

# ASTM D2000 Specifications Broken Down

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ASTM D2000, "Standard Classification for Rubber Products in Automotive Applications", is identical to a second standard, SAE J200, "Classification System for Rubber Products". Once the fundamentals are broken down, ASTM D2000 is easy to understand.

Line call outs include the document number (D 2000), the revision year, the prefix letter "M", the grade number, type and class designation, the hardness and tensile strength, and the suffix requirements, if any.

#### Revision Year:

ASTM D 2000-04 M2BG714 B14 EA14 EF11 EF31 EO14 EO34 F17

This is the year that the standard was last revised; in this case 2004.

#### Units of Measure:

ASTM D 2000-04 M2BG714 B14 EA14 EF11 EF31 EO14 EO34 F17

The "M" represents the unit of measure and in this case signifies that metric units will be used. For example, Centigrade instead of Fahrenheit and mega Pascals instead of psi. If no "M" is present, then English units of measure are to be assumed, although this is seldomly used.

#### Material Grade:

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In the event the basic requirements (Grade 1) do not sufficiently cover the desired properties, other grades will be specified here.

#### Material Type:

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This letter represents the type of material. Materials are classified by temperature resistance. ASTM D2000 requires that all rubber materials meet the below requirements after 70 hours of heat aging at various temperatures depending on the material selected.

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

The test temperature chart is below for reference:

Type	Test Temp C° Degree
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 based on resistance to swelling in IRM No. 903 Oil after 70 hours at the temperatures below.

Type	Max. Swll, %
A	No Requirement
B	140
C	120
D	100
E	80
F	60
G	43
H	30
J	20
K	100

The reference chart below shows which polymers are used with a corresponding Type and Class.

Classification System D2000-SAE J200 Material Designation (Type and Class)	Type of Polymer Most Often Used
AA	Natural rubber, reclaimed rubber, SBR, butyl, EP polybutadiene, polyisoprene
AK	Polysulfides
BA	Ethylene propylene, high-temperature SBR and butyl compounds
BC	Chloroprene polymers (neoprene), cm
BE	Chloroprene polymers (neoprene), cm
BF	NBR polymers
BG	NBR polymers, urethanes
BK	NBR
CA	Ethylene propylene
CE	Chlorosulfonated polyethylene (Hypalon), cm
CH	NBR polymers, epichlorohydrin polymers
DA	Ethylene propylene polymers
DE	CM, CSM
DF	Polyacrylic (butyl-acrylate type)
DH	Polyacrylic polymers, HNBR
EE	AEM
EH	ACM
EK	FZ
FC	Silicones (high strength)
FE	Silicones
FK	Fluorinated silicones
GE	Silicones
HK	Fluorinated elastomers (Viton, Fluorel, etc.)
KK	Perfluoro elastomers

**Material Hardness:**

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The highlighted digit, in this case 7, specifies the hardness of the material (i.e. Shore A durometer). The 7 would represent 70 Durometer with a tolerance of ± 5.

**Material Tensile Strength:**

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This digit represents the tensile strength. Remember the reference above regarding the Unit of Measure being “M” for metric. This equates to 14 MPa. (To convert to psi, simply multiply the MPa number by 145) EX: 14 MPa = 203 PSI

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The remaining suffix requirements are specified when the basic requirements set forth in the standard ASTM D2000 call-out of a particular type and class of material are not sufficient. Suffix requirements always consist of one or two of both alpha and numeric characters. The meanings of the alpha characters are below:

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

Special requirements can be added using a “Z” call-out. This is typically done after the last call-out and number. Below are a few examples that we have seen over time:

Z1 – A14 Use Grade 4 requirements  
(Since grade 2 does not have A14 call-outs, this designates which to use)

Z2 – Color Blue  
(Specific Color is required for a project)

Z3 – FDA 21 CFR 177.2600 complaint  
(Regulatory requirements need to be met)

The various call-outs can be used to meet specific needs of an application. They can be used to specifically assure a given polymer time such as, Z1- polymer EPDM, or to assure a specific grade such as Z1 - Medical Silicone.

Even without additional call-outs, using the ASTM D2000 will give basic requirements. Typically, it is a minimum physical requirement for a heat age, oil age (depending on polymer), and a compression set test. Solely using these minimum call-outs can help put controls in place to assure quality compounds are used — leading to a more robust part. An example would be ASTM D2000 M2BG710.