RETAINING RING MANUFACTURERS CROSS REFERENCE BY SERIES

	ARCON	WALDES	I.R.R.	ROTOR CLIP	MILITARY STANDARD
	N1300	N5000	3000	HO	MS16625**
	1400	5100	3100	SH	MS16624**
	1308	5008	4000	HOI	MS16627**
	1408	5108	4100	SHI	MS16626**
	1460	5160	7200	SHR	MS 3217**
	5560*	5560*	5560*	SHM	—
	1540	5144	1200	RE	MS 3215**
	1500	5133	1000	E	MS16633**
	1800	5103	2000	C	MS16632**
	5107	5107	5107	LC	MS90708**
	5304	5304	5304	PO	—
	T5304	T5304	T5304	POL	—
	1501	5131	1001	BE	MS16634**
	1301	N5001	3001	BHO	MS16629**
	1401	5101	3101	BSH	MS16628**
	N1302	N5002	N5002	VHO	MS16631**
	1402	5102	5102	VSH	MS16630**
	1440	5555	7100	SHF	MS90707**
	1465	5115	5115	TX	—
	1405	5105	6100	TY	—
	5590*	5590*	5590*	not offered	—
	5900*	5900*	5900*	not offered	—
	1305	5005	5005	TI	—

DIN METRIC RETAINING RINGS

	ARCON	WALDES	DIN	ROTOR CLIP	SEEGER
	D1300	D1300	472	DHO	J
	D1400	D1400	471	DSH	A
	D1500	D1500	6799	DE	RA
	M1465	M1465	M1465	DTX	ZA

* Available on Special Order Only.

** Military Standard References have a four digit dash number.
The first digit identifies the material and finish.
The last three digits indicate the size of the ring.

eg:MS 16625 -1025=1300-25 CD (Carbon Steel, Cadmium Dichromate) (We no longer supply)
2025=1300-25 ZD (Carbon Steel, Zinc Dichromate)
3025=1300-25 PP (Carbon Steel, Standard Phosphate)
4025=1300-25 AS (Stainless Steel, Passivate)
5025=1300-25 C (Beryllium Copper)

MATERIALS AND FINISHES

Material	Availability	Interchangeability Code			
		Anderton	Truarc	IRR	Rotor Clip
Carbon Steel (SAE1060-1090) Austempered for maximum performance. Maximum recommended operating temperatures for rings: 480°F (300°F under severe stress).	**All rings except** 1400 sizes 12 thru 23 1500 size 4 Series 500 thru 1000 (hard drawn carbon steel, work hardened and stress relieved)	S	S	ST	ST
Stainless Steel* PH 15-7 Mo (Armco) Precipitation hardened. Withstands all dilute non-acidic chemicals. The most effective material for long term resistance to industrial atmospheres. Maximum recommended operating temperatures for rings: 1000°F (850°F under severe stress).	N1300 sizes 25 thru 150 1308 sizes 75 thru 150 1400 sizes 25 thru 200 1408 sizes 50 thru 200 1440 all sizes 1460 sizes 39 thru 66 1500 all sizes except 4 1501, 1540, 1800 all sizes Other series & sizes on application	AS	H	SS2	SS2
Beryllium Copper* Alloy 25 Precipitation hardened. Poor resistance to industrial atmospheres but widely used in marine applications. Maximum recommended operating temperatures for rings: 660°F for limited period of time.	N1300 sizes 25 thru 150 1308 sizes 75 thru 150 1400 sizes 12 thru 200 1408 sizes 50 thru 200 1440 all sizes 1460 sizes 39 thru 66 1500, 1501, 1540, 1800 all sizes Other series & sizes on application	BC	C	BC	BC

*Not all sizes in Stainless Steel and Beryllium Copper in stock — inquire for availability.

Finish	Suitability	Interchangeability Code			
		Anderton	Truarc	IRR	Rotor Clip
Phosphate	Zinc-based coating sealed with lanolin-based oil. Provides added shelf-life plus a measure of protection in corrosive environments. Used as the standard finish for several PP series of rings. Coating weight in excess of 1000 mg/ft^2.	PP	PP	PA	PA
Bright Zinc*	Forms a barrier between the steel substrate and the corrosive environment. It is preferentially attacked, forming sacrificial anodes in the circuit made by its contact with the steel. Superior to Cadmium in general industrial use and considerably less expensive. Should not be used in conjunction with alkaline solutions, hot water or steam. Though not as toxic as Cadmium, it is not recommended for use where prolonged contact with foodstuffs is involved.	ZP	Z	ZB	ZF
Zinc Dichromate** (Yellow)		ZD	ZD	ZD	ZD

*Bright finish rings are clear passivated to improve resistance to finger stains and normal darkening during storage.
**Dichromate is a post-plating process, improving corrosion resistance and restricting the formation of "white rust" on Zinc plated surfaces under humid conditions. It has a yellowing effect on the finish.

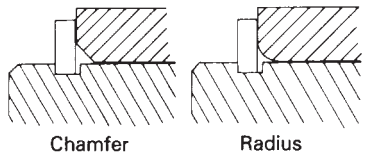
THRUST LOAD CALCULATIONS

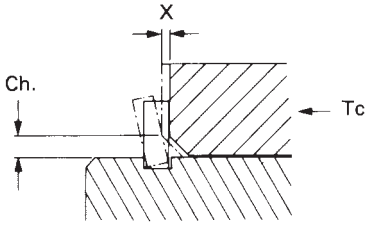
Special Materials
If circlips or grooves are produced in materials other than those shown in the catalog, then thrust load figures must be adjusted accordingly.

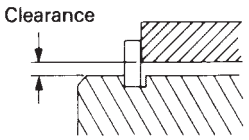
Groove
Groove materials may, in practice, vary considerably from our accepted norm of 'MILD STEEL.' The adjacent table shows typical figures for other common materials.

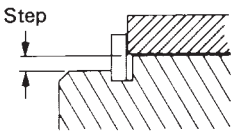
Multiply the catalog figure by conversion factor to obtain the modified groove thrust capacity: Tg'=Tg × Cfg.

For intermediate materials, groove capacity may be obtained by ratio method.
i.e. $Tc' = \frac{Tc \times Y'}{Y}$ (Actual / 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 × Cfc.

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

Groove Material	Ultimate Tensile Strength Kg/mm²	Yield Strength			Approx. Hardness BHN	Conversion Factor-Groove Cfg
		ib/in²	Kg/mm²	N/mm²		
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:

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

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

Elastic Modulus:
E=204100 N/mm² 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
$Tci = \frac{Tc.t}{2}$ N.m.(ft.lb)

Groove
$Tgi = \frac{Tg.d}{2}$ 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)