

3M™ Dyneon™
Perfluoroelastomer PFE 7502BZ



The best properties from
two curing systems
in one solution



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Due to harsher environments within the Chemical Processing Industry, there is an increasing requirement for a single product that combines both benefits of overall excellent chemical resistance with a higher continuous operating temperature resistance (up to 275 °C).

Dyneon has overcome the technical challenges faced in combining both of these features into one single technology, for one single product. The new development 3M™ Dyneon™ Perfluoroelastomer PFE 7502BZ is a proprietary, black, 75 Shore A compound with excellent chemical resistance and continuous operating temperature at 275 °C.

The cost effectiveness of a sealing technology is determined by its overall costs. Aside from the purchase price, this includes the installation expense and the costs associated with down time, caused by leakages, maintenance and cleaning procedures.

Mechanical Properties

The rheological and physical properties of the new compound are presented in the table below:

Typical Rheological Properties

(MDR @ 177 °C; 0,5 Arc, 30')

ML (in-lbs)	1,0
MH (in-lbs)	18,2
ΔT=MH-ML (in-lbs)	17,2
ts ₂ (minutes)	0,9
t'50 (minutes)	5,8
t'90 (minutes)	19,4

Typical Physical Properties

Press cure 15' @ 177 °C | Post cure 24' @ 250 °C

Hardness (Shore A2)	76
Modulus 100% (Mpa)	11,6
Tensile (Mpa)	15,8
Elongation (%)	129

Compression Set

[ASTM D 395 Method B, O-rings]

70hr @ 200 °C (25% deflection)	15
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Table 1: Physical properties of new Dyneon PFE 7502BZ chemically improved compound

Chemical Resistance

In the chart below we demonstrate the excellent all-around chemical resistance of Dyneon PFE 7502BZ.

The low volume swell results provide evidence of the outstanding chemical resistance to water, steam, primary and tertiary amines, acids, bases and solvents. This makes Dyneon PFE 7502BZ the ideal candidate for meeting the requirements of the Chemical Processing Industry.

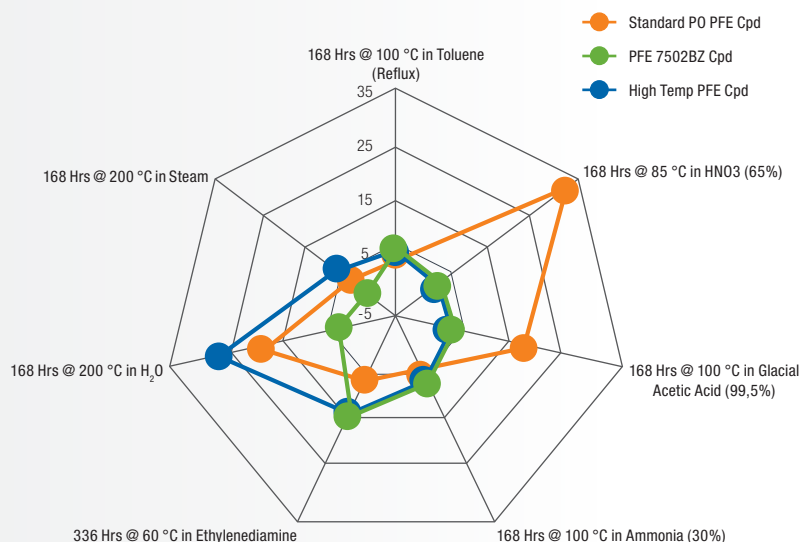


Fig. 1: % Volume Swell data of PFE 7502BZ Cpd compared to a standard PO PFE - & High Temp PFE Cpd

Heat Aging Properties

The compression set resistance is always an indication of the ability of the polymer to retain its 'elastic memory'. Temperature is one of the most important causes of compression set increase over time and sealing failure. With increasing temperature the bonds can be broken that make up the polymer backbone and the crosslinks. Below the excellent retention of compression set, even at 275 °C, can be seen for the new 3M™ Dyneon™ Perfluoroelastomer PFE 7502BZ black compound in comparison with a standard PO PFE compound and a 'High Temperature' resistant material.

