



SONKIT

Specializing in Metal Seal



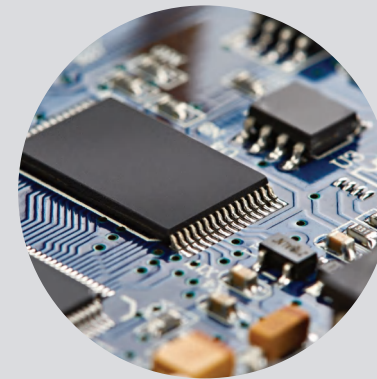
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2024.07

Sonkit Metal Seal

Sealing Solution for Extreme Working Conditions

Sonkit Industry Technology Co.,Ltd is a privately owned metal seal manufacturer founded in Shanghai in 2010. Since 2012, Sonkit has been specialized in metal seals. So far, Sonkit can develop and manufacture all kinds of high-performance metal seals and offer metal sealing solutions for extreme sealing applications, like high temperatures, high pressures, corrosion medium or combinations.



Sonkit Products

O-Ring Series:

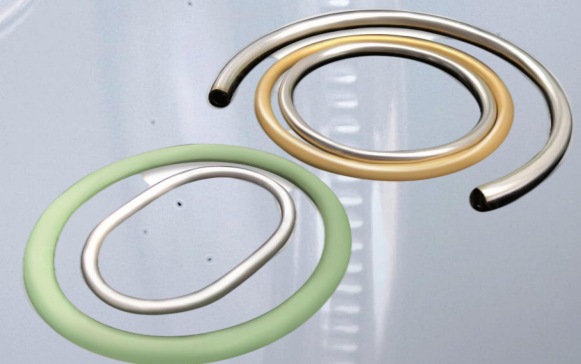
- Metal O-Ring
- Balanced Metal O-Ring
- Spring Energized Metal O-Ring
- Gas Energized Metal O-Ring

C-Ring Series:

- Metal C-Ring
- Spring Energized Metal C-Ring
- Aluminum Metal C-Ring
- Blade Spring Energized Metal C-Ring

Other Series:

- Metal V Ring
- Metal W Ring(E Ring)
- Metal Comma Ring
- Spring Energized Metal Comma Ring

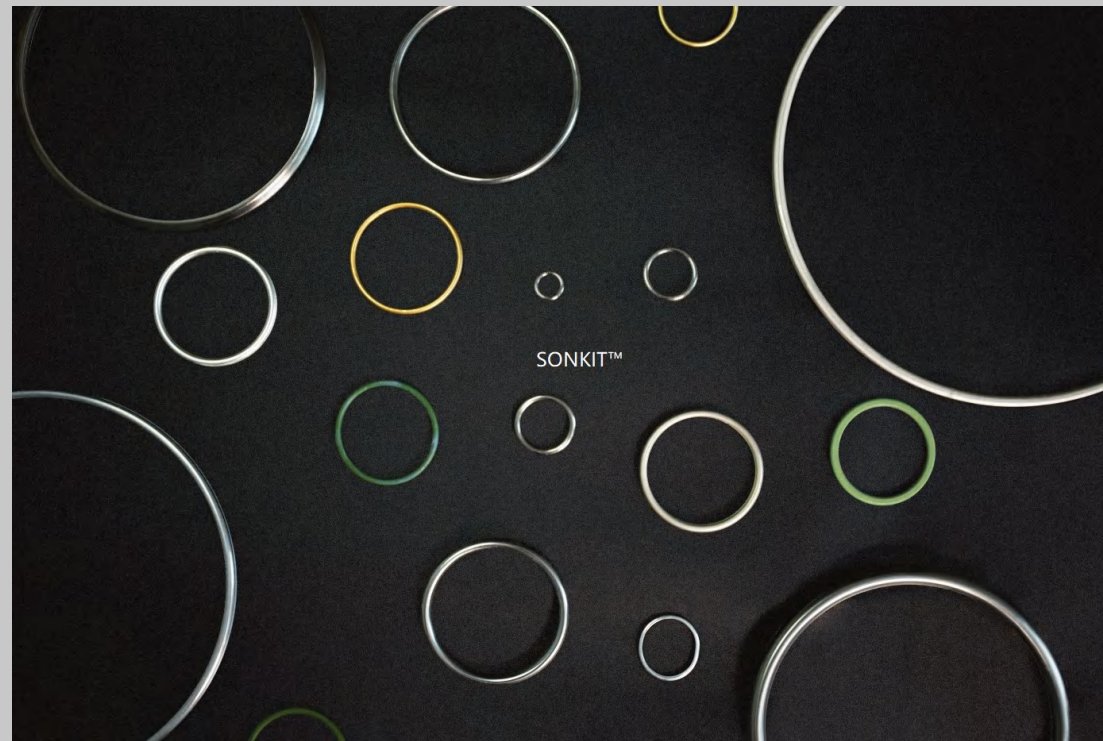


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ISO 9001:2015 Certified

Sonkit Product Naming



Sonkit Metal Seals are offered in a variety of shapes, sizes, thicknesses, and materials to meet the sealing requirements in critical environments.

Sonkit provides a simple and efficient product naming schema (see right page), including key elements such as material composition, dimension and process of heat treatment. The product naming schema simplifies the process of metal seal's selection and adoption, which enables our customers put more attention on the product design.



Type



Material



Size

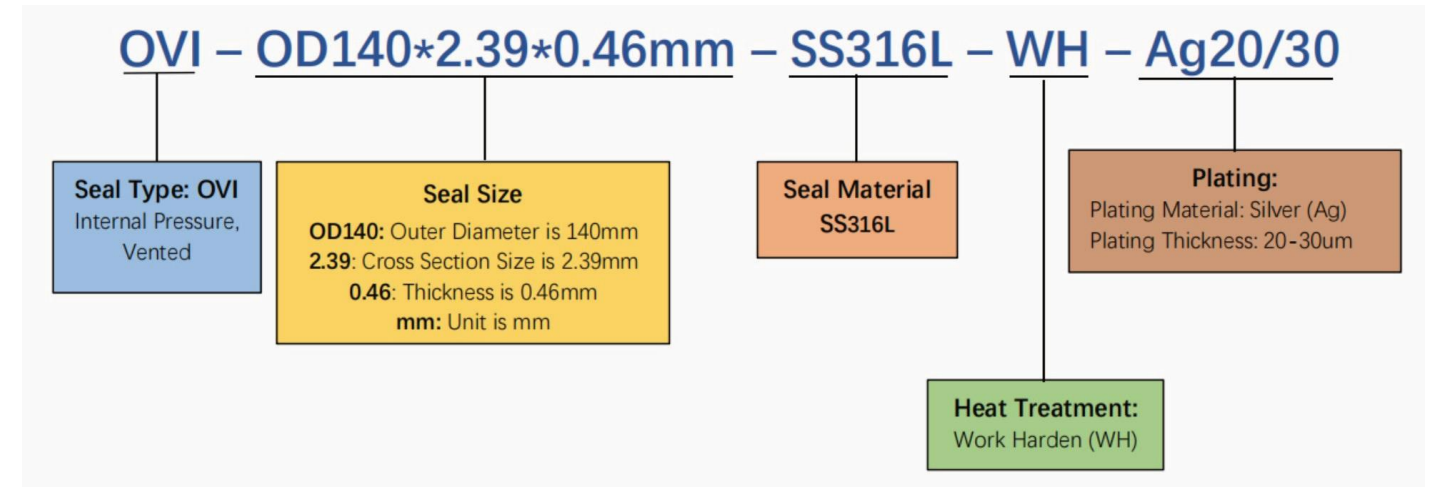


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Naming Schema



Naming Example



+86 139-1719-2435
Product & Service



Metal Seal General Properties

Considering the differentiation in application conditions, Sonkit recommends customers to check the general properties before selecting an appropriate metal seal.

Please do not hesitate to contact our engineer team for specific queries,
johnny@sonkit.cn.



Cross Section
0.79mm to 12.7mm



Working Temperature
-270°C to 750°C



Working Pressure
Vacuum to 300Mpa



Leakage Rate
1E-10 Pa*m3/s or less



Seal Diameter
6.9mm -4.5m



Excellent Resistance
Corrosion & Radiation



Metal Seal Types

Ring Type	Pressure Direction	Seal Type	Description
Metal O-Ring (also called O-Seal)	Internal	OI	Standard, Internal Pressure, No Venting
		OVI	Internal Pressure, Vented, with system pressure energized
		OSI	Internal Pressure, O-Ring Spring Energized
		OGI	Internal Pressure, O-Ring Gas filled
	External	OE	External Pressure, Standard, No Venting
		OVE	External Pressure, Vented O-Ring, system pressure energized
		OSE	External Pressure, O-Ring with Spring Energized
		OGE	External Pressure, O-Ring with Gas filled
Metal C-Ring (also called C-Seal)	Internal	CI	Standard C-Ring, Internal Pressure, system pressure energized
		CSI	Internal Pressure, Spring energized C-Ring
	External	CE	Standard, External Pressure, system pressure energized
		CSE	External Pressure, Spring energized C-Ring
	Axial	CA	Standard, Axial Pressure, System pressure energized C-Ring
	CSA	Axial Pressure, Spring energized C-Ring	
Metal V-Ring (also called V-Seal)	Internal	VI	Standard, Internal Pressure V-Ring
	External	VE	Standard, External Pressure V-Ring
	Axial	VA	Standard, Axial Pressure V-Ring
Comma Ring	Internal	COI	Spring energized CommaSeal, Internal Pressure
	External	COE	Spring energized CommaSeal, External Pressure
Metal W-Ring (Also called W-Seal)	Internal	WI	Standard, Internal Pressure W-Ring
	External	WE	Standard, External Pressure W-Ring



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Common Material Temperature Capabilities

Materials temperature resistance is the primary factor for selecting an appropriate metal seal. Sonkit uses a variety of stainless steels and nickel alloys to produce metal seal jacket, spring and plating.

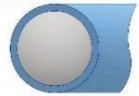
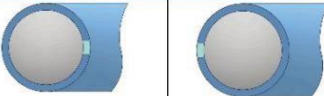
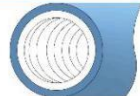

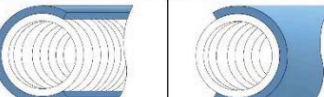




Material for Metal Seal Jacket

Material	UNS No.	Maximum Recommended Service Temperature	Usage & Application
SS 316L	S31600	316°C	Typically used for Metal C-Ring or O-Ring in cryogenic to moderate temperature, with mild corrosion resistance.
SS 304L	S30403	316°C	
SS321	S32100	427°C	
Alloy 600	N07600	538°C	Used C-Ring requiring corrosion resistance to specific environments.
Alloy 718	N07718	649°C	Apply for all types of seals, regularly used in gas turbines and other applications with large thermal transients. Harder than Alloy X750 with improved weldability.
Alloy X-750	N07750	593°C	Apply for all types of seals. It is a traditional material which can be substituted by Alloy 718.
Aluminum Alloy 1100	A91100	538°C	Used in machined seals

Material for Metal Seal Plating

Material	Maximum Recommended Service Temp	Typical Usage
Silver (Ag)	Oxidizing: 650°C Non-oxidizing: 425°C	The Most selected material for plating. Good corrosion and temperature resistance. Excellent anti-galling properties. Most cost-effective than other plating materials
Gold (Au)	927°C	Soft metal with excellent chemical and oxidation resistance, high temperature capability. Expensive.
Copper (Cu)	930°C	Relatively soft and economic plating
Nickel (Ni)	1204°C	Highest temperature tolerance among the listed materials. Harder than silver. Apply for very hot, oxidizing environment
Tin (Sn)	190°C	Similar properties with Silver. Apply in lower load sealing conditions. High performance in vacuum applications
Teflon (PTFE)	230°C	Chemically inert soft polymer. Cannot apply in high load sealing. Allow some permeation of gases.

