



PRODUCT DATA SHEET

Nitrile 70 Durometer U-Cup Seal, AN6226-24

Symmetrical U-Cup for petroleum hydraulic and air cylinders to 500 psi. 1-1/4" rod x 1-3/4" bore x 1/4" section.

Part number	AN6226-24 (TORS model 6226-24)
Compound designation	TORS NBR-70
Material type	Acrylonitrile butadiene rubber (nitrile, Buna-N), medium acrylonitrile content, thermoset. ISO 1629 designation NBR
Nominal hardness	70 Shore A, tolerance ± 5 (65 to 75 Shore A)
Color	Black
Seal style	Symmetrical U-Cup, equal inner and outer lips. Single acting. Works as a rod seal or a piston seal.
Size	Dimensions: 1-1/4" ID x 1-3/4" OD x 1/4" CS Actual: 1.250" ID x 1.750" OD x 0.250" CS Metric: 31.75 mm ID x 44.45 mm OD x 6.35 mm CS
Dimensional standard	AN6226 Rev. 7, Packing, "U" Cup, Hydraulic. Full dimensional data in Section 7.
Pressure rating	Up to 500 psi (34.5 bar). AN6226 limits the whole packing family to 600 psi (41.4 bar).
Regulatory status	Not FDA compliant. See Section 8.
Cross reference	Comparable to Parker Hannifin 42956226-24, Hercules 870-24, Martin Fluid Power 6226-24, Precision Associates 6226-24

1. What this material is

Nitrile is a synthetic copolymer of butadiene and acrylonitrile. The acrylonitrile content is the number that drives its behavior. More acrylonitrile means better oil resistance and worse cold flexibility, less means the reverse. This U-Cup uses a medium acrylonitrile general purpose grade, which is the standard commercial balance: very good resistance to petroleum oils and hydraulic fluids, with usable flexibility down into sub-zero weather.

The U-Cup shape is what makes this part different from an O-Ring in the same gland. An O-Ring seals by being squeezed. A U-Cup seals with two flexible lips that are pressure energized, meaning system pressure pushes the lips harder against the rod and bore as pressure rises and lets off as it drops. That gives lower breakout and running friction than a squeezed O-Ring and more tolerance for wear, which is why the AN6226 U-Cup has been the go-to cylinder seal in moderate pressure hydraulic and pneumatic equipment for decades. AN6226 was set inactive for new design in 1998, but it remains the common interchange standard, and parts built to it are still made and stocked by the major seal manufacturers.

2. What this material does

The short version: this is the standard nitrile U-Cup for petroleum hydraulic and air cylinders running at 500 psi or less. It is the right part most of the time, and the reasons to change are a different fluid, more heat, or more pressure.

Performance area	How this compound behaves
Oil and fuel resistance	Very good in petroleum hydraulic oil, mineral oil, grease, and diesel. Typical volume swell is 10 to 20 % in reference oil at 212 °F, which the U-Cup lips absorb without losing their seal.
Sealing action	Lip interference seals at zero and low pressure. As pressure rises, the lips load up harder against the rod and bore, so the seal gets tighter when it needs to.
Friction	Noticeably lower breakout and running friction than a 70 durometer O-Ring in the same bore. This is the main reason U-Cups are the usual choice on air cylinders and low pressure hydraulics.
Extrusion resistance	Fair. At 70 durometer the heel handles 500 psi with tight clearance. Above that, or with a worn or loose gland, the heel gets nibbled into the gap. See Section 6.
Wear and abrasion	Good for an elastomer. The lips wear in and keep sealing. A polyurethane U-Cup runs roughly 5 to 10 times the wear life of nitrile in sliding service when wear is the problem.
Compression set and memory	Good. Typically 15 to 25 % set at 212 °F, so the lips hold their flare and keep their interference through normal service.
Water resistance	Good in water below 150 °F. Hot water softens and slowly degrades the compound.
Ozone, UV, and weathering	Poor unless protected. Surface cracks form under ozone and sunlight, fastest where the rubber is stretched.
Heat aging	Hardens and takes a set above about 225 °F continuous. A hard, flattened U-Cup with no lip flare left was run too hot.
Low temperature flexibility	Rated to -40 °F. The lips stiffen noticeably below about -20 °F. Static sealing holds, dynamic sealing on a cold start will weep until the seal warms up.