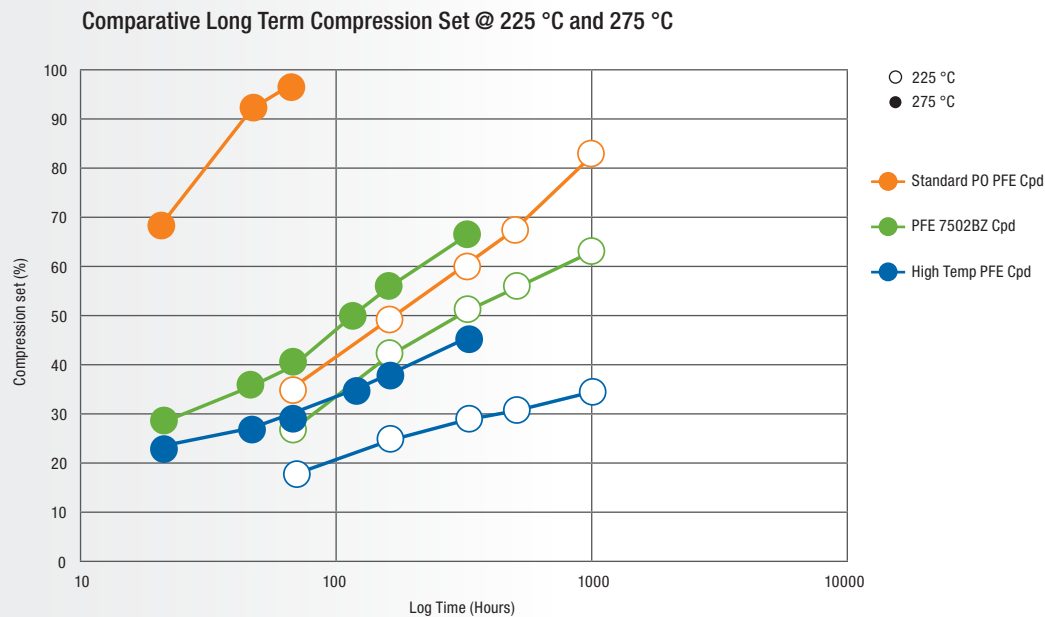


Fig. 2: Comparative Long Term Compression Set at ○ 225 °C and ● 275 °C

Comparative longer term compression set with an equivalent competitor grade at high temperature can be seen in figure 3 below.

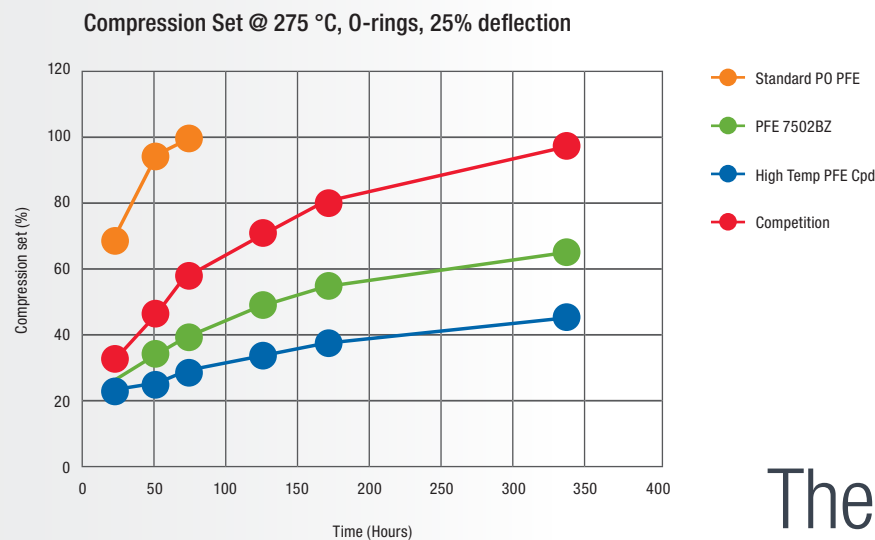


Fig. 3: Longer Term Compression Set at 275 °C, ASTM 214 O-rings, 25% deflection

The heat aging results confirm a long sealing life at higher temperatures, which is not permissible with conventional peroxide cured systems.

