

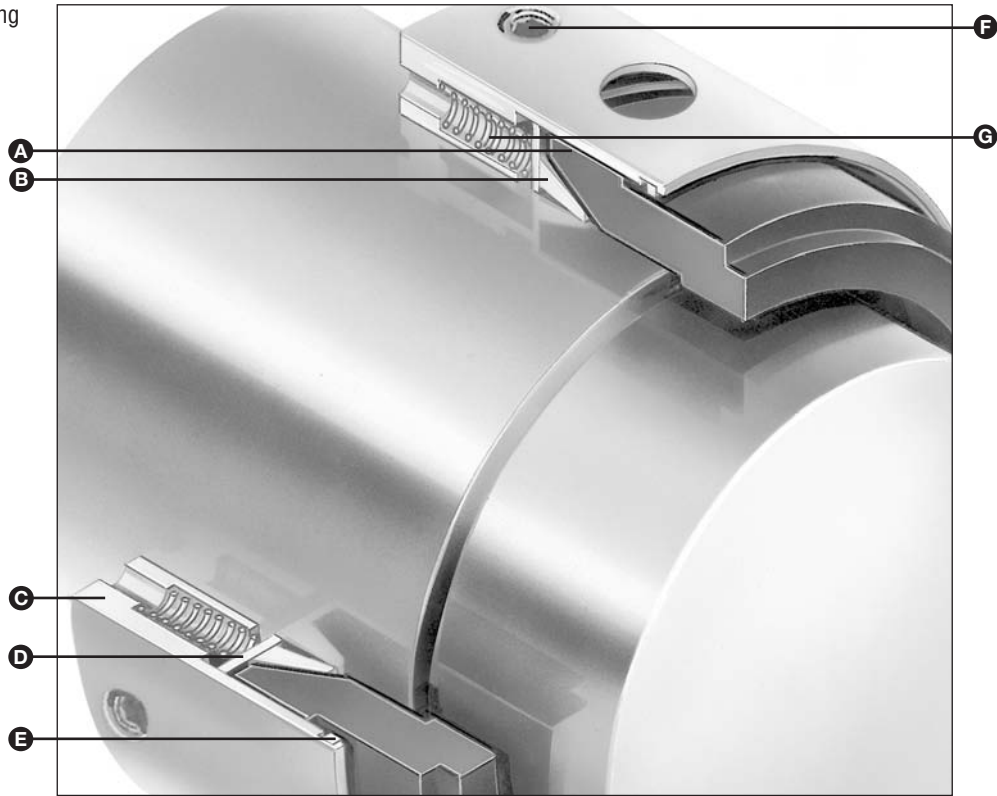


TYPE 9B/9BT

PTFE Wedge Seals

9B/9BT

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



Product Description

Type 9B Seals are standards for use where corrosive liquids are being processed. Wedge construction of the secondary sealing element provides virtually universal service application. All components are held together by a snap ring in a unitized construction design which eases installation and removal. Hydropad seal versions available.

- For extremely corrosive, high pressure fluid applications, such as sulphuric, nitric, phosphoric or hydrochloric acids.
- Compact design permits use in all types of rotating equipment, such as centrifugal pumps, mixers and agitators.

Design Features

- Wedge Sealing Member — available in PTFE and flexible graphite materials. Creates positive seal for use in extreme temperature/chemical applications.
- Balanced Design — positive hydraulic balancing permits use in higher pressures.
- Mechanical Drive — reduces slippage on shaft or sleeve to eliminate galling and premature wear.

