tech note

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tech note #3

Radial O-ring Static Male Seal Design for external pressure

(Source:Parker O-Ring Handbook, ORD5700)

This issue's tech note provided by
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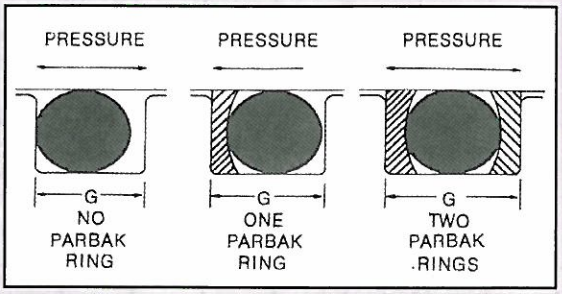
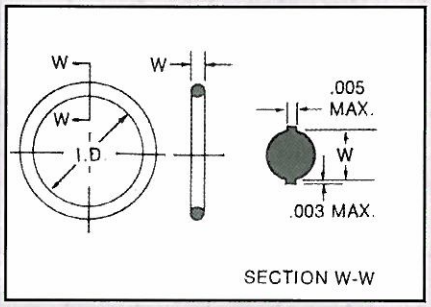
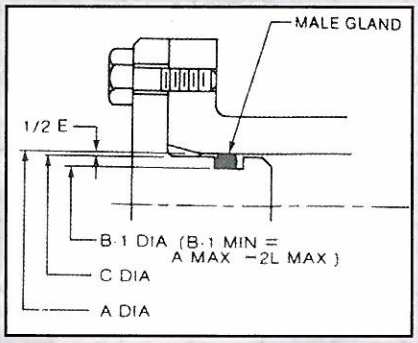
Parker Seals literally wrote the book on O-rings. The Parker O-ring Handbook (ORD5700) is an indispensable reference for ocean engineers. Designers can follow Parkers' short form, where general allowances are given (Parker ORD5700, Design Chart A5-1 (Radial Seals) and Design Chart A5-2 (Face Seals), or refine the design for a specific application.



Radial O-ring seals are used to seal a plug in a bore. These are useful where there is limited cross-sectional dimension for a face seal and load carrying area. The trick is the radial seal gland dimensions require enough diameteral clearance to keep the plug from binding on installation, but close enough to restrict the gap between the plug and bore where the O-ring can fail by extrusion. Higher durometer and larger cross-section O-rings resist extrusion better, lower durometer O-rings are more tolerant of surface imperfections. Parker made it easy to have both features with the invention of the ParBak back-up ring. A 90 durometer back-up ring acts like a backstop to a 70 durometer O-ring. The soft O-ring makes the seal, while the harder back-up ring spans the diameteral clearance gap. Grease should be used sparingly. Make sure the O-ring groove inner wall is thick enough to withstand the shear load applied by the external pressure. A chamfered lead-in to the bore of 10-20 degrees to compress the o-ring will simplify assembly, and prevent unintended damage to the o-ring.





Circular Radial Seal Design flowchart for external pressure
(variables correspond to Parker Handbook *Chart* A5-1, with minimum one back-up ring and values for E, G, L, W and "Squeeze" and "% Squeeze" from Design *Chart* A5-1, values for A, B1, C, and G from Design *Table* A5-1, and values for ID, OD, and "O-ring Vol" from Design *Tabie* B6.)

Tubing Bore ID, T = _____
A (Bore dia.) ≤T = _____
W = cross-section dia. = _____
O-RING SIZE: _____
C= Plug OD = _____
OD nom. = O-ring OD (ref, Table B6, Col. 17) = _____
ID = O-ring ID (ref, Table B6, Col. 18) = _____
E = Diameteral Clr (Recom.) = _____
Diameteral Clr (Calc.) = A-C = _____
L = Overall Gland depth (ref.) = _____
F = groove depth = (L-(E/2)) = _____
G = Groove width, with 0, 1 or 2 back-up ring(s) (ref.) = _____
B1 = Groove ID = _____
Squeeze (recom.) = _____
Squeeze (calc.) = (W-L) = _____
% Squeeze (ref.) = _____
% Squeeze (calc.) = Squeeze (calc.)/W) x 100% = _____
Stretch (recom.) = 0-3% OK, over 5% is not recommended
(More on stretch, ORD 5700, Chapter A4)
The Parker O-ring Handbook (ORD 5700) may be downloaded at :
www.parker.com/literature/ord_5700_parker_o-ring_handbook.pdf

Use of DeepSea Power & Light's free program, "Under Pressure" (http://www.deepsea.com/tools.html) will assist the designer in determining optimal pressure case dimensions.