



CHEMRAZ[®]

Superior Chemical Resistance



Chemraz[®] Perfluoroelastomer



HIGH-PERFORMANCE MATERIALS AT A GLANCE

Greene, Tweed's extensive portfolio of Chemraz® materials ensures customers the best compound available for each unique application.

Chemraz 555, 605 and 600—broad chemical resistance

Chemraz 555, our newest compound, offers broad chemical resistance in an extremely wide temperature range, outstanding physical properties and superior compression set resistance. Chemraz 605 and 600 provide the same chemical resistance as Chemraz 505 but with a higher temperature range.

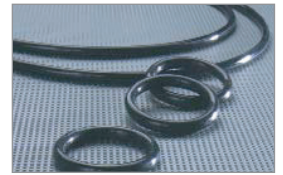
Compound	555	605	600
Shore A Hardness	80	80	90
Temperature Range	10°F to 600°F (-12°C to 316°C)	-4°F to 500°F (-20°C to 260°C)	
Color	Black		



Chemraz 505, 504 and 510—low compression set and low temperature

Chemraz 505 offers broad chemical resistance for a wide range of applications. Chemraz 504 and 510 are softer and harder versions of Chemraz 505. Chemraz 504 is ideal for applications experiencing low forces, while 510 is perfect for high-pressure applications.

Compound	505	504	510
Shore A Hardness	75	65	90
Temperature Range	-22°F to 446°F (-30°C to 230°C)		
Color	Black		



Chemraz 615—for high temperatures

Ideal for continuous high temperatures up to 615°F (324°C) because of its low compression set and outstanding mechanical properties.

Compound	615
Shore A Hardness	80
Temperature Range	0°F to 615°F (-18°C to 324°C)
Color	Black



Chemraz 514 and 517—white compounds

White compounds used wherever carbon black contamination must be avoided.

Compound	514	517
Shore A Hardness	70	80
Temperature Range	-22°F to 428°F (-30°C to 220°C)	
Color	White	



Chemraz 584 and 585—specific media

Ideal for use in strong oxidizing media and hot aqueous solutions.

Compound	584	585
Shore A Hardness	70	80
Temperature Range	-22°F to 428°F (-30°C to 220°C)	
Color	Cream	



Chemraz SD625, SD517 and SD585—compliant compounds

These specialty compounds are USP Class VI and FDA compliant. Additionally, SD625 and SD517 meet 3-A® Sanitary Standards.

Compound	SD625	SD517	SD585
Shore A Hardness	80	80	80
Temperature Range	-4°F to 500°F (-20°C to 260°C)	-22°F to 428°F (-30°C to 220°C)	
Color	Black	White	Cream



Chemraz 526—explosive decompression resistant

Explosive decompression resistant Chemraz with the same chemical resistance as Chemraz 505.

Compound	526
Shore A Hardness	95
Temperature Range	-4°F to 482°F (-20°C to 250°C)
Color	Black



SPECIALTY COMPOUNDS FOR SPECIFIC REQUIREMENTS

Greene, Tweed's engineering experts work side by side with customers to find the best possible material and design for every application. The following sections highlight some specialty elastomers that were designed to meet the needs of specific challenging applications.

	FDA and USP Class VI Compliant	3-A Sanitary Standards
Chemraz® SD625	X	X
Chemraz SD517	X	X
Chemraz SD585	X	

Compliance to U.S. FDA regulations is critical for those manufacturing products for the food and drug market. Greene, Tweed constantly strives to provide seal components that optimize both mechanical and physico-chemical (absorption and extractables) performance. As a result, we do things for our customers that other companies are not able to offer. For complete and uncompromising solutions to pharmaceutical or hygienic fluid handling applications, only Greene, Tweed has virtual prototype and test capabilities in house. Our FEA design validations use mock-up equipment to deliver solutions that meet all your compliance needs in innovative ways.

At Greene, Tweed we take compliance seriously. Our reputation is built on the reputation of our customers. All of our compounded materials are third-party compliance tested. No matter what pharmaceutical or hygienic fluid handling process you are working with—or what part of the world you operate in—we deliver the most effective solution possible.

The FDA approves the use of food contact substances via the FCN process (Food Contact Substance Notification) described in Section 409(h) of the Federal Food, Drug and Cosmetic Act (21 U.S.C Section 348(h)). In publishing FCNs 000245 and 000247, the FDA confirmed that articles made from the Chemraz perfluoroelastomers SD625, SD517 and SD585 comply with the requirements for repeated use in contact with foods.

Extraction data

All extraction data have been determined by an independent certified test laboratory according to the descriptions in the FDA paragraph 21 CFR, part 58 Good Laboratory Practice for Nonclinical Laboratory Studies:

- Total extractions according to 21 CFR 177.2400(d)(1)
(0.2 mg/in² = 3,1 mg/dm²)
- Fluoride extractions according to 21 CFR 177.2400(d)(2)
(0.03 mg/in² = 0,47 mg/dm²)

Parts made from these materials can be supplied with a certificate of conformity if required.

Note: For perfluoroelastomers the very strict extractive limitations of FDA article 21 CFR 177.2400 Perfluorocarbon Cured Elastomers should always be applied. FDA article 21 CFR 177.2600 is effective for most other elastomers like EPDM, FKM and NBR. FDA article 21 CFR 177.2400 has much stricter requirements for the total extractions, including limitations for fluorides. As a matter of course, Chemraz SD625, SD517 and SD585 fulfill the extraction limitations of the stricter article.

