transmission Engineering: Disc Brakes, Brake Linings.
DIN 15435-2: Power Transmission Engineering: Drum Brakes, Brake Shoes.
DIN 15435-2: Power Transmission Engineering: Drum Brakes, Brake Linings.
DIN 22261-4: Excavators, Spreaders and Auxiliary Equipment in Opencast Lignite Mines—Part 4: Hoisting Winch Brakes.
DIN 22261-5: Excavators, Spreaders and Auxiliary Equipment in Opencast Lignite Mines—Part 5: Slewing Brakes and Overload Protecting Devices.
DIN 25108: Suburban Railways: Interface and Outline Dimensions for Magnetic Track Brakes.
DIN 27205-4: State of Railway Vehicles—Brakes—Part 4: Non-ventilated Axle-Mounted Brake Discs.
DIN 27205-5: State of Railway Vehicles—Brakes—Part 5: Wheel-Mounted Brake Discs.
ISO 8710:1995: Motorcycles—Brakes and Braking Devices—Test and Measurement Methods.
ISO 8709:1995: Mopeds—Brakes and Braking Devices—Test and Measurement Methods.
ISO 7176-3:2003: Wheelchairs—Part 3: Determination of Effectiveness of Brakes.
KSA B4045: Mechanical Multiple-Disc Clutches (Wet Type).
KSA B4080: Mechanical Multiple-Disc Clutches (Wet Type).
KSA B4081: Oil Hydraulic Multiple-Disc Clutches (Wet Type).
KSA B4082: Electromagnetic Multiple-Disc Clutches (Wet Type).
DoD-STD-2144 NOT 2: Induction Clutches, Low-Magnetic-Field Design of.
MIL-C-18087A: Clutches for Propulsion Units and Auxiliary Machinery, Naval Shipboard.