9B/9BT

PTFE WEDGE SEALS

Applications

Type 9B Seals are standards for use where expensive and corrosive liquids are being processed. Wedge construction of the secondary sealing element virtually eliminates leakage. 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.
- Lapping process results in high precision finish with optimal flatness.
- For use in chemical processing, food processing, offshore, oil and refinery, petrochemical processing, power generation, pulp and paper and wastewater industries.
- 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:**
  - **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 with positive hydraulic balancing

  See Chart 3 for operating pressures.

  See Chart 8 for hydrostatic pressures.
- **Speeds:** 25 m/s **/**5000 fpm

9B/9BT

INCH RANGE

9B/9BT

PTFE WEDGE SEALS

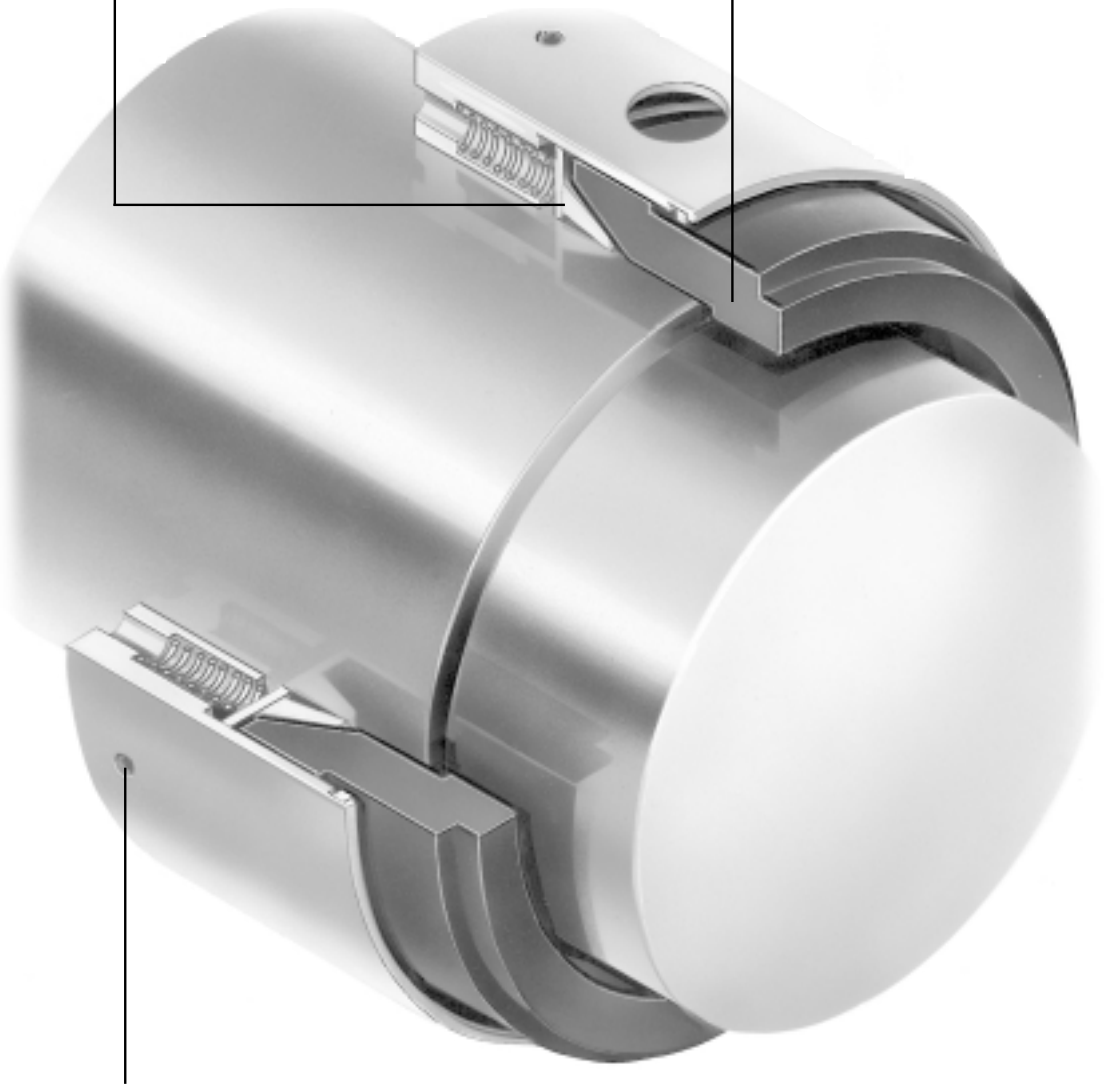
Design Features

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.

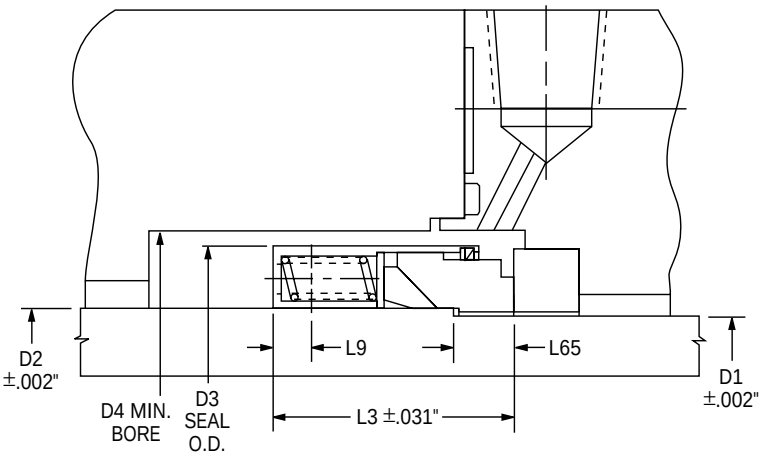


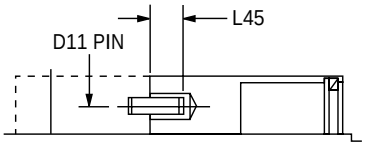
Mechanical Drive

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

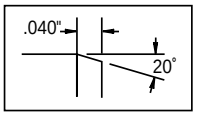
PTFE WEDGE SEALS

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.



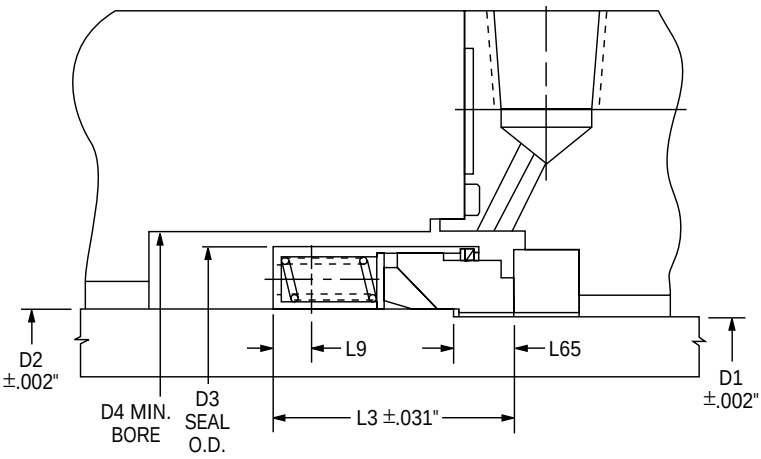
For ease of installation, the lead-in edge of shaft or sleeve should be chamfered as shown.

