

Fluid Sealing Association

STANDARD

FSA-PSJ-703-19
GUIDELINES FOR ELASTOMERS USED IN
PIPING SYSTEMS NON-METALLIC
EXPANSION JOINTS

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(supersedes 2011 edition)



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**FLUID SEALING ASSOCIATION STANDARD
FSA-PSJ-703-19**

**GUIDELINES FOR ELASTOMERS USED IN
PIPING SYSTEMS NON-METALLIC
EXPANSION JOINTS**

1. SCOPE:

1.1 Application

This guideline provides the typical properties of elastomers most frequently used for tube and cover compounds in the manufacture of piping expansion joints for a wide range of applications. Properties listed have shown to provide acceptable performance in various services. The Standard is not intended to limit or restrict the use of materials to those listed in this Standard. Other materials may also be suitable and future developments may provide other materials that also are suitable.

1.2 Safety

While the materials and methods described or referenced in this standard may involve the use of hazardous substances, this standard does not address the hazards that may be involved in such use. It is the sole responsibility of the user/tester to ensure familiarity with the safe and proper use of any hazardous materials and test procedures and to take the necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

2.1 *ASTM International:*

ASTM D-2000	Standard Classification System for Rubber Products in Automotive Applications
ASTM D-395	Test Method for Rubber Property – Compression Set
ASTM D-412	Rubber Properties in Tension
ASTM D-471	Rubber Property - Effect of Liquids
ASTM D-573	Rubber - Deterioration in an Air Oven
ASTM D-2240	Rubber Property - Durometer Hardness
ASTM D-297	Rubber Products - Chemical Analysis

3. SIGNIFICANCE AND USE

The Standard is based on ASTM International Standard D-2000-08 which classifies important properties of elastomers through designation of *types and classes*. This edition of the D-2000 remains the default subsequent to any revisions. Should these guidelines conflict with any specification for any of these elastomers the specification should take precedence.

4. LIST OF APPLICABLE ELASTOMERS AND THEIR PROPERTIES

FLUROELASTOMER (FKM)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M1HK706Z1Z2Z3Z4

Note - these values are based on Non-Post cured material

Details of Recommended Requirements:

GRADE = 1

DUROMETER – TYPE A = **70 ±5**

Z1 TENSILE STRENGTH - MINIMUM (MPa) = **6**
(Minimum Tensile Strength - psi = **870**)

Z2 ULTIMATE ELONGATION – MINIMUM = **225%**

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 250°C
Maximum Change in Hardness = ± **15 Points**
Maximum Change in Tensile Strength = **-30%**
Maximum Change in Ultimate Elongation = **-50%**

IRM 903 Oil TEST METHOD D471: 70 Hr @ 150°C
Maximum Volume Change = + **10%**

Z3 COMPRESSION SET TEST METHOD D395: 22 Hr @ 150°C (METHOD “B” SOLID DISCS)
Maximum Compression Set = **50%**

Z4 (SPECIAL REQUIREMENTS): Specific Gravity **1.75 – 1.90**

CHLOROPRENE (CR)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M3BC610 A14 Z1

Details of Recommended Requirements:

GRADE = 3

DUROMETER – TYPE A = **60 ±5**

TENSILE STRENGTH - MINIMUM (MPa) = **10**
(Minimum Tensile Strength - psi = **1450**)

ULTIMATE ELONGATION– MINIMUM = **350%**

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 100°C
Maximum Change in Hardness = ± **15 Points**
Maximum Change in Tensile Strength = **-15%**
Maximum Change in Ultimate Elongation = **-40%**

IRM 903 Oil TEST METHOD D471: 70 Hr @ 100°C
Maximum Volume Change = + **120%**

COMPRESSION SET TEST METHOD D395: 22 Hr @ 100°C (METHOD “B” SOLID DISCS)
Maximum Compression Set = **80%**

Z1 (SPECIAL REQUIREMENTS): Specific Gravity **1.30 – 1.50**

CHLOROSULFUNATED POLYETHYLENE (CSM)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M2CE610 A16 Z1

Details of Recommended Requirements:

GRADE = 2

DUROMETER – TYPE A = **60 ±10**

TENSILE STRENGTH - MINIMUM (MPa) = **10**
(Minimum Tensile Strength - psi = **1450**)

ULTIMATE ELONGATION– MINIMUM = **350%**

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 150°C
Maximum Change in Hardness = ± **20 Points**
Maximum Change in Tensile Strength = ±**30%**
Maximum Change in Ultimate Elongation = **-60%**

IRM 903 Oil TEST CONDITIONS: 70 Hr @ 125°C
Maximum Volume Change = + **80%**

COMPRESSION SET TEST METHOD D395: 22 Hr @ 70°C (METHOD “B” SOLID DISCS)
Maximum Compression Set = **80%**

Z1 (SPECIAL REQUIREMENTS): Specific Gravity **1.25 – 1.40**

EPDM (EP, EPDM)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M4CA610 A25 EA14 Z1

Details of Recommended Requirements:

GRADE = 4

DUROMETER – TYPE A = 60 ±10

TENSILE STRENGTH - MINIMUM (MPa) = 10
(Minimum Tensile Strength - psi = 1450)