3. Typical physical properties

Values are typical for the compound class and are offered for engineering reference. They are not specification limits. Lot specific results are reported on the Certificate of Conformance supplied with each shipment.

Property	Test method	Typical value
Hardness	ASTM D2240	70 ± 5 Shore A
Tensile strength	ASTM D412	1,800 to 2,500 psi (12 to 17 MPa)
Elongation at break	ASTM D412	300 to 450 %
Modulus at 100 %	ASTM D412	500 to 800 psi (3.4 to 5.5 MPa)
Tear strength, Die C	ASTM D624	150 to 250 lbf/in (26 to 44 kN/m)
Compression set, 70 hr at 212 °F	ASTM D395 Method B	15 to 25 %
Specific gravity	ASTM D792	1.20 to 1.30
Rebound resilience	ASTM D2632	30 to 40 %
Low temperature retraction, TR-10	ASTM D1329	-20 to -30 °F (-29 to -34 °C)
Volume swell, IRM 903 (ASTM No. 3) oil, 70 hr at 212 °F	ASTM D471	10 to 20 %

4. Service temperature

Condition	Range
Continuous service, petroleum oil (product rating)	-40 °F to +225 °F (-40 °C to +107 °C)
Continuous service, dry air	-40 °F to +212 °F (-40 °C to +100 °C)
Intermittent, short excursion	to +250 °F (+121 °C)
Continuous in water	to +150 °F (+66 °C)
Low temperature dynamic limit, recommended	-20 °F (-29 °C)
Low temperature brittle point, ASTM D2137	approx. -50 °F (-46 °C)

At the hot end, nitrile does not fail all at once. It hardens a little every hour it spends above its rating, the lips lose their flare, and the seal starts to leak on the next cool down when the metal shrinks away from a lip that no longer follows it. At the cold end, the lips stiffen and stop tracking the rod, so a cylinder that seals fine at noon can weep on a cold morning start and then seal again once it warms up. Surviving a temperature and sealing at it are two different things, and the dynamic limit in the table is the one to design to.

5. Media compatibility

RECOMMENDED Petroleum based hydraulic fluids, including mineral, AW, and ISO VG grades. Mineral oils and greases. Diesel fuel, aliphatic gasoline, and kerosene. Lubricated compressed air below 212 °F. Silicone oils and greases. Water in oil and water glycol fire resistant fluids (HFA, HFB, HFC). Vegetable and animal oils. Ethylene glycol antifreeze. Propane and butane.	LIMITED OR CONDITIONAL Water is fine below 150 °F, but hot water and long term immersion soften the compound. Mild acids and bases are usable dilute and at room temperature, so verify the concentration and temperature first. Ozone, sunlight, and outdoor exposure crack unprotected nitrile, so shield the rod seal or specify a protected grade. Alcohol blended fuels such as E85 and high aromatic gasoline cause moderate swell. Steam is short term only. Dry, unlubricated air shortens lip life.	NOT RECOMMENDED Strong and concentrated acids. Glycol based brake fluid, DOT 3, DOT 4, and DOT 5.1. Aromatic hydrocarbons such as toluene, benzene, and xylene. Ketones such as MEK and acetone. Solvent esters. Chlorinated solvents. Phosphate ester hydraulic fluids such as Skydrol and Fyrquel. Strong oxidizers. Nitro hydrocarbons.
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6. Pressure and extrusion caution

Heel extrusion is how this U-Cup fails. Stay at or under 500 psi and keep the clearance tight.