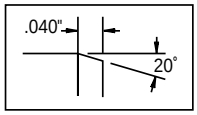
Chart 1. Type 9B Dimensional Data (Inches)

Seal Size (Inches)	D1	D2	D3	D4	D11	D12	L3	L9	L45	L65	N
1.000	0.875	1.000	1.562	1.750	1.265	.125	1.312	.187	.125	.343	1
1.125	1.000	1.125	1.687	1.875	1.437	.187	1.375	.218	.187	.343	1
1.250	1.125	1.250	1.875	2.000	1.562	.187	1.375	.187	.187	.343	1
1.375	1.125	1.375	2.000	2.125	1.687	.187	1.437	.187	.187	.343	1
1.500	1.250	1.500	2.125	2.250	1.812	.187	1.437	.187	.187	.343	1
1.625	1.375	1.625	2.375	2.500	2.000	.187	1.750	.281	.187	.437	1
1.750	1.500	1.750	2.500	2.625	2.125	.187	1.750	.281	.187	.437	1
1.875	1.625	1.875	2.625	2.750	2.250	.187	1.750	.281	.187	.437	1
2.000	1.750	2.000	2.750	2.875	2.375	.187	1.750	.281	.187	.437	1
2.125	1.875	2.125	3.000	3.125	2.562	.250	2.062	.343	.250	.500	1
2.250	2.000	2.250	3.125	3.250	2.718	.250	2.062	.343	.250	.500	1
2.375	2.125	2.375	3.250	3.375	2.812	.250	2.062	.343	.250	.500	1
2.500	2.250	2.500	3.375	3.500	2.968	.250	2.062	.343	.250	.500	1
2.625	2.375	2.625	3.500	3.625	3.062	.312	2.062	.343	.312	.500	1
2.750	2.500	2.750	3.625	3.750	3.187	.312	2.062	.343	.312	.500	1
2.875	2.625	2.875	3.750	3.875	3.312	.312	2.062	.343	.312	.500	1
3.000	2.750	3.000	3.812	4.000	3.390	.312	2.062	.343	.312	.500	1
3.125	2.875	3.125	3.937	4.062	3.515	.312	2.062	.343	.312	.562	1
3.250	3.000	3.250	4.125	4.250	3.687	.312	2.062	.343	.312	.562	1
3.375	3.125	3.375	4.250	4.375	3.796	.312	2.062	.343	.312	.562	1
3.500	3.250	3.500	4.375	4.500	3.937	.312	2.062	.343	.312	.562	1
3.625	3.375	3.625	4.500	4.625	4.046	.312	2.062	.343	.312	.562	1
3.750	3.500	3.750	4.625	4.750	4.187	.312	2.062	.343	.312	.562	1
3.875	3.625	3.875	4.750	4.875	4.296	.312	2.062	.343	.312	.562	1
4.000	3.750	4.000	4.875	5.000	4.421	.312	2.062	.343	.312	.562	1
4.125	3.875	4.125	5.000	5.125	–	.312	2.062	.343	.312	.562	2
4.250	4.000	4.250	5.250	5.375	4.781	.187	2.062	.343	.187	.562	2
4.375	4.125	4.375	5.375	5.500	–	–	2.062	.343	.312	.562	2
4.500	4.250	4.500	5.500	5.625	4.953	.250	2.062	.343	.250	.562	2
4.625	4.375	4.625	5.625	5.750	5.046	.250	2.062	.343	.250	.562	2
4.750	4.500	4.750	5.750	5.875	5.109	.250	2.062	.343	.250	.562	2
4.875	4.625	4.875	5.875	6.000	5.359	.250	2.062	.343	.250	.562	2
5.000	4.750	5.000	6.000	6.125	5.484	.250	2.062	.343	.250	.562	2
5.125	4.875	5.125	6.125	6.250	–	.250	2.062	.343	.250	.562	2
5.250	5.000	5.250	6.500	6.625	5.750	.250	2.375	.312	.250	.625	2
5.375	5.125	5.375	6.625	6.750	–	.250	2.375	.312	.250	.625	2
5.500	5.250	5.500	6.750	6.875	5.984	.250	2.375	.312	.250	.625	2
5.625	5.375	5.625	6.875	7.000	6.109	.250	2.375	.312	.250	.625	2
5.750	5.500	5.750	7.000	7.125	6.250	.250	2.375	.390	.250	.625	2
5.875	5.625	5.875	7.125	7.250	–	.250	2.375	.390	.250	.625	2
6.000	5.750	6.000	7.250	7.375	6.484	.250	2.375	.312	.250	.625	2