Types-Meterials-Applications

O/OG Type		OVI/OVE Type		OS Type	
					
Internal & external Pressure		Internal Pressure	External Pressure	Internal and External Pressure	
✓ Alloy 718 ✓ Alloy X-750 ✓ 316 SS ✓ 321 SS ✓ Alloy 600		✓ Alloy 718 ✓ Alloy X-750 ✓ 316 SS ✓ 321 SS ✓ Alloy 600		✓ Alloy 718 ✓ Alloy X-750 ✓ 316 SS ✓ 321 SS ✓ Alloy 600	
Hot mold equipment, Nuclear (Reactor vessel and connection seals), Gas turbines (Fuel Systems, Exhaust connectors, Heat exchangers)		Hot mold equipment, Gas turbines (Fuel Systems, Exhaust connectors, Heat exchangers), With system pressure energized.		Hot mold equipment, Gas turbines (Fuel Systems, Exhaust connectors, Heat exchangers), With spring energized.	
C Type		CS Type		V Type	
					
Internal Pressure	External Pressure	Internal Pressure	External Pressure	Internal Pressure	External Pressure
✓ Alloy 718 ✓ Alloy X-750 ✓ 316 SS ✓ 304 SS		✓ Alloy 718 ✓ Alloy X-750 ✓ 316 SS ✓ 304 SS		✓ Alloy 718	
Aerospace, Oil & gas, Power generation (GT, ST-casing, heat exchangers, nuclear waste), Injection systems, Valves, Cryocoolers, Exhaust, Lasers, Vacuum applications, Hot mold		Aerospace, Oil & gas, Power generation (GT, ST-casing, heat exchangers, Nuclear waste), Injection systems, Valves, Cryocoolers, Exhaust, Lasers, Vacuum applications, Window seals		Gas & steam turbines, Valves, Swivels, Turbochargers	
JCE Type		CA/CSA Type		CO type	
					
Internal & external Pressure		Axial Pressure		Internal Pressure	External Pressure
✓ Alloy 718 + Aluminum layer		✓ Alloy 718 ✓ Alloy X-750 ✓ 316 SS ✓ 304 SS		✓ Alloy 718	
Vacuum, ANSI flanges, nuclear environments, Cryogenic applications, Accelerators		Piston seal, Rod seal, Semi-dynamic, rotational, and reciprocating applications		Piston seal, Rod seal, Semi-dynamic, rotational, and reciprocating applications	

Leakage rate: (Per Helium leakage test)

For metal seal, with higher load, the lower leakage rate can be achieved. The table below lists the minimum leakage rate for each metal seal type with adequate load. For other gases such as oxygen, nitrogen, and air, the equivalent leak rate can be calculated by multiply 0.3.

Leakage Rate Reference

Seal Type	Leakage Rate (unit: mbar*l/s)			
	Unpolished Bare Seal	Polished without plating	Plated	Polished & Plated
O Ring	10 ⁻³	10 ⁻⁴	10 ⁻¹⁰	10 ⁻¹¹
C Ring	10 ⁻³	10 ⁻⁴	10 ⁻¹⁰	10 ⁻¹²
V Ring	10 ⁰	10 ⁻⁴	N/A	N/A
E Ring	10 ⁻⁴	N/A	N/A	N/A
Spring Energized C Ring	10 ⁻³	10 ⁻⁴	10 ⁻¹⁰	10 ⁻¹³

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different types of medium, Sonkit recommends the following groove surface roughnesses.

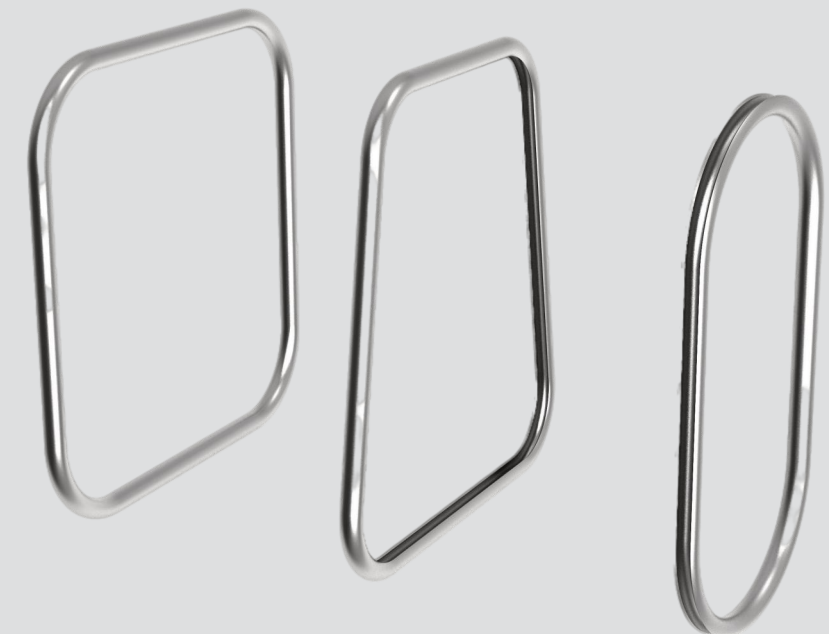
Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended

Shaped Metal Seals

Non-Circular seals also called shaped seals can be manufactured in O Ring, C Ring and spring energized C Ring. Cross section can be produced from 0.89mm to 12.7 mm.

The minimum radius for each type of metal sealingrings is given in the table below. Unlike other circular metal seals, Sonkit asks to provide an application datasheet and to provide a sketch or drawing.

Minimum Radii in mm for shaped Seal									
Metal Seal Type	Free Height (mm)								
	0.89	1.57	2.39	3.18	3.96	4.78	6.35	9.53	12.7
Metal O Ring	5	10	15	25	50	75	100	200	300
Metal O Ring (Spring)	N/A	N/A	15	25	50	75	100	200	300
Metal C Ring	5	7	12	15	25	50	75	200	250
Metal C-Ring (Spring)	N/A	N/A	12	15	25	50	75	200	250



In house lab



In house HT

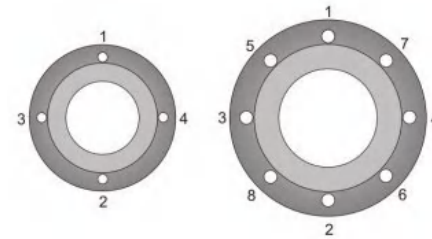


Test Report

Installation Precautions

In order to maximize the sealing effect, Sonkit recommends customers to check the following installation precautions beforehand. The essential elements that influence an ideal sealing effect are summarized below:

- Reasonable selection of surface coating
- Appropriate groove size
- Appropriate flange roughness
- Working conditions within the design conditions
- Sufficient bolt load



1. Sealing Ring

- * Inspect the original package of the seal ring is not damaged before installation
- * When opening the package, prevent sharp objects from scratching the sealing ring. Even tiny scratches on the surface of the sealing ring may lead to the risk of leakage
- * When installing the metal seal ring, Sonkit recommends customers carefully check the groove for possible problems, such as scratches, damage, etc
- * When placing or checking the sealing ring, operators are required to wear clean gloves

2. Groove or Flange

- * When installing sealing rings to the groove or flange, the circumferential direction of the installation must be consistent with the processing direction, directly milled groove or flange surface may cause leakage
- * The smaller the load, the higher the smoothness of the sealing surface
- * The leakage rate mainly depends on the sealing condition and the surface roughness of the groove
- * The selection of sealing ring is determined by the roughness of sealing surface
- * Make sure that the mounting groove, flange or cover plate is free of dust, oil, or burrs
- * Very small scratches can cause leakage unless the direction of the very small scratches is consistent with the circumferential direction of the groove
- * Before the installation, Sonkit recommends customers wipe the groove, flange or cover plate with a clean cotton cloth dipped in isopropanol or acetone, a double check for scratch or any possible damages is also recommended

3. Installation

- * The sealing ring must be put into the groove very carefully to prevent scratches
- * The cover plate or flange must be placed at the right position, and avoiding any scratches or other damage
- * Avoid exposing Sonkit metal seal rings in the lubricating oil, grease or other auxiliary installation materials
- * If it is fastened with bolts, please install and tighten the nuts one by one (20% - 50% - 80% - 90% - 100%) with cross method to ensure the sealing ring is compressed smoothly.

Clearance and Tolerances

The groove diameter should be match with the diameter of placed metal seal.
By compressing the seal in the groove, the outer diameter of the seal will be increased for internal pressure. Likewise, the inner diameter of the seal will be decreased for external pressure.
This phenomena is covered by the parameter "DC" (Diametrical Clearance) in the design guide. The DC will give allowance for this increase or decrease of the seal diameter.

The seal tolerance and also groove tolerance shall be kept as small as possible. It is better for the seal performance to keep the DC in compressed condition as small as possible.
Ideally, once compressed, for internal pressure, the seal outer diameter should slightly touch the groove outer diameter. For external pressure, the seal inner diameter should slightly touch the groove inner diameter.

