PRODUCT DATA SHEET

Nitrile 70 Durometer O-Ring

General purpose petroleum, hydraulic, and pneumatic sealing compound.

Compound designation	TORS NBR-70, carried on our paperwork and packaging as compound B70
Material type	Nitrile butadiene rubber, copolymer of butadiene and acrylonitrile, medium to high acrylonitrile content. ISO 1629 and ASTM D1418 designation NBR
Nominal hardness	70 ± 5 Shore A
Color	Black
ASTM D2000 callout	ASTM D2000-99 Grade M2BG714 B14 EA14 EF11 EF21 EO14 EO34 Z1, TR10 = -31.9 °C
Regulatory status	Not FDA compliant. See Section 8.

1. What this material is

Nitrile is a copolymer of butadiene and acrylonitrile. The acrylonitrile content, usually shortened to ACN, is the one number that drives everything the material does. More acrylonitrile means better resistance to petroleum oils and fuels and worse flexibility in the cold. Less acrylonitrile trades the other direction. This compound runs a relatively high acrylonitrile content, which is why it holds its size in mineral oil and hydrocarbon fuel while still retracting at -31.9 °C on the ASTM D1329 TR-10 test.

Seventy durometer nitrile is the most widely used O-Ring material in the world, and that is not an accident. It is inexpensive, it is available in every AS568 size off the shelf, and it does the job in the great majority of hydraulic, pneumatic, and general industrial applications. The honest way to think about it is that nitrile is the right answer until something specific makes it wrong, and the things that make it wrong are a short list: sunlight and ozone, temperatures over 250 °F, phosphate ester and brake fluids, ketones, esters, chlorinated and aromatic solvents. If none of those are in the application, spending more money on a different polymer usually buys nothing.

2. What this material does

The short version: it is the default sealing compound for petroleum service, and there is usually no reason to spend more.

Performance area	How this compound behaves
Petroleum oil resistance	Excellent. Certified volume change of +7.8 % in ASTM No. 3 oil and -3.7 % in ASTM No. 1 oil after 70 hours at 212 °F. In mineral hydraulic oil the ring holds its size and its squeeze.
Fuel resistance	Good on aliphatic fuel, +1.5 % volume in Fuel A. High aromatic fuel swells it, +21.1 % volume in Fuel B, which is 30 % aromatic. Fine in service as long as the gland has room for the swell.
Water resistance	Good below 150 °F. Certified +6.2 % volume and +2 durometer points after 70 hours at 212 °F, so short hot water exposure is survivable, but continuous hot water is not what this compound is for.
Compression set	Better than the specification requires. Certified 16.7 % against a 25 % maximum, 22 hours at 212 °F. That margin is what keeps a static seal holding after the machine has been sitting.
Heat aging	Very stable to 250 °F in oil. After 70 hours at 212 °F the compound moved +1 durometer point and +4 % tensile. Above 250 °F it hardens and takes a set, which is a permanent change, not a temporary one.
Low temperature	TR-10 at -25 °F (-31.9 °C). Static seals hold to about -30 °F. Dynamic sealing gets unreliable below roughly -20 °F because the compound stops following the surface fast enough.
Strength and toughness	Certified 2,476 psi (17 MPa) tensile and 385 % elongation, against ASTM D2000 minimums of 2,031 psi (14 MPa) and 250 %. That extra elongation is real margin when a ring has to stretch over a shaft shoulder during assembly.
Abrasion and wear	Good for a general purpose elastomer, better in sliding service than FKM, EPDM, or silicone. Well short of polyurethane, which runs roughly 5 to 10 times the wear life in hard sliding service.
Gas permeability	Low for an elastomer, one of the reasons nitrile is standard in propane, natural gas, and vacuum work. Silicone and EPDM leak considerably more gas through the seal body.
Ozone, UV, and weather	This is the weak spot. Unprotected nitrile surface cracks under ozone and sunlight, especially when the ring is stretched. See Section 6.
Chemical resistance	Fine with dilute acids and alkalis at ambient, glycol antifreeze, and silicone fluids. Ketones, esters, chlorinated and aromatic solvents, and phosphate ester based brake and hydraulic fluids will destroy it.

