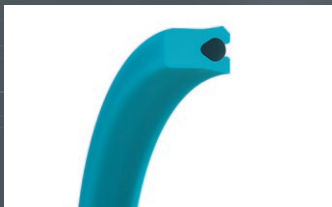




Zurcon[®] Excluder[®] ESA

**PROVEN ROBUST AND UNPARALLELED SCRAPING
PERFORMANCE FOR LANDING GEAR APPLICATIONS**



Zurcon® Excluder® ESA

Maximizing the service life of landing gear shock absorbers with unparalleled scraping performance.

Specially engineered for the aerospace industry, the Zurcon® Excluder® ESA is a highly effective hydraulic scraper, designed to prevent ingress of contaminants into critical landing gear shock absorber applications. Its unique design makes it easier to install, optimizes scraping performance, maximizes wear resistance, and extends the service life of both the scraper and the shock absorber.

Innovative material formulation

Manufactured from abrasion resistant Zurcon® Z07 polyurethane (PU) material, the Zurcon® Excluder® ESA demonstrates extended service life. This unique material is compatible with, but is not limited to, hydraulic fluids BMS3-32 (Type I, II, III), MIL-PRF-5606, MIL-PRF 87257, MIL-PRF 83282, and MIL-PRF-6083, as well as deicers and cleaning fluids typically found in landing gear shock absorbers.

Unique design for optimum performance

The Zurcon® Excluder® ESA features an energizing O-Ring, which ensures effective scraping performance when the scraper experiences side loads at both low and high temperatures. Additionally, the O-Ring makes the Zurcon® Excluder® ESA easier to install into closed gland positions than metal spring energized scrapers.

Designed for landing gear shock absorbers with scraper glands based upon AS4716 and AS4832 rod diameters, Zurcon® Excluder® ESA is suitable for assembly into closed glands, allowing for simple and cost-effective gland design.

**Compatible
with a wide
range of media**

**Ultra wear-
resistant
material**

**Extends landing
gear service life**

**Maximum
scraping
performance**

**Simplifies
assembly**

Benefits:

- Excellent wear resistance for a long service life
- Outstanding scraping performance protects landing gear from contamination
- Simplifies installation, to lower assembly costs, while maintaining high quality
- Withstands large amounts of radial deflection even on the largest shock absorbers
- O-Ring energizer can match application specific fluids or contaminants
- Suitable for counter surfaces with hard chrome or high velocity oxygen fuel (HVOF) coatings
- Easy to install into closed glands based on AS4716 and AS4832

Operating characteristics:

- Temperature range: -65 °F to +225 °F / -54 °C to +107 °C
- Hardness: 92 Shore A
- Capable of operating from ground level to high altitude pressure conditions
- Can withstand exposure to high pressure water spray
- Effective scraping performance at the linear speeds found in all aircraft landing gear

Rounded OD corner profile

Matches groove corner radius to prevent distortion.

Elastomer O-Ring

Specified from a wide range of elastomers to match the media in the application.

Angled OD sealing lip

Enables a secure fit into the scraper gland, while facilitating easier assembly.

Zurcon® ESA jacket

Made to fit into 1 Back-up Ring width size glands, the extended heel stabilizes the seal during arduous landing gear operation.

Zurcon® material

Robust PU material enhances scraper performance over the service life of the landing gear.

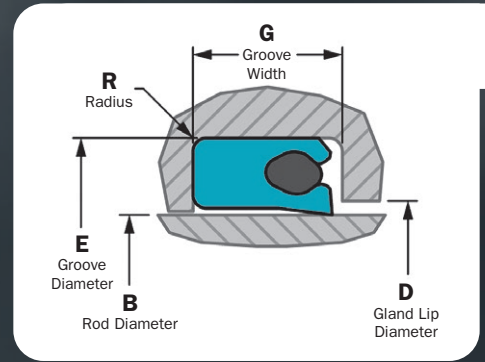
90° Scraper lip

Maximizes scraping performance to prevent contamination of the landing gear.