PTFE WEDGE SEALS

Type 9BT Typical Arrangement/Dimensional Data





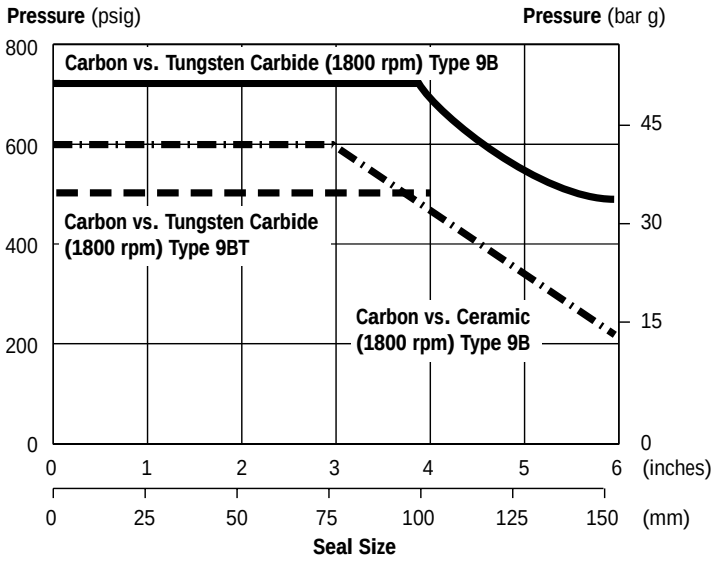
For ease of installation, the lead-in edge of shaft or sleeve should be chamfered as shown.

Chart 2. Type 9BT Dimensional Data (Inches)

Seal Size (Inches)	D1	D2	D3	D4	L3	L9	L65
1.000	0.875	1.000	1.437	1.625	1.312	.187	.343
1.125	1.000	1.125	1.562	1.750	1.375	.218	.343
1.250	1.125	1.250	1.687	1.875	1.375	.187	.343
1.375	1.125	1.375	1.937	2.125	1.687	.187	.343
1.500	1.250	1.500	1.937	2.125	1.437	.187	.343
1.625	1.375	1.625	2.250	2.437	1.593	.187	.437
1.750	1.500	1.750	2.312	2.500	1.750	.281	.437
1.875	1.625	1.875	2.500	2.687	1.750	.281	.437
2.000	1.750	2.000	2.625	2.812	1.750	.281	.437
2.125	1.875	2.125	2.812	3.000	2.062	.343	.500
2.250	2.000	2.250	2.843	3.031	1.750	.234	.500
2.375	2.125	2.375	3.000	3.187	2.062	.343	.500
2.500	2.250	2.500	3.125	3.312	1.750	.234	.500
2.625	2.375	2.625	3.250	3.437	2.062	.343	.500
2.750	2.500	2.750	3.375	3.562	2.062	.343	.500
2.875	2.625	2.875	3.500	3.687	2.062	.343	.500
3.000	2.750	3.000	3.625	3.812	2.062	.343	.500
3.125	2.875	3.125	3.750	3.937	2.062	.343	.562
3.250	3.000	3.250	3.875	4.062	2.062	.343	.562
3.375	3.125	3.375	4.000	4.187	2.062	.343	.562
3.500	3.250	3.500	4.125	4.312	2.062	.343	.562
3.625	3.375	3.625	4.250	4.437	2.062	.343	.562
3.750	3.500	3.750	4.375	4.562	2.062	.343	.562
3.875	3.625	3.875	4.500	4.687	2.062	.343	.562
4.000	3.750	4.000	4.625	4.812	2.062	.343	.562

PTFE WEDGE SEALS

Chart 3. Pressure/Velocity (PV) Limits



To determine the maximum pressure for the size Type 9B and Type 9BT 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	**
Sealed 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 9B

