

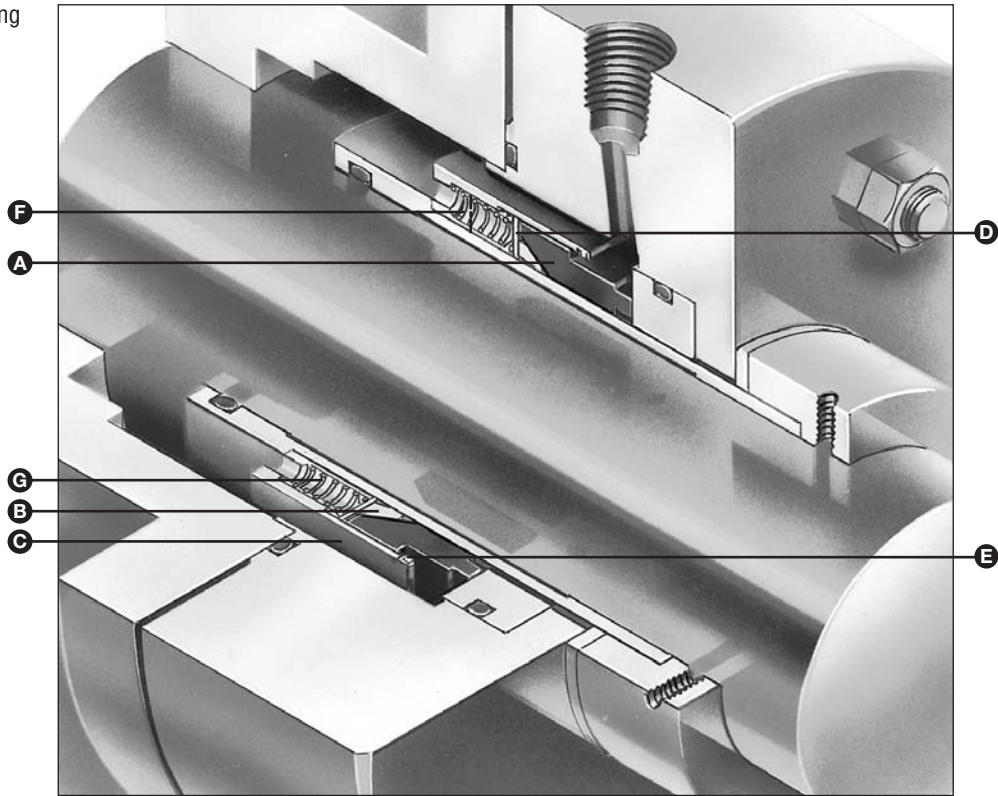


# TYPE 9/9T

## PTFE Wedge Seals

9/9T

- A – Face/Primary Ring
- B – Secondary Seal
- C – Retainer
- D – Disc
- E – Snap Ring
- F – Set Screws
- G – Spring



### Product Description

**Type 9 Seals are standard for use where corrosive liquids are being processed. PTFE Wedge construction of the secondary sealing element provides virtually universal service application. 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.

### 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.

### Performance Capabilities

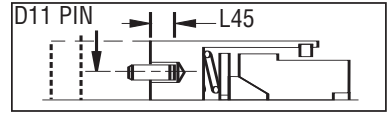
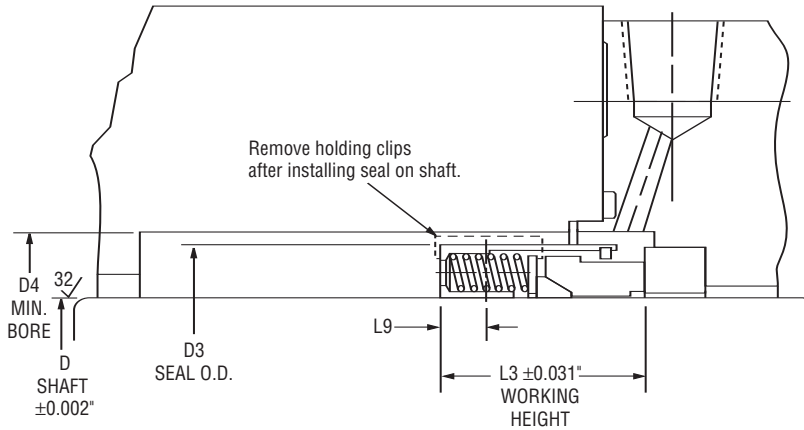
- Temperatures:
  - 9:** -212°C to 400°C/-350°F to 750°F
  - 9T:** -59°C to 260°C/-75°F to 500°F (depending on materials used.)
- Pressures: Up to 24 bar g/350 psig
- Speeds: 25 mps/5000 fpm



