

Summary of the third F51 Standards TaskForce meeting for determining O-ring and seal standards

The group reviewed the following guideline

	Key Category 1	Key Category 2	Key Category 3	Key Category 4	Key Category 5
Type of Service	Wet (Water)	Wet (Other)	Vacuum	Plasma	Diffusion
Chemical Resistance	Generic Chemical Compound A	Generic Chemical Compound B	Generic Chemical Compound C	Generic Chemical Compound D	Generic Chemical Compound E
Compression Set	Value/Range A	Value/Range B	Value/Range C	Value/Range D	Value/Range E
Elongation % Allowed	Value/Range A	Value/Range B	Value/Range C	Value/Range D	Value/Range E
Shore Hardness	Value/Range A	Value/Range B	Value/Range C	Value/Range D	Value/Range E
Cross-sectional Profile/Shape (Round, D, Square, Oval, etc ..)	Round	D	Square	Oval	Custom
Fillers	Generic Ingredient A	Generic Ingredient B	Generic Ingredient C	Generic Ingredient D	Generic Ingredient E
Binders	Generic Ingredient A	Generic Ingredient B	Generic Ingredient C	Generic Ingredient D	Generic Ingredient E

The TaskForce discussed and defined the purpose and objectives of the above guideline. Objectives noted were:

1. Key codes should be created to define proper categories based on services, equipments, etc.
2. Elements such as "Static", "Dynamic", "Temperature", "Sizes", "Chemical Resistance", etc. shall be addressed as main features of the guidelines.

Also determined that the guidelines should be expanded into "Physical Properties", "Compositions", etc. Also proposed, was the possibility of creating different standards for o-rings, and bonded gates.

## Semiconductor Standard, Elastomer Specification

This standard was developed specifically for use in the Semiconductor Industry to address their unique requirements. This Standard is one of the most direct and simplest ways to define elastomer properties as they pertain to Semiconductor requirements.

This requirement will have a product definition callout that reads something like: 'SEMIXXXXX-2011 M2BG7014-A7-B4-Z2.' Although this can appear rather foreboding to those not technically informed on semiconductor seals and their properties, it is actually fairly simple to decipher. Using the aforementioned sample code, the individual elements of the standard are as follows:

### Specification Number

**SEMI-XXXXXX-2011 M2FK7014-A7-B4-Z2**

Semiconductor Equipment and Materials International XXXXXXX-2011 or just SEMI-XXXXXX

## Revision

**SEMI-XXXXXXX-2011** M2FK7014-A7-B4-Z2

Indicates the revision (year) of the Standard

## Units (Metric/English)

**SEMI-XXXXXXX-2011** M2FK7014-A7-B4-Z2

The 'M' indicates Metric units or 'E' indicates English measurements.

## Service

**SEMI-XXXXXXX-2011** M2FK7014-A7-B4-Z2

Service Numbers are used to indicate the type of service seen by the sealing components

1. Vacuum / Gas
2. Liquid

## Typical Type – Elastomer Chemical Group Associations

**SEMI-XXXXXXX-2011** M2FK7014-A7-B4-Z2

The standard does not directly specify elastomeric compounds or chemical groups (e.g. Neoprene, Buna-n, etc.). Rather, it sets forth Type criterion ("FK" in sample) that, in turn, narrow the field of options based on application requirements. However, for reference only, **SEMI-XXXXXXX** lists the following typical associations between Type designations and elastomer groups:

AA - Butyl (polybutadiene), SBR, (Polyisoprene) AK - Polysulfides  
BA - Butyl, EPDM (Ethylene Propylene)  
BC - Neoprene (Chloroprene)  
BE - Neoprene (Chloroprene)  
BF - Buna-N (Nitrile, NBR)  
BG - Buna-N (Nitrile, NBR), Urethanes  
BK - Buna-N (Nitrile, NBR)  
CA - EPDM (Ethylene Propylene)  
CE - Hypalon (Chlorosulfonated Polyethylene)  
CH - Buna-N (Nitrile, NBR), ECH (Epichlorohydrin)  
DA - Ethylene Propylene  
DF - Polyacrylate  
DH - Polyacrylate, HNBR  
EE - Vamac (Ethylene Acrylic, AEM)  
EH - Polyacrylate (ACM)  
EK - FZ (Polyphosphazene)  
FC - Silicone (high strength)  
FE - Silicone  
FK - Fluorosilicone  
GE - Silicone  
HK - Viton™ (Fluoroelastomers)  
KK – Perfluoroelastomers

## Hardness

**SEMI-XXXXXXXX-2011 M2FK7014- A7-B4-Z2**

Shore A Durometer; e.g. 70 in the example indicates 70 Shore A hardness. Ref: ASTM D2240

## Tensile Strength

**SEMI-XXXXXXXX-2011 M2FK7014-A7-B4-Z2**

For English measure: **SEMI-XXXXXXXX-2011 E2FK702013- A7-B4-Z2**

Stated in MPa (megapascals) or PSI (pounds per square inch), depending on whether Metric or English Units are indicated (see above). PSI can be converted to MPa by dividing by 145, or, conversely, MPa values can be multiplied by 145 to obtain PSI. Tensile strength in the sample is 14 MPa or 2,031 PSI. Ref: ASTM D412

## Suffix Requirements (Alpha)

**SEMI-XXXXXXXX-2011 M2FK7014-A7-B4-Z2**

Indicates criteria for various elements i.e. Temperature, Compression Set, Chemical Compatibility. Each element is cited by an alpha code (below) indicating a particular property followed by a numeric code that identifies specific performance criteria.

A = Heat Resistance; ref: ASTM D573

1 = 70°C / 158°F

2 = 100°C / 212°F

3 = 125°C / 257°F

4 = 150°C / 302°F

5 = 175°C / 347°F

6 = 200°C / 392°F

7 = 225°C / 437°F

8 = 250°C / 482°F

9 = 275°C / 527°F

10 = 300°C+ / 572°F+

B = Compression Set; ref: ASTM D395

1 =

2 =

3 =

4 =

5 =

C = Ozone or Weather Resistance; ref: ASTM D1171

1 =

2 =

3 =

4 =

E = Fluid Resistance (Aqueous); ref: ASTM D471

F = Low Temperature Resistance; ref: ASTM D2173

G = Tear Resistance

J = Abrasion Resistance

M = Flammability Resistance

Z = Special Requirements

Z1 = O<sub>2</sub> Plasma resistance

Z2 = NF<sub>3</sub> Plasma Resistance