Under pressure, the back of the U-Cup, called the heel, is pushed against the clearance gap between the rod and the gland, or the piston and the bore. A 70 durometer heel will flow into a gap that is too big, and the rod stroke then nibbles off a little at a time until the heel is gone and the seal leaks. The AN6226 standard itself limits this packing family to 600 psi for exactly this reason. Pressure spikes count, so size to the peak, not the gauge average.

Exposure	Guidance
Up to 500 psi, diametral clearance 0.010 in (0.25 mm) or less	Normal service. This is the rated envelope for this part.
500 to 600 psi	Inside the AN6226 family limit but above the rating on this part. Hold diametral clearance to 0.005 in (0.13 mm) or less, or move to a harder compound.
Above 600 psi	Outside AN6226. Use a polyurethane U-Cup or a U-Cup with an anti-extrusion ring.
Pressure spikes, shock loads, or relief valve set above 500 psi	Treat the peak as the working pressure. A 400 psi system that spikes to 900 psi is a 900 psi seal application.
Worn rod bushing, side load, or misalignment	Clearance opens up on one side and the heel extrudes there first. Replace the bushing along with the seal, or the new U-Cup follows the old one.
Service above 225 °F	Hot nitrile is softer and extrudes at lower pressure. Derate the pressure or move to a higher temperature compound.

Ozone cracking and heat hardening are the nitrile weak points.

Unprotected nitrile cracks under ozone and sunlight, and it starts where the rubber is stretched, which on a U-Cup is the lip edge. An exposed cylinder rod that sat outside all winter is the classic case. Separately, nitrile run above its rating hardens and loses its lip flare, then leaks on the next cool down. A U-Cup that comes out hard, flat, and shiny was too hot.

If the cylinder runs above 500 psi, sees heavy cycling, or eats U-Cups from wear, ask us about a polyurethane U-Cup in the same AN6226 size. It trades some heat and hot water capability for much better extrusion and wear resistance, and in the right application it is the difference between a seal that lasts a season and one that lasts a year. If the problem is heat or outdoor exposure instead, ask us about fluorocarbon or hydrogenated nitrile in the same size.

7. Design and installation guidance

Dimensional data, AN6226-24

Dimension	Inch	Metric	Note
Nominal ID (rod diameter)	1.250	31.75 mm	1-1/4"
Nominal OD (bore diameter)	1.750	44.45 mm	1-3/4"
Nominal radial cross section	0.250	6.35 mm	1/4", equal to the height, square section
Height (axial length)	0.250 ± 0.005	6.35 ± 0.13 mm	Per AN6226 Table I
Heel ID, free state	1.265	32.13 mm	Per AN6226 Table I, clears the rod
Heel OD, free state	1.735	44.07 mm	Per AN6226 Table I, clears the bore
Mean diameter	1.500	38.10 mm	Per AN6226 Table I
Tolerance where not stated	± 0.016	± 0.41 mm	Per AN6226 Note 4

The heel is deliberately smaller than the gland on both sides so it does not drag. The sealing lips flare past the nominal rod and bore diameters in the free state, and that flare is what creates the interference seal. Measure a U-Cup at the heel, not the lips, when checking it against this table.