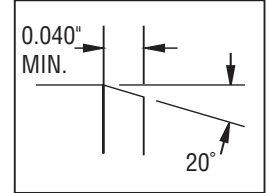
# TYPE 9/9T

## PTFE Wedge Seals

### 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.

### Type 9 Dimensional Data (inches)

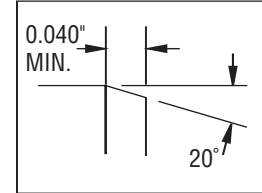
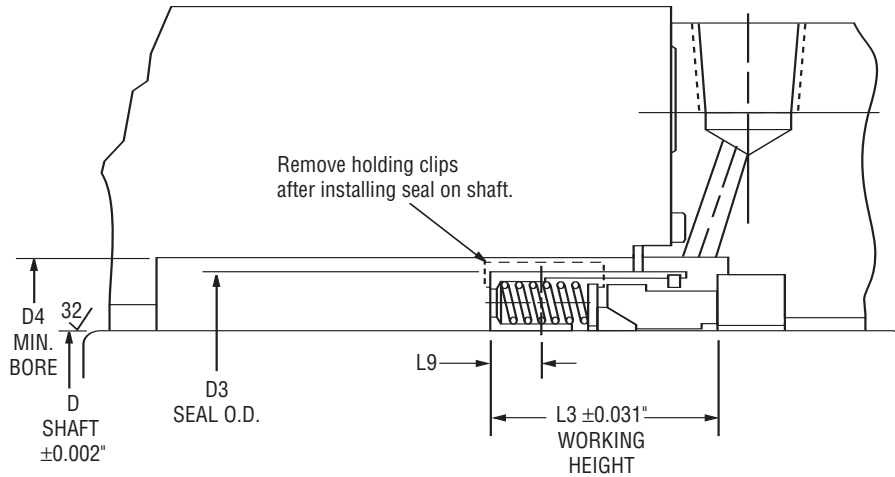
Seal Size/D (inches)	D3	D4	D11	D12	Working Height			N
					L3	L9	L45	
0.500	1.031	1.156	--	--	0.812	0.156	--	--
0.625	1.187	1.312	--	--	0.750	0.156	--	--
0.750	1.312	1.437	--	--	0.875	0.187	--	--
0.875	1.437	1.562	1.140	0.156	0.937	0.187	0.125	1
1.000	1.562	1.750	--	--	1.000	0.187	--	--
1.125	1.687	1.875	1.437	0.187	1.062	0.218	0.187	1
1.250	1.875	2.000	1.562	0.187	1.062	0.187	0.187	1
1.375	2.000	2.125	1.687	0.187	1.125	0.187	0.187	1
1.500	2.125	2.250	1.812	0.187	1.125	0.187	0.187	1
1.625	2.375	2.500	2.000	0.187	1.375	0.187	0.250	1
1.750	2.500	2.625	2.125	0.187	1.375	0.281	0.250	1
1.875	2.625	2.750	2.250	0.187	1.375	0.281	0.250	1
2.000	2.750	2.875	2.375	0.187	1.375	0.281	0.250	1
2.125	3.000	3.125	2.593	0.250	1.687	0.343	0.312	1
2.250	3.125	3.250	2.718	0.250	1.687	0.343	0.312	1
2.375	3.250	3.375	2.843	0.250	1.687	0.343	0.312	1
2.500	3.375	3.500	2.968	0.250	1.687	0.343	0.312	1
2.625	3.500	3.625	3.062	0.312	1.687	0.343	0.312	1
2.750	3.625	3.750	3.187	0.312	1.687	0.343	0.312	1
2.875	3.750	3.875	3.312	0.312	1.687	0.343	0.312	1
3.000	3.812	4.000	3.406	0.312	1.687	0.343	0.312	2
3.125	3.937	4.062	3.531	0.312	1.687	0.343	0.312	1
3.250	4.125	4.250	3.687	0.312	1.687	0.343	0.312	1
3.375	4.250	4.375	3.812	0.312	1.687	0.343	0.312	1
3.500	4.375	4.500	3.937	0.312	1.687	0.343	0.312	1
3.625	4.500	4.625	4.062	0.312	1.687	0.343	0.312	1
3.750	4.625	4.750	4.187	0.312	1.687	0.343	0.312	1
3.875	4.750	4.875	4.312	0.312	1.687	0.343	0.312	1
4.000	4.875	5.000	4.437	0.312	1.687	0.343	0.312	2
4.125	5.000	5.125	4.656	0.312	1.687	0.343	0.312	2
4.250	5.250	5.375	4.781	0.312	1.687	0.343	0.312	2
4.375	5.375	5.500	4.906	0.312	1.687	0.343	0.312	2
4.500	5.500	5.625	4.968	0.312	1.687	0.343	0.312	2
4.625	5.625	5.750	--	--	1.687	0.343	--	--
4.750	5.750	5.875	5.250	0.312	1.687	0.343	0.312	2
4.875	5.875	6.000	5.375	0.312	1.687	0.343	0.312	2
5.000	6.000	6.125	5.500	0.312	1.687	0.343	0.312	2
5.125	6.125	6.260	5.625	0.312	1.687	0.343	0.312	2
5.250	6.500	6.625	5.750	0.312	2.000	0.312	0.312	2
5.375	6.375	6.750	5.875	0.312	2.000	0.312	0.312	2
5.500	6.750	6.875	6.000	0.312	2.000	0.312	0.312	2
5.625	6.875	7.000	6.125	0.312	2.000	0.312	0.312	2
5.750	7.000	7.125	6.250	0.312	2.000	0.312	0.437	2
5.875	7.125	7.260	6.375	0.281	2.000	0.312	0.437	2
6.000	7.250	7.375	6.500	0.281	2.000	0.312	0.437	2