Shallow Angle Profile

Optimized design relieves pressure in the application.

Part Number Guide



Trelleborg Sealing Solutions Aerospace developed the new Zurcon® Excluder® ESA to fit existing hardware designs commonly used in aircraft landing gear shock absorbers. These gland dash sizes are based on AS4052 and AS4088 standards for landing gear scrapers. Additional sizes are available upon request.

Series No.	Dash Size per Gland Standard
WEA2	206 - 222
WEA3	325 - 349
WEA4	425 - 454

Ordering Example: **WEA** | **3** | **0** | **B** | **326** | **A** | **Z07** | **NJ**

Excluder® ESA ASSY Gland Standard B = Trelleborg Sealing Solutions Gland Standard Zurcon® Material Code

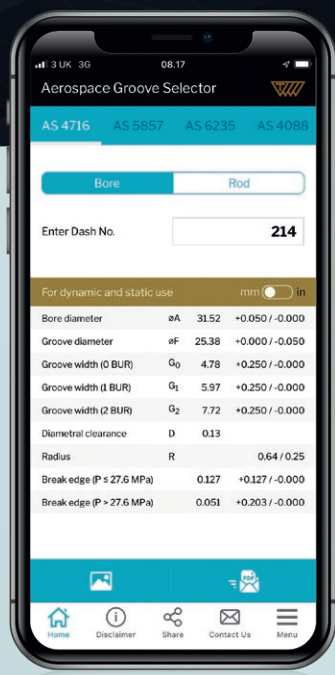
Note: The part number is incomplete without a material suffix.

Cross Section
 2 = 200 series
 3 = 300 series
 4 = 400 series

Quality Index
 A = Aerospace

Turel® Energizing O-Ring
Material Codes
 NJ = Turel® NJ NBR per AMS3220
 UA = Turel® UA, PU per Trelleborg Sealing Solutions specification
 NE = Turel® NE NBR per AMS-P-83461
 FT = Turel® FT FKM per AMS7287

Design Code
 0 = Standard



Aerospace Groove Selector

To ease specification of seals for aerospace applications, use the Aerospace Groove Selector. It covers five of the most important SAE aerospace groove standards for hydraulic systems: AS4716, AS5857, AS6235, AS4088, and AS4832. The app makes it simple to find groove sizes and determine if grooves are suitable for dynamic or static seals.

