

ISO 9001:2000		TOLERANCES FOR INCH SEALS		
Bore Diameter inch	Press-Fit Allowance		Tolerance	
	Metal Case	Rubber O.D.	Metal Case	Rubber O.D.
UNDER 1.000		+0.006		
1.001-2.000	+0.004	+0.007	+/-0.002	+/-0.003
2.001-3.000		+0.008		
3.001-4.000		+0.010	+/-0.002	+/-0.003
4.001-6.000	+0.005		+0.003/-0.002	+/-0.004
6.001-8.000	+0.006		+0.004/-0.002	+/-0.004
8.001-10.000			+0.006/-0.002	
10.001-20.000	+0.008		+0.010 / -0.002	+/-0.004

ISO 9001:2000		TOLERANCES FOR METRIC SEALS	
Bore Diameter mm	Metal Case		Rubber O.D.
	UNDER 50.00	+0.10 / +0.20	
50.01-80.00	+0.13/+0.23		+0.20/+0.35
80.01-120.00	+0.15/+0.25		
120.01-180.00	+0.18/+0.28		+0.25/+0.45
180.01-315.00	+0.20/+0.30		
315.01-500.00	+0.23/+0.35		0

ISO 9001:2000		WIDTH TOLERANCES FOR BOTH INCH AND METRIC SEALS		
Inch Seals	Tolerance		Metric Seals	Tolerance
	inch			mm
UNDER 0.313	+/-0.008		UNDER 8	+/-0.20
0.314-0.472	+/-0.012		8.01-12	+/-0.30
0.473-0.709	+/-0.016		12.01-18	+/-0.40
OVER 0.710	+/-0.20		OVER 18	+/-0.50

ISO 9001:2000		PRESS-FIT ALLOWANCE AND PERMISSIBLE ECCENTRICITY OF SEAL O.D.		
Bore Diameter mm	Press-Fit Allowance		Permissible Eccentricity	
	Metal Case	Rubber O.D.		
UNDER 50.00	+0.10/+0.20	+0.15/+0.30	0.25	
50.01-80	+0.13/+0.23	+0.20/+0.35	0.35	
80.01-120	+0.15/+0.25		0.50	
120.01-180	+0.18/+0.28	+0.25/+0.45	0.65	
180.01-300	+0.20/+0.30		0.80	
300.1-500.00	+0.23/+0.35	+0.30/+0.55	1.00	

Damage of the sealing lip is the most common cause for oil seal failures and leakages. The most common way for the sealing lip to become damaged is misalignment of the oil seal. Misalignment can cause serious damage during shaft rotation by eccentricity on the shaft and housing, or insufficient concentricity of the seal body.

### Eccentricity on Shaft and Housing

Eccentricity of the housing is not as bad as eccentricity of the shaft (shaft whip), since the latter involves alternating displacement of the sealing lip at a frequency determined by the shaft speed. There is a limit to the speed of recovery of the displaced sealing lip, so that the higher the shaft speed, the less the shaft eccentricity which can be accommodated without leakage.

### Insufficient Concentricity of Seal Body

In many cases, shaft surface will be damaged due to uneven spring force of insufficient concentricity of seal body. Therefore, the permissible eccentricity of the seal O.D. is necessary. See table 1&2.

ISO 9001:2000	ECCENTRICITY IN INCH SIZES	
Bore Diameter	Metal	Rubber
inch	O.D.	
Up to 1.000	0.05	0.10
1.001-2.000	0.06	0.12
2.001-3.000		0.14
3.001-4.000	0.07	0.18
4.001-6.000	0.09	0.23
6.001-8.000	0.12	TBA
8.001-9.000	0.15	
9.001-10.000	0.15	

ISO 9001:2000	ECCENTRICITY IN METRIC SIZES	
Bore Diameter	Metal	Rubber
mm	O.D.	
Up to 25.00	0.13	0.25
25.01-50.00	0.15	0.30
50.01-75.00		0.36
75.01-100.00	0.18	0.46
100.01-150.00	0.23	0.58
150.01-200.00	0.30	TBA
200.01-225.00	0.38	
225.01-250.00	0.38	