Diameter	Groove Tolerances		Seal Tolerances	
	Groove ID h10	Groove OD H10	Seal OD h11	Seal ID H11
7 – 10	0 / -0.058	0 / +0.058	0 / -0.090	0 / +0.090
11 – 18	0 / -0.070	0 / +0.070	0 / -0.110	0 / +0.110
19 – 30	0 / -0.084	0 / +0.084	0 / -0.130	0 / +0.130
31 - 50	0 / -0.100	0 / +0.100	0 / -0.160	0 / +0.160
51 – 80	0 / -0.120	0 / +0.120	0 / -0.190	0 / +0.190
81 – 120	0 / -0.140	0 / +0.140	0 / -0.220	0 / +0.220
121 – 180	0 / -0.160	0 / +0.160	0 / -0.250	0 / +0.250
181 – 250	0 / -0.185	0 / +0.185	0 / -0.290	0 / +0.290
251 – 315	0 / -0.210	0 / +0.210	0 / -0.320	0 / +0.320
316 – 400	0 / -0.230	0 / +0.230	0 / -0.360	0 / +0.360
401 – 500	0 / -0.250	0 / +0.250	0 / -0.400	0 / +0.400
501 - 760	0 / -0.300	0 / +0.300	0 / -0.500	0 / +0.500
761 – 1050	0 / -0.400	0 / +0.400	0 / -0.630	0 / +0.630
1051 – 1425	0 / -0.500	0 / +0.500	0 / -0.760	0 / +0.760
1426 - 1940	0 / -0.630	0 / +0.630	0 / -1.000	0 / +1.000

Comman Bolt Grades

Size	Bolt Stress Area (sq. mm)	DIN 13 Grade 6.9 Bolts			DIN 13 Grade 8.8 Bolts			DIN 13 Grade 10.9 Bolts			DIN 13 Grade 12.9 Bolts		
		Maximum Bolt Clamping Load (N)	Torque Dry (N·m)	Torque Lubricate d (N·m)	Maximum Bolt Clamping Load (N)	Torque Dry (N·m)	Torque Lubricate d (N·m)	Maximum Bolt Clamping Load (N)	Torque Dry (N·m)	Torque Lubricate d (N·m)	Maximum Bolt Clamping Load (N)	Torque Dry (N·m)	Torque Lubricate d (N·m)
M4 X 0,7	8.78	3400	2.4	2.3	4000	2.9	2.7	5650	4.1	3.8	6750	4.9	4.6
M5 X 0,8	14.2	5550	5.0	4.7	6550	6.0	5.5	9200	8.5	8.0	11100	10	9.5
M6 X 1,0	20.1	7800	8.5	8.0	9250	10	9.5	13000	14	13	15600	17	16
M8 X 1,25	36.6	14300	21	19	17000	25	23	23900	35	32	28700	41	39
M10 X 1,5	58.0	22800	41	39	27100	49	46	38000	69	64	45700	83	77
M12 X 1,75	84.3	33400	72	67	39500	86	80	55500	120	110	66700	145	135
M14 X 2,0	115	45600	115	105	54000	135	125	76000	190	180	91300	230	215
M16 X 2,0	157	63000	180	165	75000	210	195	105000	295	275	126000	355	330
M18 X 2,5	192	76500	245	225	90500	290	270	127000	405	390	153000	485	455
M20 X 2,5	245	98500	345	325	117000	410	385	164000	580	540	197000	690	650
M22 X 2,5	303	123000	465	435	145000	550	510	205000	780	720	245000	930	870
M24 X 3,0	353	142000	600	560	169000	710	660	237000	1000	930	284000	1200	1100
M27 X 3,0	459	187000	890	830	221000	1050	980	311000	1500	1400	374000	1800	1650
M30 X 3,5	561	227000	1200	1100	269000	1450	1350	379000	2000	1850	454000	2400	2250

Metal O-Ring Internal Pressure

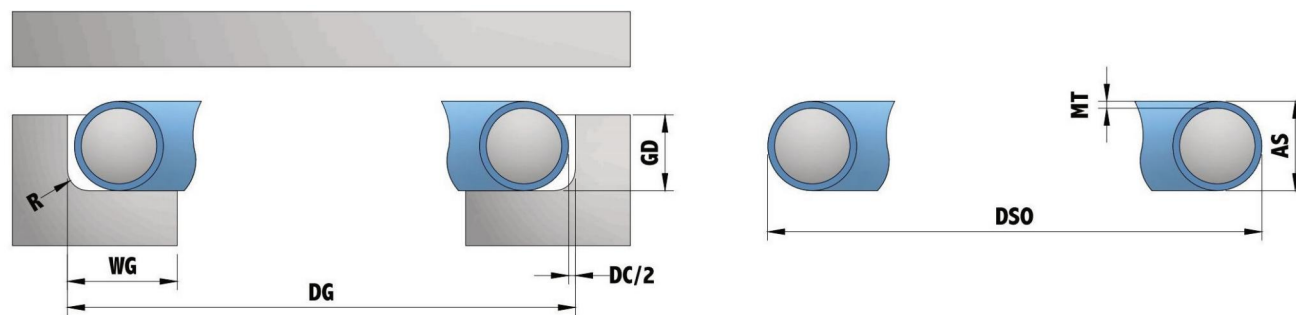
Common Metallic Material Options

• Alloy 718 • Alloy X-750 • Alloy 600 • 316 SS • 321 SS • Waspaloy

Common Plating Options

• Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design

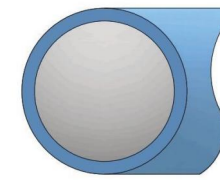


Seal: $DSO = DG - DC - (\text{Plating thickness}) \times 2$
Groove: $DG = DSO + DC + (\text{Plating thickness}) \times 2$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



OI-OVI-OSI-OGI

Note: the data below is based on Alloy 750 and metal seal types of OI, OVI and OGI, OSI is excluded. Load and spring back figures are based on Alloy 750 with work hardened heat treatment.

Groove Dimension				Seal Dimension					Performance			
DG	GD	WG	R	AS		MT		DC	Load		SB	
Groove Diameter Range	Groove Depth Range	Width Groove (min)	Radius (max)	Axial Section	Tolerance On AS (cross section)	Material Thickness		Diametrical Clearance	N/mm Circumference		Spring Back (mm)	
						M	H		M	H	M	H
6 - 25	0.64-0.69	1.40	0.25	0.89	+0.08/-0.03	0.15	N/A	0.20	65	N/A	0.01	N/A
10- 50	0.94 -1.02	1.78	0.30	1.19	+0.08/-0.03	N/A	0.20	0.25	N/A	80	N/A	0.03
12-200	1.14 – 1.27	2.29	0.38	1.57	+0.08/-0.03	0.25	0.36	0.28	100	220	0.03	0.03
25-200	1.88 – 2.01	3.18	0.51	2.39	+0.08/-0.03	0.25	0.46	0.33	55	200	0.05	0.03
50-400	2.54 – 2.67	4.06	0.76	3.18	+0.08/-0.03	0.25	0.51	0.43	35	160	0.07	0.04
75-650	3.18 – 3.30	5.08	1.27	3.96	+0.10	0.41	0.51	0.61	70	115	0.10	0.08
100-800	3.84 -3.99	6.35	1.27	4.78	+0.13	0.51	0.64	0.71	90	150	0.10	0.08
200-1200	5.05 – 5.28	8.89	1.52	6.35	+0.13	0.64	0.81	0.76	100	180	0.20	0.10
300-2000	8.26 – 8.51	12.70	1.52	9.53	+0.13	0.97	1.24	1.02	160	280	0.15	0.12
800-3000	11.05-11.43	16.51	1.52	12.70	+0.15	1.27	1.65	1.27	200	365	0.22	0.18

Typical Applications

- Hot mold equipment
- Nuclear (Reactor vessels and connection seals)
- Gas turbines (Fuel systems, Exhaust connectors, Heat exchangers)



In house lab



In house HT



Test Report

Metal O-Ring External Pressure

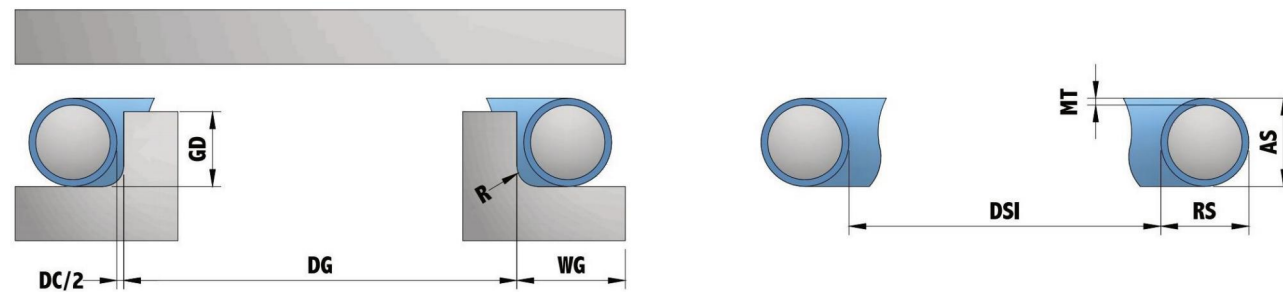
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Common Plating Options

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Groove and Seal Design

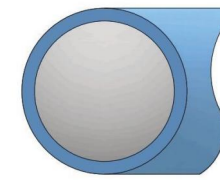


Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



OE-OVE-OSE-OGE

Note: the data below is based on Alloy 750 and metal seal types of OE, OVE and OGE, OSE is excluded. Load and spring back figures are based on Alloy 750 with work hardened heat treatment.

Groove Dimension				Seal Dimension				Performance				
DG	GD	WG	R	AS		MT		DC	Load		SB	
Groove Diameter Range	Groove Depth Range	Width Groove (min)	Radius (max)	Axial Section	Tolerance On AS (cross section)	Material Thickness		Diametrical Clearance	N/mm Circumference		Spring Back (mm)	
						M	H		M	H	M	H
6 - 25	0.64-0.69	1.40	0.25	0.89	+0.08/-0.03	0.15	N/A	0.20	65	N/A	0.01	N/A
10- 50	0.94 -1.02	1.78	0.30	1.19	+0.08/-0.03	N/A	0.20	0.25	N/A	80	N/A	0.03
12-200	1.14 – 1.27	2.29	0.38	1.57	+0.08/-0.03	0.25	0.36	0.28	100	220	0.03	0.03
25-200	1.88 – 2.01	3.18	0.51	2.39	+0.08/-0.03	0.25	0.46	0.33	55	200	0.05	0.03
50-400	2.54 – 2.67	4.06	0.76	3.18	+0.08/-0.03	0.25	0.51	0.43	35	160	0.07	0.04
75-650	3.18 – 3.30	5.08	1.27	3.96	+0.10	0.41	0.51	0.61	70	115	0.10	0.08
100-800	3.84 -3.99	6.35	1.27	4.78	+0.13	0.51	0.64	0.71	90	150	0.10	0.08
200-1200	5.05 – 5.28	8.89	1.52	6.35	+0.13	0.64	0.81	0.76	100	180	0.20	0.10
300-2000	8.26 – 8.51	12.70	1.52	9.53	+0.13	0.97	1.24	1.02	160	280	0.15	0.12
800-3000	11.05-11.43	16.51	1.52	12.70	+0.15	1.27	1.65	1.27	200	365	0.22	0.18

Typical Applications

- Hot mold equipment
- Nuclear (Reactor vessels and connection seals)
- Gas turbines (Fuel systems, Exhaust connectors, Heat exchangers)