Performance Capabilities

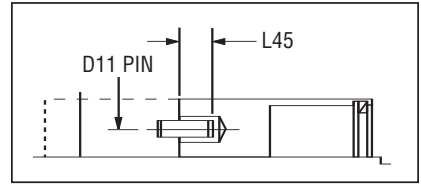
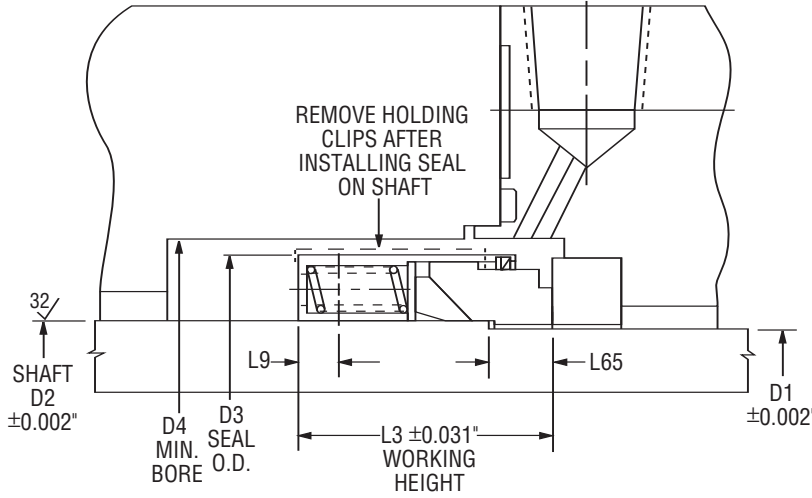
- Temperatures:
 - 9B:** -212°C to 400°C/-350°F to 750°F (depending on materials used)
 - 9BT:** -29°C to 260°C/-20°F to 500°F (depending on materials used)
- Pressures:
 - Up to 52 bar g/750 psig
 - See Basic Pressure Ratings for operating pressures.
 - See Hydrostatic Pressure Limits for hydrostatic pressures.
- Speeds:
 - 25 mps/5000 fpm



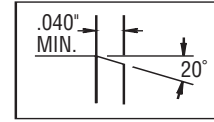
TYPE 9B/9BT

PTFE Wedge Seals

Type 9B Typical Arrangement/Dimensional Data



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



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

Type 9B Dimensional Data (inches)

