



9/9T

S-9/9T-A

PTFE WEDGE SEALS

Applications

Type 9 Seals are standard for use where expensive and corrosive liquids are being processed. Wedge construction of the secondary sealing element virtually eliminates leakage. A snap ring holds all parts together in a unitized construction design which eases installation and removal.

- For service in chemical processing, food processing, marine, nuclear service, offshore oil and refinery, petrochemical processing, pharmaceutical, power generation, pulp and paper, wastewater, and water desalination industries.
- Compact design permits use in all types of rotating equipment, such as centrifugal pumps, mixers, agitators, blowers and fans.
- Seals can be repaired easily on-site or at any John Crane Seal Rebuilding Center and/or converted to O-ring seals.

Operating Conditions

- **Temperatures:**
 - 9: -212°C to 400°C/
-350°F to 750°F
 - 9T: -59°C to 260°C/
-75°F to 500°Fdepending on materials used.
- **Pressures:** Up to 24 bar g/350 psig
- **Speeds:** 25 m/s/5000 fpm

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INCH RANGE





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PTFE WEDGE SEALS

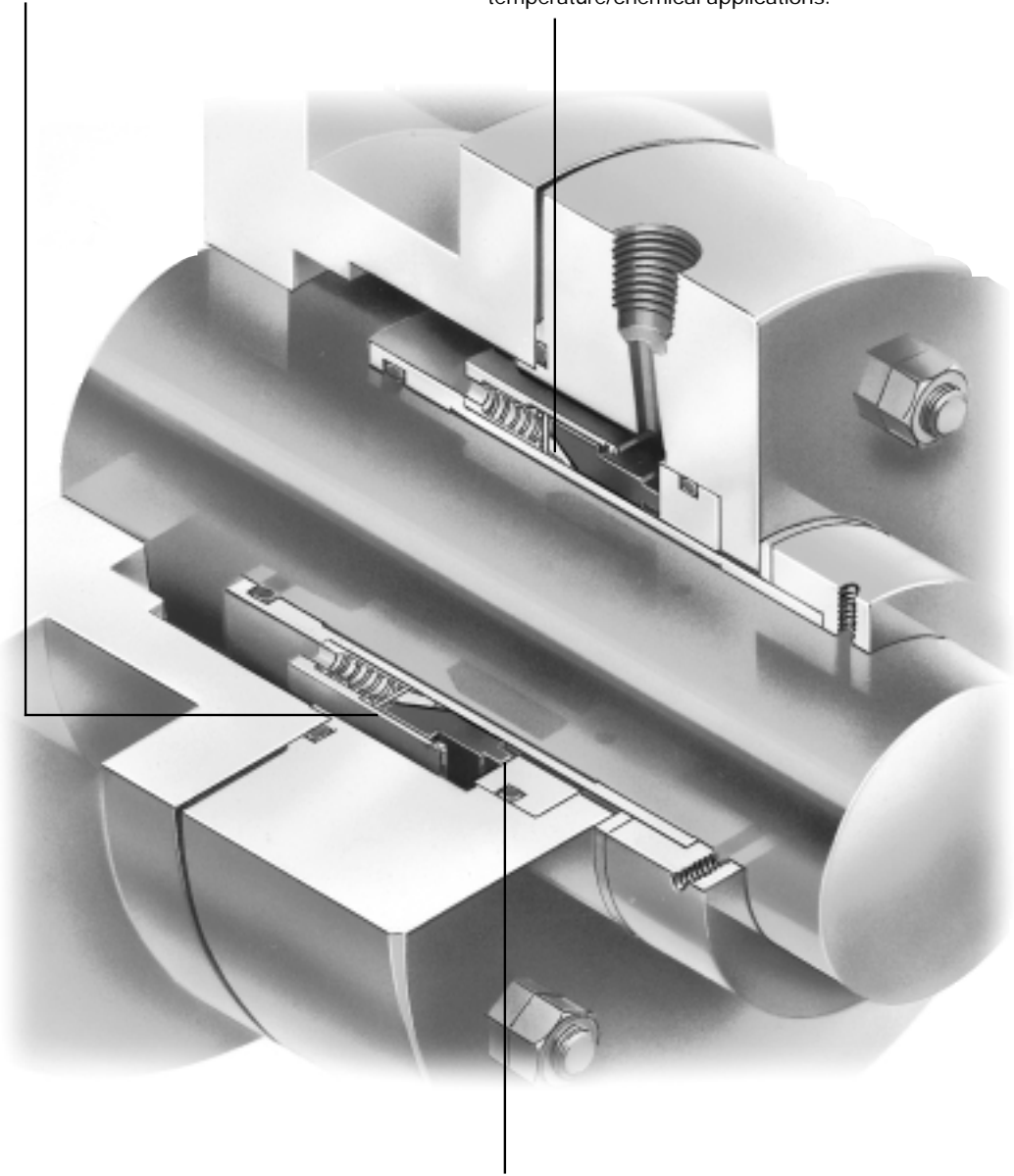
Design Features

Mechanical Drive

Reduces slippage on shaft or sleeve to eliminate galling and premature wear.