Available in:
 Google Play for Android The iPhone AppStore

Gland Sizes (AS4052 or AS4088 Dash No.)	Inch					Millimeter				
	B Rod Diameter Tolerance	E Groove Diameter Tolerance	D Gland Lip Diameter Tolerance	G Groove Width Tolerance	R Radius Tolerance	B Rod Diameter Tolerance	E Groove Diameter Tolerance	D Gland Lip Diameter Tolerance	G Groove Width Tolerance	R Radius Tolerance
206	0.498	0.741	0.610			12.65	18.82	15.49		
207	0.560	0.803	0.672			14.22	20.40	17.07		
208	0.623	0.866	0.735			15.82	22.00	18.67		
209	0.685	0.928	0.797			17.40	23.57	20.24		
210	0.748	0.991	0.860			19.00	25.17	21.84		
211	0.810	1.053	0.922			20.57	26.75	23.42		
212	0.873	1.116	0.985			22.17	28.35	25.02		
213	0.935	1.178	1.047			23.75	29.92	26.59		
214	0.998	1.241	1.110	0.235	0.010/ 0.025	25.35	31.52	28.19	5.97	0.25/ 0.64
215	1.060	1.303	1.172		+0.010/-0.000	26.92	33.10	29.77		
216	1.123	1.366	1.235			28.52	34.70	31.37		
217	1.185	1.428	1.297			30.10	36.27	32.94		
218	1.248	1.491	1.360			31.70	37.87	34.54		
219	1.310	1.553	1.422			33.27	39.45	36.12		
220	1.373	1.616	1.485			34.87	41.05	37.72		
221	1.435	1.678	1.547			36.45	42.62	39.29		
222	1.498	1.741	1.610			38.05	44.22	40.89		
325	1.498	1.870	1.674			38.05	47.50	42.52		
326	1.623	1.995	1.799			41.22	50.67	45.69		
327	1.748	2.120	1.924			44.40	53.85	48.87		
328	1.873	2.245	2.049			47.57	57.02	52.04		
329	1.998	2.370	2.174			50.75	60.20	55.22		
330	2.123	2.495	2.299			53.92	63.37	58.39		
331	2.248	2.620	2.424			57.10	66.55	61.57		
332	2.373	2.745	2.549			60.27	69.72	64.74		
333	2.498	2.870	2.674			63.45	72.90	67.92		
334	2.623	2.995	2.799			66.62	76.07	71.09		
335	2.748	3.120	2.924	0.334	0.020/ 0.035	69.80	79.25	74.27	8.48	0.51/ 0.89
336	2.873	3.245	3.049		+0.010/-0.000	72.97	82.42	77.44		
337	2.997	3.369	3.173			76.12	85.57	80.59		
338	3.122	3.494	3.299			79.30	88.75	83.79		
339	3.247	3.619	3.423			82.47	91.92	86.94		
340	3.372	3.744	3.548			85.65	95.10	90.12		
341	3.497	3.869	3.673			88.82	98.27	93.29		
342	3.622	3.994	3.799			92.00	101.45	96.49		
343	3.747	4.119	3.923			95.17	104.62	99.64		
344	3.872	4.244	4.048			98.35	107.80	102.82		
345	3.997	4.369	4.173			101.52	110.97	105.99		
346	4.122	4.494	4.299			104.70	114.15	109.19		
347	4.247	4.619	4.423			107.87	117.32	112.34		
348	4.372	4.744	4.548			111.05	120.50	115.52		
349	4.497	4.869	4.673			114.22	123.67	118.69		
425	4.497	4.974	4.726			114.22	126.34	120.04		
426	4.622	5.099	4.851			117.40	129.51	123.22		
427	4.747	5.224	4.976			120.57	132.69	126.39		
428	4.872	5.349	5.101			123.75	135.86	129.57		
429	4.997	5.474	5.226			126.92	139.04	132.74		
430	5.122	5.599	5.351			130.10	142.21	135.92		
431	5.247	5.724	5.476			133.27	145.39	139.09		
432	5.372	5.849	5.601			136.45	148.56	142.27		
433	5.497	5.974	5.726			139.62	151.74	145.44		
434	5.622	6.099	5.851			142.80	154.91	148.62		
435	5.747	6.224	5.976			145.97	158.09	151.79		
436	5.872	6.349	6.101			149.15	161.26	154.97		
437	5.997	6.474	6.226			152.32	164.44	158.14		
438	6.247	6.724	6.476	0.475	0.020/ 0.035	158.67	170.79	164.49	12.07	0.51/ 0.89
439	6.497	6.974	6.726		+0.010/-0.000	165.02	177.14	170.84		
440	6.747	7.224	6.976			171.37	183.49	177.19		
441	6.997	7.474	7.226			177.72	189.84	183.54		
442	7.247	7.724	7.476			184.07	196.19	189.89		
443	7.497	7.974	7.726			190.42	202.54	196.24		
444	7.747	8.224	7.976			196.77	208.89	202.59		
445	7.997	8.474	8.226			203.12	215.24	208.94		
446	8.247	8.724	8.476			209.47	221.59	215.09		
447	8.497	8.974	8.726			215.82	227.94	221.64		
448	8.747	9.224	8.976			222.17	234.29	227.79		
449	8.997	9.474	9.226			228.52	240.64	233.94		
450	9.247	9.724	9.476			234.87	246.99	240.09		
451	9.497	9.974	9.726			241.22	253.34	246.24		
452	9.747	10.224	9.976			247.57	259.69	252.39		
453	9.997	10.474	10.226			253.92	266.04	258.54		
454	10.247	10.724	10.476			260.27	272.39	264.69		
455	10.497	10.974	10.726			266.62	278.74	270.84		
456	10.747	11.224	10.976			272.97	285.09	276.99		
457	10.997	11.474	11.226			279.32	291.44	283.14		
458	11.247	11.724	11.476			285.67	297.79	289.24		
459	11.497	11.974	11.726			292.02	304.14	295.34		
460	11.747	12.224	11.976			298.37	310.49	301.49		
461	11.997	12.474	12.226			304.72	316.84	307.54		
462	12.247	12.724	12.476			311.07	323.19	313.64		
463	12.497	12.974	12.726			317.42	329.54	319.74		

