

## ASTM D 2000 Standards

The most common material classification system used in O-ring specification is probably "Standard Classification System for Rubber Products in Automotive Applications." or ASTM D 2000. This system is designed to aid in the selection of practical rubber products for specific environments and provides a "line call-out" designation for the specification of elastomer seal materials.

### How to read an ASTM D 2000 Line Call-Out

#### Specification Revision

ASTM D2000-99 M 2 HK 7 14 A1-10, B38, C12, EF31, EO88, F15, Z1

This indicates the revision year of D2000 to which the line call-out makes reference.

#### Measurement Units

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If an M is present, metric units will be used for tensile strength, temperature, and tear strength (MPa, °C, and kN/m respectively). If no M is present, English units will be used (psi, °F, and ppi respectively).

#### Grade Number

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Indicates the level of test requirements to which a material may be subjected. For example, Grade 1 shows that only basic properties are required, while Grades 2-9 require additional testing criteria such as low temperature brittleness or special heat aging tests. In our example, we will be looking at a fluorocarbon material that must meet some or all Grade 2 requirements. Note that Grade Numbers may not be relevant to all material Types and Classes.

#### Type and Class

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The table shown below are the most common polymers used for type and class.

#### Classification System D 2000 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, 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	Chlorosulfinated polyethylene (Hypalon), cm
CH	NBR polymers, epichlorohydrin polymer
DA	Ethylene propylene polymers
DE	CM, CSM
DF	Polyacrylic (butyl-acrylate type)
DH	Polyacrylic polymers, HNBR



EE	AEM
EH	ACM
EK	FZ
FC	Silicone (high strength)
FE	Silicones
FK	Fluorinated silicones
GE	Silicones
HK	Fluorinated elastomers (Viton ®, Fluorel, etc.)
KK	Perfluoroelastomers

For each Type and Class, ASTM D 2000 includes a table giving all basic requirements, physical properties, and all suffix requirements.

### Hardness (Durometer)

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This number indicates durometer range in Shore A units (plus or minus 5 points). In our example, the material specified would possess a hardness of 70±5 durometer.

### Tensile Strength

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The next two digits indicate the material's minimum tensile strength. If measurements are in metric units, the digits show MPa. If measurements are in English units, the digits show psi and only the first two digits of that measurement are indicated. In our example (which is in metric units), the two tensile strength digits are "14" thus the minimum tensile strength required would be 14MPa. If this example were non-metric, this callout would be 20 (14 Mpa = 2031 psi).

The first six characters of a Line Call-Out give a lot of basic information about the type of elastomer required and its physical properties. Most specifications require more information to guarantee that the seal will meet the needs of the application.

### Additional Requirement Suffixes

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Suffixes appended to the Line Call-Out are letter and number combinations that indicate a material's test and performance criteria per the Grade number indicated. In our example, A1-10 indicates a heat resistance test. B38 indicates a compression set test. C12 indicates resistance to ozone. EF31 and EO88 indicate fluid resistance criteria. F15 indicates low temperature brittleness criteria. Z1 indicates a user-defined requirement as must be specified including test criteria. Refer to ASTM D 2000 for expanded suffix call-out details.

#### Suffix Letter Test Required

A	Heat Resistance
B	Compression Set
C	Ozone or Weather Resistance
D	Compression-Deflection Resistance
EA	Fluid Resistance (Aqueous)
EF	Fluid Resistance (Fuels)
EO	Fluid Resistance (Oils and 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 Any Special Requirement (Specified in Detail)