Wedge Sealing Member

Available in PTFE and flexible graphite materials. Creates positive seal for use in extreme temperature/chemical applications.



Precision Lapped Sealing Faces

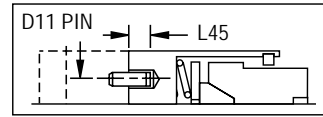
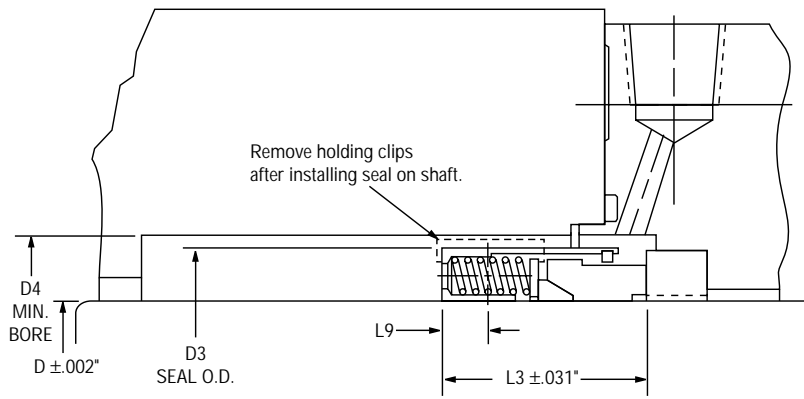
Lapping process results in high precision finish with optimal flatness.

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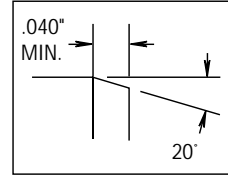


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Type 9 Typical Arrangement/Dimensional Data



(N) number of pins (D12) pin diameter
Pin press fit into collar or impeller.
Engages holes in retainer. Design option standard on Type 9 Seals only.



For ease of installation, the lead-in edge of the shaft or sleeve should be chamfered as shown.