# TYPE 9/9T

## PTFE Wedge Seals

### Type 9T Typical Arrangement/Dimensional Data



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

### Type 9T Dimensional Data (inches)

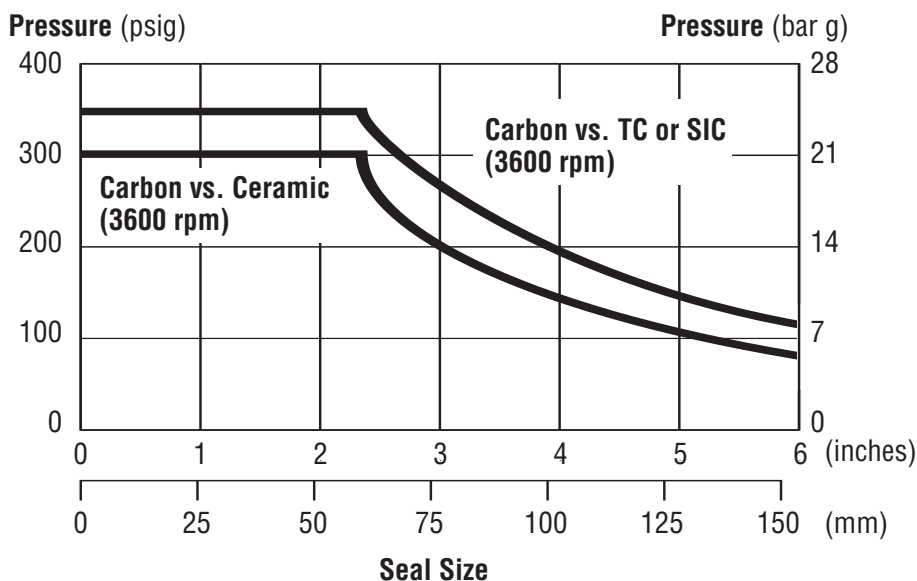
Seal Size/D (inches)	D3	D4	Working Height	
			L3	L9
0.500	0.937	1.062	0.937	0.187
0.625	1.062	1.187	0.937	0.156
0.750	1.187	1.312	0.937	0.187
0.875	1.312	1.437	0.937	0.187
1.000	1.437	1.562	1.000	0.187
1.125	1.562	1.687	1.000	0.218
1.250	1.687	1.812	1.000	0.187
1.375	1.937	2.062	1.375	0.187
1.500	1.937	2.062	1.125	0.187
1.625	2.250	2.375	1.156	0.187
1.750	2.312	2.437	1.375	0.281
1.875	2.500	2.625	1.375	0.281
2.000	2.625	2.750	1.375	0.281
2.125	2.812	2.937	1.687	0.343
2.250	2.843	2.968	1.375	0.234
2.375	3.000	3.125	1.687	0.343
2.500	3.125	3.250	1.375	0.234
2.625	3.250	3.375	1.687	0.343
2.750	3.375	3.500	1.687	0.343
2.875	3.500	3.625	1.687	0.343
3.000	3.625	3.750	1.687	0.343
3.125	3.750	3.875	1.687	0.343
3.250	3.875	4.000	1.687	0.343
3.375	4.000	4.125	1.687	0.343
3.500	4.125	4.250	1.687	0.343
3.625	4.250	4.375	1.687	0.343
3.750	4.375	4.500	1.687	0.343
3.875	4.500	4.625	1.687	0.343
4.000	4.625	4.750	1.687	0.375