ULTIMATE ELONGATION – MINIMUM = 250%

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 125°C
Maximum Change in Hardness = ± 10 Points
Maximum Change in Tensile Strength = - 20%
Maximum Change in Ultimate Elongation = - 40%

IRM 903 Oil TEST METHOD D471: No Requirements
Maximum Volume Change = No Requirements

COMPRESSION SET TEST METHOD D395: 22 Hr @ 100°C (METHOD “B” SOLID DISCS)
Maximum Compression Set = 60%

WATER RESISTANCE TEST METHOD D471: 70 Hr @ 100 °C
Volume Change % = ± 5

Z1 (SPECIAL REQUIREMENTS): Specific Gravity 1.00 – 1.20

BUTYL (HR)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M2AA608 A13 Z1

Details of Recommended Requirements:

GRADE = 2

DUROMETER – TYPE A = **60 ±5**

TENSILE STRENGTH - MINIMUM (MPa) = **8**
(Minimum Tensile Strength - psi = **1160**)

ULTIMATE ELONGATION – MINIMUM = **300%**

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 70°C

Maximum Change in Hardness = ± **15 Points**

Maximum Change in Tensile Strength = ±**30%**

Maximum Change in Ultimate Elongation = - **50%**

IRM 903 Oil TEST METHOD D471: No Requirement

Maximum Volume Change = **No Requirements**

COMPRESSION SET TEST METHOD D395: 22 Hr @ 70°C (METHOD “B” SOLID DISCS)

Maximum Compression Set = **50%**

Z1 (SPECIAL REQUIREMENTS): Specific Gravity **1.10 – 1.20**

CHLOROBUTYL (CHR)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M2BAA607A13 Z1 Z2

Details of Recommended Requirements:

GRADE = 2

DUROMETER – TYPE A = **60 ±5**

TENSILE STRENGTH - MINIMUM (MPa) = 7
(Minimum Tensile Strength - psi = **(1015)**)

ULTIMATE ELONGATION – MINIMUM = **300%**

HEAT RESISTANCE TEST CONDITIONS: 70 Hr @ 100°C

Maximum Change in Hardness = ± **15 Points**

Maximum Change in Tensile Strength = ±**30%**

Maximum Change in Ultimate Elongation = - **50%**

IRM 903 Oil TEST CONDITIONS: No Requirement

Maximum Volume Change = **No Requirements**

COMPRESSION SET TEST METHOD D395: 22 Hr @ 70°C (METHOD “B” SOLID DISCS)

Maximum Compression Set = **50%**

Z1 (SPECIAL REQUIREMENTS): Specific Gravity **1.10 – 1.40**

Z2 (SPECIAL REQUIREMENTS): WATER RESISTANCE TEST METHOD D471: 70 Hr @ 100 °C

Volume Change = ± **5%**

STYRENE-BUTADIENE (SBR)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M2AA608 A13 Z1

Details of Recommended Requirements:

GRADE = 2

DUROMETER – TYPE A = **60 ±5**

TENSILE STRENGTH - MINIMUM (MPa) = **8**
(Minimum Tensile Strength - psi = **(1160)**)

ULTIMATE ELONGATION – MINIMUM = **300%**

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 70°C
Maximum Change in Hardness = ± **15 Points**
Maximum Change in Tensile Strength = ±**30%**
Maximum Change in Ultimate Elongation = - **50%**

IRM 903 Oil TEST METHOD D471: No Requirement
Maximum Volume Change = **No Requirement**

COMPRESSION SET TEST METHOD D395: 22 Hr @ 70°C (METHOD “B” SOLID DISCS)
Maximum Compression Set = **50%**

Z1 (SPECIAL REQUIREMENTS): Specific Gravity **1.10 – 1.30**

NITRILE (NBR)

USED IN NON-METALLIC PIPING EXPANSION JOINTS

D-2000-08 CLASSIFICATION:

LINE CALL OUT: M5BG610 A14 B14 EO34 Z1

Details of Recommended Requirements:

GRADE = 5

DUROMETER – TYPE A = **60 ±5**

TENSILE STRENGTH - MINIMUM (MPa) = **10**
(Minimum Tensile Strength - psi = **(1450)**)

ULTIMATE ELONGATION – MINIMUM = **300%**

HEAT RESISTANCE TEST METHOD D573: 70 Hr @ 100°C

Maximum Change in Hardness = ± **15 Points**

Maximum Change in Tensile Strength = **-20%**

Maximum Change in Ultimate Elongation = **-40%**

IRM 903 Oil TEST METHOD D471: 70 Hr @ 100°C

Change in Hardness = **0 to -15 Points**

Maximum Change in Tensile Strength = **-45%**

Maximum Change in Ultimate Elongation = **-45%**

Volume Change = **0 to +35%**

COMPRESSION SET TEST METHOD D395: 22 Hr @ 100°C (METHOD “B” SOLID DISCS)

Maximum Compression Set = **25%**

Z1 (SPECIAL REQUIREMENTS): Specific Gravity **1.20 – 1.30**