3. Typical physical properties

Values marked certified are from the compound manufacturer's certified test report on file at The O-Ring Store, tested to ASTM D2000-99 Grade M2BG714. Remaining values are typical for the compound class and are offered for engineering reference. Nothing in this table is a specification limit. Lot specific results are reported on the Certificate of Conformance supplied with each shipment.

Property	Test method	Value
Hardness	ASTM D2240	70 ± 5 Shore A, certified 70
Tensile strength	ASTM D412	2,476 psi (17 MPa) certified, 2,031 psi (14 MPa) minimum
Elongation at break	ASTM D412	385 % certified, 250 % minimum
Modulus at 100 %	ASTM D412	500 to 800 psi, class typical
Tear strength, Die C	ASTM D624	150 to 250 lbf/in, class typical
Specific gravity	ASTM D792	1.24 certified
Compression set, 22 hr at 212 °F	ASTM D395 B	16.7 % certified, 25 % maximum
Heat age, 70 hr at 212 °F, hardness change	ASTM D573	+1 point certified, ±15 allowed
Heat age, 70 hr at 212 °F, tensile change	ASTM D573	+4 % certified, ±30 % allowed
Heat age, 70 hr at 212 °F, elongation change	ASTM D573	-16 % certified, -50 % allowed
Water, 70 hr at 212 °F	ASTM D471	+2 points, +6.2 % volume, certified
ASTM No. 1 oil, 70 hr at 212 °F	ASTM D471	+2 points, -3.7 % volume, certified
ASTM No. 3 oil, 70 hr at 212 °F	ASTM D471	-5 points, +7.8 % volume, certified
Fuel A, 70 hr at 73 °F	ASTM D471	+1 point, +1.5 % volume, certified
Fuel B, 70 hr at 73 °F	ASTM D471	-7 points, +21.1 % volume, certified
Low temperature retraction, TR-10	ASTM D1329	-25 °F (-31.9 °C) certified

4. Service temperature

Condition	Range
Continuous service in petroleum oil	-30 °F to +250 °F (-34 °C to +121 °C)
Continuous service in air	-30 °F to +212 °F (-34 °C to +100 °C)
Intermittent, short excursion	to +275 °F (+135 °C)
Continuous service in water	to +150 °F (+66 °C)
Low temperature dynamic limit, recommended	-20 °F (-29 °C)
Low temperature retraction, TR-10	-25 °F (-31.9 °C)
Brittle point, ASTM D746	approx. -50 °F (-46 °C)

The two numbers that get confused in the field are the brittle point and the sealing limit. Nitrile does not shatter until roughly -50 °F, but it stops following a moving surface well before that, which is why the practical dynamic limit is around -20 °F and why a machine that leaks on a cold morning and stops leaking by noon has a compound problem, not a gland problem. At the top end, the difference between the air rating and the oil rating is oxidation. Oil keeps air off the rubber, so the same compound lives longer at 250 °F submerged than it does at 212 °F in open air. Run it past 250 °F and it hardens and takes a set, then leaks on the next thermal cycle when the metal moves and the ring no longer can.

5. Media compatibility

RECOMMENDED

Petroleum oils and greases. Mineral hydraulic fluids, ISO VG and AW grades. Diesel fuel. Aliphatic gasoline. Kerosene. Propane, butane, and natural gas. Silicone oils and greases. Water below 150 °F. Ethylene glycol antifreeze. Compressed air below 212 °F. Vegetable and animal oils. Dilute acids and alkalis at ambient temperature. HFA, HFB, and HFC water based hydraulic fluids.

LIMITED OR CONDITIONAL

High aromatic gasoline swells the compound, size the gland for it. Water above 150 °F softens it and eventually breaks it down. Alcohol blended fuel such as E85 causes moderate swell. Sour crude and H2S service hardens standard nitrile over time, ask about HNBR. Steam is short duration only. Ozone and direct sunlight cause surface cracking unless the compound is specifically protected, which matters in outdoor service and in storage.

NOT RECOMMENDED

Ketones such as MEK and acetone. Esters. Chlorinated hydrocarbons. Aromatic solvents such as toluene, benzene, and xylene. Nitro hydrocarbons. Phosphate ester hydraulic fluids. Automotive brake fluid, DOT 3 and DOT 4, and aircraft brake fluid. Concentrated acids. Strong oxidizers. Ozone rich environments. Extended direct sunlight.