Proven Performance

Trelleborg Sealing Solutions Aerospace completed FEA modeling and physical testing of the Zurcon® Excluder® ESA to verify the performance for shock absorber applications.

1 FEA Modeling

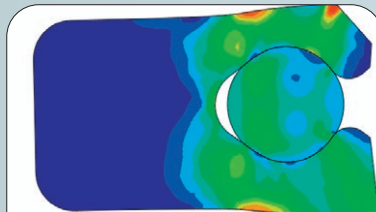
FEA modeling of the Zurcon® Excluder® ESA installed in hardware allows visualization of how stress is distributed throughout the scraper. The contact forces of the Zurcon® Excluder® ESA exerted on the housing and the rod were analyzed at different operating temperatures.

Uninstalled Condition



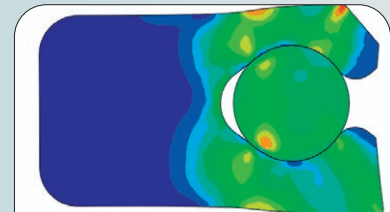
Extreme Low Temperature

-65 °F / -54 °C



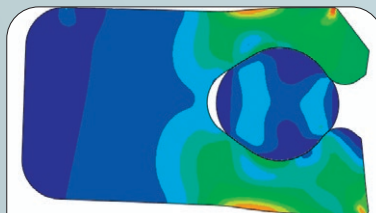
Low Temperature

-40 °F / -40 °C



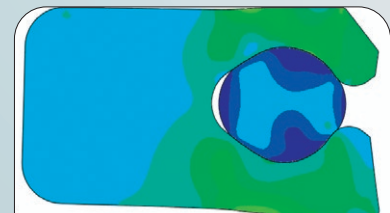
Room Temperature

+71 °F / +22 °C

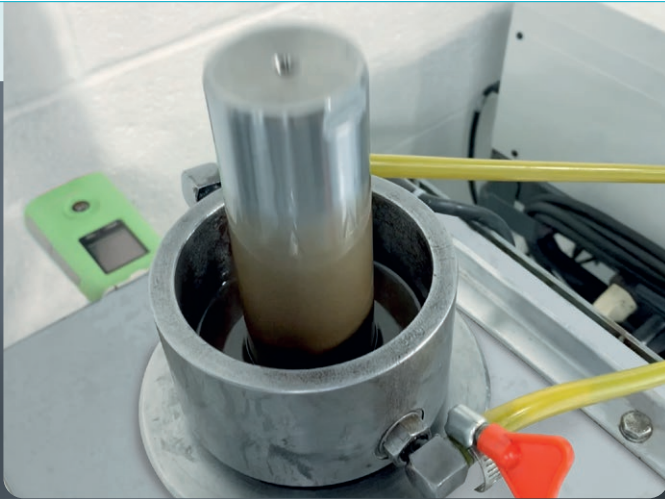


High Temperature

+250 °F / +121 °C



FEA models demonstrate that at all operating temperatures the Zurcon® Excluder® ESA maintains sufficient contact force with the rod to prevent contamination and ingress of debris, such as dirt, dust and ice.