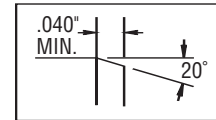
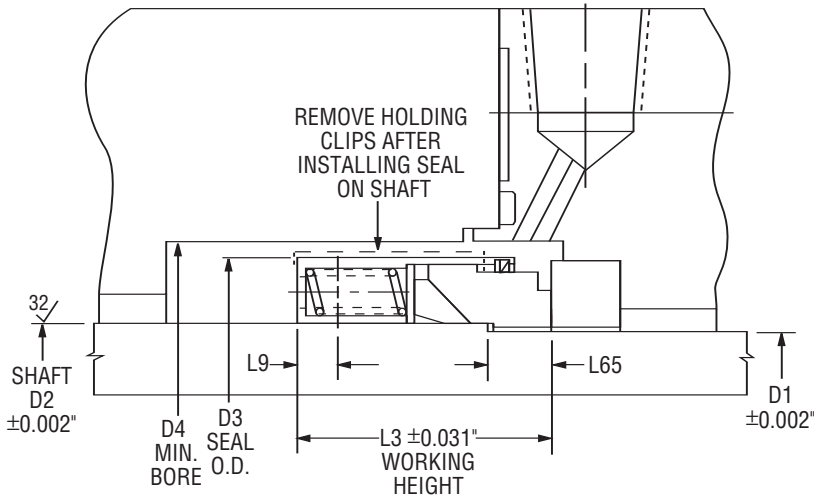
Seal Size (Inches)	Working Height						L3	L9	L45	L65	N
	D1	D2	D3	D4	D11	D12					
1.000	0.875	1.000	1.562	1.750	--	--	1.312	0.187	--	0.343	--
1.125	1.000	1.125	1.687	1.875	1.437	0.187	1.375	0.218	0.187	0.343	1
1.250	1.125	1.250	1.875	2.000	1.562	0.187	1.375	0.187	0.187	0.343	1
1.375	1.125	1.375	2.000	2.125	1.687	0.187	1.437	0.187	0.187	0.343	1
1.500	1.250	1.500	2.125	2.250	1.812	0.187	1.437	0.187	0.187	0.343	1
1.625	1.375	1.625	2.375	2.500	2.000	0.187	1.750	0.281	0.250	0.437	1
1.750	1.500	1.750	2.500	2.625	2.125	0.187	1.750	0.281	0.250	0.437	1
1.875	1.625	1.875	2.625	2.750	2.250	0.187	1.750	0.281	0.250	0.437	1
2.000	1.750	2.000	2.750	2.875	2.375	0.187	1.750	0.281	0.250	0.437	1
2.125	1.875	2.125	3.000	3.125	2.593	0.250	2.062	0.343	0.312	0.500	1
2.250	2.000	2.250	3.125	3.250	2.718	0.250	2.062	0.343	0.312	0.500	1
2.375	2.125	2.375	3.250	3.375	2.843	0.250	2.062	0.343	0.312	0.500	1
2.500	2.250	2.500	3.375	3.500	2.968	0.250	2.062	0.343	0.312	0.500	1
2.625	2.375	2.625	3.500	3.625	3.062	0.312	2.062	0.343	0.312	0.500	1
2.750	2.500	2.750	3.625	3.750	3.187	0.312	2.062	0.343	0.312	0.500	1
2.875	2.625	2.875	3.750	3.875	3.312	0.312	2.062	0.343	0.312	0.500	1
3.000	2.750	3.000	3.812	4.000	3.406	0.312	2.062	0.343	0.312	0.500	2
3.125	2.875	3.125	3.937	4.062	3.531	0.312	2.062	0.343	0.312	0.562	1
3.250	3.000	3.250	4.125	4.250	3.687	0.312	2.062	0.343	0.312	0.562	1
3.375	3.125	3.375	4.250	4.375	3.812	0.312	2.062	0.343	0.312	0.562	1
3.500	3.250	3.500	4.375	4.500	3.937	0.312	2.062	0.343	0.312	0.562	1
3.625	3.375	3.625	4.500	4.625	4.062	0.312	2.062	0.343	0.312	0.562	1
3.750	3.500	3.750	4.625	4.750	4.187	0.312	2.062	0.343	0.312	0.562	1
3.875	3.625	3.875	4.750	4.875	4.312	0.312	2.062	0.343	0.312	0.562	1
4.000	3.750	4.000	4.875	5.000	4.437	0.312	2.062	0.343	0.312	0.562	2
4.125	3.875	4.125	5.000	5.125	4.656	0.312	2.062	0.343	0.312	0.562	2
4.250	4.000	4.250	5.250	5.375	4.781	0.312	2.062	0.343	0.312	0.562	2
4.375	4.125	4.375	5.375	5.500	4.906	0.312	2.062	0.343	0.312	0.562	2
4.500	4.250	4.500	5.500	5.625	4.968	0.312	2.062	0.343	0.312	0.562	2
4.625	4.375	4.625	5.625	5.750	--	--	2.062	0.343	0.312	0.562	--
4.750	4.500	4.750	5.750	5.875	5.250	0.312	2.062	0.343	0.312	0.562	2
4.875	4.625	4.875	5.875	6.000	5.375	0.312	2.062	0.343	0.312	0.562	2
5.000	4.750	5.000	6.000	6.125	5.500	0.312	2.062	0.343	0.312	0.562	2
5.125	4.875	5.125	6.125	6.250	5.625	0.312	2.062	0.343	0.312	0.562	2
5.250	5.000	5.250	6.500	6.625	5.750	0.312	2.375	0.312	0.312	0.625	2
5.375	5.125	5.375	6.625	6.750	5.875	0.312	2.375	0.312	0.312	0.625	2
5.500	5.250	5.500	6.750	6.875	6.000	0.312	2.375	0.312	0.312	0.625	2
5.625	5.375	5.625	6.875	7.000	6.125	0.312	2.375	0.312	0.312	0.625	2
5.750	5.500	5.750	7.000	7.125	6.250	0.312	2.375	0.390	0.437	0.625	2
5.875	5.625	5.875	7.125	7.250	6.375	0.281	2.375	0.390	0.437	0.625	2
6.000	5.750	6.000	7.250	7.375	6.500	0.281	2.375	0.312	0.437	0.625	2



TYPE 9B/9BT

PTFE Wedge Seals

Type 9BT Typical Arrangement/Dimensional Data



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

Type 9BT Dimensional Data (inches)

