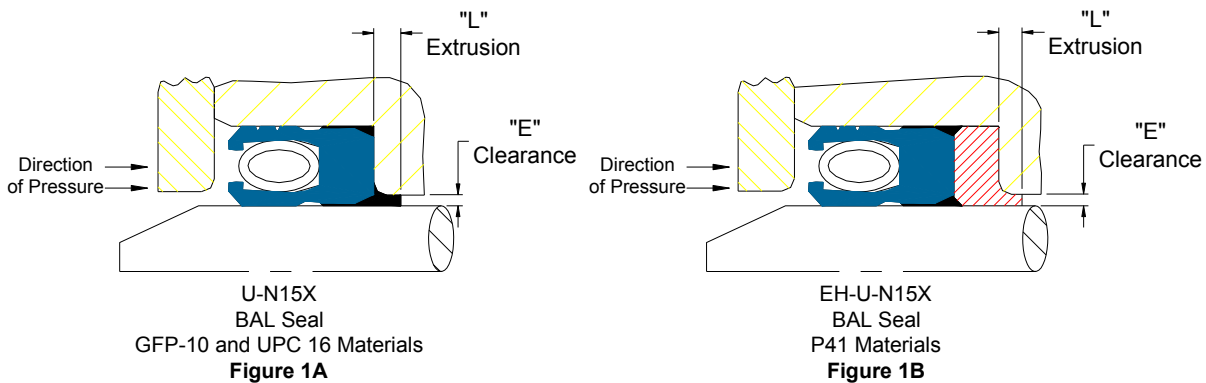


## EXTRUSION LENGTHS OF BAL SEAL® MATERIALS USED IN HIGH-PRESSURE SERVICE

Seals used in plunger pumps are often subject to pressures as high as 30,000 psi (2,109 kg/cm<sup>2</sup>). These seals are subject to extrusion, depending on the temperatures, pressures and radial clearances.

Listed below are the extrusion values of various Bal Seal® materials tested at pressures from 10,000 to 30,000 psi (703 to 2,109 kg/cm<sup>2</sup>). The testing method for Bal Seal UPC-16 and GFP-10 materials is shown in Figure 1A. The testing method for Bal Seal P-41 material is shown in Figure 1B. Test results are shown in Table 1.



Method Used to Test Extrusion of Bal Seal Materials

Material	Pressure PSI (kg/cm <sup>2</sup> )	"E" Clearance Inch (mm)	"L" Extrusion Inch (mm)	Pressure PSI (kg/cm <sup>2</sup> )	"E" Clearance Inch (mm)	"L" Extrusion Inch (mm)
UPC-16	10,000 (703)	0.004 (0.10)	0.0017 (0.043)	15,000 (1,055)	0.004 (0.10)	0.0079 (0.201)
		0.010 (0.25)	0.0028 (0.071)			0.0100 (0.254)
		0.018 (0.46)	0.0038 (0.097)	30,000 (2,109)	0.004 (0.10)	0.0194 (0.493)
GFP-10	10,000 (703)	0.004 (0.10)	0.0037 (0.094)	20,000 (1,406)	0.004 (0.10)	0.0110 (0.279)
		0.010 (0.25)	0.0058 (0.147)			0.0257 (0.653)
		0.018 (0.46)	0.0068 (0.173)			
P-41	30,000 (2,109)	0.004 (0.10)	Not measurable	UPC-16: Ultra-high molecular weight polyethylene GFP-10: Graphite-fiber reinforced PTFE High-performance BAL™ Seal aromatic polymer P-41:		
		0.010 (0.25)	0.0006 (0.015)			
		0.018 (0.46)	0.0011 (0.028)			

FIGURE 2:  
Extrusion of Bal Seal seals and back-up rings when pressure is sustained for sixty minutes at 70°F (21°C) at the pressures and radial clearances indicated

Extrusion increases as pressure and radial clearance ("E") increases. Bal Seal P-41 material has the greatest extrusion resistance. No measurable extrusion was recorded at 30,000 psi (2,109 kg/cm<sup>2</sup>) or at a radial clearance of 0.004 inch (0.10 millimeter). Optimum results are obtained when the seal is supported with a P-41 back-up ring and radial clearances are minimized.

For more information and technical assistance, consult the Technical Sales Department.

PATENTS: The items described in this page include products that are the subject of issued United States and foreign patents or products where patents are pending, including the following: Patents 6,641,141 B2; 7,210,398 B2; 6,161,838; 5,992,856; 5,134,244

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