# TYPE 9/9T

## PTFE Wedge Seals

### Basic Pressure Ratings



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 Multiplier Factors Chart to obtain the maximum operating pressure.

The Basic Pressure Rating is for a standard Type 9 or 9T seal, as shown in the typical arrangement, when installed according to the criteria given in this data sheet and generally accepted industrial practices.

The Basic Pressure Rating assumes stable operation at 3600 rpm in a clean, cool, lubricating, nonvolatile liquid, with an adequate flush rate. When used with the Multiplier Factors, the Basic Pressure Rating can be adjusted to provide a conservative estimate of the dynamic pressure rating. For process services outside this range or a more precise assessment of the dynamic pressure rating, contact John Crane for more information.

### Multiplier Factors

	Selection Considerations	Multiplier
<b>Speed</b>	Up to 3600 rpm	x 1.00
	Above 3600 rpm	**
<b>Seal Fluid Lubricity</b>	Gasoline, Kerosene or better	x 1.00
	Aqueous solutions	x 0.67
<b>Sealed Fluid Temperature</b>	Below 79°C/175°F	x 1.00
	Above 79°C to 121°C/175°F to 250°F	x 0.90
	Above 121°C to 177°C/250°F to 350°F	x 0.80
	Above 177°C/350°F	x 0.65

\* Multiplier = 3600/new speed

Example: If new speed = 4000 rpm  
Multiplier = 3600/4000 = 0.90

#### Example for Determining Pressure Rating 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 the Basic Pressure Rating chart, the maximum pressure would be 24 bar g/350 psig.

From the Multiplier Factors chart, 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.



# TYPE 9/9T

## PTFE Wedge Seals

### Materials of Construction

SEAL COMPONENTS	MATERIALS	
Description	Standard	Options
Face/Primary Ring	Carbon	Carbon (Nuclear Service) Carbon Severe (Chemical Service) Tungsten Carbide (Nickel Binder) Solid Silicon Carbide
Wedge	PTFE	Flexible Graphite PTFE-Filled
Disc Set Screws Retainer Snap Ring	316 Stainless Steel	Monel® Alloy 20 CB-3 SS Hastelloy B® Alloy C-276 (UNS N10276) Titanium
Springs	316 Stainless Steel	Monel Alloy 20 CB-3 SS Hastelloy B Alloy C-276 (UNS N10276) Titanium

Hastelloy B is a registered trademark of Hayes International.

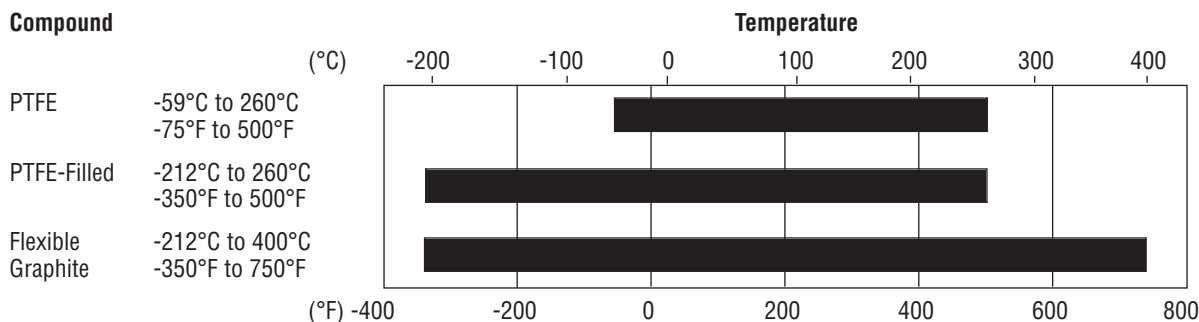
Monel is a registered trademark of Inco Alloys International, Inc.



# TYPE 9/9T

## PTFE Wedge Seals

### Secondary Sealing Temperature Limits



### 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"



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