In house lab



In house HT



Test Report

Metal C-Ring Internal Pressure

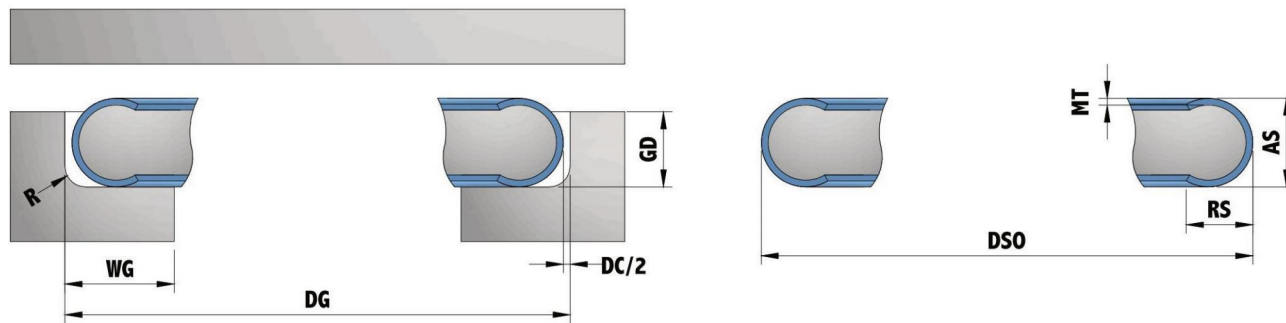
Common Metallic Material Options

- Alloy 718 • Alloy X-750 • 316 SS

Common Plating Options

- Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design

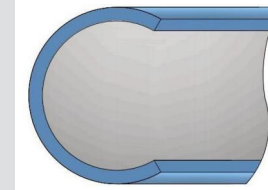


Seal: $DSO = DG - DC - (\text{Plating thickness}) \times 2$
 Groove: $DG = DSO + DC + (\text{Plating thickness}) \times 2$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



CI

Note: O.R. = On Request, Performance data is based on Alloy 718, without plating

Groove Dimension				Seal Dimension						Performance			
DG	GD	WG	R	AS		RS	MT		DC	Load		SB	
Groove Diameter Range	Groove Depth Range	Width Groove (min)	Radius (max)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material Thickness		Diametrical clearance	N/mm Circumference		Spring Back (mm)	
							M	H		M	H	M	H
6 - 25	0.64-0.69	1.02	0.25	0.79	±0.05	0.71	0.13	0.18	0.08	30	65	0.04	0.03
8-50	0.94 -1.02	1.40	0.30	1.19	±0.05	0.96	0.13	0.20	0.13	20	50	0.05	0.04
10-200	1.27-1.37	1.91	0.38	1.57	±0.05	1.26	0.15	0.25	0.15	20	60	0.08	0.06
13-200	1.60-1.68	2.30	0.45	2.00	±0.05	1.60	0.25	O.R.	0.20	45	O.R.	0.06	O.R.
13-200	1.76-1.85	2.50	0.47	2.20	±0.05	1.76	0.25	O.R.	0.22	45	O.R.	0.08	O.R.
13-400	1.91-2.01	2.67	0.51	2.39	±0.05	1.91	0.25	0.38	0.24	45	95	0.10	0.08
20-400	2.23-2.34	3.10	0.55	2.79	±0.05	2.25	0.38	O.R.	0.28	70	O.R.	0.12	O.R.
30-600	2.54-2.67	3.43	0.76	3.18	±0.08	2.54	0.38	0.51	0.32	55	105	0.15	0.13
45-600	2.88-3.02	3.90	0.90	3.60	±0.08	2.88	0.41	O.R.	0.36	50	O.R.	0.12	O.R.
45-750	3.18-3.30	4.32	1.27	3.96	±0.08	3.17	0.41	0.61	0.39	45	115	0.20	0.17
75-800	3.52-3.69	4.70	1.27	4.40	±0.08	3.52	0.41	O.R.	0.44	40	O.R.	0.21	O.R.
75-900	3.84-3.99	5.08	1.27	4.78	±0.10	3.82	0.51	0.76	0.47	60	145	0.22	0.18
75-900	4.00-4.20	5.30	1.27	5.00	±0.10	4.01	0.51	O.R.	0.50	55	O.R.	0.23	O.R.
75-900	4.16-4.37	5.50	1.27	5.20	±0.10	4.16	0.51	O.R.	0.52	55	O.R.	0.23	O.R.
75-1000	4.48-4.70	5.90	1.27	5.60	±0.10	4.50	0.51	O.R.	0.56	50	O.R.	0.22	O.R.
100-1200	5.08-5.28	6.60	1.52	6.35	±0.10	5.08	0.64	0.97	0.64	65	175	0.30	0.27
100-1500	6.32-6.58	8.22	1.52	7.90	±0.10	6.32	0.97	O.R.	0.79	130	O.R.	0.30	O.R.
300-2000	7.62-8.03	9.65	1.52	9.53	±0.10	7.62	0.97	1.27	0.96	100	185	0.40	0.32
600-3000	10.16-10.67	12.70	1.52	12.70	±0.13	10.16	1.27	1.65	1.27	125	230	0.55	0.48

Typical Applications

- Aerospace • Oil & gas • Injection systems
- Valves • Cryocoolers • Exhaust
- Lasers • Vacuum applications • Hot mold
- Power generation (GT, ST-casing, heat exchangers, Nuclear waste)



In house lab



In house HT



Test Report

Metal C-Ring External Pressure

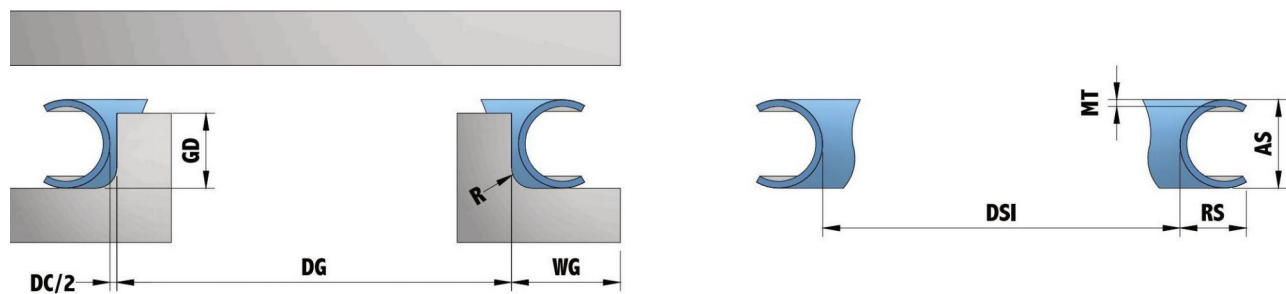
Common Metallic Material Options

- Alloy 718 • Alloy X-750 • 316 SS

Common Plating Options

- Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design

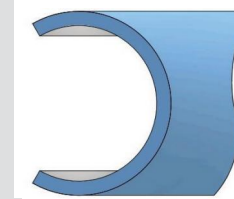


Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



CE

Note: O.R. = On Request, Performance data is based on Alloy 718, without plating

Groove Dimension				Seal Dimension						Performance			
DG	GD	WG	R	AS		RS	MT		DC	Load		SB	
Groove Diameter Range	Groove Depth Range	Width Groove (min)	Radius (max)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material Thickness		Diametrical clearance	N/mm Circumference		Spring Back (mm)	
							M	H		M	H	M	H
6 - 25	0.64-0.69	1.02	0.25	0.79	±0.05	0.71	0.13	0.18	0.08	30	65	0.04	0.03
8-50	0.94 -1.02	1.40	0.30	1.19	±0.05	0.96	0.13	0.20	0.13	20	50	0.05	0.04
10-200	1.27-1.37	1.91	0.38	1.57	±0.05	1.26	0.15	0.25	0.15	20	60	0.08	0.06
13-200	1.60-1.68	2.30	0.45	2.00	±0.05	1.60	0.25	O.R.	0.20	45	O.R.	0.06	O.R.
13-200	1.76-1.85	2.50	0.47	2.20	±0.05	1.76	0.25	O.R.	0.22	45	O.R.	0.08	O.R.
13-400	1.91-2.01	2.67	0.51	2.39	±0.05	1.91	0.25	0.38	0.24	45	95	0.10	0.08
20-400	2.23-2.34	3.10	0.55	2.79	±0.05	2.25	0.38	O.R.	0.28	70	O.R.	0.12	O.R.
30-600	2.54-2.67	3.43	0.76	3.18	±0.08	2.54	0.38	0.51	0.32	55	105	0.15	0.13
45-600	2.88-3.02	3.90	0.90	3.60	±0.08	2.88	0.41	O.R.	0.36	50	O.R.	0.12	O.R.
45-750	3.18-3.30	4.32	1.27	3.96	±0.08	3.17	0.41	0.61	0.39	45	115	0.20	0.17
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75-900	3.84-3.99	5.08	1.27	4.78	±0.10	3.82	0.51	0.76	0.47	60	145	0.22	0.18
75-900	4.00-4.20	5.30	1.27	5.00	±0.10	4.01	0.51	O.R.	0.50	55	O.R.	0.23	O.R.
75-900	4.16-4.37	5.50	1.27	5.20	±0.10	4.16	0.51	O.R.	0.52	55	O.R.	0.23	O.R.
75-1000	4.48-4.70	5.90	1.27	5.60	±0.10	4.50	0.51	O.R.	0.56	50	O.R.	0.22	O.R.
100-1200	5.08-5.28	6.60	1.52	6.35	±0.10	5.08	0.64	0.97	0.64	65	175	0.30	0.27
100-1500	6.32-6.58	8.22	1.52	7.90	±0.10	6.32	0.97	O.R.	0.79	130	O.R.	0.30	O.R.
300-2000	7.62-8.03	9.65	1.52	9.53	±0.10	7.62	0.97	1.27	0.96	100	185	0.40	0.32
600-3000	10.16-10.67	12.70	1.52	12.70	±0.13	10.16	1.27	1.65	1.27	125	230	0.55	0.48

Typical Applications

- Aerospace • Oil & gas • Injection systems
- Valves • Cryocoolers • Exhaust
- Lasers • Vacuum applications • Hot mold
- Power generation (GT, ST-casing, heat exchangers, Nuclear waste)



In house lab



In house HT



Test Report

Metal C-Ring Internal Pressure Spring Energized

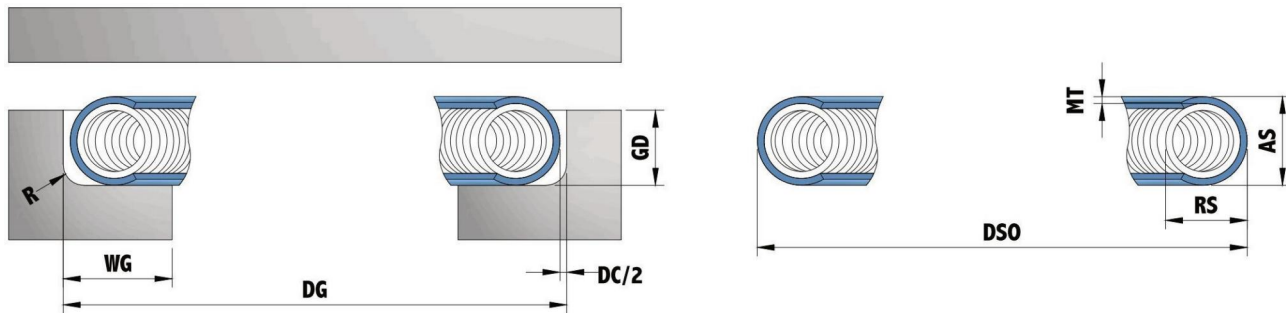
Common Metallic Material Options

- Alloy 718 • Alloy X-750 • 316 SS

Common Plating Options

- Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design

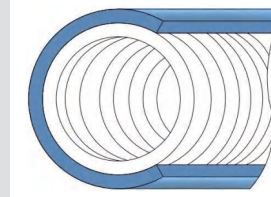


Seal: $DSO = DG - DC - (\text{Plating thickness}) \times 2$
 Groove: $DG = DSO + DC + (\text{Plating thickness}) \times 2$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



CSI

Note: Performance data based on Alloy 718 jacket and spring, without heat treatment and plating.