The best properties
from two curing
in one step



Summary

Dyneon has developed an extraordinarily well balanced compound: 3M™ Dyneon™ Perfluoroelastomer PFE 7502BZ. This grade combines the chemical resistance capability of a peroxide curable FFKM with increased high temperature performance and provides superior sealing capability in comparison to other conventional Perfluoroelastomer grades in the market place. The technical strengths of the new development versus the current available systems are documented in the table below.

	E-20657 (PFE 90Z)	PFE 7502BZ	E-20659
Chemical Resistance	Black Compounds		
Solvents	++	++	++
Acids	+	++	++
hydrochlorid acids	+	++	++
nitric acids	+	++	++
sulfuric acids	++	++	++
carboxylic acids	+	++	++
Base (ammonia, NaCH)	++	++	++
Ethylene diamine	++	+	+
Water	+	++	∅
Steam	++	++	+
Temperature Resistance			
Continuous (in °C)	220	275	316
Compression set			
70 hrs @ 200 °C	29	15	14

Swell (%)	Rating
<=10	++
10-20	+
>20	∅

Table 2: Overview of Dyneon Perfluoroelastomer PFE 7502BZ cpd compared to E-20657 (PFE 90Z) and E-20659.

Conclusion

The Chemical Processing Industry faces many new challenges related to improved productivity and reliability of sealing solutions.

The new development of 3M™ Dyneon™ Perfluoroelastomer PFE 7502BZ provides highest reliability in terms of chemical and temperature resistance as shown above. It helps to extend the lifetime of a sealing solution, to prolong the periods between routine maintenance and to reduce the risk of unplanned downtime and environmental issues. This product is the best singular solution for processes exposed to variable temperature ranges the number of stock items to be reduced.

Sealing solutions based on the latest Perfluoroelastomer from Dyneon help to reduce overall costs and facilitate improved safety and increased productivity in chemical production plants.

Introduction

Perfluoroelastomers (FFKM) are widely used in market segments where hostile chemical and temperature environments are common. Such markets include the Chemical Processing Industry, Aerospace, Semicon and Oil & Gas. The Perfluoroelastomer product portfolio from Dyneon utilizes a broad range of polymer and curative technologies, enabling us to meet the demands of these challenging market sectors.

The Dyneon product range includes the peroxide curable 3M™ Dyneon™ Perfluoroelastomer E-20657 (PFE 90Z) and the high temperature, triazine cure-material 3M™ Dyneon™ Perfluoroelastomer E-20659, having superior temperature resistance (continuous 316 °C).

However nitrile curable Perfluoroelastomer compounds in general are not recommended when subjected to steam, water and nucleophiles at high temperatures. Peroxide cured materials have better resistance to these media but are limited in maximum temperature resistance (continuous 220 °C). The table below shows a comparison between the two products.

Peroxide Curable Perfluoroelastomer

High resistance against aggressive chemicals

Easy and safe processing

Thermal resistance up to 230 °C

Longterm proven sealing capability

Continuous max. service life around 220 °C

High Temperature Perfluoroelastomer

Superior temperature resistance (up to 320 °C)

High chemical resistance

High sealing force retention

Low compression set

Limited water and steam - resistance at high temperatures

Table 3: Comparing features of standard peroxide curable FFKM and a high temperature FFKM

Technical Information and Test Data

Technical information, test data and advice provided by Dyneon personnel are based on information and tests we believe are reliable and are intended for persons with knowledge and technical skills sufficient to analyze test types and conditions, and to handle and use raw polymers and related compounding ingredients. No license under any Dyneon or third party intellectual rights is granted or implied by virtue of this information.

General recommendations on health and safety in processing, on work hygiene and on measures to be taken in the event of accident are detailed in our material safety data sheet.

You will find further notes on the safe handling of fluoropolymers in the brochure "Guide for the safe handling of Fluoropolymers Resins" by PlasticsEurope, Box 3, B-1160 Brussels, Tel. +32 (2) 676 17 32.

Important Notice

All information set forth herein is based on our present state of knowledge and is intended to provide general notes regarding products and their uses. It should not therefore be construed as a guarantee of specific properties of the products described or their suitability for a particular application. Because conditions of product use are outside Dyneon's control and vary widely, user must evaluate and determine whether a Dyneon product will be suitable for user's intended application before using it. The quality of our products is warranted under our General Terms and Conditions of Sale as now are or hereafter may be in force.

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