Vulcanized O-Rings & O-Ring Cord

Custom spliced and bonded rings for large diameters, prototype quantities, and non-standard sizes without tooling costs

Overview

Vulcanized O-rings provide an essential manufacturing solution for sealing applications where molded O-rings are impractical due to size, quantity, or lead time constraints. Produced by splicing and bonding extruded elastomer cord stock into continuous rings, vulcanized seals bridge the gap between off-the-shelf molded inventory and the specialized requirements of large-diameter flanges, prototype assemblies, and legacy equipment maintenance. This manufacturing approach eliminates the substantial tooling investment required for compression molding large diameters, while enabling rapid turnaround for custom sizes that would otherwise require 8-12 week mold lead times.

The manufacturing process for vulcanized O-rings begins with precision-extruded cord stock manufactured to tight dimensional tolerances. The cord is cut to the calculated developed length based on the specified inside diameter and cross-section, with length compensation for the joint overlap. The two cut ends are then prepared-typically by skiving or abrading to create a clean, fresh bonding surface-and joined using one of three methods: hot vulcanization, cold bonding, or butt splicing. Hot vulcanization, the premium method, applies uncured rubber compound to the joint faces and cures the assembly under heat and pressure in a precision mold. This process achieves joint tensile strength of 70-90% of the parent cord, creating a bond with physical properties approaching the bulk material. Cold bonding uses high-performance elastomer adhesive to join the prepared ends without heat, achieving 30-50% of parent cord strength. Butt splicing simply abuts the cut ends with minimal bonding agent, suitable only for very low-pressure applications.

Joint integrity is the critical performance variable in vulcanized O-ring applications. In static sealing-where the O-ring is compressed between two flanges and experiences no relative motion-the joint must withstand the hydrostatic pressure force attempting to push the seal through the flange interface. For hot vulcanized joints, the 70-90% strength retention is more than adequate for static pressures up to 50 bar in most applications, and up to 100 bar in carefully engineered flange designs with adequate bolt preload. Cold-bonded joints, with their lower strength retention, are appropriate for low-pressure static service below 10 bar, vacuum applications, and emergency field replacements where immediate availability outweighs maximum performance requirements. Neither joint type should be used in dynamic sealing applications-reciprocating, rotary, or oscillating motion will cause joint failure within a short number of cycles because the splice represents a stress concentration that cannot withstand repeated flexural loading.

Size capabilities for vulcanized O-rings extend far beyond the practical limits of compression molding. While molded O-rings are generally limited to approximately 600 mm inside diameter by standard mold capabilities, vulcanized rings can be manufactured to virtually any diameter-our standard production regularly produces rings up to 3,000 mm (3 meters) inside diameter, and larger rings are available by special arrangement. Cross-sections from 1.5 mm to 25 mm are routinely spliced from stocked cord diameters. The dimensional tolerance for vulcanized cord cross-section is typically +/-0.10-0.15 mm, slightly wider than the +/-0.05-0.08 mm achievable with precision-molded O-rings to ISO 3601 Grade S. Inside diameter tolerance depends on cutting precision and is typically +/-0.5-1.0% of the nominal ID. For applications where these tolerances are acceptable-and in most large-diameter static flanges, groove tolerances themselves are wider than the seal tolerances-vulcanized rings provide a fully functional and economical solution.

Material availability for vulcanized O-rings encompasses the full range of standard elastomer compounds. NBR remains the most economical and widely specified material for general industrial static seals, hydraulic tank flanges, and fuel system applications. FKM provides superior heat and chemical resistance for high-temperature flanges, chemical tank closures, and aggressive fuel systems. EPDM excels in water, steam, and outdoor environments due to its outstanding ozone and UV resistance. VMQ (silicone) offers the widest temperature range with FDA-compliant grades available for food processing and medical device applications. PTFE cord, while not an elastomer, provides a unique solution for chemical processing and cryogenic applications where rubber compounds are excluded by fluid

compatibility requirements.

Prototyping represents one of the most valuable applications of vulcanized O-ring manufacturing. When developing a new product or modifying an existing design, engineers often need to validate seal dimensions before committing to production mold tooling that can cost $3,000-$15,000 and require 8-12 weeks for fabrication. Vulcanized rings allow rapid iteration of inside diameter, cross-section, and groove design at minimal cost-prototype rings can be produced in 3-5 days for common materials, enabling design validation testing to proceed in parallel with production tooling procurement. Once the design is frozen, the validated dimensions transfer directly to the production mold specification, eliminating the risk of mold rework due to dimensional errors discovered after tooling completion.