Groove Dimension				Seal Dimension						Performance			
DG	GD	WG	R	AS		MT		DC	RS	Load		SB	
Groove Diameter Range	Groove Depth Range	Width Groove (min)	Radius (max)	Axial Section	Tolerance On AS (cross section)	Material No	Thickness	Diametrical clearance	Radial Section	N/mm Circumference		Spring Back (mm)	
										M	H	M	H
15-280	1.27-1.37	2.05	0.35	1.57	±0.05	M/H	0.15	0.15	1.42	75	175	0.08	0.07
20-300	1.60-1.68	2.50	0.40	2.00	±0.05	M	0.25	0.20	1.75	180	245	0.08	O.R.
25-300	1.76-1.85	2.86	0.45	2.20	±0.05	M	0.25	0.32	1.95	155	210	0.08	O.R.
25-400	1.91-2.01	3.10	0.50	2.39	±0.05	M/H	0.25	0.24	2.14	140	310	0.13	0.11
25-500	2.23-2.34	3.60	0.50	2.79	±0.05	M/H	0.38	0.28	2.41	215	345	0.12	0.10
25-600	2.54-2.67	4.10	0.75	3.18	±0.08	M/H	0.38	0.32	2.80	140	285	0.15	0.12
32-750	2.88-3.02	4.68	0.75	3.60	±0.08	M	0.41	0.36	3.19	160	350	0.12	O.R.
32-750	3.18-3.30	5.10	1.20	3.96	±0.08	M/H	0.41	0.39	3.55	145	320	0.20	0.15
50-800	3.52-3.69	5.72	1.20	4.40	±0.08	M	0.41	0.44	3.99	180	265	0.20	O.R.
75-900	3.84-3.99	6.20	1.20	4.78	±0.10	M/H	0.51	0.47	4.37	185	420	0.28	0.20
75-900	4.00-4.20	6.50	1.20	5.00	±0.10	M	0.51	0.50	4.49	175	395	0.35	O.R.
75-900	4.16-4.37	6.76	1.20	5.20	±0.10	M/H	0.51	0.52	4.69	235	375	0.29	O.R.
75-1000	4.48-4.70	7.30	1.20	5.60	±0.10	M/H	0.51	0.56	5.09	215	340	0.30	O.R.
100-1800	5.08-5.28	8.30	1.50	6.35	±0.10	M/H	0.64	0.64	5.71	325	555	0.35	0.30
150-3000	6.32-6.58	10.40	1.50	7.90	±0.10	M/H	0.97	0.79	6.93	335	675	0.40	O.R.
300-3000	7.62-8.03	12.40	1.50	9.53	±0.10	M/H	0.97	0.96	8.56	505	805	0.43	0.35
600-7600	10.16-10.67	16.50	1.50	12.70	±0.13	M/H	1.27	1.27	11.43	635	915	0.56	O.R.

Typical Applications

- Aerospace • Oil & gas • Injection systems
- Valves • Turbo chargers • Exhaust
- Vacuum applications • Windows Seals
- Power generation (GT, ST-casing, heat exchangers, Nuclear waste)



In house lab



In house HT



Test Report

Metal C-Ring External Pressure Spring Energized

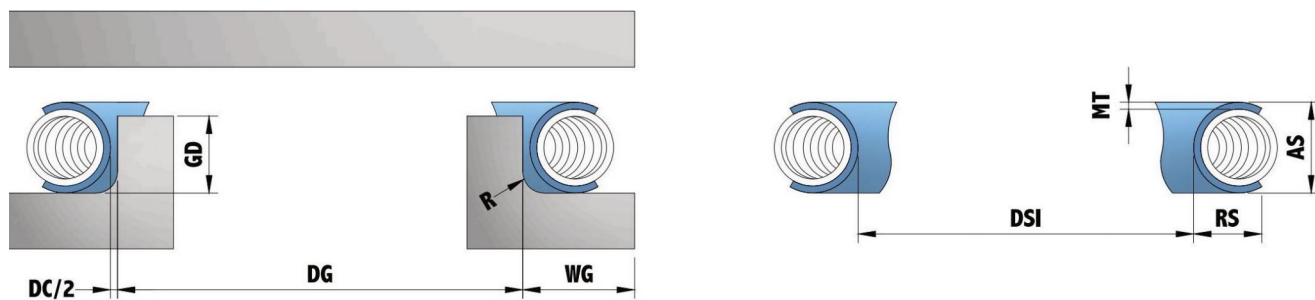
Common Metallic Material Options

- Alloy 718 • Alloy X-750 • 316 SS

Common Plating Options

- Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design

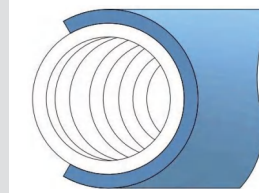


Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



CSE

Note: Performance data based on Alloy 718 jacket and spring without heat treatment and plating.

Groove Dimension				Seal Dimension						Performance			
DG	GD	WG	R	AS		MT		DC	RS	Load		SB	
Groove Diameter Range	Groove Depth Range	Width Groove (min)	Radius (max)	Axial Section	Tolerance On AS (cross section)	Material No	Thickness	Diametrical clearance	Radial Section	N/mm Circumference		Spring Back (mm)	
										M	H	M	H
15-280	1.27-1.37	2.05	0.35	1.57	±0.05	M/H	0.15	0.15	1.42	75	175	0.08	0.07
20-300	1.60-1.68	2.50	0.40	2.00	±0.05	M	0.25	0.20	1.75	180	245	0.08	O.R.
25-300	1.76-1.85	2.86	0.45	2.20	±0.05	M	0.25	0.32	1.95	155	210	0.08	O.R.
25-400	1.91-2.01	3.10	0.50	2.39	±0.05	M/H	0.25	0.24	2.14	140	310	0.13	0.11
25-500	2.23-2.34	3.60	0.50	2.79	±0.05	M/H	0.38	0.28	2.41	215	345	0.12	0.10
25-600	2.54-2.67	4.10	0.75	3.18	±0.08	M/H	0.38	0.32	2.80	140	285	0.15	0.12
32-750	2.88-3.02	4.68	0.75	3.60	±0.08	M	0.41	0.36	3.19	160	350	0.12	O.R.
32-750	3.18-3.30	5.10	1.20	3.96	±0.08	M/H	0.41	0.39	3.55	145	320	0.20	0.15
50-800	3.52-3.69	5.72	1.20	4.40	±0.08	M	0.41	0.44	3.99	180	265	0.20	O.R.
75-900	3.84-3.99	6.20	1.20	4.78	±0.10	M/H	0.51	0.47	4.37	185	420	0.28	0.20
75-900	4.00-4.20	6.50	1.20	5.00	±0.10	M	0.51	0.50	4.49	175	395	0.35	O.R.
75-900	4.16-4.37	6.76	1.20	5.20	±0.10	M/H	0.51	0.52	4.69	235	375	0.29	O.R.
75-1000	4.48-4.70	7.30	1.20	5.60	±0.10	M/H	0.51	0.56	5.09	215	340	0.30	O.R.
100-1800	5.08-5.28	8.30	1.50	6.35	±0.10	M/H	0.64	0.64	5.71	325	555	0.35	0.30
150-3000	6.32-6.58	10.40	1.50	7.90	±0.10	M/H	0.97	0.79	6.93	335	675	0.40	O.R.
300-3000	7.62-8.03	12.40	1.50	9.53	±0.10	M/H	0.97	0.96	8.56	505	805	0.43	0.35
600-7600	10.16-10.67	16.50	1.50	12.70	±0.13	M/H	1.27	1.27	11.43	635	915	0.56	O.R.

Typical Applications

- Aerospace • Oil & gas • Injection systems
- Valves • Turbo chargers • Exhaust
- Vacuum applications • Windows Seals
- Power generation (GT, ST-casing, heat exchangers, Nuclear waste)



In house lab



In house HT



Test Report

Metal C-Ring Axial Pressure Spring Energized

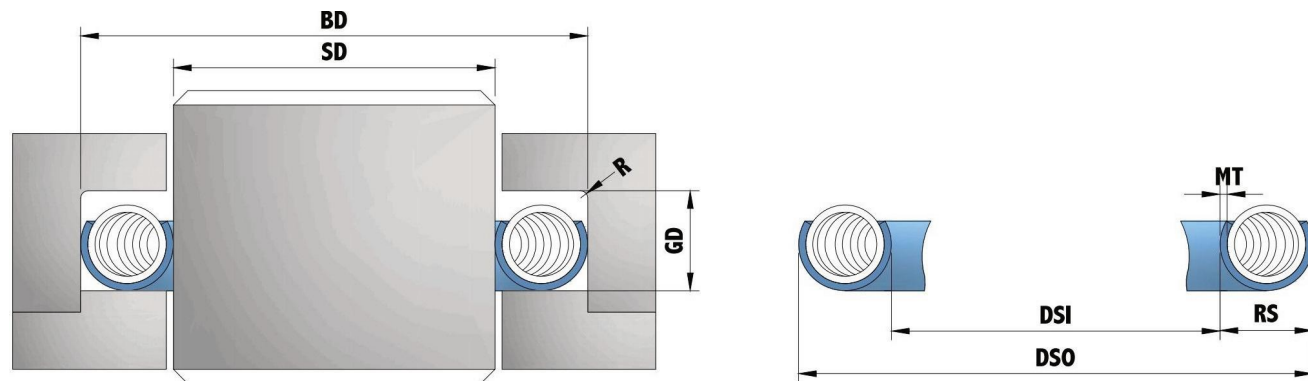
Common Metallic Material Options

- Alloy 718 • Alloy X-750 • 316 SS

Common Plating Options

- Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design



Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



Note: RS and GD values in the table below are for CA-Rings, The groove for CSA will be 15% deeper with the values below.