Chart 1. Type 9 Dimensional Data

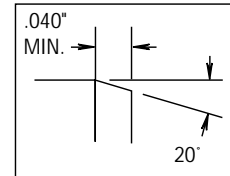
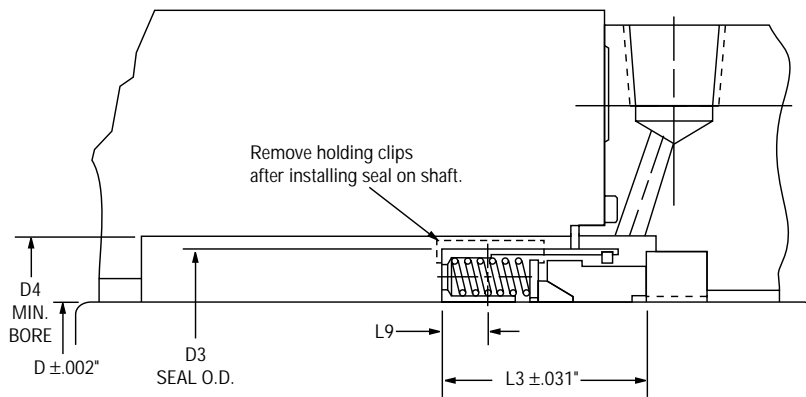
Seal Size/D (inches)	D3	D4	D11	D12	L3	L9	L45	N
0.500	1.031	1.156	.750	.125	.812	.156	.125	1
0.625	1.187	1.312	.890	.125	.750	.156	.125	1
0.750	1.312	1.437	1.015	.125	.875	.187	.125	1
0.875	1.437	1.562	1.125	.125	.937	.187	.125	1
1.000	1.562	1.750	1.265	.125	1.000	.187	.125	1
1.125	1.687	1.875	1.437	.187	1.062	.218	.187	1
1.250	1.875	2.000	1.562	.187	1.062	.187	.187	1
1.375	2.000	2.125	1.687	.187	1.125	.187	.187	1
1.500	2.125	2.250	1.812	.187	1.125	.187	.187	1
1.625	2.375	2.500	2.000	.187	1.375	.187	.187	1
1.750	2.500	2.625	2.125	.187	1.375	.281	.187	1
1.875	2.625	2.750	2.250	.187	1.375	.281	.187	1
2.000	2.750	2.875	2.375	.187	1.375	.281	.187	1
2.125	3.000	3.125	2.562	.250	1.687	.343	.250	1
2.250	3.125	3.250	2.718	.250	1.687	.343	.250	1
2.375	3.250	3.375	2.812	.250	1.687	.343	.250	1
2.500	3.375	3.500	2.968	.250	1.687	.343	.250	1
2.625	3.500	3.625	3.062	.312	1.687	.343	.312	1
2.750	3.625	3.750	3.187	.312	1.687	.343	.312	1
2.875	3.750	3.875	3.312	.312	1.687	.343	.312	1
3.000	3.812	4.000	3.390	.312	1.687	.343	.312	1
3.125	3.937	4.062	3.515	.312	1.687	.343	.312	1
3.250	4.125	4.250	3.687	.312	1.687	.343	.312	1
3.375	4.250	4.375	3.796	.312	1.687	.343	.312	1
3.500	4.375	4.500	3.937	.312	1.687	.343	.312	1
3.625	4.500	4.625	4.046	.312	1.687	.343	.312	1
3.750	4.625	4.750	4.187	.312	1.687	.343	.312	1
3.875	4.750	4.875	4.296	.312	1.687	.343	.312	1
4.000	4.875	5.000	4.421	.312	1.687	.343	.312	1
4.125	5.000	5.125	--	.312	1.687	.343	.312	2
4.250	5.250	5.375	4.781	.187	1.687	.343	.187	2
4.375	5.375	5.500	--	--	1.687	.343	.312	2
4.500	5.500	5.625	4.953	.250	1.687	.343	.250	2
4.625	5.625	5.750	5.046	.250	1.687	.343	.250	2
4.750	5.750	5.875	5.109	.250	1.687	.343	.250	2
4.875	5.875	6.000	5.359	.250	1.687	.343	.250	2
5.000	6.000	6.125	5.484	.250	1.687	.343	.250	2
5.125	6.125	6.260	--	.250	1.687	.343	.250	2
5.250	6.500	6.625	5.750	.250	2.000	.312	.250	2
5.375	6.375	6.750	--	.250	2.000	.312	.250	2
5.500	6.750	6.875	5.984	.250	2.000	.312	.250	2
5.625	6.875	7.000	6.109	.250	2.000	.312	.250	2
5.750	7.000	7.125	6.250	.250	2.000	.312	.250	2
5.875	7.125	7.260	--	.250	2.000	.312	.250	2
6.000	7.250	7.375	6.484	.250	2.000	.312	.250	2



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Type 9T Typical Arrangement/Dimensional Data



For ease of installation, the lead-in edge of the shaft or sleeve should be chamfered as shown.

Chart 2. Type 9T Dimensional Data

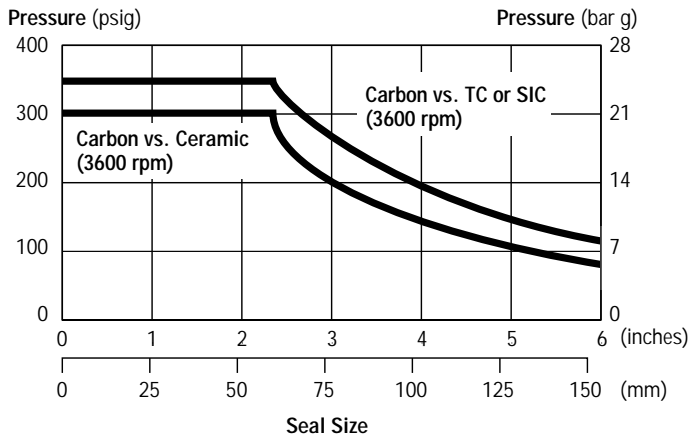
Seal Size/D (inches)	D3	D4	L3	L9
0.500	0.937	1.062	.937	.187
0.625	1.062	1.187	.937	.156
0.750	1.187	1.312	.937	.187
0.875	1.312	1.437	.937	.187
1.000	1.437	1.562	1.000	.187
1.125	1.562	1.687	1.000	.218
1.250	1.687	1.812	1.000	.187
1.375	1.937	2.062	1.375	.187
1.500	1.937	2.062	1.125	.187
1.625	2.250	2.375	1.156	.187
1.750	2.312	2.437	1.375	.281
1.875	2.500	2.625	1.375	.281
2.000	2.625	2.750	1.375	.281
2.125	2.812	2.937	1.687	.343
2.250	2.843	2.968	1.375	.234
2.375	3.000	3.125	1.687	.343
2.500	3.125	3.250	1.375	.234
2.625	3.250	3.375	1.687	.343
2.750	3.375	3.500	1.687	.343
2.875	3.500	3.625	1.687	.343
3.000	3.625	3.750	1.687	.343
3.125	3.750	3.875	1.687	.343
3.250	3.875	4.000	1.687	.343
3.375	4.000	4.125	1.687	.343
3.500	4.125	4.250	1.687	.343
3.625	4.250	4.375	1.687	.343
3.750	4.375	4.500	1.687	.343
3.875	4.500	4.625	1.687	.343
4.000	4.625	4.750	1.687	.375



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Chart 3. Pressure/Velocity (PV) Limits



TC= Tungsten Carbide
SiC = Silicon Carbide

To determine the maximum pressure for the size Type 9 and Type 9T Seal required, multiply the maximum pressure by the factors in Chart 4 to obtain the maximum operating pressure.

