

ASTM D2000 Test Standard Explained

Most specifications for rubber compounds are based on ASTM D 2000 (Standard Classification for Rubber Products in Automotive Application).

Specification SAE J200 (Classification System for Rubber Products) is almost identical to ASTM D 2000.

An example of how to read a line call is shown below. We have used our general purpose NBR (N70) for this particular example.

ASTM D2000-12 M2BG714 B14 EA14 EF11 EF21 EO14 EO34 F16 Z1= A14

This indicates the revision year of the specification to which the line call refers

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The "M" denotes that units of measure used in test results will be in International System of Units (SI). They will be in metric units e.g. degrees Centigrade instead of Fahrenheit, mega Pascals instead of psi, etc.

If M is not shown then Imperial units of measure are to be assumed.

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This is the Grade number of the material, often specified when the basic requirements (Grade 1) do not sufficiently cover the desired properties of a given material. Designating a grade other than 1 allows for the addition of suffix requirements. .

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ASTM D2000-12 M2 **BG** 714 B14 EA14 EF11 EF21 EO14 EO34 F16 Z1= A14

This refers to the type and class of materials - the most common polymers used are detailed below.

MATERIAL DESIGNATION (TYPE & CLASS)	TYPE OF POLYMER MOST OFTEN USED
AA	Natural Rubber, SBR, Butyl, EP, Polybutadiene , polyisoprene
AK	Polysulfides
BA	Ethylene propylene, high temp SBR, Butyl
BC	Chloroprene (Neoprene)
BE	Chloroprene (Neoprene)
BF	NBR
BG	NBR, Urethane
BK	NBR
CA	Ethylene propylene
CE	Chlorosulfonated polyethylene (Hypalon)
CH	NBR, Epichlorohydrin (Hydrin)
DA	Ethylene propylene
DE	CM, CSM
DF	Polyacrylic (butyl-acrylate type)
DH	Polyacrylic polymers, HNBR
EE	Ethylene Acrylic, AEM, Vamac®
EH	Polyacrylate ACM
EK	FZ
FC	Silicone (high strength)
FE	Silicone
FK	Fluorosilicone
GE	Silicone
HK	Fluorocarbon, Viton®, Fluorel®
KK	Perfluoroelastomers

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ASTM D2000-12 M2B G714 B14 EA14 EF11 EF21 EO14 EO34 F16 Z1= A14

This refers to the type of material, and is used to classify materials by temperature resistance. ASTM D2000 stipulates rubber materials must meet the following requirements after 70 hours of heat aging at various temperatures, according to type:

1. Change in tensile strength: $\pm 30\%$
2. Change in hardness: -50% max
3. Change in hardness: ± 15 points

The test temperatures by type are as follows:

TYPE	TEST TEMP, °C
A	70
B	100
C	125
D	150
E	175
F	200
G	225
H	250
J	275
K	300

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This is the class of material. Class is used to differentiate materials on the basis of resistance to swelling in IRM No. 903 Oil, after 70 hours at the temperatures per the immediately preceding table. However, a maximum of 150°C has been established, which is the limit of stability of the test oil. The maximum allowable volume swell by class is set forth in the table below:

CLASS	MAX. SWELL, %
A	No Requirement
B	140
C	120
D	100
E	80
F	60
G	40
H	30
J	20
K	10

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Durometer hardness and tensile strength are defined by a three-digit number. In the above example, 714, the "7" denotes a material durometer hardness, in A units, of 70 ± 5 . The "14" means that the tensile strength must be at least 14 mega Pascals or 2031psi.

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The remainder of the specification consists of suffix requirements. These are specified when the basic requirements as detailed in ASTM D 2000 for a particular type and class of material are not sufficient to achieve the desired properties in the finished product. Suffix requirements always consist of one, or two alpha and numeric characters. The definitions are explained in the following table:

SUFFIX	REQUIRED TEST
A	Heat Resistance
B	Compression Set
C	Ozone or Weather Resistance
D	Compression-Deflection Resistance
EA	Water Resistance
EF	Fuel Resistance
EO	Oil and Lubricant Resistance
F	Low Temperature Resistance
G	Tear Resistance
H	Flex Resistance
J	Abrasion Resistance
K	Adhesion
M	flammability Resistance
N	Impact Resistance
P	Staining Resistance
R	Resilience

When there is a special requirement not covered by the tests in the tables above, they are designated as "Z" requirements. They are user defined, should always be clearly specified, and agreed upon by the customer and manufacturer in advance.

The numeric characters in suffix requirements serve two purposes. The first number specifies the duration of the test, and the test method to be used. The second number indicates the temperature at which the test is to be carried out. In the example, "B14" means that the compression set test must be completed using Test Method D 395 for a period of 22 hours. The test temperature is 100°C. For a complete listing of the meaning of numeric characters in ASTM specifications, please consult Tables 4 and 5 in ASTM D 2000.

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With the exception of type / class FC, FE, FK, and GE, all materials are assumed to be black. Any change in colour of a rubber material almost always has an effect on its physical properties, and the same performance cannot always be obtained. It is also important that suffix requirements are only specified when needed to achieve the desired properties in the end product. It is not necessary to specify all available suffix requirements for a given grade number.



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