Seal Dimension										Groove Dimension					
D	MC	AS		RS	MT	DSO		DSI		BD		SD		GD	R
Diameter Range	Material No	Axial Section	Tolerance On AS (cross section)	Radial Section	Thickness	Diameter Seal Outside	DSO Tolerance	Diameter Seal Inside	DSI Tolerance	Bore Diameter	Tolerance on BD	Shaft/Rod Diameter	Tolerance on SD	Groove Depth (min)	Radius (max)
12-38	1.57M	1.35	+0.05/-0.10	1.64	0.15	BD+0.08	+0.06/-0.03	DSO-3.28	+0.03/-0.06	SD+3.12	+0.03	BD-3.12	-0.03	1.50	0.25
38-45	1.57M	1.35	+0.05/-0.10	1.64	0.15	BD+0.10	+0.06/-0.03	DSO-3.28	+0.03/-0.06	SD+3.07	+0.03	BD-3.07	-0.03	1.50	0.25
30-38	2.39M	1.99	+0.05/-0.10	2.42	0.25	BD+0.08	+0.06/-0.03	DSO-4.85	+0.03/-0.06	SD+4.70	+0.03	BD-4.70	-0.03	2.14	0.28
38-85	2.39M	1.99	+0.05/-0.10	2.42	0.25	BD+0.10	+0.06/-0.03	DSO-4.85	+0.03/-0.06	SD+4.65	+0.03	BD-4.65	-0.03	2.14	0.28
50-85	3.18M	2.65	+0.05/-0.15	3.22	0.38	BD+0.10	+0.06/-0.03	DSO-6.45	+0.05/-0.08	SD+6.25	+0.03	BD-6.25	-0.03	2.80	0.38
85-150	3.18M	2.65	+0.05/-0.15	3.22	0.38	BD+0.15	+0.08/-0.05	DSO-6.45	+0.05/-0.08	SD+6.15	+0.05	BD-6.15	-0.05	2.80	0.38
150-200	3.18M	2.65	+0.05/-0.15	3.22	0.38	BD+0.20	+0.08/-0.05	DSO-6.45	+0.05/-0.08	SD+6.05	+0.05	BD-6.05	-0.05	2.80	0.38
85-150	3.96M	3.30	+0.05/-0.20	4.01	0.38	BD+0.15	+0.08/-0.05	DSO-8.03	+0.05/-0.08	SD+7.72	+0.05	BD-7.72	-0.05	3.45	0.51
150-250	3.96M	3.30	+0.05/-0.20	4.01	0.38	BD+0.20	+0.08/-0.05	DSO-8.03	+0.05/-0.08	SD+7.62	+0.05	BD-7.62	-0.05	3.45	0.51
100-150	4.78M	3.96	+0.05/-0.20	4.81	0.51	BD+0.15	+0.08/-0.05	DSO-9.63	+0.05/-0.08	SD+9.32	+0.05	BD-9.32	-0.05	4.11	0.51
150-300	4.78M	3.96	+0.05/-0.20	4.81	0.51	BD+0.20	+0.08/-0.05	DSO-9.63	+0.05/-0.08	SD+9.22	+0.05	BD-9.22	-0.05	4.11	0.51
150-300	6.35M	5.27	+0.05/-0.25	6.40	0.64	BD+0.20	+0.08/-0.05	DSO-12.80	+0.05/-0.08	SD+12.40	+0.05	BD-12.40	-0.05	5.42	0.76

Typical Applications

- Piston seal • Rod seal • Semi-dynamic
- Rotational and reciprocating applications



In house lab



In house HT



Test Report

Metal C-Ring External Pressure Spring Energized Aluminium Jacket

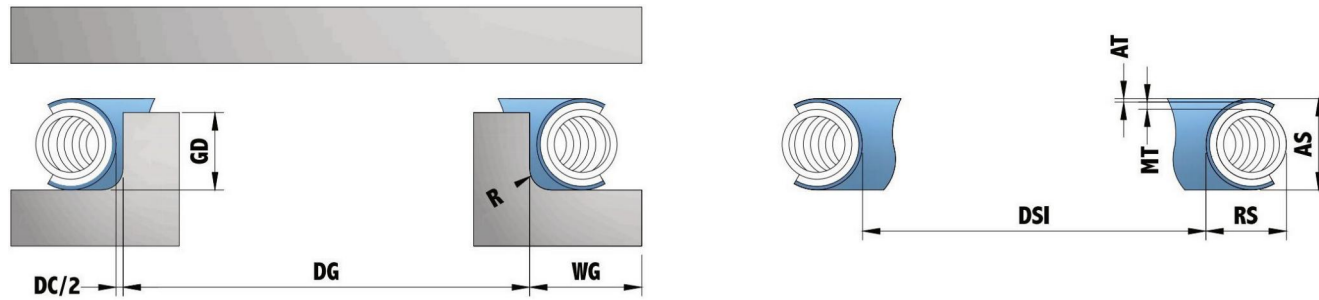
Common Metallic Material Options

- Alloy 718 + Aluminum layer

Common Plating Options

- Silver • Nickel • Gold • Stannum • Copper • PTFE

Groove and Seal Design

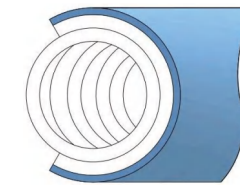


Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



JCE

Groove Dimension				Seal Dimension						
DG	GD	WG	R	AS		RS	MT/AT		DC	
Groove Diameter Range (mm)	Groove Depth Range (mm)	Width Groove	Radius (max)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material No	Jacket Thickness	Alu Layer Thickness	Diametrical clearance
20-180	1.60-1.68	2.50	0.40	2.00	-0.10/+0.20	0.40	M	0.15	0.20	0.20
20-180	2.08-2.18	3.50	0.50	2.60	-0.10/+0.20	0.50	M	0.25	0.20	0.25
35-300	2.80-2.94	4.60	0.75	3.50	-0.10/+0.20	0.75	M	0.38	0.20	0.35
40-400	3.20-3.36	5.10	1.20	4.00	-0.10/+0.20	1.20	M	0.41	0.20	0.40
50-500	3.60-3.78	5.80	1.20	4.50	-0.10/+0.20	1.20	M	0.41	0.30	0.45
60-600	3.84-4.03	6.20	1.20	4.80	-0.10/+0.20	1.20	M	0.41	0.20	0.48
80-750	4.48-4.70	7.30	1.20	5.60	-0.10/+0.20	1.20	M	0.51	0.30	0.56
100-750	4.96-5.20	8.10	1.40	6.20	-0.10/+0.20	1.40	M	0.51	0.30	0.62

Typical Applications

- Vacuum • ANSI flanges • Nuclear environments
- Cryogenic applications • Accelerators



In house lab



In house HT



Test Report

Metal V-Ring Internal Pressure

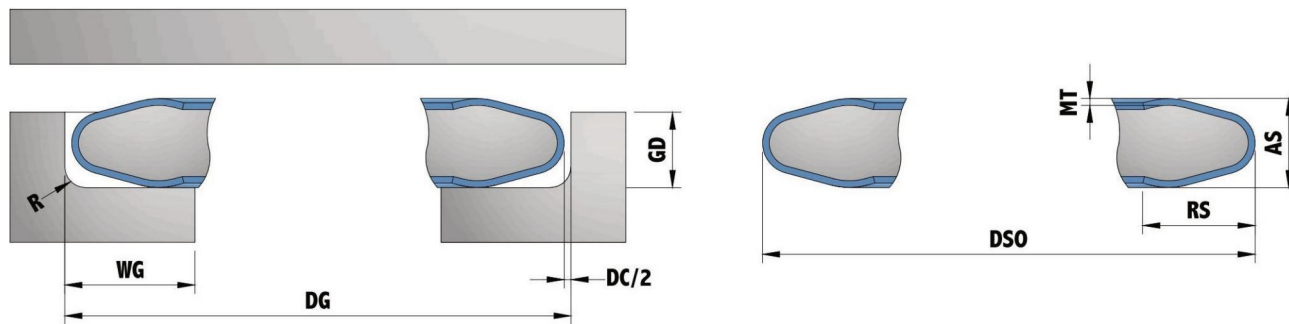
Common Metallic Material Options

- Alloy 718

Common Plating Options

- Silver

Groove and Seal Design



Seal: $DSO = DG - DC - (\text{Plating thickness}) \times 2$
 Groove: $DG = DSO + DC + (\text{Plating thickness}) \times 2$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



Note: Load and spring back figures are based on Alloy 718 in the heat-treated condition. Actual performance should be accordingly considered due to various working conditions. Tolerances on groove depth, plating, diametrical clearance, and differences in material batches can create differences of up to 100% for the cross section less than 3mm, down to 50% for the bigger cross section.

Groove Dimension				Seal Dimension						Performance	
DG	GD	WG	R	AS		RS	MT		DC	Load	SB
Groove Diameter Range (mm)	Groove Depth Range (mm)	Width Groove	Radius (max)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material No	Thickness	Diametrical clearance	N/mm Circumference	Spring Back (mm)
30-400	1.91-2.01	3.10	0.50	2.39	±0.05	2.63	M	0.25	0.14	22	0.28
45-600	2.54-2.67	4.10	0.75	3.18	±0.08	3.50	M	0.38	0.19	30	0.27
65-750	3.18-3.30	5.10	1.20	3.96	±0.08	4.36	M	0.41	0.24	22	0.37
70-900	3.84-3.99	6.20	1.20	4.78	±0.10	5.26	M	0.51	0.29	22	0.56
80-1000	4.48-4.70	7.30	1.20	5.60	±0.10	6.16	M	0.51	0.34	20	0.60
120-1800	5.08-5.28	8.30	1.50	6.35	±0.10	6.99	M	0.64	0.38	30	0.60
300-3000	7.62-8.03	12.40	1.50	9.53	±0.10	10.49	M	0.97	0.57	45	0.90
600-7600	10.16-10.67	16.50	1.50	12.70	±0.13	13.98	M	1.27	0.76	57	1.20

Typical Applications

- Gas & steam turbines
- Valves
- Swivels
- Turbochargers



In house lab



In house HT



Test Report

Metal V-Ring External Pressure

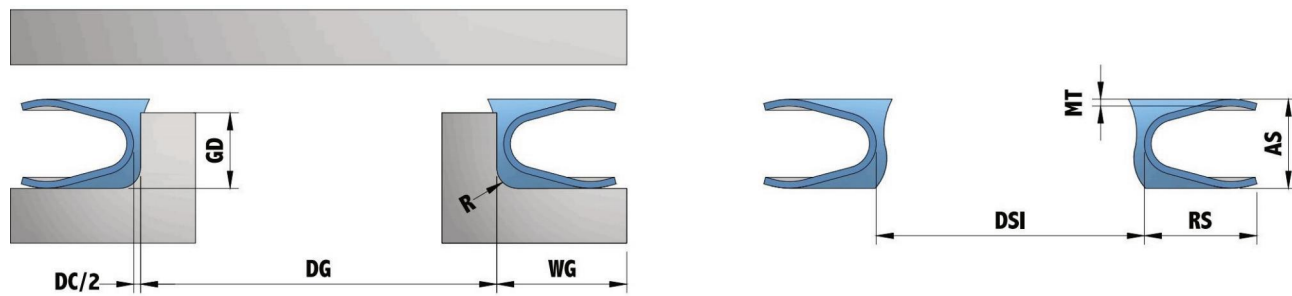
Common Metallic Material Options

- Alloy 718

Common Plating Options

- Silver

Groove and Seal Design



Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



Note: Load and spring back figures are based on Alloy 718 in the heat-treated condition. Actual performance should be accordingly considered due to various working conditions. Tolerances on groove depth, plating, diametrical clearance, and differences in material batches can create differences of up to 100% for the cross section less than 3mm, down to 50% for the bigger cross section.