6. Ozone cracking and heat hardening cautions

Ozone and sunlight crack unprotected nitrile, and it happens in storage as well as in service.

Nitrile has double bonds in its backbone, and ozone attacks them. Cracks start on the surface where the rubber is under strain and work inward, running across the direction of stretch. A ring stretched over a groove is under strain the whole time it sits, so parts fail on the shelf and in equipment that sat outside all winter. Ozone comes off electric motors, welders, and arc equipment, which is why the worst storage spot in most shops is the shelf above the motor.

Above 250 °F nitrile hardens and takes a set, and it does not come back.

Heat keeps crosslinking the compound after it leaves the mold. The ring gets harder, loses elongation, and forgets its round shape. It usually keeps sealing while everything is hot and static, then leaks the first time the machine cools and the metal moves. The tell on a failed part is simple: a ring that comes out hard, flat sided, and shiny was too hot for the compound.

Exposure	Guidance
Indoor storage, sealed original packaging	No action needed. Keep bags closed, out of sunlight, away from motors and welders.
Outdoor or UV exposed installation	Expect surface cracking over time on standard nitrile. Specify an ozone protected grade, or move to EPDM if the fluid allows it.
Ozone generating equipment nearby	Store parts in opaque, closed packaging and keep them at least a few feet from motors, arc welders, and ozone generators.
Continuous service, 212 °F to 250 °F in oil	Acceptable. Expect gradual hardening over the life of the seal and plan the change interval accordingly.
Continuous service above 250 °F	Not recommended. Move to HNBR or FKM.
Short excursions to 275 °F	Survivable, not a design condition. Repeated excursions age the compound quickly.

If the seal lives outdoors, in sunlight, or anywhere near ozone, ask us about EPDM. It gives up petroleum oil resistance completely, so it only works when the fluid is water, glycol, or air, but in weather it lasts years longer than nitrile. If the problem is heat rather than weather, ask about HNBR. It keeps nitrile's oil resistance and adds roughly 50 °F of headroom for a few times the price, which is worth it when rings are coming out hard and flat and not worth it otherwise.

7. Design and installation guidance

Item	Guidance
Gland type	Standard AS568 and SAE AS4716 glands. No special gland geometry required.
Squeeze, static	18 to 25 % on standard cross sections. Smaller cross sections toward the high end, 0.275 cross sections toward the low end.
Squeeze, dynamic	10 to 16 % reciprocating. Rotary service closer to 10 % to hold down friction heat, which is what usually kills a rotary nitrile seal.
Stretch on installation	5 % maximum permanent installed stretch on the ID. Temporary assembly stretch to 50 % is acceptable. Permanent stretch thins the cross section and reduces squeeze.
Gland fill	75 to 85 % at ambient. Nitrile swells in aromatic fuel and expands with heat, so leave room or the ring will extrude when it has nowhere to go.
Surface finish, dynamic	8 to 16 microinch Ra on the sliding surface. Rougher than 16 abrades the seal, smoother than 8 wipes the lubricant film off and runs dry.
Surface finish, static	32 to 63 microinch Ra on the sealing faces, 63 to 125 microinch Ra on the groove sides and bottom.
Lead-in chamfer	15 to 20 degrees, and break every sharp edge the ring crosses on the way in. Most installation damage is a cut, not a design problem.
Backup rings	Consider them above 1,500 psi with standard diametral clearance. Required sooner if clearance is generous or the seal runs hot, since heat softens the compound and it extrudes into the gap.
Lubrication	Mineral oil or silicone based assembly lubricants. Do not use phosphate ester or brake fluid based lubricants, and skip ester based greases, they attack the compound.
Friction	Comparable to other 70 durometer elastomers, lower breakout than polyurethane at the same hardness.
Cure date	Cure date and lot number are on every bag. Rotate stock oldest first and store per Section 9.

8. Regulatory status

This compound is not FDA compliant.

Standard black nitrile is not formulated or certified to FDA 21 CFR 177.2600, and it is not certified to NSF/ANSI 61, NSF/ANSI 51, USP Class VI, or 3-A Sanitary Standards. Keep it out of food contact, beverage, potable water, pharmaceutical, and medical device applications where any of those apply.