Quality control for vulcanized O-rings encompasses multiple inspection stages. Incoming cord stock is verified for dimensional conformance, Shore A hardness, and batch material certification. During splicing, joint alignment, overlap length, and bonding compound application are visually inspected and dimensionally checked. Finished rings undergo 100% visual inspection for surface defects, joint irregularities, and dimensional verification of inside diameter and cross-section. For critical applications, destructive testing of sample rings from each production batch verifies joint tensile strength and confirms that bond integrity meets specification. All production is conducted under our ISO 9001 certified quality management system with full lot traceability from cord stock batch through finished ring.

Types

d pressure to form a continuous ring. The joint strength approaches the parent material when processed correctly. Standard method for most large-diameter static seals.
red in a heated mold under pressure. Produces a joint with physical properties nearly identical to the cord stock-tensile strength 85-90% of parent material.
parent cord. Adequate for low-pressure static sealing, emergency replacement, and prototype validation where heat equipment is unavailable.

Advantages

per size-and mold lead times extend to 8-12 weeks. Vulcanized rings eliminate this capital investment entirely because they are fabricated from standard extruded cord s
retical upper size limit. Our standard production routinely manufactures rings up to 3,000 mm (3 meters) inside diameter, and we have produced specialty rings exceedin
cally catastrophic. Vulcanized rings can be produced in 3-5 business days for standard materials, with same-day or next-day emergency service available for critical breal
rk if dimensional adjustments are needed. Vulcanized rings resolve this dilemma by enabling rapid, low-cost prototype seals in any diameter and cross-section. Enginee
le and extreme temperature applications, and even PTFE for universal chemical resistance. This material breadth ensures that vulcanized rings can be specified for virtu
ritical static seals, vacuum applications, and higher-pressure service. Cold bonded rings provide a fast, economical solution for low-pressure static sealing and emergenc

Materials

es	Best For
+120 C, excellent petroleum oil and fuel resistance, most economical cord material	Hydraulic tanks, fuel system flanges, general industrial static seals, MRO kits
+200 C, superior chemical and heat resistance, brown standard	Chemical tanks, high-temperature flanges, aggressive fuel systems, aerospace gro
+150 C, excellent water, steam and UV resistance	Water treatment flanges, HVAC equipment, outdoor enclosures, marine hatches, st
+230 C, FDA grades available, extreme temperature flexibility	Food processing equipment, medical devices, oven seals, freezer seals, wide-temp
o +260 C, universal chemical resistance, self-lubricating, non-compressible	Chemical processing flanges, cryogenic systems, high-purity static seals where ela

Sizing

Vulcanized O-rings are made to your exact inside diameter and cross-section. We stock common cord diameters and can splice any size within manufacturing limits. Cross-section tolerance for vulcanized cord is typically +/-0.10-0.15 mm, slightly wider than molded O-ring tolerances (+/-0.05-0.08 mm for ISO 3601 Grade S).

Available Size Ranges

Series	Coverage
Standard Cord Diameters	1.50 mm, 2.00 mm, 2.50 mm, 3.00 mm, 3.53 mm, 4.00 mm, 5.00 mm, 5.33 mm, 6.00 mm, 6.99 mm, 8.00 mm, 10.00 mm
Large Diameter Rings	100 mm to 3,000 mm ID (and larger on request)
Custom	Any cord diameter and ring ID manufactured to specification

FAQ

How strong is the joint on a vulcanized O-ring?

Hot vulcanized joints achieve 70-90% of the parent cord tensile strength-adequate for most static sealing applications. Cold-bonded joints are weaker (30-50% of parent strength) but sufficient for low-pressure static and emergency replacement service. Neither joint type should be used in dynamic sealing; for dynamic applications, specify molded O-rings to avoid joint failure under repeated motion.

Can vulcanized O-rings be used in dynamic applications?

Vulcanized O-rings are recommended for static sealing only. The splice joint is the weakest point in the ring and will fail under repeated dynamic pressure cycling, reciprocating motion, or rotary service. For large-diameter dynamic seals (rotating tank agitators, large-bore pistons), molded O-rings or continuous PTFE seals are the correct solution. If the bore is too large for standard mold tooling, contact us for custom molding options.