Groove Dimension				Seal Dimension						Performance	
DG	GD	WG	R	AS		RS	MT		DC	Load	SB
Groove Diameter Range (mm)	Groove Depth Range (mm)	Width Groove	Radius (max)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material No	Thickness	Diametrical clearance	N/mm Circumference	Spring Back (mm)
30-400	1.91-2.01	3.10	0.50	2.39	±0.05	2.63	M	0.25	0.14	22	0.28
45-600	2.54-2.67	4.10	0.75	3.18	±0.08	3.50	M	0.38	0.19	30	0.27
65-750	3.18-3.30	5.10	1.20	3.96	±0.08	4.36	M	0.41	0.24	22	0.37
70-900	3.84-3.99	6.20	1.20	4.78	±0.10	5.26	M	0.51	0.29	22	0.56
80-1000	4.48-4.70	7.30	1.20	5.60	±0.10	6.16	M	0.51	0.34	20	0.60
120-1800	5.08-5.28	8.30	1.50	6.35	±0.10	6.99	M	0.64	0.38	30	0.60
300-3000	7.62-8.03	12.40	1.50	9.53	±0.10	10.49	M	0.97	0.57	45	0.90
600-7600	10.16-10.67	16.50	1.50	12.70	±0.13	13.98	M	1.27	0.76	57	1.20

Typical Applications

- Gas & steam turbines
- Valves
- Swivels
- Turbochargers



In house lab



In house HT



Test Report

Metal Comma-Ring Internal Pressure

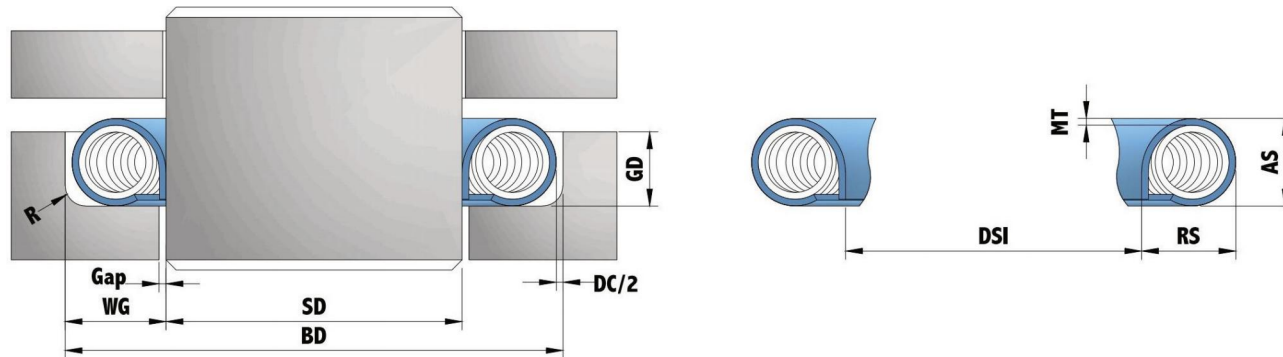
Common Metallic Material Options

- Alloy 718

Common Plating Options

- Silver

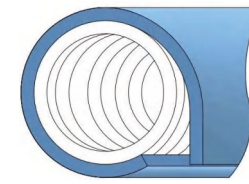
Groove and Seal Design



Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



COI

Note: Load and spring back figures are based on Alloy 718 in the heat-treated condition. Actual performance should be accordingly considered due to various working conditions. Tolerances on groove depth, plating, diametrical clearance, and differences in material batches can create differences of up to 100% for the cross section less than 3mm, down to 50% for the bigger cross section.

Groove Dimension							Seal Dimension						
GD	WG	SD	BD		R	Gap	D	AS		RS	MT		DC
Groove Diameter Range (mm)	Groove Depth (mm)	Tolerance on Shaft Diameter	Bore Diameter	Tolerance on Bore Diameter	Radius (max)	Min/Max	Diameter Range (mm)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material No	Thickness	Diametrical clearance
1.27-1.32	1.86	+0/-0.03	SD+3.73	-0/+0.08	0.30	0.20/0.30	20-150	1.57	±0.05	1.79	M	0.15	0.15
1.91-2.01	2.83	+0/-0.03	SD+5.66	-0/+0.10	0.50	0.40/0.50	35-200	2.39	±0.05	2.73	M	0.25	0.20
2.54-2.67	3.78	+0/-0.03	SD+7.56	-0/0.12	0.75	0.60/0.75	45-200	3.18	±0.08	3.63	M	0.38	0.30
3.18-3.30	4.72	+0/-0.05	SD+9.45	-0/+0.15	1.20	0.70/0.80	60-200	3.96	±0.08	4.52	M	0.41	0.41
3.84-3.99	5.69	+0/-0.05	SD+11.38	-0/+0.15	1.20	0.80/1.00	100-200	4.78	±0.10	5.46	M	0.46	0.46

Tightness

The tightness with a Comma Ring (COI) is more than with any other metal seals in a function of the bore condition.

The finish surface of the bore should be smoothly polished, meanwhile, a certain degree of pressure is required for fastening. With these measures in place, the sliding motions of seal can be avoided, which would extend the seal's life cycle and therefore enhance the safety of applied machineries.

In addition, we advise to silver plate Comma ring for better tightness, reduced friction, and wear.

Typical Applications

- Piston seal
- Rod seal
- Semi-dynamic
- Rotational and reciprocating applications



In house lab



In house HT



Test Report

Metal Comma-Ring External Pressure

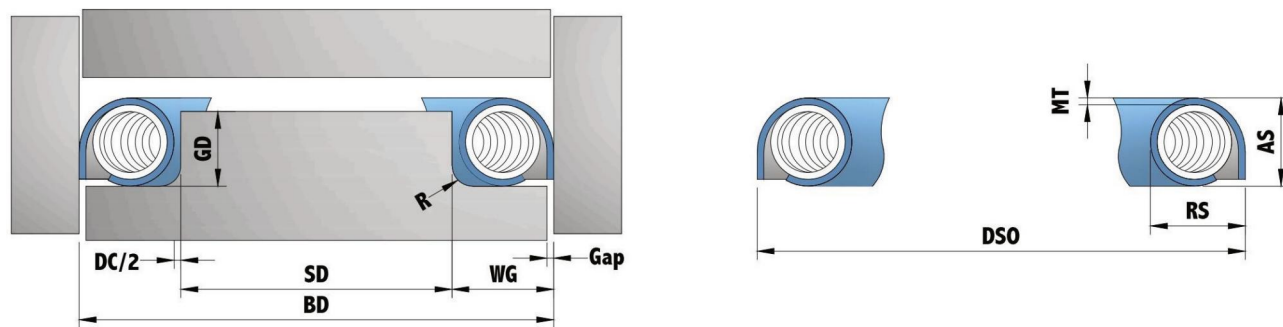
Common Metallic Material Options

- Alloy 718

Common Plating Options

- Silver

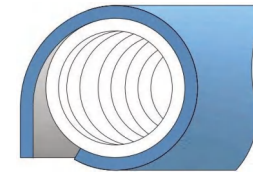
Groove and Seal Design



Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



COE

Note: Load and spring back figures are based on Alloy 718 in the heat-treated condition. Actual performance should be accordingly considered due to various working conditions. Tolerances on groove depth, plating, diametrical clearance, and differences in material batches can create differences of up to 100% for the cross section less than 3mm, down to 50% for the bigger cross section.

Groove Dimension							Seal Dimension						
GD	WG	BD	SD		R	Gap	D	AS		RS	MT		DC
Groove Diameter Range (mm)	Groove Depth (mm)	Tolerance on Bore Diameter	Shaft Diameter	Tolerance on Shaft Diameter	Radius (max)	Min/Max	Diameter Range (mm)	Axial Section	Tolerance On AS (cross section)	Radial Section	Material No	Thickness	Diametrical clearance
1.27-1.32	1.86	-0/+0.03	BD-3.73	+0/-0.08	0.30	0.20/0.30	20-150	1.57	±0.05	1.79	M	0.15	0.15
1.91-2.01	2.83	-0/+0.03	BD-5.66	+0/-0.10	0.50	0.40/0.50	35-200	2.39	±0.05	2.73	M	0.25	0.20
2.54-2.67	3.78	-0/+0.03	BD-7.56	+0/-0.12	0.75	0.60/0.75	45-200	3.18	±0.08	3.63	M	0.38	0.30
3.18-3.30	4.72	-0/+0.05	BD-9.45	+0/-0.15	1.20	0.70/0.80	60-200	3.96	±0.08	4.52	M	0.41	0.41
3.84-3.99	5.69	-0/+0.05	BD-11.38	+0/-0.15	1.20	0.80/1.00	100-200	4.78	±0.10	5.46	M	0.51	0.46

Tightness

The tightness with a Comma Ring (COE) is more than with any other metal seals in a function of the bore condition.

The finish surface of the bore should be smoothly polished, meanwhile, a certain degree of pressure is required for fastening. With these measures in place, the sliding motions of seal can be avoided, which would extend the seal's life cycle and therefore enhance the safety of applied machineries.

In addition, we advise to silver plate Comma ring for better tightness, reduced friction, and wear.

Typical Applications

- Piston seal
- Rod seal
- Semi-dynamic
- Rotational and reciprocating applications



In house lab



In house HT



Test Report

Metal W-Ring Internal Pressure

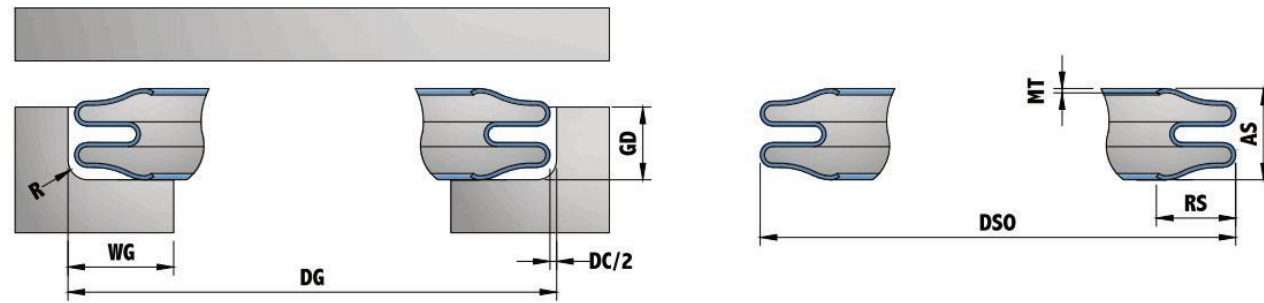
Common Metallic Material Options

- Alloy 718

Common Plating Options

- Silver

Groove and Seal Design

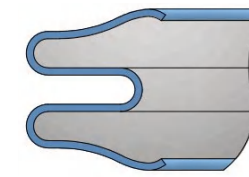


Seal: $DSO = DG - DC - (\text{Plating thickness}) \times 2$
 Groove: $DG = DSO + DC + (\text{Plating thickness}) \times 2$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



WI

Note: All dimensions are in mm. Performance data is based on Alloy718 in the heat treated condition. Actual performance should be accordingly considered due to various working conditions. Multi-convolution W-rings available for very high spring back requirement .