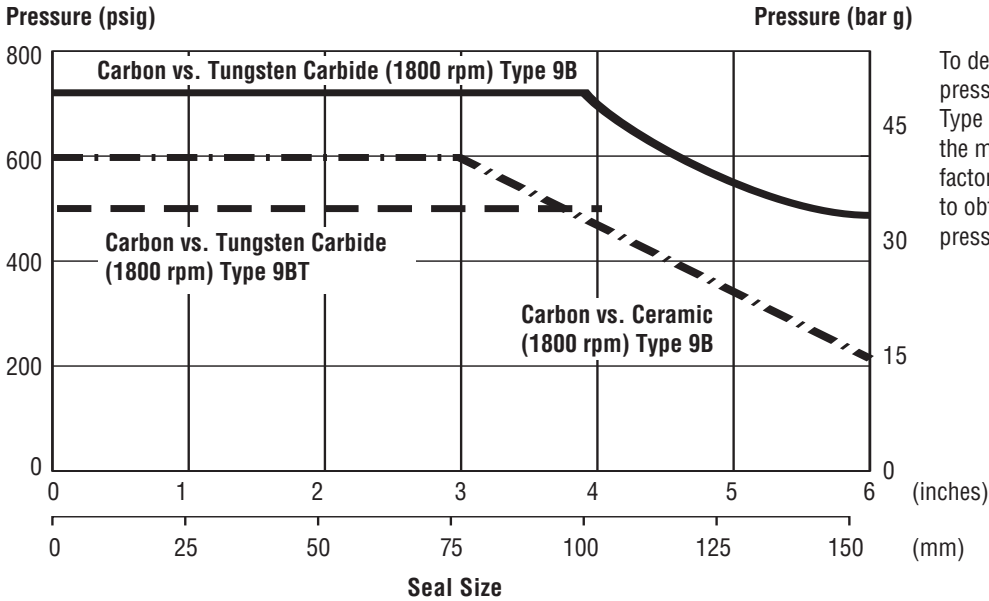
Seal Size (Inches)	D1	D2	D3	D4	Working Height		
					L3	L9	L65
1.000	0.875	1.000	1.437	1.625	1.312	0.187	0.343
1.125	1.000	1.125	1.562	1.750	1.375	0.218	0.343
1.250	1.125	1.250	1.687	1.875	1.375	0.187	0.343
1.375	1.125	1.375	1.937	2.125	1.687	0.187	0.343
1.500	1.250	1.500	1.937	2.125	1.437	0.187	0.343
1.625	1.375	1.625	2.250	2.437	1.593	0.187	0.437
1.750	1.500	1.750	2.312	2.500	1.750	0.281	0.437
1.875	1.625	1.875	2.500	2.687	1.750	0.281	0.437
2.000	1.750	2.000	2.625	2.812	1.750	0.281	0.437
2.125	1.875	2.125	2.812	3.000	2.062	0.343	0.500
2.250	2.000	2.250	2.843	3.031	1.750	0.234	0.500
2.375	2.125	2.375	3.000	3.187	2.062	0.343	0.500
2.500	2.250	2.500	3.125	3.312	1.750	0.234	0.500
2.625	2.375	2.625	3.250	3.437	2.062	0.343	0.500
2.750	2.500	2.750	3.375	3.562	2.062	0.343	0.500
2.875	2.625	2.875	3.500	3.687	2.062	0.343	0.500
3.000	2.750	3.000	3.625	3.812	2.062	0.343	0.500
3.125	2.875	3.125	3.750	3.937	2.062	0.343	0.562
3.250	3.000	3.250	3.875	4.062	2.062	0.343	0.562
3.375	3.125	3.375	4.000	4.187	2.062	0.343	0.562
3.500	3.250	3.500	4.125	4.312	2.062	0.343	0.562
3.625	3.375	3.625	4.250	4.437	2.062	0.343	0.562
3.750	3.500	3.750	4.375	4.562	2.062	0.343	0.562
3.875	3.625	3.875	4.500	4.687	2.062	0.343	0.562
4.000	3.750	4.000	4.625	4.812	2.062	0.343	0.562



TYPE 9B/9BT

PTFE Wedge Seals

Basic Pressure Ratings



To determine the maximum pressure for the size Type 9B and Type 9BT 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 9B or 9BT 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
Speed	Up to 3600 rpm	x 1.00
	Above 3600 rpm	**
Seal Fluid Lubricity	Gasoline, Kerosene or better	x 1.00
	Aqueous solutions	x 0.67
Sealed Fluid Temperature	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 9B

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 52 bar g/750 psig.

From the Multiplier Factors chart, apply the multipliers for the specific service requirements to determine the maximum operating pressure for the application.

