

## SILICONE RUBBER FEP ENCAPSULATED O RING

### 1. MATERIAL ANALYSIS

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Chem-Ring Encapsulation Material

- Chemours Teflon® FEP CJ95 Fluoropolymer Resin or equivalent
- Chemours Teflon® PFA 350 Fluoropolymer Resin or equivalent

Chem-Ring Core Material

- AH3188U Silicone Compound
- Alternative Silicone Peroxide Cured Silicone Compound FPLTRD 70-1

### 2. PROPERTIES

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#### a) Original

- Tensile strength

Chemours FEP CJ95  
Silicone AH3188U

ASTM D-2116-07 type IV: 5000 psi  
ASTM D412: 110 kgf/cm<sup>2</sup>

- Silicone AH3188U: Elongation of break     ASTM D412: 410%
- Silicone AH3188U: Durometer             ASTM D2240: 75 +/- 5 Shore A
- Silicone AH3188U: Density Value         ASTM D792: 1.19-1.25 g/cm<sup>3</sup>
- Silicone AH3188U: % Shrinkage         ASTM Die B D624: 3.6%
- Silicone AH3188U: Tear Strength         ASTM Die B D624: 18 kgf/cm
- Compression set Test - Silicone AH3188U: ASTM D395-03 (2008) Method B

Lab Temperature = 23 +/- 2 °C. Relative Humidity = 50 +/- 5%

#### **Test one:**

Amount of Compression = 25%, Compression condition: 175°C, 24hr, Recovery condition = RT, 30min: RESULT = 46.7%

#### **Test two:**

Amount of Compression = 25%, Compression condition: 23°C, 24hr, Recovery condition = RT, 30min: RESULT = 4.7%

- Temperature Range
  - **FEP Encap**  
- 60°C to +205°C ( -75°F to +400°F )  
Short duration to +260°C ( +500°F )
  - **PFA Encap**  
- 60°C to +260°C ( -75°F to +500°F )  
Short duration to +300°C ( +575°F )

#### Durometer

FEP/PFA Encapsulated Solid Core Silicone  
FEP/PFA Encapsulated Hollow Core Silicone

85 – 90 Shore A  
75 - 80 Shore A

**b) MATERIAL TEST DATA – FEP**

Gas Permeability (gm/2540mm<sup>2</sup>/24hrs based on 40mu FEP)

	23°C	35°C	50°C
Carbon dioxide	None	None	None
Helium	None	None	None
Hydrogen chloride	None	None	None
Nitrogen	0.18	None	None
Oxygen	None	None	None

Vapour Permeability (gm/2540mm<sup>2</sup>/24hrs based on 40mu FEP)

	23°C	35°C	50°C
Acetic Acid (Ethanoic Acid)	None	0.42	None
Acetone (Ethanone)	None	0.42	None
Benzene	0.15	0.64	None
N-Butyl ether	0.08	None	0.65
Decane	0.72	None	1.03
Ethanol	0.11	0.69	None
Ethyl acetate (Ethyl ethanoate)	0.06	0.77	2.90
Hexane	None	0.57	None
Hydrochloric acid 20%	None	None	None
Methanol	None	None	5.61
Piperidine (Pentamethyleneamine)	0.04	None	None
Sodium hydroxide 50%	None	None	None
Sulphuric acid	None	None	None
Tetrachloromethane	0.11	0.31	None
Toluene	0.37	None	2.93
Water	0.09	0.45	0.89

Absorption (168hrs at temperature stated, PFA & FEP)

	Test Temp. °C	Range of weight gain
Aniline	185	0.3 to 0.4%
Acetophenone	201	0.6 to 0.8%
Benzaldehyde	179	0.4 to 0.5%
Bromine	22	0.5% (PFA only)
Chlorine	120	0.5 to 0.6%
Chlorosulphonic acid	150	0.7 to 0.8%
Chromic acid 50%	120	0.01% both
Dimethyl sulphoxide	190	0.1 to 0.2%
Ferric chloride 25%	100	0.01% both
Freon 113	47	1.2% (PFA only)
Hydrochloric acid 37%	120	0.01 to 0.03%
Iso-octane	99	0.7 to 0.8%
Nitrobenzene	210	0.7 to 0.9%
Perchloroethylene	121	2.0 to 2.3%
Phosphoric acid	100	0.01% both
Sulphuryl chloride	68	1.7 to 2.7%
Tetrachloromethane	78	2.3 to 2.4%
Toluene	110	0.7 to 0.8%
Tributyl phosphate	200	1.8 to 2.0%
Zinc chloride	100	0.01% to 0.03%