Groove Dimension				Seal Dimension				Performance		
DG	GD	WG	R	RS	AS	M	DC	Load	SB	
Groove Diameter Range (mm)	Groove Depth Range (mm)	Width Groove	Radius (max)	Maximum Radial Section	Axial Section (Free Hight)	Tolerance on AS	Material Thickness	Diametrical clearance	N/mm Circumference	Spring Back (mm)
45-203	1.55-1.6	2.29	0.38	1.68	1.88	±0.05	0.13	0.08	6	0.30
51- 305	2.16-2.21	2.92	0.51	2.31	2.59	±0.08	0.25	0.08	6	0.38
57-305	2.16-2.26	4.32	0.51	3.68	2.74	±0.08	0.23	0.08	7	0.53
51-305	2.16-2.26	2.92	0.51	2.31	2.74	±0.10	0.25	0.08	16	0.46
51-610	2.95-3.05	4.20	0.76	3.10	3.56	±0.10	0.30	0.13	11	0.56
51-610	2.95-3.05	4.20	0.76	3.10	3.35	±0.10	0.38	0.13	13	0.36
86-915	4.55-4.65	5.84	1.02	4.83	5.53	±0.10	0.38	0.15	9	0.94
152-1220	6.20-6.35	8.00	1.52	6.78	7.49	±0.13	0.51	0.20	14	1.22

Typical Applications

- Gas & steam turbines
- V-Band Coupling
- Very low load flanges or joints with considerable movements



In house lab



In house HT



Test Report

Metal W-Ring External Pressure

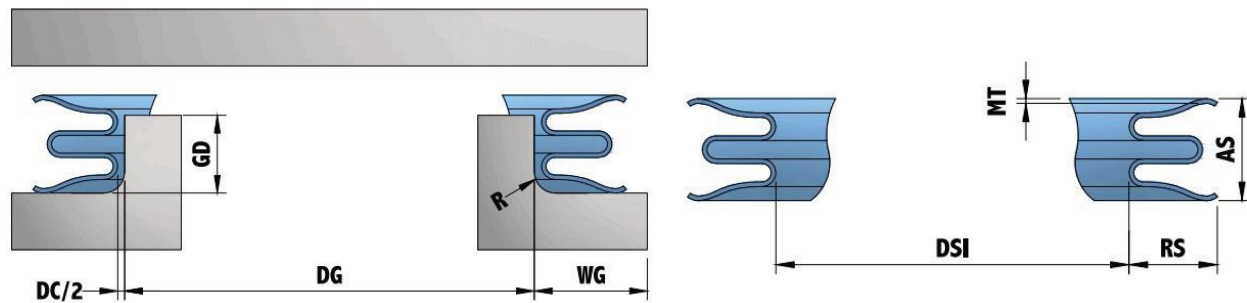
Common Metallic Material Options

- Alloy 718

Common Plating Options

- Silver

Groove and Seal Design

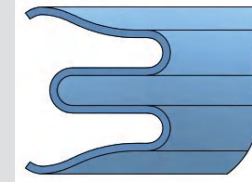


Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



WE

Note: All dimensions are in mm. Performance data is based on Alloy718 in the heat treated condition. Actual performance should be accordingly considered due to various working conditions. Multi-convolution W-rings available for very high spring back requirement .

Groove Dimension				Seal Dimension				Performance		
DG	GD	WG	R	RS	AS	M	DC	Load	SB	
Groove Diameter Range (mm)	Groove Depth Range (mm)	Width Groove	Radius (max)	Maximum Radial Section	Axial Section (Free Hight)	Tolerance on AS	Material Thickness	Diametrical clearance	N/mm Circumference	Spring Back (mm)
45-203	1.55-1.6	2.29	0.38	1.68	1.88	±0.05	0.13	0.08	6	0.30
51- 305	2.16-2.21	2.92	0.51	2.31	2.59	±0.08	0.25	0.08	6	0.38
57-305	2.16-2.26	4.32	0.51	3.68	2.74	±0.08	0.23	0.08	7	0.53
51-305	2.16-2.26	2.92	0.51	2.31	2.74	±0.10	0.25	0.08	16	0.46
51-610	2.95-3.05	4.20	0.76	3.10	3.56	±0.10	0.30	0.13	11	0.56
51-610	2.95-3.05	4.20	0.76	3.10	3.35	±0.10	0.38	0.13	13	0.36
86-915	4.55-4.65	5.84	1.02	4.83	5.53	±0.10	0.38	0.15	9	0.94
152-1220	6.20-6.35	8.00	1.52	6.78	7.49	±0.13	0.51	0.20	14	1.22

Typical Applications

- Gas & steam turbines
- V-Band Coupling
- Very low load flanges or joints with considerable movements



In house lab



In house HT

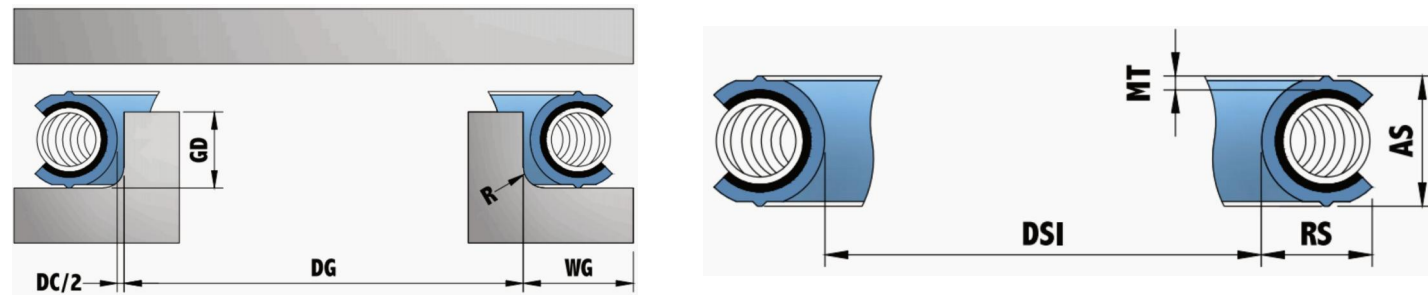


Test Report

Blade Metal C-Ring External Pressure

- Common Metallic Material Options**
 • Aluminum • Silver • Copper • Nickel • SS
Common Plating Options
 • Silver

Groove and Seal Design

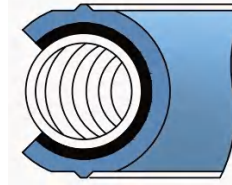


Seal: $DSI = DG + DC + (\text{Plating thickness} \times 2)$
 Groove: $DG = DSI - DC - (\text{Plating thickness} \times 2)$

Groove Finish Recommendation

Groove finish is a critical factor for metal seal. Depend on different medium, Sonkit recommends the following groove surface roughnesses

Medium	For metal seal with plating	For metal seal without plating
Viscous media	Ra = 1.6 – 2.5	Ra = 0.8 – 1.6
Liquid media	Ra = 0.4 – 0.8	Unrecommended
Vacuum/ gases	Ra = 0.2 -0.6	Unrecommended



BCSE

Note: All dimensions are in mm. Performance data is based on Aluminum. Actual performance should be accordingly considered due to various working conditions. For other Materials data, please contact Sonkit Sales. As long as the minimum hardness requirements are upheld, there is typically minimal risk of harming the flange sealing surfaces.

Groove Dimension				Seal Dimension				Performance	
DG	GD	WG	R	RS	AS	M	DC	Load	Compression
Groove Diameter Range (mm)	Groove Depth Range (mm)	Width Groove	Radius (max)	Maximum Radial Section	Axial Section (Free Height)	Tolerance on AS	Material Thickness	N/mm Circumference	Optimum Compression (mm)
19-203	1.85-1.96	3.81	0.38	2.69	2.59	+0.13	0.51	140	0.6
25-407	2.46-2.57	4.57	0.51	3.40	3.30	+0.13	0.76	140	0.7
50-508	3.05-3.15	5.33	0.51	4.09	3.99	+0.13	0.76	140	0.8
76-762	3.84-3.99	6.22	0.51	4.90	4.80	+0.13	0.89	140	0.9
101-762	4.50-4.65	7.11	0.76	5.79	5.59	+0.13	1.02	150	1
127-762	5.51-5.66	8.13	0.76	6.91	6.71	+0.13	1.02	150	1.1

Typical Applications

- Electronic Enclosures • Satellite Systems • Mass Flow Controllers
- Laser & RF Guidance Systems • Chamber Lids • Exhaust Lines



In house lab



In house HT



Test Report

Capabilities & Experience

The metal seal products produced by Sonkit are widely applied including, but not limited to oil and gas Industry, nuclear power equipment, plastic molding, chemicals, aerospace and defense, semiconductor vacuum equipment, pressure pipeline equipment, and a growing variety of industrial equipment.

So far, Sonkit has provided products and services to 2000+ customer in more than 20 countries, include Fortune 500 companies. Our products have been unanimously recognized and praised.



In-house
Heat treatment



In-house
Test lab



Adopted by
Fortune 500



Scan to learn more
about us

Warranty

Specialized in metal seals, Sonkit designs and manufactures resilient metal seals for extreme working conditions. Sonkit Products include Metal O-Rings, Metal C-Rings, spring energized C Rings, Metal V-Rings. They are produced by high quality alloy materials under strict quality control, full traceability, and inspection procedures.

Sonkit works closely with customers to offer pragmatic sealing solutions. Based on established R&D process and customers' feedback, Sonkit is able to design and manufacture desirable seals for given applications.

We strive to manufacture the best-fit products and are confident that our seals will be free of all material or manufacturing defects. Should a mistake being made then we will replace, free of charge, any defective products with the highest priority.

Our warranty is limited to the replacement value of the defective seals only. Any additional or consequential liabilities are not included.

Metal seals' high performance depends on various factors. Installment steps or applications' conditions such as handling, groove size and surface roughnesses are fairly crucial for achieving a desired result.

The seal, being only one part of the sealing solution, Sonkit cannot guarantee any leak rate, nor can we accept any liability for costs following poor sealing results.

However, should the problem be related to faulty parts, Sonkit will offer parts replacement freely.

Except for the general recommendations found in this design manual, we cannot give specific warranties for life-expectancy, leakage rate or other operational parameters.

Customers are always advised to qualify seals, preferably by real life test, or by similarity, in the exact configuration of their intended use.