If the application does need a food or water rating, we stock FDA compliant white and black nitrile, FDA compliant EPDM and silicone, and NSF/ANSI 61 listed EPDM for potable water, and we can send the listing paperwork with the quote so the quality file is complete the first time. Tell us the fluid, the temperature, and which standard your customer is holding you to, and we will tell you which one fits.

Standard	Status
FDA 21 CFR 177.2600, rubber articles for repeated food contact	Not compliant
NSF/ANSI/CAN 61, drinking water system components	Not certified
NSF/ANSI 51, food equipment materials	Not certified
USP Class VI	Not tested

3-A Sanitary Standards	Not certified
EC 1935/2004, food contact materials	Not compliant
RoHS 2011/65/EU restricted substances	Contains none intentionally added
REACH SVHC	No SVHC above 0.1 % w/w to the current candidate list
California Proposition 65 listed substances	None intentionally added
Animal derived materials	None used
Natural rubber latex	Contains none

9. Storage, handling, and shelf life

Storage guidance follows SAE ARP5316 and ISO 2230, which are the standards a quality department will want cited. Nitrile is one of the compounds where storage actually matters, because ozone and sunlight damage parts that never left the shelf.

- Store between 40 °F and 77 °F (4 °C to 25 °C). Below 60 °F, let parts reach room temperature before installing, since cold rings are stiff and tear on assembly.
- Relative humidity below 75 %. Avoid condensation.
- Keep parts out of direct sunlight and fluorescent light, and away from electric motors, arc welders, and anything else that makes ozone.
- Leave parts in the original sealed, opaque packaging until they are needed. The bag is part of the shelf life.
- Store relaxed. No stretching, hanging on nails or wire, kinking, or stacking heavy parts on top of rings.
- Shelf life for nitrile under ARP5316 is 15 years from the cure date quarter when the conditions above are met. ISO 2230 is more conservative for this family, so if your quality system cites ISO 2230, use that number instead.
- Clean with isopropyl alcohol or mild soap and water only. Do not clean nitrile with ketones, chlorinated solvents, or aromatic solvents, the cleaner does more damage than the dirt.

10. Typical applications

Hydraulic cylinders, pumps, valves, and fittings. Pneumatic cylinders and air tools. Fuel systems on diesel and gasoline engines, fuel pumps, injectors, and filter housings. Engine and transmission static seals. Propane and natural gas fittings, regulators, and meters. Agricultural and construction equipment, including cabs, hydraulic circuits, and implement couplers. Compressors, gearboxes, and lubrication systems. Water and glycol coolant circuits below 150 °F. Vacuum flanges and fittings. Firearms, small engines, marine drives, and general shop repair. Wherever a machine runs on mineral oil, air, or fuel and lives indoors or under a hood, this is the compound that belongs in the groove, and the reason to move off it is always a specific fluid, a specific temperature, or sunlight, never a general feeling that something more expensive would seal better.

11. What you get from The O-Ring Store

We stock the most common O-Ring sizes, plus the ones our customers ask for and use. Every batch is certified by the Olypsys® O-Ring Measurement System from The O-Ring Store LLC, an ISO 9001:2015 certified distributor.

- Certificate of Conformance with every shipment, no charge and no asking twice.
- Dimensional verification on every lot through the Olypsys® system, reporting actual measured ID, cross section, and out of round rather than a pass or fail stamp.
- Full AS568 size range, plus metric and custom sizes.
- Lot traceability maintained on all material. Cure date and lot number on every bag.
- Technical support on gland design, compound selection, and failure analysis at no charge. Send us the failed part along with the fluid and the temperature, and we will tell you what happened to it.

THE O-RING STORE LLC

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We make getting O-Rings easy!

The O-Ring Store O-RING HANDBOOK

Free O-Ring engineering reference:
oringhandbook.com

The information in this data sheet is offered in good faith for engineering reference. Typical values represent the compound class and are not specification limits, guarantees, or warranties of performance. Compatibility, service life, and suitability for any specific application must be verified by the user under actual service conditions. Revision A, September 2026.