Gland and installation

Item	Guidance
Gland	Rod 1.250 in, bore 1.750 in, radial groove depth 0.250 in. Standard AN6226 gland, no special machining.
Groove length	0.270 to 0.285 in (6.9 to 7.2 mm), seal height plus roughly 10 %, so the U-Cup is not pinched axially. This is common industry practice, not an AN6226 requirement.
Lip orientation	The open side of the U faces the pressure. Installed backward, it leaks on the first stroke. For a double acting piston, use two U-Cups back to back in separate grooves, never two in one groove.
Pressure	Up to 500 psi (34.5 bar), including spikes. See Section 6.
Extrusion clearance	0.010 in (0.25 mm) diametral maximum at 500 psi. Tighter at elevated temperature.
Surface speed	Up to approx. 1.5 ft/s (0.5 m/s) in reciprocating service, typical for nitrile U-Cups.
Surface finish, dynamic	8 to 16 microinch Ra on the rod or bore. Rougher wears the lips fast. Mirror finishes below about 4 microinch Ra can starve the lip of lubricant.
Surface finish, static	32 to 63 microinch Ra on the groove walls and root.
Lead-in chamfer	15 to 20 degree chamfer on the rod end and the bore entrance, with all edges broken. Cover threads, ports, and cross holes during installation. A nicked lip leaks from day one.
Stretch and compression on installation	Piston seals can be stretched over the piston land if done quickly and evenly, then allowed to recover before assembly. Rod seals in closed grooves can be folded into a kidney shape and snapped into place. Never roll or twist the seal.
Lubrication	Install with clean petroleum hydraulic oil or a compatible petroleum or silicone grease. Do not use phosphate ester or brake fluid based lubricants. Lubricated air is preferred in pneumatic service.
Friction	Lower than a 70 durometer O-Ring in the same gland, especially at breakout.

8. Regulatory status

This compound is not FDA compliant.

This U-Cup is not compliant to FDA 21 CFR 177.2600 and is not certified to NSF/ANSI 51, NSF/ANSI 61, USP Class VI, or 3-A Sanitary Standards. Keep it out of food, beverage, potable water, pharmaceutical, and medical contact applications. It is also a commercial nitrile 70 compound, not qualified to MIL-P-25732, the material called out in the AN6226 standard, unless the purchase order specifically requires it and the qualification paperwork ships with the parts.

If your application needs FDA compliant material or MIL-P-25732 documentation, tell us before you order. We can look at FDA grade nitrile, EPDM, or fluorocarbon U-Cups in this size, and at documented material for military work, and give you a straight answer on availability and lead time.

Standard	Status
AN6226 Rev. 7, dimensions	Dimensions per Table I
MIL-P-25732, material	Not certified
FDA 21 CFR 177.2600	Not compliant
NSF/ANSI 61, potable water	Not certified
NSF/ANSI 51, food equipment	Not certified
USP Class VI	Not certified
3-A Sanitary Standards	Not certified
RoHS 2011/65/EU	Declaration not on file
REACH SVHC	Declaration not on file
California Proposition 65	Not tested
Animal derived materials	Declaration not on file
Natural rubber latex	Synthetic polymer, not a natural rubber compound

9. Storage, handling, and shelf life

Store to SAE ARP5316 and ISO 2230, the storage standards a quality department will ask about. Nitrile stores well when these conditions are followed.

- Temperature below 77 °F (25 °C), away from furnaces, heaters, and direct heat sources.
- Relative humidity below 65 %, with no condensation.
- Keep away from sunlight, fluorescent light, and ozone sources such as electric motors, welders, and high voltage equipment. Ozone is what cracks nitrile in storage.
- Keep in the original sealed, opaque bag with the lot number and cure date on it until use.
- Store flat and relaxed. Do not hang U-Cups on pegs or wire, and do not stack heavy loads on them. A crushed or bent lip may not recover its flare.
- SAE ARP5316 lists nitrile at 15 years from cure date under proper storage. ISO 2230 gives nitrile an initial 7 years, with a 3 year extension after inspection.
- Clean with mild soap and water only, then air dry. No solvents.

10. Typical applications

Rod and piston seals in hydraulic cylinders running petroleum oil at 500 psi or less, pneumatic cylinders and air actuators, hydraulic and pneumatic valves, pumps and plungers, hydraulic jacks, lifts and presses, agricultural and light mobile equipment cylinders, material handling equipment, and OEM and maintenance replacements across aviation ground support, automotive, and general industrial service. AN6226 U-Cups also turn up in older military and aviation hardware where the drawing still calls out the AN number. Anywhere an O-Ring on a rod or piston is sticking, chattering, or wearing out from breakout friction at low pressure, this U-Cup is the swap.

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.
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