$750 \text{ psig} \times 1 \times .67 \times 1 = 503 \text{ psig}$

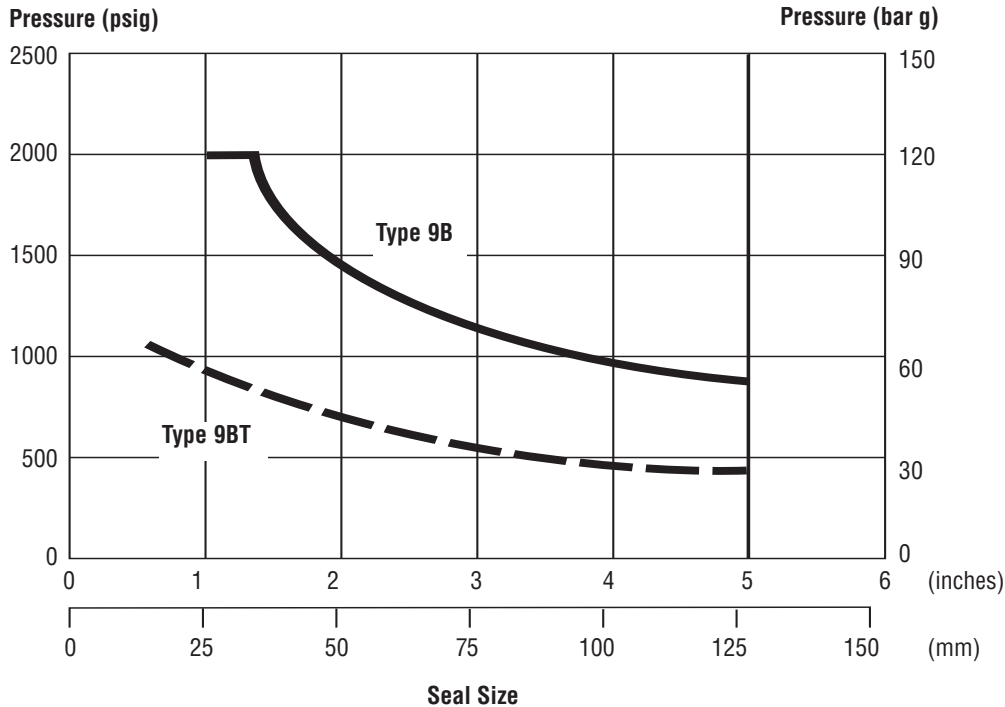
At 3600 rpm with the service conditions noted, a 2 inch diameter Type 9B seal has a maximum operating limit of 35 bar g/503 psig. If operating pressure exceeds the PV limit, consult your John Crane Sales/Service Engineer.



TYPE 9B/9BT

PTFE Wedge Seals

Hydrostatic Pressure Limits



Materials of Construction

SEAL COMPONENTS	MATERIALS	
	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.

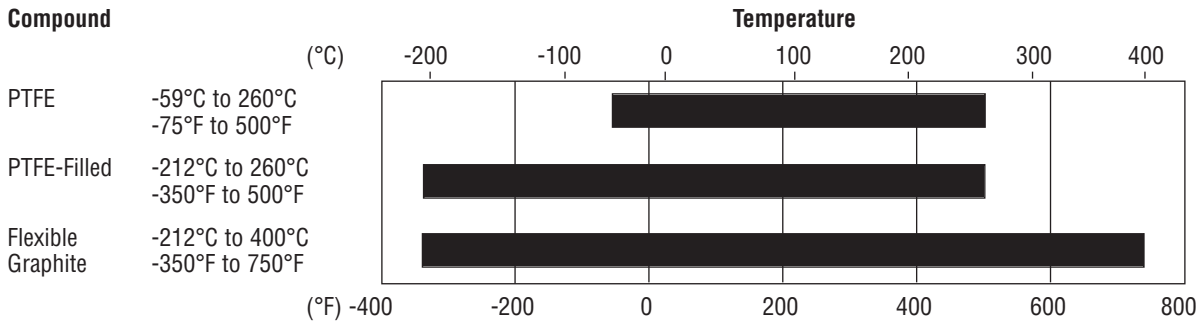
Monel is a registered trademark of Inco Alloys International, Inc.



TYPE 9B/9BT

PTFE Wedge Seals

Secondary Sealing Temperature Limits



Criteria for Installation

Shaft/Sleeve	Limits
Surface Finish	32 Ra
Ovality/Out of Roundness (Shaft)	0.051mm/0.002"
End Play/Axial Float Allowance	±0.13mm/0.005"



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smiths

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