Product: Water

Face Materials: Carbon vs. Tungsten Carbide

Operating Temperature: 16°C/60°F

Operating Speed: 3600 rpm

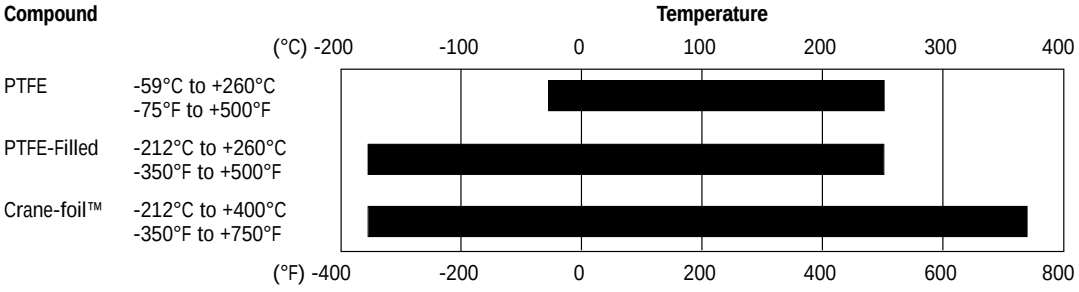
Using Chart 3, the maximum pressure would be 52 bar g/750 psig.

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

750 psig x 1 x .67 x 1 = 35 bar g/503 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.

Chart 5. Secondary Sealing Temperature Limits



9B/9BT

PTFE WEDGE SEALS

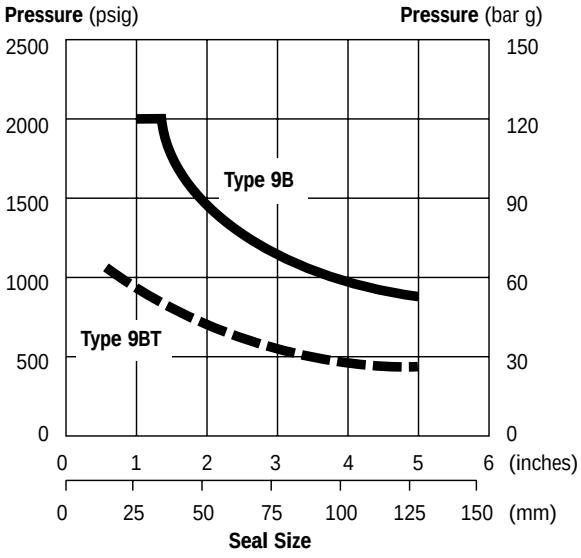
Chart 6. Materials of Construction

Seal Component Materials		Secondary Sealing Elements Wedge/Mating Rings	Primary Ring	Hardware Retainer, Disc, Snap Ring, Set Screw	Mating Ring	Mechanical Loading Device Springs
Material	Standard	**PTFE**	**Carbon**	**316 Stainless Steel**		**316 Stainless Steel**
	Options	**Crane-foil**	**Carbon** FDA Approved Food Service	**20 CB-3-SS** Alloy 20		**20 CB-3-SS** Alloy 20
		PTFE Filled Resin	**Tungsten Carbide** Nickel Binder	**Alloy C-276** (UNS N10276)		**Alloy C-276** (UNS N10276)
			Solid Silicon Carbide			

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	± .13 mm/.005"

Chart 8. Hydrostatic Pressure Limits



John Crane Mechanical Seals
Engineered Sealing Systems

North America
Morton Grove, Illinois USA

Tel: 1-847-967-2400
Fax: 1-847-967-3915
1-800-SEALING

Latin America
Mexico City, Mexico

Tel: 52-5-567-4511
Fax: 52-5-587-2342

Europe, Middle East, Africa
Slough, UK

Tel: 44-1753-224000
Fax: 44-1753-224224

Asia Pacific
Singapore

Tel: 65-222-9161
Fax: 65-223-5035

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice.

©1997 John Crane Mechanical Seals Print 8/97

Web Site: http://www.johncrane.com

ISO 9001 Certified