USP Class VI

The biocompatibility between a plastic or elastomer and a living organism is regulated with tests defined by the USP. Cytotoxicity is determined in the test tube (in vitro), while toxicity to the living organism is determined in the body (in vivo). Chemraz SD625, SD517 and SD585 are USP Plastic Class VI compliant; therefore, they are biocompatible.

Chemraz SD625 has also passed USP Physicochemical Testing <661> and has also been successfully tested to USP Elastomeric Closures <381>. This makes it the most comprehensively tested perfluoroelastomer for the food, drug and biomedical technology markets today.

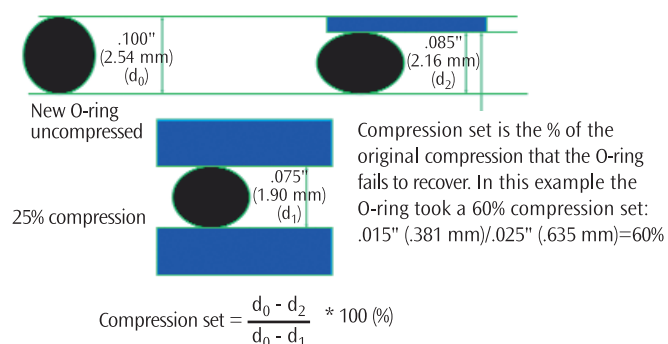
3-A® Sanitary Standards

3-A® SSI (3-A Sanitary Standards, Inc.) is a nonprofit organization serving the U.S. public health community through the development of standards for the advancement of food sanitation and hygiene. Chemraz SD625 and SD517 have passed the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-03, meaning these perfluoroelastomers meet strict hygienic criteria applicable to dairy equipment and systems.

COMPRESSION SET

Generally, an elastomer's compression set is determined according to ASTM 395B. All tests are carried out in air at a temperature of 400°F (204°C) over 70 hours unless otherwise stated.

Compression set is as follows:



ASTM 395B states that compression set must be measured on a test body with a diameter of 1.14" (29 mm) and a thickness of .49" (12.5 mm). Although the value for compression set obtained by this method is very low, it is of little significance for parts used in the field. Greene, Tweed's data reflects the compression set obtained on O-rings of size -214 (.98" x .14" / 24.99 mm x 3.53 mm). These percentages are larger than those obtained on the test body but are more practical for the user.

The table below compares compression set measurements on three Chemraz® materials, first on the size -214 O-ring and second on the ASTM 395B test body, at otherwise identical conditions (70hr, air, 400°F/204°C). Depending on the particular material, the compression set measured in air can be very different from that measured in nitrogen. Chemraz materials deliver superior performance in a wide range of environments.

	With O-ring -214	With test body
Chemraz 505	25%	13%
Chemraz 510	30%	17%
Chemraz 605	20%	11%

Resilience, temperature changes

Most methods for measuring compression set only measure resilience. They do not take into account the time taken by a seal to recover or its response to changes in temperature. Many dynamic applications, e.g., mechanical seals or quick-release couplings, require the rapid recovery of an elastomer for the safe functioning of a seal. Chemraz materials excel in these environments by delivering the type of rapid recovery usually associated with rubber.

EXPLOSIVE DECOMPRESSION RESISTANT—CHEMRAZ® 526

The severe consequences of ED (explosive decomposition) occur in elastomers when there is a sudden drop in the pressure of gases, gas compounds or liquefied gases.

All elastomers are more or less permeable. When an elastomer is exposed to a high gas pressure for a certain length of time, it absorbs the gases that settle in the interstices between the elastomer's molecule chains. This process continues until the pressure inside the seal equals the pressure in the surrounding system. The higher the pressure, the more gas is absorbed. If the system depressurizes rapidly, the gas in the elastomer will expand under its own high pressure. If pressure cannot escape from the elastomer fast enough or if the elastomer's structure is not stable enough, bubbles or cracks will form, destroy the seal and lead to a loss of functionality. These problems will continue to occur hours after the drop in pressure. The seal's rapid increase in volume may also cause extrusion phenomena.

The photo below shows an O-ring that has been exposed to rapid depressurization in natural gas extraction at high pressure and high temperature. The ruptures and blisters caused by the sudden and rapid drop in pressure are visible.



Gases penetrating a seal



O-ring exposed to rapid depressurization

When ED is an issue, consider the following when choosing an elastomer: type of gas, temperature, pressure (pressure level, pressure progression, rate of pressure drop) and seal material (hardness, polymer architecture, cross-section diameter and compression).

Components made from ED resistant Chemraz 526 withstand the challenging conditions caused by the mix of high pressures and high temperatures. Chemraz 526 offers superior explosive decompression properties, broader chemical compatibility and an improved low-temperature operating window. Its compression set delivers improved sealing and leak prevention unmatched by the leading competitive material. In addition, the hardness of ED resistant Chemraz 526 significantly reduces the risk of gap extrusion.

COLLABORATING TOWARD SUCCESS

At Greene, Tweed our goal is satisfied customers who look forward to partnering with us again and again. In our efforts to meet and exceed customer expectations we constantly strive to formulate and produce better, more efficient materials that anticipate our customers ever-changing needs.

With fully qualified engineering, sales and support personnel located throughout the Americas, Europe and Asia, Greene, Tweed delivers innovative solutions to individual customer challenges on a global scope. This consistent high level of experience and skill creates a unique customer experience. Our success is based on providing products and services that make our customers successful. We are committed to providing local service and technical expertise to help our customers thrive.