What is the largest vulcanized O-ring you can make?

We regularly manufacture vulcanized rings up to 3,000 mm (3 meters) inside diameter from cord stock. Rings above 3,000 mm ID are available by special arrangement-there is no theoretical upper limit for a cord splice. For very large diameters, we recommend hot vulcanized joints for maximum joint integrity, and can advise on multiple-joint configurations for rings where a single splice point is a concern.

How fast can you deliver a custom vulcanized O-ring?

Standard lead time is 3-5 business days for common materials (NBR, EPDM, FKM) and sizes in stock cord diameters. Emergency same-day or next-day service is available for equipment breakdowns-contact us with the cross-section, inside diameter, and material, and we will confirm turnaround. PTFE cord and specialty materials may require 5-10 days depending on cord availability.

Do vulcanized O-rings cost less than molded O-rings?

For large diameters (typically above 300 mm ID) and low quantities (1-50 pieces), vulcanized rings are more economical because there are no mold tooling costs-tooling for large-diameter molds can cost $3,000-$15,000. For high-volume production of diameters below 300 mm, molded O-rings have lower unit cost and tighter tolerances. The break-even point depends on annual quantity, diameter, and whether dimensional tolerances require molded precision.

How accurate are vulcanized O-ring dimensions versus molded O-rings?

Cross-section tolerance for vulcanized cord is typically +/-0.10-0.15 mm, compared to +/-0.05-0.08 mm for molded O-rings to ISO 3601 Grade S. Inside diameter tolerance for a vulcanized ring depends on the cutting and splicing precision-typically +/-0.5-1.0% of ID. For applications requiring ISO 3601 Grade S or Grade CS tolerances, molded O-rings are required. For general static sealing in large grooves where groove dimensions themselves have wider tolerances, vulcanized cord dimensions are typically adequate.

How do I measure a large-diameter O-ring I need to replace?

For a worn or damaged seal that cannot be measured directly: (1) Measure the groove inside diameter with a tape measure or inside micrometer-the O-ring ID nominally equals the groove ID for unstretched installation. (2) Measure the groove width-the cross-section (CS) of the O-ring is approximately 70-80% of groove width. (3) Confirm by

measuring any undamaged portion of the old seal's cross-section with a caliper. For completely destroyed seals, measure the groove dimensions and use the O-ring groove design standard (ISO 3601-2 or Parker O-Ring Handbook) to calculate the nominal O-ring ID and CS. Send us groove dimensions and we can confirm the correct replacement size.

When should I choose hot vulcanization versus cold bonding?

Hot vulcanization is the correct choice for all critical static seals, vacuum applications, pressure vessels, and any application where joint integrity is paramount. The 70-90% joint strength of hot vulcanization provides a safety margin that ensures reliable performance even under unexpected pressure spikes or thermal cycling. Cold bonding is appropriate for low-pressure static applications below 10 bar, emergency field repairs where heat equipment is unavailable, and prototype validation where the ring will be replaced before long-term service. Butt splicing should be reserved only for non-critical, very low-pressure applications where cost is the dominant consideration and joint failure would not create a safety or environmental hazard.

Can you produce vulcanized rings with material certifications and traceability?

Yes. All vulcanized rings are produced under our ISO 9001 certified quality management system with full lot traceability from cord stock batch through finished ring. Available documentation includes: certificates of conformance (CoC) confirming material specification and dimensional compliance; material data sheets (MDS/TDS) with full physical property data; FDA compliance certificates for food-grade compounds (VMQ, EPDM); and lot-specific traceability records linking the finished ring to the raw material batch. For regulated industries, specify your documentation requirements at the time of order and we will ensure all required certificates are included with the shipment.

What is the shelf life of vulcanized O-rings compared to molded O-rings?

Vulcanized O-rings have the same shelf life as molded O-rings of the same material because the base elastomer compound is identical. NBR vulcanized rings: 7 years when stored at 15-25 C away from ozone, UV, and humidity above 65% RH. FKM and VMQ: 10+ years under the same conditions. EPDM: 7 years. PTFE cord: effectively unlimited. The joint itself does not reduce shelf life if properly manufactured. Store vulcanized rings in sealed bags in a climate-controlled environment per ISO 2230 guidelines. For critical applications, we recommend inspecting the joint visually before installation even within the stated shelf life, as storage conditions in field environments may vary from ideal parameters.