Chart 4. Multiplier Factors

	Selection Considerations	Multiplier
Speed	Up to 3600 rpm	x 1.00
	Above 3600 rpm	**
Seal Fluid Lubricity	Gasoline, Kerosene or better	x 1.00
	Aqueous solutions	x .67
Sealed Fluid Temperature	Below 79°C/175°F	x 1.00
	Above 79°C to 121°C/175°F to 250°F	x .90
	Above 121°C to 177°C/250°F to 350°F	x .80
	Above 177°C/350°F	x .65

** Multiplier = 3600/new speed

Example: If new speed = 4000 rpm
Multiplier = 3600/4000 = .90

Example for Determining PV Limits:

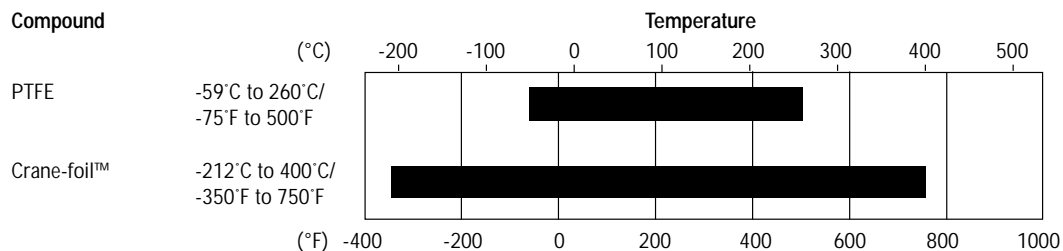
Seal: 51 mm/2 inch diameter Type 9
Product: Water
Face Material: Carbon vs. Tungsten Carbide
Temperature: 16°C/60°F
Speed: 3600 rpm

Using Chart 3, the maximum pressure would be 24 bar g/350 psig.

From Chart 4, apply the multipliers for the specific service requirements to determine the maximum operating pressure for the application.

24 bar g/350 psig x 1 x .67 x 1 = 16 bar g/235 psig
At 3600 rpm with the service conditions noted, a 51 mm/2 inch diameter Type 9 seal has a maximum operating limit of 16 bar g/235 psig. If operating pressure exceeds the PV limit, consult your John Crane Sales/Service Engineer.

Chart 5. Secondary Sealing Temperature Limits





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Chart 6. Materials of Construction

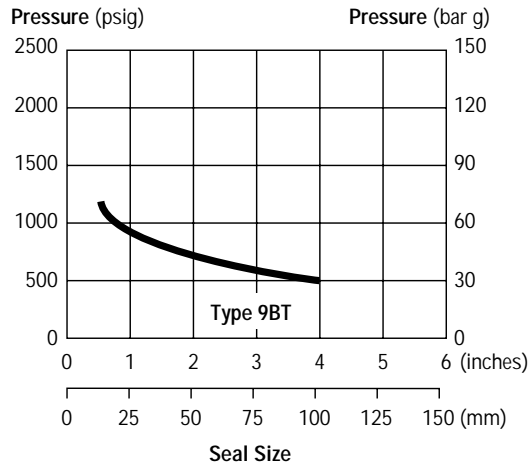
Seal Component Materials		Secondary Sealing Element	Primary Ring	Hardware Retainer, Disc, Snap Ring, Set Screws	Mating Ring	Mechanical Loading Device Springs
Material	Standard	PTFE	Carbon	316 Stainless Steel		316 Stainless Steel
	Options	Crane-foil	Tungsten Carbide Nickel Binder	Monel		Monel
			Solid Silicon Carbide	20 CB-3 SS Alloy 20		20 CB-3 SS Alloy 20
				Hastelloy B*		Hastelloy B*
Alloy C-276 (UNS N10276)	Alloy C-276 (UNS N10276)					

* Hastelloy B is a registered trademark of Haynes International.

Chart 7. Criteria for Installation

Shaft/Sleeve	Limits
Surface Finish	32 Ra
Ovality/Out of Roundness (Shaft)	0.051 mm/0.002"
End Play/Axial Float Allowance	±0.130 mm/0.005"

Chart 8. Hydrostatic Pressure Limits



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