2 Arizona Road Dust Testing (ARDT)

Test Conditions:

Temperature:	+70 °F / +20 °C
Pressure:	0 PSI
Velocity:	1 Hertz
Stroke:	6.00" / 152.4 mm retract 6.00" / 152.4 mm extend 100,000 cycles
Fluid:	Slurry Mixture ratio: 85% 10W oil with 15% medium road dust

Zurcon® Excluder® ESA with part number WEA30B326AZ07NJ used in tests

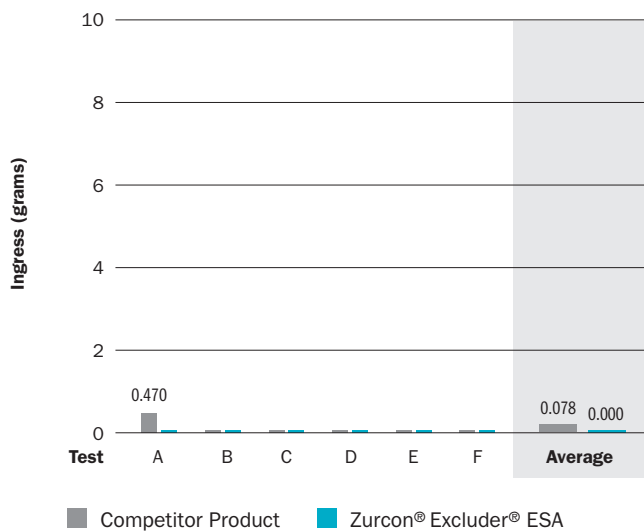
Testing with Arizona road dust verified the ability of the Zurcon® Excluder® ESA to prevent dust and debris from entering the shock absorber. The scraper was back-to-back tested against a commercially available competitor product six times each over 100,000 cycles.

Tests prove the Zurcon® Excluder® ESA is the optimum choice to prevent contamination of landing gear. In addition, significantly smaller changes to the radial height of the scrapers tested indicate the ability of Zurcon® Excluder® ESA to better withstand operating conditions, offering efficient scraping performance over a longer service life.

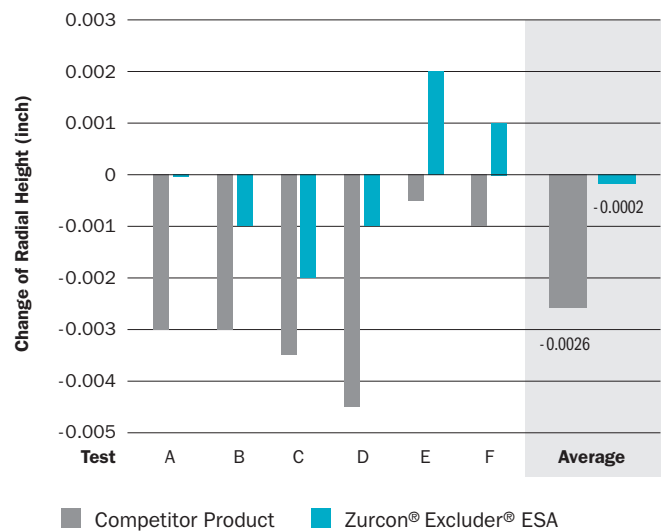
Gland Dimensions:

AS4716-326 rod test rig	
Shaft (ØB):	1.623" / 41.22 mm
Groove (ØE):	1.995" / 50.67 mm
Rod Bore (ØC):	1.625" / 41.28 mm
Groove Width (G):	0.334" / 8.48 mm
Relief Dia (K):	1.761" / 44.73 mm
Groove Radius:	0.020 +0.015" / 0.51 +0.38 mm

Scraper Comparison – Debris Ingress



Change of Radial Height



Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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