

## Decoding ASTM D2000 (SAE J200)

The most common specification used for defining rubber materials is ASTM D2000 “Standard Classification System for Rubber Products in Automotive Applications”. Although the standard refers to automotive applications, it is used across all industries for specifying elastomer requirements including natural and synthetic rubber compounds.

This classification provides a universal way to designate a commercially available rubber material, according to its physical properties and the extent of additional test requirements and the description of these tests by the use of alpha numeric “line callouts”.

An example might be:

<b>ASTM D2000</b>	<b>M 2</b>	<b>B C</b>	<b>5 17</b>	<b>A14</b>	<b>EO34</b>
↑	↑ ↑	↑ ↑	↑ ↑	↑	↑
a	b c	d e	f g	h1	h2

A “line call-out” contains [values in parentheses demonstrates specification above]:

- the specification name;
- the prefix letter **M** if the classification system is based on SI units. If there is no prefix, the “inch-pound” unit system is to be used;
- the grade number, which is either ‘1’ if the basic requirements apply or grades higher than ‘1’ if there is a deviation or additional requirements;
- the material designation based on **Type** (heat resistance);
- the material designation based on **Class** (oil resistance);
- the hardness in shore A divided by 10;
- minimum tensile strength in MPa (or psi divided by 100 for inch-pound system);
- additional suffix requirements indicating additional requirements.

For the example above:

**M** = specification is in SI units.

**2** = Grade 2.

**B** = Material with temperature resistance to 100°C.

**C** = Material with no greater than 120% volume swell when exposed to IRM 903 oil for 70 hours.

**5** = 50 shore A hardness (typically ±5 shore A).

**17** = 17 MPa minimum tensile strength

**A14** = ‘A’ denotes “heat resistance”; ‘1’ indicates “test method D 573” which shall be applied for 70 hours; ‘4’ indicates a test temperature of 100°C. Additionally, for grade 2, the change in durometer hardness shall be no greater than +15 points, the change in tensile strength shall be no greater than –15% and the change in ultimate elongation shall be no greater than –40%.

**EO34** = ‘EO’ denotes “fluid resistance in oils and lubricants”; ‘3’ indicates that “test method D 471”, which uses IRM 903 Oil for 70 hours; ‘4’ indicates a test temperature of 100°C. Additionally, for grade 2, the change in volume shall be no greater than 5% and no less than 3%.

The tables below will help you to decode the Type (heat resistance) and Class (oil resistance).

**Table 1: Heat Resistance**

Type	Test Temperature
A	70°C (158°F)
B	100°C (212°F)
C	125°C (257°F)
D	150°C (302°F)
E	175°C (347°F)
F	200°C (392°F)
G	225°C (437°F)
H	250°C (482°F)
J	275°C (527°F)
K	300°C (572°F)

**Table 2: Oil Resistance**

Class	Volume Swell, max %
A	No requirement
B	140
C	120
D	100
E	80
F	60
G	40
H	30
J	20
K	10

The following tables will help identify a particular rubber compound appropriate for the specific Type and Class and identify the suffix letters.

**Table 3: Rubber Compounds**

Type & Class	Suitable Elastomer
AA	Natural rubber, styrene butadiene (SBR), butyl
AK	Polysulfides
BA	Ethylene propylene
BC	Polychloroprene (Neoprene®)
BE	Polychloroprene (Neoprene®)
BF	Nitrile (NBR)
BG	Nitrile (NBR), polyurethane
BK	Nitrile (NBR)
CA	Ethylene propylene
CE	Chlorosulfonated polyethylene (Hypalon®)
CH	Nitrile (NBR)
DA	Ethylene propylene
DE	CM, CSM
DF	Polyacrylate
DH	Polyacrylate
EE	Ethylene acrylate (AEM)
EF	Ethylene acrylate (Vamac®)
EH	Polyacrylate (ACM)
EK	Fluoroalkoxyphosphazene (FZ)
FC	Silicone
FE	Silicone
FK	Fluorosilicone
GE	Silicone
HK	Fluorinated elastomer (Viton®)
KK	Perfluoroelastomers

**Table 4: Suffix Codes**

Suffix Code	Meaning
A	Heat resistance
B	Compression set
C	Ozone resistance
D	Compression deflection resistance
EA	Fluid resistance (water)
EF	Fluid resistance (fuels)
EO	Fluid resistance (oils & lubricants)
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
Z	Special Requirements