Absorption (Long term at temperature stated, PFA & FEP)

Test Temp. °C	Range of weight gain
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Acetone (Ethanone)	50	0.4% on 12months
Ammonium hydroxide	70	0.1% on 12months
Ethanol 95%	50	0.01% on 12months
Ethanol 95%	70	0.01% on 2weeks
Ethyl acetate (Ethyl ethanoate)	50	0.7% on 12months
Hydrochloric acid 10%	70	0.01% on 12months
Nitric acid 10%	70	0.1% on 12months
Sodium hydroxide 10%	70	0.1% on 12months
Sulphuric acid 30%	70	0.01% on 12months
Tetrachloromethane	50	1.6% on 12months
Tetrachloromethane	70	1.9% on 2weeks
Toluene	50	0.6% on 12months
Toluene	70	0.6% on 2weeks

### c) Specifications

Manufactured to meet the stringent requirements of AS568 / BS1806 tolerance specifications.

### 3. RESTRICTION OF HAZARDOUS SUBSTANCES (ROHS)

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The restrictions of the use of certain Hazardous Substances (ROHS) Directives 2002/95/EC and 2002/96/EG came into force on 1<sup>st</sup> July 2006. Global O-Ring and Seal recognizes these requirements and declare that all products sold by Global O-Ring and Seal do comply with the European Directives.

### 4. REGISTRATION, EVALUATION, AUTHORISATION AND RESTRICTION OF CHEMICALS (REACH)

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The EU Regulations (EC 1907/2006) came into force on 1<sup>st</sup> June 2007. Global O-Ring and Seal are familiar with the European Regulation on chemicals being the producer of products from raw materials. The elements of our product that could be considered chemical based are in actual fact rubber, being Silicon and is classified in the Regulations as polymers and is therefore exempt.

### 5. COMPLIANCES

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#### a) FEP/PFA Encapsulation

FDA

The clear TEFLON FEP/PFA Encapsulation of our CHEM-RING Encapsulated 'O' Ring complies with Part 177 of Title 21 of the Food and Drug Administration regulations for safe use as articles or components of articles for producing, manufacturing, processing, preparing, treating, packing, transporting or holding food in accordance with FDA regulation 21.CFR.177.1550.

3A® Sanitary Standard

Further, we can advise that Table One (attached) of number 20-22 3A® Sanitary Standard documents that FEP and PFA materials, to the previously mentioned FDA 21.CFR.177.1550 Compliance standard, is also compliant to this 3A® Sanitary Standard Number 20-22.

USP Chapter 87 & 88 Class VI

Teflon® FEP/PFA fluoropolymers have been tested in accordance with USP Protocol and meet the requirements of a USP Class VI plastic both Chapter 87 & Chapter 88.



EU VO 1935/2004

Global O-Ring's suppliers have researched and evaluated BFR documentation especially "Recommendations of the Federal Institute for Risk Assessment on Plastics intended to come in to contact with Food".

The principle underlying this Regulation is that any material or article intended to come into contact directly or indirectly with food must be sufficiently inert to preclude substances from being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition of the food or a deterioration in its organoleptic properties.

On our Encapsulated 'O' Rings, the outer encapsulate is a FEP or PFA melt processable polymer of P.T.F.E. (otherwise known as the brand Teflon®). These material P.T.F.E polymers are highly inert and are utilised intensively in industrial Food Processing, and Domestic Food cooking equipment.

Our FEP / PFA Encapsulated 'O' Rings Encapsulate materials and their manufacture are compliant with all relevant sections 1 to 21 of the E.C Regulation Number 1935/2004 and the subsequent Articles.

We are pleased to advise that FEP/PFA Encapsulated 'O' rings are compliant to EU VO 1935/2004 certification.

PFOA & PFOS

Teflon® FEP/PFA fluoropolymers have been tested in accordance with US EPA 3550C:2007 protocol and meet the test conditions required. Since 2009 PFOS has been incorporated in to the Registration, Evaluation, Authorisation and Restriction (REACH) regulations, which is compliant with the SVHC list from ECHA updated twice yearly.

## **b) Silicone Core**

FDA

The Silicone core (Silicone AH3188U) of our CHEM-RING Encapsulated 'O' Ring complies with Part 177 of Title 21 of the Food and Drug Administration regulations for safe use as articles or components of articles for producing, manufacturing, processing, preparing, treating, packing, transporting or holding food in accordance with FDA regulation 21.CFR.177.2600. Global O-Ring and Seal Chem-Rings with an FDA compliant Silicone core are supplied from stock as standard and at no extra charge.

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