

# THRUST LOAD CALCULATIONS

## Special Materials

If circlips or grooves are produced in materials other than those shown in the catalog, then thrust load figures must be adjusted accordingly.

## Groove

Groove materials may, in practice, vary considerably from our accepted norm of 'MILD STEEL.' The adjacent table shows typical figures for other common materials.

Multiply the catalog figure by conversion factor to obtain the modified groove thrust capacity:  
 $Tg' = Tg \times Cfg$

For intermediate materials, groove capacity may be obtained by ratio method.

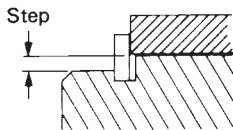
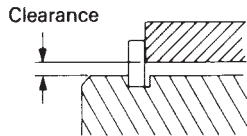
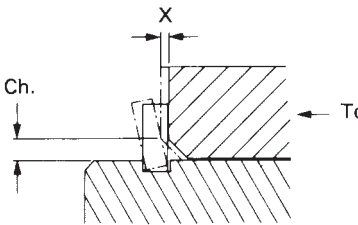
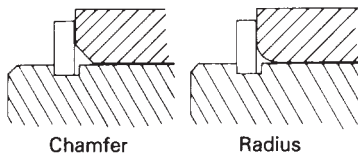
i.e.  $Tc' = Tc \times \frac{Y'}{Y}$  (Actual)  
 Y (Catalog)

## Circlip

Conversion factors are listed in adjacent table for special circlip materials. Multiply the catalog figure by conversion factor to obtain modified thrust capacity:  
 $Tc' = Tc \times Cfc$

Material	Code	Conversion Factor-Circlip Cfc
Stainless	RS	0.95
	AS	0.95
	SS	0.85
Beryllium Copper Phosphor Bronze	BC	0.6
	PB	0.4

Groove Material	Ultimate Tensile Strength Kg/mm <sup>2</sup>	Yield Strength			Approx. Hardness BHN	Conversion Factor-Groove Cfg
		ib/in <sup>2</sup>	Kg/mm <sup>2</sup>	N/mm <sup>2</sup>		
Hardened Steel	125	145,000	100	980	360	3.25
Mild Steel	47	45,000	31.5	300	125	1.0
Cast Iron	32	32,000	22.5	220	85	0.73
Brass (cold rolled)	47	60,000	43.0	420	125	1.4
Brass (soft)	35	18,500	13.0	130	110	0.43
Zinc Alloy	30	21,500	15.0	147	80	0.47
Aluminum	20	18,000	12.7	125	65	0.42



## Radiused, Chamfered Abutment

Where possible, radiused or chamfered abutment should be avoided since the load bearing capacity will be significantly reduced.

If chamfered or radiused parts must be used, then the allowable thrust load will be reduced in proportion to the chamfer depth or radius.

The thrust load for a given corner break may be calculated as follows:

$$Tc = \frac{X \cdot \pi \cdot E \cdot t^3 \ln\left(1 + \frac{2b}{c}\right)}{6 \cdot L^2}$$

Where:

- X=Acceptable component deflection
- L=Ch+0.05mm OR 0.75R=0.05mm
- In=Natural log.

Elastic Modulus:

E=204100 N/mm<sup>2</sup> for Carbon Spring Steel

Note that where there is a larger clearance between shaft/bore and retained part or a step in the shaft/bore, then these situations should be treated in the same way as the chamfered abutment.

## Impact Loading

The maximum acceptable impact load for a circlip assembly may be determined by the use of the following formula:

### Circlip

$$Tci = \frac{Tc \cdot t}{2} \text{ N.m. (ft.lb)}$$

### Groove

$$Tgi = \frac{Tg \cdot d}{2} \text{ N.m. (ft.lb)}$$

Tc=Catalog thrust load circlip N (lb)

Tg=Catalog thrust load groove N (lb)

t=Circlip thickness converted to meters (feet)

d=Groove depth converted to meters (feet)